Cardno ENTRIX

Shaping the Future

Useppa Utility Company

Completion Report for Class V Exploratory Well EX-1

April 2012

Prepared For

Useppa Utility Company

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Chapter 1

Executive Summary

Cardno ENTRIX was contracted by the Useppa Utility Company to provide hydrogeologic services in support of drilling and testing of a Class V Group 9 Exploratory Injection Well to determine the feasibility of construction of Class V Group 4 disposal system for reverse osmosis concentrate.

A truck mounted Speedstar 135 drilling rig was mobilized to Useppa Island on January 23, 2012 and was demobilized from the island on February 24, 2012. The exploratory well, EX-1, was constructed using 10-inch schedule 40 casing set to a depth of 50 feet below land surface (bls). Exploratory drilling below the 10-inch casing reached a total depth of 181 feet bls. Formation water samples were collected at discreet depth intervals below the casing and were analyzed for chloride and total dissolved solids (TDS) concentrations. The water sampled from the permeable limestone between 50 and 60 feet bls had a TDS concentration of 48,656 milligrams per liter (mg/l). Subsequent water samples collected from four deeper permeable intervals located between 90 and 180 feet bls had TDS concentrations ranging from 4,232 mg/l to 5,572 mg/l. The exploratory borehole was backplugged from 181 feet up to a depth of 60 feet bls. The open interval of the completed well extends from the base of casing at 50 feet to the bottom of the 9.875-inch borehole at 60 feet bls.

A withdrawal test of EX-1 was performed by pumping the well at a rate of 81 gallons per minute. Water levels were measured in the pumping well, in four surrounding monitor wells, and in a tidal creek adjacent to the well site. The maximum drawdown measured in the pumping well was about 9.5 feet. The maximum drawdown measured in the four shallow monitor wells was about 1.5 feet during the withdrawal test. Water level data were collected over a period of approximately 6 days and included intervals before, during, and after the withdrawal test.

The exploratory drilling program suggest that due to the lack of high quality water above the proposed injection zone and the significant confinement below the proposed injection zone, injection of the Utilities wastestream should not result in adverse impacts to any potential developable water resources in the area of the injection well. Using data collected during the constant rate drawdown test of EX-1, the transmissivity of the proposed injection zone is estimated to range from about 12,000 to 17,000 gallons per day per foot. These estimates suggest this zone is transmissive enough to accept the Utilities wastestream although additional injection testing should be conducted to design an appropriate injection system.

Chapter 2

Introduction

The Useppa Utility Company maintains permits with the Florida Department of Environmental Protection (FDEP) for domestic wastewater disposal (Permit No. FLA 014494) and Reverse Osmosis (RO) concentrate disposal (Permit No. FLA 146102). Domestic wastewater is currently disposed within a percolation pond and RO concentrate are currently disposed within a drainfield. Approximately 30,000 gallons of domestic wastewater and approximately 50,000 gallons of RO concentrate are generated during a maximum or peak day demand.

The FDEP indicated that disposal of RO concentrate via a Class V injection well system appears to be a possible long term solution if acceptable hydrogeologic conditions are encountered. The FDEP also indicated that the domestic wastewater could possibly be disposed through this injection well system.

Cardno ENTRIX was authorized on December 1, 2009 by Useppa Utility Company to prepare and submit a Class V Exploratory Well Construction and Testing Permit Application to the FDEP. Cardno ENTRIX submitted the application and supporting documents to FDEP on June 10, 2010. On November 18, 2010 the FDEP issued the draft permit for construction and testing of a Class V Group 9 Exploratory Injection Well (Permit No. 45884-002-UC/5X). Cardno ENTRIX was authorized on June 28, 2010 by Useppa Utility Company to complete the exploratory program according to the permit. Cardno ENTRIX subcontracted a licensed Florida well drilling contractor, David Cannon Well Drilling (DCWD), to perform drilling and well construction in support of the exploration and testing program. Cardno ENTRIX worked with DCWD for a period of approximately five weeks between January 23 and February 24, 2012 to accomplish the drilling and testing described in this report. Refer to **Figure 1** for a map showing the regional location of the project site in relation of Lee County Florida.

Chapter 3

Well Drilling and Construction

3.1 Drilling Pad Construction

The specific dimensions and design of a drilling pad were submitted by Cardno ENTRIX to FDEP and approved prior to the mobilization of the drilling rig. Useppa Island Utilities staff constructed the drilling pad using 2 layers of 6-millimeter thick polyethylene plastic sheeting separated by a layer of clean fill. The drilling pad included 2-foot high earthen berms and three individual containment cells to facilitate the storage of drilling fluid and solids. The drilling pad was modified to encompass an in-ground pit area to the north of the drilling rig. This in-ground section was also double lined and surrounded by the required earthen berm. After casing installation was completed, the in-ground pit was filled in and the berm was reconfigured to its original position (**Figure 2**).

3.2 Pad Monitor Well Construction and Testing

Cardno ENTRIX provided oversight and supervision of the drilling contractor during all phases of drilling. Daily geologist's reports are provided as **Appendix A** for the days when Cardno ENTRIX was onsite. These reports and other pertinent documents and data were previously submitted in weekly reports to the Technical Advisory Committee via e-mail in electronic format.

The pad monitor well drilling was accomplished on January 24, 2012. Four pad monitor wells were constructed with one well located at each corner of the rectangular drilling pad. The wells were designated according to their approximate location relative to the pad; i.e. the well located northeast of the pad was designated as the Northeast Monitor Well or NEMW. The wells were constructed in the following order; NEWM, SEMW, SWMW, and finally NWMW (**Figure 2**). Immediately following the completion of construction, the pad monitor wells were connected to a gasoline powered centrifugal pump and were developed by pumping at rate of approximately 20 gallons per minute (gpm) for approximately 20 minutes. Initial samples were collected for laboratory analysis for TDS and chlorides. The report of the laboratory analyses of these samples is included as **Appendix B**. Water level measurements, field titrated chloride concentration, and water quality parameters of pH, temperature, and conductivity were measured and recorded on a weekly basis for the five weeks of drilling and testing and also for one additional week after the drilling rig was demobilized and all site activity had been completed. These pad monitor well reports are included as **Appendix C**.

The rotary drilling method utilized potable water as the drilling fluid. The potable water produced by Useppa Island Utility and transported to the site by the Useppa Island Fire Department in a 1,000 gallon tanker truck. The pad monitor well boreholes were drilled using a 4.875-inch tricone roller bit attached via a sub to the drilling rig Kelly. The fluid return containing the drilled solids was allowed to flow out onto the ground surface and was not recirculated. The borehole for each of the pad monitor wells was advanced to a depth of 16 feet below land surface. Each well was constructed using a 15 foot long, 2-inch diameter flush

threaded PVC well screen and casing assembly. Each assembly consisted of 10 feet of 0.01-inch millslot screen with a conical cap on the bottom and topped with a 5 foot section of blank casing. The wells were gravel packed using 20/30 silica sand. The wells were grouted above the filter sand using coarse bentonite topped by neat cement. A schematic of the construction details of the pad monitor wells is included as **Figure 3**.

Water samples were collected from each of the pad monitoring wells on January 24, 2012. Field titrations of the samples indicate the dissolved chloride concentration ranges from about 3,900 to 5,000 mg/l from 5 to 15 feet bls. Laboratory analysis indicates the TDS concentration ranges from about 9,200 to 10,600 within this same interval (**Table 3**).

3.3 Mud Rotary Drilling and Reaming

Drilling of the borehole for EX-1 commenced on January 25, 2012. The initial drilling was accomplished with a 16-inch diameter drag bit which was advanced via the mud rotary method using a bentonite based drilling mud. The drilling mud was prepared using potable water delivered to the site in the fire truck mixed with powdered bentonite using a venturi type nozzle and funnel flash mixer. Although the original plan did not include surface casing, the unconsolidated nature of the surficial sediments required support to prevent borehole caving or collapse during drilling and testing. The 16-inch borehole for the surface casing was advanced to a depth of 50 feet where a sufficiently consolidated limestone unit was encountered.

3.4 Surface Casing Installation

Initially, the contractor attempted to install a casing string consisting of 10-inch diameter Schedule 40 PVC and SDR 41 PVC casing. This attempt was aborted when the casing could not be installed deeper than 30 feet bls. The FDEP determined that the surface casing was required to be Schedule 40 and also must consist of full lengths of casing except for the uppermost section. The contractor utilized a 16-inch diameter roller cone bit combined with a heavyweight guide to ream and clean out the borehole. Following the reaming, a string of new 10-inch Schedule 40 PVC well casing was installed to a depth of 50 feet below land surface. The casing tally is included as **Table 1**. The casing specifications are included as **Appendix D**.

The casing was grouted in place during an initial pressure grouting stage followed by two subsequent tremie grout stages. **Table 2** indicates the cementing method and amounts utilized to grout the 10-inch casing in place. Three cement stages were emplaced on three consecutive days of cementing with a total of 64 sacks of portland cement installed.

3.5 Open Hole Mud Rotary Drilling and Testing from 50 to 121 feet bls

The open hole section below the 10-inch casing was drilled via the mud rotary method initially using a 7.875-inch diameter bit. After the borehole was advanced to a depth of 62 feet, the drilling mud was purged from the borehole and a water sample was collected by purging the drilling mud from the well using a 2-inch centrifugal pump. This water sample was delivered to a laboratory for field analysis for chlorides and TDS.

After mixing additional drilling mud with fresh water, the 7.875-inch diameter borehole was advanced to a depth of 81 feet bls. In order to improve the up-hole velocity of the drilling fluid and cuttings, it was decided that a smaller diameter bit would be employed. The borehole from

81 to 101 feet bls was advanced using a 4.875-inch diameter tri-cone roller bit. An attempt to collect a water sample from a zone between 90 and 100 feet was aborted due to blockage of the 0.01-inch slot screen assembly. In order to improve the up-hole velocity and clear the borehole of cuttings, a 5-inch temporary casing string was installed to a depth of 81 feet bls. A rubber formation packer was connected around the base of this casing and it was seated into the 4.875-inch diameter borehole to create a seal. Once in place, the cleaning out of the borehole between 90 and 100 feet was effectively achieved with mud circulation. A formation water sample from 90 to 100 feet was collected using a 3-inch diameter, 11 foot long, 0.04-inch slot screen assembly topped by a formation packer to help hydraulically isolate the screen section. The assembly was run to the bottom of the borehole attached to thread and coupled 2-inch PVC casing. A gasoline centrifugal pump was connected to the upper end of the sampling string and the sampling string was purged before collection of the sample for laboratory analysis.

As the borehole was advanced below 100 feet, a loss of drilling fluid circulation occurred at a depth of 113 feet bls. The borehole was advanced to 121 feet with no returns. A formation water sample was collected using the method previously described with the screen assembly positioned on the bottom of the borehole at 121 feet bls. Both samples were delivered to the laboratory for analysis for TDS and chlorides.

3.6 Reverse Air Drilling of Open Hole from 121 to 181 feet bls

After an adequate air supply was transported to the island and an acceptable disposal location was determined for water infiltration, the contractor was able to utilize the reverse air method of drilling. After drilling reached a depth of 141 feet bls, the drill string was tripped out of the hole and a formation water sample was collected between 130 and 140 feet bls. The borehole was advanced from 141 to 181 feet and a final formation water sample was collected from the 170 to 180 foot interval. Based on the water quality trends to be discussed in a following section, it was decided that further drilling was not warranted.

3.7 Water Quality Sampling of EX-1

As previously described, water quality sampling was performed at discreet intervals of the borehole. Including the samples collected from the 5-15 feet bls zone screened in the pad monitor wells, there were six depth intervals sampled for TDS and chlorides. **Table 3** contains a synopsis of the laboratory analyses results for the laboratory analyses results for TDS and chlorides. The laboratory results of these zone samples are included as **Appendix E**. The most noteworthy aspect of the water quality profile the EX-1 exploratory borehole was the highly mineralized water encountered between 50 and 60 feet bls. The level of total dissolved solids in this interval are unusually high; in fact, the measured level of 48,656 mg/l exceeds that of typical seawater which is about 34,500 mg/l. A possible explanation for the occurrence of this hyper-saline water might be due to natural processes that have happened within the isolated tidal lagoon adjacent to the site of EX-1. This lagoon has likely been isolated from tidal circulation by shoaling at its entrance to create what is commonly known as a salt pond.

It should be noted that the TDS values for the formation water samples collected below 60 feet are an order of magnitude lower than the 50 to 60 foot zone values. Although there was some variation in the quality of the water quality measured in the four deeper zones, these differences were minor. The hydraulic separation between the upper (50-60 foot) zone and the lower zones

was evidenced by a higher static water level inside the 5-inch (lower zone) casing than inside the 10-inch (upper zone) casing. A single water sample was collected for Total Organic Carbon (TOC) from the 50 to 60 foot interval to determine whether a generic permit for discharge to surface water would be feasible. The measured level of TOC of 17 mg/l exceeded the permit discharge screening limit of 10 mg/l; therefore, no groundwater was discharged to surface water.

3.8 Geophysical Logging

The geophysical logging firm of RM Baker LLC. was contracted by the drilling contractor to perform geophysical logging of the borehole. The geophysical logging unit was transported to the island and performed logging services on February 15, 2012. The 5-inch temporary casing remained in the borehole during the logging; however, the casing was lifted slightly before the logging and a limited slug of salty water is believed to have entered the borehole below the 5-inch casing as evidenced on the fluid conductivity log. The geophysical tools run in the hole included dual induction/natural gamma, caliper, fluid conductivity temperature, and sonic. These logs are included in hard copy as **Appendix F** and digital **Appendix G**. The scale of the hard copy logs is 1-inch per 10 feet. The sonic log signature inside the 5-inch PVC pipe from land surface to about 85 feet does not reflect any formation properties. The dual induction log exhibited a dramatic spike from the metal hose clamp on the rubber formation packer outside of the 5-inch casing. This effect was removed from the final log and replaced with a notation indicating metallic interference from 78 to 83 feet bls.

3.9 Backplugging from 181 to 60 feet bls

Upon conclusion of the geophysical logging, backplugging the borehole with neat cement was initiated. It was decided that the temporary 5-inch casing should remain in place during the cementing of borehole below about 85 feet to minimize any fluid migration from one zone of water quality into a different zone; specifically, to prevent upward flow from lower zones with higher artesian pressure. The backplugging operation consisted of pumping five stages of neat cement over the course of five separate days of grouting operations. The interval between 115 and 109 feet bls was filled with 4.5 gallons of limestone gravel followed by 1 gallon of coarse limestone sand. This interval had been the approximate location of a loss of circulation during mud rotary drilling and it was determined that attempted cement lifts were not successfully filling this portion of the borehole. A record of the backplugging operations is included as **Table 4**.

3.10 Reaming and Airlifting 50 – 60 feet bls

After backplugging the borehole had achieved the desired 60 foot bottom depth, the borehole was reamed with a 9.785-inch diameter bit. When this bit was lowered into the borehole, there was no significant resistance between 50 and 60 feet. Apparently, the original 7.875-inch diameter borehole had been enlarged during drilling. Direct airlift development of the well was performed with the bit on the bottom and also with the bit being alternatively lifted and lowered through the open hole section of the borehole. Airlift development was performed for a period of approximately one-half hour. The amount of water produced during this time period filled the available fluid storage volume of the three cells of the drilling pad. The estimated volume of the water airlifted is approximately 10,000 gallons based on the dimensions of the pad area filled with water. This equates to a discharge rate of approximately 330 gallons per minute. The water

was determined to be visibly free of suspended solids when development was completed. The final configuration of EX-1 is shown in **Figure 4**.

Chapter 4

Hydrogeology

4.1 Introduction

The lithologic sampling conducted during drilling of EX-1 was accomplished by collection of drill cuttings from the fluid returns during mud rotary and then reverse-air drilling. Field descriptions of the samples were conducted by geologists generally using the Dunham classification system for carbonate sediments. Field color descriptions are based on a Musnell® Rock color chart. A lithologic log of the formations encountered was prepared based on the field observations of the onsite geologist (**Appendix H**).

The two primary aquifer systems penetrated at the site were the Surficial Aquifer System (SAS) and Intermediate Aquifer System. This interpretation is based on correlation with an assessment of groundwater conducted by the South Florida Water Management district on nearby Pine Island (Burns and Bower, 1988). The Surficial Aquifer System on Useppa Island is similar to that on Pine Island as it consists of an unconsolidated sand water table aquifer underlain by a competent water bearing limestone. At EX-1 these two aquifers are separated by a less permeable section of sandy silt and marl. The other primary aquifer system encountered in EX-1 is the Intermediate Aquifer System (IAS). Specifically, the Sandstone Aquifer was encountered along with the uppermost zone of the Mid-Hawthorn Aquifer. These (IAS) aquifers occur within the Peace River and Arcadia Formations of the Hawthorne Group. A hydrostratigraphic column depicting the formations and the hydrogeology as evidenced in drilling and testing of EX-1 is presented as **Figure 5**.

4.2 Surficial Aquifer System

The Surficial Aquifer System consists of undifferentiated surficial deposits and the Tamiami Formation.

4.2.1 Undifferentiated Surficial Deposits

The uppermost 17 feet of sediments at the project site consist primarily of sands with an organic clay rich layer between 4 and 10 feet bls. This undifferentiated material is believed to be of Holocene to Pleistocene age and may be considered part of the Pamlico Sand, the Fort Thompson Formation, or the Caloosahatchee Marl. The pad monitor well screen intervals from 5 to 15 feet bls included a portion of the clay rich organics along with an underlying fine sand layer. When these wells were in a static condition, they exhibited a natural stratification in the water quality with the conductivity increasing with depth.

4.2.2 Tamiami Formation

The sandy silt between 17 and 42 feet bls along with the marl between 42 and 48 feet are believed to be a semiconfining unit within the Surficial Aquifer System. This unit corresponds to an unnamed marl unit within the Tamiami Formation. The limestone present between 50 and 60 feet bls is the primary water bearing unit within the Tamiami formation. It is generally a well indurated and highly fossiliferous limestone with good moldic porosity and good apparent

permeability. The lower carbonate portion of the Surficial Aquifer System has been described as responding as a "semi-unconfined aquifer" from pump tests observed on Pine Island (Burns and Bower, 1988).

4.3 Intermediate Aquifer System

The Intermediate Aquifer System consists of the Peace River Formation and the Arcadia Formation.

4.3.1 Peace River Formation

The Peace River Formation at the site consists mainly of siliclastic sediments dominated by quartz sands and sandstones with distinctive clay layers that provide hydraulic separation from the overlying and underlying aquifers. The uppermost clay occurs from 60 to 84 feet bls locally known as the Cape Coral Clay. This confining zone has been referred to as the Upper Hawthorn Confining Zone. Between the base of this clay at 84 feet bls and 148 feet is a sequence of mainly sandstone which is designated as the Sandstone Aquifer. The most distinctive feature of this Sandstone Aquifer at EX-1 is a loss of circulation zone between about 113 and 115 feet bls. The water quality of a sample collected from 110 to 120 feet exhibited slightly higher TDS level than the previous water sample collected between 90 and 100 feet bls. A minor clay unit between 103 and 105 feet bls which may provide some hydraulic division between the sampled intervals. The final water sample collected within the Sandstone Aquifer came from between 130 and 140 feet bls. This sample was collected after reverse air drilling had been utilized to drill from 120 to 140 feet. This sample indicates that there is a pronounced increase of approximately 500 ppm TDS within the formation from 120 to 140 feet bls. The lower boundary of the Sandstone Aquifer is marked by a clay unit which occurs between 148 and 158 feet bls. This clay is believed be the lowermost portion of the Peace River Formation called the Fort Myers Clay Member and also is designated as the Mid-Hawthorn Confining Zone.

4.3.2 Arcadia Formation

The Arcadia Formation underlies the Peace River Formation and consists primarily of dolostone and variably dolomitic limestone between 158 and at least 181 feet bls. A distinctive layer of very well indurated dolostone occurs at the top of the Formation in EX-1 between 158 and 161 feet bls. The underlying limestone and dolomitic limestone between 161 and 170 feet had an abundance of fossils and generally good apparent permeability. A marly dolomitic limestone between 170 and 176 marked a transition into a dolostone zone at the base of the borehole which exhibited an increase in apparent flow during reverse air drilling and a change in water quality as observed by a decrease in the specific conductance of the airlifted water from the bit face. The deepest water sample collected from the borehole came from between 170 and 180 feet bls. This sample had a TDS value 740 ppm less than the previous sample collected at 130 to 140 feet.

Chapter 5

Well Testing

5.1 EX-1 Withdrawal Testing

After development of EX-1 was completed and a period of 20 hours had elapsed for well recovery, a 4-hour constant rate drawdown test was conducted. Immediately prior to the well development, digital pressure transducer/dataloggers were installed at 10 feet below the tops of casings (btoc) in the four pad monitor wells and at about 3 feet of water depth in a nearby tidal creek. The locations of the water level monitoring stations are shown in **Figure 6**.

The dataloggers were Leveltrol ® Model 500 and 700 transducers manufactured by In-Situ Inc., These instruments are vented transducers that compensate for atmospheric pressure variations by means of a vent tube within the communication cable. The reference levels of the monitor well dataloggers were set prior to the initiation of data collection by inputting the measured static levels of each well in feet btoc.. The tidal creek transducer was set up to record the depth of water above the probe without any specific starting reference. The density of seawater (1.024 g/cm^3) was used for the fluid density setting for the tidal transducer. The density of water with 10,000 ppm TDS (1.00458 g/cm^3) was used for the pad monitor wells. The dataloggers recorded the water levels in the wells and the tidal creek at a frequency of one reading per minute for a period of 6 days. Data was recorded for about one day prior to withdrawal testing, during the 4 hour test, and for the next 5 days after testing. A transducer was installed at about 35 feet btoc in EX-1. This instrument was set for a seawater density fluid and collected data starting 1.5 hours prior to the start of the test and continued collecting data for the next 5 days. All of the transducers clocks were synchronized to a single laptop computer and data collection was programmed to occur exactly on the minute in all of the instruments. This setting insured that all water level readings were collected simultaneously in all of the instruments.

The 4-hour withdrawal test was accomplished using a gasoline powered centrifugal pump. The suction end of the pump was connected to a 40 foot long, 2-inch riser pipe that was suspended inside EX-1. The pump discharge was routed via a semi-rigid hose through a 2-inch totalizing flowmeter and into a lined and bermed section of the drilling pad. A second gasoline powered centrifugal pump was used to move the water from the drilling pad through a 2-inch temporary pipe over a distance of approximately 250 feet to the south into a designated infiltration area. The location of this area is shown in **Figure 7**. The throttle settings of the centrifugal pump remained constant for the duration of the 4-hour test. The discharge rate of the pump was calculated using a 2-inch totalizing flowmeter. The average flow over the 4-hour test was 81 gallons per minute. The flow rate was also checked by timing the filling of a 200 gallon tank and also a 150 gallon tank; the meter was determined to be accurate. Periodic water level measurements conducted in the pumping well and the monitor wells showed close agreement with the datalogger records (**Appendix G**).

5.2 Response of Wells to Pumping

Water levels were recorded with pressure transducers in the pad monitor wells and in well EX-1 during the drawdown test. Refer to **Appendix G** for the electronic files of the raw water level data. There was not a common survey point to establish all well casings to a common elevation so water levels were recorded relative to the tops of casings of the individual wells except for the tidal data which was measured in feet of water over the probe. Water levels in the wells are therefore shown as drawdown from the static water level rather than the actual elevations (**Figure 8 and Figure 9**). The tidal creek water levels were measured in water level above the fixed probe whereas the well data is recorded as water level below a fixed point; thus, the tidal increases in the creek show up as decreases in the depths to water in the wells. The actual water level in the wells is rising in concert with the tides.

The raw data for the monitor wells was adjusted by designating an arbitrary point in time as zero so that changes from then onward are referenced to a common point in time. This mathematical adjustment was applied to all of the subsequent readings. The zero point was picked when all the monitor well transducers had started collection at 11:40 AM on 2/22/12 and before there was any pumping or development of EX-1. This adjustment assumes that the static water level in the four wells is a flat planar surface at that point. Although that assumption might not be entirely accurate due to natural gradients and tides, this adjustment was necessary to clearly demonstrate and examine drawdown from a static level and that rising water levels would be represented by increasing numbers. The tidal creek data was also adjusted such that the level at 11:40 AM was zero and that all changes after that point were positive for rising water and negative for falling water. EX-1 data collection did not start until 2/23/12, so a zero point at 9:34 AM was chosen to reference the EX-1 data. This point was picked to correspond to a zero value in monitor wells. It should be stressed that there is no actual common reference for the drawdown data and the water levels in the monitor wells and the production wells may not be the same. This information would need to be established by a survey, which has not been performed to date. The land surface onsite was not sufficiently level after construction to correct static levels to a common land surface based upon the measured heights of casings.

5.3 Aquifer Test Data Analysis

A multiple well aquifer performance test (APT) was not conducted at the site because of the lack of observation wells tapping the proposed injection zone (50-60 feet bls). Drawdown was observed in the pad monitoring wells (5-15 feet bls) during the constant rate drawdown testing of EX-1. However, analysis of the pad monitor well drawdown data using standard APT techniques would not be appropriate because the pad monitor wells were not screened in the same zone as the open interval of EX-1.

Drawdown and pumping data collected in EX-1 was used to estimate the transmissivity of the proposed injection zone. The water level data from the pumping well EX-1 indicate that the water level dropped from a static level of 4.56 feet below top of casing to a maximum low water level of 14.23 feet btoc after 37 minutes of pumping. This maximum drawdown of 9.67 feet at the 81 gpm minute flow rate translates to a specific capacity of 8.38 gallons per minute per foot (gpm/ft). Using the Cooper-Jacob (1946) solution for flow to a well in a confined aquifer, Driscoll (1986) developed the following equations to estimate the transmissivity of an aquifer based on the specific capacity of a pumped well:

$$T = \frac{2000\ (Q)}{s}$$ for a confined aquifer

$$T = \frac{1500\ (Q)}{s}$$ for a unconfined aquifer

Where: T = transmissivity; gallons per day per foot (gpd/ft)

Q = constant discharge rate; gallons per minute (gpm)

s = drawdown in the pumped well; feet

Using these equations, the transmissivity is estimated to range from about 12,000 gpf/ft assuming the aquifer is unconfined to about 17,000 gpd/ft assuming the aquifer is confined. The actual transmissivity could be significantly higher of lower than estimated. These estimates suggest this zone is transmissive enough to accept the Utilities wastestream. It is important to note that these equations only provide estimates of the transmissivity of the proposed injection zone. Additional injection testing should be conducted to ensure the zone can adequately accept the Utility's wastestream and to design an appropriate injection system.

Chapter 6

Conclusions and Recommendations

6.1 Conclusions

The presence of favorable hydrogeological conditions for an injection zone were identified between 50 and 60 feet bls. Preliminary testing suggests this zone is adequately transmissive to accept the maximum anticipated wastestream. Well EX-1 was pumped at twice the normal operational wastestream flow rate during the drawdown test and about 50% above the maximum potential flow rate. Results of the pump test indicate the potential drawdown in the pad wells of up to 1.5 feet at the conclusion of the active pumping. The drawdown in the pad monitor wells was consistent with aquifer depressurization and not a point source cone of depression.

The exploratory drilling program indicates that significant vertical confinement is present between the proposed injection zone (50-60 feet bls) and the lower USDW zone that the island's RO supply wells are tapping (280-340 feet bls).

Although significant vertical confinement was not observed above the proposed injection zone, no high quality or moderately brackish groundwater was encountered between the 5 feet bls and 60 feet bls. This suggests that a USDW is not present above the proposed injection zone in the immediate area that might be influenced by injection into EX-1.

Water quality sampling indicates the interval from about 5 to 60 feet bls is highly stratified with regards to the TDS concentration. The initial pad monitor well water quality data averaged about 9,300 mg/l TDS from four wells that were cased to five feet bls and screened to a depth of about 15-feet bls. The water quality of the 50 to 60 foot interval was about 48,600 TDS which indicates the water quality of the interval between 5 and 60 feet bls degrades exponentially with depth. An approximately 24-foot thick confining unit, consisting of light olive, medium stiff to soft clay, is present from 60 to 84 feet below the proposed injection zone. The TDS concentration of the strata immediately below the base of this clay strata is about 4,200 mg/l at 90 feet bls, which indicates that the clay strata effectively confines the proposed injection zone from the deeper water bearing zones. The TDS concentration from 90 to 180 feet bls (base of the exploratory well) ranged from about 4,200 to 5,500 mg/l.

Due to the lack of high quality water above the proposed injection zone and the significant confinement below the proposed injection zone, injection of the Utilities wastestream should not result in adverse impacts to any potential developable water resources in the area of the injection well. Further, water levels in the pad monitor wells (5-15 feet bls) and the monitored interval of well EX-1 (50-60 feet bls) indicate that both flow zones are under direct tidal influence.

6.2 Recommendations

Cardno ENTRIX requests authorization from FDEP to proceed with injection testing of exploratory well EX-1 using potable water supplied from the water treatment plant. Testing will be conducted at variable rates with adequate recovery time between tests. The proposed testing

plan would consider 50% and 100% flow rates of the anticipated wastestream (25 and 50 gpm). This would serve to determine the potential for impacts to the shallow groundwater. The injection testing will also provide useful data for the final design of a multiple injection well system. The use of multiple wells may be necessary to minimize mounding. Additionally, the proposed testing will address potential mounding issues for each wastestream (RO Concentrate and wastewater) separately and combined if necessary of future expansion.

The injection test will consists of injection a potable water stream into well EX-1 while recording groundwater levels in the pad monitor wells and in well EX-1. Monitoring of the injection well (EX-1) will consist of a pressure transducer positioned just above the base of the open borehole and a pressure gauge on the wellhead. Specific conductivity data will also be collected in the pad monitor wells during the injection test. The use of potable water as the injectate will provide the most conservative results as the positively buoyant water will likely be recognized in the nearby pad monitor wells as the less dense waters mixed with the brackish native groundwater.

Background and post test water level and water quality data will be collected for up to one week on either side of the injection test to track the tidal responses and the potential subsurface movement of the injected potable water.

Chapter 7

References

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Tables

Cardno ENTRIX

Casing Log

Date: 1/31/2012
Project Name: Useppa Island Class V
Exploratory Well
Project No.: 02626001.00
Prepared By: Andrew McThenia
Well: EX-1

Page 1 of 1

Surface Casing is 10-InchSchedule 40 Solvent Weld Belled End
Casing Outside Diameter (inches): 10.75
Casing wall thickness (inches): 0.365
Stick Up Height (feet): **3.7' ALS***

*The casing was subsequently cut off to a stick up height of 1.6 feet Above Land Surface

Pipe No. and Install Order	Time of Install	Time Glue Connected to Next Pipe	Length (ft)	Cumulative String Length (ft)	Run Depth (ft bls)
1	13:39	13:45	19.60	19.60	15.90
2	13:46	13:50	19.60	39.20	35.50
3	13:55		14.50	53.70	50.00

Table 1. 10-Inch Casing Installation Log

Cardno ENTRIX

Cementing Log

Hole Diameter (in.): 16-inch
Casing OD = 10.75-inch
Annular Area = 0.766 square ft/vertical ft.

Dates: 2/6/2012
Project Name: Useppa Island Class V Exploratory Well
Project No.: 02626001.00
Prepared By: Andrew McThenia
Well: EX-1

Stage	Date	Start Time	End Time	Cementing Method	Tag Depth Before Cementing (ft bls)	Number of Sacks of Cement Used	Yield of Cement per Sack (cubic feet)	Volume of Cement Pumped (cubic ft.)	Cumulative Volume of Cement (cubic ft.)	Theoretical Vertical Lift (ft.)	Actual Vertical Lift (ft.)	Percentage Actual vs Theoretical Lift	Comments
1	1/31/12	14:41	14:22	Pressure	50	32	1.18	37.8	37.8	50	26	52%	Used 32 sacks of cement onsite.
2	2/1/12	13:50	14:00	Tremie	24	8	1.18	9.44	47.24	12.3	16	130%	Stage aborted after 8 sacks due to pump failure.
3	2/2/12	9:14	9;25	Tremie	8	24	1.18	28.32	75.56	37	8	22%	Excess cement overflowed from annulus into cuttings pit

Table 2. 10-Inch Casing Cementing Log

Cardno ENTRIX

Shaping the Future

Synopsis of Laboratory Results of Water Quality Samples

Dates: 2/6/2012
Project Name: Useppa Island Class V Exploratory Well
Project No.: 02626001.00
Prepared By: Andrew McThenia
Well: EX-1

Well Name	Sample Date	Depth Interval Sampled (ft.bls*)	Chlorides (mg/l)	Total Dissolved Solids (mg/l)
NEMW	01/24/12	5 - 15	4,900	10,600
SEMW	01/24/12	5 - 15	5,000	9,800
SWMW	01/24/12	5 - 15	3,930	8,160
NWWM	01/24/12	5 - 15	4,400	8,480
AVERAGE		5 - 15	4,558	9,260
EX-1	02/03/12	50 - 60	29,574	48,656
EX-1	02/08/12	90 - 100	2,639	4,232
EX-1	02/08/12	110 - 120	2,865	5,296
EX-1	02/10/12	130 - 140	3,370	5,572
EX-1	02/13/12	170 - 180	2,631	4,888

*bls = below land surface

Table 3. Zone Sampling Laboratory Results Summary

Cardno ENTRIX

Backplug Cementing Log

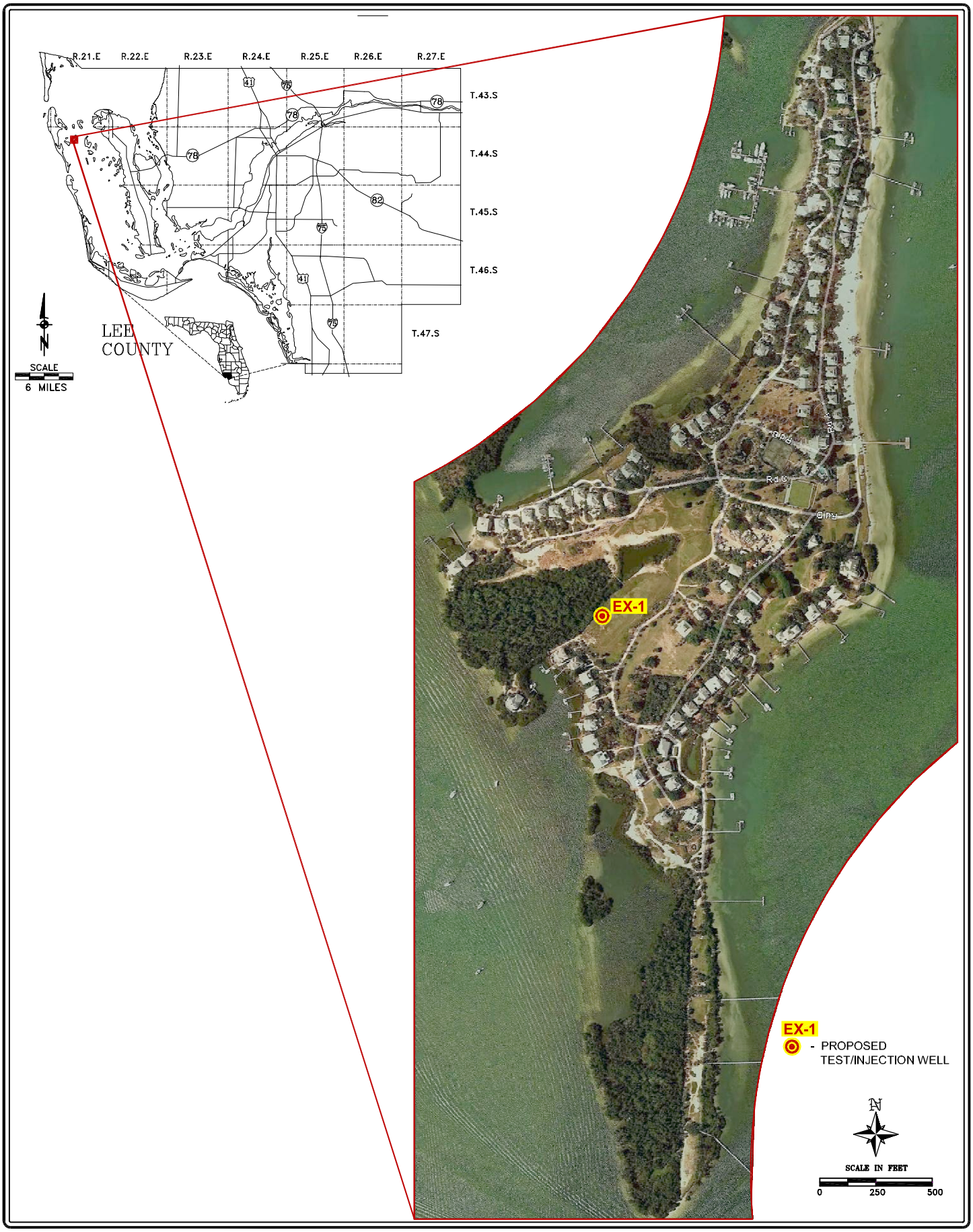
Dates: 2/7/2012
Project Name: Useppa Island Class V Exploratory Well
Project No.: 02626001.00
Prepared By: Andrew McThenia
Well: EX-1

Hole Diameter (in.): 4.875 inches
Annular Area of 7.875-inch Diameter Borehole from 50 to 81 ft. bls = 0.3382 square ft/vertical ft.
Annular Area of 7.875-inch Diameter Borehole from 81 to 181 ft. bls = 0.1296 square ft/vertical ft.

Stage	Date	Start Time	End Time	Cementing Method	Tag Depth Before Cementing (ft bls)	Number of Sacks of Cement Used	Yield of Cement per Sack (cubic feet)	Volume of Cement Pumped (cubic ft.)	Cumulative Volume of Cement (cubic ft.)	Theoretical Vertical Lift (ft.)	Actual Vertical Lift (ft.)	Percentage Actual vs Theoretical Lift
1	2/15/12	13:34	13:40	Tremie	181	7	1.18	8.26	8.26	63.7	1.5	2%
2	2/16/12	10:15	10:20	Tremie	179.5	14	1.18	16.52	24.78	127.5	40.5	32%
3	2/17/12			Tremie	139	7	1.18	8.26	33.04	63.7	24	38%
4	2/20/12	8:45	9:00	Direct Pour	115	5.5 gallons of gravel and sand	NA	0.735 (gravel)	NA	5.7	6	105%
5	2/20/12	9:50	10:00	Tremie	109	3	1.18	3.54	36.58	27.3	21	77%
6	2/21/12	10:00	10:07	Tremie	88	6	1.18	7.08	43.66	25.3	28	111%
	2/22/12				60							

Table 4. Record of Backplugging

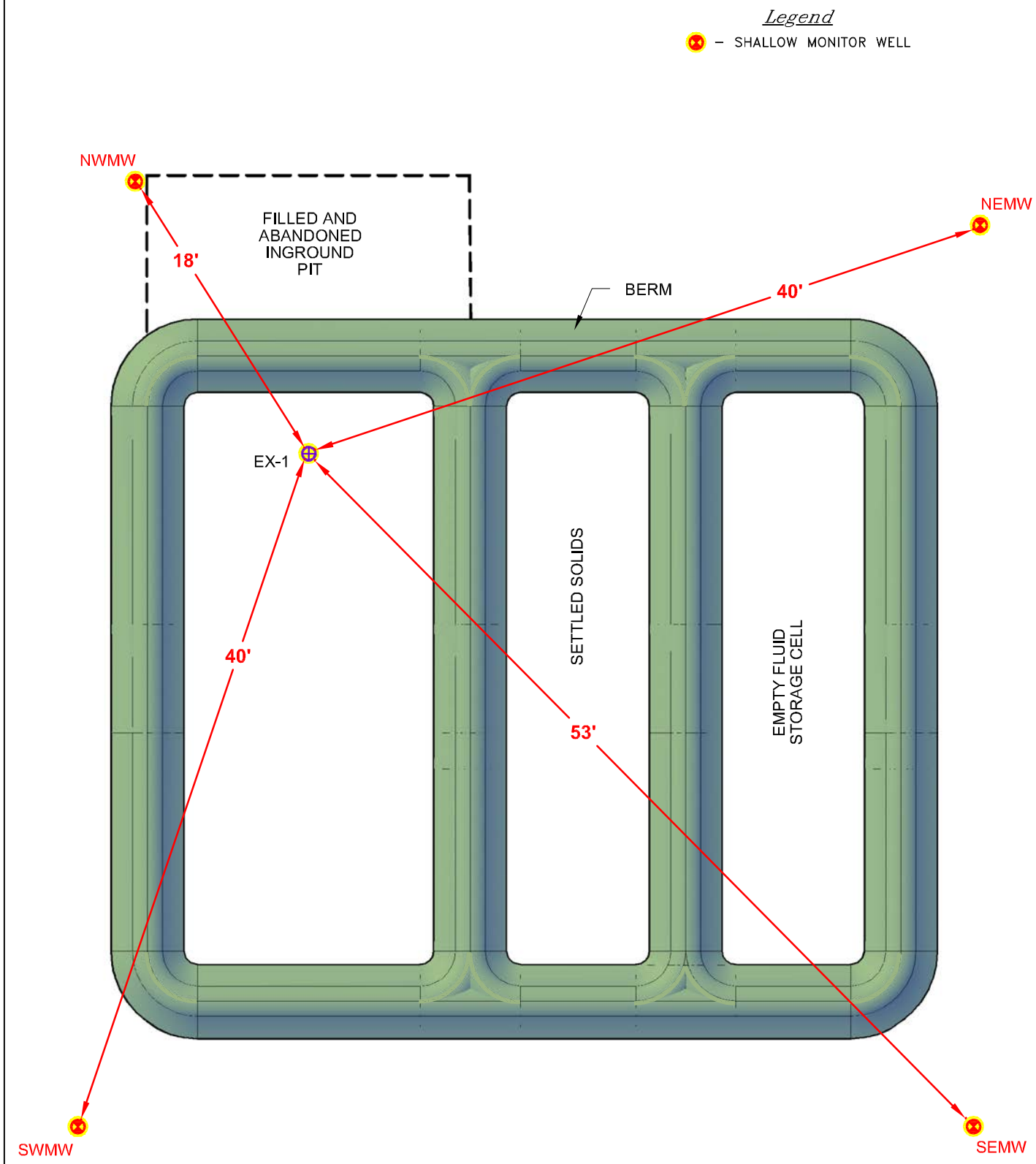
Figures



Cardno ENTRIX	PROJECT NAME: USEPPA ISLAND RO CONCENTRATE DISPOSAL	DWG. NUMBER: 02626001je1
	PROJECT NUMBER: 02626001	DATE: 03/09/12

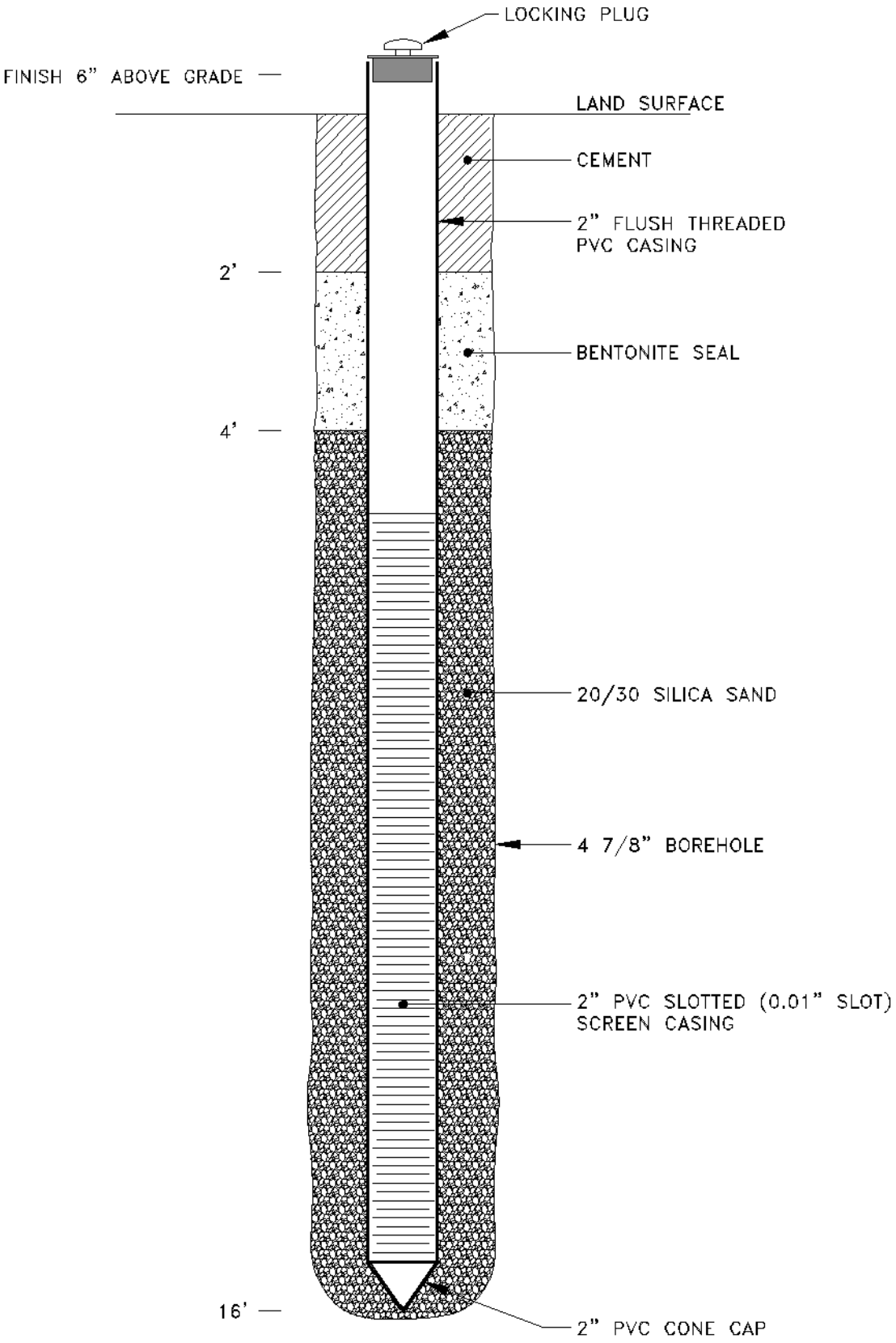
FIGURE 1. MAP SHOWING LOCATION OF PROJECT SITE.

NOT TO SCALE



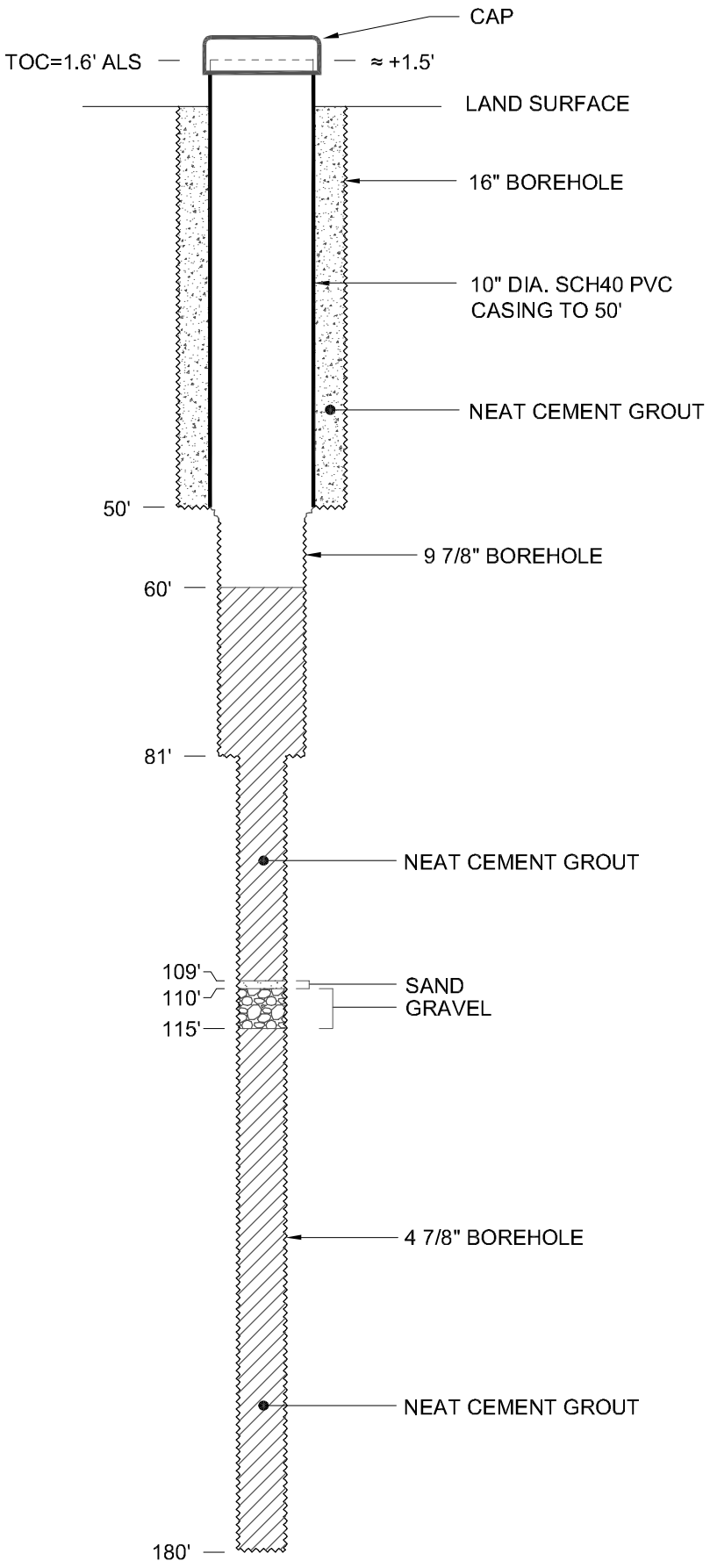
Cardno ENTRIX	PROJECT NAME: USEPPA	DWG. NUMBER: 02626001am1
	PROJECT NUMBER: 02626001	DATE: 03/09/12

FIGURE 2. DRILLING PAD AND WELL LOCATION DIAGRAM.



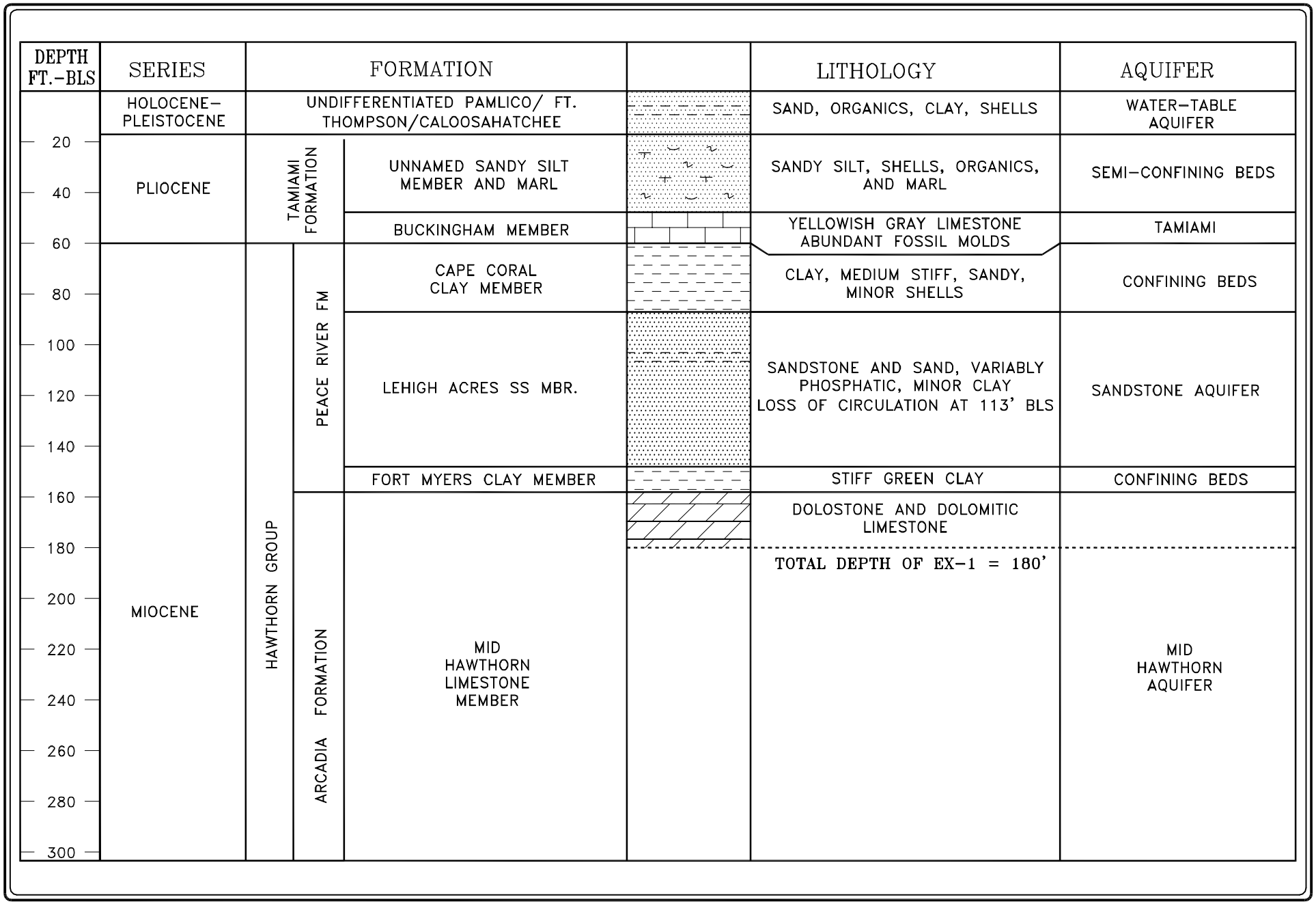
Cardno ENTRIX	PROJECT NAME: USEPPA ISLAND	DWG. NUMBER: 02626001am1
	PROJECT NUMBER: 02626001	DATE: 03/09/12

FIGURE 3. AS-BUILT DRILLING PAD WATER TABLE MONITORING WELL CONSTRUCTION DETAILS.



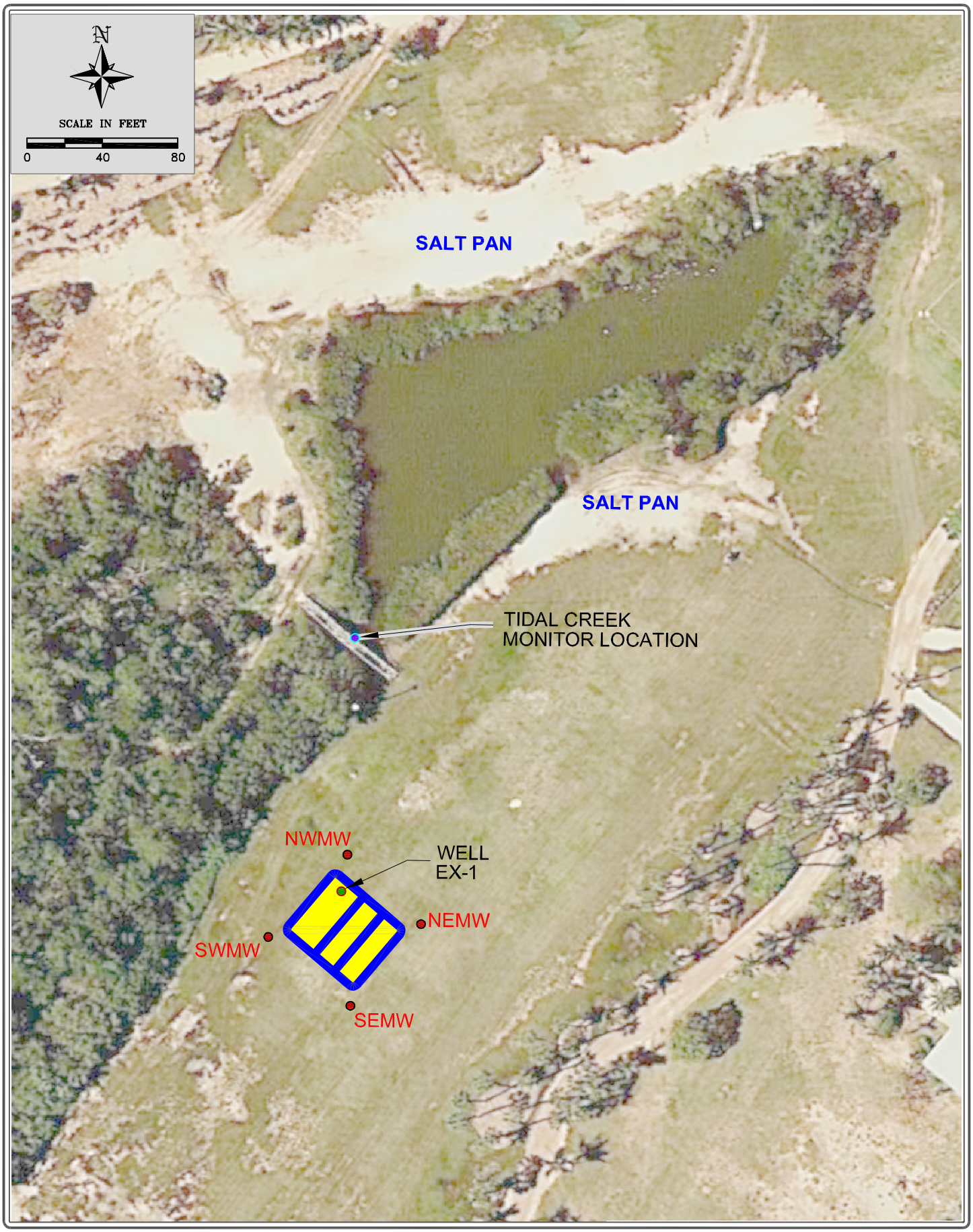
Cardno ENTRIX	PROJECT NAME: USEPPA ISLAND RO CONCENTRATE DISPOSAL	DWG. NUMBER: 02626001je2
	PROJECT NUMBER: 02626001	DATE: 03/09/12

FIGURE 4. AS-BUILT SCHEMATIC FOR EX-1 (EXPLORTATORY/TEST WELL).



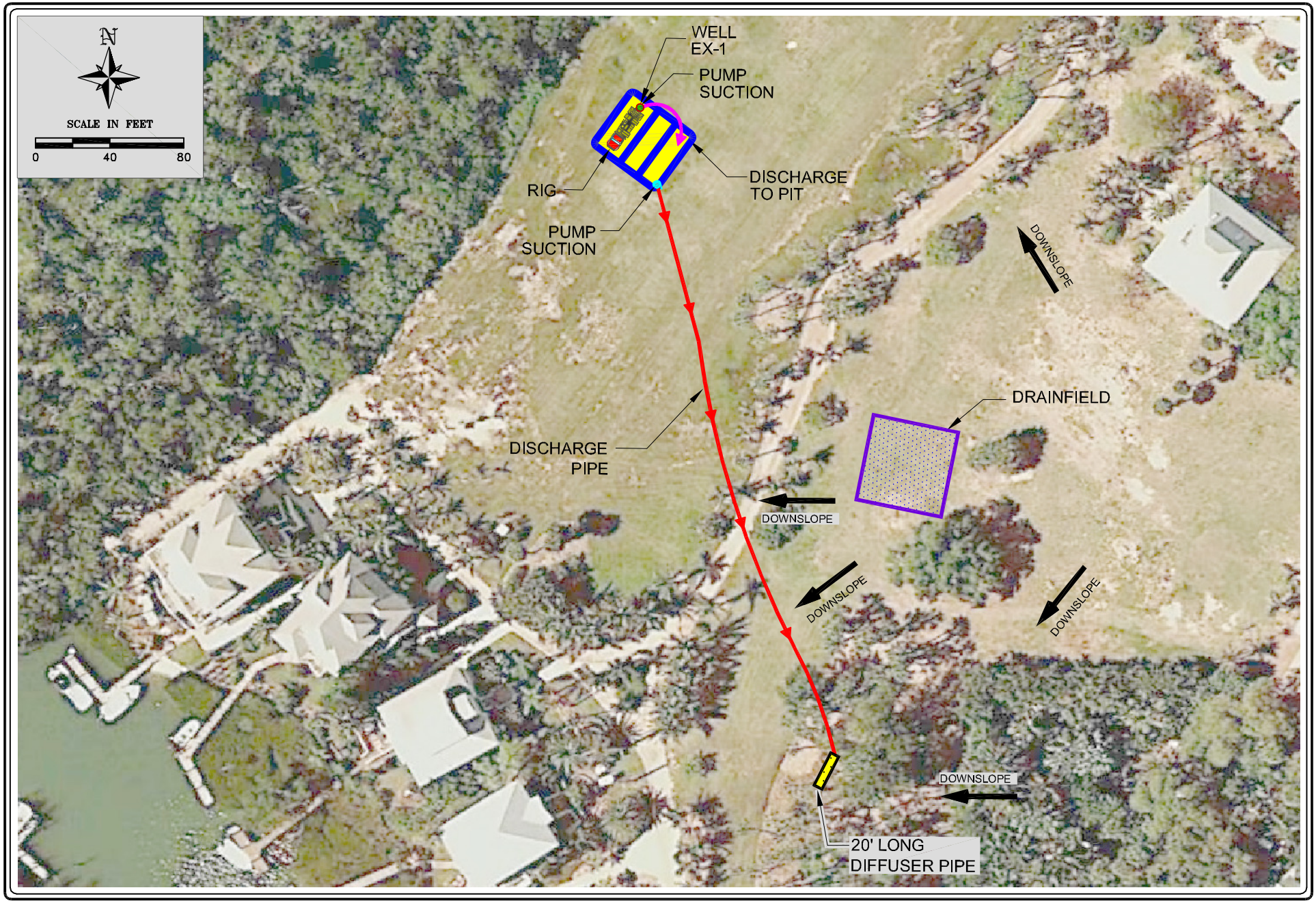
Cardno ENTRIX	PROJECT NAME: USEPPA ISLAND RO CONCENTRATE DISPOSAL	DWG. NUMBER: 02626001je1
	PROJECT NUMBER: 02626001	DATE: 03/09/12

FIGURE 5. HYDROSTRATIGRAPHIC COLUMN FOR USEPPA ISLAND.



Cardno ENTRIX	PROJECT NAME: USEPPA ISLAND RO CONCENTRATE DISPOSAL	DWG. NUMBER: 02626001je2
	PROJECT NUMBER: 02626001	DATE: 03/09/12

FIGURE 6. AERIAL SHOWING WATER LEVEL MONITORING SITES.



Cardno ENTRIX	PROJECT NAME: USEPPA ISLAND RO CONCENTRATE DISPOSAL	DWG. NUMBER: 02626001je2
	PROJECT NUMBER: 02626001	DATE: 03/09/12

FIGURE 7. PRODUCED GROUNDWATER DISCHARGE DIAGRAM.

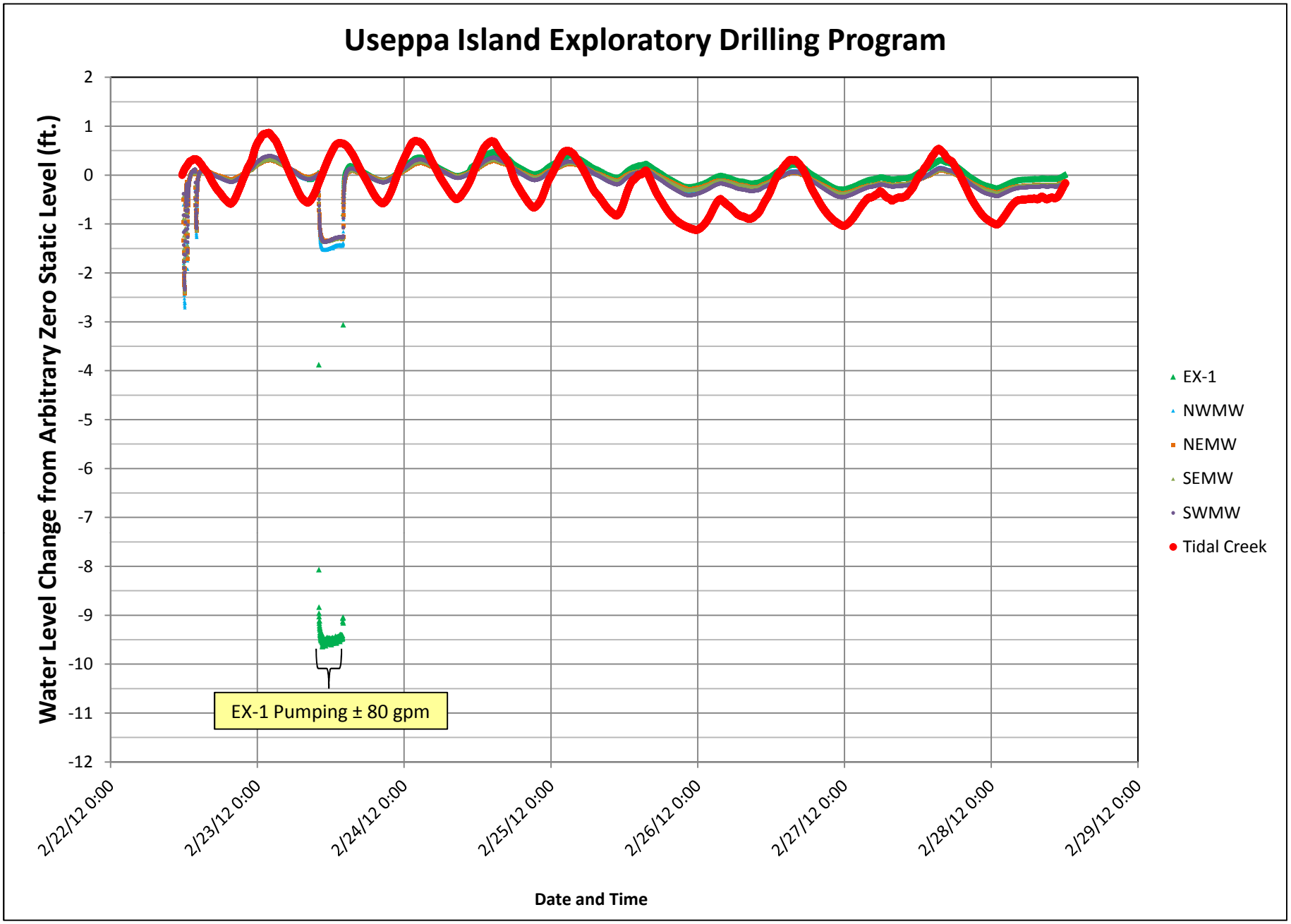


Figure 8. Water Level Drawdwon Pre and Post Pumping Test

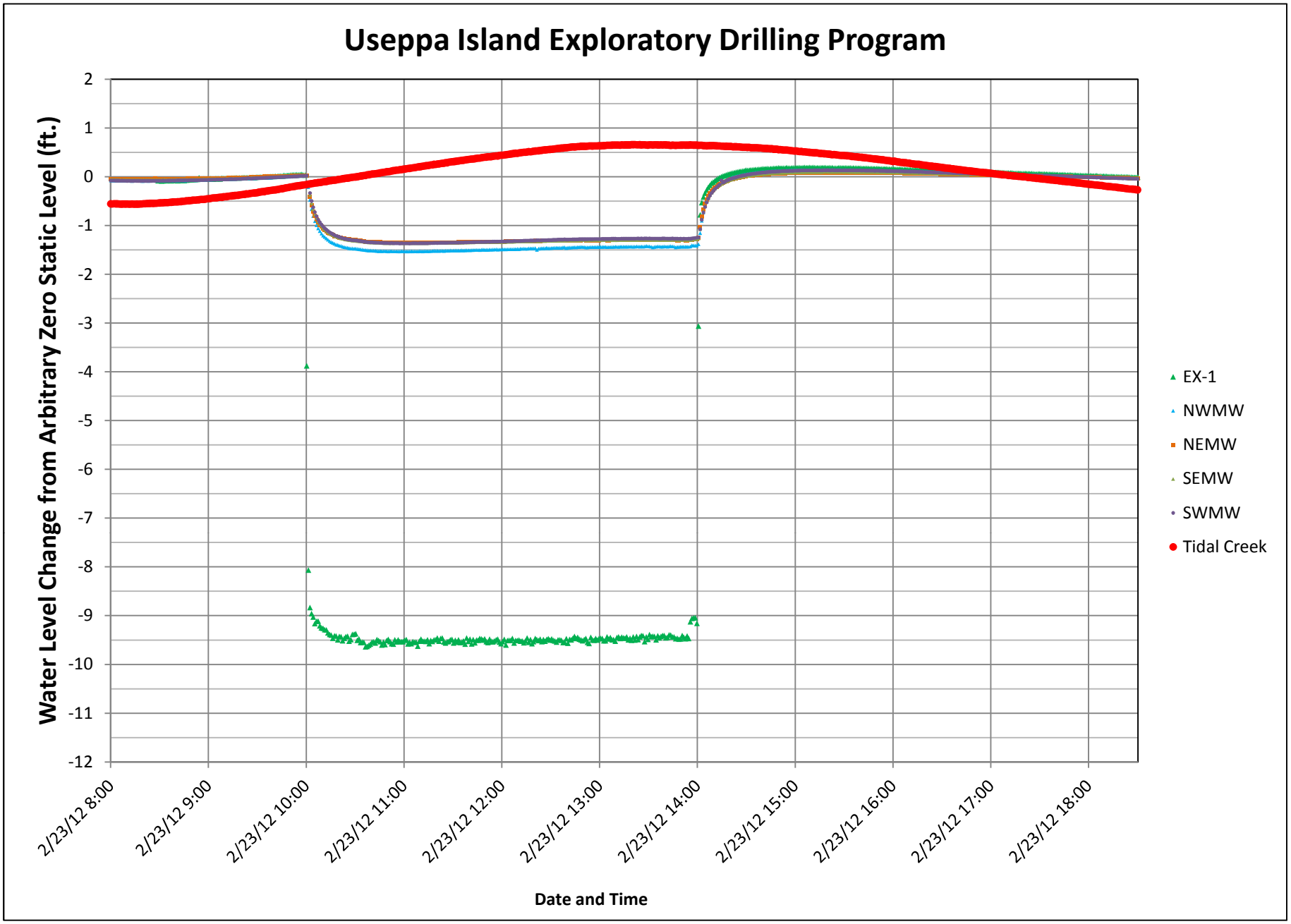


Figure 9. Water Level Drawdwon During Pumping Test (Figure 8 zoomed in)

Appendix A

Daily Reports

Cardno ENTRIX

Daily Log

Date:	1/24/2012
Project Name:	Useppa Island Class V Exploratory Well
Project No.:	02626001.00
Prepared By:	Andrew McThenia
Well:	EX-1

Time	Description of Activities
8:00	Arrive at Bokeelia Island Club Marina. Board Useppa Island Club shuttle boat.
8:20	Arrive at Useppa Island
8:30	Arrive at drill site. David Cannon Well Drilling (DCWD) drilling rig is a truck mounted Speedstar 135, table drive, kelly rig with piston type mud pump, and out of commission air compressor.
8:35	DCWD driller Tyrone Harris moves drill rig and sets up on NE corner of drilling pad area.
9:00	DCWD assembles flush thread 2-inch PVC monitor well sections. Each section is 5' long. Assembly consists of 10' of 0.01-inch slot screen with 5' of blank casing at the top. The bottom consists of a cone shaped plug.
10:00	Section off a part of lined pit due to limited water availability.
10:19	Fire truck arrives and fills the small section of lined pit with ~ 1000 gallons water. Water specific conductance is 600 microseimens per centimeter.
10:22	Section of pit is full of clean water
10:27	Driller begins to jet/drill using 4&7/8-inch bit. Water and cuttings returns are piling up beside well. Finish drilling/jetting at 16 feet bls.
10:40	Drillers install casing assembly with 6-inches sticking above grade. Install eight (8) 50 lb. sacks of Standard Sand and Silica 20/30 silica sand by pouring into the well annulus. Tag sand at ~4 feet below land surface. Install ~ 12.5 lbs. (1/4) sack of coarse bentonite by Wyomben. Tag bentonite at ~2' below land surface. Mix ~ 12 lbs. of Portland cement and install neat cement in upper 2' of annulus.
11:00	Begin purge Northeast Monitor Well (NEMW) using 2-inch submersible pump using 9 volt DC power from golf cart.
11:16	Flow rate is ~4 gpm. Measure specific conductance of water at 1000 uS/cm. Decide to use 2-inch gas powered centrifugal for purge.
11:19	Flow rate is 20 gpm. Purge method requires connecting to well casing.

11:32	Measure conductivity, temperature, pH, and chlorides. Collect lab sample. Run argentometric titration using 0.1 Normal titrant solution of Silver Nitrate. Use 10 ml of sample. Titration endpoint (Silver chloride precipitation stops) at 10.2 ml of titrant. Multiply by 500. Result is 5,100 mg/l chloride.
11:41	Stop purge. pH = 6.90, Temp. = 25.7 degrees C, Specific conductance = 16.53 milliseimens/centimeter.
12:00	Move drilling rig to southeast corner of pad. Set up for Southeast monitor well (SEMW) drilling.
12:10	Take lunch break.
12:30	Pump middle pit water into small section of east pit..
12:32	Level up rig and begin to pump straight water.
12:37	Begin jet/drill SEMW.
12:39	Reach 16 feet. Stop drilling. Install casing, sand, bentonite, and cement as previously installed for NEMW.
13:10	Measure static level in NEMW at 3.01 feet below top of casing. Begin purge SEMW using 2-inch gas trash pump as described for NEWM.
13:20	Conductivity = 1530 mS/cm and rising.
13:25	Conductivity = 15.92 mS/cm and rising.
13:30	Measure stabilized conductivity at 1607 mS/cm. Measure pH at 6.92, Temp = 25.3 degrees C., Titrate sample for chlorides - 4,750 mg/l. Collect lab sample.
13:45	Move rig to Southwest corner of pad (SWMW).
14:00	Drill to 16 feet and install monitor well as previously described for NEMW and SEMW.
14:26	Begin purge Northeast Monitor Well (NEMW) using 2-inch submersible
14:40	Conductivity is 1350 mS/cm and rising.
14:45	Conductivity is 1380 and stable. pH = 6.85, T = 25.6, Chlorides = 3,875 mg/l. Collect lab sample.
14:50	Stop purge, move rig.
15:00	Water level is 2.82 feet btoc in SEMW.
15:05	Set up rig on Northwest corner of pad (NWMW).
15:10	Drill 16 foot deep hole and install NWMW as previously described.
15:25	Measure water level in SWMW at 1.96 feet btoc. Begin purge NWMW.
15:35	Conductivity = 12.25 and rising in NWMW.
15:45	Conductivity is 14.02 and stable. T = 25.7 degrees C, pH - 6.84, Chloride = 4,125 mg/l.
15:50	Leave site.
16:00	Board shuttle and leave Useppa
16:15	Arrive Bokeelia. Drive to Fort Myers office.

Cardno ENTRIX

Daily Log

Date:	1/26/2012
Project Name:	Useppa Island Class V Exploratory Well
Project No.:	02626001.00
Prepared By:	Andrew McThenia
Well:	EX-1

Time	Description of Activities
9:35	Arrive at Bokeelia Island Club Marina. Board Useppa Island Club shuttle boat.
10:00	Arrive at Useppa Island
10:15	Start rig
10:20	Mix up drilling mud in pit and add additional 4 sacks of 50 lbs. each. Mud has coagulated and must be stirred up. Lower drilling rod with bit into hole. Rod encounters fill at ~10 feet bls.
10:24	Connect drill pipe to kelly and begin to circulate.
10:28	Circulate/drill back down to 40 feet bls. total depth of hole. Much organic material in returns, much silt and fine sand.
10:34	Add water to mud pit. Mud pump suction is pulling in sand because pit is full of sand at suction point.
10:37	Stop circulation. Raise kelly. Kelly bar jumps out of track. Lower kelly. Get back in track.
10:48	Lower pipe in hole. Pipe stops at ~35 feet bls. Hole filled in.
10:50	Begin drill down from 40'. Material becomes stiff and hard at 42 feet bls.
10:55	Stop drilling at 45 feet bls. Waiting for returns. Returns are very disaggregated. Drill from 45 to 49. Smooth and stiff. Stiff marl. Drilling mud turns lighter color. Very fine colloidal marl cuttings.
11:00	Hit hard limestone at 49 feet bls. Drill to 50 feet bls. Decide to stop at this point to set surface casing.
11:15	Stop circulation. Trip out of hole.
11:25	Drag bit removal is problematic and requires come along and sledge
11:28	Drag bit loose and off. Finish trip out of hole.
11:30	Glue coupling to 16 foot long section of casing. Put it in the well. Glue 10 foot long section with bell end to coupling. Lower 36 foot assembly into well.
11:36	Add another 10' section. Casing is SDR 41. Silverline Brand PVC. 100 PSI.
11:44	Use come along and kelly to try to push casing into hole. Hole is crooked and casing will not go past 30 feet bls. Use of drag bit with no guide resulted in out of plumb hole.
11:58	Pull casing out of hole. Cut top section at about 9 feet below top and above the top bell joint coupling.
12:06	Finish pull casing. Discuss plan. Clean out pit to prepare for reaming hole with guide and larger diameter bit tomorrow.
14:20	Board shuttle.
14:50	Arrive Bokeelia dock. Return to Fort Myers office.

Cardno ENTRIX

Daily Log

Date:	1/25/2012
Project Name:	Useppa Island Class V Exploratory Well
Project No.:	02626001.00
Prepared By:	Andrew McThenia
Well:	EX-1

Time	Description of Activities
10:00	Arrive at Bokeelia Island Club Marina. Board Useppa Island Club shuttle boat.
10:30	Arrive at Useppa Island
10:40	Arrive at well site. Discuss plans for necessary modification of pit to accommodate cuttings from surface casing installation. Gravity flow of mud/cuttings not possible to section of pit inside berm.
11:02	Driller moves rig inside existing bermed/lined drilling pad. Eric Glidden uses bobcat to dig pit adjacent to NW corner of bermed pad area.
12:13	Finish creating in ground mud pit lined with 2 layers of 6 mil plastic and bermed. Edge of plastic is tucked under existing double liner to make seal at edge.
13:00	Raise derrick on rig
13:15	Set up suction hose suspension above new pit. Attach 16-inch diameter drag bit on a sub and connect it to the kelly.
13:25	Fire truck arrives and fills new pit with ~1000 gallons of potable water.
13:30	Fire truck finishes and leaves. Crew begins mixing dry bentonite drilling
13:35	Crew begins mixing six (6) 50 lb. sacks of dry bentonite drilling mud (Wyoben) with water in funnel/venturi flash mixer using rig pump.
13:45	Begin drill 0-20 feet. Material is very soft. 0-4 sand, 4-10 organics and clay, 10-17 very fine sand, 17-20 silt.
14:05	Reach 20 feet bls. Circulate. Trip out kelly. Break loose bit. Connect bit to drill pipe.
14:08	Connect kelly to first 20' section of drill pipe. Trip in
14:10	Drill from 20 feet to 40 feet bls. Hit some minor hard shell layers at 27 feet and 38 feet. Otherwise, material is mainly soft silt and very fine sand.
14:42	Driller only has 36 feet of 10-inch PVC surface casing and will not set casing in in soft material or face washout beneath casing. Driller muds up hole by mixing of 2 additional sacks of bentonite and circulating into borehole. Trip out of hole.
14:50	Shut down rig.
15:30	Arrive at dock
16:00	Board shuttle.
16:15	Arrive Bokeelia dock. Return to Fort Myers office.

Cardno ENTRIX

Daily Log

Date:	1/31/2012
Project Name:	Useppa Island Class V Exploratory Well
Project No.:	02626001.00
Prepared By:	Andrew McThenia
Well:	EX-1

Time	Description of Activities
8:50	Arrive at Bokeelia Island Club Marina. Board Useppa Island Club shuttle boat.
9:10	Arrive at Useppa Island
9:15	Arrive at site
9:20	Static water level in NEMW = 3.39 feet below top of casing (btoc). Driller and crew work to the new bit attached to the guide. They need to break loose another bit that is attached. Use borrowed torches.
9:32	Begin purge Northeast Monitor Well (NEMW). Purge 3 gallons then stop.
9:36	Static water level in Southeast Monitor Well (SEMW) is 3.09 feet btoc.
9:38	Static water level in Southwest Monitor Well (SWMW) is 2.48 feet
9:40	Static water level in Northwest Monitor Well (NWMW) is a 3.33 feet btoc.
9:44	Resume purge NEMW using 2-inch 12 Volt DC Submersible pump.
9:52	Pumping rate is 1.81 gpm. PWL is 5.05 feet btoc.
10:09	Have purged about 45 gallons. Water quality is stabe. 1 casing volume is 2.45 gallon. Have purged about 18 casing volumes. Measure water quality parameters. Conductivity = 17.24 millseimens/cm (mS/cm). Temperature = 24.9 degrees C. pH = 6.92. Titrate chlorides. Result is 5,550 mg/l.
10:22	Begin purge SEMW. Crew begins to pump water from large pit to in ground pit for mixing drilling mud.
10:30	Start up rig. Water begins to flow from pit into borehole. Dam this up.
10:35	Measure pumping water level at 4.68 feet btoc and flow rate of 1.94 gpm from SEMW.
10:40	Sample SEMW. Cond. = 16.83 mS/cm, T = 25.1 degrees C, pH = 6.84, Chlorides = 4,875 mg/l.
10:43	Stop purge SEMW
10:51	Begin purge SWMW. Crew has mixed 3 X 50 lb. sacks of bentonite powder. Crew is running previously used 16-inch drag bit on kelly to clear the upper part of the hole to facilitate installation of the guide assembly with the new bit.
11:00	Bit on bottom at ~ 23 feet below land surface. Had fill at up to about 15 feet bls.
11:06	Bit at ground level.
11:13	Lower guide and roller cone bit with ears (16-inch diameter bit). Guide and bit assembly is 23.6 feet long.
11:15	Connect kelly to assembly and circulate to move/drill it down.
11:25	Sample SWMW. Cond. = 13.37 mS/cm, T = 25.2 degrees C, pH = 6.79, Chlorides = 4,050 mg/l. Q = 1.9 gpm. Pumping water level = 3.62 feet btoc.
11:32	Kelly down at 43 feet bls
11:41	Trip up. Put on a drill pipe between kelly and guide. Pipe assembly will only lower down to about 30 feet bls. Either fill or dogleg in hole is keeping the assembly from going down.
11:51	Re-reaming the borehole from 20 to 40 feet bls.
12:10	Reached 43 feet again. Able to make the connection to the single drill pipe.

Time	Description of Activities
12:12	Sample NWMW. Cond. = 14.11 mS/cm, T = 25.6 degrees C, pH = 6.89, Chlorides = 4,250 mg/l. Q = 1.88 gpm. Pumping water level = 4.15 feet btoc.
12:15	Bit at 50 feet. Circulate. Mix bentonite.
12:30	Continue to circulate
12:35	Pipe Tally = 3 Joints. Each is 20.1 feet total length. Each is 19.6 feet from top of the bell end to a black factory line located .5 feet from the bottom end.
12:40	Pipe factory stencil print reads: 10" Silver Line® PVC -1120 SCH 40 PR 140 PSI @ 75° F. ASTM D-1785 NSF -PWG WELL CASING IC-0 (ASTM F-480 NSF-WC) PVC-DWV ASTM D-2665 NSF-dwv SL-M 15NC 05/15/11 10:02 Other two pipes are identical except times are 9:48 and 9:52.
13:10	Circulating on bottom. Mixing gel. Fire truck adds 1000 gallons of water to large middle ground level pit.
13:15	Truck finishes delivery of water.
13:27	Begin trip oout
13:30	Lone drill pipe is out of hole.
13:35	Hang guide beneath table. Slide table toward front of rig. Hook guide back to lifting block. Raise it up. Use forklift to tail out guide and bit assembly, lay it down.
13:39	Pick up pipe joint No. 1. Install it in the well. Secure it to rig with come-along.
13:45	Lift pipe joint No. 2. Cover its beveled end with solvent then glue. Cover inside of No. 1 bell end with solvent then glue. Install beveled end of No. 2 in bell end of No. 1. Let glue set up. Lower assembly into
13:50	Lift pipe joint No. 3. Cover its beveled end with solvent then glue. Cover inside of No. 2 bell end with solvent then glue. Install beveled end of No. 3 in bell end of No. 3. Let glue set up. Lower assembly into
14:01	Pipe stops at ~ 50 feet bls. Driller cuts 5.1 feet off joint No. 3 with bell end and glues on cementing header. Header is 10X5 PVC reducer then 5-inch pipe with screw on steel cap reducing to 3 inch with gate valve.
14:15	Calculate annular volume of 16-inch borehole with 10.75-inch OD casing is 38.3 cubic feet. Using cement yield of 1.18 cubic feet per sack should require theoretical volume of 32.5 sacks of cement. There is a total of 32 sacks of cement onsite.
14:22	Fill cementing tub with ~ 60 gallons of water. Take suction from this tub and run it through flash mixer. Begin mixing portland cement.
14:27	Have mixed and finished pumping 12 X 93 lb sacks of portland
14:36	Finish mix and pump 12 more sacks of cement and 60 gallons water.
14:41	Finish pumping 8 more sacks of cement with ~ 40 gallons of water. Begin pump 200 gallons of water for displacement.
14:47	Finish pumping displacement. No cement returns at surface. Close
14:53	Pump pit contents into far ground level pit.
15:15	Board shuttle boat.
15:30	Arrive Bokeelia.

Cardno ENTRIX

Daily Log

Date:	2/1/2011
Project Name:	Useppa Island Class V Exploratory Well
Project No.:	02626001.00
Prepared By:	Andrew McThenia
Well:	EX-1

Time	Description of Activities
10:00	Eric Glidden reports that Florida State employees landed a boat on the beach and took pictures of the site this AM without any Useppa Club permission. Employees who spoke with the State Agents reported that they were there at the behest of FDEP.
11:30	Board shuttle at Bokeelia with drillers.
11:45	Arrive at Useppa Island
12:00	Arrive at site
12:05	Use 1-inch tremie pipe and tag cement in annulus at 24 feet below land surface (bls). Tag cement on opposite sides of casing.
12:14	Start rig. Pallet of portland cement is delivered by Useppa Island staff from barge. There are 35 X 94 lb. sacks on the pallet.
12:50	Drillers have discovered cement hardened in several hoses, valves, and fittings from yesterday's pressure grout mixing. These hoses were not used for the displacement and were not flushed out. They use hammers and tools to try to clear the hoses.
13:42	Use 2-inch centrifugal "trash" pump to mix 8 sacks of cement in 50 gallons of water.
13:50	Driller's pump starter cord breaks then pull loose. Eric Glidden provides a new pump.
14:00	Finish pumping 8 sacks of cement through tremie pipe. Decide not to attempt to pump more cement because centrifugal pump will not provide sufficient pressure to come up to surface with tremie pipe at 23 feet bls.
14:16	Clean up equipment. Leave site
14:30	Board shuttle boat. Return to Bokeelia.
14:45	Arrive at Bokeelia.

Cardno ENTRIX

Daily Log

Date:	2/2/2011
Project Name:	Useppa Island Class V Exploratory Well
Project No.:	02626001.00
Prepared By:	Andrew McThenia
Well:	EX-1

Time	Description of Activities
8:00	Board shuttle at Bokeelia with drillers.
8:20	Arrive at Useppa Island
8:30	Arrive at site.
8:40	Tag cement in annulus at 8 feet bls. Tag on opposite sides of casing.
8:50	Fill tub with about 80s gallon of water.
9:10	Begin mixing portland cement using flash mixer and mud pump.
9:14	Finish mixing cement. Pump cement down 2-inch tremie pipe with base at 8 feet below land surface.
9:16	Finsh pumping 12 sacks of cement down tremie. Mud returns observed from annulus but no returns of cement yet.
9:20	Mix another 12 sack batch using 80 gallon of water.
9:23	Begin pump cement.
9:25	Observe cement returns of about 30 gallons. Finish cement pumping.
9:30	Rinse out hoses etc.
9:45	Pump mud from in ground pit into outer ground level pit.
10:00	Remove plastic from edges of in ground pit and fill in with sand. Restore berm to location directly behind rig. Fold liner back into place over berm. Cover berm with layer of sandy soil. Put additional layer of liner plastic over berm and bring this up under rig around the well. Grade the area behind the rig. Lay drill pipes out on berm behind rig.
11:37	Use bobcate to srape cement residue from ground and incorporate into side of berm.
12:30	Crew has cut the cementing header off the casing and installed a 10-inch Tee without using glue. Crew installs 10-inch by 10 foot side discharge to run from well to middle mud pit.
13:00	Trip in 22.8 foot long 7&7/8-inch tricone roller bit and guide assembly into well. Using this to drill out cement from base of casing and to create a centered hole for the pilot bit.
13:20	Tag cement inside the casing at 45 feet below land surface.
13:30	Drill out cement from 45 to 50 feet bls. Circulate
13:35	Drill from 50 to 55 feet. Circulate. Material is moderately hard yellowish gray, fossiliferous limestone.

Time	Description of Activities
13:40	Drill from 55 to 62 feet. Material is softer, marly limestone with more sand. Circulate.
14:00	Trip out of well.
14:11	Attempt to pump drilling mud out of well to develop and sample the uppermost limestone. Pump will not lift from 3 feet below top of casing. Pump is disfunctional.
14:50	Stop trying to get pump to work.
15:00	Leave site.
15:20	Board shuttle boat. Return to Bokeelia.
14:45	Arrive at Bokeelia.

Cardno ENTRIX

Daily Log

Date:	2/3/2012
Project Name:	Useppa Island Class V Exploratory Well
Project No.:	02626001.00
Prepared By:	Andrew McThenia
Well:	EX-1

Time	Description of Activities
10:00	Board Useppa Island Club shuttle boat at Bokeelia.
10:20	Arrive at Useppa Island
10:30	Arrive at site. Static level in 10-inch casing is 5.58 ft. btoc.
10:38	Begin purge well using new 2-inch centrifugal gasoline powered trash pump
10:43	Measure pumping rate at about 72 gpm. Measure pumping water level at 16.7 ft. btoc.
11:00	Collect water sample for laboratory analysis for TDS and Chlorides. Measure field parameters: Conductivity = 67.7 mS/cm T = 25.2 degrees C. Chlorides = 21,500 mg/l per field titration. Field parameters stabilized. Have purged ~1500 gallons = ~ 7.5 casing volumes.
11:10	Specific conductance of lagoon adjacent to site = 47.2 mS/cm.
11:12	Start up rig.
11:30	Attempt to lower 60' of drill string in the well. String stops at 50 feet. Cuttings blocking pipe from going below bottom of casing.
11:40	Go to bottom using 2 drill pipes and the kelly. Drill/circulate down to 61 feet bls.
11:49	Trip up. Kelly comes off track. Get kelly on track. Trip up.
11:56	Trip in 3 drill pipes. Can't lower string below base of casing again. Cuttings are not getting removed during drilling due to too thin drilling mud. Drilling mud has been diluted with salt water.
12:30	Attempt to circulate/drill out cuttings below casing.
12:52	Trip out 4.875-inch bit assembly and pick up guide and 7.875-inch bit. Trip that assembly into hole.
13:00	Drill down through cuttings to 61 feet again with 7.875-inch bit.
13:16	Stop circulation. Only very fine limestone sand is returning. No large cuttings are returning in very thin drilling fluid.
13:40	Trip out of hole. Attempt to lower 60' long pipe string without kelly attached. Pipe string stops at 50 feet again. Cuttings remain in open hole blocking access for lowering drill string.
14:00	Shut down operations. Discuss situation with salty thinned out drilling mud. Request Eric Glidden to dispose of water in pit and to rinse the middle pit with fresh water to get the salt water out of the working drilling mud.
14:30	Board shuttle boat.
15:00	Arrive Bokeelia.
16:05	Deliver sample for TDS and Chlorides to Benchmark Lab in North Port.
17:00	Arrive Fort Myers office.

Cardno ENTRIX

Daily Log

Date:	2/6/2012
Project Name:	Useppa Island Class V Exploratory Well
Project No.:	02626001.00
Prepared By:	Andrew McThenia
Well:	EX-1

Time	Description of Activities
10:00	Board Useppa Island Club shuttle boat at Bokeelia.
10:20	Arrive at Useppa Island. Eric Glidden reports that he disposed of about 1500 gallons of decanted fluid by putting it into his RO concentrate drainfield on Saturday. Eric hauled the fluid 200 gallons at a time using a portable tank. Eric also rinsed the drilling mud by addition of 1000 gallons of potable water.
10:35	Arrive at site. Pump off clear fluid off the top of the drilling mud and move it into the outer fluid storage area.
10:45	Fire truck delivers 1000 gallons of water to middle mud pit. Use water to stir up drilling mud that has settled out.
10:54	Fire truck finishes delivery of water.
11:00	Crew begins mixing bentonite drilling mud using flash mixer funnel system and rig mud pump. Stirring mud pit with push broom to suspend drilling mud solids.
11:30	Finish mixing in 8 X 50 lb sacks of bentonite drilling mud. Trip in 7.875-inch bit and guide assembly and circulate fluid downhole. Use 2-inch pump to circulate drilling fluids in the pit area to maintain consistent viscosity and keep solids suspended. Drilling mud has been exposed to cement cuttings from drill out at base of casing. The cement is believed to be a factor in the drilling mud rapid flocculation.
11:45	Have circulated down to 61 feet bls. Larger cuttings of limestone have been returning. Mud thickness is sufficient for keeping cuttings suspended. Add a third drill pipe to the string. Lower it in. Connect the kelly. String lowers freely. Cuttings have been removed below casing down to 60 feet bls.
11:55	Start circulation again. Begin drilling at 61 feet bls.
12:00	Drill from 61 to 65 feet bls. Material is soft green clay. Good cuttings returning.
12:05	Drill from 65 to 70 feet bls. Pause and circulate clean. Still in clay.
12:10	Drill from 70 to 75 feet bls. Pause and circulate clean. Still in clay.
12:15	Drill from 75 to 81 feet bls. Kelly down. Pause and circulate clean. Material is still clay but became hard at about 80 feet bls.
12:18	Stop circulation. Returns are clear of cuttings.

Time	Description of Activities
12:19	Trip out 7.875-inch bit and guide assembly.
12:30	Rain shower hits. Forklift assists in laying down guide.
13:00	Rain has paused. Install 4.875-inch bit and guide and 3 additional 20 foot long drill rods.
13:03	Rain resumes as a drizzle to a steady downpour.
13:06	Begin circulate and drilling at 81 feet bls.
13:10	Stop drilling at 85 feet bls. Hit shell or rock layer at 84 feet bls.
13:15	Begin drilling from 85 to 90 feet bls. Moderate induration. Phosphatic sand and sandstone in cuttings.
13:18	Stop at 90 ft. bls. Mixture of sand and clay in cuttings.
13:22	Start drilling at 90 ft. bls. Very hard material. Material is sandstone.
13:30	Stop drilling at 95 feet. Circulate clean.
13:40	Drill from 95 to 101 feet bls. Material is phosphatic sand and sandstone with clay lenses.
13:45	Circulate at 101 feet bls.
13:45	Stop circulation. Trip out.
14:00	Have tripped out.
14:07	Assemble 2-inch well screen. Connect 2 lengths of 5 ft. each. Put formation packers on top and bottom of screen assembly and install glued couplings below the formation packers. The packers are 2-inch ID and 5-inch OD. Put cone shaped cap on end of 10 ft. screen section. Screen slots are 0.01-inch slot.
14:14	Use 90-feet of T&C 2-inch monitor well casing in 5 foot lengths. Install it in the well. Bottom of 100' long assembly will not go deeper than 92 ft. bls. The upper packer is barely into the 4.875-inch borehole transition at 81 feet. The drilling fluid would not enter the screen during the installation and water had to be added to the inside of the string. This indicates that screen is blocked.
14:38	Attempt to pull suction on the screen assembly using the 2-inch trash pump. No fluid will move through the well screen.
14:45	Pull screen assebly from the well. Bentonite wall cake is apparent on the screen from the target porous zone.
15:00	Crew decides to not attempt further hole cleaning or modification of screen assembly. Discuss plans to get larger slot size screen and possible well point or wash valve for 2-inch to assist installation.
16:04	Board Useppa Island Club shuttle boat at Bokeelia.
16:25	Arrive at Bokeelia.

Cardno ENTRIX

Daily Log

Date:	2/7/2012
Project Name:	Useppa Island Class V Exploratory Well
Project No.:	02626001.00
Prepared By:	Andrew McThenia
Well:	EX-1

Time	Description of Activities
7:00	Arrive at Bokeelia Island Club Marina. Board Useppa Island Club shuttle boat.
7:20	Arrive at Useppa Island
7:40	Arrive at site. Measure static water levels in pad wells: NEMW = 3.16 ft. btoc, SEMW = 2.89 ft. btoc, SWMW - 2.27 ft. btoc, NWMW = 3.14 ft. btoc.
7:50	Begin purge NEMW.
8:00	Have purged ~15 gallons. Sample NEMW. Cond. = 17.17 mS/cm, T = 24.8 degrees C, pH = 6.91, chlorides = 5,250 mg/l.
8:05	Begin purge SEMW.
8:15	Have purged ~15 gallons. Sample SEMW. Cond. = 16.46 mS/cm, T = 24.7 degrees C, pH = 6.97, chlorides = 4,500 mg/l.
8:20	Begin purge SWMW.
8:30	Have purged ~15 gallons. Sample SWMW. Cond. = 14.28 mS/cm, T = 24.8 degrees C, pH = 6.97, chlorides = 4,500 mg/l.
8:35	Begin purge NWMW.
8:45	Have purged ~15 gallons. Sample NWMW. Cond. = 14.32 mS/cm, T = 25.3 degrees C, pH = 6.89, chlorides = 4,625 mg/l.
8:50	Measure water portion of outer pit. Cond = 10.64 mS/cm, T = 25.3 degrees C., Chlorides = 3,200 mg/l.
9:00	Board shuttle boat.
9:20	Arrive Bokeelia.

Cardno ENTRIX

Daily Log

Date:	2/8/2012
Project Name:	Useppa Island Class V Exploratory Well
Project No.:	02626001.00
Prepared By:	Andrew McThenia
Well:	EX-1

Time	Description of Activities
10:00	Board Useppa Island Club shuttle boat at Bokeelia.
10:30	Arrive at Useppa Island.
10:40	Arrive at site. Measure 5-inch PVC well casing onsite. From bevelled end to bell end each joint is 20.6 feet long. From the bell end to the black line showing the effective length when glued together is 20.0 ft. Drillers install a formation packer on the end of a length of 5-inch casing and then cut the end off and glue/install a coupling to reconnect the end and block the formation packer from slipping off.
11:00	Install 5-inch well casing inside of 10-inch surface casing. Seat the bottom of 5-inch casing with formation packer at 81 feet bls. Cut off excess 5-inch casing. Remove 10-inch T from wellhead.
11:17	Stir up drilling mud in middle pit using 2-inch trash pump. Measure mud viscosity using Marsh Funnel and 1 quart measuring cup. Viscosity is 30 seconds. Put 5-inch tee on temporary casing.
11:20	Trip in 4.875-inch diameter bit and 4 drill rods 20 ft. long each.
11:26	Connect drill string to kelly and start circulation.
11:33	Circulate out large cuttings from 90 to 100' bls. This material is a mix of cement, sandstone, and very hard shell fragments. The uphole velocity inside the 5-inch temporary casing combined with thickened drilling mud allow large cuttings to be removed via mud circulation.
11:34	Stop circulation. Trip out of hole.
11:35	Begin assembly of 3-inch diameter, 0.04-inch millslot PVC screen assembly. Use four premade sections each 3 ft. long. Cut off ends of 3 of these units and connect them together using couplings. Lower section has factory flat blank end, upper section has factory 3X2 reducer. Connect upper screen to 2-inch flush threaded PVC casing material and install a formation packer around the 2-inch pipe immediately above the screen.
11:51	3-inch screen assembly is 11 feet long. Begin install inside 5-inch temporary casing.
12:10	Have added 90' of 2-inch. The bottom of the assembly is resting on the bottom of the hole at 101' bls.
12:14	Begin pump from the 2-inch pipe using trash pump. Fluid level remains stable in 10-inch casing but drops below sight level in 5-inch casing.
12:26	Water discharge is clearing. Conductivity = 7.71 mS/cm. T = 25.7 degrees C.

Time	Description of Activities
12:27	Water discharge has cleared. Conductivity = 7.65 mS/cm. Chlorides = 2,500 mg/l per field titration.
12:30	Measure pumping rate at 9.36 seconds/5 gallons = 32 gpm. Have purged for 15 minutes = 480 gallons. Collect lab sample. Put on ice.
12:40	Have tripped out the screen assembly.
12:45	Trip in 4.875-inch diameter bit and 5 drill rods 20 ft. long each.
12:47	Connect kelley and begin to circulate
12:53	Begin drill at 101 feet bls. Hard sandstone.
12:57	Reach 105 feet bls. Hard yellow sandtone, then gray clay, then gray sandstone. Circulate cuttings out of hole.
13:05	Resume drilling. Drill from 105 to 110 feet bls. Hard gray sandstone with abundant phosphatic sand.
13:10	Circulate out cuttings.
13:13	Resume drilling at 110 feet bls.
13:14	Sandstone cuttings returning, then bit drops from 113 to about 114 feet bls. All circulation stops. Lift drill string off bottom at 115 feet bls. Disscuss.
13:20	Drill with no returns from 115 to 121 feet bls. Attempt circulate. Pull drill string up, lower string back down. Hole remains open to 120 feet bls.
13:25	Trip out of hole.
13:34	Install screen assembly inside 5-inch casing with bottom of assembly at 120 feet bls. Screen covers from 110 to 120 foot interval within 4.875-inch borehole.
13:42	Connect 2-inch pump to assembly and begin to purge the intended sample zone. Fluid levels in 10-inch and 5-inch remain stable. The screen assembly has isolated the lower section effectively. Pumping rate is approximately 80 gpm. Drilling mud lost to formation returns for about 3 minutes, then gradually begins to clear.
13:50	Conductivity = 8.70 mS/cm, T = 26 degrees C.
13:55	Conductivity = 9.03 mS/cm, T = 26 degrees C.
14:00	Conductivity = 9.15 mS/cm, T = 25.9 degrees C. Water has cleared up. Water is overflowing from outer storage area to middle mud storage area and has nearly filled the mud storage area.
14:05	Collect lab sample. Conductivity = 9.24 mS/cm. T = 26 degrees C. Put sample on ice. Stop pumping the well.
14:10	Shut down operations.
14:30	Board Useppa Island Club shuttle boat at Bokeelia.
15:00	Arrive at Bokeelia.

Cardno ENTRIX

Daily Log

Date:	2/9/2012
Project Name:	Useppa Island Class V Exploratory Well
Project No.:	02626001.00
Prepared By:	Andrew McThenia
Well:	EX-1

Time	Description of Activities
9:30	David Cannon Well Drilling delivers air compressor to barge site for transport out to the Island by Useppa Island Club Utilities.
	No work performed on the Exploratory Well EX-1.

Cardno ENTRIX

Daily Log

Date:	2/10/2012
Project Name:	Useppa Island Class V Exploratory Well
Project No.:	02626001.00
Prepared By:	Josh Epting
Well:	EX-1

Time	Description of Activities
10:00	Board Useppa Island Club shuttle boat at Bokeelia.
10:20	Arrive at Useppa Island. Drillers have been onsite since 8:00 am setting up for reverse air drilling. TD of well is currently 121 feet.
10:30	Eric Glidden building U-shaped berm down slope from the utility's drain field to allow infiltration of produced groundwater
11:00	Bermed area completed. Stacked off corners of drainfield to show than bermed area is down slope from the drainfield. Took pictures and sent to David Rhodes. David approved the location of the bermed area
11:20	Began pumping from pad pits to the bermed area using 2" submersible pump hooked to 1 3/4" discharge line.
11:25	Drillers tripping in to TD
12:45	Begin reverse air drilling at 121' bls. Collecting continuous cutting samples from reverse air discharge.
13:15	Took water samples from reverse air discharge. Current depth 130' bls. Conductivity 9.66 mS/cm; Chlorides 2800 mg/l
13:25	Tripping out to take water sample with sampling apparatus. Allowed to pump for 5 minutes to until water was free from turbidity
14:00	Took water sample with sampling apparatus at 141' bls. Conductivity 9.64 mS/cm; Chlorides 2750 mg/l
14:15	Tripping back in the hole. Resume reverse air drilling at 141' bls.
15:30	Stopping drilling at 154' bls to catch the 4:00 pm ferry.
16:00	Taking ferry boat back to mainland
16:30	Arrive in Bokeelia

Cardno ENTRIX

Daily Log

Date:	2/13/2012
Project Name:	Useppa Island Class V Exploratory Well
Project No.:	02626001.00
Prepared By:	Andrew McThenia
Well:	EX-1

Time	Description of Activities
8:00	Board Useppa Island Club shuttle boat at Bokeelia.
8:30	Arrive onsite
8:40	Driller and helper pull 120' of 1/2-inch pCi airline out of the drill string and add 30 feet of additional pCi using glue couplings and set screws on airline.
8:55	Install airline and connect kelly to string.
8:58	Start air compressor and apply air down the drill string through the airline.
9:00	Air is forcing water out of the bit and out of the 5-inch casing and then out of the kelly hose discharge. Stop air compressor. Pull airline.
9:05	Shorten airline by about 8 feet. Reinstall airline.
9:07	Begin reverse air drilling at 154 feet below land surface.
9:24	Clay continues to plug off the circulation. Driller is lifting and partially dropping the drill string to shake loose the clay from the bit and loosen the cuttings clogging up the drill string.
9:49	Have made little progress. Drilling at 156-157. Still in stiff green clay.
11:20	At 158 feet break out of clay and into hard dolostone that does not clog the bit and drills faster.
11:30	Reach 161 feet, make drill pipe connection. Begin drilling at 161 ft. bls.
11:40	Conductivity of reverse air discharge is 9.4 mS/cm.
12:00	Reach 175 feet. Discharge water conductivity is 9.57 mS/cm. T = 25.1 degrees C.
12:09	Reach 181 feet bls. Have been in hard dolostone since 176 feet. Let water clear up.
12:20	Conductivity of water is 7.58 mS/cm from reverse airlift discharge with kelly down and bit at 181 feet bls. Titrate water - Chlorides - 2,125 mg/l.
12:25	Start trip out for bottom zone water sampling.
12:32	Airline out. Start to pull drill pipe.
12:45	Have finished trip out.
12:52	Install zone sampling string with 10 feet of 3-inch screen (0.04 inch slot) on 130 feet of flush thread and coupled 2-inch PVC pipe. Use 40 feet of 2-inch bell and coupling solvent weld 2-inch PVC at top of string.
13:20	Begin pumping from zone sampling string. Q = 40 gpm.

Cardno ENTRIX

Daily Log

Date:	2/13/2012
Project Name:	Useppa Island Class V Exploratory Well
Project No.:	02626001.00
Prepared By:	Andrew McThenia
Well:	EX-1

Time	Description of Activities
13:30	Sample from 170 to 180 foot zone for laboratory sample. Conductivity = 7.57 mS/cm, Temp. = 25.7 degrees C, Chlorides = 2,250 mg/l.
13:43	Have removed the sampling assembly from the well. Discuss plans for plugging lower portion of the borehole with cement.
14:30	Board Useppa Island Club shuttle.
14:50	Arrive at Bokeelia.

Cardno ENTRIX

Daily Log

Date:	2/14/2012
Project Name:	Useppa Island Class V Exploratory Well
Project No.:	02626001.00
Prepared By:	Andrew McThenia
Well:	EX-1

Time	Description of Activities
7:00	Board Useppa Island Club shuttle boat at Bokeelia.
7:30	Arrive on island. No drilling activity today. Pad well monitoring only.
7:37	Measure static levels in 4 pad monitor wells.
7:43	Measure static level in 10-inch casing = -1.7 feet bls. In 5-inch casing static is 0.8 feet als. 10-inch zone had been left with drilling mud inside.
7:45	Begin purge NEMW.
8:00	Sample NEMW.
8:05	Begin purge SEMW.
8:15	Sample SEMW.
8:20	Begin purge SWMW.
8:30	Purge SWMW.
8:35	Begin purge NWMW.
8:45	Sample NWMW. (See table for results of sampling)
9:00	Board Useppa Island Club shuttle boat..
9:20	Arrive at Bokeelia.

Cardno ENTRIX

Daily Log

Date:	2/15/2012
Project Name:	Useppa Island Class V Exploratory Well
Project No.:	02626001.00
Prepared By:	Andrew McThenia
Well:	EX-1

Time	Description of Activities
8:20	Board Useppa Island barge with Rob Baker and geophysical logging trailer. Logging company name is RM Baker LLC, based in Orlando FL.
9:50	Arrive at Useppa dock and unload logging trailer.
10:15	Arrive at well site. Set up logging trailer.
10:25	Driller and helper onsite.
10:30	Crew lifts 5-inch casing 3 feet then puts it back down. Casing did not need to be disturbed for logging. Logging to occur through 5-inch temporary casing. Water is flowing from the 5-inch casing very slightly and overflowing into the 10-inch casing. Less than 1 gpm.
10:45	Logger Rob Baker put dual induction/gamma tool on cable and hangs tool in well for zero. Zero is land surface.
10:50	Begin running tool down.
10:56	Tool on bottom at 180.7 feet bls. Begin logging up.
11:06	Tool arrives at surface. Disconnect tool. Connect caliper tool.
11:20	Caliper tool at surface and zeroed. Start running tool down.
11:30	Caliper tool on bottom. Open caliper arms. Begin raising the tool.
11:41	Caliper tool at surface. Disconnect tool. Connect fluid conductivity/temp tool.
11:50	Fluid conductivity/temperature tool starts logging down.
12:12	Tool at surface. Disconnect. Connect sonic tool. Add 2 centralizers.
12:25	Sonic tool starting down.
12:30	Sonic tool on bottom. Begin log upwards.
12:40	Sonic tool at surface, rerun sonic tool to improve log with gain adjustment.
12:57	Sonic tool up and disconnected.
13:15	Crew gets fresh water from fire truck to mix cement. Crew uses about 42 gallons of water to mix 7 sacks of cement.
13:34	Crew pumps cement down 1.25-inch PVC tremie put into the bottom of the well to 180 feet bls.
13:40	Drillers pull tremie from the hole. Rob Baker and logging trailer leave site.
13:45	Static level in 10-inch casing is 2.45 feet btoc. Static is suppressed by drilling mud in casing. Begin to pump out from 10-inch casing.

Time	Description of Activities
14:00	Measure flow rate in 100 gallon tub at ~100 gpm. Pumping water level in 10-inch casing is 6.1 feet btoc. Shut off pump.
14:15	Measure static level of 1.3 feet btoc in 10-inch casing.
14:30	Board Useppa Island Club shuttle.
14:50	Arrive at Bokeelia.

Cardno ENTRIX

Daily Log

Date:	2/16/2012
Project Name:	Useppa Island Class V Exploratory Well
Project No.:	02626001.00
Prepared By:	Andrew McThenia
Well:	EX-1

Time	Description of Activities
8:00	Board Useppa Island shuttle.
8:20	Arrive at Useppa with driller and helper.
8:40	Driller and helper tag cement at 179.5 feet bls. Virtually no lift from cement pumped on 02/15/12.
8:54	Begin pump water from outer fluid storage area to infiltration area.
9:25	Finish pump water out of outer fluid storage area.
9:36	Useppa fire truck arrives to deliver 1000 gallons of fresh water into storage area for cement mixing.
10:07	Driller and helper begin mixing 14 sacks of cement in about 70 gallons of water.
10:15	Begin pumping cement down tremie with bottom at 179 feet bls.
10:20	Finish pump cement, pull tremie, flush out equipment. Put flush water into middle fluid storage area.
11:00	Board Useppa Island shuttle.
11:20	Arrive at Bokeelia

Cardno ENTRIX

Daily Log

Date:	2/17/2012
Project Name:	Useppa Island Class V Exploratory Well
Project No.:	02626001.00
Prepared By:	Josh Epting
Well:	EX-1

Time	Description of Activities
10:40	Eric Glidden onsite with drillers. Tag reported at 139 feet bls. This lift amount from 180 feet is 41 feet. Theoretical lift was 121 feet. Lift is 34 % of theoretical lift of 121 feet. (41/121 = 34%)
10:53	Discuss plan with driller Tyrone Harris. Instruct Tyrone to pump 7 sacks of neat cement. To lift from 139 to 85 feet is 54 feet of lift. The theoretical amount of cement for that lift is 6.2 sacks at 1.18 cubic feet per sack (6 gallons water/sack).
11:00	Board shuttle boat at Bokeelia.
11:30	Onsite with drillers. They have pumped 7 sacks and cleaned up.
11:50	Connect 2-inch centrifugal and begin to purge 10-inch casing for TOC sample. Purge water begins to look like cement. Stop pumping. Fluid levels in 10-inch and in 5-inch were dropping during pumping.
12:00	Drillers report that when pumping cement, water came out of 10-inch casing. Use kelly and push 5-inch casing down approximately 1 foot.
13:00	Begin pumping out of 10-inch casing. Water comes out looking like cement water for about 5 minutes. Water level in 5-inch casing does not move. Continue purge 10-inch casing.
13:17	Pumping water level in 10-inch casing is 11.2 feet btoc. Did not get accurate static level. Measure pumping rate using 100 gallon tub. Rate is 28 gpm. Measure with 5 gallon bucket, rate is 32 gpm. Average is 30 gpm.
13:30	Collect water sample from 50-60 foot zone for TOC laboratory analysis.
13:40	Pump fluid out of fluid storage area to infiltration area.
14:30	Board shuttle boat at Bokeelia.
14:50	Arrive in Bokeelia
16:00	Drop sample for TOC at Benchmark lab in Northport.
17:00	Arrive at Fort Myers Cardno ENTRIX office.

Cardno ENTRIX

Daily Log

Date:	2/20/2012
Project Name:	Useppa Island Class V Exploratory Well
Project No.:	02626001.00
Prepared By:	Andrew McThenia
Well:	EX-1

Time	Description of Activities
8:00	Board Useppa Island Club shuttle boat at Bokeelia.
8:30	Arrive onsite with drillers.
8:40	Tag cement at 120 feet bls. 139-115 = 24 feet of lift.
8:45	Add 4 gallons of coarse gravel down inside 5-inch casing. This is 0.535 cubic feet, theoretical lift is 4 feet. (0.13635 cubic ft./vertical ft in 5-inch borehole)
9:00	Finish adding 4 gallons of coarse gravel. Tag at 113 feet. Add approximately 1/2 gallon finer gravel followed by 1 gallon of limestone sand to keep cement from migrating downward in coarse gravel.
9:38	Cut off bottom of tremie pipe. Tremie is about 110 feet long. Put tremie inside 5-inch casing. Tremie pipe just touches top of gravel. Lift tremie pipe and secure.
9:44	Get load of fresh water from fire department. 1000 gallons.
9:50	Mix up 6 sacks of cement. Plan is to pump 3 sacks to achieve fill from 112 to 85 feet or 27 vertical feet = 3.68 cubic feet (1.18 cf/sack). Tub (100 gallons) and mud pump suction require more volume than necessary, so have to mix 6 sacks minimum and pump 3 sacks to waste.
10:00	Pump approximately 25 gallons of grout down tremie and about 25 gallons into solids collection pit. Rinse out equipment using water from fluid storage pit. Pump cement water into solids collection pit.
10:30	Pump decanted fluid from containment area into infiltration area.
11:00	Board shuttle.
11:20	Arrive at Bokeelia.

Cardno ENTRIX

Daily Log

Date: 2/21/2012
Project Name: Useppa Island Class V Exploratory Well
Project No.: 02626001.00
Prepared By: Andrew McThenia
Well: EX-1

Time	Description of Activities
7:00	Board Useppa Island Club shuttle boat at Bokeelia.
7:20	Arrive on island. Get battery and golf cart.
7:34	Measure static levels of pad wells. (See Report Form)
7:40	Measure static levels in EX-1. Measure inside of 10-inch casing (upper 50-60 foot zone = 4.56 ft. on 10-inch casing btoc) which equates to 5.6 feet btoc of 5-inch), 5-inch casing sticks up 1.04 feet above 10-inch. Measue water level inside 5-inch static level is 3.40 ft. btoc. Therefore static in 5-inch (deeper zones) is 2.2 feet above static inside 10-inch (50-60 foot zone).
7:45	Begin purge NE Monitor Well.
8:00	Sample NEMW.
8:05	Begin purge SE Monitor Well
8:15	Sampe SEMW.
8:20	Begin purge SW Monitor Well.
8:40	Sample SWMW.
8:45	Begin purge NW Monitor Well
9:00	Sampe NWMW.
9:05	Drillers arrive and tag inside 5-inch casing at 88 feet bls.
9:23	Lift up on 5-inch casing. Base was pushed in at 83 feet bls.
9:40	Cut approximately 20 feet of 5-inch casing off. Secure casing with base at 60 feet bls.
9:50	Measure and cut 85 feet of 1.25-inch tremie pipe. Install inside 5-inch casing.
10:00	Begin mixing 6 sacks of cement with 30 gallons of water in tub using rig mud pump and flash mixer.
10:02	Finish pumping 6 sacks of cement.
10:07	Finish rinsing out hoses and tubs and putting cement water into middle lined pit area.
10:30	Discuss TOC exceedance with Eric Glidden (preliminary verbal from lab is 17 mg/l). Decide to propose alternative fluid disposal site downslope and further from well site in palm grove area.
11:00	Board Useppa Island Club shuttle boat at Useppa dock.
11:20	Arrive at Bokeelia.

Cardno ENTRIX

Daily Log

Date: 2/22/2012
Project Name: Useppa Island Class V Exploratory Well
Project No.: 02626001.00
Prepared By: Andrew McThenia
Well: EX-1

Time	Description of Activities
8:00	Two shuttle boats full of employees. Wait for one boat to go and return.
8:30	Catch shuttle to Useppa.
8:45	Arrive at Useppa dock. Wait for golf cart.
9:00	Arrive at rig. Tag inside 5-inch casing at 63.5 feet bls.
9:05	Fire up rig. Pull 5-inch casing out of 10-inch.
9:06	Static level in NEMW = 3.10 ft. btoc.
9:20	Install pressure transducer in NEMW. Level Troll 500, 15 PSIG, S/N 103332 at 10 feet btoc in NEMW.
9:38	Set up transducer for 1 reading per minute, reference = 3.12 ft. btoc, fluid density = 10,000 mg/l TDS = 1.004583 grams/cubic centimeter. Schedule data collection to start at 9:40AM.
9:40	Confirm data being collected in NEWM.
9:50	Install pressure transducer in SEMW. Level Troll 500, 15 PSIG, S/N 103418 at 10 feet btoc in SEMW.
10:00	Static level in SEMW is 2.75 ft. btoc. Set reference. Set up transducer for 1 reading per minute to start at 10:05 AM. Set up with density as previous well. Density = 1.004583.
10:05	Confirm datalogger in SEMW begins collecting data.
10:10	Drillers are reconfiguring rig for direct airlifting.
10:20	Static level in SWMW is 2.10 ft. btoc. Install Level Troll 700, 15 PSIG at 10 ft. btoc, S/N is 118269. Set frequency to 1 reading per minute. Density setting = 1.004583. Schedule readings to start at 10:25
10:25	Confirm transducer is collecting data.
10:40	Install Level Troll 500, 30 PSIG. S/N 127143 in NWMW at 10 ft. btoc. Static level is 2.89 ft. btoc. Set probe start readings at 10:50. Set density and freqency same as other MWs.
10:50	Confirm start of datalogger in NWMW.
11:00	Put 11' 3-inch screen assembly into tidal creek. Mount vertically against the bridge support post in deepest part of channel. Water depth is about 3 feet.
11:05	Water level is 8.05 feet below top of railing. Cut off sampling tool top even with top of railing. Install probe inside screen assembly at 10 feet below railing. Move probe down to just off bottom of screen at depth of about 3 feet. Set probe up in depth mode. Seawater density. 1 Reading per minute. Start time at 11:40 AM.
11:40	Confirm transducer in Tidal Creek is collecting data.
11:45	Driller reports no resistance to 9.875-inch bit tripping in. Drill string tags bottom at 60 feet bls.
11:47	Driller turns on air compressor.

Cardno ENTRIX

Daily Log

Date:	2/22/2012
Project Name:	Useppa Island Class V Exploratory Well
Project No.:	02626001.00
Prepared By:	Andrew McThenia
Well:	EX-1

Time	Description of Activities
11:52	Begin airlifing EX-1 with bit at 60 feet bls. Initial returns are gray like cement and drilling mud. Some coarse rock fragments and sand return
12:00	Measure distances from monitor wells to EX-1. NWMW = 18 ft.. NEMW = 40 ft., SEMW = 53 ft., SWMW = 40 ft.
12:04	Measure water level in NWMW at 5.4 feet btoc. Well has dropped from static of 2.89 feet. Water is relatively clear. Running out of room for water storage. 2-inch pump to infiltration area is not keeping up with airlift rate.
12:05	Stop airlifting. Pump water from around rig containment into outer containment area. Pump water up to infiltration area.
12:26	Fire up rig. Airlift while raising drill string from 60 to about 50 feet bls.
12:33	Stop airlifing well. Fluid levels in storage area getting near overflow.
12:40	Drillers trip out drill string. Begin pumping off water into infiltration area.
13:42	Stop pumping to infiltration area. Have installed 2-inch PVC vertical suction riser inside 10-inch casing. Connect to 2-inch pump suction.
13:48	Measure static level in EX-1 at 4.55 ft. btoc.
13:50	Begin pumping EX-1 with 2-inch centrifugal pump.
13:55	Measure pumping water level at 14.56 ft. btoc. Static was 4.55 ft. btoc. Drawdown is 10.01 ft. Measure pumping rate using 130 gallon tub. 130 gallons/1.5 minutes = 87 gpm. Specific capacity = 8.69 gpm/ft.
14:00	Stop pumping from well.
14:30	Board shuttle at Useppa dock.
14:50	Arrive at Bokeelia.

Cardno ENTRIX

Daily Log

Date:	2/23/2012
Project Name:	Useppa Island Class V Exploratory Well
Project No.:	02626001.00
Prepared By:	Andrew McThenia
Well:	EX-1

Time	Description of Activities
7:00	Catch shuttle to Useppa.
7:30	Arrive at Useppa dock.
7:45	Static level in EX-1 is 4.72' btoc. TOC = 1.58' ALS.
8:04	Install Level Troll 700 pressure transducer, 15 PSIG at ~35 feet below top of casing in EX-1. Let probe equilibrate.
8:24	Set probe reference = 4.68 feet btoc (Current depth to water), Set probe for seawater density, 1.02400 grams/cubic centimeter, Schedule probe to begin data collection at 8:30AM at a frequency of 1 reading per minute.
9:00	Have installed 1-inch pipe and conduit from wellsite to wooded palm grove approximatly 100 yards south of well site. Begin pump water from storage area over to infiltration area.
9:19	Download data from NEMW. Water level manual reading is 2.83 feet btoc.
9:25	Static level in SWMW = 1.95 feet btoc. Download data.
9:30	Static level in SEMW = 2.55 feet btoc. Download data.
9:32	Static level in drainfield monitor well = 3.20 ft. btoc.
9:35	Static level in NEMW = 1.95 feet btoc. Download data.
9:47	Static level of 4.61 feet btoc in EX-1
9:59	Reading on 2-inch totalizer = 2030790 gallons
10:00	Begin pumping EX-1. 1 Minute reading of totalizer = 83 gpm.
10:10	Measure flow rate using 130 gallon tank. Tank is measured and volumes are calculated. 1 minute 34 seconds/130 gallons = 83 gpm.
10:30	Eric brings 200 gallon marked tank. Flow takes 2 minutes and 32 seconds to fill tank. Discharge hose was lifted to spill into tank. Discharge hose end was higher above ground than previously. 200 gallons takes 2 minutes and 32 seconds, or 2.53 minutes. 200/2.53 = 79 gpm. This is not as accurate due to wave action at water surface precluding precise timing volume reading at any elapsed time.

Cardno ENTRIX

Daily Log

Date:	2/23/2012
Project Name:	Useppa Island Class V Exploratory Well
Project No.:	02626001.00
Prepared By:	Andrew McThenia
Well:	EX-1

Time	Description of Activities
10:32	Pumping water level in EX-1 is 14.08 feet btoc. Observe various levels of drawdown in monitor wells. Approximatly 1.5 feet of drawdown observed in closest monitor well NWMW located 18 feet north of EX-1. Dataloggers recording data. Continue to monitor water ponding in palm grove, No runoff occurs during test out of designated area.
10:45	Conductivity of discharge is 68.6 mS/cm, T = 25.8 degrees C.
11:30	Conductivity of discharge is 67.4 mS/cm, T = 25.8 degrees C.
12:42	Conductivity = 67.4 mS/cm, T = 25.8 degrees C, pH = 6.38.
13:00	Totalizer = 02045300. 14,510 gallons pumped/180 minutes = 81 gpm.
14:00	Final conductivity = 66.8 mS/cm. T = 25.8 degrees C, pH= 6.38. Final totalizer = 02050200. 19410 gallons pumped/240 minutes = 80.875 gpm. Round to 81 gpm. Stop pumping. 4 Hour Test Completed.
14:10	Download data from all transducers. Leave all transducers running in wells and in tidal creek.
14:30	Board shuttle at Useppa dock.
14:50	Arrive at Bokeelia.

Cardno ENTRIX

Daily Log

Date:	2/24/2012
Project Name:	Useppa Island Class V Exploratory Well
Project No.:	02626001.00
Prepared By:	Josh Epting
Well:	EX-1

Time	Description of Activities
NA	Cardno ENTRIX staff not onsite. David Cannon Well Drilling mobilized the drilling rig off of the island via a private barge hired by Useppa Island Utilities.

Cardno ENTRIX

Daily Log

Date: 2/28/2012
Project Name: Useppa Island Class V Exploratory Well
Project No.: 02626001.00
Prepared By: Andrew McThenia
Well: EX-1

Time	Description of Activities
11:30	Board Useppa Island Club shuttle boat at Bokeelia.
12:00	Arrive at site. Rig and equipment have been demobilized. Berm in front of rig was pushed down and driven over.
12:04	Measure static levels in pad monitor wells (See worksheet). Static level in EX-1 is 4.62 feet below top of casing. Top of casing is 1.6 feet above land surface. Tidal creek is 8.25 feet below the railing of the bridge above the creek.
12:15	Connect to probe in NEMW. Stop recording data. Download probe. Pull probe from well.
12:20	Begin purge NEMW.
12:30	Sample NEMW.
12:36	Connect to probe in SEMW. Stop recording data. Download probe. Pull probe from well.
12:40	Begin purge SEMW.
12:48	Connect to probe in SWMW. Stop recording data. Download probe. Pull probe from well.
12:50	Sample SEMW
13:00	Begin purge SWMW
13:01	Connect to probe in NWMW. Stop recording data. Download probe. Pull probe from well.
13:06	Connect to probe in EX-1. Stop recording data. Download probe. Pull probe from well.
13:10	Sample SWMW
13:20	Begin purge NWMW
13:23	Connect to probe in Tidal Creek. Stop recording data. Download probe. Pull probe from stilling pipe.
13:30	Sample NEWM
13:50	Remove stilling pipe from tidal creek. Install 10-inch cap on EX-1. Load ENTRIX equipment into cart. Return battery utilities area. Drop equipment at dock. Return cart to utilities area. Disuss plans with Eric Glidden.
14:30	Board Useppa Island Club shuttle boat.
14:50	Arrive at Bokeelia dock.

Appendix B

Pad Monitor Well Laboratory Results

Sanders Laboratories
Environmental Testing Services

Laboratory Test Report

Lab Project #: F1201355

Page 1 of 4

All subsequent pages are identified by: F1201355 . These pages may include, but are not limited to: Analytical Data, Chains of Custodys, Subcontracted Data and Case Narratives.

Questions regarding this report should be directed to your **Laboratory Contact**:

None

Client: Entrix / Water Resource Solutions

1388 Colonial Blvd.

Ft Myers, FL 33907

Phone: 239-574-1919office

Fax: 239-574-8106

E-mail:

Project Name: Useppa Pad Wells

QUALIFIER DEFINITIONS

B: Results based upon colony counts outside the acceptable range.
I: The reported value is greater than or equal to the laboratory MDL but less than the laboratory PQL.
J: Estimated Value.
J7: Excessive amounts of Sodium Sulfite used to dechlorinate the sample due to high levels of chlorine present.
K: Off scale low, actual value is known to be less than the value given.
L: Off scale high, actual value is known to be greater than the value given.
Q: Sample held beyond acceptable holding time.
U: The compound was analyzed for, but not detected.
V: Indicates that the analyte was detected at or above the MDL in both the sample and the associated method blank and the value of 10 times the blank value was equal to or greater than the associated sample value.
Y: The laboratory analysis was from an improperly preserved sample.
Z: Too many colonies were present for accurate counting.
HACH results may not meet NELAC standards.

A statement of estimated uncertainty of results is available upon request.

Analytical results provided relate only to the samples received for this project.

Test results meet all the requirements of the NELAC standards, unless otherwise noted.

Laboratory report shall not be reproduced except in full, without the written approval of Sanders Laboratories.

Sanders Laboratories follows DEP standard operating procedures for field sampling, unless otherwise noted.

Laboratory PQL's are available upon request.

Reports are archived for a minimum of 5 years. Copies of reports which are less than 1 year old are available for a fee of $25.00 per report. Reports older than 1 year are available for a fee of $50.00 per report. Copies will be provided within 1 week of the time of the request.

Comments:

Approved by:

Gayle Menard/Lab Manager
Jeff Walsh/Project Manager

SANDERS LABORATORIES, INC.

Laboratory Test Report

Client: Entrix / Water Resource Solutions

Client Project: Useppa Pad Wells

Lab Project: F1201355

Report Date: 02/01/12

Lab ID	Sample Description	Matrix	Sample Type	Received Date/Time	Sample Date/Time
F1201355-01	NE WELL	Ground Water	GRAB	1/25/12 11:20	1/24/12 11:30

Parameter	Result	Qual	MDL	PQL	Units	Method	Batch #	Analysis Date/Time	Analyst	Lab ID
Total Dissolved Solids	10600		20	20	mg/L	SM2540C	FB120201002	1/27/12 9:15	CC	E85457

Lab ID	Sample Description	Matrix	Sample Type	Received Date/Time	Sample Date/Time
F1201355-02	SE WELL	Ground Water	GRAB	1/25/12 11:20	1/24/12 13:25

Parameter	Result	Qual	MDL	PQL	Units	Method	Batch #	Analysis Date/Time	Analyst	Lab ID
Total Dissolved Solids	9800		20	20	mg/L	SM2540C	FB120201002	1/27/12 9:15	CC	E85457

Lab ID	Sample Description	Matrix	Sample Type	Received Date/Time	Sample Date/Time
F1201355-03	SW WELL	Ground Water	GRAB	1/25/12 11:20	1/24/12 14:46

Parameter	Result	Qual	MDL	PQL	Units	Method	Batch #	Analysis Date/Time	Analyst	Lab ID
Total Dissolved Solids	8160		20	20	mg/L	SM2540C	FB120201002	1/27/12 9:15	CC	E85457

Lab ID	Sample Description	Matrix	Sample Type	Received Date/Time	Sample Date/Time
F1201355-04	NW WELL	Ground Water	GRAB	1/25/12 11:20	1/24/12 15:50

Parameter	Result	Qual	MDL	PQL	Units	Method	Batch #	Analysis Date/Time	Analyst	Lab ID
Total Dissolved Solids	8480		20	20	mg/L	SM2540C	FB120201002	1/27/12 9:15	CC	E85457

Lab ID	Sample Description	Matrix	Sample Type	Received Date/Time	Sample Date/Time
F1201355-05	NE WELL	Ground Water	GRAB	1/25/12 11:20	1/24/12 11:30

Parameter	Result	Qual	MDL	PQL	Units	Method	Batch #	Analysis Date/Time	Analyst	Lab ID
Chloride	4900		1	4	mg/L	SM4500Cl-E	NB120126003	1/26/12 11:30	CS	E84380

Lab ID	Sample Description	Matrix	Sample Type	Received Date/Time	Sample Date/Time
F1201355-06	SE WELL	Ground Water	GRAB	1/25/12 11:20	1/24/12 13:25

Parameter	Result	Qual	MDL	PQL	Units	Method	Batch #	Analysis Date/Time	Analyst	Lab ID
Chloride	5000		1	4	mg/L	SM4500Cl-E	NB120126003	1/26/12 11:30	CS	E84380

Lab ID	Sample Description	Matrix	Sample Type	Received Date/Time	Sample Date/Time
F1201355-07	SW WELL	Ground Water	GRAB	1/25/12 11:20	1/24/12 14:46

Parameter	Result	Qual	MDL	PQL	Units	Method	Batch #	Analysis Date/Time	Analyst	Lab ID
Chloride	3930		1	4	mg/L	SM4500Cl-E	NB120126003	1/26/12 11:30	CS	E84380

Lab ID	Sample Description	Matrix	Sample Type	Received Date/Time	Sample Date/Time

SANDERS LABORATORIES, INC.

Laboratory Test Report

Client: Entrix / Water Resource Solutions

Client Project: Useppa Pad Wells

Lab Project: F1201355

Report Date: 02/01/12

Lab ID	Sample Description	Matrix	Sample Type	Received Date/Time	Sample Date/Time
F1201355-08	NW WELL	Ground Water	GRAB	1/25/12 11:20	1/24/12 15:50

Parameter	Result	Qual	MDL	PQL	Units	Method	Batch #	Analysis Date/Time	Analyst	Lab ID
Chloride	4400		1	4	mg/L	SM4500Cl-E	NB120126003	1/26/12 11:30	CS	E84380

Sanders Laboratories
Environmental Testing Services

CHAIN OF CUSTODY RECORD

Project # (Lab Use Only): F1201355

Client: Cardno ENTRIX
Address: 1388 Colonial Blvd
Fort Myers, Florida 33907
Phone: 239-829-7000
Fax: 239-574-1919

Report To: John Mayhut
Bill to: Cardno ENTRIX
P.O. #

Preservative: HCL = H, HNO_3= N, $Na_2S_2O_3$ = ST
H_2SO_4 = S, NaOH = SH, NH_4Cl = NH

Project Name: Useppa Island: Pad Wells
Project Location: Useppa Island
Customer Type:
Kit #:
Requested Due Date: 2/6/12

Sampled By (PRINT)					Preservatives						Analysis Requested											Sample ID # (Lab Use Only)
Sampler Signature		Sample									TDS	Dissolved Chloride										
Matrix	Sample Description	Date	Time	Type	pH	Ice																
GW	NE Well	1/24/2012	11:30	G		X					X											-01A
GW	SE Well	1/24/2012	1:25	G		X					X											02A
GW	SW Well	1/24/2012	2:46	G		X					X											03A
GW	NW Well	1/24/2012	3:50	G		X					X											04A
GW	NE Well	1/24/2012	11:30	G		X						X										05A
GW	SE Well	1/24/2012	1:25	G		X						X										06A
GW	SW Well	1/24/2012	2:46	G		X						X										07A
GW	NW Well	1/24/2012	3:50	G		X						X										08A

Bottle Lot #			Relinquished By/Affiliation	Date	Time	Accepted By/Affiliation	Date	Time
006700		Okay to Run As Is	Andy McTheria	1/25	07:30		1/25	7:30A
		Client Initial:		1/25	10:30		1/25	10:30
				1/25	11:20	Mathilde Marignadin	1/25	1120
		Samples On Ice						
	2.A	Yes No						

1050 Endeavor Ct, Nokomis, FL 34275-3623 (941) 488-8103 fax(941) 484-6774 10090 Bavaria Rd., Fort Myers, FL 33913 (239) 590-0337 fax (239) 590-0536

Sanders Laboratories, Inc.
Environmental Testing Services

Non-Conforming Sample Receipt Report

Date: 1/25/12

Project #: F1201355

Client: Entrix

Project: Useppa Is. Pad Wells

Reason for Report:

_____ Chilling Process had not yet begun (samples received same day)

_____ Samples not at required temperature (0-6°C)(samples received day or more later)

_____ Required preservation not used

_____ Incorrect preservation used

_____ Parameter holding time exceeded

__X__ Inappropriate sample containers

_____ Inadequate sample volume

_____ Sample bottle leaked or broke

_____ Other (explain)_____

Client Contacted: __X__ Yes _____ No

Who Contacted: ILIA LOPAREV

How Contacted: _____ Phone _____ Fax _____ Email
__X__ In Person

Person Completing Report: Michelle Mayer

Copy to be attached to receiving COC
Original to be attached to original COC

If there are any questions please contact Andrew Konopacki or Tami Bright at 941-488-8103.

Effective March 9th, 2009

Appendix C

Weekly Pad Monitor Well Reports

Cardno ENTRIX

Pad Monitoring Well Analysis Log

Date: 1/24/2012

Project Name: Useppa Island Class V Exploratory Well

Job No.: 02626001

Prepared By: Andy McThenia

Well(s) EX-1

* microseimens / centimeter

Well	Date	Collection Time	Depth to Water (ft BTOC)	Temp. (^{o}C)	Chlorides (mg/L)	Conductivity (mS/cm*)	pH (SU)
NEMW	1/24/2012	11:32	3.01	25.7	5100	16.53	6.90
SEMW	1/24/2012	13:30	2.82	25.3	4750	16.07	6.92
SWMW	1/24/2012	14:45	1.96	25.6	3875	13.80	6.85
NWMW	1/24/2012	15:45	Not Measured	25.7	4125	14.02	6.84

Cardno ENTRIX

Pad Monitoring Well Report

Date: 1/31/2012

Project Name: Useppa Island Class V Exploratory Well

Job No.: 02626001

Prepared By: Andy McThenia

Well(s) EX-1

* microseimens / centimeter

Well	Date	Collection Time	Depth to Water (ft BTOC)	Temp. (^{o}C)	Chlorides (mg/L)	Conductivity (mS/cm*)	pH (SU)
NEMW	1/31/2012	10:09	3.39	24.9	5550	17.24	6.92
SEMW	1/31/2012	10:40	3.09	25.3	4875	16.83	6.84
SWMW	1/31/2012	11:25	2.48	25.6	4050	13.37	6.79
NWMW	1/31/2012	12:12	3.33	25.7	4250	14.11	6.89

Cardno ENTRIX

Pad Monitoring Well Report

Date: 2/7/2012 - Week 3

Project Name: Useppa Island Class V Exploratory Well

Job No.: 02626001

Prepared By: Andy McThenia

Well(s) Class V Exploratory Well

* milliseimens / centimeter

Well	Date	Collection Time	Depth to Water (ft BTOC)	Temp. (°C)	Chlorides (mg/L)	Conductivity (mS/cm*)	pH (SU)
NEMW	2/7/2012	8:00	3.16	24.8	5250	16.46	6.91
SEMW	2/7/2012	8:15	2.89	24.7	4800	16.46	6.97
SWMW	2/7/2012	8:30	2.27	24.8	4500	14.28	6.89
NWMW	2/7/2012	8:45	3.14	25.3	4625	14.32	6.89

Cardno ENTRIX

Pad Monitoring Well Report

Date: 2/14/2012 - Week 4

Project Name: Useppa Island Class V Exploratory Well

Job No.: 02626001

Prepared By: Andy McThenia

Well(s) Class V Exploratory Well

* milliseimens / centimeter

Well	Date	Collection Time	Depth to Water (ft BTOC)	Temp. (^{o}C)	Chlorides (mg/L)	Conductivity (mS/cm*)	pH (SU)
NEMW	2/14/2012	8:00	3.05	24.7	5125	16.74	6.95
SEMW	2/14/2012	8:15	2.44	24.7	5000	16.40	7.08
SWMW	2/14/2012	8:30	2.09	24.9	4500	14.15	6.98
NWMW	2/14/2012	8:45	2.92	25.2	4125	14.01	6.95

Cardno ENTRIX

Pad Monitoring Well Report

Date: 2/21/2012 - Week 5

Project Name: Useppa Island Class V Exploratory Well

Job No.: 02626001

Prepared By: Andy McThenia

Well(s) Class V Exploratory Well

* milliseimens / centimeter

Well	Date	Collection Time	Depth to Water (ft BTOC)	Temp. (^{o}C)	Chlorides (mg/L)	Conductivity (mS/cm*)	pH (SU)
NEMW	2/21/2012	8:00	3.18	24.6	4875	17.02	7.03
SEMW	2/21/2012	8:15	2.89	24.6	4800	16.74	6.97
SWMW	2/21/2012	8:40	2.35	24.9	4750	14.58	6.83
NWMW	2/21/2012	9:00	3.17	25.1	4250	14.27	6.79

Cardno ENTRIX

Pad Monitoring Well Report

Date: 2/28/2012 - Week 6

Project Name: Useppa Island Class V Exploratory Well

Job No.: 02626001

Prepared By: Andy McThenia

Well(s) Class V Exploratory Well

* milliseimens / centimeter

Well	Date	Collection Time	Depth to Water (ft BTOC)	Temp. (^{o}C)	Chlorides (mg/L)	Conductivity (mS/cm*)	pH (SU)
NEMW	2/28/2012	12:30	3.00	24.7	5250	16.70	7.03
SEMW	2/28/2012	12:50	2.71	24.7	4800	16.56	6.89
SWMW	2/28/2012	13:10	2.08	25.0	4300	14.48	6.81
NWMW	2/28/2012	13:30	2.92	25.2	4250	14.15	7.04

Appendix D

10-Inch PVC Casing Specifications

Silver-Line Plastics

PVC Well Casing

BASIC USES

Silver-Line PVC Well Casing is the standard bearer for the well drilling industry. Although used primarily to line wells for drinking water, PVC Well Casing pipe has also proven itself as a superior monitor pipe. Its advantages include:

- ∞ Non-Corrosion
- ∞ Resistance to Micro- and Macro- Biological Attack
- ∞ Lighter Weight
- ∞ Ease of Handling and Installation
- ∞ Competitive Price

Our PVC Well Casing is produced from Type I Grade 1 virgin PVC compound, which exceeds the materials requirements of ASTM Standard F 480, the governing standard specification for thermoplastic well casing pipe made in SDR and Schedules 40 and 80. This product is specially manufactured for use in water well construction and for ground water monitoring, and is tested and listed by NSF International.

The following information, adapted from ASTM F 480, outlines the storage, handling, and assembly procedures for SDR and SCH 40 thermoplastic well casing pipe:

STORAGE: PVC Well Casing pipe should not be stored in direct sunlight for long periods and should be stored in a manner to prevent sagging or bending of the pipe.

HANDLING: PVC Well Casing pipe should be kept clean and free of debris. Pipe ends should be cut square and any burrs must be removed before coupling. Cleaners and primers are recommended for use in accordance with the manufacturer's instructions, to soften and dissolve the pipe surfaces prior to cementing.

ASSEMBLY: Prior to assembly, ensure a full and tight fit between the pipe and belled end. Before the cement is applied, the pipe should insert half the length of the bell without unnecessary force. Use solvent cement, in accordance with the manufacturer's instructions, to join the pipe and belled end. After the joint is made, any excess cement should be wiped away from the new joint. Allow the cement to set properly and the joint to develop good handling strength before installation. Cure time will depend on many factors. Generally, however, short cure periods are satisfactory for high ambient temperatures, low humidity, and interference-type fittings. Longer cure periods are recommended for low ambient temperatures, high humidity, larger pipe sizes, and loose fitting joints.

TOO MUCH CEMENT WILL DAMAGE THE PIPE

PVC PIPE IS NOT RECOMMENDED FOR AIR PRESSURE

Silver-Line Plastics

What Is IC-2 Rated Well Casing and How Does It Benefit You?

Although other manufacturers produce this product, few if any, subject it to the rigorous testing required of pipe conforming confroming to Impact Classification 2 (“IC-2”) of ASTMF 480.
For example, the IC-2 standard for 4-1/2” PVCSDR 17 Well Casing pipe requres that 9 out of 10 samples, pre-conditioned to the temperature of 32°F, withstand the impact of 30 pound dropped from 7.1 feet (213 ft lb.).
On 6-1/4” PVCSDR21 and 6-1/4” SDR27.6, IC-2 requres 9 of 10 samples, similarly conditioned, to withstand the Impact of 30 pound dropped from 8.9 feet (267 ft lb.)

By testing and marking this production as IC-2, Silver Line subjects this prodcut to these performance tests by NSF International and certifies this product as an industry leader for quality and serviceability.

Nominal Pipe Size	Impact Classification Comparison			Minimum Pipe Stiffness Comparison (@5% Deflection)		PVC 1120 Compound Cell Class. Type I Grade 1
	IC-0* (ft LB)	IC-1 (ft LB)	IC-2 (ft LB)	PVC DWV (D 2665)	Well Casing (F 480)	
4" SCH 40	Not specified	160-200	200-240	310 psi	310 psi	12454-B
4-1/2" SDR 17	Not specified	170-210	211-250		452 psi	12454-B
4-1/2" SDR 21	Not Specified	170-210	211-250		224 psi	12454-B
4-1/2" SDR 26	Not Specified	170-210	211-250		112 psi	12454-B
5" SDR 17	Not specified	180-220	220-260		452 psi	12454-B
5" SCH 40	Not specified	180-220	220-260		208 psi	12454-B
5" SDR 21	Not specified	180-220	220-260		224 psi	12454-B
5" SDR 26	Not specified	180-220	220-260		112 psi	12454-B
6" SDR 17	Not specified	200-260	260-300		452 psi	12454-B
6" SCH 40	Not specified	200-260	260-300	150 psi	150 psi	12454-B
6" SDR 21	Not specified	200-260	260-300		224 psi	12454-B
6" SDR 26	Not specified	200-260	260-300		112 psi	12454-B
6-1/4" SDR 17	Not specified	208-265	265-300		452 psi	12454-B
6-1/8" (I.D.) SDR 21	Not specified	208-265	265-300		224 psi	12454-B
6-1/4" (I.D.) SDR 27.6	Not specified	208-265	265-300		95 psi	12454-B
8" SCH 40	Not specified	260-300	>300	100 psi	100 psi	12454-B

* No impact testing required by ASTM F 480.

What Is Laying Length Pipe and How Does It Benefit You?

Most bell-end PVC pipe is manufactured to a standard overall length of 20 ft.
That length is comprised of the length of the pipe and the length of the bell-joint.
At Silver-Line, most of our products that are frequently used in the well-water industry are manufactured to a laying length.
With our well casing, even after the pipe is joined, you are still getting a true 20 ft. of pipe. Our actual lengths are as follows:

Type of Pipe	Overall Length
2" SCH 40, SDR 21 & 26	20' 3 1/2
2-1/2" SCH 40, SDR 21 & 26	20' 4 1/2
3” SCH 40, SDR 21 & 26	20' 5 1/4
4" SCH 40, SDR 21 & 26	20' 6
4-1/2" SDR 17, 21 & 26	20' 6 1/4
5" SCH 40, SDR 17, 21 & 26	20' 7
6" SCH 40, SDR 17, 21, & 26	20' 7 1/4
6-1/4" SDR 17	20' 7 1/4
6-1/8" (I.D.) SDR 21	20' 7 1/4
6-1/4" (I.D.) SDR 27.6	20' 7 1/4
8" SCH 40	20' 7 1/4

TOO MUCH CEMENT WILL DAMAGE THE PIPE

PVC PIPE IS NOT RECOMMENDED FOR AIR PRESSURE

Silver-Line Plastics

PVC WELL CASING PVC 1120 TYPE I GRADE1

BELLED END 20 FT. LENGTHS

Nominal Size	Item Number	Bar Code 7 17141	Outside Diameter	Min. Wall Thickness	Wt/100'	Bell Depth (inch)	Ft/ Pallet	SDR
4-1/2"	34.442	34442 8	4.950	0.291	275	6 1/4	860	17
4-1/2"	34.452	34452 7	4.950	0.236	229	6 1/4	860	21
4-1/2"	32.452	32452 9	4.950	0.190	187	6 1/4	860	26
5"	34.512	34512 8	5.563	0.327	360	7 1/4	460	17
6"	34.642	34642 2	6.625	0.390	496	7 1/4	520	17
6-1/4"	34.742	34742 9	6.900	0.406	545	7 1/4	660	17
6-1/8" I.D.	34.612	34612 5	6.900	0.329	445	7 1/4	660	21
6-1/4" I.D.	34.622	34622 4	6.900	0.250	345	7 1/4	660	27.6

Note: All Sizes Are Laying Length and IC-2 Rated NSF-wc

PVC SCH 40 WELL CASING PVC 1120 TYPE I GRADE1 BELLED END 20 FT. LENGTHS

Nominal Size	Item Number	Bar Code 7 17141	Outside Diameter	Min. Wall Thickness	Wt/100'	Bell Depth (inch)	Ft/Pallet
2"	35.202	35202 7	2.375	0.154	70	3 1/2	2,800
3"	35.302	35302 4	3.500	0.216	144	5 1/4	1,500
4"	35.402	35402 1	4.500	0.237	205	6	1,140
5"	35.502	35502 8	5.563	0.258	288	7	460
6"	35.602	35602 5	6.625	0.280	364	7 1/4	520
8"	35.802	35802 9	8.625	0.322	546	7 1/4	280
10"	35.910	35910 1	10.750	0.365	753	8	220
12"	35.912	35912 5	12.750	0.406	1000	9 1/2	80

Note: 2" – 8" Are Laying Length and 4"–8" Are IC-2 Rated NSF-wc & NSF-pw

PVC SDR 21 WELL CASING PVC 1120 TYPE I GRADE1 BELLED END 20 FT. LENGTHS

Nominal Size	Item Number	Bar Code 7 17141	Outside Diameter	Min. Wall Thickness	Wt/100'	Bell Depth (inch)	Ft/Pallet
2"	34.202	34202 8	2.375	0.113	53	3 1/2	2,800
3"	34.302	34302 5	3.500	0.167	114	5 1/4	1,500
4"	34.402	34402 2	4.500	0.214	189	6	1,140
5"	34.502	34502 9	5.563	0.265	295	7	460
6"	34.602	34602 6	6.625	0.316	390	7 1/4	520

Note: 2"– 6" Are Laying Length and 5" and 6" Are IC-2 Rated NSF-wc & NSF-pw

PVC SDR 26 WELL CASING PVC 1120 TYPE I GRADE1 BELLED END 20 FT. LENGTHS

Nominal Size	Item Number	Bar Code 7 17141	Outside Diameter	Minimum Wall Thickness	Wt/100'	Bell Depth (inch)	Ft/Pallet
4"	32.402	32402 4	4.500	0.173	156	6	1,140
5"	32.502	32502 1	5.563	0.214	240	7	460
6"	32.602	32602 8	6.625	0.255	320	7 1/4	520

Note: 4"– 6" Are Laying Length and 5" Is IC-2 Rated NSF-wc & NSF-pw

Material complies with ANSI / NSF Standard 61 and ASTM F 480

TOO MUCH CEMENT WILL DAMAGE THE PIPE

PVC PIPE IS NOT RECOMMENDED FOR AIR PRESSURE

Appendix E

Laboratory Reports of Zone Sampling

BENCHMARK
EnviroAnalytical Inc.

NELAC Certification # E84167

ANALYTICAL TEST REPORT
THESE RESULTS MEET NELAC STANDARDS

Submission Number : 12020153

Cardno Entrix
1388 Colonial Blvd.
Fort Myers, Fl 33907

Project Name : USEPPA EX-1
Date Received : 02/04/2012
Time Received : 1200

Submission Number 12020153

Sample Number: 001
Sample Date: 02/03/2012
Sample Time: 1100
Sample Description: 50-60' Zone Useppa
Sample Method: Grab

Parameter	Result	Units	MDL	PQL	Procedure	Analysis Date	Analysis Time	Analyst
CHLORIDE	29574	MG/L	0.353	1.412	300.0	02/09/2012	16:35	CB
TOTAL DISSOLVED SOLIDS	48656	MG/L	7.26	29.04	SM2540C	02/06/2012	14:00	DM

BENCHMARK
EnviroAnalytical Inc.

NELAC Certification # E84167

02/15/2012

Dale D. Dixon / Laboratory Director — Date

Tülay Tanrisever/ QC Officer

Jennifer Jordan / QC Officer

DATA QUALIFIERS THAT MAY APPLY:

A = Value reported is an average of two or more determinations.

B = Results based upon colony counts outside the ideal range.

H = Value based on field kit determination. Results may not be accurate.

I = Reported value is between the laboratory MDL and the PQL.

J = Estimated value.

J1 = Est. value surrogate recovery limits exceeded.

J2 = Est. value. No quality control criteria exists for component.

J3 = Est. value quality control criteria for precision or accuracy not met.

J4 = Est. value. Sample matrix interference suspected.

J5 = Est. value. Data questionable due to improper lab or field protocols.

K = Off-scale low. Value is known to be < the value reported.

L = Off-scale high. Value is known to be > the value reported

N = Presumptive evidence of presence of material.

O = Sampled, but analysis lost or not performed.

Q = Sample held beyond accepted hold time.

T = Value reported is < MDL. Reported for informational purposes only and shall not be used in statistical analysis.

U = Analyte analyzed but not detected at the value indicated.

V = Analyte detected in sample and method blank.Results for this analyte in associated samples may be biased high. Standard , Duplicate and Spike values are within control limits. Reported data are usable

Y = Analysis performed on an improperly preserved sample. Data may be inaccurate.

Z = Too many colonies were present (TNTC). The numeric value represents the filtration volume.

! = Data deviate from historically established concentration ranges.

? = Data rejected and should not be used. Some or all of QC data were outside criteria, and the Presence or absence of the analyte cannot be determined from the data.

* = Not reported due to interference.

NOTES:

NOTES:

PQL = 4xMDL.

MBAS calculated as LAS; molecular weight = 348.

X = Value exceed MCL.

For questions and comments regarding these results, please contact Bettina Beilfuss at (941) 723-9986

Results relate only to the samples.

Benchmark EnviroAnalytical,Inc	**Client Information:**	**Cardno Entrix** (CAR ENT)
1711 12th Street East Palmetto, Fl 34221 941-723-9986 941-723-6061 Fax www.benchmarkea.com		1388 Colonial Blvd. Ft. Myers Fl 33907 239-829-7013 (Office) 239-246-1972 (Cell) andrew.mcthenia@cardno.com

Project Name: Useppa EX-1

Laboratory Submission # 12020153

Sample Name	Sample Type[1]	Sample Matrix[2]	Parameters, Preservation[4], Container Type[3] TDS (SM2540C) Cl (300.0) Plain 1 x ½ Pint Plastic	Laboratory Sample #
50-60' Zone Useppa	G	GW	Date & Time: 02/03/2012 11:00 AM	1
	G	GW	Date & Time:	
	G	GW	Date & Time:	
	G	GW	Date & Time:	
	G	GW	Date & Time:	
	G	GW	Date & Time:	
	G	GW	Date & Time:	

1 "Sample Type" is used to indicate whether the sample was a grab (G) or whether it was a composite (C).
2 "Sample Matrix" is used to indicate whether the sample is being discharged to drinking water (DW), groundwater (GW), surface water (SW), soil, sediment (SDMNT), or sludge (SLDG).
3 "Container Type" is used to indicate whether the container is plastic (P) or glass (G).
4 **Sample must be refrigerated or stored in wet ice after collection. The temperature during storage should be less than or equal to 6°C (42.8°F).**
Under "Preservative," list any preservatives that were added to the sample container.

Instructions:
1. Each bottle has a label identifying sample ID, premeasured preservative contained in the bottle, sample type, client ID, and parameters for analysis.
2. The following information should be added to each bottle label after collection with permanent black ink: date and time of collection, sampler's name or initials, and any field number or ID.
3. All bottles not containing preservative may be rinsed with appropriate sample prior to collection.
4. The client is responsible for documentation of the sampling event. Please note special sampling events on the sample custody form.

Laboratory Sample Acceptability: pH <2 : ☐
BEA Temperature: 4.4°C

1	Collected By: [signature]	Date 02/03/12	Time 16:05	Received By: Melenda Merchant	Date 2/3/12	Time 1605
2	Relinquished By: Melenda Merchant	Date 2/4/12	Time	Received By: [signature]	Date 2/4/12	Time 1200
3	Relinquished By:	Date	Time	Received By:	Date	Time

BENCHMARK

EnviroAnalytical, Inc.

NELAC CERTIFICATION #E84167

QC REPORT

Submission Number: 12020153

Project Name: USEPPA EX-1

SUBMISSION	METHOD	ANALYTE	LAB SAMPLE	ANALYSIS DATE	QC FLAG	QC VALUE	SAMPLE RESULT	DUPLICATE RESULT	LR %RSD	SPK RESULT	STD-SPK RECOVERY
12020085 021	300.0	CHLORIDE	316162	02/09/2012 00:48	LR		642.000	639.000	0.33		
12020085 031	300.0	CHLORIDE	316172	02/09/2012 05:08	LR		771.000	774.000	0.27		
12020085 041	300.0	CHLORIDE	316182	02/09/2012 09:28	LR		83.200	82.800	0.34		
12020121 003	300.0	CHLORIDE	316244	02/09/2012 13:48	LR		1094.000	1092.000	0.13		
12020174 002	300.0	CHLORIDE	316332	02/09/2012 18:27	LR		207.000	212.000	1.69		
	300.0	CHLORIDE		02/09/2012 04:12	MB	0.00	0.000				
12020085 026	300.0	CHLORIDE	316167	02/09/2012 02:39	SPK	95.20	234.000			327.000	97.7
12020085 036	300.0	CHLORIDE	316177	02/09/2012 06:59	SPK	95.20	77.200			177.000	104.8
12020085 042	300.0	CHLORIDE	316183	02/09/2012 10:05	SPK	90.90	72.500			170.000	107.3
12020174 001	300.0	CHLORIDE	316331	02/09/2012 17:13	SPK	90.90	46.300			141.000	104.2
12020191 001	300.0	CHLORIDE	316335	02/09/2012 19:41	SPK	90.00	32.700			124.000	101.4
	300.0	CHLORIDE		02/09/2012 00:10	STD	100.00	100.000				100.0
	300.0	CHLORIDE		02/09/2012 04:31	STD	100.00	101.000				101.0
	300.0	CHLORIDE		02/09/2012 08:51	STD	100.00	102.000				102.0
	300.0	CHLORIDE		02/09/2012 13:11	STD	100.00	101.000				101.0
	300.0	CHLORIDE		02/09/2012 17:50	STD	100.00	102.000				102.0
	300.0	CHLORIDE		02/09/2012 22:10	STD	100.00	94.300				94.3
12020088 01B	SM2540C	TOTAL DISSOLVED SOLIDS	316192	02/06/2012 14:00	LR		908.000	908.000	0.00		
12020089 01B	SM2540C	TOTAL DISSOLVED SOLIDS	316194	02/06/2012 14:01	LR		512.000	488.000	3.39		
12020118 001	SM2540C	TOTAL DISSOLVED SOLIDS	316233	02/06/2012 14:02	LR		620.000	596.000	2.79		
	SM2540C	TOTAL DISSOLVED SOLIDS	100	02/06/2012 14:00	MB	0.00	0.000				
	SM2540C	TOTAL DISSOLVED SOLIDS		02/06/2012 14:00	STD	300.00	288.000				96.0
	SM2540C	TOTAL DISSOLVED SOLIDS		02/06/2012 14:01	STD	300.00	308.000				102.7

QC FLAGS: MB or BLK = METHOD BLANK LR = LAB REPLICATE MSD = MATRIX SPIKE DUPLICATE STD or LCS = STANDARD SPK or MS = MATRIX SPIKE

BENCHMARK
EnviroAnalytical Inc.

NELAC Certification # E84167

ANALYTICAL TEST REPORT
THESE RESULTS MEET NELAC STANDARDS

Submission Number : 12020371

Cardno Entrix
1388 Colonial Blvd.
Fort Myers, Fl 33907

Project Name : USEPPA EX-1
Date Received : 02/09/2012
Time Received : 1440

Submission Number 12020371

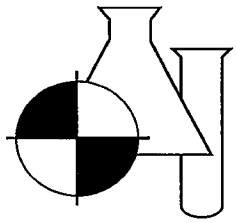
Sample Number: 001
Sample Date: 02/08/2012
Sample Time: 1230
Sample Description: 90'-100' Useppa EX-1
Sample Method: Grab

Parameter	Result	Units	MDL	PQL	Procedure	Analysis Date	Analysis Time	Analyst
CHLORIDE	2635	MG/L	0.353	1.412	300.0	02/15/2012	15:38	CB
TOTAL DISSOLVED SOLIDS	4232	MG/L	7.26	29.04	SM2540C	02/10/2012	13:40	DM

Submission Number 12020371

Sample Number: 002
Sample Date: 02/08/2012
Sample Time: 1405
Sample Description: 110'-120' Useppa EX-1
Sample Method: Grab

Parameter	Result	Units	MDL	PQL	Procedure	Analysis Date	Analysis Time	Analyst
CHLORIDE	2865	MG/L	0.353	1.412	300.0	02/15/2012	15:57	CB
TOTAL DISSOLVED SOLIDS	5296	MG/L	7.26	29.04	SM2540C	02/10/2012	13:40	DM



NELAC Certification # E84167

02/17/2012

Dale D. Dixon / Laboratory Director — Date

Tülay Tanriseven / QC Officer

Jennifer Jordan / QC Officer

DATA QUALIFIERS THAT MAY APPLY:

A = Value reported is an average of two or more determinations.

B = Results based upon colony counts outside the ideal range.

H = Value based on field kit determination. Results may not be accurate.

I = Reported value is between the laboratory MDL and the PQL.

J = Estimated value.

J1 = Est. value surrogate recovery limits exceeded.

J2 = Est. value. No quality control criteria exists for component.

J3 = Est. value quality control criteria for precision or accuracy not met.

J4 = Est. value. Sample matrix interference suspected.

J5 = Est. value. Data questionable due to improper lab or field protocols

K = Off-scale low. Value is known to be < the value reported.

L = Off-scale high. Value is known to be > the value reported

N = Presumptive evidence of presence of material.

O = Sampled, but analysis lost or not performed.

Q = Sample held beyond accepted hold time.

T = Value reported is < MDL. Reported for informational purposes only and shall not be used in statistical analysis.

U = Analyte analyzed but not detected at the value indicated.

V = Analyte detected in sample and method blank.Results for this analyte in associated samples may be biased high. Standard , Duplicate and Spike values are within control limits. Reported data are usable

Y = Analysis performed on an improperly preserved sample. Data may be inaccurate.

Z = Too many colonies were present (TNTC). The numeric value represents the filtration volume.

! = Data deviate from historically established concentration ranges.

? = Data rejected and should not be used. Some or all of QC data were outside criteria, and the Presence or absence of the analyte cannot be determined from the data.

* = Not reported due to interference.

NOTES:

PQL = 4xMDL.

MBAS calculated as LAS; molecular weight = 348.

X = Value exceed MCL.

NOTES:

For questions and comments regarding these results, please contact Bettina Beilfuss at (941) 723-9986

Results relate only to the samples.

Benchmark EnviroAnalytical,Inc	Client Information:	Cardno Entrix (CAR ENT)
1711 12th Street East Palmetto, Fl 34221 941-723-9986 941-723-6061 Fax www.benchmarkea.com		1388 Colonial Blvd. Ft. Myers Fl 33907 239-829-7013 (Office) 239-246-1972 (Cell) andrew.mcthenia@cardno.com Please email report

Project Name: Useppa EX-1	Laboratory Submission #	12020371

Sample Name	Sample Type[1]	Sample Matrix[2]	Parameters, Preservation[4], Container Type[3] TDS (SM2540C) Cl (300.0) Plain 1 x ½ Pint Plastic	Laboratory Sample #
90'-100' Useppa EX-1	G	GW	Date & Time: 02/08/12 12:30	1
110'-120' Useppa EX-1	G	GW	Date & Time: 02/08/12 14:05	2
	G	GW	Date & Time:	
	G	GW	Date & Time:	
	G	GW	Date & Time:	
	G	GW	Date & Time:	
	G	GW	Date & Time:	

1 "Sample Type" is used to indicate whether the sample was a grab (G) or whether it was a composite (C).
2 "Sample Matrix" is used to indicate whether the sample is being discharged to drinking water (DW), groundwater (GW), surface water (SW), soil, sediment (SDMNT), or sludge (SLDG).
3 "Container Type" is used to indicate whether the container is plastic (P) or glass (G).
4 **Sample must be refrigerated or stored in wet ice after collection. The temperature during storage should be less than or equal to 6°C (42.8°F).**
Under "Preservative," list any preservatives that were added to the sample container.

Instructions:
1. Each bottle has a label identifying sample ID, premeasured preservative contained in the bottle, sample type, client ID, and parameters for analysis.
2. The following information should be added to each bottle label after collection with permanent black ink: date and time of collection, sampler's name or initials, and any field number or ID.
3. All bottles not containing preservative may be rinsed with appropriate sample prior to collection.
4. The client is responsible for documentation of the sampling event. Please note special sampling events on the sample custody form.

Laboratory Sample Acceptability: pH <2 : ☒
BEA Temperature: 1.1 2

1	Collected By: Andrew McThenia	Date 02/08/12	Time 16:08	Received By: Melinda Merchant	Date 2/8/12	Time 1608
2	Relinquished By: Melinda Merchant	Date 2/9/12	Time 1130	Received By: Wayne Van Cammen	Date 2-9-12	Time 1130
3	Relinquished By: Wayne Van Cammen	Date 2-9-12	Time 1440	Received By:	Date 2/9/12	Time 1440

3 of 3

BENCHMARK

EnviroAnalytical, Inc.

NELAC CERTIFICATION #E84167

QC REPORT

Submission Number: 12020371

Project Name: USEPPA EX-1

SUBMISSION	METHOD	ANALYTE	LAB SAMPLE	ANALYSIS DATE	QC FLAG	QC VALUE	SAMPLE RESULT	DUPLICATE RESULT	LR %RSD	SPK RESULT	STD-SPK RECOVERY
12020306 001	300.0	CHLORIDE	316596	02/15/2012 01:23	LR	0.00	92.000	92.900	0.69		
12020314 001	300.0	CHLORIDE	316613	02/15/2012 05:43	LR	0.00	111.000	111.000	0.00		
12020323 005	300.0	CHLORIDE	316635	02/15/2012 10:04	LR	0.00	100.000	101.000	0.70		
12020354 002	300.0	CHLORIDE	316718	02/15/2012 14:24	LR	0.00	20.200	20.200	0.00		
12020380 001	300.0	CHLORIDE	316770	02/15/2012 18:25	LR	0.00	53.500	52.900	0.80		
12020418 001	300.0	CHLORIDE	316852	02/15/2012 23:22	LR	0.00	423.000	415.000	1.35		
	300.0	CHLORIDE		02/15/2012 00:27	MB	0.00	0.000				
12020309 003	300.0	CHLORIDE	316602	02/15/2012 02:56	SPK	90.00	100.000			188.000	97.8
12020316 001	300.0	CHLORIDE	316617	02/15/2012 06:39	SPK	90.00	118.000			201.000	92.2
12020353 001	300.0	CHLORIDE	316715	02/15/2012 12:32	SPK	90.00	126.000			222.000	106.7
12020354 003	300.0	CHLORIDE	316719	02/15/2012 15:01	SPK	90.00	25.300			121.000	106.3
12020380 002	300.0	CHLORIDE	316771	02/15/2012 19:02	SPK	90.00	175.000			262.000	96.7
12020417 001	300.0	CHLORIDE	316851	02/15/2012 22:45	SPK	90.00	110.000			196.000	95.6
	300.0	CHLORIDE		02/15/2012 00:46	STD	100.00	100.000				100.0
	300.0	CHLORIDE		02/15/2012 05:06	STD	100.00	101.000				101.0
	300.0	CHLORIDE		02/15/2012 09:26	STD	100.00	101.000				101.0
	300.0	CHLORIDE		02/15/2012 13:47	STD	100.00	102.000				102.0
	300.0	CHLORIDE		02/15/2012 17:48	STD	100.00	103.000				103.0
	300.0	CHLORIDE		02/15/2012 22:08	STD	100.00	105.000				105.0
12020312 001	SM2540C	TOTAL DISSOLVED SOLIDS	316607	02/10/2012 13:40	LR		508.000	496.000	1.69		
12020312 002	SM2540C	TOTAL DISSOLVED SOLIDS	316608	02/10/2012 13:41	LR		660.000	644.000	1.74		
12020312 003	SM2540C	TOTAL DISSOLVED SOLIDS	316609	02/10/2012 13:43	LR		624.000	604.000	2.30		
	SM2540C	TOTAL DISSOLVED SOLIDS		02/10/2012 13:40	MB	0.00	0.000				

QC FLAGS: MB or BLK = METHOD BLANK LR = LAB REPLICATE MSD = MATRIX SPIKE DUPLICATE STD or LCS = STANDARD SPK or MS = MATRIX SPIKE

SUBMISSION	METHOD	ANALYTE	LAB SAMPLE	ANALYSIS DATE	QC FLAG	QC VALUE	SAMPLE RESULT	DUPLICATE RESULT	LR %RSD	SPK RESULT	STD-SPK RECOVERY
	SM2540C	TOTAL DISSOLVED SOLIDS		02/10/2012 13:40	STD	300.00	312.000				104.0
	SM2540C	TOTAL DISSOLVED SOLIDS		02/10/2012 13:41	STD	300.00	316.000				105.3
	SM2540C	TOTAL DISSOLVED SOLIDS		02/10/2012 13:42	STD	300.00	308.000				102.7

NOTES:

BENCHMARK
EnviroAnalytical Inc.

NELAC Certification # E84167

ANALYTICAL TEST REPORT
THESE RESULTS MEET NELAC STANDARDS

Submission Number : 12020688

Cardno Entrix
1388 Colonial Blvd.
Fort Myers, Fl 33907

Project Name : USEPPA EX-1
Date Received : 02/17/2012
Time Received : 1400

Submission Number 12020688

Sample Number: 001
Sample Date: 02/10/2012
Sample Time: 1400
Sample Description: 130'-140' Zone Useppa
Sample Method: Grab

Parameter	Result	Units	MDL	PQL	Procedure	Analysis Date	Analysis Time	Analyst
CHLORIDE	3370	MG/L	0.353	1.412	300.0	02/21/2012	23:50	CB
TOTAL DISSOLVED SOLIDS	5572 Q	MG/L	7.26	29.04	SM2540C	02/19/2012	13:15	RW

BENCHMARK
EnviroAnalytical Inc.

NELAC Certification # E84167

02/23/2012

Dale D. Dixon / Laboratory Director — Date

Tülay Tanrisever/ Jennifer Jordan - QC Officers

Robert L. Sullivan / Laboratory Manager

DATA QUALIFIERS THAT MAY APPLY:

A = Value reported is an average of two or more determinations.

B = Results based upon colony counts outside the ideal range.

H = Value based on field kit determination. Results may not be accurate.

I = Reported value is between the laboratory MDL and the PQL.

J = Estimated value.

J1 = Est. value surrogate recovery limits exceeded.

J2 = Est. value. No quality control criteria exists for component.

J3 = Est. value quality control criteria for precision or accuracy not met.

J4 = Est. value. Sample matrix interference suspected.

J5 = Est. value. Data questionable due to improper lab or field protocols

K = Off-scale low. Value is known to be < the value reported.

L = Off-scale high. Value is known to be > the value reported

N = Presumptive evidence of presence of material.

O = Sampled, but analysis lost or not performed.

Q = Sample held beyond accepted hold time.

T = Value reported is < MDL. Reported for informational purposes only and shall not be used in statistical analysis.

U = Analyte analyzed but not detected at the value indicated.

V = Analyte detected in sample and method blank.Results for this analyte in associated samples may be biased high. Standard , Duplicate and Spike values are within control limits. Reported data are usable

Y = Analysis performed on an improperly preserved sample. Data may be inaccurate.

Z = Too many colonies were present (TNTC). The numeric value represents the filtration volume.

! = Data deviate from historically established concentration ranges.

? = Data rejected and should not be used. Some or all of QC data were outside criteria, and the Presence or absence of the analyte cannot be determined from the data.

* = Not reported due to interference.

NOTES:

NOTES:

PQL = 4xMDL.

MBAS calculated as LAS; molecular weight = 348.

X = Value exceed MCL.

For questions and comments regarding these results, please contact Bettina Beilfuss at (941) 723-9986

Results relate only to the samples.

Benchmark EnviroAnalytical,Inc	Client Information:	Cardno Entrix (CAR ENT)
1711 12th Street East Palmetto, Fl 34221 941-723-9986 941-723-6061 Fax www.benchmarkea.com		1388 Colonial Blvd. Ft. Myers Fl 33907 239-829-7013 (Office) 239-246-1972 (Cell) andrew.mcthenia@cardno.com

Project Name: Useppa EX-1

Laboratory Submission # 12020688

Sample Name	Sample Type[1]	Sample Matrix[2]	Parameters, Preservation[4], Container Type[3] TDS (SM2540C)* Cl (300.0) Plain 1 x ½ Pint Plastic	Laboratory Sample #
130-140 Zone Useppa	G	GW	Date & Time: 02/10/12 14:00	1
	G	GW	Date & Time:	
	G	GW	Date & Time:	
	G	GW	Date & Time:	
	G	GW	Date & Time:	
	G	GW	Date & Time:	
	G	GW	Date & Time:	

1 "Sample Type" is used to indicate whether the sample was a grab (G) or whether it was a composite (C).
2 "Sample Matrix" is used to indicate whether the sample is being discharged to drinking water (DW), groundwater (GW), surface water (SW), soil, sediment (SDMNT), or sludge (SLDG).
3 "Container Type" is used to indicate whether the container is plastic (P) or glass (G).
4 **Sample must be refrigerated or stored in wet ice after collection. The temperature during storage should be less than or equal to 6°C (42.8°F).** Under "Preservative," list any preservatives that were added to the sample container.

*Client is OK having sample run out of hold time. not for compliance. mm 2/17/12 as per AM.

Instructions:
1. Each bottle has a label identifying sample ID, premeasured preservative contained in the bottle, sample type, client ID, and parameters for analysis.
2. The following information should be added to each bottle label after collection with permanent black ink: date and time of collection, sampler's name or initials, and any field number or ID.
3. All bottles not containing preservative may be rinsed with appropriate sample prior to collection.
4. The client is responsible for documentation of the sampling event. Please note special sampling events on the sample custody form.

Laboratory Sample Acceptability: pH <2 ; ✓
BEA Temperature: 1.4°c

1	Collected By: Josh Epting	Date 02/10/12	Time 14:00	Received By:	Date 02/17/12	Time 7:30
2	Relinquished By:	Date 02/17/12	Time 8:32	Received By: Melinda Merchant	Date 2/17/12	Time 0832
3	Relinquished By: Melinda Merchant	Date 2/17/12	Time 1148	Received By: Wayne Ver Cammen	Date 2-17-12	Time 1148

Wayne Ver Cammen 2-17-12 1400

2/17/12 1400

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BENCHMARK

EnviroAnalytical, Inc.

NELAC CERTIFICATION #E84167

QC REPORT

Submission Number: 12020688

Project Name: USEPPA EX-1

SUBMISSION	METHOD	ANALYTE	LAB SAMPLE	ANALYSIS DATE	QC FLAG	QC VALUE	SAMPLE RESULT	DUPLICATE RESULT	LR RPD	SPK RESULT	STD-SPK RECOVERY
12020511 003	300.0	CHLORIDE	317049	02/21/2012 02:46	LR		37.700	37.900	0.37		
12020554 004	300.0	CHLORIDE	317160	02/21/2012 07:06	LR		106.000	106.000	0.00		
12020596 002	300.0	CHLORIDE	317240	02/21/2012 11:26	LR		5.400	5.360	0.53		
12020610 001	300.0	CHLORIDE	317280	02/21/2012 16:43	LR		19.400	19.400	0.00		
12020623 002	300.0	CHLORIDE	317304	02/21/2012 21:03	LR		173.000	171.000	0.82		
	300.0	CHLORIDE		02/21/2012 01:50	MB	0.00	0.353				
12020510 02B	300.0	CHLORIDE	317046	02/21/2012 00:54	SPK	90.00	92.300			174.000	90.8
12020515 001	300.0	CHLORIDE	317056	02/21/2012 04:00	SPK	90.00	202.000			286.000	93.3
12020562 01b	300.0	CHLORIDE	317178	02/21/2012 07:43	SPK	90.00	49.000			148.000	110.0
12020596 003	300.0	CHLORIDE	317241	02/21/2012 12:22	SPK	90.00	56.900			154.000	107.9
12020621 003	300.0	CHLORIDE	317295	02/21/2012 18:15	SPK	45.00	0.000			45.300	100.7
12020623 003	300.0	CHLORIDE	317305	02/21/2012 21:40	SPK	90.00	203.000			302.000	110.0
	300.0	CHLORIDE		02/21/2012 02:08	STD	100.00	101.000				101.0
	300.0	CHLORIDE		02/21/2012 06:29	STD	100.00	102.000				102.0
	300.0	CHLORIDE		02/21/2012 10:49	STD	100.00	103.000				103.0
	300.0	CHLORIDE		02/21/2012 16:05	STD	100.00	102.000				102.0
	300.0	CHLORIDE		02/21/2012 20:25	STD	100.00	103.000				103.0
12020554 001	SM2540C	TOTAL DISSOLVED SOLIDS	317157	02/19/2012 13:15	LR		360.000	368.000	1.55		
12020688 001	SM2540C	TOTAL DISSOLVED SOLIDS	317249	02/19/2012 13:15	LR		5572.000	5652.000	1.01		
	SM2540C	TOTAL DISSOLVED SOLIDS		02/19/2012 13:15	MB	0.00	0.000				
	SM2540C	TOTAL DISSOLVED SOLIDS		02/19/2012 13:15	STD	300.00	288.000				96.0
	SM2540C	TOTAL DISSOLVED SOLIDS		02/19/2012 13:15	STD	300.00	312.000				104.0

QC FLAGS: MB or BLK = METHOD BLANK LR = LAB REPLICATE MSD = MATRIX SPIKE DUPLICATE STD or LCS = STANDARD SPK or MS = MATRIX SPIKE

BENCHMARK
EnviroAnalytical Inc.

NELAC Certification # E84167

ANALYTICAL TEST REPORT
THESE RESULTS MEET NELAC STANDARDS

Submission Number : 12020517

Cardno Entrix
1388 Colonial Blvd.
Fort Myers, Fl 33907

Project Name : USEPPA EX-1
Date Received : 02/14/2012
Time Received : 1455

Submission Number 12020517

Sample Number: 001
Sample Date: 02/13/2012
Sample Time: 1330
Sample Description: 170'-180' Useppa Ex-1
Sample Method: Grab

Parameter	Result	Units	MDL	PQL	Procedure	Analysis Date	Analysis Time	Analyst
CHLORIDE	2631	MG/L	0.353	1.412	300.0	02/21/2012	04:18	CB
TOTAL DISSOLVED SOLIDS	4888	MG/L	7.26	29.04	SM2540C	02/15/2012	10:13	RW/DM

BENCHMARK
EnviroAnalytical Inc.

NELAC Certification # E84167

02/23/2012

Dale D. Dixon / Laboratory Director — Date

Tülay Tanrisever/ Jennifer Jordan - QC Officers

Robert L. Sullivan / Laboratory Manager

DATA QUALIFIERS THAT MAY APPLY:

A = Value reported is an average of two or more determinations.

B = Results based upon colony counts outside the ideal range.

H = Value based on field kit determination. Results may not be accurate.

I = Reported value is between the laboratory MDL and the PQL.

J = Estimated value.

J1 = Est. value surrogate recovery limits exceeded.

J2 = Est. value. No quality control criteria exists for component.

J3 = Est. value quality control criteria for precision or accuracy not met.

J4 = Est. value. Sample matrix interference suspected.

J5 = Est. value. Data questionable due to improper lab or field protocols

K = Off-scale low. Value is known to be < the value reported.

L = Off-scale high. Value is known to be > the value reported

N = Presumptive evidence of presence of material.

O = Sampled, but analysis lost or not performed.

Q = Sample held beyond accepted hold time.

T = Value reported is < MDL. Reported for informational purposes only and shall not be used in statistical analysis.

U = Analyte analyzed but not detected at the value indicated.

V = Analyte detected in sample and method blank.Results for this analyte in associated samples may be biased high. Standard , Duplicate and Spike values are within control limits. Reported data are usable

Y = Analysis performed on an improperly preserved sample. Data may be inaccurate.

Z = Too many colonies were present (TNTC). The numeric value represents the filtration volume.

! = Data deviate from historically established concentration ranges.

? = Data rejected and should not be used. Some or all of QC data were outside criteria, and the Presence or absence of the analyte cannot be determined from the data.

* = Not reported due to interference.

NOTES:

NOTES:

PQL = 4xMDL.

MBAS calculated as LAS; molecular weight = 348.

X = Value exceed MCL.

For questions and comments regarding these results, please contact Bettina Beilfuss at (941) 723-9986

Results relate only to the samples.

Benchmark EnviroAnalytical,Inc	**Client Information:**	**Cardno Entrix** (CAR ENT)
1711 12th Street East Palmetto, Fl 34221 941-723-9986 941-723-6061 Fax www.benchmarkea.com		1388 Colonial Blvd. Ft. Myers Fl 33907 239-829-7013 (Office) 239-246-1972 (Cell) andrew.mcthenia@cardno.com

Project Name: Useppa EX-1	Laboratory Submission #	12021517

Sample Name	Sample Type[1]	Sample Matrix[2]	Parameters, Preservation[4], Container Type[3] TDS (SM2540C) Cl (300.0) Plain 1 x ½ Pint Plastic	Laboratory Sample #
⑨ 170'-180' Useppa EX-1	G	GW	Date & Time: 02/13/12 13:30	
	G	GW	Date & Time:	
	G	GW	Date & Time:	
	G	GW	Date & Time:	
	G	GW	Date & Time:	
	G	GW	Date & Time:	
	G	GW	Date & Time:	

1 "Sample Type" is used to indicate whether the sample was a grab (G) or whether it was a composite (C).
2 "Sample Matrix" is used to indicate whether the sample is being discharged to drinking water (DW), groundwater (GW), surface water (SW), soil, sediment (SDMNT), or sludge (SLDG).
3 "Container Type" is used to indicate whether the container is plastic (P) or glass (G).
4 **Sample must be refrigerated or stored in wet ice after collection. The temperature during storage should be less than or equal to 6°C (42.8°F).**
Under "Preservative," list any preservatives that were added to the sample container.

Instructions:
1. Each bottle has a label identifying sample ID, premeasured preservative contained in the bottle, sample type, client ID, and parameters for analysis.
2. The following information should be added to each bottle label after collection with permanent black ink: date and time of collection, sampler's name or initials, and any field number or ID.
3. All bottles not containing preservative may be rinsed with appropriate sample prior to collection.
4. The client is responsible for documentation of the sampling event. Please note special sampling events on the sample custody form.

Laboratory Sample Acceptability: pH <2 : /
BEA Temperature: 3.1°C

1	Collected By: Andrew McThenia	Date 02/13/12	Time 16:15	Received By: Melinda Merchant	Date 2/13/12	Time 1615
2	Relinquished By: Melinda Merchant	Date 2/14/12	Time 1215	Received By: Wayne Ver Steeg	Date 2-14-12	Time 1215
3	Relinquished By: Wayne Ver Steeg	Date 2-14-12	Time 1455	Received By: J. Hall	Date 2.14.12	Time 1455

3 of 3

BENCHMARK

EnviroAnalytical, Inc.

NELAC CERTIFICATION #E84167

QC REPORT

Submission Number: 12020517

Project Name: USEPPA EX-1

SUBMISSION	METHOD	ANALYTE	LAB SAMPLE	ANALYSIS DATE	QC FLAG	QC VALUE	SAMPLE RESULT	DUPLICATE RESULT	LR RPD	SPK RESULT	STD-SPK RECOVERY
12020511 003	300.0	CHLORIDE	317049	02/21/2012 02:46	LR		37.700	37.900	0.37		
12020554 004	300.0	CHLORIDE	317160	02/21/2012 07:06	LR		106.000	106.000	0.00		
12020596 002	300.0	CHLORIDE	317240	02/21/2012 11:26	LR		5.400	5.360	0.53		
12020610 001	300.0	CHLORIDE	317280	02/21/2012 16:43	LR		19.400	19.400	0.00		
12020623 002	300.0	CHLORIDE	317304	02/21/2012 21:03	LR		173.000	171.000	0.82		
	300.0	CHLORIDE		02/21/2012 01:50	MB	0.00	0.353				
12020510 02B	300.0	CHLORIDE	317046	02/21/2012 00:54	SPK	90.00	92.300			174.000	90.8
12020515 001	300.0	CHLORIDE	317056	02/21/2012 04:00	SPK	90.00	202.000			286.000	93.3
12020562 01b	300.0	CHLORIDE	317178	02/21/2012 07:43	SPK	90.00	49.000			148.000	110.0
12020596 003	300.0	CHLORIDE	317241	02/21/2012 12:22	SPK	90.00	56.900			154.000	107.9
12020621 003	300.0	CHLORIDE	317295	02/21/2012 18:15	SPK	45.00	0.000			45.300	100.7
12020623 003	300.0	CHLORIDE	317305	02/21/2012 21:40	SPK	90.00	203.000			302.000	110.0
	300.0	CHLORIDE		02/21/2012 02:08	STD	100.00	101.000				101.0
	300.0	CHLORIDE		02/21/2012 06:29	STD	100.00	102.000				102.0
	300.0	CHLORIDE		02/21/2012 10:49	STD	100.00	103.000				103.0
	300.0	CHLORIDE		02/21/2012 16:05	STD	100.00	102.000				102.0
	300.0	CHLORIDE		02/21/2012 20:25	STD	100.00	103.000				103.0
12020509 01B	SM2540C	TOTAL DISSOLVED SOLIDS	317042	02/15/2012 10:07	LR		2104.000	2156.000	1.73		
12020510 01B	SM2540C	TOTAL DISSOLVED SOLIDS	317044	02/15/2012 10:08	LR		2336.000	2308.000	0.85		
12020510 02B	SM2540C	TOTAL DISSOLVED SOLIDS	317046	02/15/2012 10:09	LR		612.000	620.000	0.92		
	SM2540C	TOTAL DISSOLVED SOLIDS	100	02/15/2012 10:06	MB	99.99	-8.000				
	SM2540C	TOTAL DISSOLVED SOLIDS		02/15/2012 10:06	STD	300.00	328.000				109.3

QC FLAGS: MB or BLK = METHOD BLANK LR = LAB REPLICATE MSD = MATRIX SPIKE DUPLICATE STD or LCS = STANDARD SPK or MS = MATRIX SPIKE

SUBMISSION	METHOD	ANALYTE	LAB SAMPLE	ANALYSIS DATE	QC FLAG	QC VALUE	SAMPLE RESULT	DUPLICATE RESULT	LR RPD	SPK RESULT	STD-SPK RECOVERY
	SM2540C	TOTAL DISSOLVED SOLIDS		02/15/2012 10:08	STD	300.00	300.000				100.0
	SM2540C	TOTAL DISSOLVED SOLIDS		02/15/2012 10:18	STD	300.00	300.000				100.0

NOTES:

QC FLAGS: MB or BLK = METHOD BLANK LR = LAB REPLICATE MSD = MATRIX SPIKE DUPLICATE STD or LCS = STANDARD SPK or MS = MATRIX SPIKE

BENCHMARK
EnviroAnalytical Inc.

NELAC Certification # E84167

ANALYTICAL TEST REPORT
THESE RESULTS MEET NELAC STANDARDS

Submission Number : 12020722

Cardno Entrix
1388 Colonial Blvd.
Fort Myers, Fl 33907

Project Name : USEPPA EX-1
Date Received : 02/18/2012
Time Received : 1130

Submission Number 12020722

Sample Number: 001
Sample Date: 02/17/2012
Sample Time: 1330
Sample Description: 50'-60' Zone Useppa Ex-1
Sample Method: Grab

Parameter	Result	Units	MDL	PQL	Procedure	Analysis Date	Analysis Time	Analyst
TOTAL ORGANIC CARBON	17.1	MG/L	0.271	1.084	SM5310B	02/20/2012	13:09	KD

BENCHMARK
EnviroAnalytical Inc.

NELAC Certification # E84167

02/22/2012

Dale D. Dixon / Laboratory Director — Date

Tülay Tanrisever/ Jennifer Jordan - QC Officers

Robert L. Sullivan / Laboratory Manager

DATA QUALIFIERS THAT MAY APPLY:

A = Value reported is an average of two or more determinations.

B = Results based upon colony counts outside the ideal range.

H = Value based on field kit determination. Results may not be accurate.

I = Reported value is between the laboratory MDL and the PQL.

J = Estimated value.

J1 = Est. value surrogate recovery limits exceeded.

J2 = Est. value. No quality control criteria exists for component.

J3 = Est. value quality control criteria for precision or accuracy not met.

J4 = Est. value. Sample matrix interference suspected.

J5 = Est. value. Data questionable due to improper lab or field protocols

K = Off-scale low. Value is known to be < the value reported.

L = Off-scale high. Value is known to be > the value reported

N = Presumptive evidence of presence of material.

O = Sampled, but analysis lost or not performed.

Q = Sample held beyond accepted hold time.

T = Value reported is < MDL. Reported for informational purposes only and shall not be used in statistical analysis.

U = Analyte analyzed but not detected at the value indicated.

V = Analyte detected in sample and method blank.Results for this analyte in associated samples may be biased high. Standard , Duplicate and Spike values are within control limits. Reported data are usable

Y = Analysis performed on an improperly preserved sample. Data may be inaccurate.

Z = Too many colonies were present (TNTC). The numeric value represents the filtration volume.

! = Data deviate from historically established concentration ranges.

? = Data rejected and should not be used. Some or all of QC data were outside criteria, and the Presence or absence of the analyte cannot be determined from the data.

* = Not reported due to interference.

NOTES:

PQL = 4xMDL.

MBAS calculated as LAS; molecular weight = 348.

X = Value exceed MCL.

NOTES:

For questions and comments regarding these results, please contact Bettina Beilfuss at (941) 723-9986

Results relate only to the samples.

Benchmark EnviroAnalytical,Inc	**Client Information:**	**Cardno Entrix** (CAR ENT)
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Project Name: Useppa EX-1	Laboratory Submission #	1202072 2

Sample Name	Sample Type[1]	Sample Matrix[2]	Parameters, Preservation[4], Container Type[3] TOC 1:1 HCl 40 mL glass Vial	Laboratory Sample #
50'-60' Zone Useppa EX-1	G	GW	Date & Time: 02/17/12 13:30	
	G	GW	Date & Time:	
	G	GW	Date & Time:	
	G	GW	Date & Time:	
	G	GW	Date & Time:	
	G	GW	Date & Time:	
	G	GW	Date & Time:	

1 "Sample Type" is used to indicate whether the sample was a grab (G) or whether it was a composite (C).
2 "Sample Matrix" is used to indicate whether the sample is being discharged to drinking water (DW), groundwater (GW), surface water (SW), soil, sediment (SDMNT), or sludge (SLDG).
3 "Container Type" is used to indicate whether the container is plastic (P) or glass (G).
4 **Sample must be refrigerated or stored in wet ice after collection. The temperature during storage should be less than or equal to 6°C (42.8°F).**
Under "Preservative," list any preservatives that were added to the sample container.

Instructions:
1. Each bottle has a label identifying sample ID, premeasured preservative contained in the bottle, sample type, client ID, and parameters for analysis.
2. The following information should be added to each bottle label after collection with permanent black ink: date and time of collection, sampler's name or initials, and any field number or ID.
3. All bottles not containing preservative may be rinsed with appropriate sample prior to collection.
4. The client is responsible for documentation of the sampling event. Please note special sampling events on the sample custody form.

Laboratory Sample Acceptability: pH <2 : ☐
BEA Temperature: 1.2°C

1	Collected By: Andrew McThenia	Date 02/17/12	Time 15:00	Received By: Melinda Merchant	Date 2/17/12	Time 1600
2	Relinquished By: Melinda Merchant	Date	Time	Received By: Samantha DeBusk	Date 2/18/12	Time 1130
3	Relinquished By:	Date	Time	Received By:	Date	Time

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BENCHMARK

EnviroAnalytical, Inc.

NELAC CERTIFICATION #E84167

QC REPORT

Submission Number: 12020722

Project Name: USEPPA EX-1

SUBMISSION	METHOD	ANALYTE	LAB SAMPLE	ANALYSIS DATE	QC FLAG	QC VALUE	SAMPLE RESULT	DUPLICATE RESULT	LR %RSD	SPK RESULT	STD-SPK RECOVERY
12020587 002	SM5310B	TOTAL ORGANIC CARBON	317211	02/20/2012 14:06	LR		4.197	4.204	0.12		
	SM5310B	TOTAL ORGANIC CARBON		02/20/2012 12:04	MB	0.00	-0.138				
12020587 001	SM5310B	TOTAL ORGANIC CARBON	317210	02/20/2012 13:41	MS	10.00	4.426			15.560	111.3
12020646 002	SM5310B	TOTAL ORGANIC CARBON		02/20/2012 22:10	MS	10.00	7.238			16.760	95.2
	SM5310B	TOTAL ORGANIC CARBON		02/20/2012 12:38	PQL	1.00	0.788				78.8
	SM5310B	TOTAL ORGANIC CARBON		02/20/2012 12:54	STD	25.00	25.210				100.8
	SM5310B	TOTAL ORGANIC CARBON		02/20/2012 16:45	STD	25.00	25.260				101.0
	SM5310B	TOTAL ORGANIC CARBON		02/20/2012 19:44	STD	25.00	25.390				101.6
	SM5310B	TOTAL ORGANIC CARBON		02/20/2012 23:18	STD	25.00	23.270				93.1

NOTES:

Appendix F

Final Geophysical Logs

RMBAKER LLC
Geology and Geophysics

WELL ID: USEPPA EX-1
LOG STAGE: EXPLORATORY

8600 Oldbridge Lane
Orlando, FL 32819
mobile ph 407-733-8958
fax 407-370-4129

rob@rmbaker.com
www.rmbaker.com

TYPES OF LOGS:
CALIPER
NATURAL GAMMA

Licensed and Insured

CO: RMBAKER LLC
WELL: USEPPA EX-1
FLD: USEPPA ISLAND
CTY: LEE
STE: FLORIDA

COMPANY: RMBAKER LLC
COLLAR/WELL ID: USEPPA EX-1
FIELD: USEPPA ISLAND
COUNTRY: USA STATE: FLORIDA

LOCATION:

NOTES1:

SEC TWP RGE

ALL SERVICES:
CALIPER
NATURAL GAMMA
DUAL INDUCTION
FLUID CONDUCTIVITY
FLUID TEMPERATURE
SONIC

PERMANENT DATUM: ELEVATION:

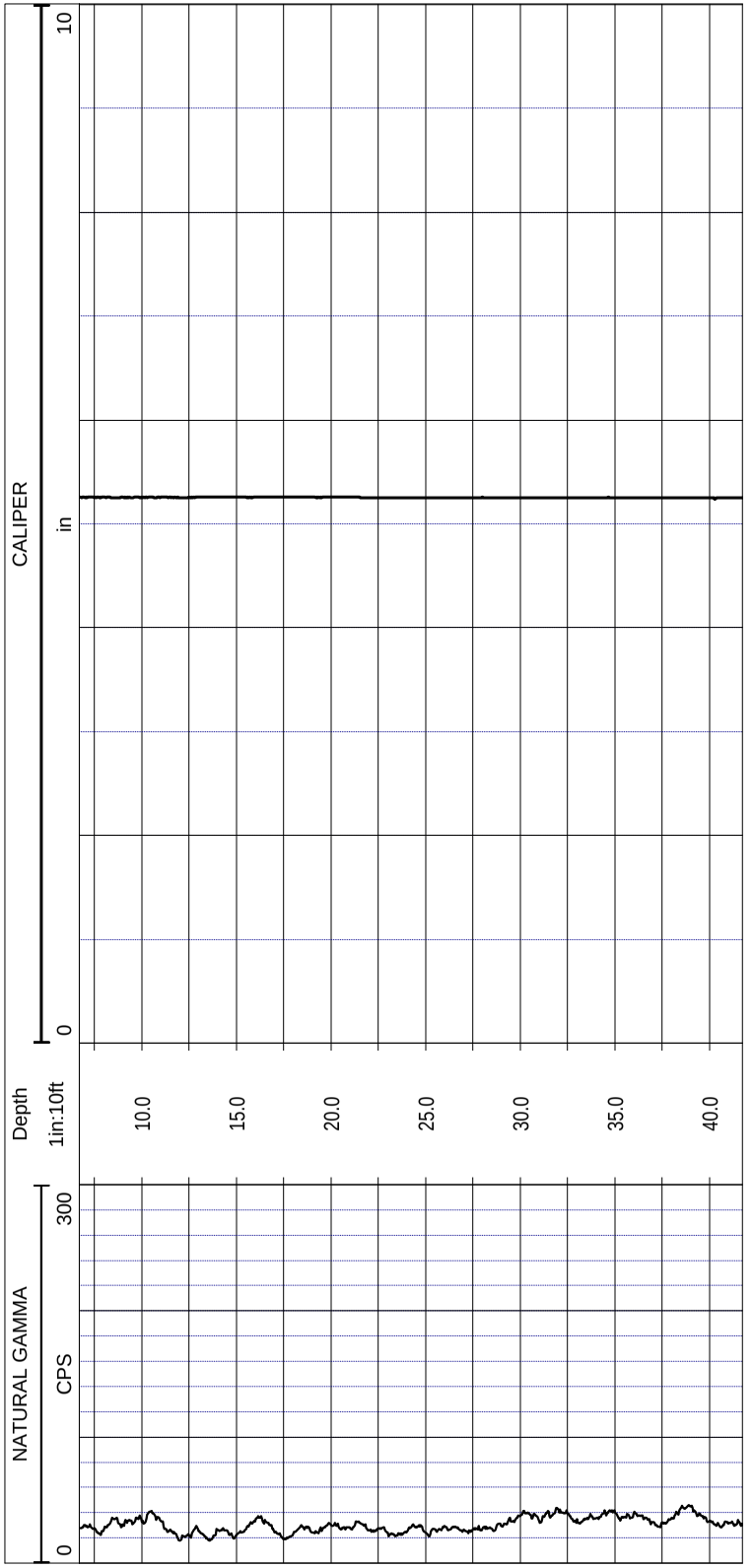
LOG MEAS. FROM: GROUND SURFACE

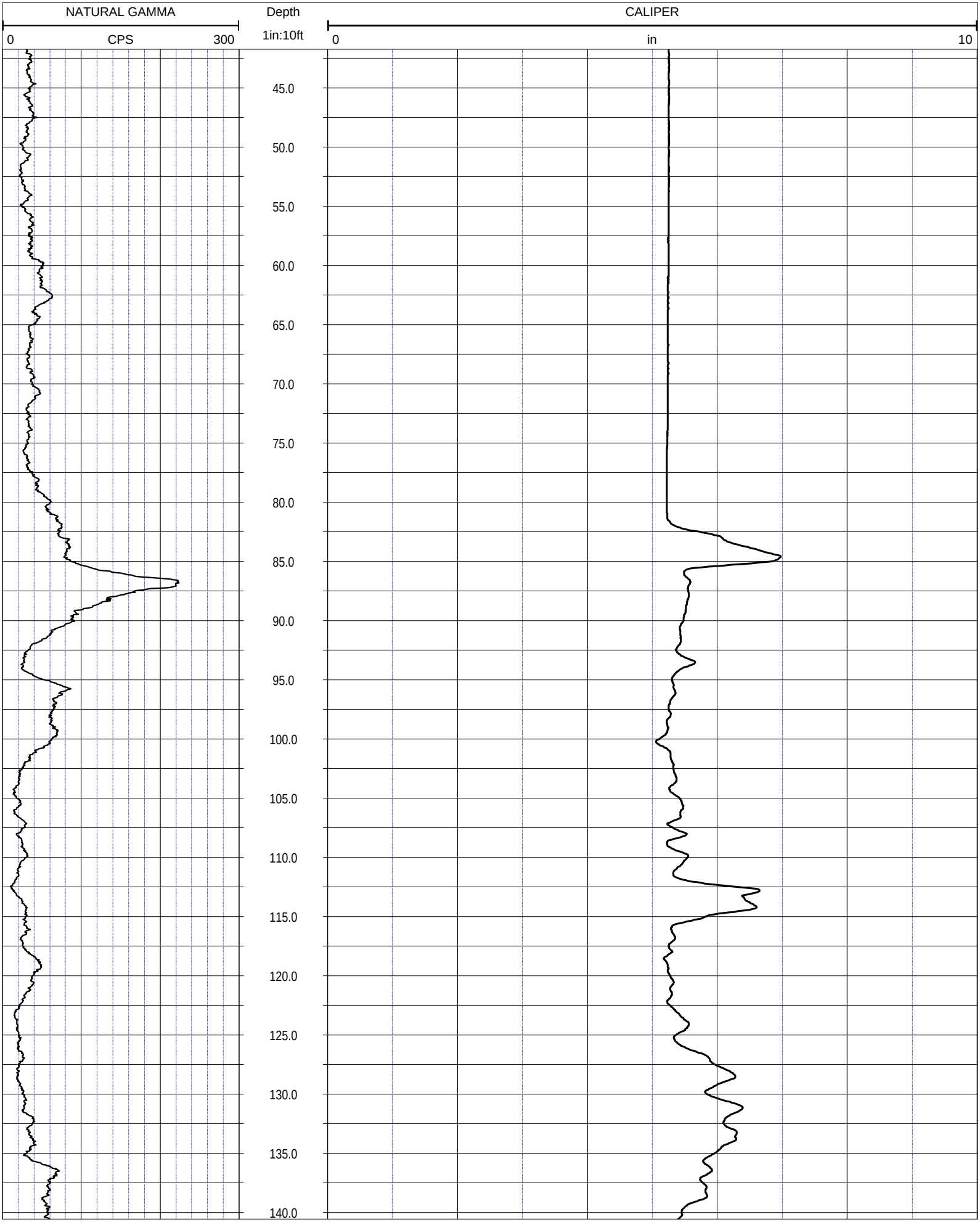
DRILLING MEAS. FROM:

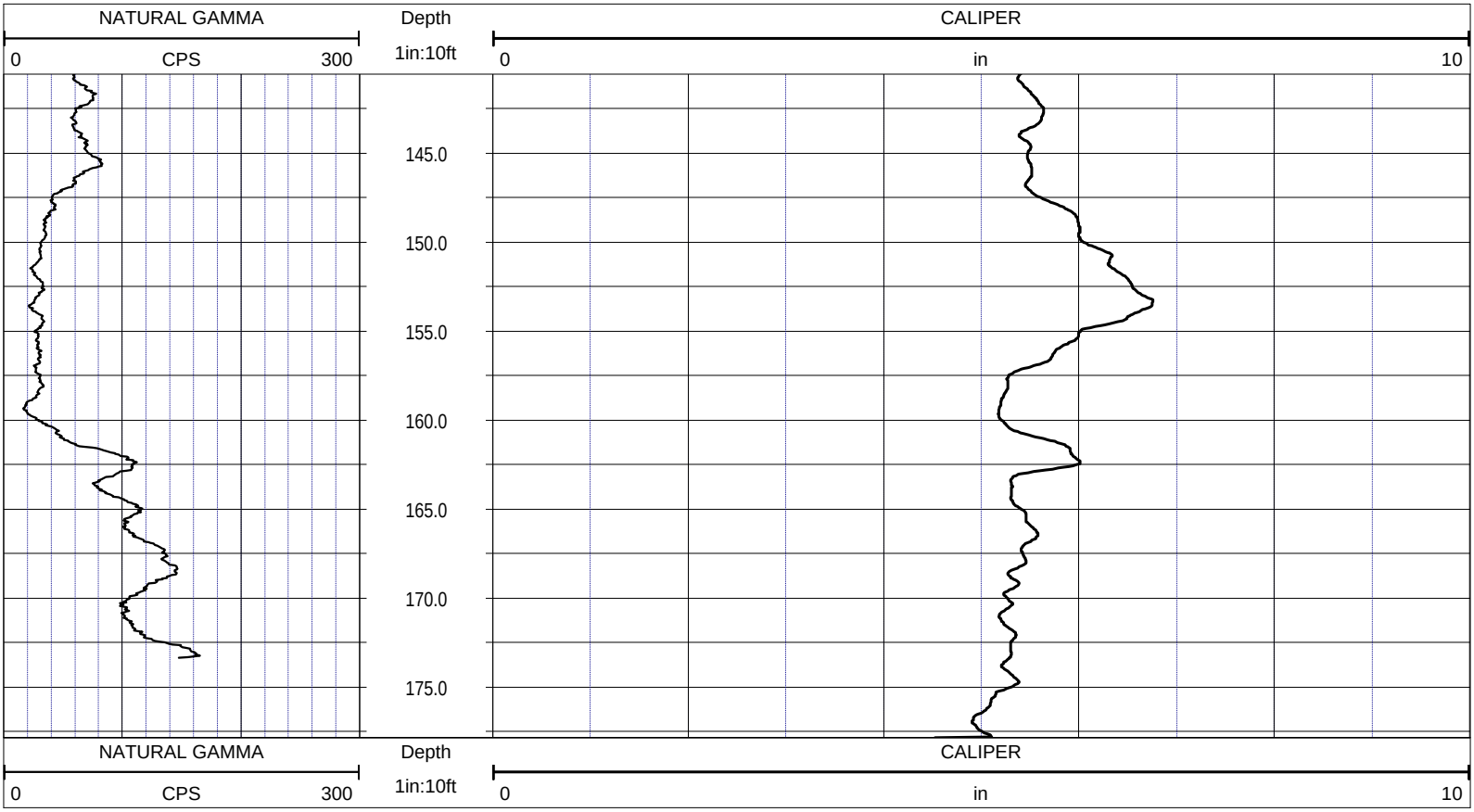
COORDINATES:

DATE	2-15-12	TYPE FLUID IN HOLE	WATER
RUN No	1	SALINITY	
TYPE LOG	CALIPER	DENSITY	
DEPTH-DRILLER	181	LEVEL	
DEPTH-LOGGER	180.7	MAX. REC. TEMP.	
BTM LOGGED INTERVAL		LOGGING SPEED (FT/MIN)	20
TOP LOGGED INTERVAL		TROLLING DIRECTION	UP
DRILLER	DCWD	PUMPING RATE (GPM)	
RECORDED BY	RMB		
WITNESSED BY	AM		

RUN	BOREHOLE RECORD			CASING RECORD			
NO.	BIT	FROM	TO	SIZE	WGT.	FROM	TO
1	4.875	81	181	5	PVC	0	81




NATURAL GAMMA
0
CPS
300
Depth
1in:10ft
45.0
50.0
55.0
60.0
65.0
70.0
75.0
80.0
85.0
90.0
95.0
100.0
105.0
110.0
115.0
120.0
125.0
130.0
135.0
140.0
CALIPER
0
in
10



NOTES:
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Certificate of Authorization GB 458

END OF LOG

RMBAKER LLC
Geology and Geophysics

WELL ID: USEPPA EX-1
LOG STAGE: EXPLORATORY

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fax 407-370-4129

rob@rmbaker.com
www.rmbaker.com

Licensed and Insured

TYPES OF LOGS:
DUAL INDUCTION
NATURAL GAMMA

CO: RMBAKER LLC
WELL: USEPPA EX-1
FLD: USEPPA ISLAND
CTY: LEE
STE: FLORIDA

COMPANY: RMBAKER LLC
COLLAR/WELL ID: USEPPA EX-1
FIELD: USEPPA ISLAND
COUNTRY: USA STATE: FLORIDA

LOCATION:

NOTES1:
METALLIC HOSE CLAMP AT END OF CASING AT 81 FEET

SEC TWP RGE

ALL SERVICES:
CALIPER
NATURAL GAMMA
DUAL INDUCTION
FLUID CONDUCTIVITY
FLUID TEMPERATURE
SONIC

PERMANENT DATUM: ELEVATION:

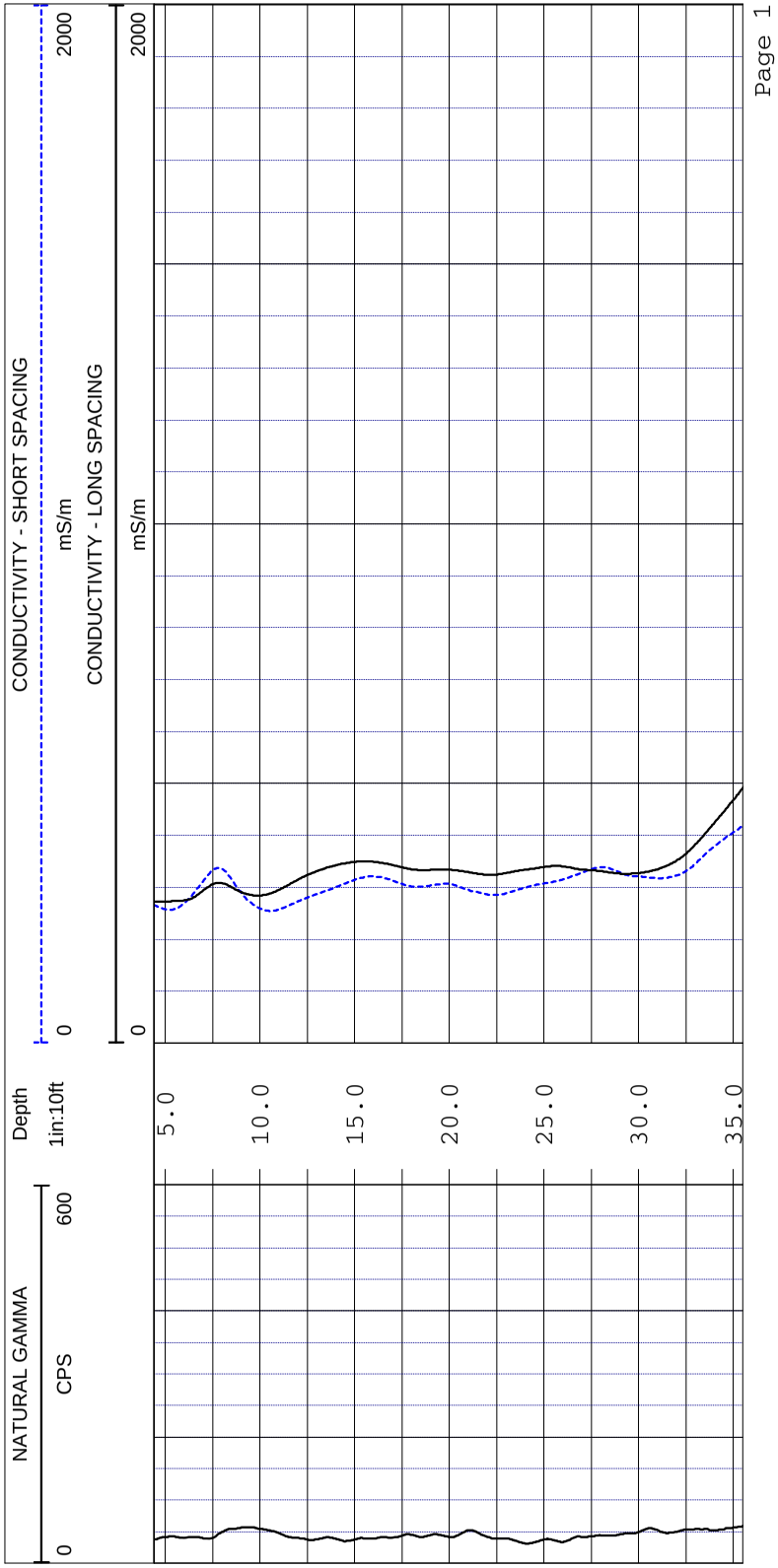
LOG MEAS. FROM: GROUND SURFACE

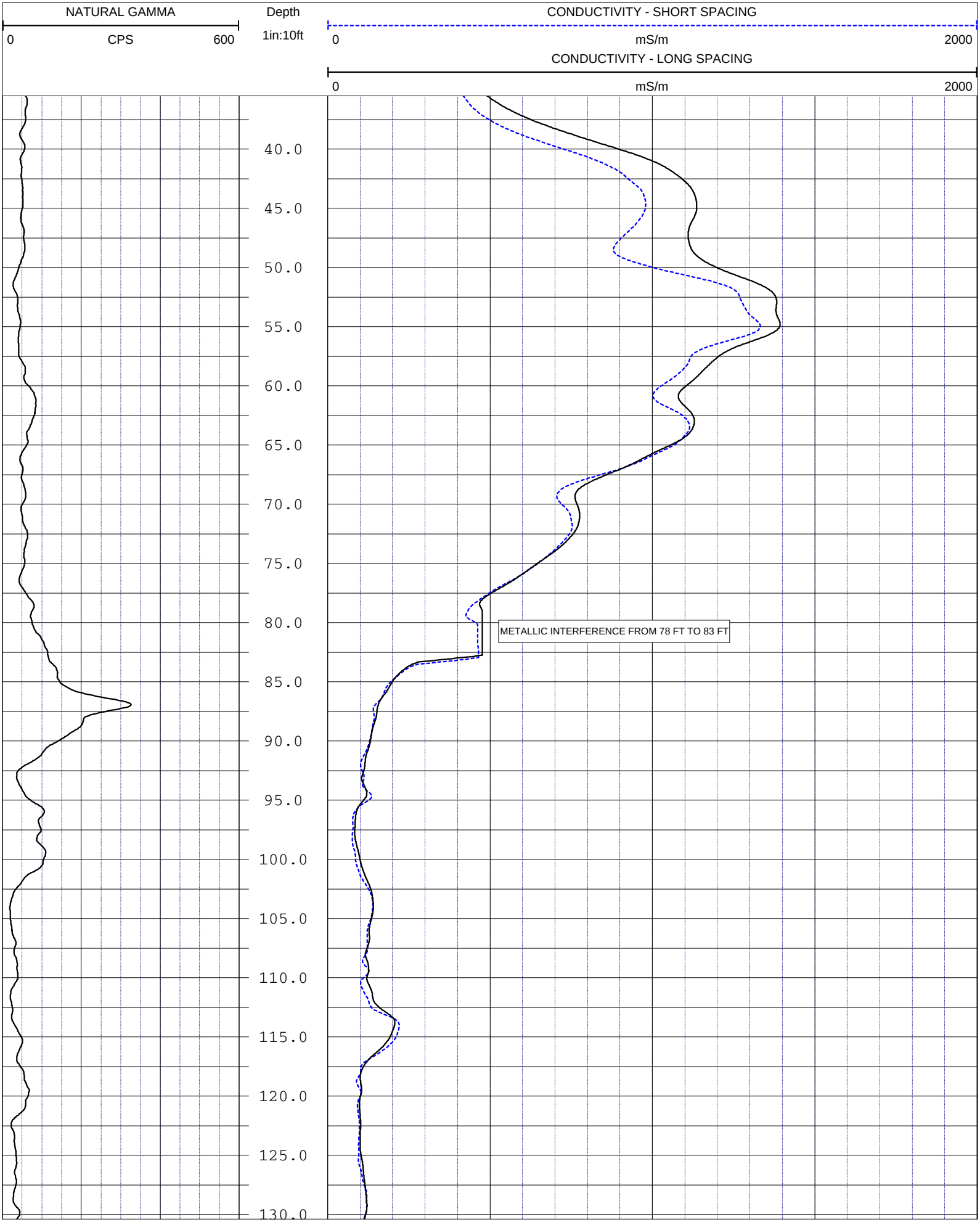
DRILLING MEAS. FROM:

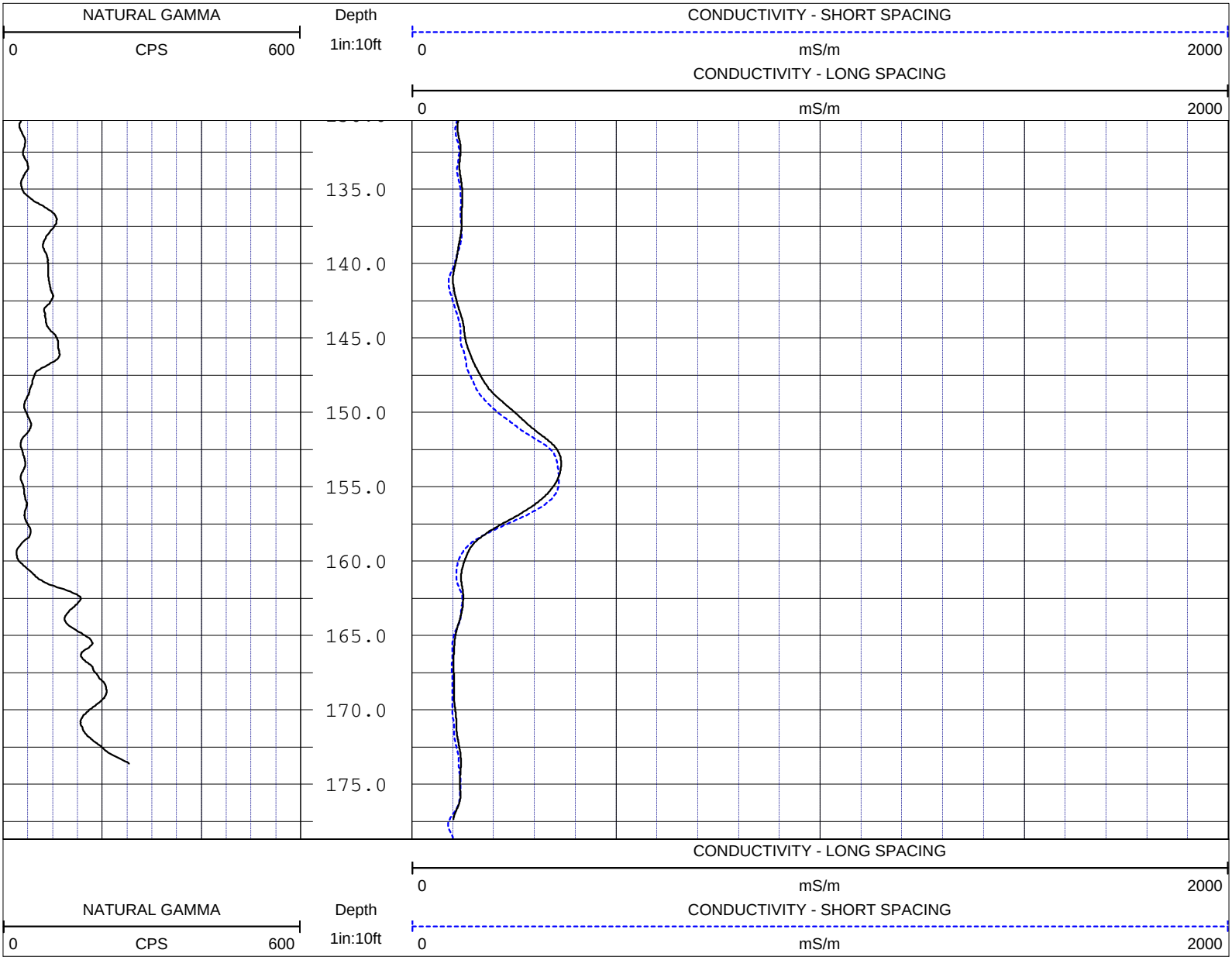
COORDINATES:

DATE	2-15-12	TYPE FLUID IN HOLE	WATER
RUN No	1	SALINITY	
TYPE LOG	DUAL INDUCTION	DENSITY	
DEPTH-DRILLER	181	LEVEL	
DEPTH-LOGGER	180.7	MAX. REC. TEMP.	
BTM LOGGED INTERVAL		LOGGING SPEED (FT/MIN)	20
TOP LOGGED INTERVAL		TROLLING DIRECTION	UP
DRILLER	DCWD	PUMPING RATE (GPM)	
RECORDED BY	RMB		
WITNESSED BY	AM		

RUN	BOREHOLE RECORD			CASING RECORD			
NO.	BIT	FROM	TO	SIZE	WGT.	FROM	TO
1	4.875	81	181	5	PVC	0	81




NATURAL GAMMA
0
CPS
600
Depth
1in:10ft
CONDUCTIVITY - SHORT SPACING
0
mS/m
2000
CONDUCTIVITY - LONG SPACING
0
mS/m
2000
40.0
45.0
50.0
55.0
60.0
65.0
70.0
75.0
80.0
85.0
90.0
95.0
100.0
105.0
110.0
115.0
120.0
125.0
130.0
METALLIC INTERFERENCE FROM 78 FT TO 83 FT



NOTES:
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Certificate of Authorization GB 458

END OF LOG

RMBAKER LLC
Geology and Geophysics

WELL ID: USEPPA EX-1
LOG STAGE: EXPLORATORY

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mobile ph 407-733-8958
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rob@rmbaker.com
www.rmbaker.com

Licensed and Insured

TYPES OF LOGS:
FLUID CONDUCTIVITY
FLUID TEMPERATURE

CO: RMBAKER LLC
WELL: USEPPA EX-1
FLD: USEPPA ISLAND
CTY: LEE
STE: FLORIDA

COMPANY: RMBAKER LLC
COLLAR/WELL ID: USEPPA EX-1
FIELD: USEPPA ISLAND
COUNTRY: USA STATE: FLORIDA

LOCATION:

NOTES1:

SEC TWP RGE

ALL SERVICES:
CALIPER
NATURAL GAMMA
DUAL INDUCTION
FLUID CONDUCTIVITY
FLUID TEMPERATURE
SONIC

PERMANENT DATUM: ELEVATION:

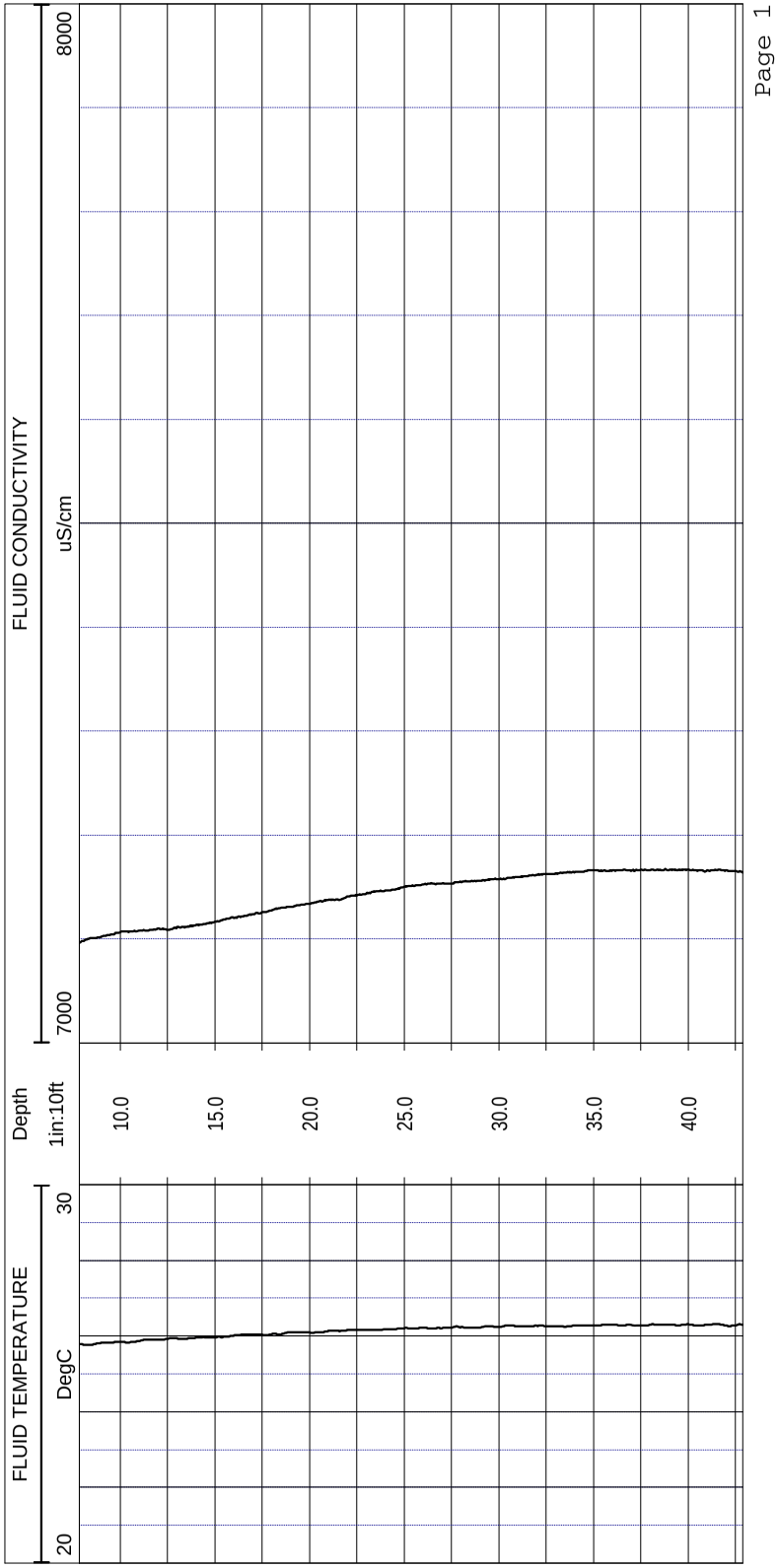
LOG MEAS. FROM: GROUND SURFACE

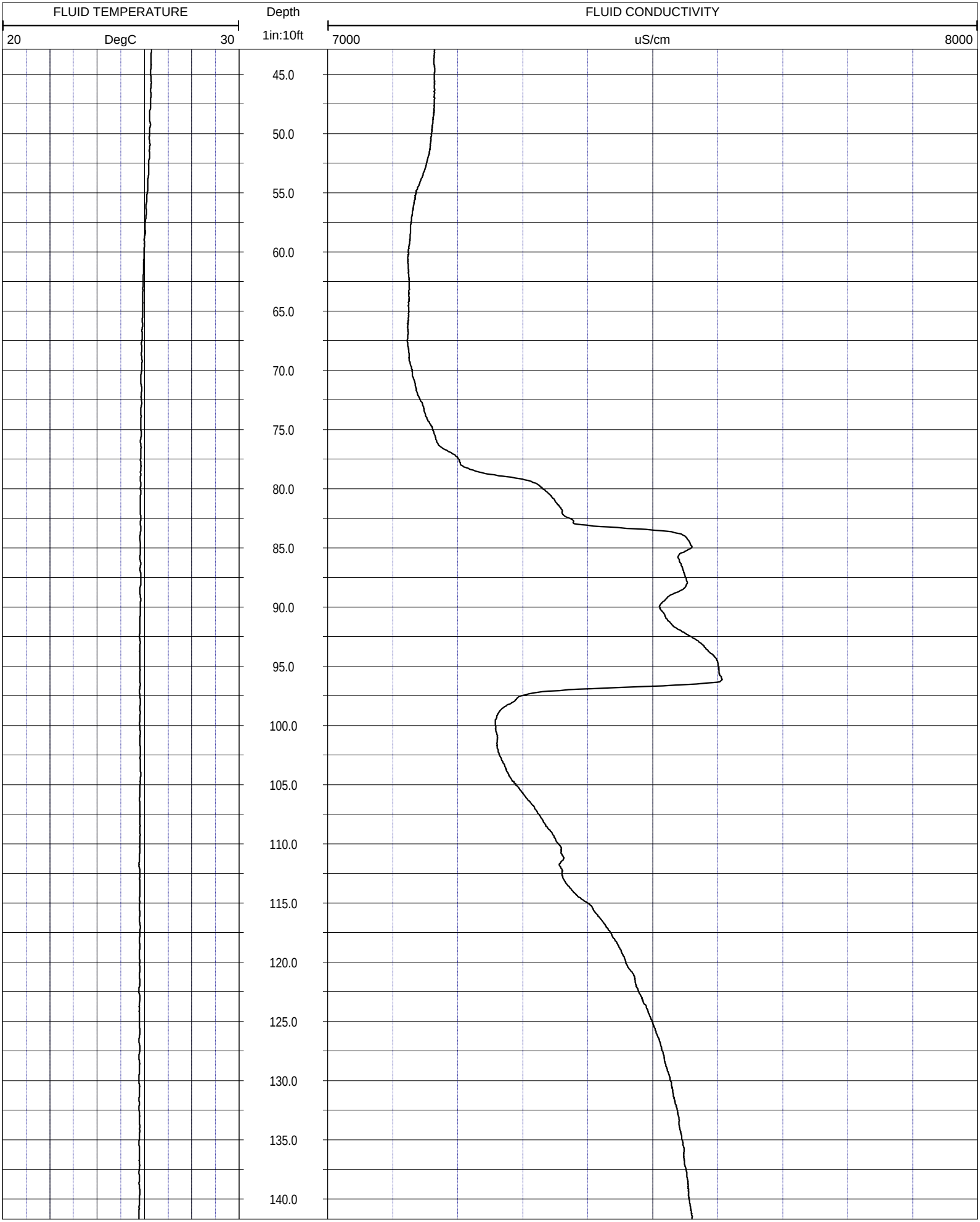
DRILLING MEAS. FROM:

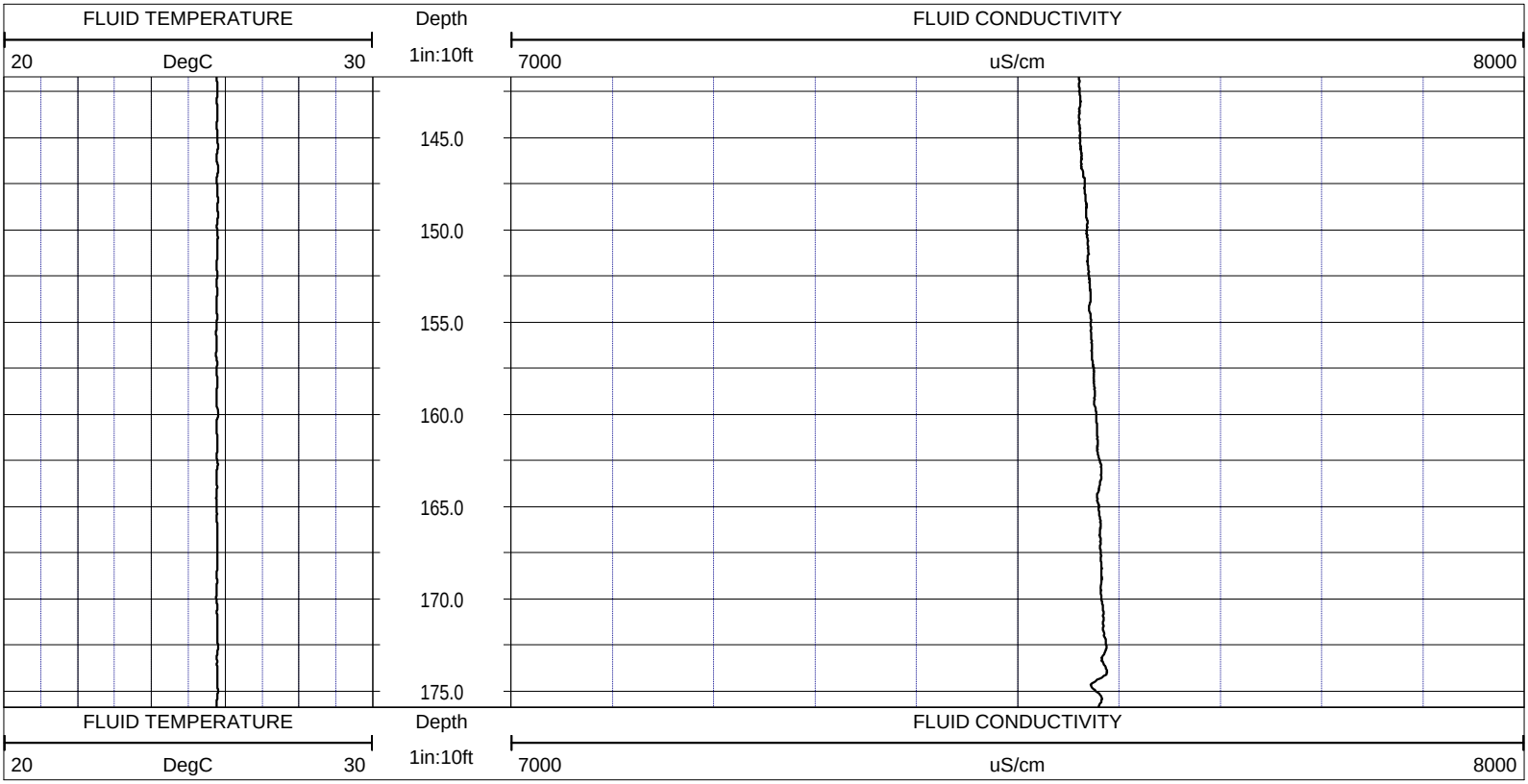
COORDINATES:

DATE	2-15-12	TYPE FLUID IN HOLE	WATER
RUN No	1	SALINITY	
TYPE LOG	FLUID TEMP & COND	DENSITY	
DEPTH-DRILLER	181	LEVEL	
DEPTH-LOGGER	180.7	MAX. REC. TEMP.	
BTM LOGGED INTERVAL		LOGGING SPEED (FT/MIN)	20
TOP LOGGED INTERVAL		TROLLING DIRECTION	DOWN
DRILLER	DCWD	PUMPING RATE (GPM)	
RECORDED BY	RMB		
WITNESSED BY	AM		

RUN	BOREHOLE RECORD			CASING RECORD			
NO.	BIT	FROM	TO	SIZE	WGT.	FROM	TO
1	4.875	81	181	5	PVC	0	81




FLUID TEMPERATURE
20
DegC
30
Depth
1in:10ft
45.0
50.0
55.0
60.0
65.0
70.0
75.0
80.0
85.0
90.0
95.0
100.0
105.0
110.0
115.0
120.0
125.0
130.0
135.0
140.0
FLUID CONDUCTIVITY
7000
uS/cm
8000



NOTES:
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END OF LOG

RMBAKER LLC
Geology and Geophysics

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LOG STAGE: EXPLORATORY

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Licensed and Insured

TYPES OF LOGS:
INTERVAL VELOCITY
NEAR RECEIVER VDL - RX3
FAR RECEIVER VDL - RX5

CO: RMBAKER LLC
WELL: USEPPA EX-1
FLD: USEPPA ISLAND
CTY: LEE
STE: FLORIDA

COMPANY: RMBAKER LLC
COLLAR/WELL ID: USEPPA EX-1
FIELD: USEPPA ISLAND
COUNTRY: USA STATE: FLORIDA

LOCATION:

NOTES1:

SEC TWP RGE

ALL SERVICES:
CALIPER
NATURAL GAMMA
DUAL INDUCTION
FLUID CONDUCTIVITY
FLUID TEMPERATURE
SONIC

PERMANENT DATUM: ELEVATION:

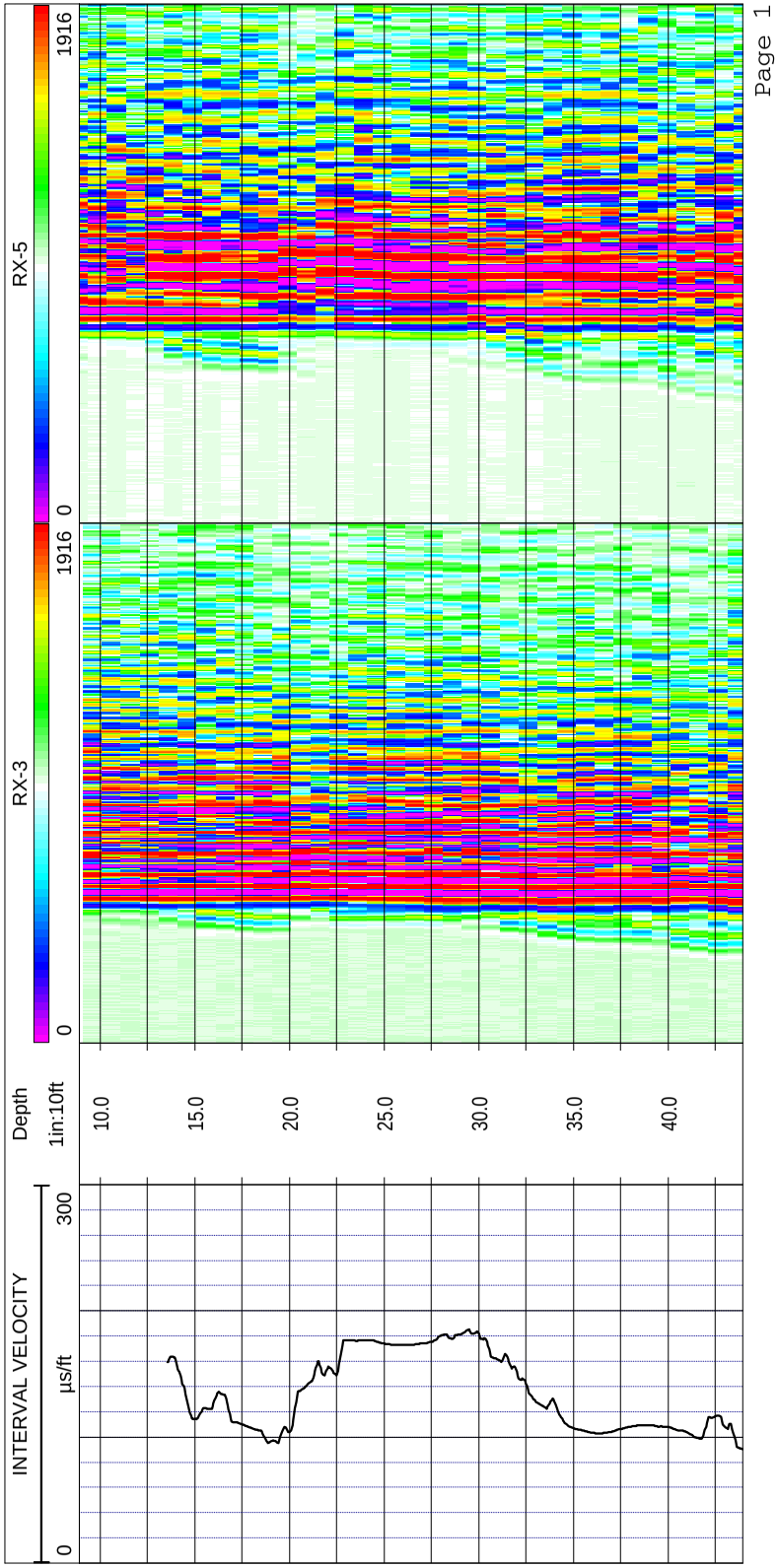
LOG MEAS. FROM: GROUND SURFACE

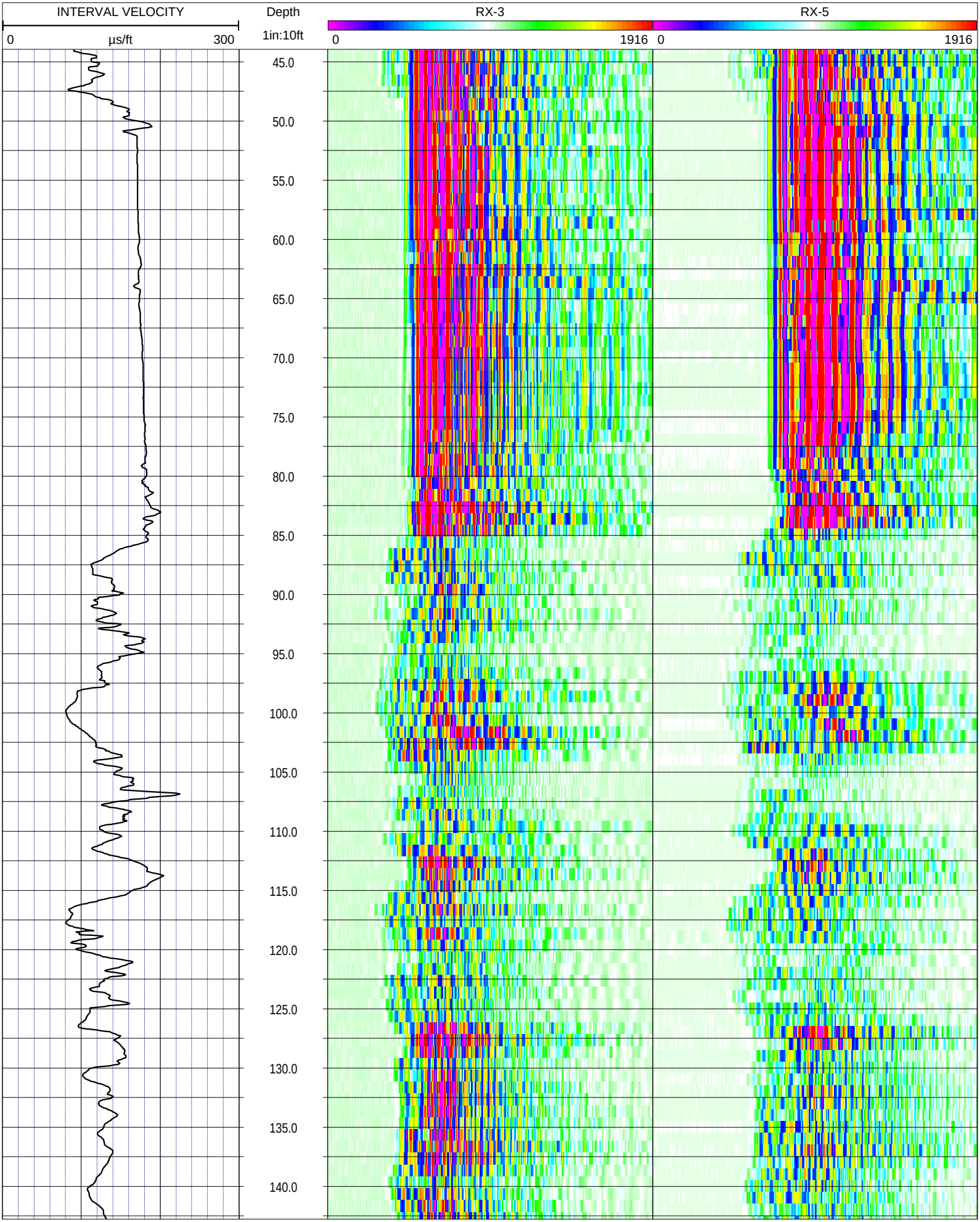
DRILLING MEAS. FROM:

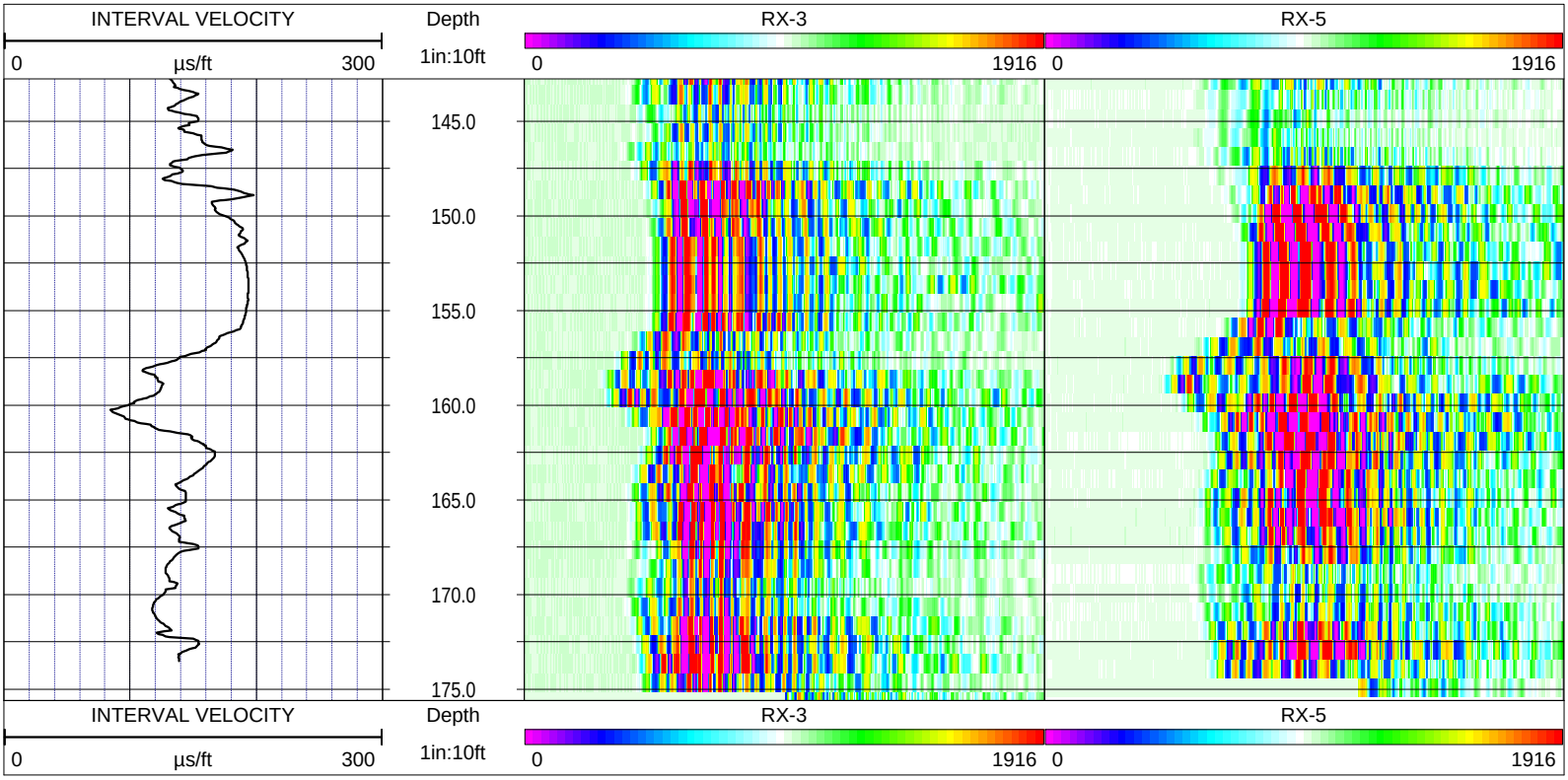
COORDINATES:

DATE	2-15-12	TYPE FLUID IN HOLE	WATER
RUN No	1	SALINITY	
TYPE LOG	SONIC	DENSITY	
DEPTH-DRILLER	181	LEVEL	
DEPTH-LOGGER	180.7	MAX. REC. TEMP.	
BTM LOGGED INTERVAL		LOGGING SPEED (FT/MIN)	20
TOP LOGGED INTERVAL		TROLLING DIRECTION	UP
DRILLER	DCWD	PUMPING RATE (GPM)	
RECORDED BY	RMB		
WITNESSED BY	AM		

RUN	BOREHOLE RECORD			CASING RECORD			
NO.	BIT	FROM	TO	SIZE	WGT.	FROM	TO
1	4.875	81	181	5	PVC	0	81




INTERVAL VELOCITY
0
µs/ft
300
Depth
1in:10ft
45.0
50.0
55.0
60.0
65.0
70.0
75.0
80.0
85.0
90.0
95.0
100.0
105.0
110.0
115.0
120.0
125.0
130.0
135.0
140.0
RX-3
0
1916
RX-5
0
1916



NOTES:

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END OF LOG

Appendix G

Digital Geophysical Logs & Aquifer Test Data

Appendix H

Lithologic Log

Cardno ENTRIX
Shaping the Future

Date: 2/16/2012
Project Name: Useppa Island Utilities
Class V Exploratory Well
Job No.: 02626001.00
Well No.: EX-1
Sampling Method: Continuous
Described By: Andy McThenia

Lithology Log (Final)
(Drill Cuttings)

Depth Interval (feet bpl)	Thickness (feet)	Sample Description
0 - 1	1	Sand, light olive grey, (5Y 5/2), loose, dry, silty, quartz, primarily very fine, minor organics, (grass roots) and organic silt, fair apparent permeability
1 - 2	1	Clayey sand, dusky yellow, (5Y 6/4), stiff, fine to coarse, common carbonate shell , moderate to low apparent permeability.
2 - 4	2	Sand, yellowish gray (5Y 7/2), loose, clean, very fine quartz, wet below ~2 feet bls, very well sorted, good apparent permeability.
4 - 10	6	Organics and clay, dark yellowish brown, (10YR 4/2), very soft, loose, spongy, abundant wood material, abundant wood fibers, common clay, common fine quartz sand, low to medium apparent permeability.
10 - 17	7	Sand, yellowish gray (5Y 7/2), loose, clean, mainly very fine quartz, (apparent hard shell layer at 14 to 15 feet) good to excellent apparent permeability.
17 - 42	25	Sandy silt, light olive grey, (5Y 5/2) to dark yellowish brown (10YR 4/2), very loose and soft, minor hard apparent shell or limestone layers at 27 and 38 feet bls, abundant organic fibers in returns, abundant fine quartz sand, low apparent permeability.
42 - 48	6	Marl, yellowish gray, (5Y 7/2), stiff, low apparent permeability.
48 - 50	2	Limestone, yellowish gray, (5Y 7/2) wackestone to mudstone, moderate to good induration, low apparent permeability.
50 - 54	4	Limestone, yellowish gray, (5Y 8/1) to very pale orange (10YR 8/6), well indurated, packstone to wackestone, fossiliferous, excellent apparent permeability.
54 - 60	6	Marly limestone, (5Y 7/2) yellowish gray to pale olive (10Y 6/2), poor induration, wackestone, abundant quartz sand, good apparent permeability.
60 - 84	24	Clay, light olive (10Y 5/4), medium stiff to soft, common sand and occasional shells, low apparent permeability.
84 - 90	6	Sand, greenish gray (5GY 6/1), moderate induration, mainly quartz and phosphate, common clay as above, low apparent permeability
90 - 96	6	Sandstone, dusky yellow (5Y 6/4) to pale olive (10Y 6/2), well indurated, very fine grained, calcareous, fossiliferous, good moldic porosity, good apparent permeability.

Cardno ENTRIX
Shaping the Future

Date: 2/16/2012
Project Name: Useppa Island Utilities
Class V Exploratory Well
Job No.: 02626001.00
Well No.: EX-1
Sampling Method: Continuous
Described By: Andy McThenia

Lithology Log (Final)
(Drill Cuttings)

Depth Interval (feet bpl)	Thickness (feet)	Sample Description
96 - 100	4	Sand, light olive grey, (5Y 5/2), quartz and phosphate, partially cemented, moderate induration, occasional clay layers, fair intergranular porosity, fair apparent permeability.
100 - 103	3	Sandstone, moderate olive brown (5Y 4/4), well indurated, abundant fine phosphatic sand, abundant fossil molds, good apparent permeability.
103 - 105	2	Clay, sandy, light olive gray (5Y 5/2), soft, abundant fine phosphatic sand, common shell fragments, low apparent permeability.
105 - 113	5	Sandstone, light olive gray, (5Y 5/2), very well indurated, abundant fossil molds, abundant phosphatic sand and granules, good apparent permeability
113 - 120	7	Complete loss of circulation at 113 feet in hard sandstone as above. Bit drop of approximately 1 foot from 113 to 114 feet bls.
120 - 125	5	Sandstone, same as above, light olive gray, (5Y 5/2), very well indurated, apparent permeability
125 - 128	3	Sandstone, same as above with slight color change to Yellowish Gray (5Y 7/2).
128 - 129	1	Sandstone, very light gray (N8), very well indurated, some shell fragments, good apparent porosity
129 - 135	6	Sandstone, grayish olive (10Y 4/2), abundant phosphatic sand, well indurated.
135 - 145	10	Sandstone, pale yellowish gray (10Y 8/2), abundant shells, abundant phosphatic sand, good apparent porosity
145 - 148	3	Sandstone, light olive gray, (5Y 5/2), very well indurated, abundant fossil molds, abundant phosphatic sand and granules, good
148 - 149	1	Clay, light olive (10Y 5/4), moderately stiff and tacky, very low apparent permeability
149 - 154	5	Clay, greenish gray (5GY 6/1), very tight clay, abundant phosphatic sand, very low apparent permeability
154-158	4	Clay, dusky yellow green (5GY 5/2), stiff, sticky, very low apparent permeability.
158 - 161	3	Dolostone, moderate olive brown (5Y 4/4), very well indurated, low apparent permeability.
161 - 165	4	Limestone, yellowish gray, (5Y 7/2), packstone to wackestone, poor induration, abundant fossil echinoid spines, abundant fossil molds, excellent apparent permeability.

Cardno ENTRIX
Shaping the Future

Date: 2/16/2012
Project Name: Useppa Island Utilities
Class V Exploratory Well
Job No.: 02626001.00
Well No.: EX-1
Sampling Method: Continuous
Described By: Andy McThenia

Lithology Log (Final)
(Drill Cuttings)

Depth Interval (feet bpl)	Thickness (feet)	Sample Description
165 - 170	5	Dolomitic limestone, light olive gray (5Y 5/2), well indurated, abundant fine phosphatic sand in rock matrix, common fossil molds, fair apparent permeability.
170 - 176	6	Marly dolomitic limestone, light olive gray (5Y 5/2), stiff, sticky, abundant fine phosphatic sand, low apparent permeability.
176 - 181	5	Dolostone, moderate yellowish brown; (10YR 5/4) to light olive gray (5Y 5/2), very well indurated, concoidal fracture, sucrosic texture, apparent change in water chemistry (fresher), and increased fluid production from reverse air. Good apparent permeability. **TOTAL DEPTH**

Cardno ENTRIX

Shaping the Future

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Down to Business.™

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Peru • United Arab Emirates • United Kingdom • United States • Operations in 70 countries