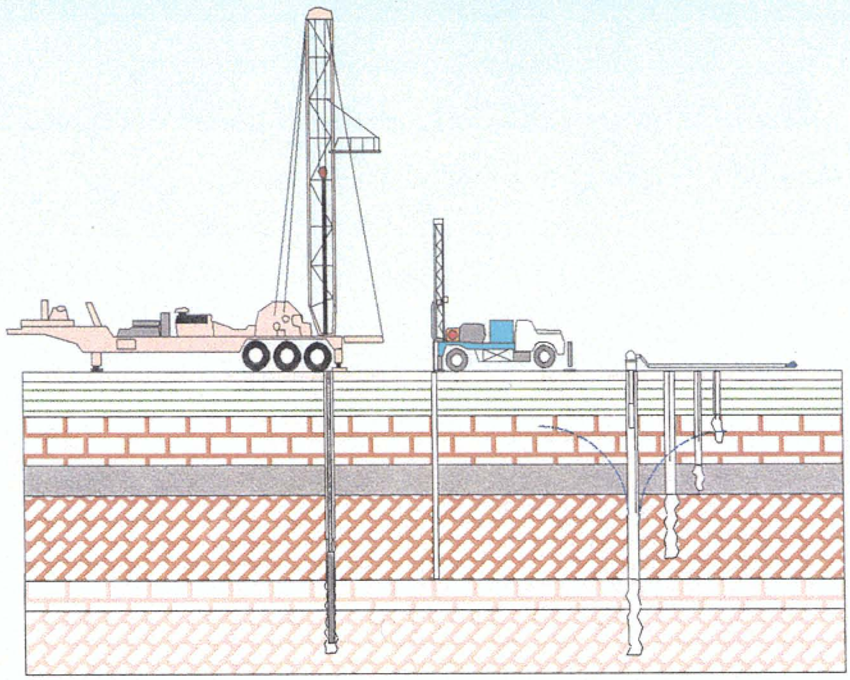
# ROMP 9.5
# INTERMEDIATE AQUIFER SYSTEM
## MONITOR WELL SITE
## DESOTO COUNTY, FLORIDA

PHASE ONE

# CORE DRILLING AND TESTING




Geohydrologic Data Section
Resource Data Department
**Southwest Florida Water Management District**



December 1998

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The geological evaluations and interpretations contained in the *ROMP 9.5 Core Drilling and Testing Report* have been prepared by or approved by a certified Professional Geologist in the State of Florida, in accordance with Chapter 492, Florida Statutes.

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Date: 12-21-1998

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**CORE DRILLING AND TESTING**

By Michael T. Gates

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## 1.O INTRODUCTION

The ROMP (Regional Observation and Monitor-well Program) 9.5 Intermediate Aquifer System (IAS) monitor well site is the pilot site for a joint project between the Southwest Florida Water Management District (District) and United States Geological Survey (USGS). The project will determine the regional hydrogeologic framework of the intermediate aquifer system in West Central Florida.

The intermediate aquifer system is present in the southern half of the District. The IAS covers approximately 5,000 square miles, roughly the same area as the Southern Water Use Caution Area (SWUCA) shown in Figure 1. The SWUCA was established by the District in October 1992 because of increasing concerns about over pumping and saltwater intrusion. The SWUCA includes all of DeSoto, Hardee, Manatee, and Sarasota Counties and parts of Charlotte, Highlands, Hillsborough, and Polk Counties (SWFWMD, 1993).

Drilling, testing, and monitor well construction at ROMP 9.5 was planned in two phases. The data collected is presented as a two phase report: *Phase One* - ***Core Drilling and Testing*** and *Phase Two* - ***Monitor Well Construction and Aquifer Performance Testing.*** The first phase, exploratory coring from land surface to 543 feet (ft) below land surface (bls), began November 1996 and was completed in March 1997. The next phase of work, monitor well construction and aquifer performance testing (APT) was initiated in May 1997 and was completed in February 1988. This report, ***Phase One - Core Drilling and Testing***, presents the data collected from the core drilling and testing at ROMP 9.5. Additional information on the intermediate aquifer system will be presented in a USGS report by G. L. Barr entitled *Hydrogeology and Geochemistry of the Intermediate Aquifer System in Southern Florida, with Emphasis in Charlotte, DeSoto, and Sarasota Counties* scheduled for publication in July 1999.

## 2.0 SITE LOCATION

The ROMP 9.5 well site is located in DeSoto County, northeast of the city of Northport on the R.V. Griffin Reserve (Figure 2). The well site is located in Section 31, Township 38 South, Range 23 East at latitude: 27° 7' 59" longitude: 82°3' 20" at a surface elevation of 38 feet above the National Geodetic Vertical Datum of 1929 (NGVD) (Figure 3). The ROMP 9.5 monitor well site diagram is presented in Figure 4.

## 3.0 DATA COLLECTION METHODS

Hollow-stem auger, wire-line coring, and mud rotary drilling methods were used to collect lithologic and aqueous samples with depth. The hollow-stem auger method was used initially in the unconsolidated sediments. The wire-line coring method was employed after encountering competent limestone. The mud-rotary method was used to install casing at various locations in order to advance the core-hole. A wire-line deployed, off-bottom packer, and a 2-inch submersible pump were used to collect the ground-water samples while coring. All ground-water samples were collected in accordance with ROMP water quality sampling protocol.

### 3.1 LITHOLOGIC SAMPLING

Drilling at ROMP 9.5 during the coring phase of work was performed with the District-owned Central Mine Exploration (CME) 75 core drilling rig. Continuous core was collected from land surface to 543 ft bls from November 1996 to March 1997. Figure 5 presents a diagram of the wire-line coring apparatus.

Ten-inch hollow-stem augers and a six-inch split spoon sampler were used to collect continuous lithologic samples from land surface to 38 ft bls. Solidified shell and clay was encountered at 38 ft bls terminating the auger hole. The auger hole was then converted to a four-inch polyvinyl-chloride (PVC) deep surficial aquifer monitor well (Figure 6).

A new 13-inch diameter borehole was drilled to 43 ft bls using the mud-rotary method. Eight-inch diameter PVC was installed to 43 ft bls and grouted in place. Four inch diameter temporary HW steel casing was installed inside the eight inch PVC to 43 feet bls and seated in the grout. Wire-line coring began at 43 feet bls inside the four inch steel HW casing. Three-inch outside diameter (OD) NQ core rods were used to collect the approximate two-inch diameter core. The core was collected continuously and retrieved at five foot intervals. Coring continued to 148 ft bls, then the four inch HW casing was removed and a six inch borehole was advanced from 43 ft bls to 143 ft bls. The HW casing was re-installed to 143 ft bls and wire-line coring resumed. Wire-line coring continued in this borehole to a depth of 543 ft bls. Coring was terminated at 543 feet bls in the Suwannee Limestone after confirming the top of the Upper Floridan aquifer at 468 feet bls. Figure 7 presents the configuration of the core hole during coring.

### 3.2 GROUND-WATER SAMPLING

Ground-water samples were collected using an inflatable, off-bottom packer developed for use in the NQ core rods. The packer allowed the collection of discrete water quality samples and head levels. During coring the core was examined for visual porosity features. Packer test intervals were determined in the field based on core sample lithology. Following installation of the packer, a submersible pump was installed inside the core rods and the sample was collected from the pump discharge. Figure 8 presents a diagram of the packer.

The ground-water samples were collected at approximate 20 feet intervals during wire-line coring. The samples were split and one sample was analyzed in the field for temperature, specific conductance, pH, chloride, sulfate, and density, while the other sample was delivered to the District Environmental Chemistry Laboratory for more extensive analyses. Chain-of-Custody forms were used to track the samples. Tables 1 and 2 present the results of the sample analyses. Results of the ground-water samples analyses are discussed in Section 6.0.

### 3.3 HYDRAULIC TESTING

Core hole water levels were measured daily while coring through the surficial, intermediate, and Upper Floridan aquifers. The daily core hole water level measurements are presented in Table 3. During packer testing, water level changes were measured with pressure transducers and recorded with a data logger. The specific capacity of the test intervals were calculated and are presented in Table 4. The drawdown and recovery curves of each test interval are presented in Appendix A.

Several core samples were sent to the Florida Geological Survey (FGS) for vertical permeability and porosity analysis. The FGS performed falling-head permeameter tests on 10 core samples selected from ROMP 9.5. The samples (2-inch diameter by 3 to 6 inches in length) were from permeable and confining units within the intermediate and Upper Floridan aquifers. Table 5 presents the hydraulic values obtained from the permeameter tests.

### 3.4 GEOPHYSICAL LOGGING

Borehole geophysical logs were collected at ROMP 9.5 during various stages of drilling and well construction. Geophysical logs were used to delineate stratigraphic units, characterize water quality, and determine grouting requirements. Figure 9 presents the geophysical logs run during the core drilling phase. All logs were run with the District's digital geophysical logging equipment and are archived with the ROMP 9.5 File of Record. Geophysical logs for ROMP 9.5 can also be found on the GeoSys™ statewide database.

## 4.0 GEOLOGY

The ROMP 9.5 well site is located within the Gulf Coastal Lowlands physiographic province, a division of the Mid-Peninsular zone of the Florida Peninsula (White, 1970). The well site is within the District Peace River Hydrologic Basin and is located approximately four miles west of Horse Creek, a tributary of the Peace River (Figure 1).

### 4.1 STRATIGRAPHY

The ROMP 9.5 well site stratigraphy was defined from lithologic descriptions of the core samples collected during core drilling from land surface to 543 feet bls. Figure 10 depicts the geology and hydrogeology described at the ROMP 9.5 well site. The lithologic log for ROMP 9.5 is presented in Appendix B.

#### 4.1.1 Undifferentiated Surficial Deposits

The Pliocene to Recent age undifferentiated surficial deposits are the uppermost geologic unit at the ROMP 9.5 well site. This unit is comprised of very fine to medium grained, unconsolidated, quartz sand, with some inter-bedded silt, clay and organic matter. The undifferentiated surficial deposits extend from land surface to 11.5 feet bls.

### 4.1.2 Tamiami Formation

The Tamiami Formation, Pliocene to Pleistocene in age, underlies the undifferentiated surficial deposits and extends from 11.5 feet bls to 34 feet bls. The Tamiami is comprised of fine to coarse quartz sand, phosphatic sand, and mollusc shell beds.

### 4.1.3 Peace River Formation

The Peace River Formation is a lower Pliocene to Miocene age marine siliciclastic unit that lies unconformably below the Tamiami Formation at ROMP 9.5. The Peace River Formation is part of the Hawthorn Group sediments described by Scott (1988). In the area of ROMP 9.5 the Peace River Formation is comprised of a thin sequence of siliciclastic sediments extending from 34 feet bls to 53 feet bls. Quartz sand, phosphatic sand and gravel, clay, and limestone lenses comprise the Peace River sediments at ROMP 9.5.

### 4.1.4 Arcadia Formation

The Arcadia Formation, part of the Hawthorn Group is middle-Miocene in age and underlies the Peace River Formation. The Arcadia Formation as described by Scott (1988), consists primarily of limestone and dolostone with some quartz sand, clay and phosphate grains. In the area of ROMP 9.5 the Arcadia Formation extends from 53 feet bls to 454 feet bls and is characterized by moderately indurated calcarenite, inter-bedded quartz sand, phosphatic sand and gravel, and some clay and dolostone. Foram, mollusk, and echinoid molds are common and account for the high permeability in the middle part of the unit.

The Tampa Member of the Arcadia Formation was described from 224 feet bls to 254 feet bls at ROMP 9.5. The Tampa Member is composed of fossiliferous limestone with some minor interbedded quartz and phosphatic sand and dolostone. Undifferentiated Arcadia is present between the overlying Tampa Member and the underlying Nocatee Member.

The Nocatee Member of the Arcadia Formation was described from 398 feet bls to 454 feet bls. The Nocatee consists of limestone with interbedded silt-sized dolostone, quartz sand and phosphatic sand and clay. At the ROMP 9.5 site, the Nocatee Member was mostly fine grained, waxy, and of low permeability.

#### 4.1.5 Suwannee Limestone

The Suwannee Limestone is Oligocene in age and extends from 454 feet bls to more than 543 feet bls (coring was stopped at 543 feet bls) at the ROMP 9.5 well site. The Suwannee Limestone is distinguished from the overlying Arcadia Formation by the absence of phosphatic sediments. The Suwannee consists of a chalky, fossiliferous, limestone alternating with thin beds of clay, dolostone, and quartz sand. Limestone beds are primarily sandy, clayey calcarenite, poor to moderate induration with varying permeability.

## 5.0 HYDROLOGY

The ROMP 9.5 well site hydrogeology was defined during initial wire-line coring. Aquifer systems were delineated from lithologic descriptions of permeable and non-permeable units, potentiometric levels, and water quality data collected during drilling. Changes in water levels were recorded while core drilling through the various aquifers. Figure 11 presents a graph of the water levels versus depth while drilling from land surface to the total cored depth of 543 feet bls.

### 5.1 SURFICIAL AQUIFER

The surficial aquifer at ROMP 9.5 is unconfined and extends from land surface to approximately 38 feet bls. Organics, silt, and quartz sand of the undifferentiated surficial deposits and quartz and phosphatic sands from the Tamiami and Peace River Formations form the surficial aquifer. The base of the surficial aquifer (38 feet bls) is formed by a lens of compact shell and clay. The water level in the surficial aquifer measured 1.7 feet bls (36.3 feet NGVD) in December 1997.

### 5.2 INTERMEDIATE AQUIFER SYSTEM

The intermediate aquifer system is a confined aquifer system located between the overlying surficial aquifer system and the underlying Upper Floridan aquifer system. In DeSoto County and other nearby counties, as many as three separate permeable artesian zones have been described within the intermediate aquifer system (Duerr and Enos, 1991). At ROMP 9.5 in DeSoto County, two confined permeable zones were delineated within the intermediate aquifer system. Both permeable zones occur in the Arcadia Formation. The intermediate aquifer system is approximately 430 feet thick and extends from 38 feet bls to 468 feet bls.

In a report by Barr (1996) the uppermost permeable zone in the intermediate aquifer system, Permeable zone 1, is described as a transmissive unit lying just above the Venice Clay but hydraulically separated from the surficial aquifer. Neither the Venice Clay nor the Permeable zone 1 was identified at ROMP 9.5.

The uppermost confined permeable zone identified at ROMP 9.5 extends from 61 feet bls to 77 feet bls in the Arcadia Formation. This unit may be equivalent to the "Tamiami-upper Hawthorn Aquifer" described by Wolansky (1983) and/or the Permeable zone 2 unit described by Barr (1996). A monitor well (MW-18) was constructed in this zone as a water supply well for coring. Water levels in this well were occasionally above land surface causing the well to flow slightly when uncapped. During the core drilling phase, numerous water level changes were noted in this well. This was an indication of offsite pumping of a well or wells tapping this zone. The potentiometric surface of this zone measured 3.1 feet bls (34.9 feet NGVD) in December 1997. Figures 12 and 13 present potentiometric maps of the Tamiami-upper Hawthorn zone of the IAS for May and September 1997.

The major permeable zone of the IAS at ROMP 9.5 occurs in the Arcadia Formation from 200 feet bls to 330 feet bls. A thick sequence of carbonates from 77 feet bls to 200 feet bls creates the confining unit between the upper IAS permeable zones and this lower permeable zone. This highly transmissive unit is comprised of fossiliferous limestone of the Arcadia Formation. This zone is probably equivalent to the Permeable zone 3 described by Barr (1996). The potentiometric surface of this unit measured 5.6 feet above land surface (43.6 feet NGVD) in December 1997. Figures 14 and 15 present potentiometric maps of the intermediate aquifer for May and September 1997.

### 5.3 UPPER FLORIDAN AQUIFER

The Upper Floridan aquifer in the vicinity of ROMP 9.5 is approximately 1,300 feet thick (Metz, 1995). The top of the Upper Floridan aquifer occurs approximately 14 feet below the top of the Oligocene Age Suwannee Limestone at approximately 468 feet bls. A rise in the head level was noted at 468 feet bls during coring. Coring and data collection was terminated at 543 feet bls in the Suwannee Limestone. The potentiometric surface of the Upper Floridan aquifer at ROMP 9.5 measured 8.6 feet above land surface (46.6 feet NGVD) in December 1997. Figures 16 and 17 present potentiometric maps of the Upper Floridan aquifer for May and September 1997.

## 6.0 GROUND-WATER QUALITY

Ground-water samples were collected from the intermediate and Upper Floridan aquifers at 20 feet intervals while core drilling. All samples were collected with a 2-inch diameter submersible pump installed inside the core drill rods, with the off-bottom packer installed at a selected test interval. This packer/pump configuration is illustrated in Figure 8. The field analyses and laboratory analyses of the ground-water samples are presented in Tables 1 and 2, respectively. Figure 18 presents a graph of the chloride, sulfate, and total dissolved solids (TDS) concentrations of the ground-water samples collected.

### 6.1 SURFICIAL AQUIFER

Ground-water samples were not collected from the surficial aquifer at ROMP 9.5 during the core drilling phase. A ground-water sample was collected in 1997 from the completed shallow surficial monitor well MW-4 (screened interval 2 to 8 feet bls) at the well site. Water quality in the surficial aquifer for most parameters is within potable limits. Chloride, sulfate, and TDS concentrations were 58 mg/L, 5 mg/L, and 432 mg/L, respectively.

### 6.2 INTERMEDIATE AQUIFER SYSTEM

Ground-water samples were collected from several packer tests intervals while core drilling through the intermediate aquifer (38 feet bls to 468 ft bls) at ROMP 9.5.

Ground-water samples were collected from packer tests performed in the upper permeable zone (61 to 77 feet bls) and in the confining units above the lower permeable zone. The water quality samples collected from these intervals were within potable standards for most parameters. Chloride concentrations ranged from 75 mg/L at 61 feet bls to 78 mg/L at 148 feet bls. Sulfate concentrations ranged from 51 mg/L at 61 feet bls to 86 mg/L at 148 feet bls. TDS concentrations ranged from 374 mg/L at 61 feet bls to 483 mg/l at 148 feet bls.

Ground-water samples were collected from packer tests in the lower permeable zone (200 feet bls to 330 feet bls) and from the confining units above the Upper Floridan (330 feet bls to 468 feet bls). The water quality samples collected from these intervals were generally within potable standards for most parameters. Iron concentrations exceeded potable standards and ranged from 0.3 mg/L to 0.7 mg/L. Chloride concentrations ranged from 102 mg/L at 188 feet bls to 63 mg/L at 468 feet bls. Sulfate concentrations ranged from 29 mg/L at 188 feet bls to 196 mg/L at 468 feet bls. TDS concentrations ranged from 423 mg/l at 188 feet bls to 561 mg/l at 468 feet bls.

### 6.3 UPPER FLORIDAN AQUIFER

One ground-water sample was collected by packer testing in the Upper Floridan while core drilling at ROMP 9.5. The packer test interval was 493 feet bls to 513 feet bls for this sample. The water quality in this zone exceeds potable standards for several parameters. The chloride, sulfate, and TDS concentrations were 75 mg/L, 286 mg/L, and 748 mg/L, respectively.

## 7.0 HYDRAULIC DATA

Specific capacity measurements were collected during all packer tests. The measurements were made in the permeable and confining units of the intermediate and Upper Floridan aquifers. The specific capacity varied from 0.01 gallons per minute/foot (gpm/ft) for a confining zone in the Arcadia to 0.55 gpm/ft for a permeable zone in the Suwannee Limestone (Table 4).

Porosity and vertical hydraulic conductivity values were calculated for 10 core samples collected while drilling in the intermediate and Upper Floridan aquifers at ROMP 9.5. Core samples exhibiting low and high porosity features were selected, to determine relative confining properties between and within permeable zones in the intermediate and Upper Floridan aquifers. The vertical hydraulic conductivity values ranged from 9.42 x $10^{-4}$ feet/day for a core sample collected in the upper permeable zone of the IAS to 2.47 x $10^{-2}$ feet/day for a confining zone in the IAS. Porosity values ranged from a low of 28% for a permeable zone core sample to a high of 52 % for a core sample collected in a confining zone. The results of the porosity and permeameter testing are presented in Table 5. The results of the testing indicate the variable nature of the sedimentary units. The vertical hydraulic values and porosity percentages are highest in the confining zones. The lowest values were measured in core samples collected from permeable units. Additional hydraulic data collected from aquifer performance tests will be presented in the ROMP 9.5 report: ***Phase Two -Aquifer Performance Testing.***

## 8.0 SUMMARY

Core drilling and testing, the first phase of a hydrogeologic investigation was conducted at the ROMP 9.5 IAS monitor well site from November 1996 to March 1997. The wire-line coring method was used to collect continuous lithologic core from land surface to 546 ft bls for description and stratigraphic correlation. Ground-water samples were collected at 20 foot intervals during coring to characterize the water quality in the intermediate and Upper Floridan aquifers. Water levels were measured daily, while coring in the surficial, intermediate and Upper Floridan aquifers. Daily logs prepared by the site geologist are presented in Appendix C.

The results of the coring investigation indicate the ROMP 9.5 well site is underlain by an unconfined surficial aquifer (land surface to 38 feet bls), an artesian intermediate aquifer with two separate permeable zones (61 feet bls to 77 feet bls, and 200 feet bls to 330 feet bls) and the artesian Upper Floridan aquifer (468 feet bls to > 543 ft bls). Water quality in the surficial aquifer is generally good with most parameters within potable limits. Ground-water samples collected from the intermediate aquifer system were generally within potable limits. One ground-water sample collected from the Upper Floridan aquifer exceeded most parameters for drinking water standards.

## 9.0 REFERENCES


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# FIGURES

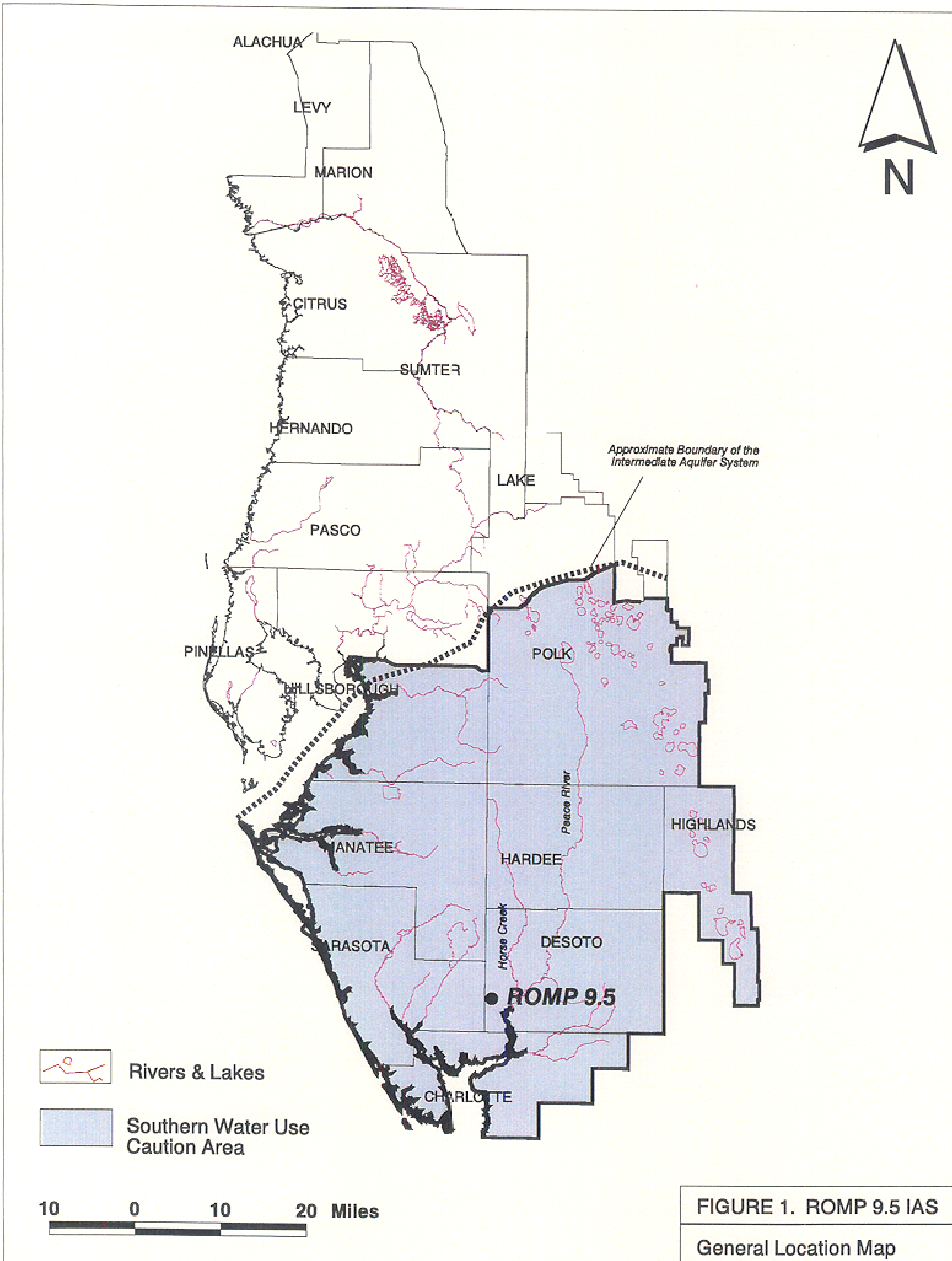


FIGURE 1. ROMP 9.5 IAS

General Location Map

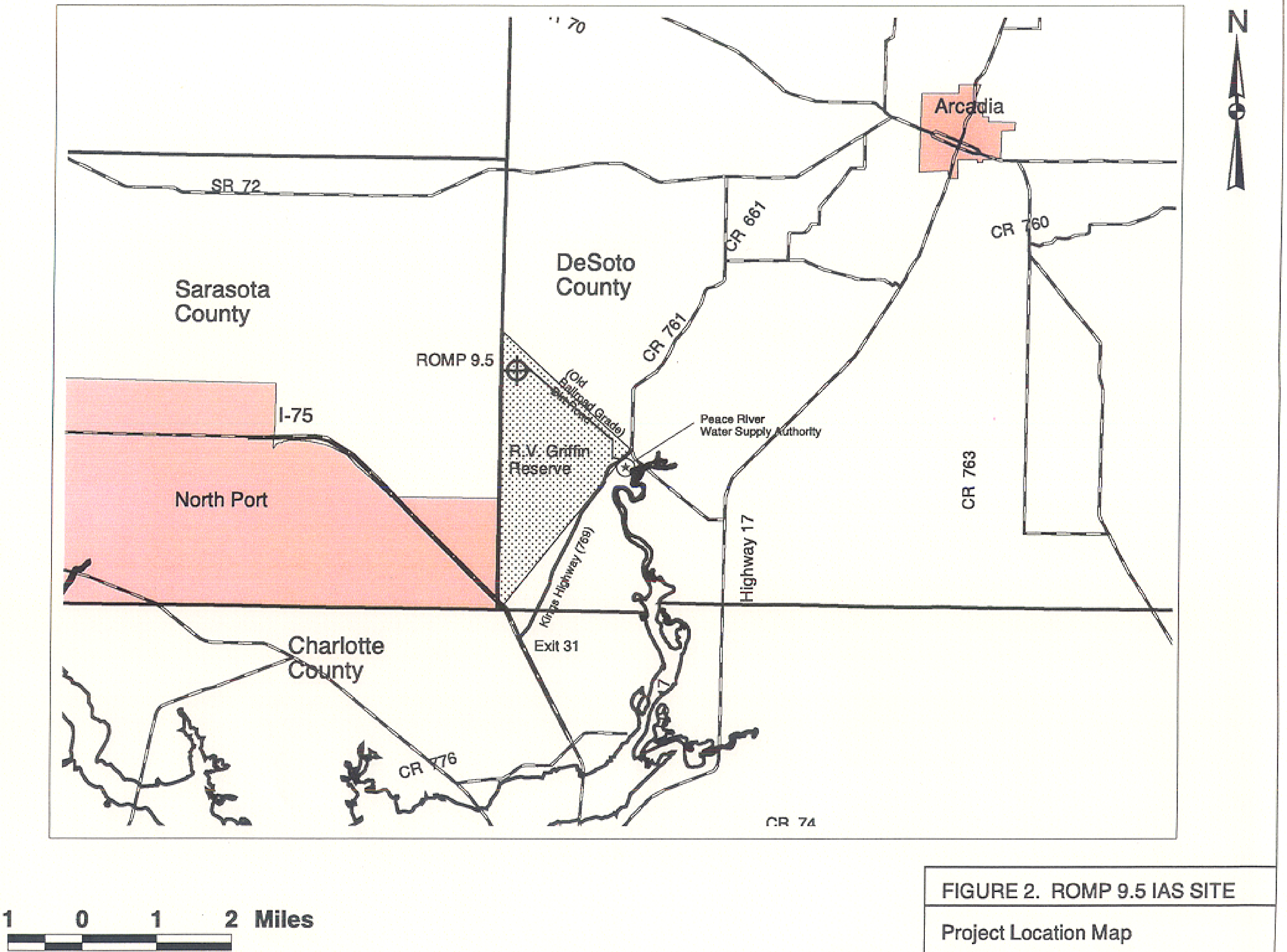


FIGURE 2. ROMP 9.5 IAS SITE

Project Location Map

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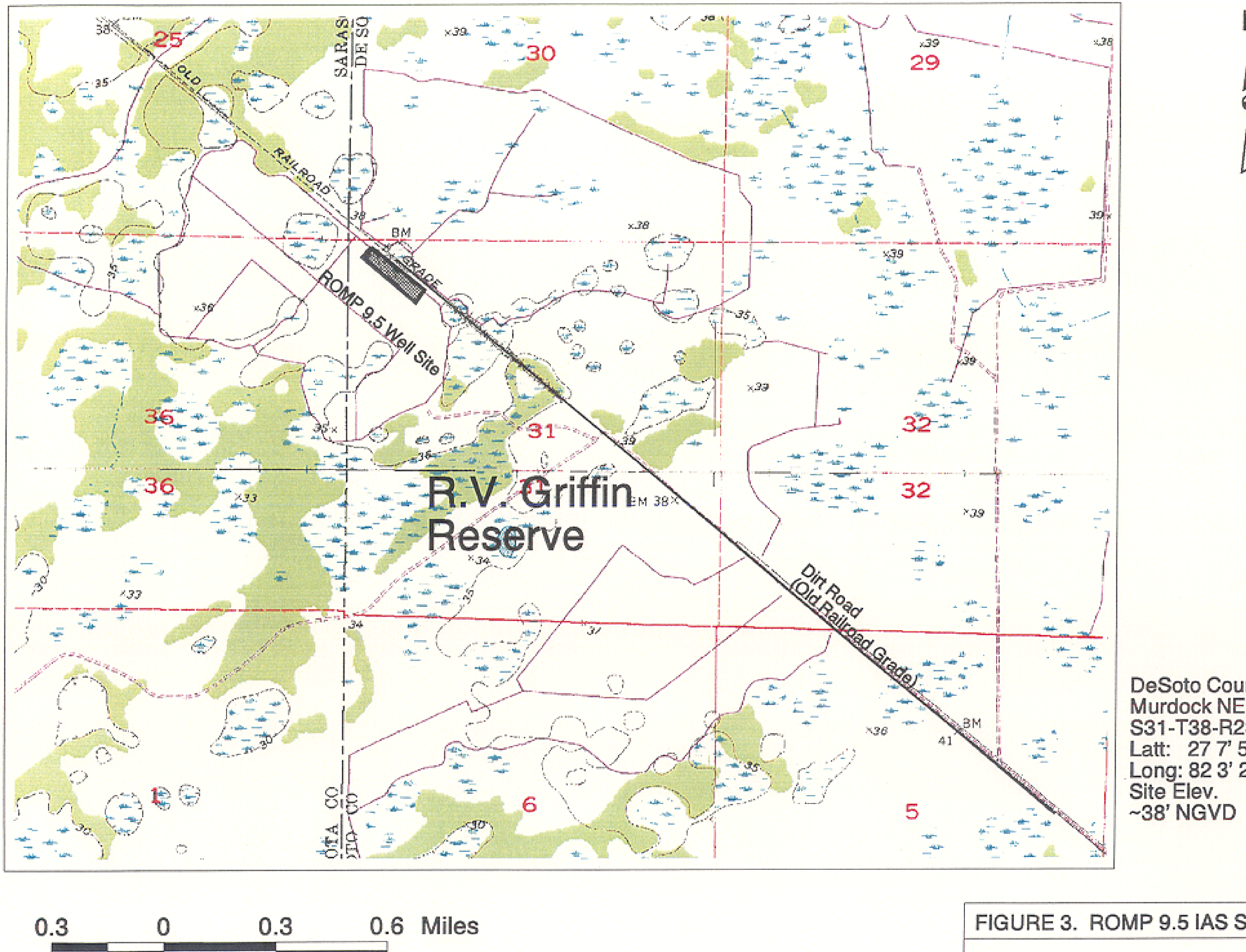
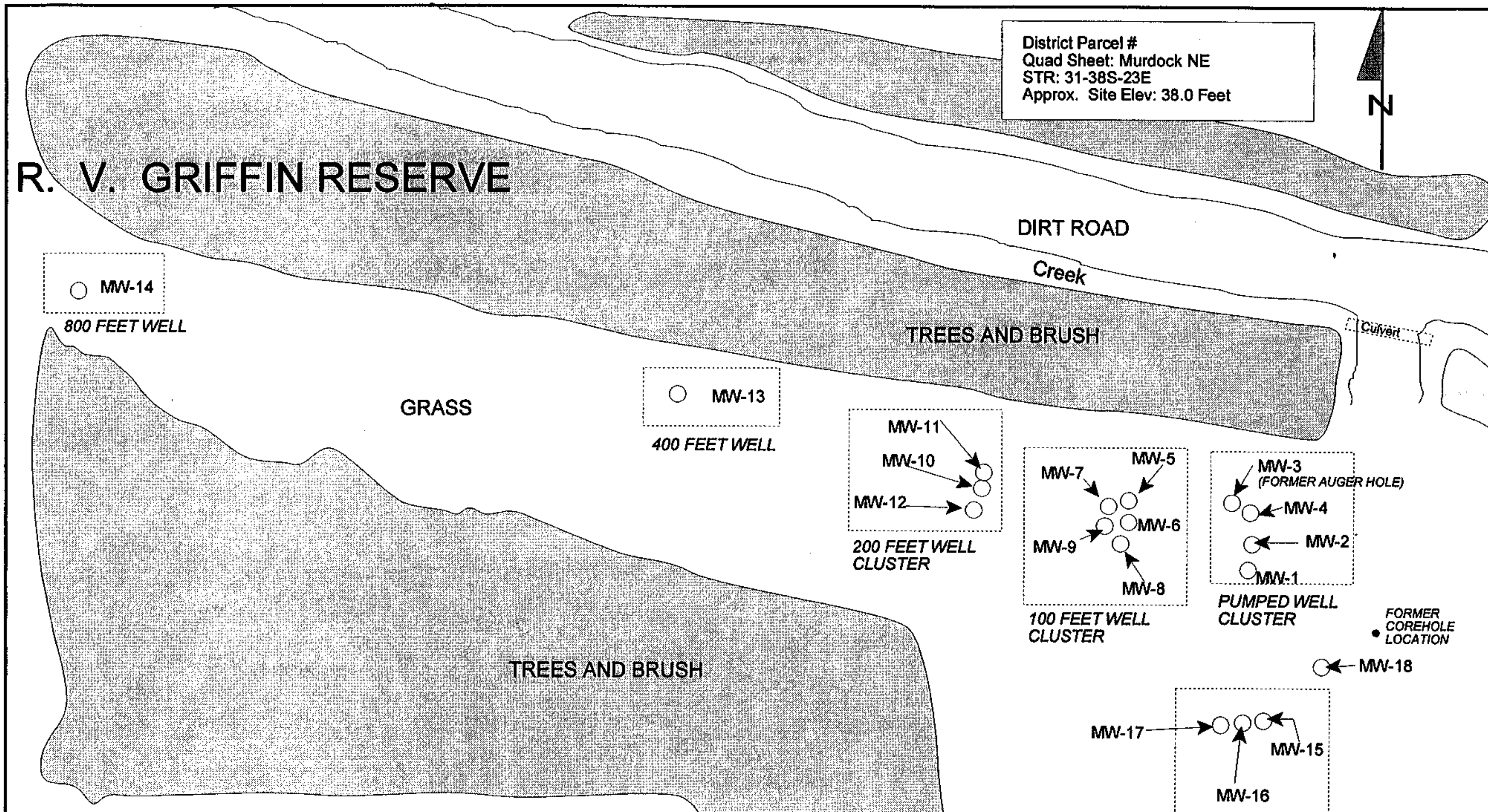



DeSoto County
Murdock NE Quad
S31-T38-R23
Latt: 27 7' 59"
Long: 82 3' 20"
Site Elev.
~38' NGVD

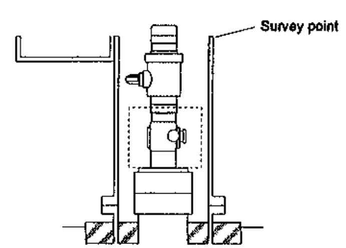
FIGURE 3. ROMP 9.5 IAS SITE

Well Site Location




NOTE: All wells are protected by locking steel covers and District combination locks.

| Well Number | Well Cluster | Well Name | Monitored Interval (ft bls) | Well Elevation (NGVD) |
|---|---|---|---|---|
| MW-18 | Core | 4" Coring H2O Supply | 61 - 77 | 40.03' |
| MW-3 | Pumped | 4" Lower surficial | 12 - 37 | 39.97 |
| MW-4 | Pumped | 4" Upper surficial | 2 - 8 | 40.39 |
| MW-2 | Pumped | 6" IAS pumped | 205 - 331 | 41.21 |
| MW-1 | Pumped | 12" UF pumped | 505 - 601 | 40.66 |
| MW-5 | 100' | 2" UF ob | 500 - 600 | 40.83 |
| MW-6 | 100' | 2" UF confiner | 470 - 475 | 41.05 |
| MW-8 | 100' | 2" IAS ob | 205 - 330 | 41.17 |
| MW-11 | 200' | 2" IAS ob | 205 - 330 | 40.73 |
| MW-10 | 200' | 2" Nocatee confiner | 340 - 350 | 40.64 |
| MW-12 | 200' | 2" Arcadia confiner | 180 - 190 | 40.42 |
| MW-13 | 400' | 2" IAS ob | 205 - 330 | 40.58 |
| MW-14 | 800' | 2" IAS ob | 205 - 331 | 38.69 |
| MW-7 | 100' | 2" Nocatee confiner | 340 - 350 | 41.14 |
| MW-9 | 100' | 2" Arcadia confiner | 180 - 190 | 41.06 |
| MW-15 | #2 100' | 2" Nocatee confiner | 340 - 350 | 38.84 |
| MW-16 | #2 100' | 2" IAS ob | 205 - 330 | 39.46' |
| MW-17 | #2 100' | 2" Arcadia confiner | 180 - 190 | 38.97 |




**Note**: MW-1 and MW-2 have flowing well head.

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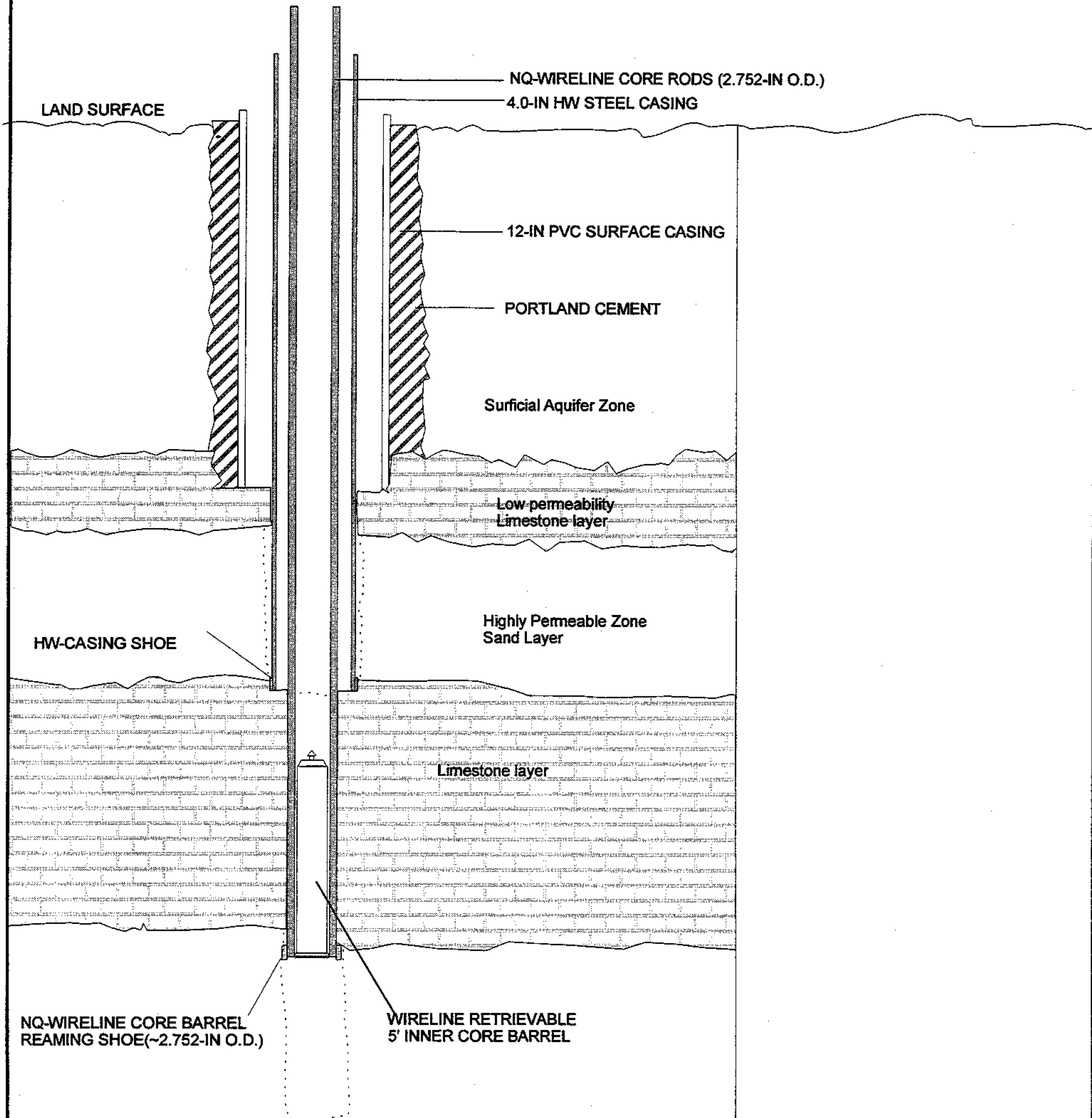
FIGURE 4. ROMP 9.5 IAS SITE

Monitor Well Site Diagram



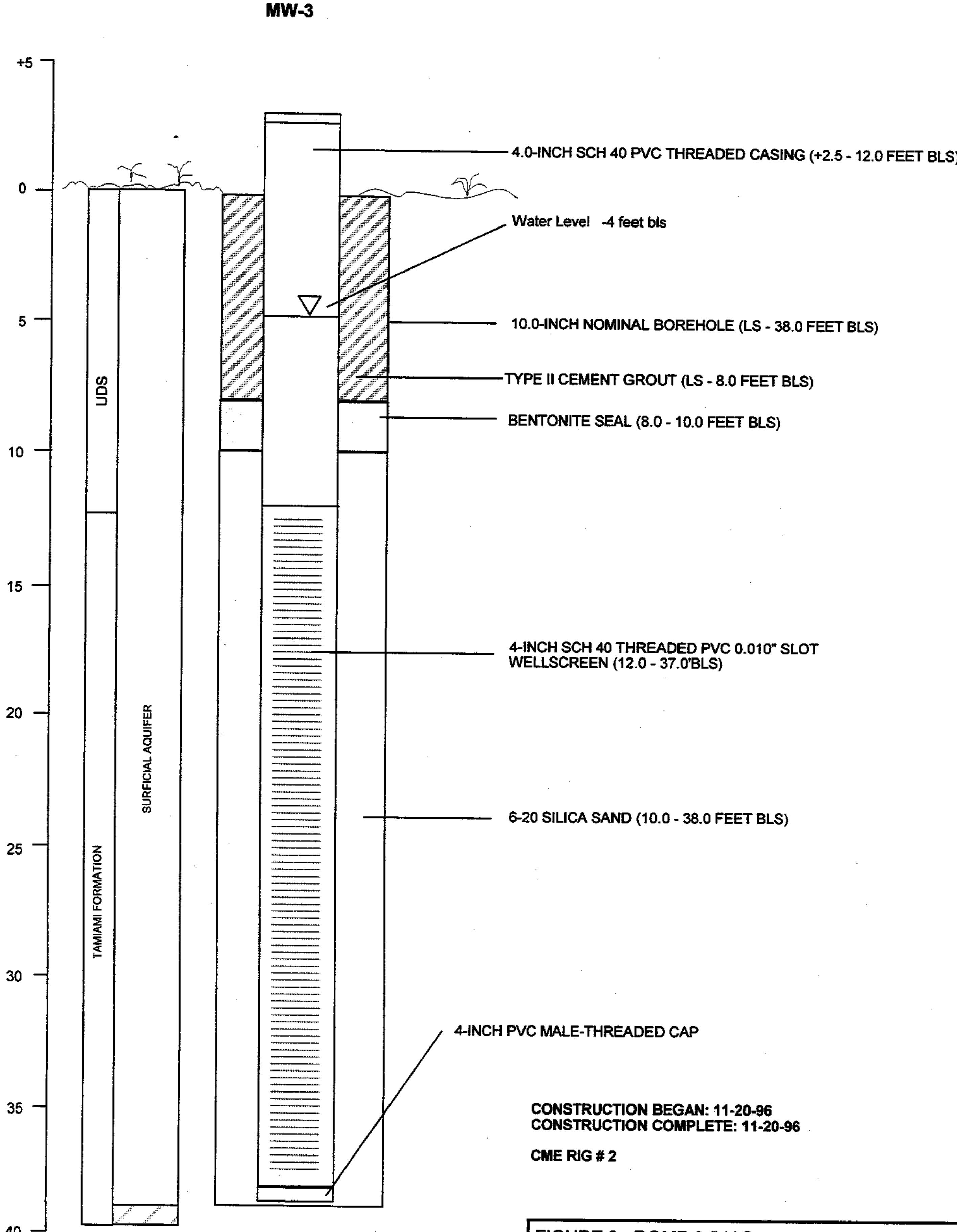

## Typical Wire line Coring Installation

FIGURE 5. ROMP 9.5 IAS

Wire Line Coring Diagram

cordrill.wpg

WCP # 585394.01




CONSTRUCTION BEGAN: 11-20-96
CONSTRUCTION COMPLETE: 11-20-96

CME RIG # 2

FIGURE 6. ROMP 9.5 IAS

Permanent Deep Surficial Well
(Former Auger Hole)

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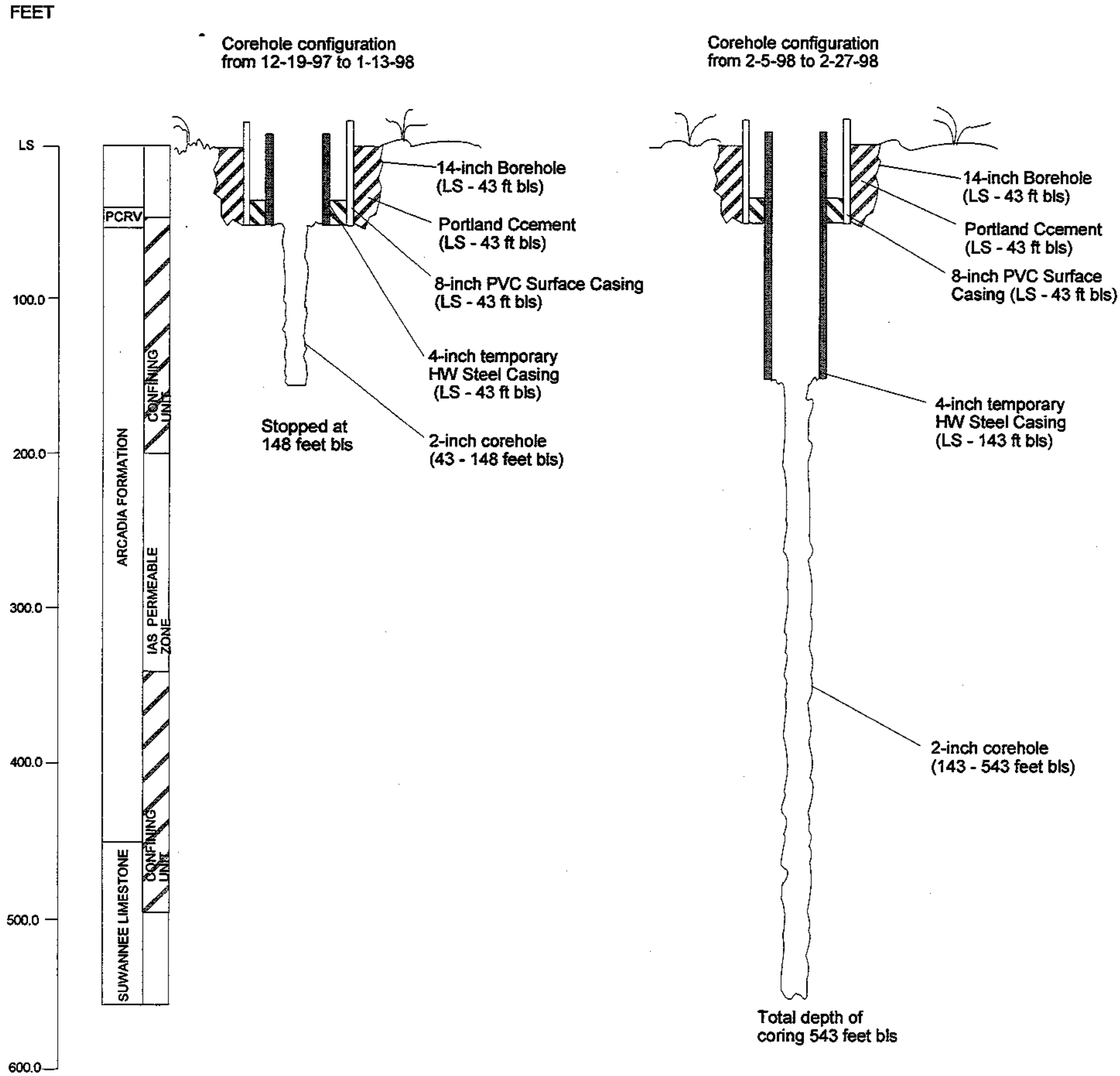


FIGURE 7. ROMP 9.5 IAS

Corehole Configuration During Coring

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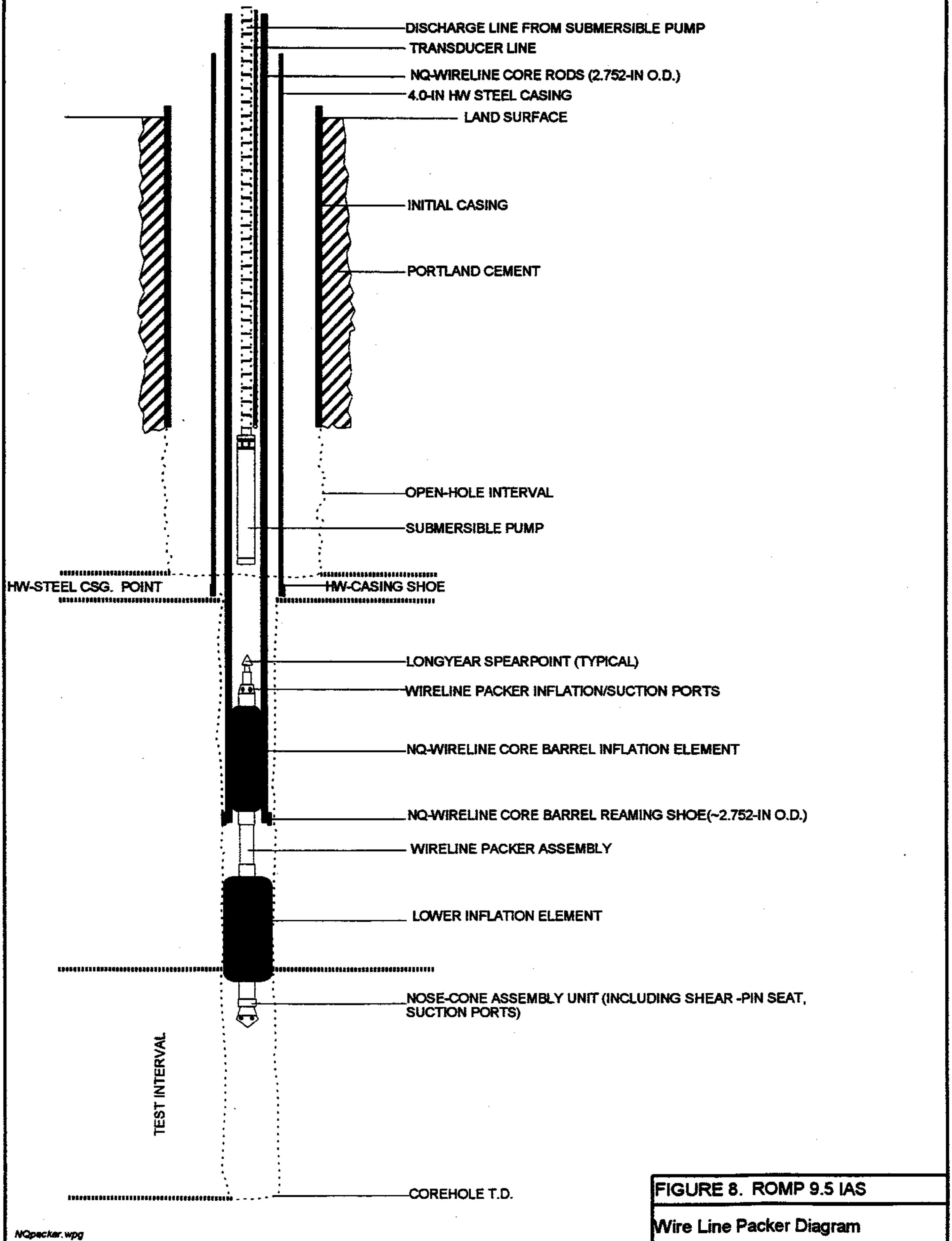


FIGURE 8. ROMP 9.5 IAS

Wire Line Packer Diagram

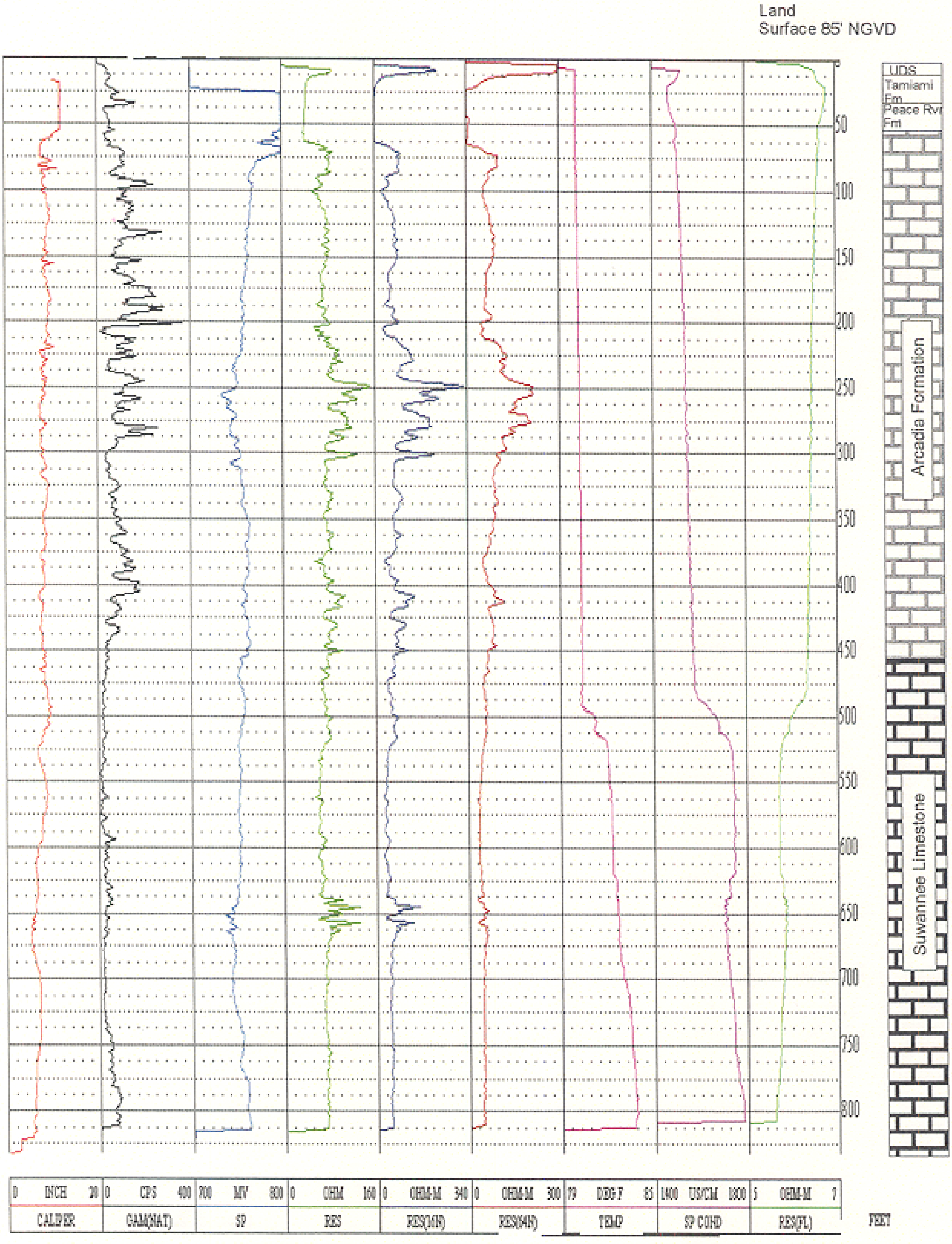


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FIGURE 9. ROMP 9.5 IAS

Geophysical Logs Run During Coring

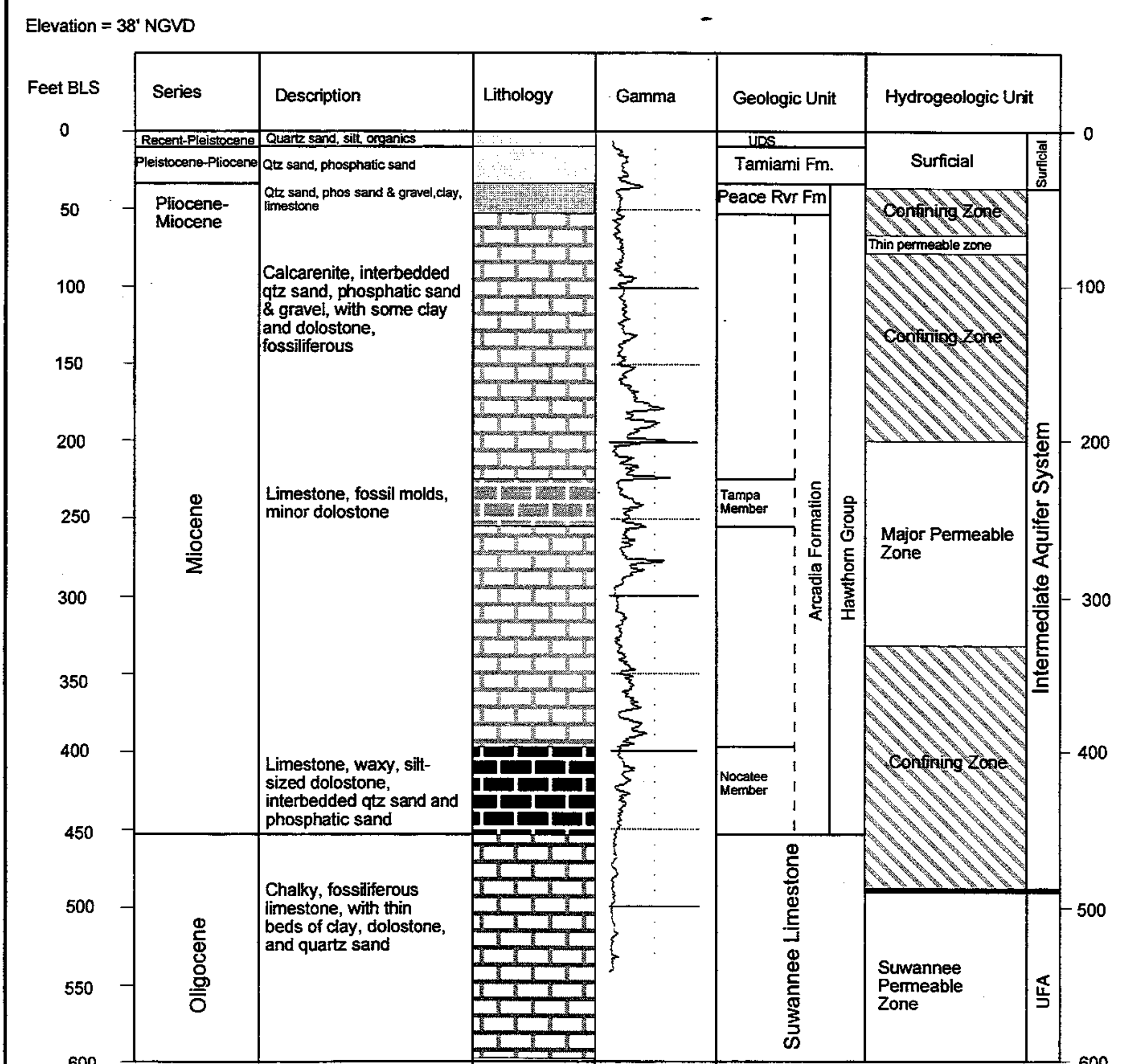


FIGURE 10. ROMP 9.5 IAS

ROMP 9.5 Hydrogeology

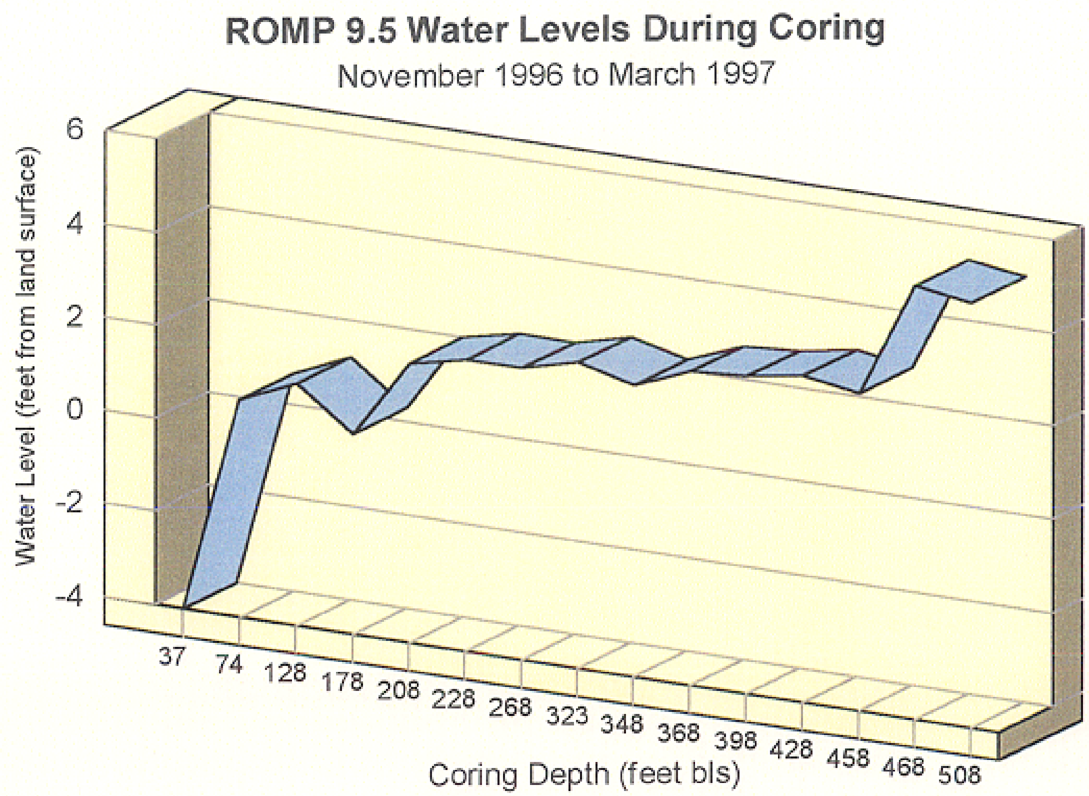


FIGURE 11. ROMP 9.5 IAS

Water Levels During Coring

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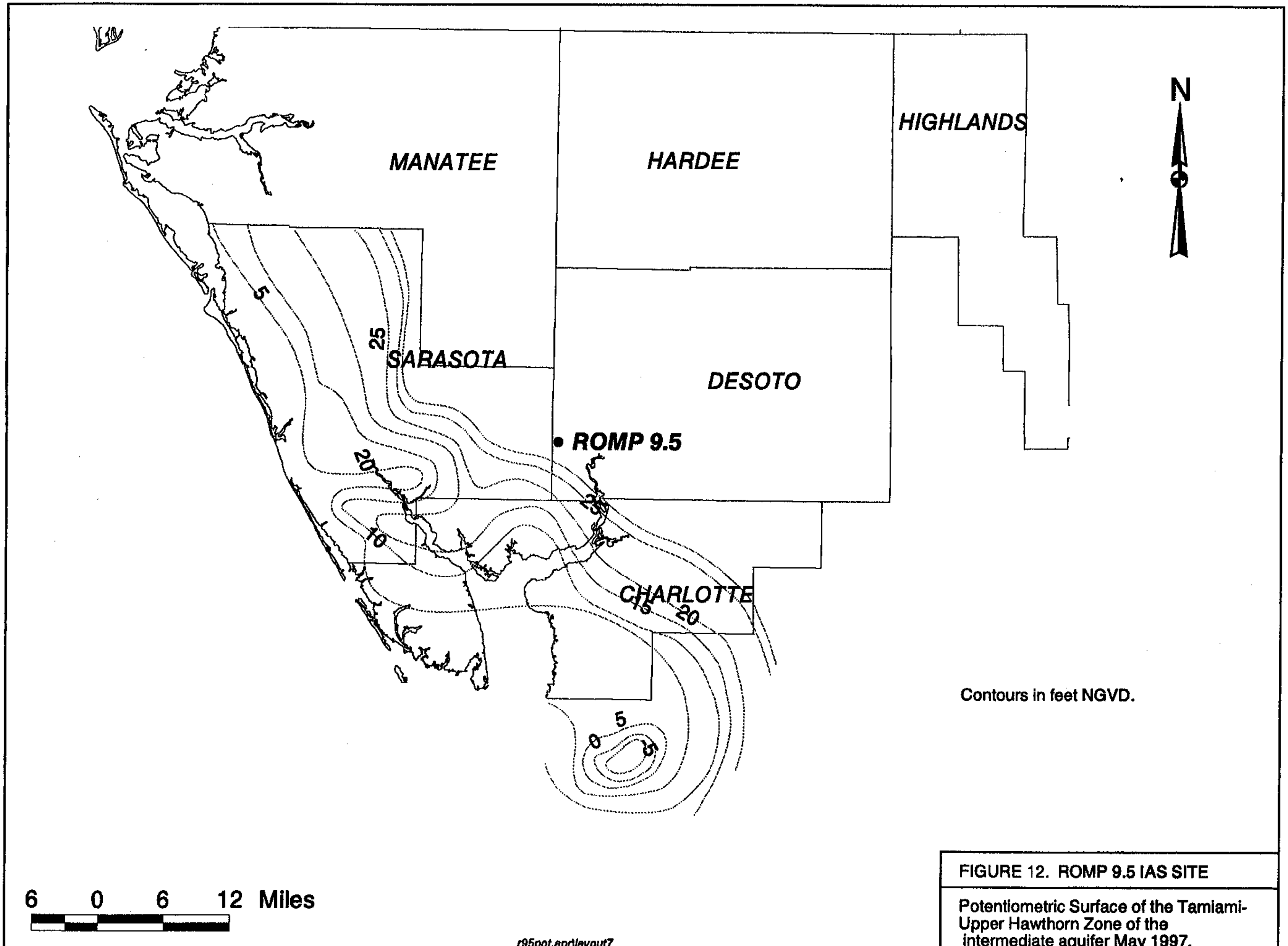



FIGURE 12. ROMP 9.5 IAS SITE

Potentiometric Surface of the Tamiami-Upper Hawthorn Zone of the intermediate aquifer May 1997.

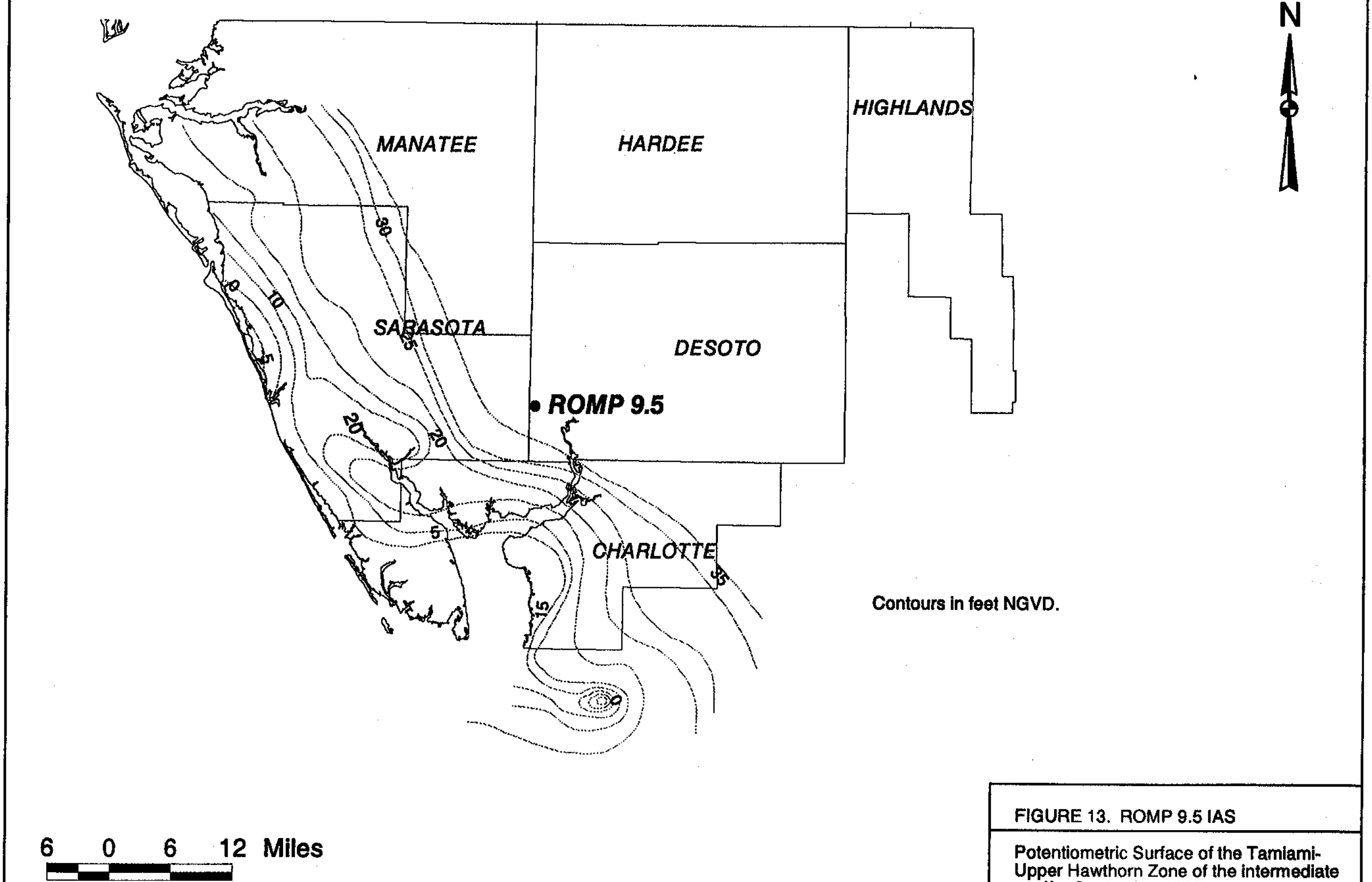



FIGURE 13. ROMP 9.5 IAS

Potentiometric Surface of the Tamiami-Upper Hawthorn Zone of the intermediate aquifer September 1997.

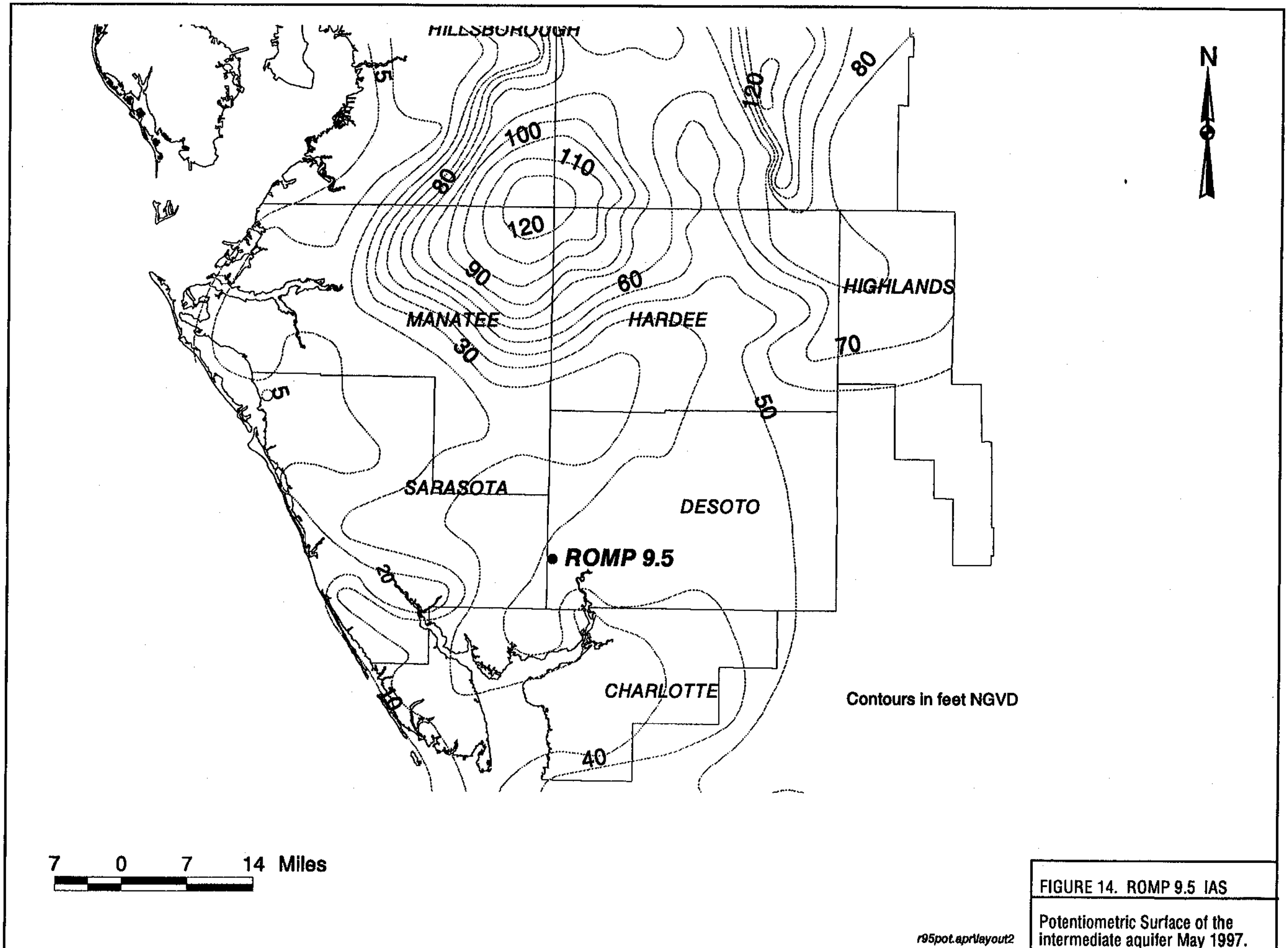



FIGURE 14. ROMP 9.5 IAS

Potentiometric Surface of the intermediate aquifer May 1997.

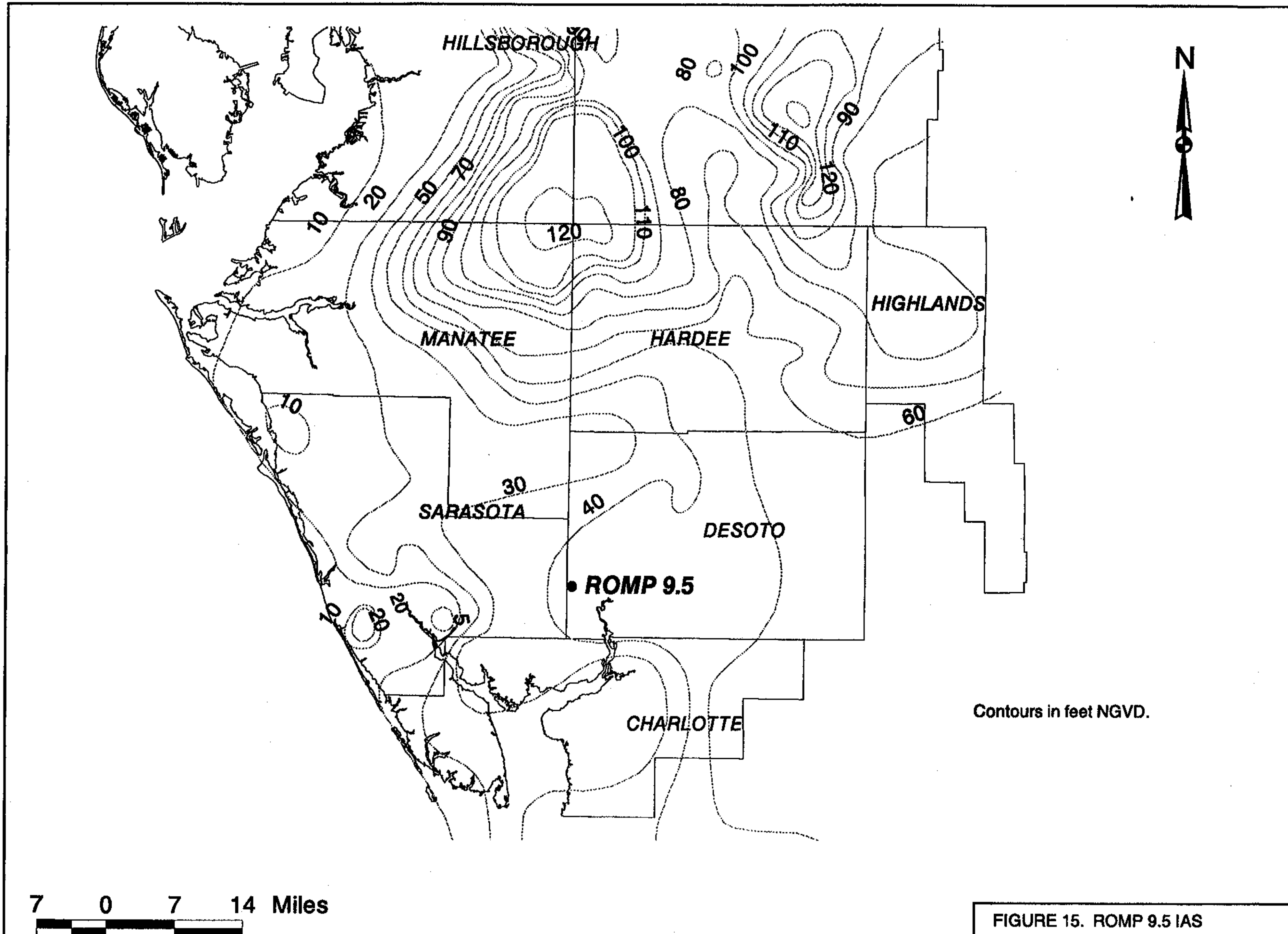



FIGURE 15. ROMP 9.5 IAS

Potentiometric Surface of the intermediate aquifer September 1997.

r95pot.apr/layout3

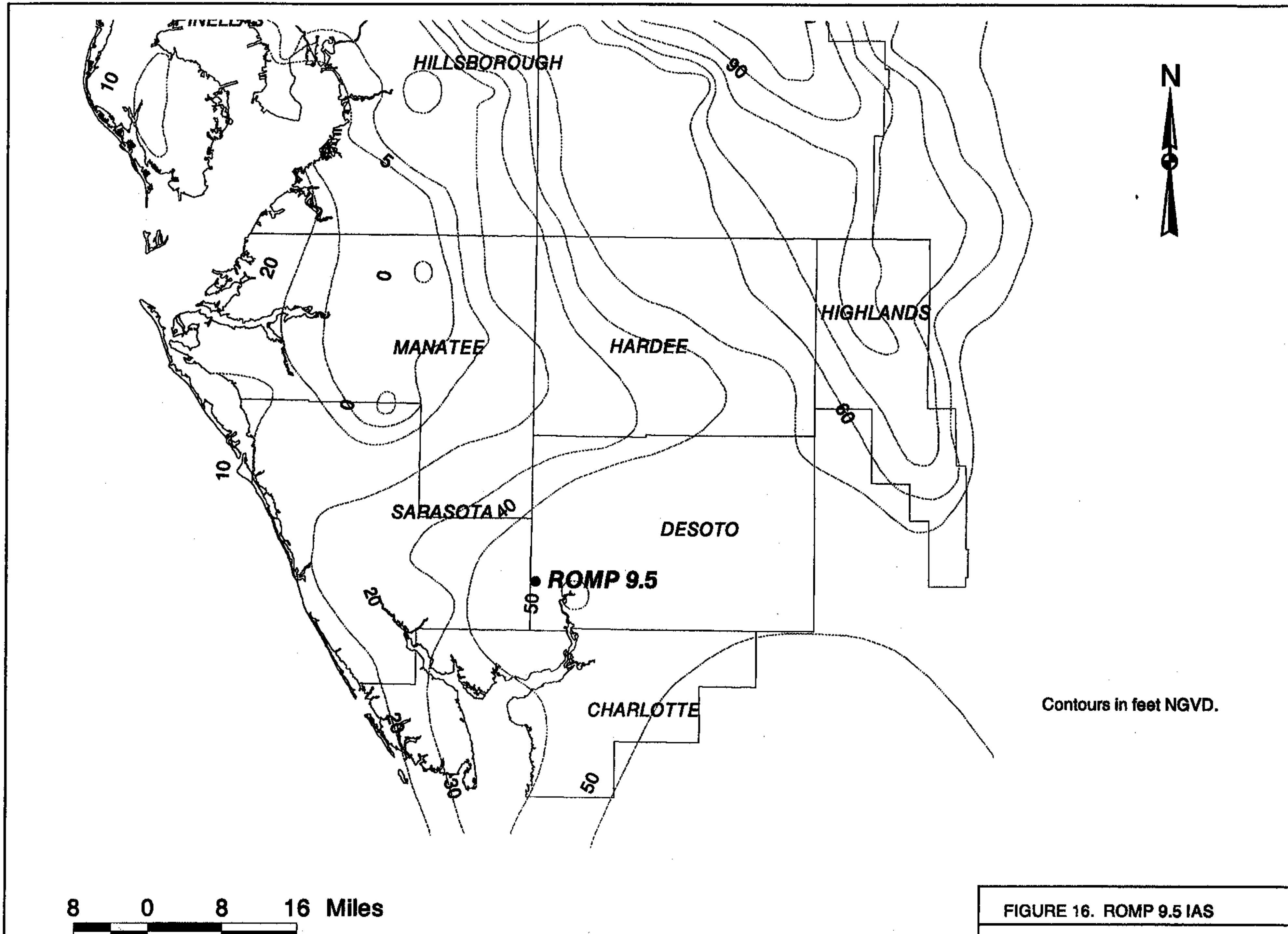
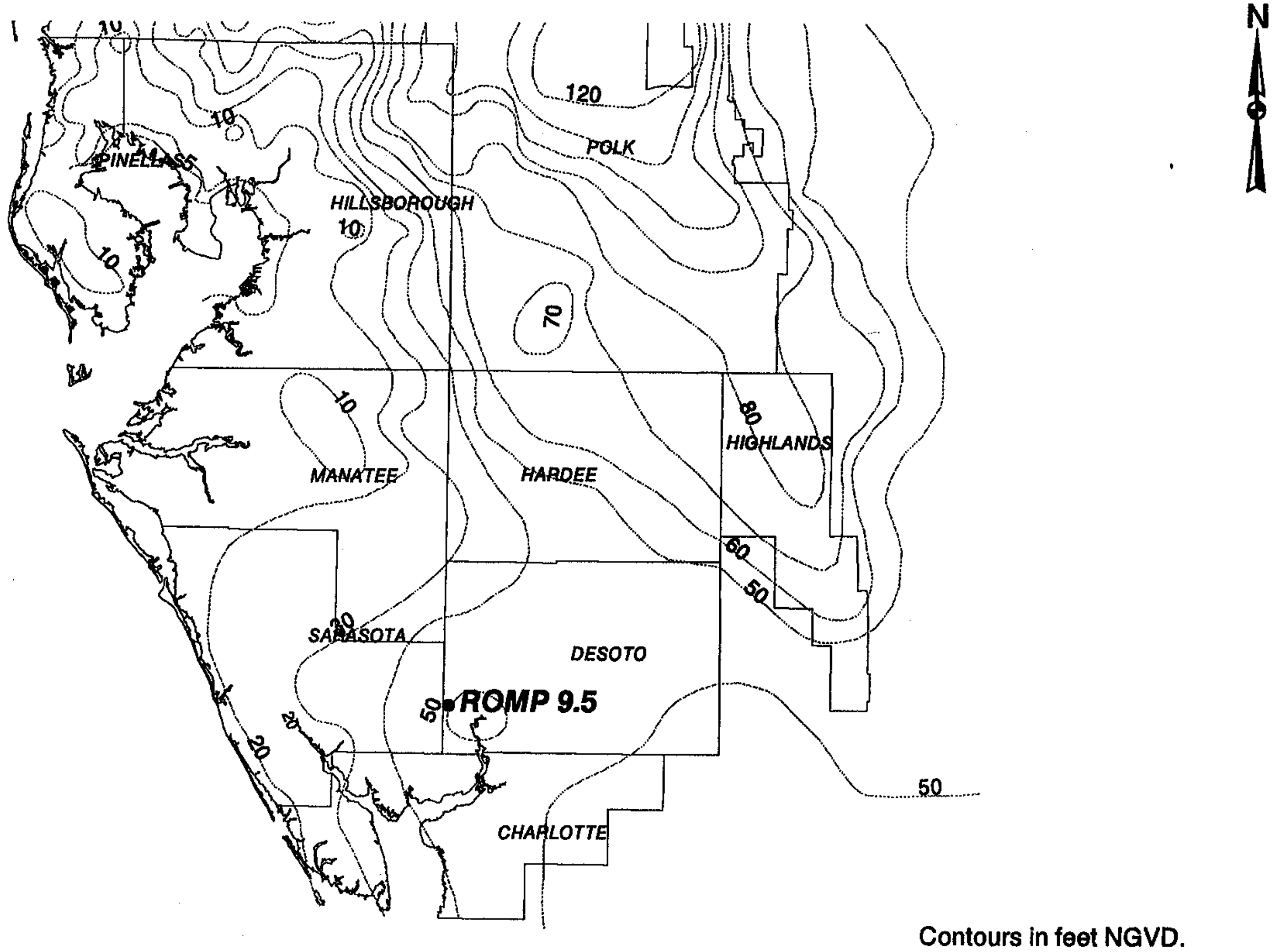



FIGURE 16. ROMP 9.5 IAS

Potentiometric Surface of the Upper Floridan Aquifer May 1997.




9 0 9 18 Miles

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FIGURE 17. ROMP 9.5 IAS

Potentiometric Surface of the Upper Floridan Aquifer September 1997.

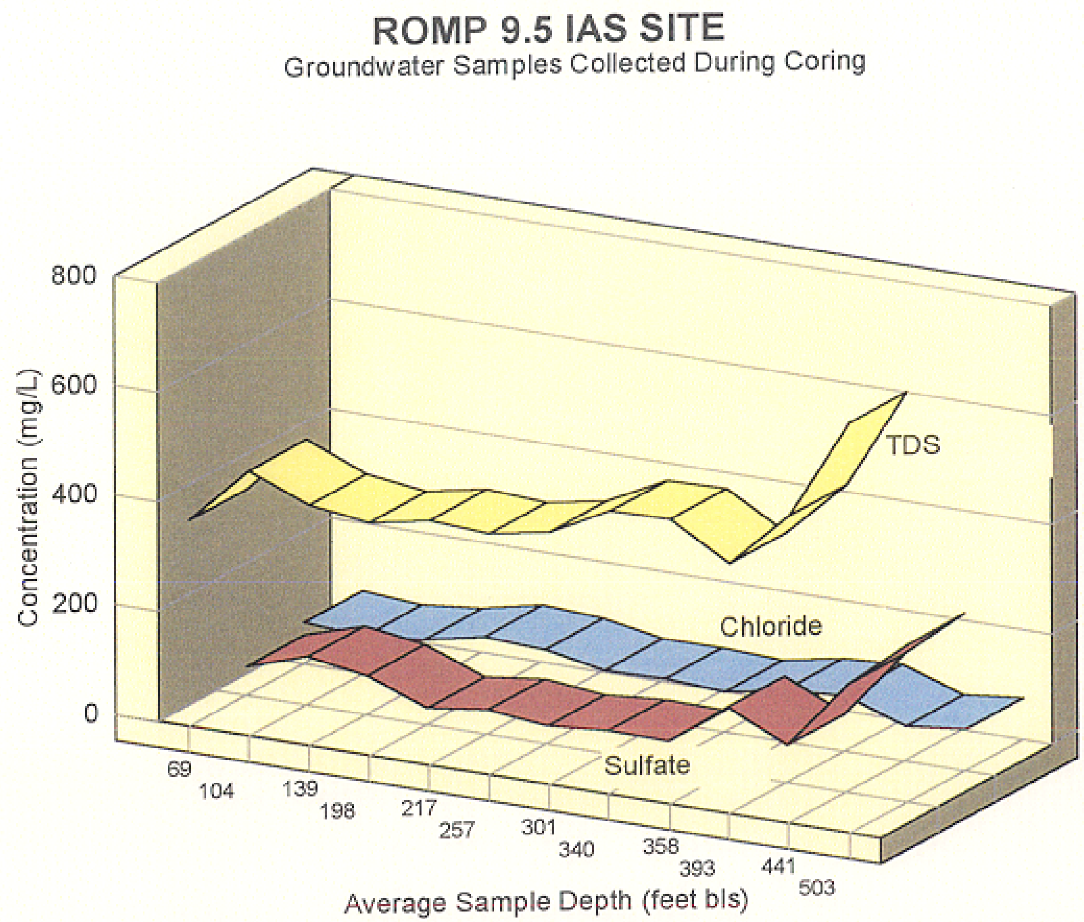



FIGURE 18. ROMP 9.5 IAS SITE

Chloride, Sulfate, and TDS Graph

9.5\figures\corewqgraph.wpg

**TABLES**

Table 1. Field Analyses of ROMP 9.5 Packer Samples Collected During Coring

| Date (M/D/Y) | Time | Depth | Water Level (~FT ALS) | Specific Cond (umohs) | H20 Temp (celcius) | H20 Density | CL (mg/l) (hach) | SO4 (mg/l) (hach) | pH | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| 12/19/96 | 1115 | 61-74 | NA | 682 | 23.5 | NA | 140 | 100 | NA | Collected from 2" pump discharge during packer test |
| 01/08/97 | 1445 | 80-128 | NA | 740 | 24.9 | NA | 120 | 200 | NA | Collected from 2" pump discharge during packer test |
| 01/13/97 | 1806 | 129-148 | NA | NA | NA | NA | NA | NA | NA | Collected from 2" pump discharge during packer test |

* All concentrations reported in mg/l unless otherwise noted

4" Steel casing 0-43' bls

NA - Not Analyzed

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 02/05/97 | 1145 | 188-208 | NA | NA | 24.7 | NA | 160 | 55 | NA | Collected from 2" pump discharge during packer test |
| 02/05/97 | 1750 | 205-228 | 2.20 | NA | 25.6 | NA | 160 | 65 | NA | Collected from 2" pump discharge during packer test |
| 02/10/97 | 1545 | 245-268 | 2.82 | 762 | 24.7 | NA | 160 | 65 | 7.69 | Collected from 2" pump discharge during packer test |
| 02/11/97 | 1400 | 293-308 | 2.20 | 783 | 24.7 | NA | NA | NA | 7.64 | Collected from 2" pump discharge during packer test |
| 02/12/97 | 1510 | 331-348 | NA | 740 | 25.3 | NA | 160 | 70 | 7.57 | Collected from 2" pump discharge during packer test |
| 02/17/97 | 1510 | 348-368 | 2.60 | 780 | 26.5 | NA | 140 | 150 | 7.57 | Collected from 2" pump discharge during packer test |
| 02/18/97 | 1540 | 388-398 | 2.88 | 740 | 24.9 | NA | 160 | 80 | 7.63 | Collected from 2" pump discharge during packer test |
| 02/26/97 | 815 | 413-468 | 4.19 | 870 | 25.5 | NA | 140 | 200 | 7.75 | Collected from 2" pump discharge during packer test |
| 02/27/97 | 1100 | 493-513 | 5.20 | 1070 | 26.2 | NA | 160 | 300 | 8.05 | Collected from 2" pump discharge during packer test |

* All concentrations reported in mg/l unless otherwise noted

4" Steel casing 0-143' bls

NA - Not Analyzed

Table 2. Laboratory Analyses of ROMP 9.5 Packer Samples Collected During Coring

| Date (M/D/Y) | Time | Depth | Water Level (ft bls) | Specific Cond. (umohs) | Water Density | CL | SO4 | pH | Br | TDS | Ca | Mg | Bicarb as (CaCO3) | K | Na | Si | Fe (ug/l) | Total Hardness (CaCO3) | ION % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12/19/96 | 1115 | 61-77 | NA | 664 | 1.0005 | 75 | 51 | 9.9 | 0.2 | 374 | 6.5 | 15 | 151 | 49.0 | 67 | 7.8 | 0 | 78 | -1.99 |
| 01/08/97 | 1445 | 80-128 | NA | 747 | 1.0005 | 68 | 86 | 7.6 | 0.0 | 483 | 86 | 22 | 232 | 1.5 | 40 | 10 | 118 | 305 | -2.77 |
| 01/13/97 | 1806 | 129-148 | NA | 750 | 1.0004 | 78 | 70 | 7.4 | 0.2 | 438 | 62 | 30 | 205 | 1.8 | 43 | 9.3 | 276 | 278 | -1.55 |

* All concentrations reported in mg/l unless otherwise noted

4" Steel casing 0-43' bls

NA - Not Analyzed

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 02/05/97 | 1145 | 188-208 | NA | 717 | 1.0004 | 102 | 29 | 7.9 | 0.3 | 423 | 40 | 28 | 187 | 2.4 | 58 | 13.6 | 200 | 215 | -1.69 |
| 02/05/97 | 1750 | 205-228 | 2.20 | 740 | 1.0004 | 96 | 43 | 7.8 | 0.3 | 445 | 44 | 30 | 195 | 2.4 | 58 | 11.2 | 32 | 233 | -1.15 |
| 02/10/97 | 1545 | 245-268 | 2.82 | 753 | 1.0004 | 77 | 33 | 7.8 | 0.2 | 438 | 39 | 31 | 194 | 2.7 | 60 | 10.2 | 231 | 225 | 3.91 |
| 02/11/97 | 1400 | 293-308 | 2.2 | 777 | 1.0004 | 78 | 41 | 7.8 | 0.2 | 459 | 44 | 32 | 196 | 2.6 | 60 | 10 | 54 | 242 | 4 |
| 02/12/97 | 1510 | 331-348 | NA | 839 | 1.0005 | 73 | 40 | 7.8 | 0.2 | 515 | 41 | 35 | 250 | 3.5 | 76 | 10.6 | 458 | 247 | 3.52 |
| 02/17/97 | 1510 | 348-368 | 2.60 | 827 | 1.0005 | 93 | 119 | 8.0 | 0.3 | 518 | 47 | 34 | 185 | 3.7 | 69 | 7.5 | 722 | 257 | -2.34 |
| 02/18/97 | 1540 | 388-398 | 2.88 | 791 | 1.0005 | 101 | 68 | 7.8 | 0.4 | 454 | 48 | 32 | 197 | 3.0 | 59 | 9.4 | 603 | 252 | -2.62 |
| 02/26/97 | 815 | 413-468 | 4.19 | 903 | 1.0005 | 63 | 196 | 7.9 | 0.2 | 561 | 58 | 37 | 145 | 4.5 | 69 | 20.5 | 570 | 297 | 2.57 |
| 02/27/97 | 1100 | 493-513 | 5.2 | 1131 | 1.0007 | 75 | 286 | 7.8 | 0.2 | 748 | 96 | 48 | 161 | 4.8 | 61 | 13 | 674 | 437 | 1.98 |

* All concentrations reported in mg/l unless otherwise noted

4" Steel casing 0-143' bls

NA - Not Analyzed

Table 3. Daily Water Level Measurements During Coring

| Date | Time | Casing Depth (feet bls) | Core Hole Depth (feet bls) | Core Hole Water Level (feet above land surface) |
|---|---|---|---|---|
| 20-Nov-1996 | 1450 | 43 | 37 | -4.00 bls |
| 6-Jan-1997 | 1058 | 43 | 74 | 0.66 |
| 7-Jan-1997 | 730 | 43 | 128 | 1.20 |
| 4-Feb-1997 | 1000 | 143 | 178 | 0.28 |
| 5-Feb-1997 | 930 | 143 | 208 | 1.99 |
| 6-Feb-1997 | 730 | 143 | 228 | 2.25 |
| 10-Feb-1997 | 810 | 143 | 268 | 2.25 |
| 12-Feb-1997 | 800 | 143 | 323 | 2.55 |
| 13-Feb-1997 | 715 | 143 | 348 | 2.25 |
| 18-Feb-1997 | 715 | 143 | 368 | 2.72 |
| 19-Feb-1997 | 750 | 143 | 398 | 2.80 |
| 20-Feb-1997 | 730 | 143 | 428 | 3.00 |
| 24-Feb-1997 | 1050 | 143 | 458 | 2.80 |
| 26-Feb-1997 | 1030 | 143 | 468 | 5.30 |
| 3-Mar-1997 | 945 | 143 | 508 | 5.11 |

*r95\tabels\permeameter.wb2*

Table 4. Results of Core Hole Packer Testing at ROMP 9.5 IAS

| Test interval (feet below land surface) | Stratigraphic Unit | Hydrogeologic Unit | Discharge (gpm) | Drawdown (feet) | Specific Capacity (gpm/ft) | Time until pumping stabilized (min) | Comments |
|---|---|---|---|---|---|---|---|
| 61-74 | Arcadia Fm | IAS upper permeable zone | 5 | 67 | 0.07 | 20 | Open hole interval no packer. |
| 80-128 | Arcadia Fm | IAS confining unit | 5 | 31 | 0.16 | 60 | Annulus drawdown -1.6 ft. |
| 128-148 | Arcadia Fm | IAS confining unit | 5 | 50 | 0.10 | 10 | |
| 148-168 | Arcadia Fm | IAS confining unit | 1 | 90 | 0.01 | n/a | Low perm zone but data unreliable. |
| 183-188 | Arcadia Fm | IAS confining unit | 6 | n/a | n/a | n/a | Water level drew down to pump. |
| 188-208 | Arcadia Fm | IAS confining unit | 5 | 70 | 0.07 | 20 | Annulus drawdown -1.6 ft. |
| 205-228 | Arcadia/Tampa Mbr | IAS lower permeable zone | 5 | 15 | 0.33 | 10 | Permeable zone. |
| 245-268 | Tampa Mbr/Arcadia | IAS lower permeable zone | 4 | 14 | 0.28 | 10 | Permeable zone. |
| 293-308 | Arcadia Fm | IAS lower permeable zone | 5 | 10 | 0.50 | 8 | Permeable zone. |
| 331-348 | Arcadia Fm | IAS confining unit | 5 | 25 | 0.20 | 8 | |
| 348-368 | Arcadia Fm | IAS confining unit | 3 | 140 | 0.02 | 50 | |
| 388-398 | Arcadia Fm | IAS confining unit | 3 | 108 | 0.02 | 50 | |
| 413-468 | Nocatee Mbr/Suwannee Lm | IAS confining unit | 4 | 42 | 0.09 | 20 | |
| 448-468 | Suwannee Lm | IAS confining unit | 5 | 42 | 0.11 | 15 | |
| 493-513 | Suwannee Lm | UFA permeable zone | 5 | 9 | 0.55 | 5 | Permeable zone. |

*permeameter.wb2*

Table 5. ROMP 9.5 Falling Head Permeameter Results

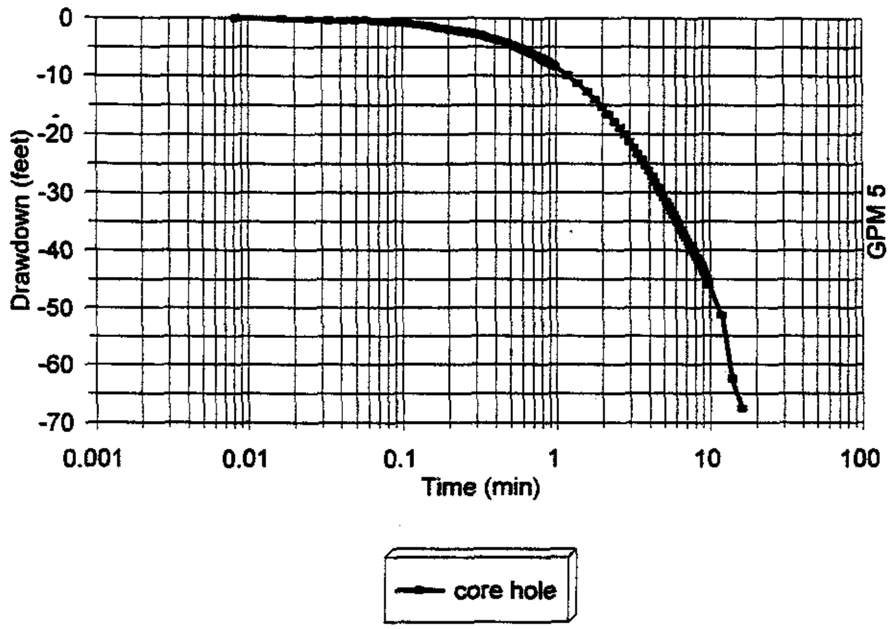
| Sample Depth (feet bls) | Formation | Lithology | Aquifer | **Vertical** Hydraulic Conductivity Average (feet/day) | Porosity (%) |
|---|---|---|---|---|---|
| 64.0 | Arcadia | limestone | IAS (permeable zone) | $9.42 \times 10^{-4}$ | 33 |
| 100.7 | Arcadia | limestone & dolostone | IAS (confining zone) | not run | 52 |
| 148.7 | Arcadia | dolostone | IAS (confining zone) | $1.67 \times 10^{-4}$ | 40 |
| 197.5 | Arcadia | dolostone & phos sand | IAS (confining zone) | $1.68 \times 10^{-4}$ | 29 |
| 257.6 | Arcadia | fossiliferous limestone | IAS (permeable zone) | $1.75 \times 10^{-4}$ | 28 |
| 337.3 | Arcadia | sandy limestone | IAS (confining zone) | $2.47 \times 10^{-2}$ | 34 |
| 361.5 | Arcadia | limestone | IAS (confining zone) | $3.09 \times 10^{-2}$ | 39 |
| 388.3 | Arcadia | limestone | IAS (confining zone) | $1.12 \times 10^{-4}$ | 33 |
| 464.2 | Suwannee | limestone | IAS (confining zone) | $3.81 \times 10^{-2}$ | 38 |
| 500.8 | Suwannee | fossiliferous limestone | UFA (permeable zone) | $3.33 \times 10^{-4}$ | 33 |

Testing performed by Florida Geological Survey

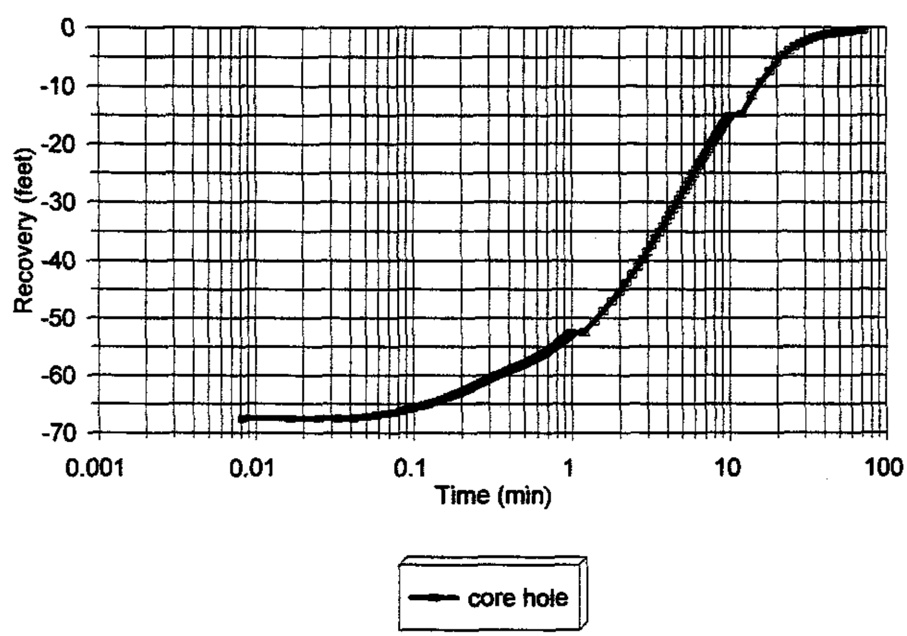
*romp9.5\tables\permeameter.wb3*

# APPENDIX A

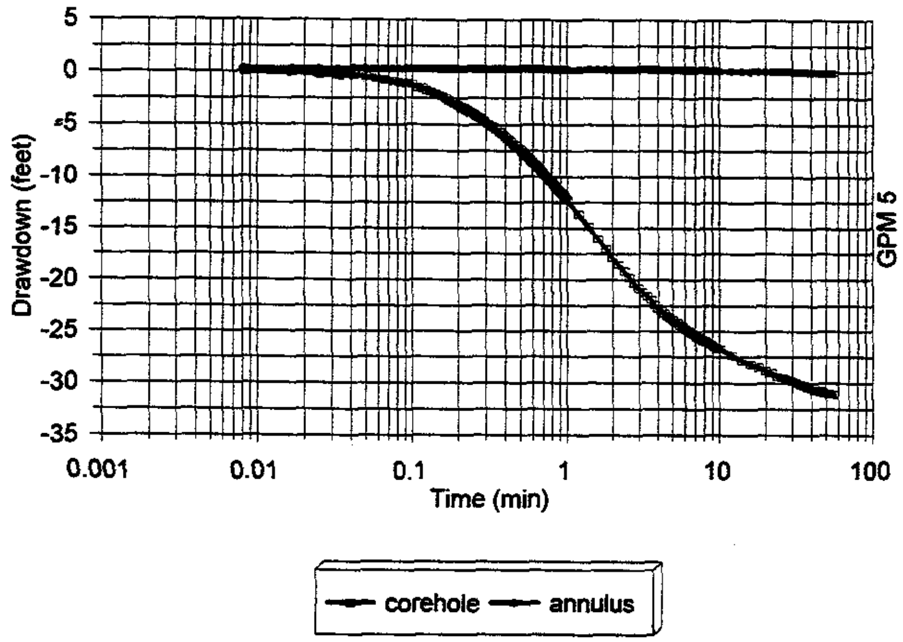
## ROMP 9.5 Core Hole Test
Arcadia Fm (61-77 Ft Bls)



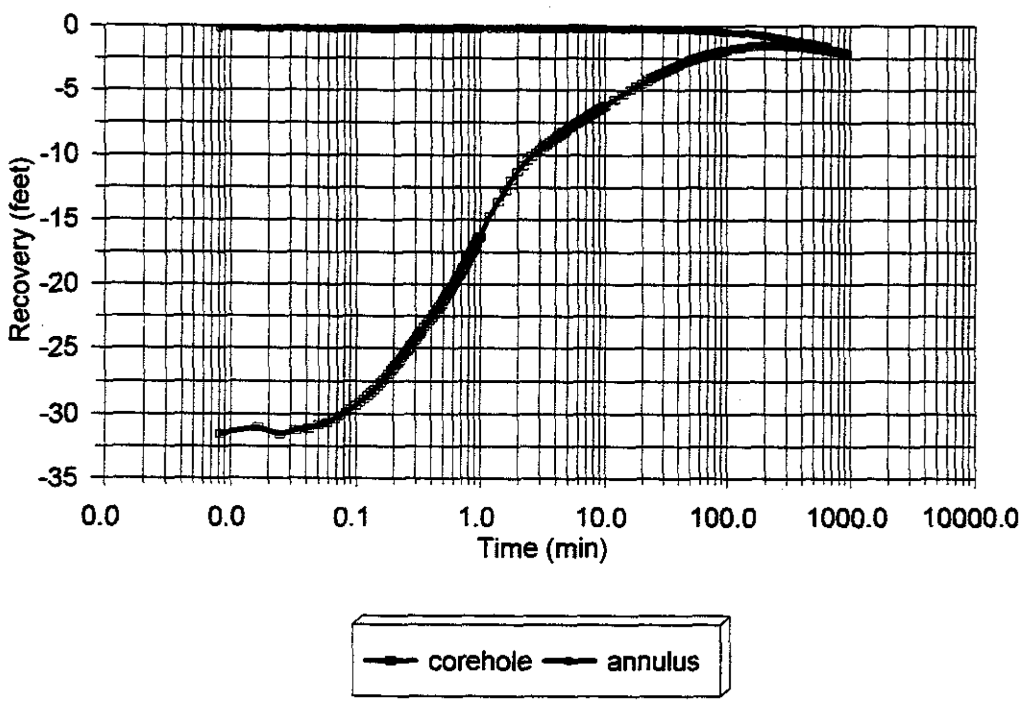

## ROMP 9.5 Core Hole Test
Arcadia Fm (61-77 Ft Bls)



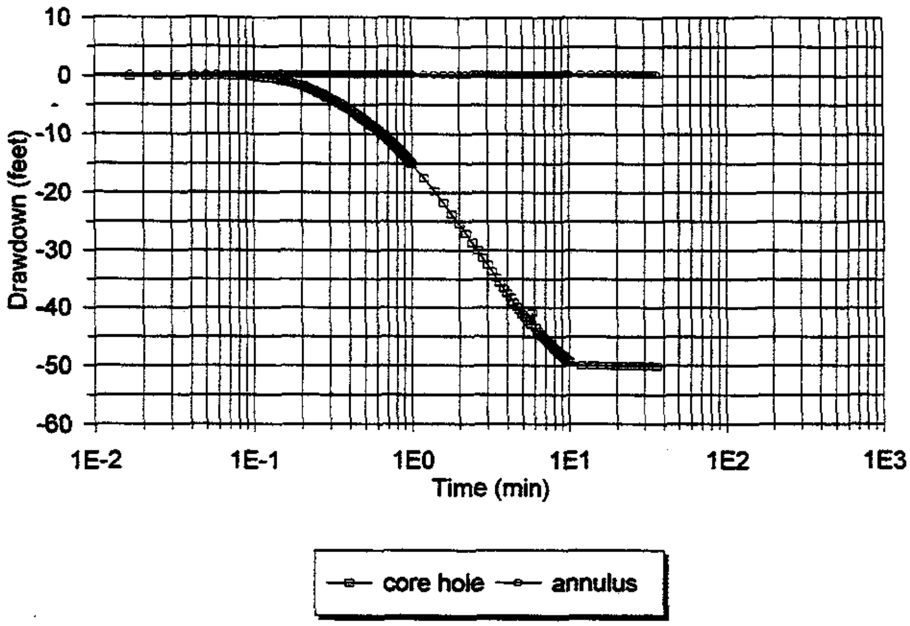
**ROMP 9.5 Core Hole Packer Test**
Arcadia Fm (80-128 ft bls)



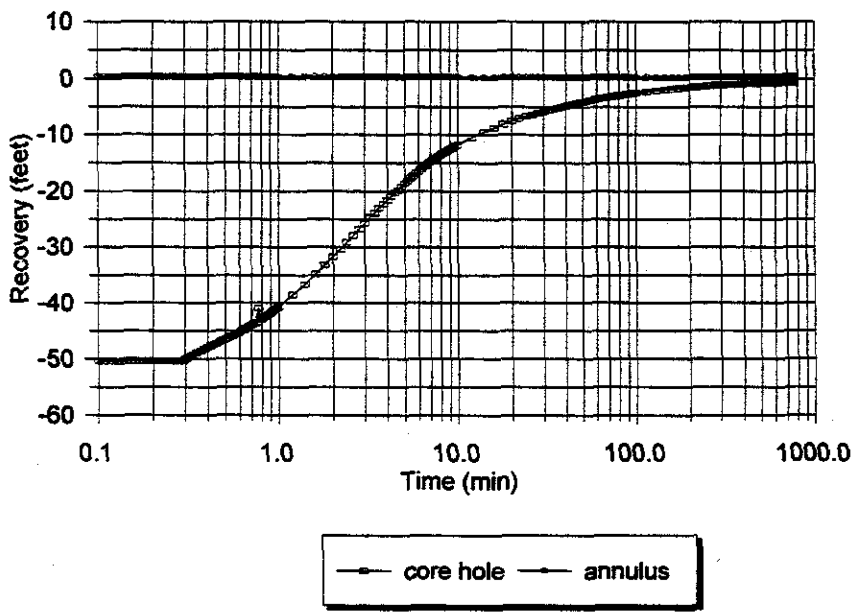

**ROMP 9.5 Core Hole Packer Test**
Arcadia Fm (80-128 Ft Bls)



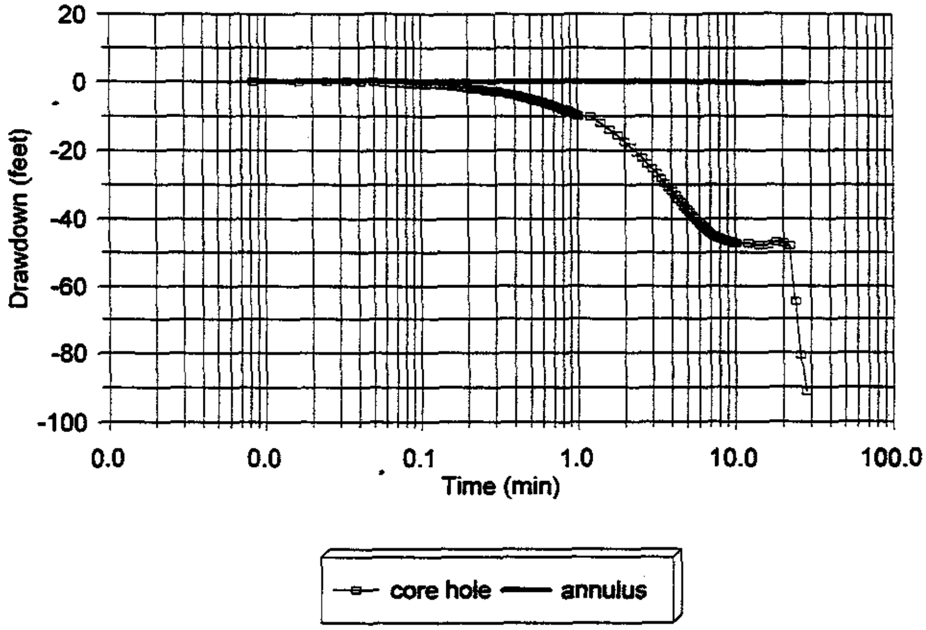
## ROMP 9.5 Core Hole Packer Test
Arcadia Fm (128-148 Ft Bls)



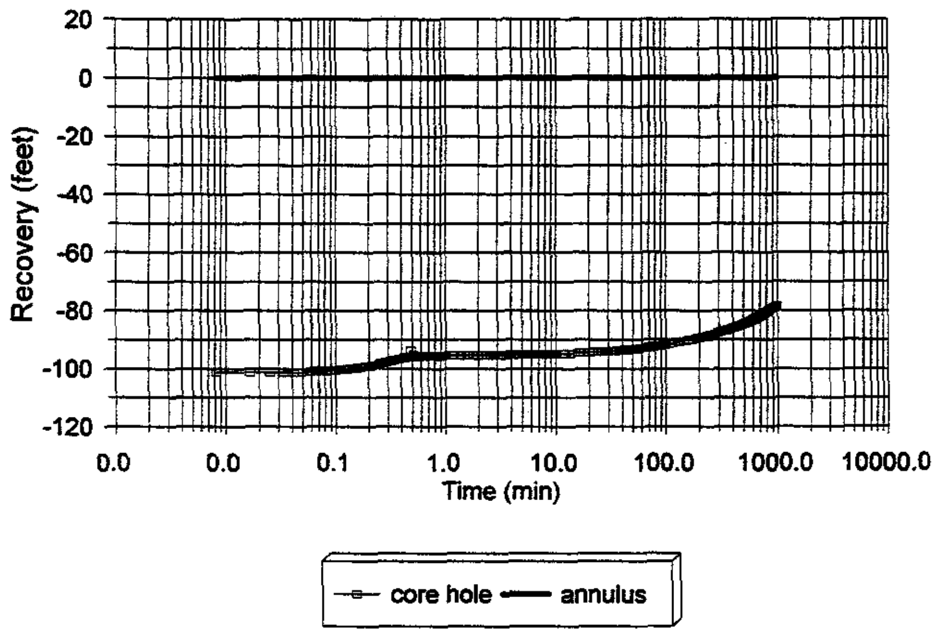

## ROMP 9.5 Core Hole Packer Test
Arcadia Fm (128-148 ft bls)



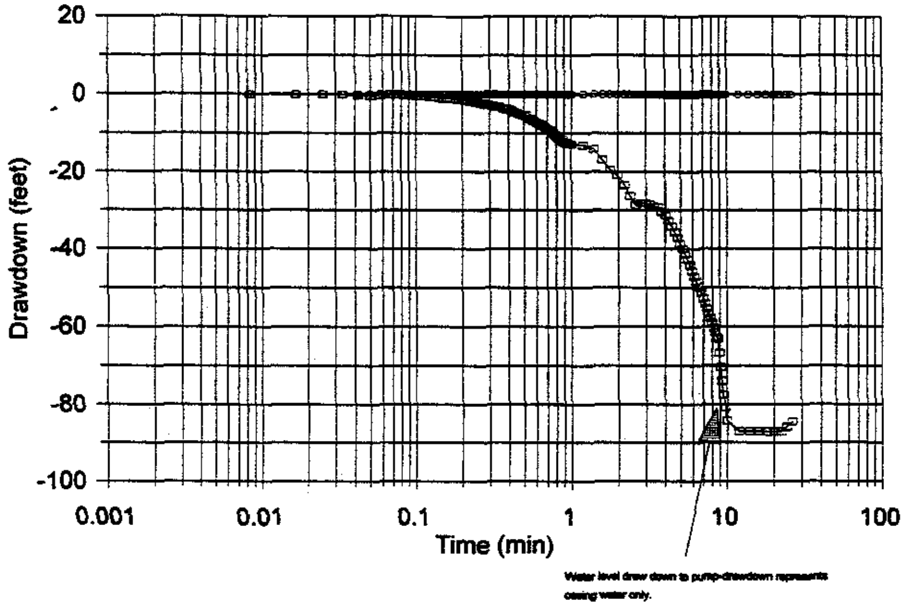
**ROMP 9.5 Core Hole Packer Test**
Arcadia Fm (148-168 ft bls)



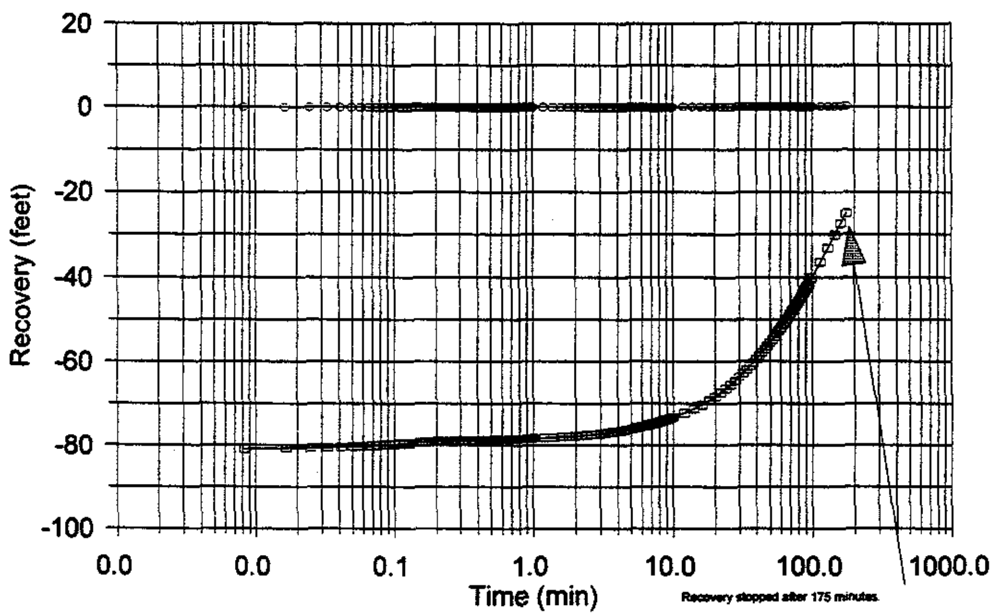

**ROMP 9.5 Core Hole Packer Test**
Arcadai Fm (148-168 ft bls)

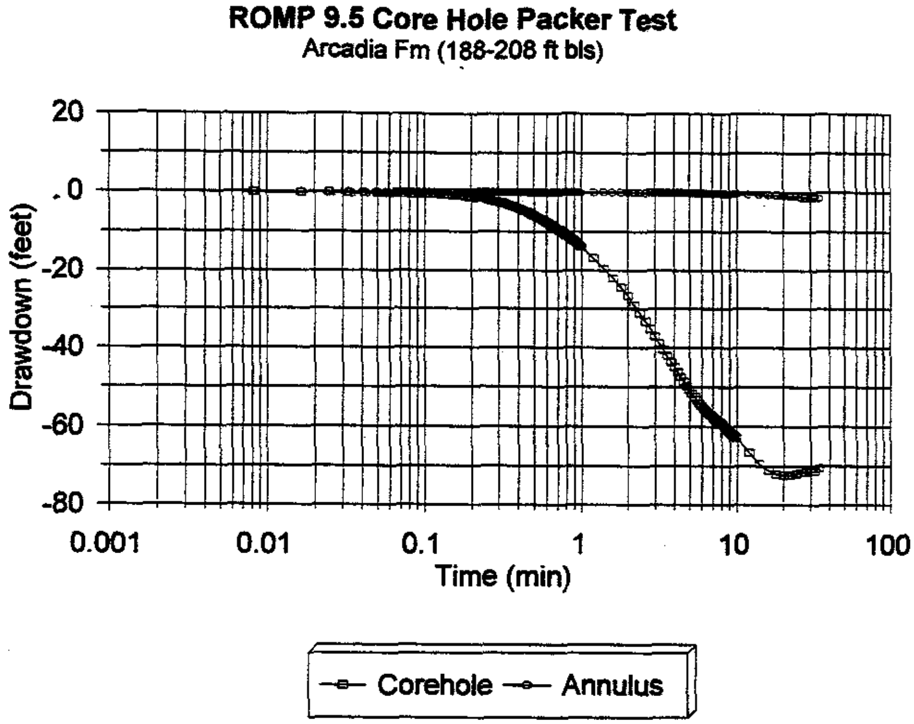


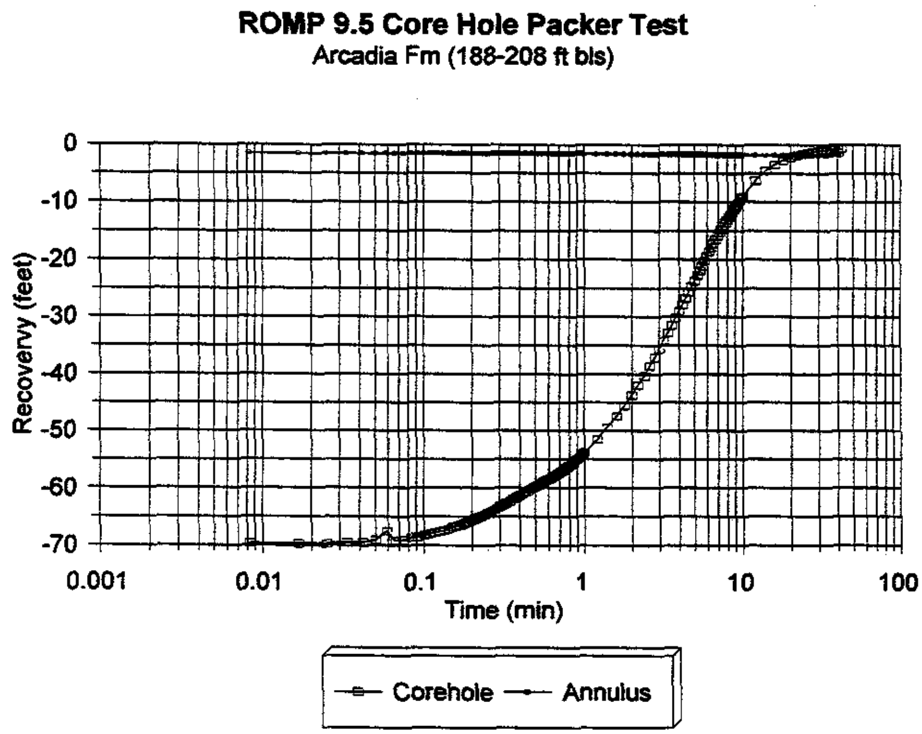
## ROMP 9.5 Core Hole Test
Arcadia Fm (183-188 ft bls)

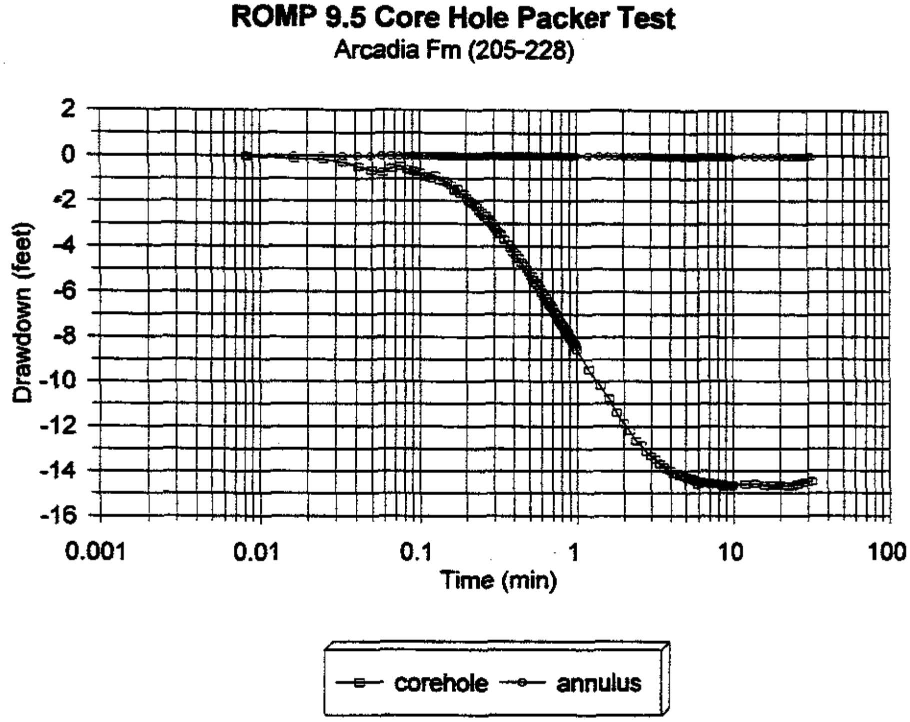



## ROMP 9.5 Core Hole Test
Arcadia (183-188) ft bls

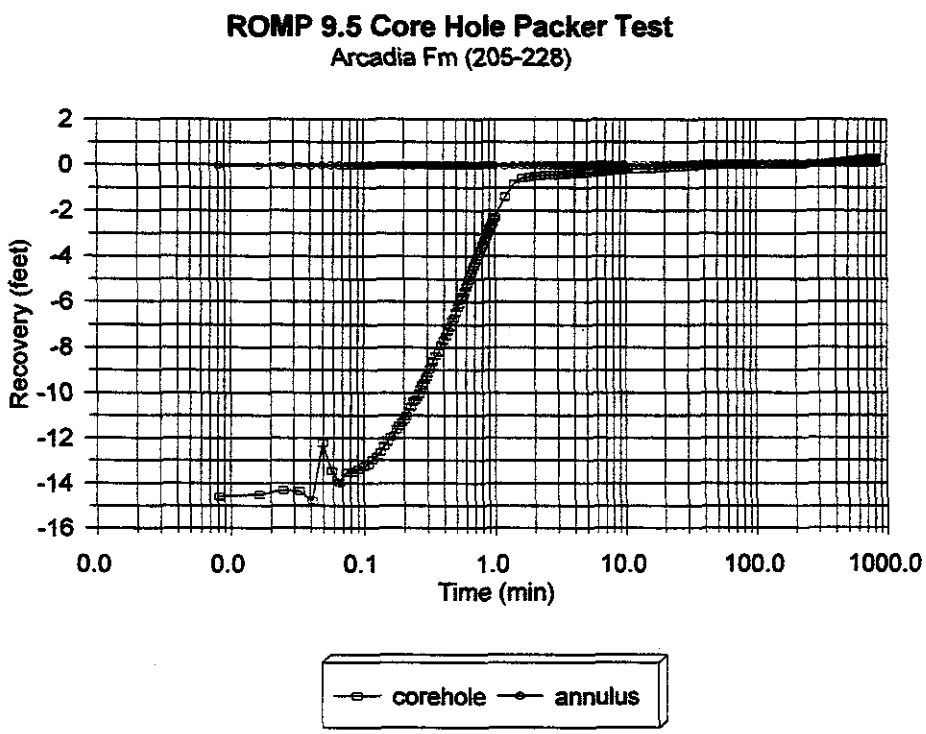



ROMP 9.5 Core Hole Packer Test
Arcadia Fm (188-208 ft bls)
Drawdown (feet)
20
0
-20
-40
-60
-80
0.001
0.01
0.1
1
10
100
Time (min)
Corehole
Annulus


ROMP 9.5 Core Hole Packer Test
Arcadia Fm (188-208 ft bls)
Recoveryy (feet)
0
-10
-20
-30
-40
-50
-60
-70
0.001
0.01
0.1
1
10
100
Time (min)
Corehole
Annulus

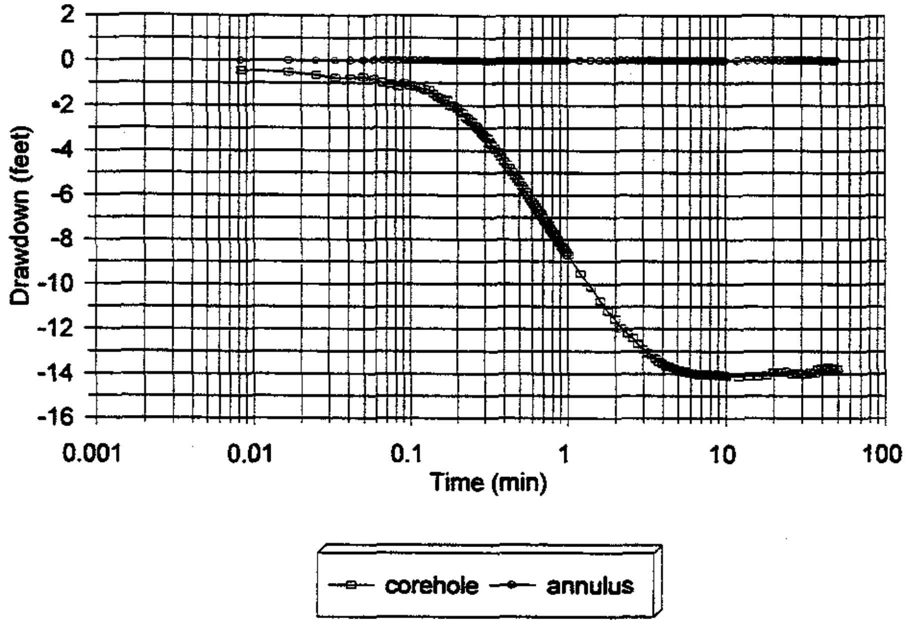


ROMP 9.5 Core Hole Packer Test
Arcadia Fm (205-228)
Drawdown (feet)
2
0
-2
-4
-6
-8
-10
-12
-14
-16
0.001
0.01
0.1
1
10
100
Time (min)
corehole
annulus

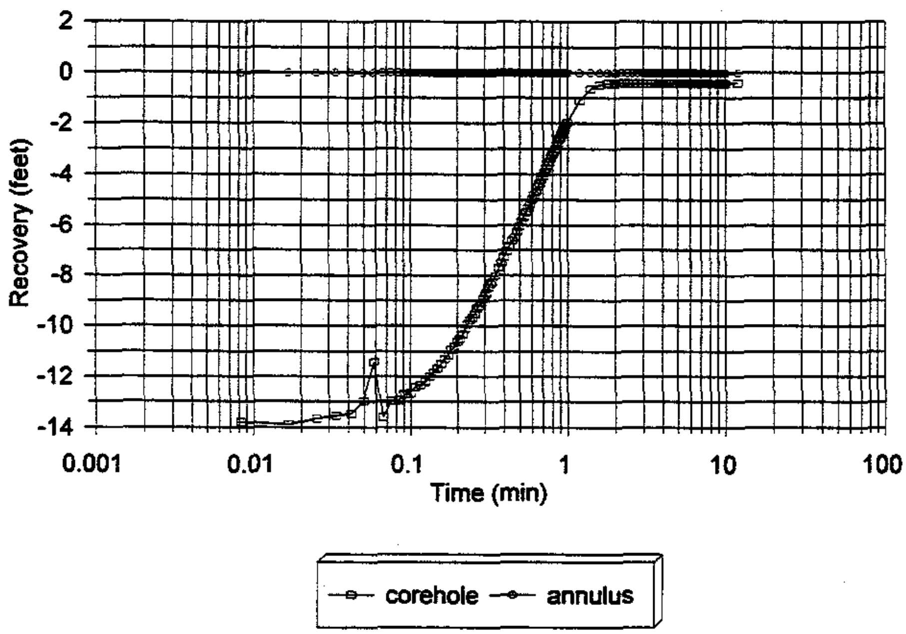



ROMP 9.5 Core Hole Packer Test
Arcadia Fm (205-228)
Recovery (feet)
2
0
-2
-4
-6
-8
-10
-12
-14
-16
0.0
0.0
0.1
1.0
10.0
100.0
1000.0
Time (min)
corehole
annulus

**ROMP 9.5 Core Hole Packer Test**
Arcadia Fm (245-268 ft bls)

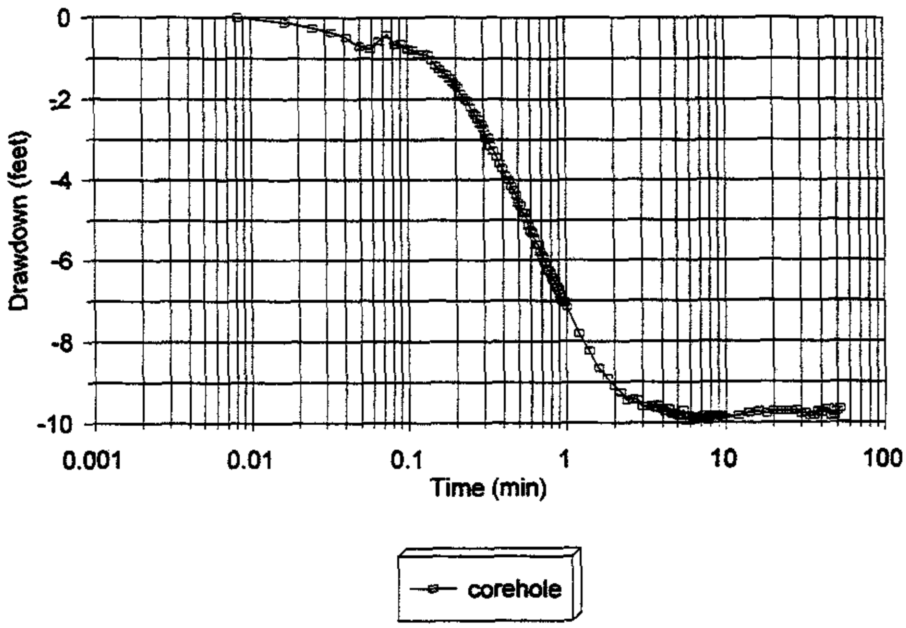



**ROMP 9.5 Core Hole Packer Test**
Arcadia Fm (245-268 ft bls)



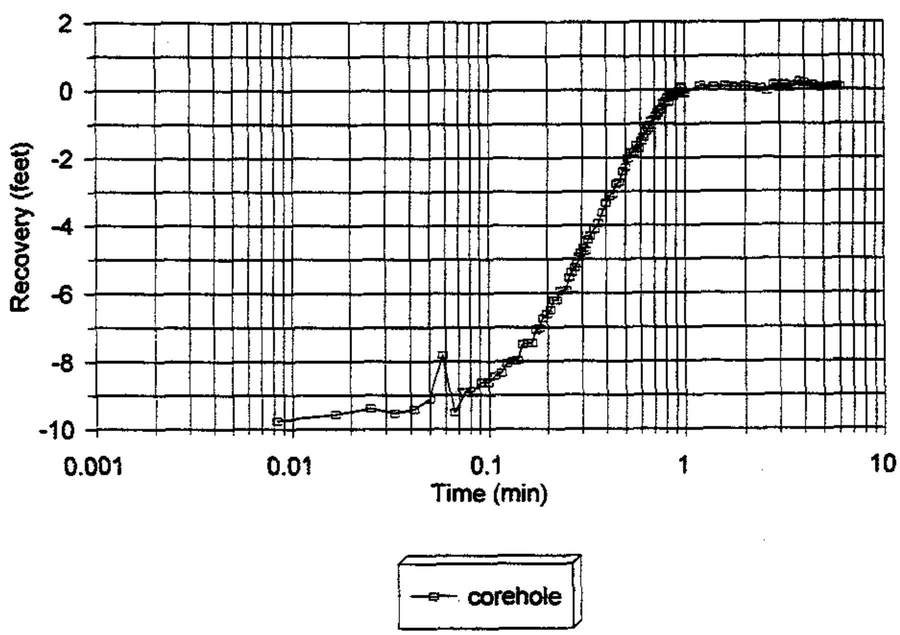
## ROMP 9.5 Core Hole Packer Test

Arcadia Fm (293-308 ft bls)

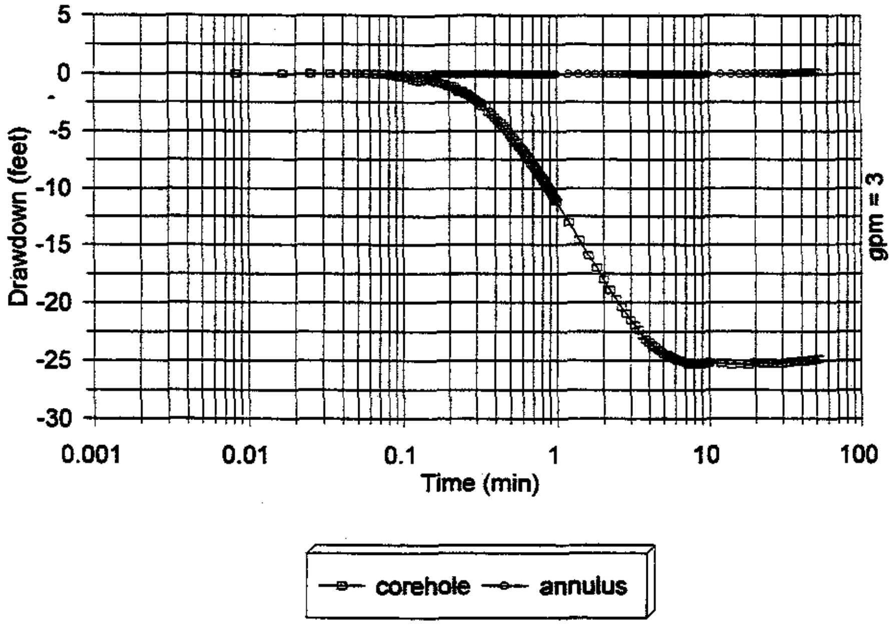



## ROMP 9.5 Core Hole Packer Test

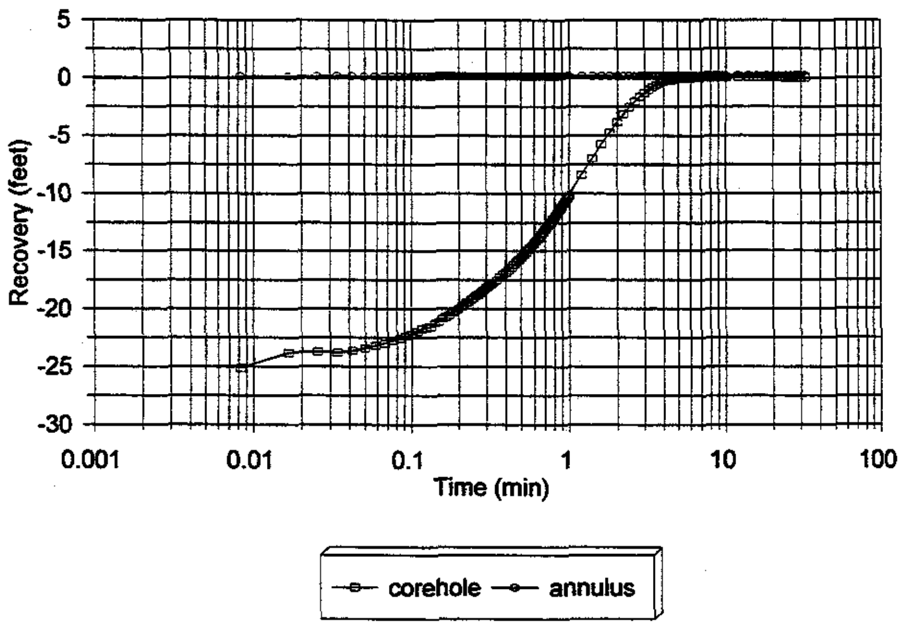
Arcadia Fm (293-308 ft bls)



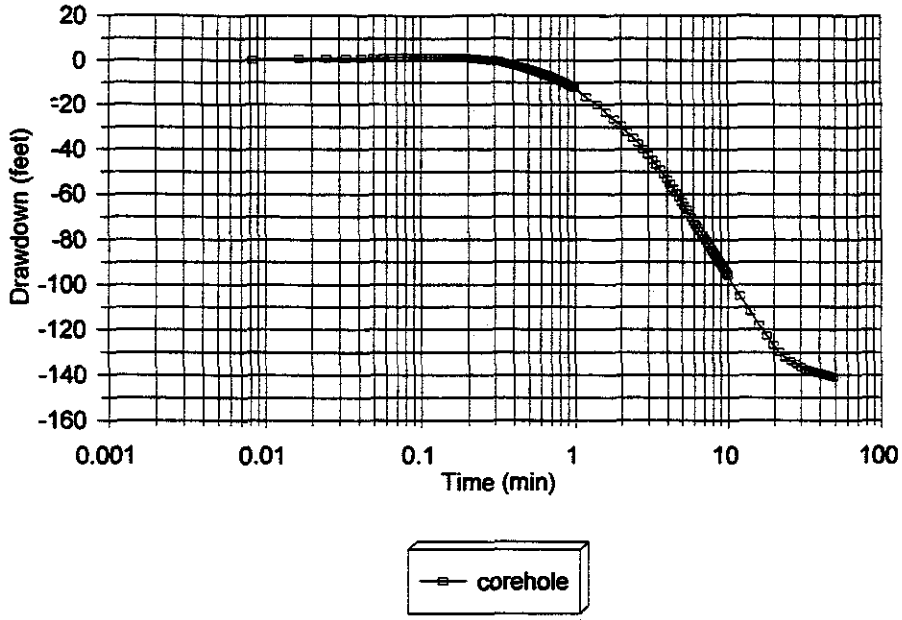
## ROMP 9.5 Core Hole Packer Test
Arcadia Fm (331 - 348 ft bls)



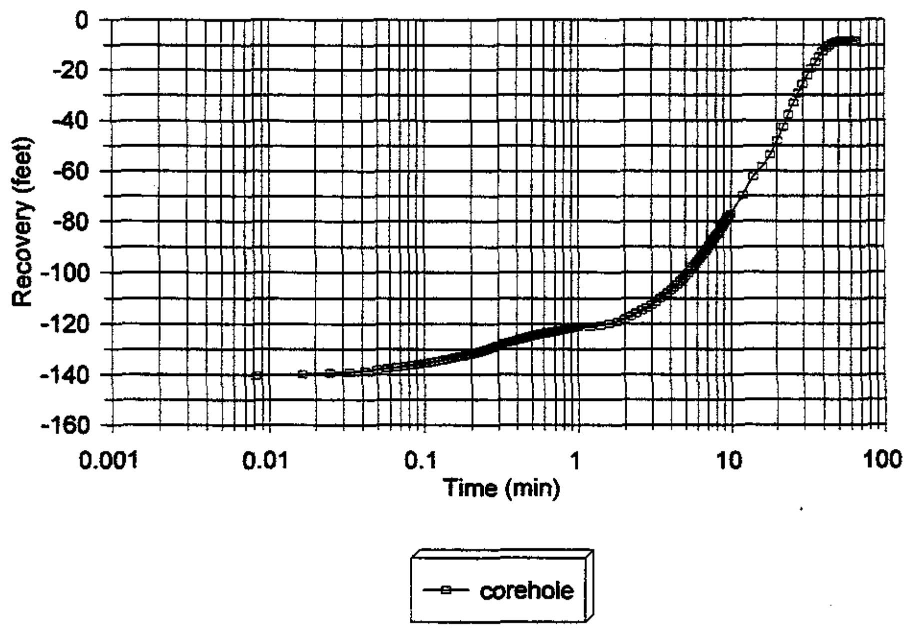

## ROMP 9.5 Corehole Packer Test
Arcadia Fm (331 - 348 ft bls)

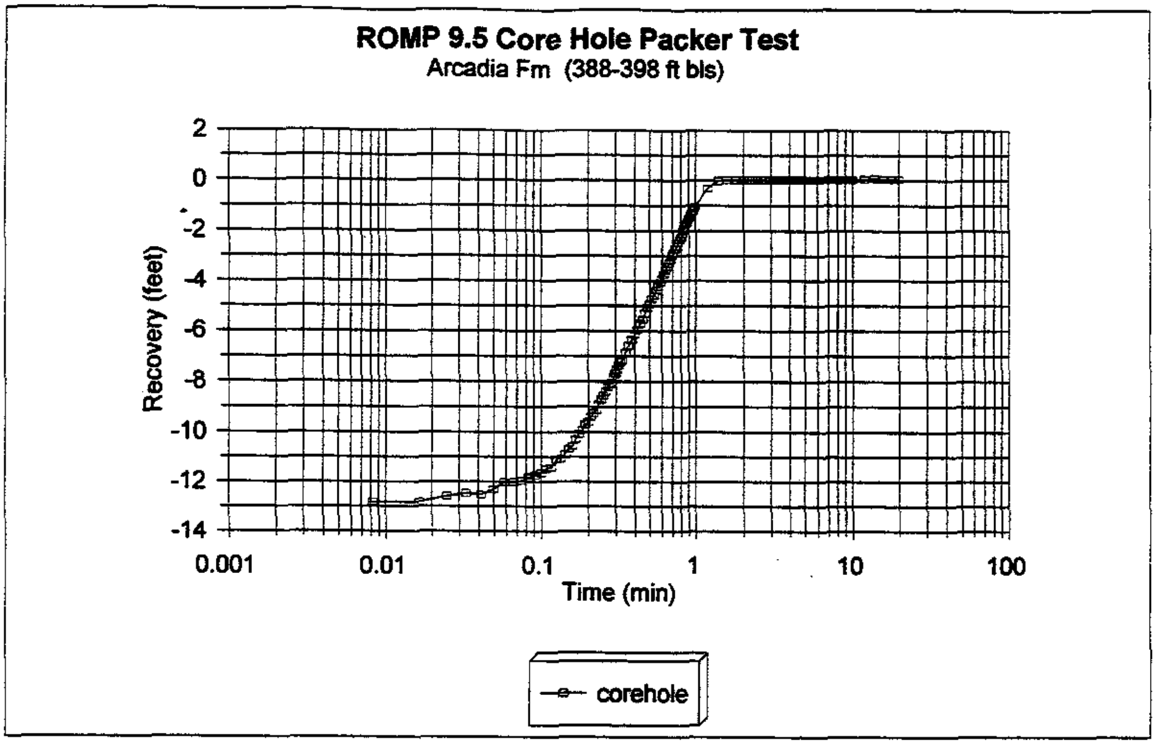


## ROMP 9.5 Core Hole Packer Test
Arcadia Fm (348-368 ft bls)

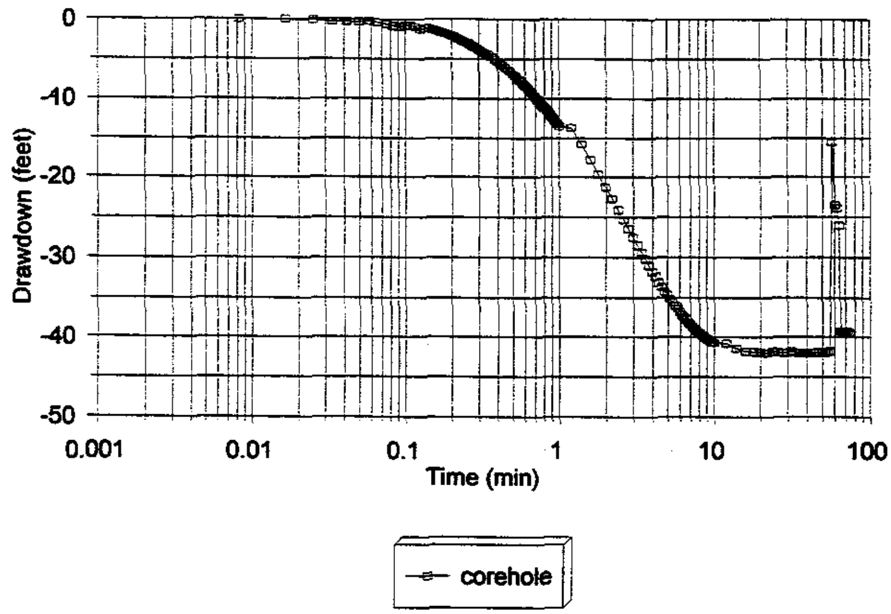



## ROMP 9.5 Core Hole Packer Test
Arcadia Fm (348-368 ft bls)

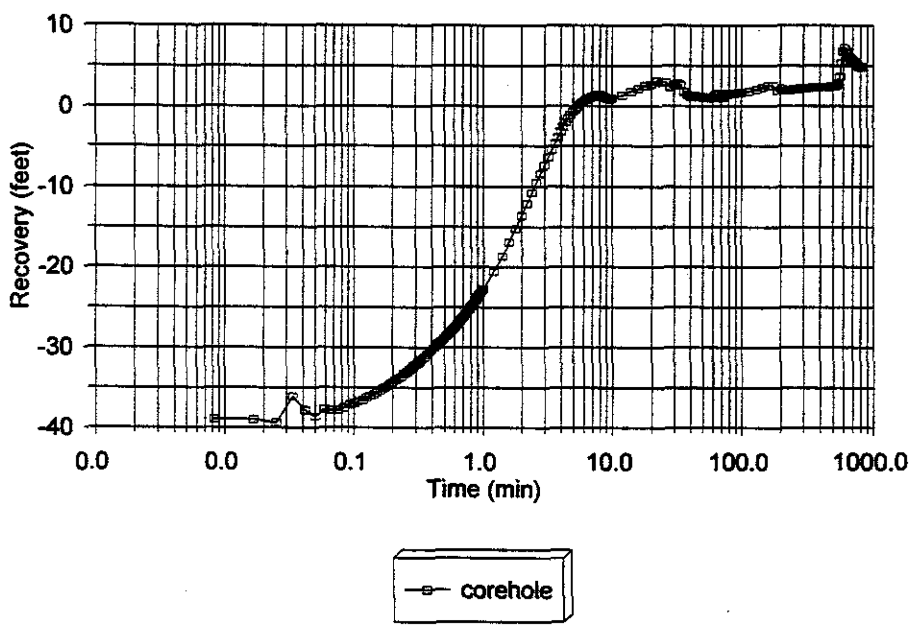


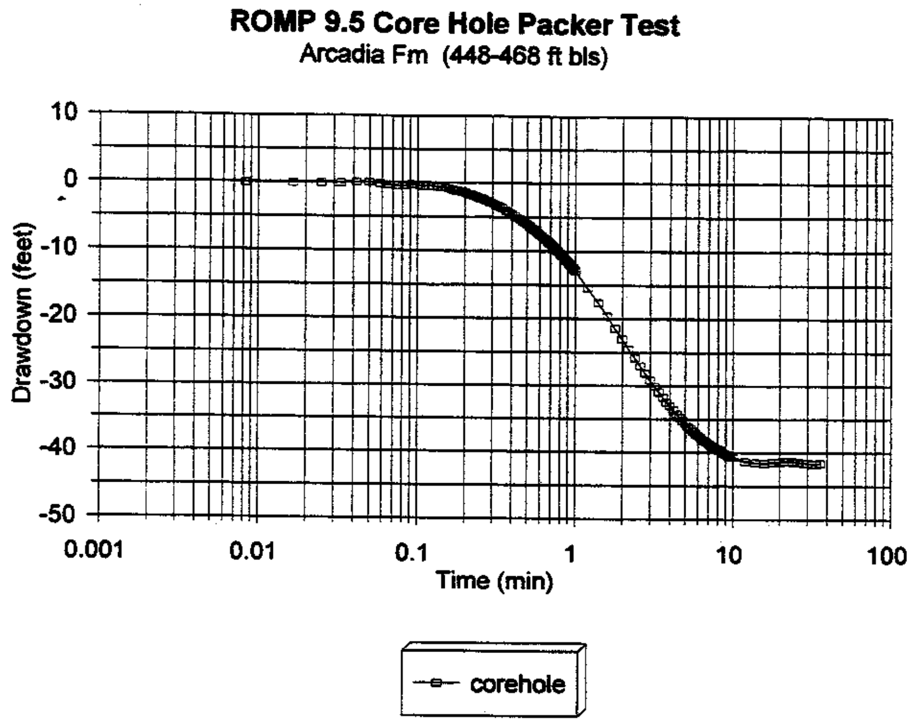

ROMP 9.5 Core Hole Packer Test
Arcadia Fm (388-398 ft bls)
Recovery (feet)
2
0
-2
-4
-6
-8
-10
-12
-14
0.001
0.01
0.1
1
10
100
Time (min)
corehole

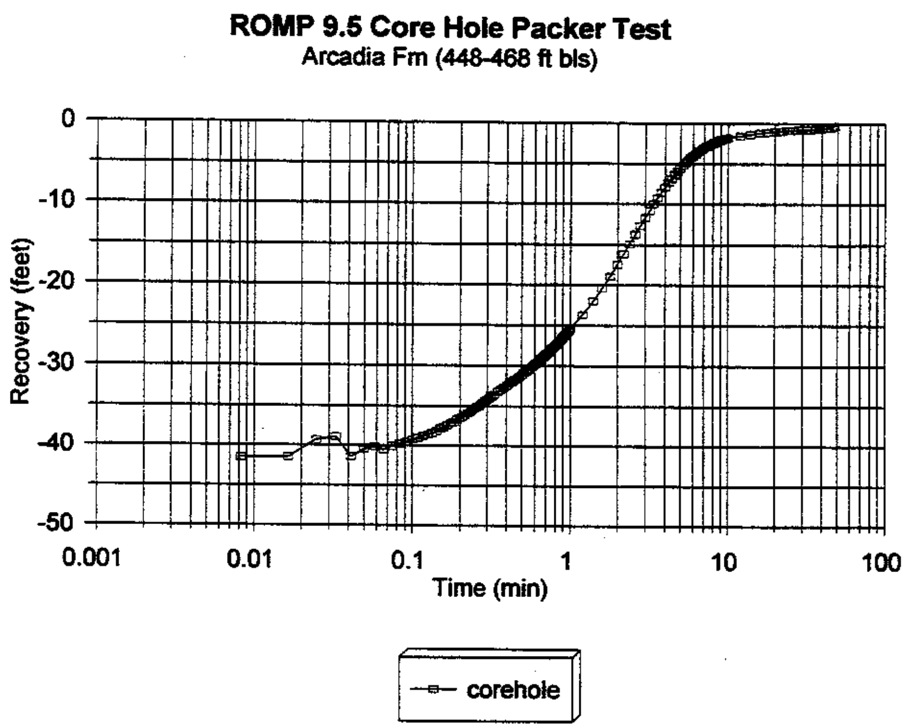
**ROMP 9.5 Core Hole Packer Test**
Arcadia Fm (413-468)




**ROMP 9.5 Core Hole Packer Test**
Arcadia Fm (413-468 ft bls)

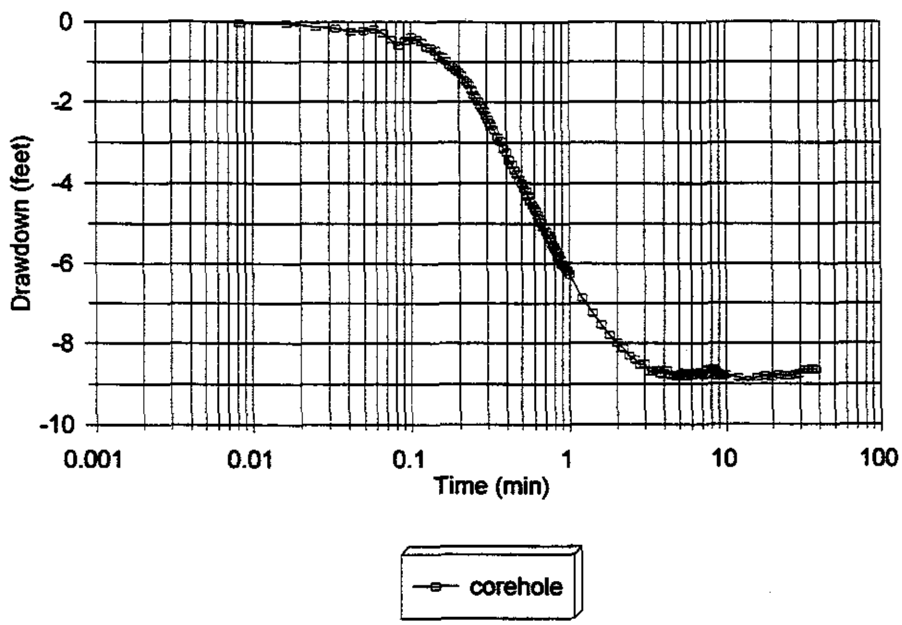



ROMP 9.5 Core Hole Packer Test
Arcadia Fm (448-468 ft bls)
Drawdown (feet)
10
0
-10
-20
-30
-40
-50
0.001
0.01
0.1
1
10
100
Time (min)
corehole


ROMP 9.5 Core Hole Packer Test
Arcadia Fm (448-468 ft bls)
Recovery (feet)
0
-10
-20
-30
-40
-50
0.001
0.01
0.1
1
10
100
Time (min)
corehole

## ROMP 9.5 Core Hole Packer Test

Suwannee Lm (493-513)



# APPENDIX B

LITHOLOGIC WELL LOG PRINTOUT                SOURCE - FGS

WELL NUMBER: W-17597                COUNTY - DESOTO
TOTAL DEPTH: 543 FT.                LOCATION: T.38S R.23E S.31
SAMPLES - 2" CORE                LAT = 27D 07M 59S
LON = 82D 03M 20S
COMPLETION DATE: 02/28/97                ELEVATION: 38 FT
OTHER TYPES OF LOGS AVAILABLE - GEOPHYSICAL WELL LOGS (0 - 800 FT BLS)

OWNER/DRILLER: SWFWMD ROMP 9.5 (IAS) /DRILLED BY PAT MEADORS (SWFWMD DRILLER)
LOCATED WITHIN THE RV GRIFFIN RESERVE

WORKED BY: TED GATES (SWFWMD GEOLOGIST)
WIRE LINE ROTARY CORING FROM 0 FT. TO 543 FT. BLS

| | | | |
|---|---|---|---|
| 0.0 - 11.5 | 090UDSC | UNDIFFERENTIATED SAND AND CLAY |
| 11.5 - 34.0 | 122TMIM | TAMIAMI FM. |
| 34.0 - 53.0 | 122PCRV | PEACE RIVER FM. |
| 53.0 - 224.0 | 122ARCA | ARCADIA FM. |
| 224.0 - 254.0 | 122TAMP | TAMPA MEMBER OF ARCADIA FM. |
| 254.0 - 398.0 | 122ARCA | ARCADIA FM. |
| 398.0 - 454.0 | 122NOCA | NOCATEE MEMBER OF ARCADIA FM. |
| 454.0 - T.D. | 123SWNN | SUWANNEE LIMESTONE |

0 - 3 SAND; MODERATE GRAY TO MODERATE DARK GRAY
30% POROSITY; INTRAGANULAR
GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
ROUNDNESS: SUB-ANGULAR TO SUB-ROUNDED; MEDIUM SPHERICITY
UNCONSOLIDATED
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: SILT-20%, PLANT REMAINS-01%
FOSSILS: NO FOSSILS
SAND QUARTZ, SOME SILT AND ORGANICS, DRY

3 - 4.3 SAND; MODERATE LIGHT GRAY TO BROWNISH GRAY
30% POROSITY; INTRAGRANULAR
GRAIN SIZE: MEDIUM; RANGE: FINE TO MEDIUM
ROUNDNESS: SUB-ANGULAR TO SUB-ROUNDED; MEDIUM SPHERICITY
UNCONSOLIDATED
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: SILT-02%
FOSSILS: NO

4.3 - 7.3 SAND; BLACK
30% POROSITY: INTRAGRANULAR
GRAIN SIZE: FINE; RANGE: VERY FINE TO MEDIUM
ROUNDNESS: SUB-ANGULAR TO SUB-ROUNDED; MEDIUM SPHERICITY
UNCONSOLIDATED
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: SILT-05%,
FOSSILS: NO FOSSILS

7.3- 9.4 SAND; LIGHT OLIVE GRAY TO GREENISH GRAY
20% POROSITY: INTRAGRANULAR
GRAIN SIZE: MEDIUM; RANGE: FINE TO COARSE
ROUNDNESS: SUB-ANGULAR TO SUB-ROUNDED; MEDIUM SPHERICITY
POOR INDURATION
CEMENT TYPE(S): CLAY MATRIX
ACCESSORY MINERALS: CLAY-15%, IRON STAIN-20%, SILT-05%
PHOSPHATIC SAND-01%
FOSSILS: NO FOSSILS
SAND, QUARTZ, CLAYEY, IRON STAINED, SOME PHOSPHATIC SAND

9.4- 12.5 SAND; YELLOWISH GRAY TO LIGHT GREENISH GRAY
20% POROSITY: INTRAGRANULAR
GRAIN SIZE: MEDIUM; RANGE: FINE TO COARSE
ROUNDNESS: SUB-ANGULAR TO SUB-ROUNDED; MEDIUM SPHERICITY
UNCONSOLIDATED
SEDIMENTARY STRUCTURES: INTERBEDDED, MOTTLED
ACCESSORY MINERALS: PHOSPHATIC SAND-05%, SILT-04%
CLAY-01%
OTHER FEATURES: PLATY, CALCAREOUS
FOSSILS: ECHINOID, FOSSIL FRAGMENTS
SAND, QUARTZ, SHELL FRAGMENTS, ECDINOID
FRAGMENTS,INTERBEDDED PHOSPHATE

12.5- 29 SAND; MODERATE LIGHT GRAY TO MODERATE GRAY
30% POROSITY: INTRAGRANULAR
GRAIN SIZE: MEDIUM; RANGE: FINE TO COARSE
ROUNDNESS: ANGULAR TO SUB-ROUNDED; MEDIUM SPHERICITY
UNCONSOLIDATED
SEDIMENTARY STRUCTURES: INTERBEDDED, MOTTLED
ACCESSORY MINERALS: PHOSPHATIC SAND-10%, SILT-02%
OTHER FEATURES: FROSTED, SPECKLED
FOSSILS: MOLLUSKS, FOSSIL FRAGMENTS
QUARTZ SAND WITH PHOPHATIC SAND, FEW LARGE SHELL FRAGMENTS

29 - 34 SAND; OLIVE GRAY TO BLACK
30% POROSITY: INTRAGRANULAR
GRAIN SIZE: MEDIUM; RANGE: FINE TO COARSE
ROUNDNESS: SUB-ANGULAR TO SUB-ROUNDED; MEDIUM SPHERICITY
UNCONSOLIDATED
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: PHOSPHATIC SAND-20%
PHOSPHATIC GRAVEL-02%, LIMESTONE-02%, CLAY-01%
OTHER FEATURES: FROSTED, GRANULAR, SPECKLED
FOSSILS: MOLLUSKS, FOSSIL FRAGMENTS
SAND, QUARTZ, PHOSPHATIC SAND, LARGE SOLIDIFIED MOLLUSK
SHELLS AND FRAGMENTS, PECTIN MOLDS

34 - 37.4 SAND; MODERATE GRAY TO BLACK
20% POROSITY: INTRAGRANULAR
GRAIN SIZE: MEDIUM; RANGE: FINE TO COARSE
ROUNDNESS: SUB-ANGULAR TO SUB-ROUNDED; MEDIUM SPHERICITY
POOR INDURATION
CEMENT TYPE(S): CLAY MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: PHOSPHATIC SAND-25%, CLAY-05%
PHOSPHATIC GRAVEL-03%
OTHER FEATURES: FROSTED, SPECKLED
SAND, QUARTZ, PHOSPHATIC SAND AND GRAVEL, INTERBEDDED WITH
BLUE-GREEN CLAY; AROUND 35.0' LARGE CLAYSTONE FRAGMENTS
HARD.

37.4- 48 CLAY; LIGHT OLIVE GRAY TO DARK GREENISH GRAY
05% POROSITY: LOW PERMEABILITY; MODERATE INDURATION
CEMENT TYPE(S): CLAY MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: QUARTZ SAND-20%, PHOSPHATIC SAND-05%
OTHER FEATURES: GRANULAR, SPECKLED
FOSSILS: FOSSIL FRAGMENTS
CLAY, SANDY, LOW PERMEABILITY

48 - 53 LIMESTONE; YELLOWISH GRAY TO YELLOWISH GRAY
10% POROSITY: FRACTURE, MOLDIC
GRAIN TYPE: BIOGENIC, CALCILUTITE
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO CRYPTOCRYSTALLINE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: QUARTZ SAND-03%, PHOSPHATIC SAND-01%
OTHER FEATURES: GRANULAR
FOSSILS: FOSSIL FRAGMENTS

53 - 58 LIMESTONE; WHITE TO YELLOWISH GRAY
10% POROSITY: FRACTURE, MOLDIC
GRAIN TYPE: BIOGENIC, CALCILUTITE
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO CRYPTOCRYSTALLINE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: QUARTZ SAND-03%, PHOSPHATIC SAND-02%
OTHER FEATURES: GRANULAR
FOSSILS: FOSSIL FRAGMENTS, BENTHIC FORAMINIFERA, MOLLUSKS

58 - 68 CALCILUTITE; YELLOWISH GRAY TO LIGHT OLIVE GRAY
03% POROSITY: FRACTURE
GRAIN TYPE: CALCILUTITE, SKELETAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO VERY FINE; GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, DOLOMITE CEMENT
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: PHOSPHATIC SAND-25%, QUARTZ SAND-03%
SILT-03%, DOLOMITE-01%
OTHER FEATURES: FROSTED, SPECKLED, FOSSILIFEROUS
FOSSILS: FOSSIL FRAGMENTS
CALCILUTITE, VERY LOW POROSITY, SANDY, FEW FOSSILS

68 - 70 SANDSTONE; LIGHT OLIVE GRAY TO OLIVE GRAY
08% POROSITY: INTERGRANULAR, FRACTURE
GRAIN SIZE: MEDIUM; RANGE: FINE TO COARSE
ROUNDNESS: ANGULAR TO SUB-ANGULAR; MEDIUM SPHERICITY
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: CALCILUTITE-40%, QUARTZ SAND-15%
OTHER FEATURES: CALCAREOUS, GRANULAR, SPECKLED
PHOSPHATIC SANDSTONE, CALCILUTITE CEMENT MATRIX

70 - 73 CALCILUTITE; YELLOWISH GRAY TO LIGHT OLIVE GRAY
03% POROSITY: FRACTURE, INTERGRANULAR
GRAIN TYPE: CALCILUTITE, BIOGENIC, SKELETAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: CRYPTOCRYSTALLINE TO VERY FINE; GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, DOLOMITE CEMENT
SEDIMENTARY STRUCTURES: INTERBEDDED, MOTTLED
ACCESSORY MINERALS: PHOSPHATIC SAND-25%, QUARTZ SAND-05%
OTHER FEATURES: PARTINGS, SPECKLED, FOSSILIFEROUS
FOSSILS: MOLLUSKS

73 - 79 CALCILUTITE; LIGHT OLIVE GRAY TO OLIVE GRAY
10% POROSITY: INTERGRANULAR, FRACTURE
GRAIN TYPE: CALCILUTITE, BIOGENIC
GRAIN SIZE: MICROCRYSTALLINE
RANGE: CRYPTOCRYSTALLINE TO VERY FINE; MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: PHOSPHATIC SAND-40%, QUARTZ SAND-05%
OTHER FEATURES: FROSTED, GRANULAR, SPECKLED
FOSSILS: NO FOSSILS
CALCILUTITE MATRIX WITH HIGH PERCENTAGE OF PHOSPHATIC SAND

79 - 79.7 PHOSPHATE; OLIVE GRAY TO PINKISH GRAY
20% POROSITY: INTERGRANULAR, FRACTURE
POSSIBLY HIGH PERMEABILITY; UNCONSOLIDATED
CEMENT TYPE(S): CALCILUTITE MATRIX, CLAY MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: CALCILUTITE-30%, QUARTZ SAND-05%
CHERT-02%
OTHER FEATURES: CALCAREOUS, FROSTED, GRANULAR, SPECKLED
PHOSPHATIC SAND, INTERBEDDED SILT SIZED LIMESTONE

79.7- 83.1 CALCILUTITE; LIGHT OLIVE GRAY TO OLIVE GRAY
03% POROSITY: FRACTURE
GRAIN TYPE: CALCILUTITE, BIOGENIC
GRAIN SIZE: MICROCRYSTALLINE
RANGE: CRYPTOCRYSTALLINE TO VERY FINE; GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, DOLOMITE CEMENT
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: PHOSPHATIC SAND-25%, QUARTZ SAND-05%
CHERT-02%
OTHER FEATURES: FROSTED, GRANULAR, SPECKLED
FOSSILS: BENTHIC FORAMINIFERA, MOLLUSKS
CALCILUTITE WITH PHOSPHATIC SAND INTERBEDDED

83.1- 88.7 CALCILUTITE; WHITE TO YELLOWISH GRAY
10% POROSITY: FRACTURE, MOLDIC, POSSIBLY HIGH PERMEABILITY
GRAIN TYPE: CALCILUTITE, BIOGENIC, SKELETAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: CRYPTOCRYSTALLINE TO VERY FINE; GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, DOLOMITE CEMENT
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: PHOSPHATIC SAND-05%
PHOSPHATIC GRAVEL-02%, DOLOMITE-03%, CLAY-02%
OTHER FEATURES: CHALKY, FOSSILIFEROUS
FOSSILS: MOLLUSKS, BENTHIC FORAMINIFERA, FOSSIL MOLDS
CALCILUTITE, HARD, MOLDIC, MOLDS FILLED WITH PHOSPHATIC
SAND

88.7- 90.7 CLAY; LIGHT OLIVE GRAY TO OLIVE GRAY
N % POROSITY, MODERATE INDURATION
CEMENT TYPE(S): CLAY MATRIX
ACCESSORY MINERALS: PHOSPHATIC SAND-02%, LIMESTONE-01%
CLAY, LOW PERMEABILITY, VERY LITTLE INTERBEDDED ACCESSORY
MINERALS

90.7- 93 CALCILUTITE; LIGHT OLIVE GRAY TO OLIVE GRAY
03% POROSITY: FRACTURE, MOLDIC, POSSIBLY HIGH PERMEABILITY
GRAIN TYPE: CALCILUTITE
GRAIN SIZE: CRYPTOCRYSTALLINE; MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: PHOSPHATIC SAND-13%, QUARTZ SAND-01%
PHOSPHATIC GRAVEL-01%
CALCILUTITE MATRIX, INTERBEDDED SILT-SIZED LIMESTONE AND
PHOSPHATIC SAND, SOME GRAVEL

93 - 98.6 CALCILUTITE; YELLOWISH GRAY TO LIGHT OLIVE GRAY
10% POROSITY: MOLDIC, FRACTURE
GRAIN TYPE: CALCILUTITE, BIOGENIC, SKELETAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: CRYPTOCRYSTALLINE TO MEDIUM; GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, DOLOMITE CEMENT
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: PHOSPHATIC SAND-05%, DOLOMITE-02%
QUARTZ SAND-01%, PHOSPHATIC GRAVEL-01%
OTHER FEATURES: DOLOMITIC, CHALKY, HIGH RECRYSTALLIZATION
FOSSILIFEROUS
FOSSILS: ECHINOID, BENTHIC FORAMINIFERA, MOLLUSKS
CALCILUTITE, MOLDIC, SOME MOLDS FILLED WITH DOLOSTONE AND
PHOSPHATIC SAND

98.6- 102.2 CLAY; GREENISH GRAY TO DARK GREENISH GRAY
01% POROSITY: INTERGRANULAR; MODERATE INDURATION
CEMENT TYPE(S): CLAY MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: PHOSPHATIC SAND-02%
PHOSPHATIC GRAVEL-01%, QUARTZ SAND-01%, GLAUCONITE-01%
CLAY, LITTLE INTERBEDDED MINERALS, LOW PERMEABILITY GRADES
TO CALCARENITE BELOW 101.6' 35-40% QUARTZ AND PHOSPHATIC
SAND TO 103.4' VERY LOW PERMEABILITY

102.2- 103.4 CLAY; LIGHT OLIVE GRAY TO OLIVE GRAY
LI% POROSITY, POOR INDURATION
CEMENT TYPE(S): CLAY MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: PHOSPHATIC SAND-15%, QUARTZ-15%
OTHER FEATURES: CALCAREOUS
VERY LOW PERMEABILITY, QUARTZ AND PHOSPHATIC SAND WITH
VARIABLE PERCENTAGE, INDURATION VARIABLE: MEDIUM TO POOR

103.4- 109.4 CALCARENITE; YELLOWISH GRAY TO LIGHT OLIVE GRAY
02% POROSITY: PIN POINT VUGS, LOW PERMEABILITY
GRAIN TYPE: CALCILUTITE
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO CRYPTOCRYSTALLINE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: PHOSPHATIC SAND-20%, QUARTZ-20%
OTHER FEATURES: FOSSILIFEROUS, SPECKLED
VERY LOW TO LOW PERMEABILITY, VARYING PERCENTAGES OF QUARTZ
AND PHOSPHATIC SAND, PIN HOLE TO 1/2" VUGS 110' IS CONTACT
BETWEEN PEACE RIVER FORMATION AND UNDIFFERENTIATED ARCADIA

109.4- 128 CALCARENITE; WHITE TO YELLOWISH GRAY
02% POROSITY: PIN POINT VUGS, LOW PERMEABILITY
GRAIN TYPE: CALCILUTITE
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO CRYPTOCRYSTALLINE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: PHOSPHATIC SAND-02%, QUARTZ- %
OTHER FEATURES: FOSSILIFEROUS
FOSSILS: ECHINOID, FOSSIL FRAGMENTS, FOSSIL MOLDS
VERY LOW TO MODERATE PERMEABILITY, PIN HOLE TO 2" VUGS
VARYING PERCENTAGES OF QUARTZ AND PHOSPHATIC SAND
PHOPHATIC SAND IS LESS COMMON

128 - 140 CALCARENITE; WHITE TO YELLOWISH GRAY
03% POROSITY: PIN POINT VUGS, FRACTURE
GRAIN TYPE: CALCILUTITE, SKELETAL, SKELTAL CAST
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO FINE; MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: PHOSPHATIC SAND-01%, QUARTZ- %
OTHER FEATURES: FOSSILIFEROUS
FOSSILS: ECHINOID, FOSSIL FRAGMENTS, FOSSIL MOLDS
VERY LOW TO LOW PERMEABILITY (VERY LOW 144.5'-153') PIN
HOLE TO 1" VUGS TO 144.5', VARYING PERCENTAGES OF QUARTZ
AND PHOSPHATIC SAND LIMESTONE IS MUCH CLEANER, VERY FEW
INTERBEDDED ACCESSORY MINERALS

140 - 153 CALCARENITE; WHITE TO YELLOWISH GRAY
03% POROSITY: FRACTURE, PIN POINT VUGS
GRAIN TYPE: BIOGENIC, PELLET, CALCILUTITE
GRAIN SIZE: VERY FINE
RANGE: MICROCRYSTALLINE TO VERY FINE; MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: PHOSPHATIC SAND-01%, QUARTZ SAND-02%
OTHER FEATURES: FOSSILIFEROUS
FOSSILS: NO FOSSILS

153 - 160.8 CLAY; YELLOWISH GRAY TO LIGHT OLIVE GRAY
01% POROSITY: LOW PERMEABILITY; MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, CLAY MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: PHOSPHATIC SAND-01%, QUARTZ SAND-01%
LIMESTONE-20%, CLAY-03%
OTHER FEATURES: FOSSILIFEROUS
VERY LOW PERMEABILITY

160.8- 163.8 CALCARENITE; YELLOWISH GRAY TO LIGHT OLIVE GRAY
03% POROSITY: INTERGRANULAR, PIN POINT VUGS
LOW PERMEABILITY
GRAIN TYPE: CALCILUTITE, PELLET
GRAIN SIZE: MICROCRYSTALLINE
RANGE: CRYPTOCRYSTALLINE TO MICROCRYSTALLINE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: PHOSPHATIC SAND-10%, QUARTZ SAND-07%
CLAY-02%
OTHER FEATURES: FOSSILIFEROUS
FOSSILS: FOSSIL FRAGMENTS, WORM TRACES
LOW PERMEABILITY, EFFERVECES WITH ACID

163.8- 187.2 CALCARENITE; YELLOWISH GRAY TO LIGHT OLIVE GRAY
05% POROSITY: MOLDIC, FRACTURE
GRAIN TYPE: BIOGENIC, CALCILUTITE, SKELETAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: CRYPTOCRYSTALLINE TO VERY FINE; GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: PHOSPHATIC SAND-02%, QUARTZ SAND-02%
PHOSPHATIC GRAVEL-01%
OTHER FEATURES: PARTINGS, FOSSILIFEROUS
FOSSILS: ECHINOID, MOLLUSKS, FOSSIL FRAGMENTS
LIMESTONE, MOLDIC, APPEARS PERMEABLE, NUMEROUS MOLLUSK
MOLDS

187.2- 189.7 CLAY; LIGHT OLIVE GRAY TO GREENISH GRAY
02% POROSITY: LOW PERMEABILITY; POOR INDURATION
CEMENT TYPE(S): CLAY MATRIX, CALCILUTITE MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: LIMESTONE-40%, DOLOMITE-05%
PHOSPHATIC SAND-03%, QUARTZ SAND-02%
OTHER FEATURES: CALCAREOUS
CLAY, INTERBEDDED WITH LIMESTONE MATRIX

189.7- 196 CALCARENITE; LIGHT OLIVE GRAY TO GREENISH GRAY
03% POROSITY: INTERGRANULAR, PIN POINT VUGS
GRAIN TYPE: BIOGENIC, CRYSTALS, PELLET
GRAIN SIZE: VERY FINE; RANGE: CRYPTOCRYSTALLINE TO FINE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, CLAY MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: PHOSPHATIC SAND-15%, QUARTZ SAND-10%
CLAY-02%
OTHER FEATURES: GRANULAR, SPECKLED, CRYSTALLINE
CALCARENITE, INTERBEDDED PHOSPHATIC AND QUARTZ SAND LOW
PERMEABILITY

196 - 198.3 CALCARENITE; WHITE TO YELLOWISH GRAY
03% POROSITY: INTERGRANULAR, MOLDIC
GRAIN TYPE: BIOGENIC, PELLET, SKELETAL
GRAIN SIZE: VERY FINE; RANGE: CRYPTOCRYSTALLINE TO FINE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
OTHER FEATURES: FOSSILIFEROUS
FOSSILS: ECHINOID, BENTHIC FORAMINIFERA, MOLLUSKS

198.3- 202.6 CALCARENITE; LIGHT OLIVE GRAY TO OLIVE GRAY
05% POROSITY: INTERGRANULAR, MOLDIC
GRAIN TYPE: BIOGENIC, SKELETAL, PELLET CAST
GRAIN SIZE: VERY FINE; RANGE: CRYPTOCRYSTALLINE TO FINE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, CLAY MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: CLAY-10%, ORGANICS-02%
FOSSILS: ECHINOID, BENTHIC FORAMINIFERA, MOLLUSKS

202.6- 203.4 CALCILUTITE; WHITE TO YELLOWISH GRAY
01% POROSITY: LOW PERMEABILITY
GRAIN SIZE: MICROCRYSTALLINE
RANGE: CRYPTOCRYSTALLINE TO MICROCRYSTALLINE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: ORGANICS-01%, CLAY-01%
CALCILUITE, HARD, LOW PERMEABILITY

203.4- 205.9 CLAY; LIGHT OLIVE GRAY TO GREENISH GRAY
01% POROSITY: LOW PERMEABILITY; MODERATE INDURATION
CEMENT TYPE(S): CLAY MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: LIMESTONE-03%
OTHER FEATURES: CALCAREOUS

205.9- 207.7 DOLOSTONE; LIGHT OLIVE GRAY TO OLIVE GRAY
20% POROSITY: FRACTURE, MOLDIC, POSSIBLY HIGH PERMEABILITY
10-50% ALTERED; SUBHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: CRYPTOCRYSTALLINE TO VERY FINE; GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT, CALCILUTITE MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: LIMESTONE-02%
FOSSILS: MOLLUSKS, ECHINOID, BENTHIC FORAMINIFERA
FOSSIL MOLDS, CORAL
DOLOSTONE, PERMEABLE, MOLDIC, FRACTURES, GRADES INTO MOLDIC
LIMESTONE

207.7- 211.2 CALCARENITE; YELLOWISH GRAY TO LIGHT OLIVE GRAY
15% POROSITY: FRACTURE, MOLDIC, POSSIBLY HIGH PERMEABILITY
GRAIN TYPE: BIOGENIC, SKELETAL, SKELTAL CAST
GRAIN SIZE: MICROCRYSTALLINE
RANGE: CRYPTOCRYSTALLINE TO VERY FINE; MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, DOLOMITE CEMENT
CLAY MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: CLAY-15%, DOLOMITE-05%
OTHER FEATURES: FOSSILIFEROUS

211.2- 212.6 CLAY; WHITE TO YELLOWISH GRAY
02% POROSITY: LOW PERMEABILITY; POOR INDURATION
CEMENT TYPE(S): CLAY MATRIX, CALCILUTITE MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: LIMESTONE-20%, PHOSPHATIC GRAVEL-01%
OTHER FEATURES: CALCAREOUS
CLAY, WHITE, LIMEY

212.6- 215 CALCARENITE; YELLOWISH GRAY TO LIGHT OLIVE GRAY
10% POROSITY: MOLDIC, FRACTURE, PIN POINT VUGS
GRAIN TYPE: BIOGENIC, SKELETAL, SKELTAL CAST
GRAIN SIZE: MICROCRYSTALLINE
RANGE: CRYPTOCRYSTALLINE TO MICROCRYSTALLINE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: DOLOMITE-05%
OTHER FEATURES: CHALKY, DOLOMITIC, FOSSILIFEROUS
FOSSILS: MOLLUSKS, FOSSIL MOLDS

215 - 219 DOLOSTONE; YELLOWISH GRAY TO OLIVE GRAY
10% POROSITY: MOLDIC, FRACTURE, PIN POINT VUGS
10-50% ALTERED; SUBHEDRAL
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO CRYPTOCRYSTALLINE
GOOD INDURATION
CEMENT TYPE(S): DOLOMITE CEMENT, CALCILUTITE MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: LIMESTONE-20%, PHOSPHATIC SAND-02%
QUARTZ SAND-01%
OTHER FEATURES: CALCAREOUS
FOSSILS: MOLLUSKS, BENTHIC FORAMINIFERA, FOSSIL MOLDS
FOSSIL FRAGMENTS

219 - 223.6 CALCARENITE; YELLOWISH GRAY TO LIGHT OLIVE GRAY
10% POROSITY: MOLDIC, FRACTURE, INTERCRYSTALLINE
GRAIN TYPE: BIOGENIC, SKELETAL, SKELTAL CAST
GRAIN SIZE: MICROCRYSTALLINE
RANGE: CRYPTOCRYSTALLINE TO VERY FINE; GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: CALCITE-01%, DOLOMITE-01%
FOSSILS: ECHINOID, MOLLUSKS, BENTHIC FORAMINIFERA
FOSSIL FRAGMENTS

223.6- 242 CALCILUTITE; WHITE TO YELLOWISH GRAY
10% POROSITY: FRACTURE, MOLDIC, VUGULAR
GRAIN TYPE: BIOGENIC, SKELETAL, SKELTAL CAST
GRAIN SIZE: MICROCRYSTALLINE
RANGE: MICROCRYSTALLINE TO CRYPTOCRYSTALLINE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: DOLOMITE-02%
FOSSILS: MOLLUSKS, BENTHIC FORAMINIFERA
CALCILUTITE, HARD, FEW MOLDS - NOT VERY PERMEABLE

242 - 247.7 CALCARENITE; WHITE TO YELLOWISH GRAY
10% POROSITY: FRACTURE, MOLDIC, VUGULAR
GRAIN TYPE: BIOGENIC, SKELETAL, SKELTAL CAST
GRAIN SIZE: VERY FINE
RANGE: MICROCRYSTALLINE TO CRYPTOCRYSTALLINE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: PHOSPHATIC SAND-01%, DOLOMITE-01%
FOSSILS: MOLLUSKS, BENTHIC FORAMINIFERA, ECHINOID
CALCARENITE, MOLDIC, FRACTURED, HIGH POROSITY

247.7- 256.6 CALCARENITE; WHITE TO YELLOWISH GRAY
15% POROSITY: FRACTURE, MOLDIC, INTERCRYSTALLINE
GRAIN TYPE: BIOGENIC, SKELETAL, SKELTAL CAST
GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: CALCITE-01%
OTHER FEATURES: FOSSILIFEROUS
FOSSILS: CORAL, MOLLUSKS, BENTHIC FORAMINIFERA
FOSSIL FRAGMENTS
CALCARENITE, MADE-UP ALMOST ENTIRELY OF FORAM TESTS
(SORITES)

256.6- 263 CALCARENITE; WHITE TO YELLOWISH GRAY
10% POROSITY: FRACTURE, MOLDIC, POSSIBLY HIGH PERMEABILITY
GRAIN TYPE: BIOGENIC, SKELETAL, SKELTAL CAST
GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: CALCITE-01%
OTHER FEATURES: FOSSILIFEROUS
FOSSILS: CORAL, MOLLUSKS, ECHINOID, BENTHIC FORAMINIFERA
FOSSIL FRAGMENTS
CALCARENITE FOSSILIFEROUS, CORALS, ECHINOIDS, FORAMS

263 - 296.8 CALCARENITE; WHITE TO YELLOWISH GRAY
15% POROSITY: INTERGRANULAR, MOLDIC
POSSIBLY HIGH PERMEABILITY
GRAIN TYPE: BIOGENIC, SKELETAL, SKELTAL CAST
GRAIN SIZE: FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
OTHER FEATURES: FOSSILIFEROUS
FOSSILS: ECHINOID, MOLLUSKS, BENTHIC FORAMINIFERA, CORAL

296.8- 331 CALCARENITE; VERY LIGHT ORANGE TO YELLOWISH GRAY
05% POROSITY: INTERGRANULAR, MOLDIC, PIN POINT VUGS
GRAIN TYPE: BIOGENIC, PELLET, SKELETAL
GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO FINE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: PHOSPHATIC SAND-01%, QUARTZ SAND-01%
OTHER FEATURES: GRANULAR, WEATHERED, CRYSTALLINE
FOSSILS: ECHINOID, MOLLUSKS, BENTHIC FORAMINIFERA
CALCARENITE, LESS PERMEABLE, TRACE QUARTZ AND PHOSPHATIC
SAND

331 - 343.5 CLAY; WHITE TO YELLOWISH GRAY
01% POROSITY: LOW PERMEABILITY; MODERATE INDURATION
CEMENT TYPE(S): CLAY MATRIX, CALCILUTITE MATRIX
ACCESSORY MINERALS: PHOSPHATIC SAND-01%, QUARTZ SAND-01%
LIMESTONE-03%
OTHER FEATURES: CALCAREOUS

343.5- 345.5 CALCARENITE; YELLOWISH GRAY TO LIGHT OLIVE GRAY
02% POROSITY: INTERGRANULAR, LOW PERMEABILITY
GRAIN TYPE: BIOGENIC, CALCILUTITE
GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: PHOSPHATIC SAND-03%, QUARTZ SAND-02%
CLAY-01%
OTHER FEATURES: GRANULAR, SPECKLED, HIGH RECRYSTALLIZATION
CALCARENITE, LOW PERMEABILITY, INTERBEDDED QUARTZ AND
PHOSPHATIC SAND SAND, SOME MOLDS FILLED WITH QUARTZ AND
PHOSPHATIC SAND, HIGH RECRYSTALLIZATION

345.5- 352 CALCARENITE; WHITE TO YELLOWISH GRAY
03% POROSITY: INTERGRANULAR, LOW PERMEABILITY
GRAIN TYPE: BIOGENIC, CALCILUTITE, PELLET
GRAIN SIZE: VERY FINE; RANGE: MICROCRYSTALLINE TO MEDIUM
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: PHOSPHATIC SAND-02%, CLAY-01%
QUARTZ SAND-01%
FOSSILS: BENTHIC FORAMINIFERA, FOSSIL FRAGMENTS

352 - 368.5 LIMESTONE; LIGHT GRAY TO LIGHT OLIVE GRAY
03% POROSITY: INTERGRANULAR, LOW PERMEABILITY
GRAIN TYPE: BIOGENIC
GRAIN SIZE: CRYPTOCRYSTALLINE
RANGE: CRYPTOCRYSTALLINE TO MICROCRYSTALLINE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: PHOSPHATIC SAND-03%, QUARTZ SAND-02%
CLAY-02%
OTHER FEATURES: CALCAREOUS, WEATHERED
FOSSILS: ECHINOID, BENTHIC FORAMINIFERA, FOSSIL FRAGMENTS
LIMESTONE, POORLY CONSOLIDATED, INTERBEDDED PHOSPHATIC AND
QTZ SAND, LITTLE CLAY, LOW PERMEABILITY

368.5- 373 CALCILUTITE; YELLOWISH GRAY TO LIGHT OLIVE GRAY
02% POROSITY: LOW PERMEABILITY
GRAIN TYPE: BIOGENIC, CRYSTALS
GRAIN SIZE: CRYPTOCRYSTALLINE
RANGE: CRYPTOCRYSTALLINE TO MICROCRYSTALLINE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: PHOSPHATIC SAND-02%, QUARTZ SAND-02%
FOSSILS: FOSSIL FRAGMENTS
CALCILUTITE, HARD, FEW ACCESSORY MINERALS, VERY LOW PERMEABILITY

373 - 381.3 CLAY; YELLOWISH GRAY TO LIGHT OLIVE GRAY
02% POROSITY: LOW PERMEABILITY; GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
ACCESSORY MINERALS: LIMESTONE-40%, PHOSPHATIC SAND-08%
QUARTZ SAND-05%
OTHER FEATURES: CALCAREOUS
CLAY, CALCAREOUS, INTERBEDDED

381.3- 383 CALCARENITE; YELLOWISH GRAY TO LIGHT OLIVE GRAY
05% POROSITY: INTERGRANULAR, LOW PERMEABILITY
GRAIN TYPE: BIOGENIC, CRYSTALS, SKELTAL CAST
GRAIN SIZE: MICROCRYSTALLINE
RANGE: CRYPTOCRYSTALLINE TO VERY FINE; MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: PHOSPHATIC SAND-02%, QUARTZ SAND-01%

383 - 385 LIMESTONE; YELLOWISH GRAY TO LIGHT OLIVE GRAY
02% POROSITY: INTERGRANULAR, LOW PERMEABILITY
GRAIN TYPE: BIOGENIC, CRYSTALS
GRAIN SIZE: CRYPTOCRYSTALLINE
RANGE: CRYPTOCRYSTALLINE TO MICROCRYSTALLINE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: PHOSPHATIC GRAVEL-02%, QUARTZ SAND-01%
FOSSILS: FOSSIL FRAGMENTS

385 - 389 LIMESTONE; YELLOWISH GRAY TO LIGHT OLIVE GRAY
10% POROSITY: INTERGRANULAR, MOLDIC
POSSIBLY HIGH PERMEABILITY
GRAIN TYPE: BIOGENIC, SKELETAL, SKELTAL CAST
GRAIN SIZE: MICROCRYSTALLINE
RANGE: CRYPTOCRYSTALLINE TO VERY FINE; MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: PHOSPHATIC GRAVEL-01%, QUARTZ SAND-01%
OTHER FEATURES: FOSSILIFEROUS
FOSSILS: CORAL, ECHINOID, BENTHIC FORAMINIFERA, MOLLUSKS
FOSSIL FRAGMENTS
LIMESTONE, MOLDIC, FOSSILIFEROUS, APPEARS PERMEABLE

389 - 398.5 LIMESTONE; YELLOWISH GRAY TO LIGHT OLIVE GRAY
05% POROSITY: INTERGRANULAR, MOLDIC
GRAIN TYPE: BIOGENIC, SKELETAL, SKELTAL CAST
GRAIN SIZE: MICROCRYSTALLINE
RANGE: CRYPTOCRYSTALLINE TO VERY FINE; MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: PHOSPHATIC SAND-02%, QUARTZ SAND-03%
CLAY-01%
FOSSILS: CORAL, ECHINOID, BENTHIC FORAMINIFERA, MOLLUSKS
FOSSIL FRAGMENTS

398.5- 404.8 LIMESTONE; GREENISH GRAY TO GREENISH GRAY
01% POROSITY: LOW PERMEABILITY
GRAIN TYPE: BIOGENIC
GRAIN SIZE: CRYPTOCRYSTALLINE
RANGE: CRYPTOCRYSTALLINE TO CRYPTOCRYSTALLINE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, CLAY MATRIX
ACCESSORY MINERALS: CLAY-10%, QUARTZ SAND-05%
LIMESTONE, WAXY, CLAYEY, POORLY CONSOLIDATED

404.8- 407.5 LIMESTONE; YELLOWISH GRAY TO GREENISH GRAY
02% POROSITY: LOW PERMEABILITY
GRAIN TYPE: BIOGENIC, CALCILUTITE
GRAIN SIZE: MICROCRYSTALLINE
RANGE: CRYPTOCRYSTALLINE TO MICROCRYSTALLINE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: PHOSPHATIC SAND-03%, QUARTZ SAND-02%
CLAY-05%
OTHER FEATURES: CALCAREOUS
FOSSILS: ECHINOID, BENTHIC FORAMINIFERA, FOSSIL FRAGMENTS
LIMESTONE, INTERBEDDED WITH BEDS OF WAXY, CLAYEY LIMESTONE
VERY LOW PERMEABILITY

407.5- 422.5 LIMESTONE; WHITE TO YELLOWISH GRAY
02% POROSITY: INTERGRANULAR, LOW PERMEABILITY
GRAIN TYPE: CRYSTALS, CALCILUTITE
GRAIN SIZE: MICROCRYSTALLINE
RANGE: CRYPTOCRYSTALLINE TO MICROCRYSTALLINE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: QUARTZ SAND-06%, PHOSPHATIC SAND-01%
FOSSILS: FOSSIL FRAGMENTS

422.5- 431 MUDSTONE; YELLOWISH GRAY TO LIGHT OLIVE GRAY
01% POROSITY: LOW PERMEABILITY
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, CLAY MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: QUARTZ SAND-03%, PHOSPHATIC SAND-01%
PHOSPHATIC GRAVEL-01%, CLAY-02%
FOSSILS: FOSSIL FRAGMENTS
MUDSTONE, WAXY, LOW PERMEABILITY

431 - 436 LIMESTONE; WHITE TO YELLOWISH GRAY
01% POROSITY: LOW PERMEABILITY
GRAIN TYPE: CRYSTALS, CALCILUTITE
GRAIN SIZE: MICROCRYSTALLINE
RANGE: CRYPTOCRYSTALLINE TO MICROCRYSTALLINE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: QUARTZ SAND-03%, PHOSPHATIC GRAVEL-01%
FOSSILS: BENTHIC FORAMINIFERA, FOSSIL FRAGMENTS

436 - 438.3 MUDSTONE; YELLOWISH GRAY TO LIGHT OLIVE GRAY
01% POROSITY: LOW PERMEABILITY
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, CLAY MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: QUARTZ SAND-05%, PHOSPHATIC GRAVEL-01%

438.3- 440 LIMESTONE; WHITE TO YELLOWISH GRAY
02% POROSITY: INTERGRANULAR, LOW PERMEABILITY
GRAIN TYPE: CRYSTALS, CALCILUTITE
GRAIN SIZE: MICROCRYSTALLINE
RANGE: CRYPTOCRYSTALLINE TO MICROCRYSTALLINE
GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: QUARTZ SAND-03%, PHOSPHATIC GRAVEL-01%
FOSSILS: FOSSIL FRAGMENTS

440 - 452 LIMESTONE; VERY LIGHT ORANGE TO YELLOWISH GRAY
02% POROSITY: INTERGRANULAR, LOW PERMEABILITY
GRAIN TYPE: CRYSTALS, CALCILUTITE
GRAIN SIZE: MICROCRYSTALLINE
RANGE: CRYPTOCRYSTALLINE TO MICROCRYSTALLINE
MODERATE INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
SEDIMENTARY STRUCTURES: INTERBEDDED
ACCESSORY MINERALS: QUARTZ SAND-01%
FOSSILS: FOSSIL FRAGMENTS
LIMESTONE-POSSIBLE SUWANNEE CONTACT-VERY CLEAN, PHOSPHATE
NEARLY ABSENT, VERY LITTLE QUARTZ SAND

452 - 463 LIMESTONE; VERY LIGHT ORANGE TO YELLOWISH GRAY
01% POROSITY: LOW PERMEABILITY
GRAIN TYPE: BIOGENIC, CALCILUTITE
GRAIN SIZE: MICROCRYSTALLINE
RANGE: CRYPTOCRYSTALLINE TO MICROCRYSTALLINE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, CLAY MATRIX
ACCESSORY MINERALS: CLAY-02%
FOSSILS: BENTHIC FORAMINIFERA
LIMESTONE, VERY SOFT CLAYEY, VERY LOW PEMEABILITY

463 - 483 LIMESTONE; VERY LIGHT ORANGE TO YELLOWISH GRAY
05% POROSITY: FRACTURE, INTERGRANULAR, PIN POINT VUGS
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
FOSSILS: BENTHIC FORAMINIFERA

483 - 498 LIMESTONE; VERY LIGHT ORANGE TO YELLOWISH GRAY
15% POROSITY: INTERGRANULAR, MOLDIC
POSSIBLY HIGH PERMEABILITY
GRAIN TYPE: BIOGENIC, SKELETAL, SKELTAL CAST
GRAIN SIZE: MICROCRYSTALLINE
RANGE: CRYPTOCRYSTALLINE TO VERY FINE; GOOD INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX
OTHER FEATURES: MUDDY

498 - 523 LIMESTONE; WHITE TO YELLOWISH GRAY
01% POROSITY: PIN POINT VUGS
GRAIN TYPE: CALCILUTITE
GRAIN SIZE: CRYPTOCRYSTALLINE
RANGE: CRYPTOCRYSTALLINE TO CRYPTOCRYSTALLINE
POOR INDURATION
CEMENT TYPE(S): CALCILUTITE MATRIX, CLAY MATRIX
ACCESSORY MINERALS: CLAY-01%
FOSSILS: BENTHIC FORAMINIFERA

523 - 543 END OF CORING

543 TOTAL DEPTH

# APPENDIX C

Road 134 IAS Site DeSoto Co. TED
Tues. 11-19-94

1230 TED GATES on-site @ Road 134 in DeSoto County. Meet with Lynn Barr (USGS), Pat Meeks, Robert Parker (District)

1300 move CME 75 to ~~[illegible]~~ pumped well check location setting up to auger in the first surficial well. Will be the permanent surficial aquifer monitoring & the water supply well for the coring hole.

1455 Space shuttle 21st flight goes off - barely visible from site (Discovery).

1500 Spinning in 1st auger flight (10" augers 6" inside spigot).

1730 Stop augering @ 19' in some sandy & shell fragment looks like good water producer for $H_2O$ supply well

1740 leaving site for the day

M.T. [initials]

11-15-94

ROMP 136 IAS Desoto C. TED CAMPO
Wed. 11-20-96

0700 Driving to ROMP 25 City to help St Murphy get Hydro trailer and move to ROMP 136.
1200 On-site @ ROMP 136 setting up trailer.
1300 Augering @ 34' bls encounter ~~auger~~ hard layer ~~[illegible]~~ probably limestone.
1340 Large shell layer - solidified @ 34' - continuing with another auger.
1420 Reach clay & phosphatic sand layer. Clay appears to be Venice clay w/ interbedded phosphatic sand & gravel.
1450 Installing 4" screen 37.5'-12.5' ~~37-12'~~, 4" blank from ~~10~~ 12.5-7.5' above land surface. There is a semi-confining clay zone @ 9' bls. 10-20 SAND PACK 37.5-10'. Bentonite 10-8'.
1700 4" PVC water supply is installed - left 10' of augers in the hole - will grout from 8' to surface tomorrow A.M.
1720 leaving site for the day
*Note: water level in auger ≈ 4.0' bls.

M.T. [initials]

6

Romp 136 IAS Site — TED GATES
Thurs. 11-21-94

0715 Arrive on-site, P. Meadows picks up backhoe at entrance gate. Will dig and pit for core today.

7.85' 4.70 / 1.52 / 3.15 — 6.20 / -2.22 / 3.98 — 7.85 / 3.23 / 4.62

ROMP 131 IAS Site — Tern Grey

Mon 12-16-96

1230 Arrive on-site P Mudes, R. Park, L. Johnson on-site
Pat setting up to drill 12" hole to install 8" surface casing for core hole.

1240 Discuss drilling plans for contract rig w/ b log/ work on Operations work order

1330 L. Johnson on site

1425 Measure w.l. in 1st zone intermediate well = 6.20-(2.22') = 3.98' bls

1430 leaving site for ROMP 5

1530 ROMP 5 w.l. in Upper Int. 7.85-(3.23) = 4.62' bls
w.l. in 12" Surf. 4.70' - (1.52) = 3.15' bls
w.l. in 2" U.F. OB well 7.20-(3.00) = ~4.20' bls. TD of well is > 20' well construct is ok.

1700 leaving ROMP for hotel

12-16-96

1st Zone Ind. 4" well casing = 2.22' als.
2nd Zone Ind. 4" water supply = 3.51 als

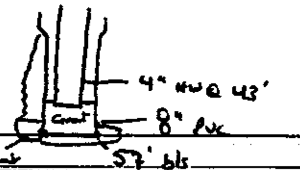
Romp 136 IAS Site — TED Gates
Tues. 12-17-94

0700 On-site @ Romp 136
0730 Pat drilled 13" hole to ~40' yesterday - will c[ontinue] drilling to 50' today and install 8" surface casing for corehole.
Water supply well: 61 4" casing, open hole 57
0940 W.L. - 1.03' bls. Top casing = 3.3' abd l[s]
0942 W.L. in 4" 1st zone = 6.27' - (2.22) = 4.05' bls
1000 Cindy Gates (Land Resources) on-site - discuss well construction plans & culvert installation.
Lynn Barr (USGS) on-site.
1130 Lunch
1300 8" casing is installed in borehole to ~~60~~ 57.5' bls. C[asing] is ~~...~~ 57 MTL
1330 Begin tremie grouting borehole.
1430 Finish 1st batch of grouting inside casing & out.
1500 Leaving site for Romp 25 Lily.
1600 On-site @ Romp 25 Lily - Doug Rappuhn @ Romp 13.
1630 Leaving Romp 13 for motel
Added total of 300 gals. of cem. ← casing Gro[ut]
1st stage 24 bags / 100 gals.
2nd stage 32 bags / 1 gel / 200 gal.

TG
12-17-94

3.3 / 1.5 / 8 / 4.

3.51




4.1 / .15 / .8

ROMP 136
Wed 12-18-96

TED GATES

0700 On-site @ ROMP 136 Pat Meeks & R. Parker also on-site

0730 W.L = UPZ well = 6.27 - (2.22) = 4.05' bls.
W.L = Water supply = 4.27 - (3.51) = 0.76' bls.

0800 Pat adding grout to annulus of casing - 4' of grout (3 bags)

0900 L. Johnson on-site picking up paperwork

0920 Installing 4" HW casing @ 43' bls on top of grout.

1200 Lunch on-site [Lynn Barr USGS on-site @ 0800]

1330 Begin coring into cement @ bottom of 4" pvc @ 43' bls.

1500 Complete 3rd core run @ 58' bls - All cement - hard

1530 Install water meter = 16373[55] @ start of 63-68' core run. Encounter Limestone on the 58-63' core run. Cement contact w/ limestone @ 59.5'. Calcilutite w/ interbedded qtz sand & phosphatic sand (Peace River Fm.) - doesn't appear very permeable

1600 Collect #4 permeability sample for FGS testing @ 64-64.8' for Peace River Fm. calcilutite.

1615 Core Run 68-73' - @ ~~71.5~~ 69.8' sandy zone in the limestone probably permeable (lost circulation during coring). Also sandy phosphatic zone @ 72.6' bls

1630 Stopped coring @ 74.5 to do a pump test with the submersible. Setting up equipment.

1730 Finished installing equipment - will run test tomorrow.

1735 Leaving site for night

12-18-96

Road 136 — Ted Gates
Thurs. 12-19-96

0700 Arrive on-site Gates, Barr, Meeder, Park.
Setting up XD's and data logger equipment.
0800 One XD (Blue 100 psi) not working.
0920 Started drawdown test in core rods. Open interval 61-74 in the Reese River Fm. The observation well (water supply) open interval 61-77.
Pumped @ 5 gpm w/ 2" submersible. Water in core rods drew down past XD @ 70' bls after 15 min.
0953 Started Recovery phase.
1105 Stopped Recovery phase (-0.4) left to recover
1115 Collected STD COMP from 61-74 w/ 2" submersible
1 volume of core rods = 17 gals
Temp: 23.5 pH – Cond: 0.682
Cl: 7x(20?) = 140 mg/L SO4: 100 mg/L
1145 George Ulrich on-site (retired USGS) to observe site activities

ROMP 134 — TED GATES
Tues. 1-7-96

0715 T. Gates on-site with Lyman Born (USGS) currently @ 128' b/s.
0800 -Reviewing data etc. conferring with Lyman about packer placement etc.
1000 Trouble-shooting new 50 psi XD and rental data logger.
1100 Pat and Al - rebuilding packer - installing new seals etc.
1200 Lunch - leaving site
1300 Back on-site. Call ROMP 5 U.Int. APT - spoke to Rick Lee. Everything seems to be going ...
1330 Pat going in with the packer element.
1415 2" pump set @ 70' (3.3' a/s) = 66.7' b/s. W.L. is @ top of drill stem (3.3' a/s). XD set @ 60-3.3-5...
1420 W.L. in annulus = 3.1' below top of 4" casing. 30 psi XD is set @ 40' below Top of 4" casing. Lin. = 1474 Scale 14.93 Offset = .0116
1435 Started test pumping @ 5 gpm for 80-128' interval
1438 Water level drew down to pump = 66.7' b/s. Stopped drawdown - initiated recovery phase - packer appears to have clogged intake ports.
1509 Going back in with the 2" pump, after checking packer and installing new seals & cleaning.
1530 W.L. in annulus is @ 3.00' b/s T.O.C. All other depths are the same. Readjusting.
1655 W.L. in Core rod 5.4' below T.O.C. Annulus is 3.2' below 4" casing. Core Rod depth was off trying again.
1710 Top pin sheared on packer - stopping for the day.
1730 Going to ROMP 5 U.Int. APT.
1830 Leaving ROMP 5 for hotel.

5.5 5.6

ROMP 136 & ROMP5 — Ted Gates

WED 1-8-96

0700 On-site @ ROMP 5 Upper Int. APT. Mike Beach, Doreen Chan on-site. Drawdown still going down slowly - curve has not yet flattened out. Myself & Rick Lee on-site, Lloyd Johnson on-site.

0930 T. Gates heading to IAS site.

1040 On-site @ IAS Pit. AC fixing hose on 2" pump.

1130 Called in to Brooksville - surficial TEST is scheduled for next week @ ROMP 5 (Greg).

1140 Packer is again installed @ 80' interval for test 80-128'.

1141 W.L in Core Rods = 5.2' below T.O.C. Annulus = 3.3' below TOC. Pump is @ 70'-(3.3)' = 67' bls. Pump is 62' below water level. XD in Rods is 60' below (TOC 3.3') = 57' or 52' below w.l.

1200 Start packer test.

1205 Call to ROMP 5 spoke to Rick Lee. Rick will stop pump and initiate Recovery phase of test.

1210 Annulus of HW Rods had w.l. drawdown. Stopping packer test, will inspect packer.

1430 Packer is set again - same depth for everything. Interval 80-128' bls. W.L. in Rods = 5.5 Annulus = 5.6

1431 Started test again. Pumping @ 5 gpm.
Rods 0.23 gal/ft = 13 gal + Hole = 14 gal - 3.2 gal

1445 Collect STD. COMPLETE SAMPLE @ 80-128' bls.
Temp: 24.9°C Cond. 0.74 umhos pH:
Cl: 120 SO4: 200

1545 Begin Recovery.

Pomp 136
THURS 1-9-97 TED GATE

0720 Arrive on-site @ Pomp 136 IAS Site.
0730 Remove xd's & 2" pump from core hole (overnight) Re: for 80-128' test

ROMP 136 HW casing reset @ 141' bls
MON. 2-3-97 TED Gets

GATE

1200 Arrive on-site @ ROMP 136. Pat previously drilled to 168' - then installed grout (50 gal) from 168 to ~148' bls. will install 4" HW and begin coring through grout.

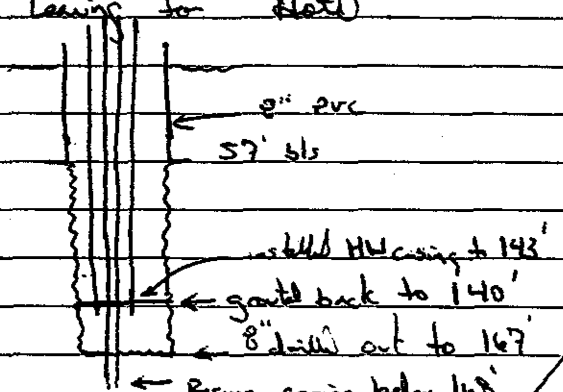
1230 Water Supply well (7.78') below csn bell.

1235 UPZ well (7.06') below top of casing.

1520 4" HW casing is reset @ 141' bls. Begin coring through the cement (141- ').

1710 Stop coring @ 158' bls - still in cement.

1715 Leaving for Hotel




2-3-97

3.62 4.98 8.42 / 4.98 / .44

ROMP 134 — TED GATES 8.71
TUES. 2-4-97

0745 Water level in 4" WS 8.71
0720 Water level in 4" VP2 well - 7.20
0815 Core rods - begin to core to the side of the cement - formation is present along w/ cement @ 163'.
0940 Stop coring @ 178' bls for a water level
0950 Water level = (4.98) - (5.42 T.O.C.) =
1000 Water level = (5.14) - (5.42 TOC) = + 0.28' above land
1105 Reach 188' bls. stopping for test
1150 Water level in core rods = (3.62) - (4.95) = +1.3
1200 XD#1 is set @ 90 - (3.7' als) = 86.7' bls
1201 XD#2 is set @ 30' - (0.7 als) = 28.3' bls
1210 XD#1 reads 86.738' of water.
XD#2 reads 23.697' of water.
1215 ~~Begin test~~ Core rods are set @ 183' bls.
Bottom of hole is 188' bls. 4" HW casing is @ 143'. 8" PVC is @ 57' bls.
1216 Begin test: 188' x (0.23 gal) = 43 gal (core rod)
4" HW Annulus casing 143' x (0.285 gal) = ~~55~~ gal 40.7 gal
Total to be removed ~~128~~ 84 gal (gpm = 6) = 14 minutes
1245 ~~Collect sample STD comp.~~
1241 Water level drew down to pump - stop test begin recovery phases
1400 Pump was installed @ ~95' bls. Water drew down to the pump after 10 minutes. The formation produced no water. 95ft x 0.285 gal = 27 gal + 22 gal = 49 gal.
49 gal ÷ 6 gpm = 8 minutes.
1550 Stop recovery test after 175 minutes w.l. still @ 28' bls.
1600 Resume coring =
1720 Stop coring @ 208' bls - still appears low permeability.
1730 Leaving for hotel.

[signature]

2.9 3.04 − 0.50 = 2.54 − .75 = 1.79

ROMP 134 0.75 TED GATES

Wed 2-5-97

0720 Arrive @ site. W.L. in 4" HW annulus is ~~approximately~~ ~~Hats~~ 1.5' als. (Annulus is same as core rods)

0740 Water Supply well = 5.15' ~~above~~ below T.O.C. (-1.55 bls)

0741 1st UPZ well = 7.04 TOC → (-4.82 bls)

0745 Pat & Al taking off 20' of core rods 208-20=188'. Setting up for 20' packer test interval.

0920 Measure W.L. in core rods = 1.99' als.

1010 ~~Pac~~ Packer is set @ 18 . Rods installed @ 188' bls. Pump set @ -180' bls. XD #1 set @ 167' bls. XD #2 set @ ~29' bls.

1015 XD #1 reads 167.42' of $H_2O$ above XD.
XD #2 reads 29.054' of $H_2O$ above XD.

1040 XD #1 reads 166.861 ←
XD #2 reads 28.710
208 x 0.053 = 50.6 gal
4" HW = 143 x 0.285 = 40.75 = 93 gal

1045 XD #1 = 166.829
XD #2 = 28.638

1047 Begin pumping Test Zone 188-208 ← Stopped

1050 Pump control - shut off - stop test. Letting water levels equilibrate again.

1120 XD #1 = 166.861
XD # = 28.404

1124 Start pumping. GPM = 5 Test zone 188-208

1125 Drawdown XD #1 = -33.46

1200 Drawdown ~ 70' XD #1

1145 Collect STD. comp @ 188-208' w/ 2" pump.
Temp = 24.7°C Cond: both dead pH both dead
Cl: 160 mg/L $SO_4$: 55 mg/L

1200 Begin recovery phase.

1330 Viewing packer test graphs - water level in B annulus drew down ~ 1.7'.

HES / tle / @ 163' / ( / level / ) = +1.33' als / ' bls / 3' bls / 3' bls / asing is / (core rods) / 40.7 gal / 83 minutes / 14 / test begin / down to / actual no / 19 gal / still / years

3.1 0.1

ROMP 136 IAS site
Wed. 2-5-97 continued

Ted Gates

1430 Call into office speak to Greg - update him on-site activities - he ~~sugg~~ gives suggestions to check for leakage during packer tests.

1535 Measure W.L. in core rods = 2.20' bls.

1600 Going in w/ packer. Core ~~rods~~ hole is @ 228' bls.

1650 Start drawdown test for PT 20~~5~~-228' bls. This zone appears permeable. GPM = 5.5

1700 XD#1 = -14.435 of drawdown
XD#2 = -0.02.
228 x 0.253 = 57 gal ÷ 5 gpm = 11 minutes

1715 Collect STD COMP @ 205-228' bls.

1720 Stop pumping begin recovery phase.
Temp: 25.6  Cond -  pH -
Cl: 160 mg/L  SO4: 65 mg/L

1740 Leaving site for hotel.

TG 

94.28 gpd/ft
T: 2442/15 = 244.2/14 = 
94.29 gal/ft = 2442 gal/ft
ft³ = 12 ft³

ROMP 136 IAS
Thurs. 2-6-97 Ted Gates

Gates
him ag-
to check
228' bls
s. This

0715 Gates, Al, Pd on-site
0730 Stop test. W.L. in annulus is 15 ± bls.
W.L. in core rods w/ packer set (205-228) = 2.225' bls
0745 Viewed a row crop across the road that may be pumping and affecting the core hole water levels.
0800 Talk to Lynn Barr (USGS) on phone. Call into the office ~~trip~~ tried to reach R. Basso - not in.
0930 Resumed coring.
1015 Dropped - analyzed data from PT 205-228'.
T = 12 ft²/day (~~[illegible]~~ recovery phase)
1330 Leaving site for Brooksville. Stopped coring @ 268 bls - still in Tampa MBR - still appears permeable

T. Gates
2-6-97

ROMP 134 IAS Site

MON. 2-10-97 Ted Gates

1430 T. Gates arrives on-site. Ed: V. on-site
Packer is set @ 245' bls. Pump is @ 200' bls
Open Interval 245-265' bls
Ed collected w.l. in 1st zone -7.13-(2.22) = 4.91
Cor bolt = +2.82 with supply = -4.72-(3.3)
1445 XD # is set @ ~ 170' bls
XD # 2 is set @ ~ 30' bls
1500 245' x 0.233 = 57 gal + 23 x 0.38 = 9 gal
66 gallon total to remove
1505 Start drawdown phase of test. GPM = 4.3
1545 Collect STD complete sample @ 245-265' bls.
Max of 14' of drawdown.
1555 Begin recovery phase of test.
1610 Fully Recovered stop test
1700 Packer is out of hole
1715 Leaving site for the day

M. T. Gates 2-10-97

Romp 134 IAS Site
Tues 2-11-97 Ted Gates

| | |
|---|---|
| 0730 | 4" 1st zone well W.L = 7.25 (TOC) - |
| | Water Supply well W.L = -9.60 (TOC) = |
| | Core rods W.L = 3.05 - (0.8) = 2.25 |
| 1200 | Reach 308' bls Stop coring |
| 1220 | Packer is set @ 293' bls Bottom of hole is @ 308 |
| 1325 | Begin pumping phase of test 293-308' |
| | 293 x 0.23 gal = 67 gal + 6 gal = 73 gal |
| | 15 minutes of pumping for 1 volume. |
| | [Using nomenclature table for annulus = 2.20' als] |
| 1400 | Collect STD COMP @ 293-308' bls |
| 1415 | Stop pumping - begin recovery phase. Drawdown was -9 ft in a permeable zone of the Tampa |
| 1421 | Stop recovery phase - fully recovered. |
| 1700 | Stop coring @ 323' bls Getting close to the Nocatee Mbr. |
| 1715 | Leaving site for the day |

2-11-97

4" HW Casing (annulus) is open from 143 to the bottom of Core Rods.

PDWF 136
Wed 2-12-97

Ted Gates

0715 W.L. in 1st Zone 4" = 7.21 (TOC)
W.L. in Water Supply well = 5.22 (TOC)
1200 Cored to 348' bls in Nacatoch Mbr. of Arcadia.
4" HW casing is not flowing.
1305 Install packer @ 333' w/ HW head seal installed. Could measure HW annulus water level w/ seal in place.
Measure W.L in core rods 333-348' zone W.L = +2.4
1315 Resetting packer - will remove 4" head seal
1420 XD#1 (200 psi) set @ ~ 170' bls
XD#2 (30 psi) set @ ~ 20' bls.
1425 XD#1 reads = 168.528
XD#2 reads = 29.193
Packer set @ 331-348' bls (appears less permeable).
1426 Start pump begin pumping phase. GPM =
331 x 0.23 = 77 gal + 7 gal = 84 gal.
1550 Stop recovery phase. Leaving packer in place for water level measurement tomorrow.

no more notes
2-12-97

3.45
1.20
2.25

ROMP 136 GATES, BARR, MEADORS, Vince P.
Thurs. 2-13-97 TED GATES

0715 Core Rods WL = 3.95 - (0.5) - (1.20) = 2.25
Annulus ~~wtr~~ is flowing again. Yesterday sand & cuttings were flowing fr HW casing.
0830 Collect Perm samples from packer test zones.
1015 Stop coring @ 388' bls in a low permeability calcarenite (Nocatee).
Heading back to Brooksville.

ND
2-13-97

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143 to
GATES
backs
Cont
WL = +2.43
...)

155 4.65 - 0.5

POAP 134 — TED GATES

Mon. 2-17-97

1300 J. Gates arrives on-site. P. Meadors, R. Parker already on-site. Temp 80°F sunny, wind NE @ 15-20 mph

1335 Packer is installed @ 348' bls. Open hole to 368'.

1340 Annulus of HW = 2.675 Csg reads = 2.60' bls.

1345 Installing 2" pump & XD's.

1425 XD# 20 psi will not return to 0. Installed @ ~170' bls. Reads 0.345' above XD.

1425 Start drawdown phase for 348-368' bls.

348' x 0.23 gal = 80 gal + 0.38 gal x 20' = 7 gal

1 volume = 87 gallons. GP = 3.75

1450 Annulus HW = 3.65 GP = 2.0

Drawdown = -134.042'.

1510 Collect SD comp. sample @ 348-368' Drawdown 140' b

1515 Stop pump begin recovery phase.

$T = \frac{264 (3)}{100'} = 7.92 \text{ gal/ft} \times \frac{1 ft^3}{7.48 gal} = 1.05 ft^2/day$

1645 Pulled pump out of well. W.L. had recovered to within ~8 ft

1710 Leaving site for the day

M.J. LB 2-17-97

-1.43 .5 3 4.65 -1.93 2.72

ROMP 134 Ted Gates
Tues. 2-18-97

0710 GATES, Meeroons coming on-site @ ROMP 136
0720 W.L in 4" HW = 2.50' als
w.l. in core rods = 2.72' als
W.L. in 4" 1st zone well = 7.14 - (2.72) =
0730 Resume coring @ 368' bls
0930 L Barr (USGS) on-site.
1030 T. Gates leaving site for ROMP 5
1200 T. Gates back on-site.
1300 Reach 398' bls. The last 5 ft. appears permeable. Stopping here for pack test and head level measurement.
1330 G. McQuown on-site. Setting up packer & XO's etc.
1445 XO #4 set @ 170' bls. Pump installed @ 200' bls. Packer set @ 388' open hole to 398'.
Annulus of HW = 2.87 Rods = 2.80' als.
1500 Begin drawdown phase
1505 Drawdown = 12.86 inside rods Annulus = 2.90' als
388 x 0.23 = 90 gal + 10 x 0.38 = 4 gal
1 volume = 94 gal. GPM = 4.6
T = 17 ft²/day
1529 Q = 4.0 gpm
1607 Stopped test @ for recovery.
1710 Leaving site for day

2-18-97

4.13

4.63
1.33
3.30

3.30
.50
2.80

TED GATER

Pump 134
Wed. 2-19-97

0715 Arrive @ well site, Meadows Gates, Bon, Parlk.
0720 HW Annulus = ~~3.10~~ 2.80' a/s. Rods = 2.80 a/s
0730 Compared measurements between the HW annulus & the core rods - difference of 0.03'.
0750 W.L. in 1st zone 4" = 7.20 - (2.22) = 4.98
0800 Resetting packer @ 388' again - packer was deflated yesterday when Pat retrieved it.
0900 Pump installing, XO's installed for 388-358'.
0913 Annulus = 2.80 GPM = 4.1 START PUMPING
0916 drawdown = 47' 1 volume = 94 gal.
0945 GPM = 2.6 Cond = 770
1005 Stop drawdown phase - begin recovery.
Annulus = 2.80 Max drawdown = 107' Cond = 7..
1045 Lynn stopped test instead of step - so we don't have recovery data - o.k. drawdown curve looks good.
1046 Letting W.L. recover to measure head inside rods.
1130 W.L still recovering - decide to resume coring.
1640 Stop coring @ 428' - still in tight formation appears to still be Nocattee. will set packer @ 408' for a water level measurement.
1730 Leaving site for the day.

M. T. Gato 2-19-97

1.33 2.78 3.09

168.96

ROAP 134 73.238 TED GATES

Thurs 2-20-97

| | |
|---|---|
| 0715 | Gates, Barr, Meadows, Parker on-site. |
| 0720 | Checked w.c. Packer apparently leaked down-overnight - Pat stated that is was partially set. W.C. in the 4" HW annulus and inside the core rods were equal 3.00' bls. Will continue coring |
| 1345 | Stop coring @ 458' bls. Appear to be near the Suwannee contact - still tight - color looks like Suwannee |
| 1400 | T. Gates leaving site for Brooksville |

N.T. 2-20-97

ED GATES

Parker

80 bls

water in the

- (222) = 458

was deflated

358'

PUMPING

97 Cond = 720

so we

core looks good.

rods.

coring.

tight formation

will set

surcount.

Monday 2-24-97 Temp 134 / Tad Cool

1300 Gates arrives on-site. P Meadows, L. Brown, A. Morris already on-site.
1500 Setting up to Packer testing from 403-468' bls
1600 Start test pumping @ 4. gpm
1610 Max drawdown -7.2 feet
1612 Stop test - begin Recovery
1700 Wireline broke, trying to remove packer.
1730 Packer out - Pul & All tripped core rods out of hole. Packer did not set @ 403'.
1800 Leaving Site for hotel.

[signature] 2-24-97

Florida Head! 1612 (2.12)-(7.54) = 6h
1614 ~ 5.20 am = 2.24 abd 2.31

8.04 − .50 = 7.54   7.54 − 2.12 = 5.42
1 for Greg

ROMP 136
Tues. 2-25-97

0700 Pat & Al putting new winch on the rig.

0800 I begin complete memo to Greg - detailing the current status and estimated completion date for all phases of work @ my projects.

1230 Randy Hinkle & Tim Bailey on-site - discuss work order for 'preparing site' for the drilling contractor.

1330 Pat & Al have all rods back in the hole - resetting the packer @ 403 again

1600 Had problems with packer - would set @ 403. Moved packer to 413 and its set.

1605 Change in water level " Grey rods water level = +5.42 above land surface. HW rods water level = +2. above land surf.

1610 Begin Pumping 413-468' bls GPM = 4.25
413 x 0.23 = 95 gal + 55 x 0.38 = 21 = 116 gal
29 minutes for sample. No change in conditions

1730 Still raining on-site. Begin recovery phase - will collect sample tomorrow.

1750 Leaving site for motel.

A. 7. [signature]
2-25-97

Bar, A.
468' bls
out of

Annulus 2.8 3.35 2.54
- 3.35

ROMP 134 TED GATES
Wed - 2-26-97

0715 Gates, Meadors, Morris, Jim on-site.
W.L. in core rods (packer in overnight 413-468) is
+4.19 Annulus = +2.8

0740 Begin pumping - will pump 1 volume before sampling
STD. core from 413-468' bls.

0930 Pulling pump & packer. Resetting packer @
448' bls.

1030 Packer is reset @ 448-468: W.L. in core rods -
+5.30, annulus = 2.50.

1120 Complete test

1230 Resume coring @ 468.

1600 Reach relatively hard section of rollic Suwannee
@ 498' bls.

1715 Stop @ 508' bls.

1720 Leaving site for hotel

M. J. [illegible]
2-26-97

5.7    3.60
5.70    .5
    3.10

ROMP 136    TED GATES
Thus. 2-27-97

0715 GATES, Barr, Meadors, Morris @ Drill Site
0720 Resume coring @ 503' bls in permeable section of Suwannee.
0850 Cored to 513'.
1000 Installing packer @ 493-513'.
493 x 0.23 = 114 gal + 20 x 0.38 = 8.
122 gal = 30 minutes
1100 Collect STD. comp. @ 493-513.
1115 Stop test recovery complete
1240 T. Gates leaving site for Brooksville.

T. Gates 2-27-97

i Gates
) is
ure Sampling
acker @
re rods -
c Suwannee

ROMP 134 : IAS
MONDAY 3-3-97

Tex Core

0900 Arrive @ ROMP 134 Site.
1230 Resume coring @ 513' bls
1700 Stop coring @ 543' bls
1730 Leaving Site for motel.

ND 3-3-97

ROMP 134 — TED GATES

Tuesday 3-4-97

0700 Gates, Pelham, Meadows, Barn on-site.

0715 Water levels: Core Rods (543') = 5.32' als

Annulus: 4.07' als

0730 Call into Brooksville - speak to G. McQuown - about site plans. Will grout hole up after getting a final water level & water sample. End of coring @ 543' bls in the Suwannee LS.

1100 Collect final perm samples - for a total of 10.

1200 Packer set @ 513' for water level & water sample in the Floridan.

513' x 0.23 gal/ft = 118 gal 40' x 0.38 = 16 gal

134 gal. Approx 34 minutes

1300 Annulus: 4.12' als. Core Rods = 5.05' als.

1305 Packer appears not to be set. Annulus water level fluctuates with flow restrictions in core rods.