

# Well Construction at the West Citrus Well Site in Citrus County, Florida



Southwest Florida Water Management District Geohydrologic Data Section

**Cover Photo:** Permanent monitor wells at the West Citrus Well Site in Citrus County, Florida in order from left to right: U FLDN AQ MONITOR, SURF AQ MONITOR, and SALTWATER INTERFACE MONITOR. Photograph by Julia Zydek.

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By Julia Zydek

January 2018

Southwest Florida Water Management District Geohydrologic Data Section

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The hydrogeologic evaluations and interpretations contained in *Well Construction at the West Citrus Well Site in Citrus County, Florida* have been prepared by or approved by a licensed Professional Geologist in the State of Florida, in accordance with Chapter 492, Florida Statutes.

No.

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### Foreword

The Geohydrologic Data Section administers the Regional Observation and Monitor-well Program (ROMP) at the Southwest Florida Water Management District (District). The ROMP was started in 1974 in response to the need for hydrogeologic information by the District. The focus of the ROMP is to quantify the flow characteristics and water quality of the groundwater systems that serve as the primary source of water supply within southwest Florida. The original design of the ROMP consisted of an inland 10-mile grid network composed of 101 well sites and a coastal transect network composed of 57 coastal monitor transects of two to three well sites each. The number of wells at a well site varies with specific regional needs; usually two to five permanent monitor wells are constructed at each site. The numbering system for both networks generally increases from south to north with ROMP-labeled wells representing the inland grid network and TR-labeled wells representing the coastal transect network.

The ROMP networks have been the primary means for data collection; however, in recent years, changing District directives have created the need for more project-specific data collection networks outside the original two well networks for various programs throughout the District. The broad objectives at each well site are to determine the geology, hydrology, water quality, and hydraulic properties, and to install wells for long-term monitoring, depending on the goal of each project. Site activities include coring, testing, and well construction. These activities provide data for the hydrogeologic and groundwater quality characterization of the well sites. These characterizations are used to ensure the monitor wells are properly designed. At the completion of each well site, a summary report is generated and can be found at the District's website at www.watermatters.org/data. The monitor wells form the backbone of the District's long-term aquifer monitoring networks, which supply critical data for the District's regional models and hydrologic conditions reporting.

Sandie Will

Manager

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### **Conversion Factors and Datums**

Multiply	Ву	To obtain				
	Length					
inch (in)	2.54	centimeter (cm)				
foot (ft)	0.3048	meter (m)				
mile (mi)	1.609	kilometer (km)				
	Area					
acre	0.004047	square kilometer (km <sup>2</sup> )				
square foot (ft <sup>2</sup> )	0.09290	square meter (m <sup>2</sup> )				
square mile (mi <sup>2</sup> )	2.590	square kilometer (km <sup>2</sup> )				
	Volume					
gallon (gal)	3.785	liter (L)				
gallon (gal)	0.003785	cubic meter (m <sup>2</sup> )				
cubic foot (ft <sup>3</sup> )	0.02832	cubic meter (m <sup>3</sup> )				
Temperature						
Celsius (°C)	$^{\circ}F = (1.8 \text{ x }^{\circ}C) + 32$	Fahrenheit (°F)				
Fahrenheit (°F)	$^{\circ}C = (^{\circ}F - 32) / 1.8$	Celsius (°C)				

Vertical coordinate information is referenced to the North American Vertical Datum of 1988 (NAVD 88).

Elevation, as used in this report, refers to distance above the vertical datum.

### **Abbreviations and Acronyms**

below land surface
Coastal Groundwater Quality Monitoring Network
Southwest Florida Water Management District
figure
Huss Drilling, Incorporated
milligram per Liter
microSiemens per centimeter
North American Vertical Datum of 1988
Northern District regional groundwater flow model
Northern District Water Resources Assessment Project
polyvinyl chloride
well construction permit
Water Management Information System
Water Quality Monitoring Program

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### Well Construction at the West Citrus Well Site in Citrus County, Florida

#### By Julia Zydek

#### Introduction

The Geohydrologic Data Section of the Southwest Florida Water Management District (District) conducted a detailed hydrogeologic investigation of a new well site in Citrus County, Florida. The data collected at the West Citrus well site will be used by the District to align with its mission to manage and protect water resources. The data will assist in establishing the vertical and geographic extent of the saltwater interface within the Upper Floridan aquifer as well as be used to refine the groundwater flow models for the evaluation of future water supply assessments and to establish minimum flow and level criteria.

The West Citrus well site was selected for further investigation to support the Northern District Water Resources Assessment Project (NDWRAP), the Northern District regional groundwater flow model (ND Model), and the District's Coastal Groundwater Quality Monitoring Network (CG-WQMN). The NDWRAP was initiated to assess the impacts of groundwater withdrawals, monitor the saltwater/freshwater interface, identify areas of poor groundwater quality, determine the nature of flow to major springs, and monitor groundwater levels in both the surficial and Upper Floridan aquifers in the northern six-county region of the District. The Northern District encompasses all of Hernando, Citrus, and Sumter Counties as well as portions of Pasco, Marion, and Levy Counties. Figure 1 presents a map of the Northern District Drilling Plan sites.

Additionally, this site has been identified as critical towards improving the calibration of the ND Model, the District Wide Regulatory model, and future simulations of saltwater interface movement. The ND Model is used to establish and evaluate the status of minimum flows and levels for the Homosassa, Chassahowitzka, Gum Spring, Rainbow Spring, and Silver Spring systems. It was recently expanded to include all of Marion County and the District's Northern Planning Region for resource assessments. Permanent monitor wells constructed at this site include a surficial aquifer monitor, an Upper Floridan aquifer monitor, and a saltwater interface monitor. Long-term water level data will be collected from the Upper Floridan aquifer monitor well. The saltwater interface monitor well will be incorporated into the Water Quality Monitoring Program (WQMP) as part of the CGWQMN to monitor the saltwater interface.

The West Citrus monitor well site was completed on December 6, 2016. This report details the well construction, hydrostratigraphy, and water quality at the West Citrus well site. The data collected at this well site supports the mission of the District to provide accurate, cost effective, and defensible data for use in the management and protection of the state's water resources and related natural systems.

#### Acknowledgments

Special thanks to Huss Drilling, Incorporated, for their continued professionalism.

#### Site Location

The West Citrus well site is in southwestern Citrus County approximately one mile southeast of the Chassahowtizka River. It is in the southwest ¼ of the southwest ¼ of Section 36, Township 20 South, and Range 17 East at latitude 28° 42′ 00.64″ north and longitude 82° 34′ 08.05″ west (fig. 2). The land surface elevation is approximately 8.76 feet above the North American Vertical Datum of 1988 (NAVD88). The West Citrus well site is located on the District-owned Chassahowitzka Wildlife Management Area. Figure 2 presents the location the West Citrus well site.

The West Citrus well site can be found by proceeding through the intersection of U.S. Highway 98/W. Ponce De Leon Boulevard and U.S. Route 19 and continuing onto Miss Maggie Drive for approximately 1 mile, turning left (south) onto S Riviera Drive for 0.6 miles, turning left (east) onto W. Southhampton Court for approximately 500 feet, keeping right at the curve and continuing onto S. Riviera Drive for 0.4 miles, and following the dirt road for approximately 450 feet to the well site.

The West Citrus well site is in the Northern Gulf Coastal Lowlands physiographic region of west-central Florida (White, 1970). It is situated between the Coastal Swamps physiographic region 0.35 miles to the west and the Brooksville Ridge physiographic region 2.18 miles to the east. The West Citrus well site is in the Chassahowitzka River Drainage

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Figure 1. Northern District Drilling Plan well sites

Basin. The Chassahowitzka Springs Group is an important hydrological feature to the area as it discharges groundwater from the Upper Floridan aquifer to the headwaters of the Chassahowitzka River.

#### Methods

The West Citrus well site investigation was conducted using a variety of methods to collect hydrogeologic data including lithologic, geophysical, water level, and water quality data. The following sections provide the data collection method details specific to the West Citrus well site. Data collected at this well site are available for download from the District's website: www.swfwmd.state.fl.us using the Water Management Information System (WMIS). Data collection sites (wells) from this well site are compiled under the portfolio named West Citrus. As of September 2017, available data include water quality and water level data. Lithologic, geophysical, and stratigraphic data will be available in the future. This report, well construction details, and survey data are also available for download from the WMIS.

#### Lithologic Sampling

Prior to well construction, lithologic samples were collected using a Failing 500 drill rig equipped for split-spoon sampling. The split-spoon sampler was advanced using a 140-pound hammer through 4.5-inch hollow-stem augers, which acted as temporary casing and held the bore hole open. Continuous lithologic samples were collected in two-foot intervals from land surface to 24 feet below land surface (bls). Eight-inch polyvinyl chloride (PVC) casing was then set to 20 feet bls. Split-spoon sampling was continued to refusal at 38 feet bls.

Following this, Huss Drilling, Incorporated (Huss) performed hydraulic rotary coring using 3-inch HQ steel coring rods and the Failing 500 drill rig to collect continuous lithologic samples from 38 to 80 feet bls in 10-foot intervals using the wireline retrieval method. Next, Huss relocated the Failing 500 drill rig to a second core hole and resumed rotary coring from 80 to 350 feet bls. The samples were boxed, described, and photographed by the onsite geologist.

#### Water Quality Sampling

Eight groundwater samples were collected while core drilling. Seven samples were collected from discrete intervals isolated by an off-bottom packer, and one sample was collected using the thief sampler after the first suite of geophysical logs were run. The seven isolated samples were collected using a 3-inch Typhoon submersible pump. A portion of each sample was analyzed in the field for specific conductance, pH, temperature, chloride, and sulfate. The remainder of each



Well site location for the West Citrus well site in Citrus County, Florida Figure 2.

Kilometers

0.5

0.25

1 Miles

0.5

0.25

 $\circ$ 



one mile, turning left (south) onto S Riviera Drive for 0.6 miles, turning left (east) onto W Southhampton Court for approximately 500 feet, keeping right at the curve and continuing onto S Riviera Drive for 0.4 miles, and following the dirt road for approximately 450 feet to the well site. In Homosassa, proceed through the intersection of U.S. Highway 98/W Ponce De Leon Boulevard and U.S. Route 19 and continuing onto Miss Maggie Drive for approximately

#### 4 Well Construction at the West Citrus Well Site in Citrus County, Florida

sample was processed and delivered to the District's Chemistry Laboratory for additional parameter analyses (Southwest Florida Water Management District, 2009). Additional readings of specific conductance, pH, and temperature were recorded from drilling discharge at various intervals during core drilling.

#### **Geophysical Logging**

Geophysical logs are used to delineate stratigraphic units; identify permeable zones and confining units; characterize water quality; and determine well casing points and grouting requirements. Borehole geophysical logs were collected at the West Citrus well site. All logs were collected by District staff using District-owned Century® geophysical logging equipment during three sessions at this well site (table 1 and appendix A).

The first suite of logs was run on November 9, 2016 in the second core hole after exploratory core drilling was completed. The 4-inch drill rods were tripped from 350 to 160 feet bls and the tools were run in the 4-inch drill rods and the open hole from 350 feet bls to land surface. The 8044C multifunction tool was run from 0.8 to 358.2 feet bls, the 9165C caliper/ gamma-ray tool was run from 0.2 to 358.4 feet bls, and the 9511C induction tool was run twice from 132.6 to 355.8 feet bls and 136.8 to 355.6 feet bls.

The second suite of logs was run on November 29, 2016, in the saltwater interface monitor well. The tools were run in the 8-inch PVC casing that was set at 80 feet, prior to setting the 4-inch PVC casing. The 8044C multifunction tool was run from 1 to 279.8 feet bls, the 9165C caliper/gamma-ray tool was run from land surface to 280.2 feet bls, and the 9511C

#### Table 1. Summary of geophysical logs collected at the West Citrus well site in Citrus County, Florida

[MM/DD/YYYY, month/day/year; ft, feet; bls, below land surface; MULTI, multifunction; CAL, caliper; GAM, gamma; PVC, polyvinyl chloride; The multifunction tool includes natural gamma-ray, single-point resistance, short normal 16-inch resistivity, long normal 64-inch resistivity, fluid resistivity, spontenous potential, specific conductance, and temperature parameters; geophysical log diagrams are in appendix A]

Logged Date (MM/DD/YYYY)	Well Name	Logged Inter- val (ft bls)	Casing Type	Casing Depth (ft bls)	Borehole Diameter (inches)	Geophysical Tool(s)
11/9/2016	WEST CITRUS CORE- HOLE 2	0.8-358.2	Steel	160	4	MULTI (8044C)
11/9/2016	WEST CITRUS CORE- HOLE 2	132.6-355.8	Steel	160	4	INDUCTION (9511C)
11/9/2016	WEST CITRUS CORE- HOLE 2	136.8-355.6	Steel	160	4	INDUCTION (9511C)
11/9/2016	WEST CITRUS CORE- HOLE 2	0.2-358.4	Steel	160	4	CAL/GAM (9165C)
11/29/2016	WEST CITRUS SALT- WATER INTERFACE MONITOR	1.00-279.8	PVC	80	8	MULTI (8044C)
11/29/2016	WEST CITRUS SALT- WATER INTERFACE MONITOR	0.6-277.2	PVC	80	8	INDUCTION (9511C)
11/29/2016	WEST CITRUS SALT- WATER INTERFACE MONITOR	0-280.2	PVC	80	8	CAL/GAM (9165C)
12/6/2016	WEST CITRUS SALT- WATER INTERFACE MONITOR	0-325.2	PVC	283	4	CAL/GAM (9165C)
12/6/2016	WEST CITRUS SALT- WATER INTERFACE MONITOR	0.6-321.2	PVC	283	4	INDUCTION (9511C)

induction tool was run from 0.6 to 277.2 feet bls.

The third suite of logs was run on December 6, 2016, in the saltwater interface monitor well after construction was completed. The tools were run in the 4-inch PVC casing that was set at 283 feet bls and in the open hole. The 9165C caliper/gamma-ray tool was run from land surface to 325.2 feet bls and the 9511C induction tool was run from 0.6 to 321.2 feet bls.

#### Well Construction

Monitor well construction at the West Citrus well site was completed by Huss and supervised by a District geologist. Permanent monitor wells were constructed for long-term water level and water quality monitoring. A total of three monitor wells were constructed, including one permanent surficial aquifer monitor well and two permanent Upper Floridan aquifer monitor wells (fig. 3). The two permanent Upper Floridan aquifer monitor wells were constructed to monitor the water elevation of the Upper Floridan aquifer and to monitor the water quality and elevation of the saltwater/freshwater interface. In this report, the saltwater/freshwater interface is defined as the depth below land surface where the chloride concentration in groundwater begins to exceed 1,000 milligrams per liter (mg/l).

The Upper Floridan aquifer monitor well (District site ID 877605) was constructed between October 25 and 28, 2016, the saltwater interface monitor well (District site ID 877606) was constructed between October 28 and December 2, 2016, and the surficial aquifer monitor well (District site ID 877604) was constructed on December 2, 2016. The completed wells were equipped with water level recorders by the District's Hydrologic Data Section for long-term groundwater level monitoring. Additionally, the Upper Floridan aquifer monitor and the saltwater interface monitor wells were entered into the District's Water Quality Monitoring Program for long term water quality monitoring.

Prior to well construction, exploratory split-spoon samples were collected from land surface to refusal at 38 feet bls. Huss switched to exploratory HQ wire-line coring using mud as the drilling fluid from 38 to 350 feet bls. Continuous 3-inch core samples were collected from 38 to 350 feet bls. These samples were used to characterize the hydrostratigraphy of the site and to aid in the design of the monitor wells.

A summary of well construction details is provided in table 2. Well construction as-built diagrams for the two core holes, surficial aquifer monitor well, Upper Floridan aquifer monitor well, and saltwater interface monitor well are presented in appendix B. Daily logs for coring and well construction operations are available from the District's online document storage database. Additional well construction details can be found in the District's WMIS.

#### **Upper Floridan Aquifer Monitor Well**

The Upper Floridan aquifer monitor well was constructed between October 25 and 28, 2016, using the Failing 500 drill rig under Well Construction Permit (WCP) number 853940. The well construction specifications are depicted in appendix B, figure B1. The well is open to the Ocala Limestone and is used to monitor the groundwater level and quality of the Upper Floridan aquifer.

Huss drilled a 12-inch nominal borehole from land surface to 20 feet bls and installed 21 feet of 8-inch schedule 40 PVC casing from one foot above land surface to 20 feet bls. Nine bags of neat cement and three bags of Quick Gel were installed in the annulus from 20 feet bls to land surface.

Huss then performed split-spoon sampling from 20 to 38 feet bls, ending when competent limestone was reached. Next, Huss began coring from 38 to 80 feet bls using HQ core rods. The core hole was then reamed to 58 feet bls using an 8-inch bit. Sixty feet of 4-inch schedule 40 PVC casing was installed to the bottom of the borehole. One bag of Hole Plug was installed in the annulus and tagged at 55 feet bls. Thirteen bags of neat cement and five bags of Quick Gel were installed in the annulus from 55 feet bls to land surface.

Next, Huss drilled the open hole below the 4-inch casing from 58 to 80 feet bls using a 37/8-inch drill bit. The well was developed after installation for 25 minutes and subsequently used as the water supply well for the remainder of the coring and well construction operations.

#### Saltwater Interface Monitor Well

The saltwater interface monitor well was constructed between October 28 and December 2, 2016, using the Failing 500 drill rig under WCP 853939. The well construction specifications are depicted in appendix B, figure B2. The well is open to the Avon Park Formation and is used to monitor the groundwater level and quality of the saltwater interface within the Upper Floridan aquifer.

Huss began construction of the saltwater interface monitor well by drilling a 16-inch pilot hole from land surface to competent rock at 23 feet bls. Next, Huss installed 24 feet of 12-inch PVC casing to 23 feet bls. Fourteen bags of neat cement and six bags of Quick Gel were installed in the annulus from 23 feet bls to land surface. Following this, Huss drilled inside the 12-inch PVC casing using a 6-inch bit from 23 to 80 feet bls, then set 5-inch temporary steel casing at 80 feet bls.

Wire-line core drilling with a nominal 3-inch diameter core bit began at 80 feet and continued to 350 feet bls. The saltwater interface was identified in the interval between 300 and 350 feet bls. To better target the 1,000 milligrams per Liter (mg/L) chloride isochlor, the core hole was back plugged to 320 feet bls. Eighty feet of 8-inch schedule 40 PVC casing was installed to 80 feet bls. Thirty bags of neat cement, seven bags of Quick Gel, and one bag of bentonite were installed in the annulus from 80 feet bls to land surface.







0.05 Miles

0.025

0.0125

0

0.05 Kilometers

0.0125 0.025

0

28°42'0"N

Huss then reamed the 3-inch core hole from 80 to 320 feet bls using an 8-inch drill bit and set 280 feet of 4-inch schedule 40 PVC casing equipped with two 4 X 8-inch packers to 280 feet bls. Thirty-seven bags of neat cement were installed in the annulus, followed by five bags of pea gravel. The annulus was tagged at 210 feet bls, and 36 more bags of neat cement and five bags of pea gravel were installed in the annulus. The annulus was tagged at 207 feet bls. A variance permit was issued allowing Huss to fill a void in the annulus with pea gravel. This 15-inch void is evident on the geophysical logs at approximately 165 feet bls. Fifty bags of pea gravel were installed in the annulus, which was then tagged at 155 feet bls. Huss then installed approximately 25 pounds of bentonite on top of the gravel from 150 to 155 feet bls. Thirty-eight bags of neat cement were then installed in the annulus. After the well installation was completed, the well was developed for 60 minutes.

#### **Surficial Aquifer Monitor Well**

The surficial aquifer monitor well was constructed on December 2, 2016, using the Failing 500 drill rig under WCP number 855282. The well construction specifications are depicted in appendix B, figure B3. The well is open to the undifferentiated sand and clay sediments and is used to monitor the groundwater level in the surficial aquifer.

Five feet of 4-inch schedule 40 PVC casing and five feet of 4-inch PVC 0.010-inch slotted well screen were installed to 10 feet bls. Five bags of 20-30 silica sand were installed from 10 to four feet bls. One bag of neat cement was installed in the annular space from four feet bls to land surface. After installation was completed, the well was developed for 110 minutes. At the end of all well construction, three-foot risers were added to each of the wells and lockable metal well covers and concrete pads were installed around the finished wells.

### Geology

The lithostratigraphy of the West Citrus well site is based on lithologic samples collected from split-spoon sampling from land surface to 38 feet bls and exploratory coring that was conducted from 38 to 350 feet bls. The geologic units encountered at the well site include, in ascending order, the Avon Park Formation, the Ocala Limestone, and the undifferentiated sand and clay deposits. A stratigraphic column detailing the lithostratigraphy encountered at the well site is presented in figure 4. The lithologic log is presented in appendix C. Digital photographs of the lithologic core samples are presented in appendix D.

The portion of the Avon Park Formation (Middle Eocene) encountered during exploratory coring extends from 157.5 to 350 feet bls. The base of the formation was not reached during coring. The Avon Park Formation primarily consists of sucrosic dolostones, wackestones, packstones, and mudstones that are generally grayish orange, very pale orange, light gray, and dark grayish brown, very fine to coarse grained, moderate to well indurated, and are moderately to highly altered with varying porosity. Organics are present throughout the formation as laminae.

Fossil molds and fragments observed within this formation primarily include echinoids, mollusks including gastropods, and benthic foraminifera such as miliolids. The foraminifera *Cushmania americana* appear at 191.5 feet bls and between 200 and 205 feet bls. The appearance of the echinoid *Neolaganum dalli*, which is a fossil characteristic of the Avon Park Formation, is present from 303.9 to 320.5 feet bls and 326 to 330 feet bls. Additionally, fractures, burrows, molds,

Table 2. Summary of well construction details at the West Citrus well site in Citrus County, Florida

[SID, site identification; ft, feet; bls, below land surface; WCP No., well construction permit number, ; well locations are shown in figure 2; well as-built diagrams are in appendix B]

SID	Well Name	Open Interval (ft bls)	Constructed By	Start Date (MM/DD/ YYYY)	Complete Date (MM/DD/YYYY)	Status	WCP No.(s)
875936	WEST CITRUS COREHOLE 1	0-80	Huss Drilling, Inc.	10/25/2016	10/26/2016	Inactive	853940
875942	WEST CITRUS COREHOLE 2	0-350	Huss Drilling, Inc.	10/28/2016	11/16/2016	Inactive	853939
877604	WEST CITRUS SURF AQ MONI- TOR	5-10	Huss Drilling, Inc.	12/2/2016	12/2/2016	Active	855282
877605	WEST CITRUS U FLDN AQ MONITOR	60-80	Huss Drilling, Inc.	10/25/2016	10/28/2016	Active	853940
877606	WEST CITRUS SALTWATER	280-320	Huss Drilling, Inc.	10/28/2016	12/2/2016	Active	853939

and vugs are lined with calcite crystals from 195 to 200 feet bls, 206 to 210 feet bls, and 220 to 221 feet bls. A spike in gamma-ray activity between 190 and 200 feet bls (appendix A, figure 3) likely corresponds to the organic material described on the lithologic log, in which the organics are said to be prominent throughout the first two feet of the description interval at 190 feet bls. Average core recovery through the Avon Park Formation is approximately 96 percent.

At the West Citrus well site, the late Eocene age Ocala Limestone extends from 17 to 157.5 feet bls. The top of the Ocala Limestone is picked at the top of the very first instance of limestone fragments in pale yellowish brown, very fine to fine grained clayey sand. The diagnostic benthic foraminifera, Lepidocyclina ocalana and Nummulites ocalanus were identified near the top of the unit. The general lithology of the Ocala Limestone at this location consists of white to light gray, poorly to well indurated, fine to medium grain size, highly fossiliferous weathered limestone, packstone, wackestone, and grainstone. Additional fossil molds and fragments observed include bryozoa, coral, mollusks, echinoids, brachiopods, benthic foraminfera such as pelecypods, and worm holes. The porosity of the limestone is predominantly intergranular, vugular, fracture, and moldic. Core recovery for the Ocala Limestone is approximately 93 percent.

At the West Citrus well site, the Pliocene to Holocene age undifferentiated sand and clay unit is present from land surface to 17 feet bls. The interval from land surface to 10 feet bls consists of very fine light gray to yellowish gray sand with root fragments. From 10 to 16 feet bls, the sample consists of pale yellowish to moderate yellowish brown, fine-grained sandy clay.

#### Hydrogeology

The characterization presented below is based on the results of all data collected during exploratory coring and testing, including lithologic, water level, water quality, discharge flow rates, and geophysical log data. The hydrogeologic units delineated at the West Citrus well site include a breached confining unit and the unconfined Upper Floridan aquifer. A representation of the hydrogeology at the West Citrus well site is presented in figure 4.

Very fine-grained sands of the undifferentiated sand and clay deposits occur from land surface to 10 feet bls. Throughout much of Florida, these sands would typically comprise the unconfined surficial aquifer containing the water table. However, this site occurs in a region of west-central Florida where the limestone is at or near land surface and the surficial aquifer is frequently absent due to very thin, discontinuous and/or breached basal confinement.

A thin, low-permeability layer of pale to moderate yellowish-brown, fine-grained sandy clay to clayey sand occurs from 10 to the top of limestone at 16 feet bls. However, data show this material does not form an effective confining



**Figure 4.** Stratigraphic column detailing the hydrogeologic setting at the West Citrus well site in Citrus County, Florida

unit between the surficial sands and the underlying Upper Floridan aquifer. Basal confinement of the surficial sediments in this region is known to be local to absent, very thin, sandy, and often breached by karst features which cause the Upper Floridan and surficial aquifer water levels to be very close to coincident. A hydrograph of water level data over time from the surficial and the Upper Floridan aquifer monitor wells constructed at this site (fig. 5) shows nearly coincident water levels that deviate slightly (roughly 0.5 feet) following storm events as water in the surficial sands mound up and then gradually equilibrate as time passes. Thus, the low-permeability sediments do not restrict, but only temporarily retard vertical recharge to the Upper Floridan aquifer. This suggests a true surficial aquifer is not present at this site and supports the criteria for a 'regionally unconfined Upper Floridan aquifer' (Ron Basso, SWFWMD, written communication, 2014).

At the West Citrus well site, the Upper Floridan aquifer is considered unconfined and extends from land surface to beyond the depth of exploratory coring at 350 feet bls (fig. 4). Figure 5 presents the hydrograph of the monitor wells at the West Citrus well site. The saltwater interface monitor well water levels are lower relative to the shallow Upper Floridan and surficial aquifer monitor well water levels in the hydrograph. This is due to the higher chloride concentration of the saltwater interface monitor well being higher than that of the shallow Upper Floridan aquifer monitor well. The heads from the deeper well have not been corrected for density due to elevated salinity concentration.



**Figure 5.** Hydrograph of the monitor wells at the West Citrus well in Citrus County, Florida

The Upper Floridan aquifer consists of rocks of the Avon Park Formation and the Ocala Limestone that have intergranular, vugular, fracture, and moldic porosity. Although discharge flow rates in the Upper Floridan aquifer during exploratory coring ranged from 20 to 30 gallons per minute (gpm) and sometimes less than 10 gpm in smaller sample intervals, regional studies and aquifer performance testing suggests permeability in the shallow parts of the Upper Floridan aquifer is extremely high due to secondary karst porosity. Observed moderate discharge rates may misrepresent actual productivity since discharge water in the shallow weathered limestones can be very turbid with weathered limestone particulates during coring process but would potentially increase significantly if time was spent developing the borehole. The lithology from 300 to 350 feet bls is described as well indurated crystalline dolostone, which can reduce discharge flow rates.

Static water level data were measured almost daily within the composite core hole (fig. 6). The static water level of the core hole primarily ranged from 4.68 to 5.31 feet NAVD88 during exploratory coring within the Upper Floridan aquifer (appendix F). The water level dropped almost 3.5 feet between 300 and 350 feet bls and is likely the result of increasing salinity and density which suppresses the actual head.

#### **Groundwater Quality**

The groundwater quality characterization at the West Citrus well site is based on the results of eight groundwater samples and multifunction geophysical logs collected during exploratory coring. The water quality samples were collected primarily in 50-foot intervals, except for the last two samples which were collected in 22 and 32-foot intervals to locate the 1,000 mg/L isochlor. Field readings of chlorides and sulfates were taken during sample collection from surface discharge using a YSI 9300 Photometer. Figure 7 and appendix H, table 2 show the concentration of chloride measured in the field rose from 5.7 to 1800 mg/L between water quality sample numbers 4 (sample interval 150 to 200 feet bls) and 5 (sample interval 325 to 350 feet bls). Concentrations again increased to over 10,000 mg/L in water quality sample number 6 (sample interval 300 to 350 feet bls). This is evident in the multifunction geophysical log where there is a spike in specific conductivity from approximately 500 to 5,000 microSiemens per centimeter (µS/cm) at approximately 325 feet bls (appendix A, figure 1). The core hole was subsequently back plugged to 320 feet bls to ensure that the open hole interval of the final well intersected the 1,000 mg/L isochlor. Two more chloride field readings were collected, one at an interval between 300 and 322 feet bls, and the other between 290 and 322 feet bls using an off-bottom packer to simulate the final well design (appendix H, table 1). The chloride field readings were 2,350 and 1,700 mg/L, respectively. It was decided that the final configuration of the saltwater interface monitor well have an open hole interval from 280 to 320 feet bls. The groundwater quality sample acquisition sheets are presented in appendix G. The field and laboratory results for the groundwater quality samples are presented in Appendix H, tables 1 and 2, respectively.

Eight water quality samples were collected from the Upper Floridan aquifer at various depth intervals between 130 and 350 feet bls. The secondary drinking water standards for chloride, sulfate, total dissolved solids (TDS), and iron are 250 mg/L, 250 mg/L, 500 mg/L, and 0.3 mg/L (300 micrograms per liter, µg/L), respectively (U.S. Environmental Protection Agency, 2012). The water quality sample results show that groundwater is within secondary standards with respect to TDS, chloride to a depth of 300 feet bls (samples 1 through 4). TDS values at these depths are 185, 203, 233, and 218 mg/L. Chloride values at these depths are 5.6, 8.9, 37.3, and 41.9 mg/L. Groundwater is within secondary standards with respect to sulfate to a depth of 322 feet bls (samples 1 through 4 and 7 through 8). Sulfate values at these depths are 0.7, 2, 4.8, 6.2, 147.47, and 140.97 mg/L. The first water quality sample to exceed the secondary drinking water standard due to TDS, chloride, and sulfate is water quality (WQ) sample number 5 (from 325 to 350 feet bls) with a concentration of 3,530, 1,848, and 256 mg/L, respectively. Iron concentrations exceed secondary drinking water standards at depths between 130 and 150, 150 and 200, and 300 and 350 feet bls (samples 1, 2, and 6). Iron concentrations at these depths are 2.22, 0.33, and 2.05  $\mu$ g/L, respectively. Water quality data are presented in figure 7



**Figure 6.** Static water level profile collected during exploratory core drilling and testing at the West Citrus well site in Citrus County, Florida

and appendix H, table 2.

Major ion concentrations generally increase with depth in the core hole until a depth of 325 feet bls (sample 5) where concentrations decrease. The equivalent weights, percent equivalent weights, and water type for each sample are presented in appendix H, table 3. The primary cations measured throughout the core hole are calcium, magnesium, and sodium; and the primary anions are bicarbonate, sulfate, and chloride. The dominant water type of the Upper Floridan aquifer is calcium bicarbonate to an approximate depth of 300 feet bls. The dominant water type of the remaining 50 feet of Upper Floridan aquifer explored is sodium chloride.

Select molar ratios were calculated to assess water quality changes with depth (figure 8 and appendix H, table 4). The gypsum track illustrates the interaction between fresh water and evaporites (gypsum and anhydrite). The dolomite track primarily identifies fresh water affected by dolomite. The sodium chloride track depicts effects from connate or seawater. The chloride to sulfate molar ratio on the gypsum track spikes between 300 and 310 feet bls before decreasing between 320 and 340 feet bls because both ions are increasing but chloride increases at a faster rate. The calcium to bicarbonate and



Figure 7. Select cations and anions, and total dissolved solids with depth for groundwater quality samples collected at the West Citrus well site in Citrus County, Florida





Figure 9. Piper Diagram of groundwater quality samples collected at the West Citrus well site in Citrus County, Florida

#### 14 Well Construction at the West Citrus Well Site in Citrus County, Florida

sulfate to bicarbonate molar ratios do not indicate significant influence from evaporites as these minerals were not identified in the core at these depths. The calcium to magnesium molar ratio on the dolomite track decreases with depth and levels off between 220 and 310 feet bls before decreasing again between 320 and 340 feet bls, indicating no influence from gypsum or anhydrite on the groundwater as these minerals were not identified in the core at these depths. This is also an indication of increased interaction with dolomite. The sodium to chloride molar ratios on the sodium chloride track show very little notable variation with depth because both ion concentrations are increasing at similar rates. The chloride to bicarbonate and sodium to bicarbonate molar ratios both spike between 270 and 330 feet bls because as bicarbonate concentrations decrease, both chloride and sodium concentrations increase.

Relative abundance trends of each major cation and anion species analyzed for in the groundwater quality samples collected at the West Citrus well site are presented on a Piper (1944) diagram as percent milliequivalents (fig. 9). Groundwater samples 1 through 4 collected within the Upper Floridan aquifer plot in the middle left of the quadrilateral, which is typical for calcium bicarbonate water types not influenced by deepwater or seawater mixing (Tihansky, 2005). Water quality samples 5 through 8 plot at the middle right of the quadrilateral and the end of the freshwater/seawater mixing trends described by Tihansky (2005). The transition on the quadrilateral plot between samples 4 and 5 directly along the freshwater/seawater mixing trend is expected near the coastline when intersecting the saltwater interface.

#### Summary

Three monitor wells were constructed at the West Citrus well site in Citrus County, Florida. The Upper Floridan aquifer monitor well was constructed in October of 2016, the saltwater interface monitor well was constructed from October 28, 2016 to December 2, 2016, and the surficial aquifer monitor well was constructed in December of 2016.

The wells were constructed as part of the NDWRAP, the ND Model, and the CGWQMN to monitor groundwater levels in the surficial and the Upper Floridan aquifers, as well as the water level and water quality of the saltwater interface. The casing and total depths of the surficial aquifer monitor well are 5 feet and 10 feet bls, respectively. The casing and total open hole depths of the Upper Floridan aquifer monitor well are 58 and 80 feet bls, respectively. The casing and total open hole depths of the saltwater interface monitor well are 280 and 320 feet, respectively. The wells are secured with locking well covers, surveyed, and groundwater levels and quality are currently being monitoring by the District's Hydrologic Data Section and the WQMP.

Prior to well construction, exploratory split-spoon and hydraulic rotary core samples were collected to delineate the hydrogeology of the well site. The general geology at the well site is, in ascending order from oldest to youngest, the Avon Park Formation from 157.5 feet below land surface to the total depth of exploration of 350 feet bls; the Ocala Limestone from 17 to 157.5 feet bls; and undifferentiated sand and clay from land surface to 17 feet bls. The hydrogeology at the West Citrus well site includes, in descending order, a surficial aquifer from land surface to 10 feet bls; a confining unit from 10 to 17 feet bls; and the Upper Floridan aquifer from 17 feet bls to possibly beyond 350 feet bls.

The primary purpose of this well site was to locate the saltwater/freshwater interface as defined by the 1,000 mg/L isochlor. The saltwater interface monitor well was designed and constructed so that the open hole interval would intersect the interface. At the time of well construction, the chloride concentration was 1,700 mg/L, which is slightly higher than the intended 1,000 mg/L. Changes in water quality in this well will be monitored by the District's WQMP.

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Appendix A. Geophysical Log Suites for the West Citrus Well Site in Citrus County, Florida



**Figure A7.** Geophysical log suite for the SALTWATER INTERFACE MONITOR well from land surface to 283 feet below land surface conducted at the West Citrus well site in Citrus County, Florida. The logging was performed on December 6, 2016, using the 9511C (induction) tool. The log was run in the borehole with four-inch polyvinyl chloride casing at 283 feet below land surface. The vertical axis scale is 2 inches per 100 feet. Horizontal axes for tracks 1 and 3 are linear and track 2 is logarithmic. The first read (F.R.) is 312.2 feet below land surface.

## Appendix B. Well As-built Diagrams for the West Citrus Well Site in Citrus County, Florida



Figure B1. Well as-built diagram for the COREHOLE 1 at the West Citrus well site in Citrus County, Florida



Figure B2. Well as-built diagram for the COREHOLE 2 at the West Citrus well site in Citrus County, Florida



Figure B3. Well as-built diagram for the SALTWATER INTERFACE MONITOR at the West Citrus well site in Citrus County, Florida


Figure B4. Well as-built diagram for the SURF AQ MONITOR at the West Citrus well site in Citrus County, Florida



Figure B5. Well as-built diagram for the U FLDN AQ MONITOR at the West Citrus well site in Citrus County, Florida

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Appendix C. Lithologic Logs for the Samples Collected at the West Citrus Well Site in Citrus County, Florida

## Appendix C1. Lithologic Log for COREHOLE 1 at the West Citrus Well Site in Citrus County, Florida

LITHOLOGIC WELL LOG PRINTOUT

WELL NUMBER: W-19634 TOTAL DEPTH: 80 FT. 23 SAMPLES FROM 0 TO 80 FT. SOURCE - FGS

COUNTY: CITRUS LOCATION: LAT = 28° 42' 0.44" LON = 82° 33' 57.45"

#### ELEVATION: FT

COMPLETION DATE: OWNER/DRILLER:/ WORKED BY: ZACHARY R. ZARRANZ 2017 WELL NAME: West Citrus Core Hole 1; See West Citrus Core Hole 2 (W-19635) for intervals 85'-350'.

0	-	17	090UDSC Undifferentiated Sand and Clay				
17	-		124OCAL Ocala Limestone				
0	-	1	Sand; Light Gray (N7) To Light Olive Gray (5Y 6/1) Intergranular Grain Size: Fine; Range: Very Fine To Medium Roundness: Sub-angular To Sub-rounded; Medium Sphericity Unconsolidated Induration Accessory Minerals: Clay-3%; Plant Remains-3%; Organics-1%; Iron Stain-<1% Loose sediment in box so exact footage is estimated. Fine grained sand with few clay iron stained chunks, plant roots, and organics.				
4	-	8	Sand; Very Light Orange (10YR 8/2) To Light Yellowish Orange (10YR 8/6) Intergranular Grain Size: Fine; Range: Very Fine To Coarse Roundness: Sub-angular To Sub-rounded; Medium Sphericity Unconsolidated Induration Accessory Minerals: Clay-2%; Organics-1% Loose sediment in box so exact footage is estimated. Fine grained sand with parts coated in orange silt. Organics present				
8	- 10		<ul> <li>Sand; White (N9) To Moderate Yellowish Brown (10YR 5/4)</li> <li>Intergranular</li> <li>Grain Size: Fine; Range: Very Fine To Coarse</li> <li>Roundness: Sub-angular To Sub-rounded; Medium Sphericity</li> <li>Unconsolidated Induration</li> <li>Accessory Minerals: Clay-5%; Phosphatic Sand-1%</li> <li>Loose sediment in box so exact footage is estimated. Fine grained sand with trace phosphate and an increasing clay content.</li> </ul>				

10	-	13	Clay; Light Yellowish Orange (10YR 8/6) To Moderate Yellowish Brown (10YR 5/4)
			Poor Induration
			Cement Type(s): Clay Matrix
			Accessory Minerals: Quartz Sand-30%: Phosphatic Sand-2%: Organics-<1%
			First indurated interval sandy clay with trace phosphate and trace organics
13	_	17	Sand: Very Light Orange (10VR 8/2) To Gravish Brown (10VR 6/2)
15	-	17	Intergranular
			Grain Size: Fine: Range: Very Fine To Coarse
			Roundness: Angular To Sub-rounded: Medium Sphericity
			Poor Induration
			Cement Type(s): Clay Matrix
			Accessory Minerals: Clay-20%: Phosphatic Sand-2%: Organics-<1%: Limestone-<1%
			Clavey Sand with trace phosphate sand limestone in trace amounts is seen for the first time at the bottom of
			this interval. Top of Ocala Limestone.
17	-	22	Limestone; Grayish Brown (10YR 6/2) To White (N9)
			Intergranular
			Grain Type: Calcilutite; Skeletal
			Grain Size: Very Fine; Range: Very Fine To Fine
			Poor Induration
			Cement Type(s): Calcilutite Matrix; Clay Matrix
			Sedimentary Structures: Interbedded
			Accessory Minerals: Quartz Sand-10%; Clay-8%; Phosphatic Sand-2%
			Other Features: Fossiliferous
			Fossils: Mollusks
			Limestone and sandy clay interbedded. Dark brown clay and quartz sand around weathered poorly indurated limestone. Fossiliferous interval where Ocala Limestone index fossils are seen for the first time. Quartz sand, clay, and phosphate sand are in this interval.
22	-	23	Limestone; Grayish Brown (10YR 6/2) To White (N9)
			Intergranular
			Grain Type: Calcilutite; Skeletal
			Grain Size: Very Fine; Range: Very Fine To Fine
			Poor Induration
			Cement Type(s): Calcilutite Matrix; Clay Matrix
			Sedimentary Structures: Interbedded
			Accessory Minerals: Quartz Sand-5%; Clay-4%; Phosphatic Sand-1%
			Other Features: Fossiliferous
			Fossils: Mollusks
			Similar interbedded interval and by 23 feet the dark clay is gone and limestone dominates the lithology going forward. Quartz sand, clay, and phosphate sand are in this interval as cavings.
23	-	28	Wackestone; White (N9) To Light Yellowish Orange (10YR 8/6)
			Intergranular

Grain Type: Calcilutite; Skeletal

Grain Size: Very Fine; Range: Very Fine To Fine Poor Induration Cement Type(s): Calcilutite Matrix Other Features: Friable; Chalky; Fossiliferous Fossils: Mollusks Intergranular wackestone that is friable and poorly indurated. Fossils are present but weathered limestone makes it harder to discern them. 33 Wackestone; White (N9) To Light Yellowish Orange (10YR 8/6) Intergranular Grain Type: Calcilutite; Skeletal Grain Size: Very Fine; Range: Very Fine To Fine Poor Induration Cement Type(s): Calcilutite Matrix Other Features: Friable; Chalky; Fossiliferous Fossils: Mollusks Similar to above, friable limestone, fossils are hard to see because of calcilutite coating of grains. -38 Wackestone; White (N9) To Light Yellowish Orange (10YR 8/6) Intergranular Grain Type: Calcilutite; Skeletal Grain Size: Very Fine; Range: Very Fine To Fine Poor Induration Cement Type(s): Calcilutite Matrix Other Features: Friable; Chalky; Fossiliferous Fossils: Mollusks Final interval of rubbly friable wackestone, next interval is more well indurated and more granular than this interval which is calcilutite dominated. 43 Grainstone; White (N9) To Very Light Orange (10YR 8/2) Intergranular Grain Type: Skeletal; Calcilutite Grain Size: Medium; Range: Fine To Medium Moderate Induration Cement Type(s): Calcilutite Matrix Accessory Minerals: Calcite-1%; Iron Stain-<1% Other Features: Fossiliferous Fossils: Benthic Foraminifera; Echinoid; Mollusks; Gastropods Moderately indurated grainstone that in this interval teeters closely to packstone/grainstone line. Highly fossiliferous and trace calcite and iron stain. 46.5 Packstone; White (N9) To Very Light Orange (10YR 8/2) Intergranular Grain Type: Skeletal; Calcilutite Grain Size: Medium; Range: Very Fine To Medium Moderate Induration Cement Type(s): Calcilutite Matrix

28

33

38

43

			Accessory Minerals: Calcite-1%
			Other Features: Fossiliferous
			Fossils: Echinoid; Mollusks; Gastropods; Brachiopod
			Less fossiliferous interval, still a packstone but more calcilutite. Lepidocyclina dominates the fossil assemblage in this interval.
46.5	-	50	Wackestone; White (N9) To Very Light Orange (10YR 8/2)
			Intergranular
			Grain Type: Calcilutite; Skeletal
			Grain Size: Very Fine; Range: Very Fine To Fine
			Poor Induration
			Cement Type(s): Calcilutite Matrix
			Other Features: Chalky
			Fossils: Benthic Foraminifera
			Calcilutite dominated interval where fossils are not as evident as above, more chalky and no real vugs or molds in this interval.
			Intergranular
50	-	52	Packstone; White (N9) To Very Light Orange (10YR 8/2)
			Intergranular
			Grain Type: Skeletal; Calcilutite
			Grain Size: Medium; Range: Very Fine To Medium
			Moderate Induration
			Cement Type(s): Calcilutite Matrix
			Accessory Minerals: Calcite-1%
			Other Features: Fossiliferous
			Fossils: Benthic Foraminifera; Echinoid; Mollusks; Gastropods
			Fossiliferous chalky packstone, where fossils are present and highly concentrated but with depth and within the center of the core the fossils are not as prevalent.
52	-	57	Packstone; White (N9) To Very Light Orange (10YR 8/2)
			Intergranular
			Grain Type: Skeletal; Calcilutite
			Grain Size: Fine; Range: Very Fine To Medium
			Poor Induration
			Cement Type(s): Calcilutite Matrix
			Accessory Minerals: Calcite-1%
			Other Features: Fossiliferous
			Fossils: Fossil Molds; Benthic Foraminifera; Gastropods
			More calcilutite dominated interval, where fossils and molds are present on the outside of the core, but when hit with rock hammer, fossils are not as prevalent in the middle of the core.
57	-	64	Packstone; White (N9) To Very Light Orange (10YR 8/2)
			Intergranular, Moldic
			Grain Type: Skeletal; Calcilutite
			Grain Size: Fine; Range: Very Fine To Medium
			Poor Induration
			Cement Type(s): Calcilutite Matrix
			Other Features: Fossiliferous; Chalky

			Fossils: Fossil Molds; Benthic Foraminifera; Mollusks; Gastropods
			Similar to above, when fractured with hammer, fossils are prevalent in the center of the core. Predominately Lepidocyclina and Nummulites.
62	-	64	Packstone; White (N9) To Very Light Orange (10YR 8/2)
			Intergranular
			Grain Type: Skeletal; Calcilutite
			Grain Size: Fine; Range: Very Fine To Medium
			Poor Induration
			Cement Type(s): Calcilutite Matrix
			Other Features: Fossiliferous; Chalky
			Fossils: Fossil Molds; Benthic Foraminifera; Mollusks; Gastropods
			Similar to above, highly fossiliferous packstone.
64	-	69	Packstone; White (N9) To Very Light Orange (10YR 8/2)
			Intergranular
			Grain Type: Skeletal; Calcilutite
			Grain Size: Fine; Range: Very Fine To Medium
			Poor Induration
			Cement Type(s): Calcilutite Matrix
			Accessory Minerals: Calcite-1%
			Other Features: Fossiliferous; Chalky
			Fossils: Fossil Molds; Benthic Foraminifera; Mollusks; Gastropods
			More fossiliferous and granular than above, packstone with Lepidocyclina and Nummulites with other fossils and molds.
69	-	71.5	Packstone; White (N9) To Very Light Orange (10YR 8/2)
			Intergranular
			Grain Type: Skeletal; Calcilutite
			Grain Size: Fine; Range: Very Fine To Fine
			Poor Induration
			Cement Type(s): Calcilutite Matrix
			Other Features: Fossiliferous; Chalky
			Fossils: Benthic Foraminifera; Mollusks; Gastropods
			Packstone with smoother chalk like texture on the outside of the core. Highly fossiliferous interval where fossils are not seen on the outside of core like the other intervals in this box and others. With depth tending back to fossils seen on the outside
71.5	-	73	Grainstone; White (N9) To Very Light Orange (10YR 8/2)
			Intergranular
			Grain Type: Skeletal; Calcilutite
			Grain Size: Medium; Range: Very Fine To Medium
			Poor Induration
			Cement Type(s): Calcilutite Matrix
			Other Features: Fossiliferous; Chalky; Friable
			Fossils: Benthic Foraminifera; Mollusks; Gastropods
			Much more dense concentration of foraminifera. Interval is friable and tends back to the chalk like interval.

73 - 80 Packstone; White (N9) To Very Light Orange (10YR 8/2) Intergranular

Grain Type: Skeletal; Calcilutite Grain Size: Fine; Range: Very Fine To Fine Poor Induration Cement Type(s): Calcilutite Matrix Other Features: Fossiliferous; Chalky Fossils: Benthic Foraminifera; Mollusks Finer grained packstone with smoother chalk like texture similar to an interval above this. Forams still present just not as concentrated as in the interval above this. Less than 100% recovery, slightly rubbly. 78 80 Packstone; White (N9) To Very Light Orange (10YR 8/2) Intergranular, Moldic Grain Type: Skeletal; Calcilutite Grain Size: Fine; Range: Very Fine To Fine Poor Induration Cement Type(s): Calcilutite Matrix Other Features: Fossiliferous; Chalky Fossils: Benthic Foraminifera; Mollusks; Fossil Molds Similar to above, slighly moldic porosity. Rubbly recovery and less than 100% recovery. See W-19635 for intervals 80'-350'.

# Appendix C2. Lithologic Log for COREHOLE 2 West Citrus Well Site in Citrus County, Florida

LITHOLOGIC WELL LOG PRINTOUT

SOURCE - FGS

WELL NUMBER: W-19635 TOTAL DEPTH: 80 FT. 76 SAMPLES FROM 80 TO 350 FT. COUNTY: CITRUS LOCATION: LAT = 28° 42' 0.35" LON = 82° 33' 57.33"

#### ELEVATION: FT

COMPLETION DATE: OWNER/DRILLER:/ WORKED BY: ZACHARY R. ZARRANZ 2017 WELL NAME: West Citrus Core Hole 2; See West Citrus Core Hole 1 (W-19634) for intervals 0'-80'.

80	-	157.5	1240CAL	Ocala Limestone
157.5	-		124AVPK	Avon Park Formation
80	-	85	Wackestone; White	(N9) To Yellowish Gray (5Y 8/1)
			Intergranular, Mold	ic
			Grain Type: Calcilu	tite; Skeletal
			Grain Size: Very Fin	ne; Range: Very Fine To Fine
			Good Induration	
			Cement Type(s): Ca	alcilutite Matrix
			Accessory Minerals	:: Calcite-1%
			Other Features: Fos	siliferous; Chalky
			Fossils: Fossil Mole	ls; Benthic Foraminifera; Mollusks; Coral
			About 80% recover chalky calcilutite, sl	y for this entire box, as one full row is empty and recovery is rubbly. Wackestone with light recrystallization, and fossil molds.
85	-	90	Packstone; White (1	N9) To Yellowish Gray (5Y 8/1)
			Intergranular, Mold	ic
			Grain Type: Skeleta	l; Calcilutite
			Grain Size: Very Fin	ne; Range: Very Fine To Medium
			Moderate Induration	n
			Cement Type(s): Ca	lcilutite Matrix
			Accessory Minerals	:: Calcite-1%
			Other Features: Fos	siliferous; Chalky
			Fossils: Fossil Mole	ls; Mollusks; Gastropods
			Similar to above, sli	ightly more moldic porosity.
90	-	95	Packstone; White (N	N9) To Yellowish Gray (5Y 8/1)
			Intergranular	
			Grain Type: Skeleta	l; Biogenic
			Grain Size: Very Fin	ne; Range: Very Fine To Medium

			Moderate Induration
			Cement Type(s): Calcilutite Matrix
			Accessory Minerals: Calcite-1%
			Other Features: Fossiliferous
			Fossils: Fossil Molds; Mollusks; Benthic Foraminifera; Bryozoa
			Larger mollusk fossils, over two inches across, as well as more fossiliferous in general. Lithology similar to
			above, full recovery.
95	-	100	Packstone; White (N9) To Yellowish Gray (5Y 8/1)
			Intergranular, Moldic
			Grain Type: Skeletal; Biogenic
			Grain Size: Fine; Range: Very Fine To Medium
			Moderate Induration
			Cement Type(s): Calcilutite Matrix
			Sedimentary Structures: Burrowed
			Other Features: Fossiliferous
			Fossils: Fossil Molds; Mollusks; Benthic Foraminifera; Bryozoa
			Similar to above, burrowed portion of interval clearly dug out and structured. Large mollusk molds present. Overall highly fossiliferous packstone.
100	-	104.5	Packstone; White (N9) To Yellowish Gray (5Y 8/1)
			Intergranular, Moldic
			Grain Type: Skeletal; Calcilutite
			Grain Size: Fine; Range: Very Fine To Medium
			Good Induration
			Cement Type(s): Calcilutite Matrix
			Accessory Minerals: Calcite-2%
			Other Features: Fossiliferous
			Fossils: Benthic Foraminifera; Mollusks; Fossil Molds
			Similar to above, more condensed fossil assemblages in this interval.
104.5	-	110	Packstone; White (N9) To Yellowish Gray (5Y 8/1)
			Intergranular, Pinpoint
			Grain Type: Skeletal; Biogenic
			Grain Size: Very Fine; Range: Very Fine To Medium
			Good Induration
			Cement Type(s): Calcilutite Matrix
			Accessory Minerals: Calcite-1%
			Other Features: Fossiliferous
			Fossils: Benthic Foraminifera; Fossil Molds
			More calcilutite in this interval. Still fossiliferous but not nearly as dense amount of fossils as above.
110	-	115	Packstone; White (N9) To Yellowish Gray (5Y 8/1)
			Intergranular, Moldic
			Grain Type: Skeletal; Biogenic
			Grain Size: Very Fine; Range: Fine To Medium
			Good Induration

			Cement Type(s): Calcilutite Matrix
			Sedimentary Structures: Burrowed
			Accessory Minerals: Calcite-2%
			Other Features: Fossiliferous
			Fossils: Fossil Molds; Benthic Foraminifera; Mollusks; Gastropods
			Moldic packstone with a trace amount of organics and quartz sand on the outside of core, most likely is the result of post drilling process.
115	-	120	Packstone; White (N9) To Yellowish Gray (5Y 8/1)
			Intergranular, Moldic, Pinpoint
			Grain Type: Skeletal; Skeletal Cast
			Grain Size: Very Fine; Range: Very Fine To Medium
			Good Induration
			Cement Type(s): Calcilutite Matrix
			Sedimentary Structures: Burrowed
			Other Features: Fossiliferous
			Fossils: Fossil Molds; Gastropods; Echinoid; Benthic Foraminifera
			Similar to above, highly moldic packstone with fossils and fossil molds throughout interval. A yellow stain on the inside of the core at $\sim$ 199.5'.
120	-	120.5	Wackestone; White (N9) To Yellowish Gray (5Y 8/1)
			Intergranular
			Grain Type: Skeletal; Calcilutite
			Grain Size: Very Fine; Range: Very Fine To Fine
			Good Induration
			Cement Type(s): Calcilutite Matrix
			Other Features: Fossiliferous; Low Recrystallization
			Fossils: Benthic Foraminifera
			Small interval of low recrystallized wackestone, just below this the foram assemblage of the limestone is the same.
120.5	-	125	Packstone; White (N9) To Yellowish Gray (5Y 8/1)
			Intergranular, Moldic, Pinpoint
			Grain Type: Skeletal; Skeletal Cast
			Grain Size: Very Fine; Range: Very Fine To Coarse
			Moderate Induration
			Cement Type(s): Calcilutite Matrix
			Accessory Minerals: Calcite-1%
			Other Features: Fossiliferous
			Fossils: Benthic Foraminifera; Miliolids; Gastropods; Fossil Molds
			Much less Lepidocyclina and Nummulites. More of a miliolid packstone, almost a grainstone just still noticeable calcilutite.
125	-	130	Packstone; White (N9) To Yellowish Gray (5Y 8/1)
			Intergranular, Moldic, Pinpoint
			Grain Type: Skeletal; Calcilutite
			Grain Size: Very Fine; Range: Very Fine To Medium
			Good Induration

			Cement Type(s): Calcilutite Matrix
			Accessory Minerals: Calcite-1%
			Other Features: Fossiliferous
			Fossils: Benthic Foraminifera; Mollusks; Gastropods; Coral
			Similar to above, large brachiopod molds still persist, as well as other fossils and molds that are present throughout the interval.
130	-	135	Packstone; White (N9) To Yellowish Gray (5Y 8/1)
			Intergranular, Moldic, Pinpoint
			Grain Type: Skeletal; Biogenic
			Grain Size: Very Fine; Range: Very Fine To Medium
			Good Induration
			Cement Type(s): Calcilutite Matrix
			Accessory Minerals: Calcite-1%
			Other Features: Fossiliferous
			Fossils: Benthic Foraminifera; Miliolids; Gastropods; Mollusks; Coral
			Similar to above, smooth but moldic texture of the outside of the core. Tending toward a grainstone. There is crystal growth within the vug spaces.
135	-	140	Grainstone; White (N9) To Yellowish Gray (5Y 8/1)
			Intergranular, Pinpoint
			Grain Type: Skeletal; Calcilutite
			Grain Size: Very Fine; Range: Very Fine To Medium
			Moderate Induration
			Cement Type(s): Calcilutite Matrix
			Accessory Minerals: Calcite-1%
			Other Features: Fossiliferous
			Fossils: Benthic Foraminifera; Miliolids
			Crystal growth continues and is most noticeable at ~137.5'. Molds are less prevalent and much smaller in this interval. Miliolid grainstone is consistent and only sparingly is this interval calcilutite is more than 10-15%.
140	-	145	Packstone; White (N9) To Yellowish Gray (5Y 8/1)
			Intergranular, Pinpoint
			Grain Type: Skeletal; Calcilutite
			Grain Size: Very Fine; Range: Very Fine To Medium
			Good Induration
			Cement Type(s): Calcilutite Matrix
			Accessory Minerals: Calcite-1%
			Other Features: Fossiliferous
			Fossils: Benthic Foraminifera; Miliolids; Fossil Molds; Mollusks
			Crystal growth still present around vugs. Packstone with more calcilutite than above. Large mollusk shell and shell fragments at the base of this interval and seen in the interval below.
145	_	150	Packstone; White (N9) To Light Yellowish Orange (10YR 8/6)
			Intergranular, Moldic, Pinpoint
			Grain Type: Skeletal; Calcilutite
			Grain Size: Very Fine; Range: Very Fine To Medium

		Moderate Induration Cement Type(s): Calcilutite Matrix Accessory Minerals: Calcite-2% Other Features: Fossiliferous; Low Recrystallization Fossils: Benthic Foraminifera; Mollusks; Miliolids; Gastropods; Fossil Molds Crystal growth within vugs and on the outside of the core continues. Moldic porosity increases with depth as does iron staining, which is present within the core from ~149'-150'. Fossils are present within the miliolid packstone.
150 -	152	Packstone; White (N9) To Yellowish Gray (5Y 8/1) Intergranular, Moldic, Pinpoint Grain Type: Skeletal; Calcilutite Grain Size: Very Fine; Range: Very Fine To Medium Good Induration Cement Type(s): Calcilutite Matrix Accessory Minerals: Calcite-3% Other Features: Fossiliferous; Medium Recrystallization Fossils: Fossil Molds; Brachiopod; Gastropods; Benthic Foraminifera More recrystallized packstone, with iron stain at the base of the interval. Highly moldic porosity and calcite crystal growth not just within vugs, but now throughout core.
152 -	155.5	Packstone; White (N9) To Very Light Orange (10YR 8/2) Intergranular Grain Type: Skeletal; Crystals Grain Size: Very Fine; Range: Microcrystalline To Medium Good Induration Cement Type(s): Calcilutite Matrix Sedimentary Structures: Laminated Accessory Minerals: Calcite-4%; Organics-<1% Other Features: Medium Recrystallization; Fossiliferous Fossils: Miliolids; Benthic Foraminifera; Fossil Molds Archaias present within the miliolid packstone. Moderate recrystallization throughout the interval that increases with depth. Trace organics in one thin layer at 155.5'. Top of Avon Park Formation at 155.5'. Decision to make formation pick based upon over
155.5 -	157.5	Packstone; Very Light Orange (10YR 8/2) To Grayish Orange (10YR 7/4) Intergranular Grain Type: Skeletal; Calcilutite Grain Size: Very Fine; Range: Very Fine To Fine Good Induration Cement Type(s): Calcilutite Matrix; Dolomite Sedimentary Structures: Laminated Accessory Minerals: Organics-1% Other Features: Medium Recrystallization; Fossiliferous; Dolomitic Fossils: Miliolids; Fossil Molds; Benthic Foraminifera Recrystallized packstone, with organic laminations and a dolomitic component.

157.5 - 158 Dolostone; Very Light Orange (10YR 8/2) To Grayish Orange (10YR 7/4)

			Intergranular; Highly (50-90%); Subhedral
			Grain Size: Verv Fine: Range: Verv Fine To Fine
			Good Induration
			Cement Type(s): Dolomite
			Accessory Minerals: Organics-1%
			Other Features: Low Recrystallization
			Dolostone interval last 6 inches of box where the last row is empty. Organics dispersed and a layer is at the
			base of the interval.
158	-	160	No Sample;
160	-	162	Dolostone; Grayish Brown (10YR 6/2) To Yellowish Gray (5Y 8/1)
			Intergranular; Highly (50-90%); Subhedral
			Grain Size: Very Fine; Range: Microcrystalline To Fine
			Good Induration
			Cement Type(s): Dolomite
			Sedimentary Structures: Laminated
			Accessory Minerals: Organics-5%
			Laminated dolostone with organics throughout interval, very good induration where interval below is more
			rubbly and less dense and crystalline. Poor recovery for box as 164'-170' is empty.
162	_	164	Dolostone: Gravish Brown (10VR 6/2) To Vellowish Grav (5V 8/1)
102		101	Intergranular Fracture: Highly (50-90%): Subhedral
			Grain Size: Very Fine: Range: Microcrystalline To Fine
			Good Induration
			Cement Type(s): Dolomite
			Sedimentary Structures: Mottled
			Accessory Minerals: Organics-1%
			Fractured dolostone with rubbly recovery compared to interval above. Organics less definitively bedded
			Poor recovery for box as 164'-170' is empty.
		1.50	
164	-	170	No Sample;
170	_	175	Dolostone; Gravish Orange (10YR 7/4) To Gravish Brown (10YR 6/2)
			Intergranular, Pinpoint, Moldic; Highly (50-90%); Subhedral
			Grain Size: Very Fine; Range: Microcrystalline To
			Good Induration
			Cement Type(s): Dolomite
			Sedimentary Structures: Laminated
			Accessory Minerals: Organics-2%
			Fossils: Fossil Molds
			Dolostone with pinpoint vugs and moldic porosity less so. Organic laminations where they are very defined
			and almost look like plant fossils. Fossil molds of forams present.
175		177	Delectory Cresich Brown (10VB (/2) Te Cresich O (10VB 7/4)
1/3	-	1//	Intergraphic Moldie Dippoint: Highly (50,000/): Such adrel
			Intergranular, Moldic, Pinpoint, Fignily (50-90%); Subnedral
			Grad Indunction

			Cement Type(s): Dolomite
			Sedimentary Structures: Laminated
			Accessory Minerals: Organics-1%
			Other Features: Fossiliferous
			Fossils: Fossil Molds; Echinoid; Mollusks
			Highly moldic dolostone with the top of the interval marked by an organic lamination. With depth tending to more densely laminated and darker dolostone with more organics.
177	-	178	Dolostone; Moderate Yellowish Brown (10YR 5/4) To Dark Yellowish Brown (10YR 4/2)
			Intergranular, Pinpoint; Highly (50-90%); Subhedral
			Grain Size: Microcrystalline; Range: Microcrystalline To Very Fine
			Good Induration
			Cement Type(s): Dolomite
			Sedimentary Structures: Laminated
			Interval with densely laminated organics.
178	-	180	Wackestone; Yellowish Gray (5Y 8/1) To Grayish Brown (10YR 6/2)
			Intergranular
			Grain Type: Calcilutite; Skeletal
			Grain Size: Very Fine; Range: Microcrystalline To Fine
			Good Induration
			Cement Type(s): Calcilutite Matrix; Dolomite
			Accessory Minerals: Dolomite-12%; Calcite-2%
			Other Features: Low Recrystallization
			Fossils: Fossil Molds
			Wackestone coated in organics and partially dolomitized. Fossil molds present and some molds have become crystallized calcite. Less than 100% recovery.
180	-	181.5	Wackestone; Grayish Orange (10YR 7/4) To Yellowish Gray (5Y 8/1)
			Intergranular, Pinpoint
			Grain Type: Skeletal; Skeletal Cast
			Grain Size: Microcrystalline; Range: Microcrystalline To Fine
			Good Induration
			Cement Type(s): Calcilutite Matrix; Dolomite
			Accessory Minerals: Dolomite-20%
			Other Features: Dolomitic
			Fossils: Fossil Molds
			Wackestone with dolomitic influence where dolomite crystals are increasing with depth. Where dolomite conversion completely occurs within the next two feet of core.
181.5	-	185	Dolostone; Grayish Brown (10YR 6/2) To Moderate Yellowish Brown (10YR 5/4)
			Intergranular, Pinpoint; Highly (50-90%); Subhedral
			Grain Size: Microcrystalline; Range: Microcrystalline To Fine
			Good Induration
			Cement Type(s): Dolomite; Calcilutite Matrix
			Accessory Minerals: Organics-1%
			Fossils: Fossil Molds

Calcareous dolo	ostone. Cemented	l forams still	present in	interval.

185	-	187.5	Dolostone; Moderate Yellowish Brown (10YR 5/4) To Dark Yellowish Brown (10YR 4/2) Intergranular, Pinpoint, Moldic; Highly (50-90%); Subhedral
			Grain Size: Microcrystalline; Range: Microcrystalline To Fine
			Good Induration
			Cement Type(s): Dolomite
			Accessory Minerals: Organics-1%
			Other Features: Sucrosic
			Fossils: Fossil Molds; Gastropods
			Dolostone with pinpoint vugs and some molds throughout interval. Pinpoint vugs abruptly stop at 187.5'
187.5	-	192	Limestone; Yellowish Gray (5Y 8/1) To Black (N1)
			Intergranular
			Grain Type: Calcilutite; Skeletal
			Grain Size: Microcrystalline; Range: Microcrystalline To Fine
			Moderate Induration
			Cement Type(s): Calcilutite Matrix; Organic Matrix
			Sedimentary Structures: Interbedded; Laminated
			Accessory Minerals: Organics-30%
			Gray interval where organic laminations dominate interval. Limestone and organics interbedded and there are intraclasts. In the interval at the base. The gray organic interbedding continues for another foot after this interval.
192	_	196	Mudstone; Yellowish Gray (5Y 8/1) To Very Light Orange (10YR 8/2)
			Intergranular, Pinpoint
			Grain Type: Calcilutite; Skeletal
			Grain Size: Microcrystalline; Range: Microcrystalline To Very Fine
			Good Induration
			Cement Type(s): Calcilutite Matrix
			Sedimentary Structures: Laminated
			Accessory Minerals: Organics-2%; Calcite-<1%
			Other Features: Low Recrystallization
			Fossils: Fossil Molds
			Mudstone with low recrystallization throughout interval and fine molds within core as well as pinpoint vugs on the outside of core.
196	_	200	Mudstone; Yellowish Gray (5Y 8/1) To Grayish Brown (10YR 6/2)
			Intergranular, Low Permeability
			Grain Type: Calcilutite; Skeletal
			Grain Size: Microcrystalline; Range: Microcrystalline To Very Fine
			Good Induration
			Cement Type(s): Calcilutite Matrix
			Accessory Minerals: Organics-1%
			Other Features: Low Recrystallization
			Fossils: Fossil Molds
			Similar to above, organic laminations dissipate. Pinpoint vugs present, more so within the inside of the core. Large fossil mold at the base of the interval, smaller ones seen throughout.

200	-	202	Wackestone; Yellowish Gray (5Y 8/1) To Grayish Orange (10YR 7/4)
			Intergranular, Low Permeability
			Grain Type: Skeletal; Calcilutite
			Grain Size: Very Fine; Range: Very Fine To Fine
			Good Induration
			Cement Type(s): Calcilutite Matrix
			Accessory Minerals: Organics-1%
			Other Features: Low Recrystallization
			Fossils: Fossil Molds; Mollusks; Gastropods; Coral
			Gray wackestone that is highly fossiliferous. This interval exhibits low recrystallization, recrystallization is concentrated around corals and other fossil molds. Organics presents intermittently. Potential barnacle fossils seen.
202	-	206	Wackestone; Yellowish Gray (5Y 8/1) To Light Olive Gray (5Y 6/1)
			Intergranular
			Grain Type: Calcilutite; Skeletal
			Grain Size: Microcrystalline: Range: Microcrystalline To Medium
			Good Induration
			Cement Type(s): Calcilutite Matrix
			Sedimentary Structures: Mottled
			Accessory Minerals: Organics-1%
			Other Features: Medium Recrystallization
			Fossils: Cones: Fossil Molds: Mollusks: Gastropods
			Lighter slightly mottled wackestone, equally fossiliferous to the interval below but recrystallization destroys
			the skeletal remains, but molds remain mostly intact. Potential barnacle fossils seen.
206	-	210	Dolostone; Yellowish Gray (5Y 8/1) To Very Light Orange (10YR 8/2)
			Intergranular, Low Permeability, Moldic; Highly (50-90%); Euhedral
			Grain Size: Microcrystalline; Range: Microcrystalline To Fine
			Good Induration
			Cement Type(s): Dolomite
			Accessory Minerals: Calcite-1%
			Other Features: Low Recrystallization
			Fossils: Fossil Molds
			Hard dense dolostone with calcite crystal growth in the vug/mold space. Fractured dolostone has its ends coated in calcilutite.
210	_	215	Dolostone; Yellowish Gray (5Y 8/1) To Grayish Orange (10YR 7/4)
			Intergranular, Pinpoint, Low Permeability; Highly (50-90%); Euhedral
			Grain Size: Microcrystalline; Range: Microcrystalline To Fine
			Good Induration
			Cement Type(s): Dolomite
			Accessory Minerals: Calcite-1%; Iron Stain-<1%
			Other Features: Low Recrystallization
			Fossils: Fossil Molds; Gastropods
			Similar to above, more pinpoint vugs seen on the outside and inside of core. Highly moldic with trace iron stain at base of interval. Crystal growth still present in pinpoint vugs, but not in every vug, growth is more sporadic.

215	-	219.5	Dolostone; Yellowish Gray (5Y 8/1) To Grayish Orange (10YR 7/4)
			Intergranular, Low Permeability, Pinpoint; Highly (50-90%); Euhedral
			Grain Size: Microcrystalline; Range: Microcrystalline To Fine
			Good Induration
			Cement Type(s): Dolomite
			Sedimentary Structures: Mottled
			Accessory Minerals: Organics-1%: Iron Stain-<1%
			Fossils: Fossil Molds
			Similar to above more dense and less vugular. Organic mottling throughout the last counterfeet of the
			interval and the base of it is marked by a friable organic dolostone.
219.5	-	221	Dolostone; Yellowish Gray (5Y 8/1) To Grayish Brown (10YR 6/2)
			Intergranular; Highly (50-90%); Subhedral
			Grain Size: Microcrystalline; Range: Microcrystalline To Fine
			Moderate Induration
			Cement Type(s): Dolomite
			Sedimentary Structures: Mottled; Laminated
			Accessory Minerals: Organics-4%
			Other Features: Low Recrystallization
			Fossils: Fossil Molds
			Mottled organic interval where organics are more prominent in this interval. Few fossil molds. Samples go back to massive dense dolostone below.
221	-	225	Dolostone; Yellowish Gray (5Y 8/1) To Dark Yellowish Orange (10YR 6/6)
			Intergranular, Pinpoint, Low Permeability; Highly (50-90%); Subhedral
			Grain Size: Microcrystalline; Range: Microcrystalline To Fine
			Good Induration
			Cement Type(s): Dolomite
			Sedimentary Structures: Mottled; Streaked
			Accessory Minerals: Organics-2%
			Other Features: Low Recrystallization
			Fossils: Fossil Molds
			Pinpoint vugs throughout interval. Dense massive interval where the only accessory is mottled dolostone that appears in the interval with some organics streaks as well.
225	-	228	Dolostone; Light Yellowish Orange (10YR 8/6) To Dark Yellowish Orange (10YR 6/6)
			Intergranular; Highly (50-90%); Euhedral
			Grain Size: Microcrystalline; Range: Microcrystalline To Fine
			Good Induration
			Cement Type(s): Dolomite
			Sedimentary Structures: Massive
			Accessory Minerals: Organics-<1%
			Euhedral dolostone that when fractured is very granular and not very recrystallized.
228	-	233	Dolostone; Very Light Orange (10YR 8/2) To Grayish Orange (10YR 7/4)
			Intergranular, Pinpoint, Low Permeability; Highly (50-90%); Subhedral
			Grain Size: Microcrystalline; Range: Microcrystalline To Fine

			Good Induration Cement Type(s): Dolomite Sedimentary Structures: Laminated Accessory Minerals: Organics-1% Other Features: Low Recrystallization Fossils: Fossil Molds; Echinoid; Gastropods Neolaganum dalli seen as molds. Dolostone with pinpoint vugs throughout and fossil molds. Crystallinity tends to anhedral with depth as do laminations.
233	-	235	Dolostone; Dark Yellowish Orange (10YR 6/6) To Moderate Yellowish Brown (10YR 5/4) Intergranular, Pinpoint, Possibly High Permeability; Highly (50-90%); Subhedral Grain Size: Microcrystalline; Range: Microcrystalline To Fine Good Induration Cement Type(s): Dolomite Other Features: Low Recrystallization Fossils: Fossil Molds More porous interval of dolostone that is most porous at 234'. Tending toward highly moldic dolostone.
235	-	237	Dolostone; Yellowish Gray (5Y 8/1) To Very Light Orange (10YR 8/2) Intergranular, Moldic, Pinpoint; Highly (50-90%); Anhedral Grain Size: Microcrystalline; Range: Microcrystalline To Very Fine Good Induration Cement Type(s): Dolomite Other Features: Fossiliferous; Low Recrystallization Fossils: Fossil Molds; Echinoid; Gastropods; Mollusks Highly moldic dolostone. Fossil molds recrystallized as fractured fossils internal structure is destroyed.
237	-	239.5	Dolostone; White (N9) To Yellowish Gray (5Y 8/1) Intergranular, Pinpoint; Highly (50-90%); Anhedral Grain Size: Microcrystalline; Range: Microcrystalline To Very Fine Moderate Induration Cement Type(s): Dolomite Fossils: Fossil Molds White dolostone that becomes less moldic and more chalky and less indurated, base of interval marked by organic laminations.
239.5	-	241	Dolostone; Yellowish Gray (5Y 8/1) To Very Light Orange (10YR 8/2) Intergranular; Highly (50-90%); Anhedral Grain Size: Microcrystalline; Range: Microcrystalline To Very Fine Moderate Induration Cement Type(s): Dolomite Sedimentary Structures: Laminated Accessory Minerals: Organics-1% Other Features: Low Recrystallization Softer chalkier interval with few organic laminations and low recrystallization.

241	-	242.1	Dolostone; Yellowish Gray (5Y 8/1) To Very Light Orange (10YR 8/2)
			Intergranular, Possibly High Permeability, Moldic; Highly (50-90%); Subhedral
			Grain Size: Microcrystalline; Range: Microcrystalline To Very Fine
			Moderate Induration
			Cement Type(s): Dolomite
			Other Features: Low Recrystallization
			Fossils: Fossil Molds
			Porous weathered light dolostone with vugs on the inside of the core with low recrystallization.
242.1	-	246.5	Dolostone; Yellowish Gray (5Y 8/1) To Very Light Orange (10YR 8/2)
			Intergranular; Highly (50-90%); Anhedral
			Grain Size: Microcrystalline: Range: Microcrystalline To Very Fine
			Moderate Induration
			Cement Type(s): Dolomite
			Sedimentary Structures: Laminated: Mottled
			Accessory Minerals: Organics-3%
			Other Features: Low Recrystallization
			Organic laminations and mottling throughout interval. Mostly anhedral crystallinity and low recrystallization
			organic rammations and mourning throughout interval. Wostry annear a crystanning and low recrystanization
246.5	_	248	Dolostone: Yellowish Gray (5Y 8/1) To Very Light Orange (10YR 8/2)
21010		2.0	Intergranular Pinnoint Moldic: Highly (50-90%): Subhedral
			Grain Size: Microcrystalline: Range: Microcrystalline To Very Fine
			Good Induration
			Cement Type(s): Dolomite
			Sedimentary Structures: Laminated
			A coessory Minerals: Organics_1%
			Other Features: Low Recrystallization
			Fossils: Fossil Molds
			Moldic interval With minor laminations and recrystallization
			worder interval, with minor familiations and reerystamzation.
248	-	250	Dolostone; Yellowish Gray (5Y 8/1) To Very Light Orange (10YR 8/2)
			Intergranular, Pinpoint; Highly (50-90%); Anhedral
			Grain Size: Microcrystalline: Range: Microcrystalline To Very Fine
			Good Induration
			Cement Type(s): Dolomite
			Sedimentary Structures: Mottled: Laminated
			Accessory Minerals: Organics-1%
			Other Features: Low Recrystallization: Chalky
			Chalkier interval with organic mottling and low recrystallization. Easils and molds are not present as
			microcystalline dolostone dominates interval.
		a	
250	-	255	Dolostone; Yellowish Gray $(5Y 8/1)$ To Yellowish Gray $(5Y 7/2)$
			Intergranular, Low Permeability; Highly (50-90%); Anhedral
			Grain Size: Microcrystalline; Range: Microcrystalline To Very Fine
			Good Induration
			Cement Type(s): Dolomite
			Sedimentary Structures: Massive; Laminated; Mottled

Accessory Minerals: Organics-3%

Very consistent massive dolostone, mottled and laminated with organics. Similar to above, and this similar lithology persists till the end of the box at 259.5' where recrystallization is noticeable.

- 255 259.5 Dolostone; Yellowish Gray (5Y 8/1) To Yellowish Gray (5Y 7/2)
   Intergranular, Low Permeability, Pinpoint; Highly (50-90%); Anhedral
   Grain Size: Microcrystalline; Range: Microcrystalline To Very Fine
   Good Induration
   Cement Type(s): Dolomite
   Sedimentary Structures: Massive; Laminated; Mottled
   Accessory Minerals: Organics-3%
   Fossils: Fossil Molds
   Slightly moldic at 258', but similar to above in the consistent microcrystalline dolostone with organics.
- 259.5 260.5 Dolostone; Yellowish Gray (5Y 8/1) To Grayish Orange (10YR 7/4) Intergranular, Pinpoint; Highly (50-90%); Subhedral Grain Size: Microcrystalline; Range: Microcrystalline To Very Fine Good Induration Cement Type(s): Dolomite Sedimentary Structures: Laminated Accessory Minerals: Organics-1% Other Features: Medium Recrystallization Fossils: Fossil Molds
  Regrutallized delectors that marks a context where, weeksetors begins to dom

Recrystallized dolostone that marks a contact where, wackestone begins to dominate lithology again. Color change does not make it noticeable but when tested with HCl and Alizarin red, limestone is confirmed as rock type.

260.5 - 265 Wackestone; Yellowish Gray (5Y 8/1) To Very Light Orange (10YR 8/2) Intergranular Grain Type: Calcilutite; Skeletal Grain Size: Very Fine; Range: Microcrystalline To Fine Good Induration Cement Type(s): Calcilutite Matrix Sedimentary Structures: Laminated Accessory Minerals: Organics-1% Other Features: Low Recrystallization Organic laminations at the top of the interval, but consistent white wackestone dominated by calcilutite.
265 - 270 Wackestone; Yellowish Gray (5Y 8/1) To Very Light Orange (10YR 8/2)

 - 270 Wackestone; Yellowish Gray (SY 8/1) To Very Light Orange (TOYR 8/2) Intergranular, Pinpoint Grain Type: Calcilutite; Skeletal Grain Size: Very Fine; Range: Microcrystalline To Fine Good Induration Cement Type(s): Calcilutite Matrix Other Features: Low Recrystallization Fossils: Fossil Molds Similar to above, increased recrystallization with depth and few fossil molds throughout interval.

270	-	271	Dolostone; Grayish Brown (10YR 6/2) To Moderate Yellowish Brown (10YR 5/4)
			Intergranular, Pinpoint; Highly (50-90%); Anhedral
			Grain Size: Microcrystalline; Range: Microcrystalline To Fine
			Good Induration
			Cement Type(s): Dolomite
			Other Features: Medium Recrystallization
			single bed of dolostone with pinpoint vugs. Back to limestone in the next interval.
271	-	276	Wackestone; Yellowish Gray (5Y 8/1) To Grayish Brown (10YR 6/2)
			Intergranular, Pinpoint, Moldic
			Grain Type: Calcilutite; Skeletal
			Grain Size: Very Fine; Range: Microcrystalline To Fine
			Good Induration
			Cement Type(s): Calcilutite Matrix
			Sedimentary Structures: Laminated
			Accessory Minerals: Organics-<1%
			Other Features: Low Recrystallization
			Fossils: Fossil Molds: Echinoid
			Similar to previous weekestone interval. More ninnoint was but similar lithology and low recrystallization
			Crystal growth in the vug space is present in this interval.
276	-	280	Wackestone; Yellowish Gray (5Y 8/1) To Very Light Orange (10YR 8/2)
			Intergranular, Pinpoint
			Grain Type: Calcilutite; Skeletal
			Grain Size: Microcrystalline; Range: Microcrystalline To Fine
			Good Induration
			Cement Type(s): Calcilutite Matrix
			Sedimentary Structures: Laminated
			Accessory Minerals: Organics-1%
			Other Features: Low Recrystallization
			Similar to above, trace laminations and low recrystallization throughout interval.
280	-	285	Wackestone; Yellowish Gray (5Y 8/1) To Very Light Orange (10YR 8/2)
			Intergranular
			Grain Type: Calcilutite; Skeletal
			Grain Size: Very Fine; Range: Microcrystalline To Very Fine
			Good Induration
			Cement Type(s): Calcilutite Matrix
			Sedimentary Structures: Laminated
			Accessory Minerals: Organics-3%
			Other Features: Low Recrystallization
			Fossils: Fossil Molds
			Similar to above, laminations continue throughout as well as recrystallization.
285	-	290	Wackestone; Yellowish Gray (5Y 8/1) To Grayish Brown (10YR 6/2)
			Intergranular
			Grain Type: Calcilutite; Skeletal

			Grain Size: Very Fine; Range: Microcrystalline To Very Fine
			Good Induration
			Cement Type(s): Calcilutite Matrix
			Sedimentary Structures: Laminated; Mottled
			Accessory Minerals: Organics-2%
			Other Features: Low Recrystallization
			Fossils: Fossil Molds
			Similar to above, consistent wackestone with low recrystallization. Organics are seen in other parts of the
			interval, more than just laminations.
290	-	295	Wackestone; Yellowish Gray (5Y 8/1) To Very Light Orange (10YR 8/2)
			Intergranular, Pinpoint
			Grain Type: Calcilutite; Skeletal
			Grain Size: Very Fine; Range: Microcrystalline To Fine
			Good Induration
			Cement Type(s): Calcilutite Matrix
			Other Features: Low Recrystallization
			Fossils: Fossil Molds
			Similar to above, fossil molds and casts are more evident in this interval as calcilutite is not as dominant throughout this interval as above.
295	-	300	Wackestone; Yellowish Gray (5Y 8/1) To Very Light Orange (10YR 8/2)
			Intergranular, Pinpoint
			Grain Type: Calcilutite; Skeletal
			Grain Size: Microcrystalline; Range: Microcrystalline To Fine
			Good Induration
			Cement Type(s): Calcilutite Matrix
			Other Features: Low Recrystallization
			Fossils: Fossil Molds
			Bedding contact at 296'. Again similar to above, with increased recrystallization with depth.
300	-	303.6	Wackestone; Yellowish Gray (5Y 8/1) To Very Light Orange (10YR 8/2)
			Intergranular
			Grain Type: Calcilutite; Skeletal Cast
			Grain Size: Microcrystalline; Range: Microcrystalline To Very Fine
			Good Induration
			Cement Type(s): Calcilutite Matrix; Dolomite
			Accessory Minerals: Dolomite-10%
			Other Features: Dolomitic
			Fossils: Fossil Molds
			Wackestone that has a dolomitic influence. Dolomite crystals are present throughout the interval and increase with depth to where the next interval is completely dolomitized.
303.6	_	307.3	Dolostone; Dark Yellowish Orange (10YR 6/6) To Moderate Yellowish Brown (10YR 5/4)
			Intergranular, Pinpoint; Highly (50-90%); Subhedral
			Grain Size: Very Fine; Range: Microcrystalline To Fine
			Good Induration

			Cement Type(s): Dolomite
			Accessory Minerals: Organics-1%
			Other Features: Sucrosic
			Fossils: Fossil Molds
			Sucrosic dolomite with abundant pinpoint vugs, some fossil molds and overall consistent lithology. Base of interval marked by organic laminations.
307.3	-	312	Dolostone; Moderate Yellowish Brown (10YR 5/4) To Dark Yellowish Orange (10YR 6/6)
			Intergranular, Pinpoint; Highly (50-90%); Subhedral
			Grain Size: Very Fine; Range: Microcrystalline To Fine
			Good Induration
			Cement Type(s): Dolomite
			Sedimentary Structures: Laminated
			Other Features: Medium Recrystallization; Sucrosic
			Fossils: Fossil Molds; Echinoid
			Similar to above, entire interval is not sucrosic but the majority of the interval is. Echinoid molds are present and the only identifiable mold in the interval.
312	_	316	Dolostone: Dark Vellowish Orange (10VR 6/6) To Light Vellowish Orange (10VR 8/6)
512		510	Intergranular Pinpoint: Highly (50-90%): Subhedral
			Grain Size: Very Fine: Range: Microcrystalline To Fine
			Good Induration
			Cement Type(s): Dolomite
			Other Features: Sucrosic: Medium Recrystallization
			Fossils: Fossil Molds: Echinoid
			Similar to above, at 314' dolostone color lightens to more yellow than brown, but crystallinity remains constant in this interval. Again echinoid molds are the only identifiable fossil in the interval.
316	-	320.5	Dolostone; Moderate Yellowish Brown (10YR 5/4) To Dark Yellowish Orange (10YR 6/6)
			Intergranular, Pinpoint; Highly (50-90%); Anhedral
			Grain Size: Microcrystalline; Range: Microcrystalline To Fine
			Good Induration
			Cement Type(s): Dolomite
			Other Features: Sucrosic; Low Recrystallization
			Fossils: Fossil Molds
			Dolomite with more pinpoint vugs than above, low recrystallization.
320.5	-	322	Dolostone; Grayish Brown (10YR 6/2) To Light Olive Gray (5Y 6/1)
			Intergranular; Highly (50-90%); Anhedral
			Grain Size: Microcrystalline; Range: Microcrystalline To Very Fine
			Good Induration
			Cement Type(s): Dolomite
			Sedimentary Structures: Mottled
			Accessory Minerals: Organics-1%
			Hard dolostone with anhedral crystals and organic mottling.

<ul> <li>Intergranular, Pinpoint; Highly (50-90%); Subhedral</li> <li>Grain Size: Microcrystalline; Range: Microcrystalline To Fine</li> <li>Good Induration</li> <li>Cement Type(s): Dolomite</li> <li>Other Features: Medium Recrystallization</li> <li>Permeable interval where the top of the interval is weathered and recrystallized.</li> <li>323.5 - 328</li> <li>Dolostone; Yellowish Gray (5Y 8/1) To Very Light Orange (10YR 8/2)</li> <li>Intergranular, Moldic, Pinpoint; Highly (50-90%); Anhedral</li> <li>Grain Size: Microcrystalline; Range: Microcrystalline To Fine</li> <li>Good Induration</li> <li>Cement Type(s): Dolomite</li> <li>Sedimentary Structures: Mottled</li> <li>Accessory Minerals: Organics-1%</li> <li>Other Features: Low Recrystallization; Chalky</li> <li>Fossils: Fossil Molds</li> <li>Moldic interval that has less molds with depth. Some organic mottling and recrystallization across the interval. Around fractures within the interval chalky texture is evident.</li> <li>328 - 332</li> <li>Dolostone; Moderate Yellowish Brown (10YR 5/4) To Dark Yellowish Orange (10YR 6/6)</li> <li>Intergranular, Pinpoint; Highly (50-90%); Subhedral</li> <li>Grain Size: Microcrystalline; Range: Microcrystalline To Fine</li> </ul>	322	-	323.5	Dolostone; Dark Yellowish Orange (10YR 6/6) To Grayish Orange (10YR 7/4)
<ul> <li>Grain Size: Microcrystalline; Range: Microcrystalline To Fine Good Induration Cement Type(s): Dolomite Other Features: Medium Recrystallization Permeable interval where the top of the interval is weathered and recrystallized.</li> <li>323.5 - 328 Dolostone; Yellowish Gray (5Y 8/1) To Very Light Orange (10YR 8/2) Intergranular, Moldic, Pinpoint; Highly (50-90%); Anhedral Grain Size: Microcrystalline; Range: Microcrystalline To Fine Good Induration Cement Type(s): Dolomite Sedimentary Structures: Mottled Accessory Minerals: Organics-1% Other Features: Low Recrystallization; Chalky Fossils: Fossil Molds Moldic interval that has less molds with depth. Some organic mottling and recrystallization across the interval. Around fractures within the interval chalky texture is evident.</li> <li>328 - 332 Dolostone; Moderate Yellowish Brown (10YR 5/4) To Dark Yellowish Orange (10YR 6/6) Intergranular, Pinpoint; Highly (50-90%); Subhedral Grain Size: Microcrystalline; Range: Microcrystalline To Fine</li> </ul>				Intergranular, Pinpoint; Highly (50-90%); Subhedral
<ul> <li>Good Induration</li> <li>Cement Type(s): Dolomite</li> <li>Other Features: Medium Recrystallization</li> <li>Permeable interval where the top of the interval is weathered and recrystallized.</li> <li>323.5 - 328 Dolostone; Yellowish Gray (5Y 8/1) To Very Light Orange (10YR 8/2)</li> <li>Intergranular, Moldic, Pinpoint; Highly (50-90%); Anhedral</li> <li>Grain Size: Microcrystalline; Range: Microcrystalline To Fine</li> <li>Good Induration</li> <li>Cement Type(s): Dolomite</li> <li>Sedimentary Structures: Mottled</li> <li>Accessory Minerals: Organics-1%</li> <li>Other Features: Low Recrystallization; Chalky</li> <li>Fossils: Fossil Molds</li> <li>Moldic interval that has less molds with depth. Some organic mottling and recrystallization across the interval. Around fractures within the interval chalky texture is evident.</li> <li>328 - 332 Dolostone; Moderate Yellowish Brown (10YR 5/4) To Dark Yellowish Orange (10YR 6/6)</li> <li>Intergranular, Pinpoint; Highly (50-90%); Subhedral</li> <li>Grain Size: Microcrystalline; Range: Microcrystalline To Fine</li> </ul>				Grain Size: Microcrystalline; Range: Microcrystalline To Fine
<ul> <li>Cement Type(s): Dolomite Other Features: Medium Recrystallization Permeable interval where the top of the interval is weathered and recrystallized.</li> <li>323.5 - 328 Dolostone; Yellowish Gray (5Y 8/1) To Very Light Orange (10YR 8/2) Intergranular, Moldic, Pinpoint; Highly (50-90%); Anhedral Grain Size: Microcrystalline; Range: Microcrystalline To Fine Good Induration Cement Type(s): Dolomite Sedimentary Structures: Mottled Accessory Minerals: Organics-1% Other Features: Low Recrystallization; Chalky Fossils: Fossil Molds Moldic interval that has less molds with depth. Some organic mottling and recrystallization across the interval. Around fractures within the interval chalky texture is evident.</li> <li>328 - 332 Dolostone; Moderate Yellowish Brown (10YR 5/4) To Dark Yellowish Orange (10YR 6/6) Intergranular, Pinpoint; Highly (50-90%); Subhedral Grain Size: Microcrystalline; Range: Microcrystalline To Fine</li> </ul>				Good Induration
<ul> <li>Other Features: Medium Recrystallization Permeable interval where the top of the interval is weathered and recrystallized.</li> <li>323.5 - 328 Dolostone; Yellowish Gray (5Y 8/1) To Very Light Orange (10YR 8/2) Intergranular, Moldic, Pinpoint; Highly (50-90%); Anhedral Grain Size: Microcrystalline; Range: Microcrystalline To Fine Good Induration Cement Type(s): Dolomite Sedimentary Structures: Mottled Accessory Minerals: Organics-1% Other Features: Low Recrystallization; Chalky Fossils: Fossil Molds Moldic interval that has less molds with depth. Some organic mottling and recrystallization across the interval. Around fractures within the interval chalky texture is evident.</li> <li>328 - 332 Dolostone; Moderate Yellowish Brown (10YR 5/4) To Dark Yellowish Orange (10YR 6/6) Intergranular, Pinpoint; Highly (50-90%); Subhedral Grain Size: Microcrystalline; Range: Microcrystalline To Fine</li> </ul>				Cement Type(s): Dolomite
<ul> <li>Permeable interval where the top of the interval is weathered and recrystallized.</li> <li>323.5 - 328 Dolostone; Yellowish Gray (5Y 8/1) To Very Light Orange (10YR 8/2) Intergranular, Moldic, Pinpoint; Highly (50-90%); Anhedral Grain Size: Microcrystalline; Range: Microcrystalline To Fine Good Induration Cement Type(s): Dolomite Sedimentary Structures: Mottled Accessory Minerals: Organics-1% Other Features: Low Recrystallization; Chalky Fossils: Fossil Molds Moldic interval that has less molds with depth. Some organic mottling and recrystallization across the interval. Around fractures within the interval chalky texture is evident.</li> <li>328 - 332 Dolostone; Moderate Yellowish Brown (10YR 5/4) To Dark Yellowish Orange (10YR 6/6) Intergranular, Pinpoint; Highly (50-90%); Subhedral Grain Size: Microcrystalline; Range: Microcrystalline To Fine</li> </ul>				Other Features: Medium Recrystallization
<ul> <li>323.5 - 328 Dolostone; Yellowish Gray (5Y 8/1) To Very Light Orange (10YR 8/2) Intergranular, Moldic, Pinpoint; Highly (50-90%); Anhedral Grain Size: Microcrystalline; Range: Microcrystalline To Fine Good Induration Cement Type(s): Dolomite Sedimentary Structures: Mottled Accessory Minerals: Organics-1% Other Features: Low Recrystallization; Chalky Fossils: Fossil Molds Moldic interval that has less molds with depth. Some organic mottling and recrystallization across the interval. Around fractures within the interval chalky texture is evident.</li> <li>328 - 332 Dolostone; Moderate Yellowish Brown (10YR 5/4) To Dark Yellowish Orange (10YR 6/6) Intergranular, Pinpoint; Highly (50-90%); Subhedral Grain Size: Microcrystalline; Range: Microcrystalline To Fine</li> </ul>				Permeable interval where the top of the interval is weathered and recrystallized.
<ul> <li>Intergranular, Moldic, Pinpoint; Highly (50-90%); Anhedral Grain Size: Microcrystalline; Range: Microcrystalline To Fine Good Induration Cement Type(s): Dolomite Sedimentary Structures: Mottled Accessory Minerals: Organics-1% Other Features: Low Recrystallization; Chalky Fossils: Fossil Molds Moldic interval that has less molds with depth. Some organic mottling and recrystallization across the interval. Around fractures within the interval chalky texture is evident.</li> <li>328 - 332 Dolostone; Moderate Yellowish Brown (10YR 5/4) To Dark Yellowish Orange (10YR 6/6) Intergranular, Pinpoint; Highly (50-90%); Subhedral Grain Size: Microcrystalline; Range: Microcrystalline To Fine</li> </ul>	323.5	-	328	Dolostone; Yellowish Gray (5Y 8/1) To Very Light Orange (10YR 8/2)
<ul> <li>Grain Size: Microcrystalline; Range: Microcrystalline To Fine</li> <li>Good Induration</li> <li>Cement Type(s): Dolomite</li> <li>Sedimentary Structures: Mottled</li> <li>Accessory Minerals: Organics-1%</li> <li>Other Features: Low Recrystallization; Chalky</li> <li>Fossils: Fossil Molds</li> <li>Moldic interval that has less molds with depth. Some organic mottling and recrystallization across the interval. Around fractures within the interval chalky texture is evident.</li> <li>328 - 332</li> <li>Dolostone; Moderate Yellowish Brown (10YR 5/4) To Dark Yellowish Orange (10YR 6/6)</li> <li>Intergranular, Pinpoint; Highly (50-90%); Subhedral</li> <li>Grain Size: Microcrystalline; Range: Microcrystalline To Fine</li> </ul>				Intergranular, Moldic, Pinpoint; Highly (50-90%); Anhedral
<ul> <li>Good Induration</li> <li>Cement Type(s): Dolomite</li> <li>Sedimentary Structures: Mottled</li> <li>Accessory Minerals: Organics-1%</li> <li>Other Features: Low Recrystallization; Chalky</li> <li>Fossils: Fossil Molds</li> <li>Moldic interval that has less molds with depth. Some organic mottling and recrystallization across the interval. Around fractures within the interval chalky texture is evident.</li> <li>328 - 332</li> <li>Dolostone; Moderate Yellowish Brown (10YR 5/4) To Dark Yellowish Orange (10YR 6/6) Intergranular, Pinpoint; Highly (50-90%); Subhedral Grain Size: Microcrystalline; Range: Microcrystalline To Fine</li> </ul>				Grain Size: Microcrystalline; Range: Microcrystalline To Fine
<ul> <li>Cement Type(s): Dolomite</li> <li>Sedimentary Structures: Mottled</li> <li>Accessory Minerals: Organics-1%</li> <li>Other Features: Low Recrystallization; Chalky</li> <li>Fossils: Fossil Molds</li> <li>Moldic interval that has less molds with depth. Some organic mottling and recrystallization across the interval. Around fractures within the interval chalky texture is evident.</li> <li>328 - 332</li> <li>Dolostone; Moderate Yellowish Brown (10YR 5/4) To Dark Yellowish Orange (10YR 6/6)</li> <li>Intergranular, Pinpoint; Highly (50-90%); Subhedral Grain Size: Microcrystalline; Range: Microcrystalline To Fine</li> </ul>				Good Induration
<ul> <li>Sedimentary Structures: Mottled Accessory Minerals: Organics-1% Other Features: Low Recrystallization; Chalky Fossils: Fossil Molds Moldic interval that has less molds with depth. Some organic mottling and recrystallization across the interval. Around fractures within the interval chalky texture is evident.</li> <li>328 - 332 Dolostone; Moderate Yellowish Brown (10YR 5/4) To Dark Yellowish Orange (10YR 6/6) Intergranular, Pinpoint; Highly (50-90%); Subhedral Grain Size: Microcrystalline; Range: Microcrystalline To Fine</li> </ul>				Cement Type(s): Dolomite
<ul> <li>Accessory Minerals: Organics-1%</li> <li>Other Features: Low Recrystallization; Chalky</li> <li>Fossils: Fossil Molds</li> <li>Moldic interval that has less molds with depth. Some organic mottling and recrystallization across the interval. Around fractures within the interval chalky texture is evident.</li> <li>328 - 332 Dolostone; Moderate Yellowish Brown (10YR 5/4) To Dark Yellowish Orange (10YR 6/6)</li> <li>Intergranular, Pinpoint; Highly (50-90%); Subhedral Grain Size: Microcrystalline; Range: Microcrystalline To Fine</li> </ul>				Sedimentary Structures: Mottled
<ul> <li>Other Features: Low Recrystallization; Chalky Fossils: Fossil Molds Moldic interval that has less molds with depth. Some organic mottling and recrystallization across the interval. Around fractures within the interval chalky texture is evident.</li> <li>328 - 332 Dolostone; Moderate Yellowish Brown (10YR 5/4) To Dark Yellowish Orange (10YR 6/6) Intergranular, Pinpoint; Highly (50-90%); Subhedral Grain Size: Microcrystalline; Range: Microcrystalline To Fine</li> </ul>				Accessory Minerals: Organics-1%
<ul> <li>Fossils: Fossil Molds Moldic interval that has less molds with depth. Some organic mottling and recrystallization across the interval. Around fractures within the interval chalky texture is evident.</li> <li>328 - 332 Dolostone; Moderate Yellowish Brown (10YR 5/4) To Dark Yellowish Orange (10YR 6/6) Intergranular, Pinpoint; Highly (50-90%); Subhedral Grain Size: Microcrystalline; Range: Microcrystalline To Fine</li> </ul>				Other Features: Low Recrystallization; Chalky
<ul> <li>Moldic interval that has less molds with depth. Some organic mottling and recrystallization across the interval. Around fractures within the interval chalky texture is evident.</li> <li>328 - 332 Dolostone; Moderate Yellowish Brown (10YR 5/4) To Dark Yellowish Orange (10YR 6/6) Intergranular, Pinpoint; Highly (50-90%); Subhedral Grain Size: Microcrystalline; Range: Microcrystalline To Fine</li> </ul>				Fossils: Fossil Molds
<ul> <li>328 - 332 Dolostone; Moderate Yellowish Brown (10YR 5/4) To Dark Yellowish Orange (10YR 6/6) Intergranular, Pinpoint; Highly (50-90%); Subhedral Grain Size: Microcrystalline; Range: Microcrystalline To Fine</li> </ul>				Moldic interval that has less molds with depth. Some organic mottling and recrystallization across the interval. Around fractures within the interval chalky texture is evident.
Intergranular, Pinpoint; Highly (50-90%); Subhedral Grain Size: Microcrystalline; Range: Microcrystalline To Fine	328	-	332	Dolostone; Moderate Yellowish Brown (10YR 5/4) To Dark Yellowish Orange (10YR 6/6)
Grain Size: Microcrystalline; Range: Microcrystalline To Fine				Intergranular, Pinpoint; Highly (50-90%); Subhedral
				Grain Size: Microcrystalline; Range: Microcrystalline To Fine
Good Induration				Good Induration
Cement Type(s): Dolomite				Cement Type(s): Dolomite
Other Features: Sucrosic; Low Recrystallization				Other Features: Sucrosic; Low Recrystallization
Fossils: Fossil Molds; Echinoid				Fossils: Fossil Molds; Echinoid
Brownish sucrosic dolostone. Fossil molds present and are mostly molds of echinoids in this interval.				Brownish sucrosic dolostone. Fossil molds present and are mostly molds of echinoids in this interval.
332 - 336 Dolostone; Grayish Brown (10YR 6/2) To Dark Yellowish Brown (10YR 4/2)	332	-	336	Dolostone; Grayish Brown (10YR 6/2) To Dark Yellowish Brown (10YR 4/2)
Intergranular, Pinpoint; Highly (50-90%); Anhedral				Intergranular, Pinpoint; Highly (50-90%); Anhedral
Grain Size: Microcrystalline; Range: Microcrystalline To Very Fine				Grain Size: Microcrystalline; Range: Microcrystalline To Very Fine
Good Induration				Good Induration
Cement Type(s): Dolomite				Cement Type(s): Dolomite
Sedimentary Structures: Laminated				Sedimentary Structures: Laminated
Accessory Minerals: Organics-1%				Accessory Minerals: Organics-1%
Other Features: Sucrosic; Medium Recrystallization				Other Features: Sucrosic; Medium Recrystallization
Hard dolostone with laminations of organics, between the laminations are dense pinpoint vugs, sucrosic texture and as well recrystallized dolostone with no pinpoint vugs.				Hard dolostone with laminations of organics, between the laminations are dense pinpoint vugs, sucrosic texture and as well recrystallized dolostone with no pinpoint vugs.
336 - 341 Dolostone; Dark Yellowish Orange (10YR 6/6) To Grayish Brown (10YR 6/2)	336	-	341	Dolostone; Dark Yellowish Orange (10YR 6/6) To Grayish Brown (10YR 6/2)
Intergranular, Fracture, Pinpoint; Highly (50-90%); Anhedral				Intergranular, Fracture, Pinpoint; Highly (50-90%); Anhedral
Grain Size: Microcrystalline; Range: Microcrystalline To Fine				Grain Size: Microcrystalline; Range: Microcrystalline To Fine
Good Induration				Good Induration
Cement Type(s): Dolomite				Cement Type(s): Dolomite
Sedimentary Structures: Laminated				Sedimentary Structures: Laminated
Accessory Minerals: Organics-2%				Accessory Minerals: Organics-2%

			Other Features: Sucrosic; Low Recrystallization
			Fossils: Fossil Molds
			Organic laminations at the top and at the base of this interval. Anhedral dolomite with pinpoint vugs and fossil molds. Molds of more than just echinoids in this interval.
341	-	343	Dolostone; Grayish Orange (10YR 7/4) To Moderate Yellowish Brown (10YR 5/4)
			Intergranular, Pinpoint; Highly (50-90%); Anhedral
			Grain Size: Microcrystalline; Range: Microcrystalline To Very Fine
			Good Induration
			Cement Type(s): Dolomite
			Sedimentary Structures: Mottled
			Accessory Minerals: Organics-<1%
			Dolostone with mottling at the base of the interval. Crystalline throughout.
343	-	345.6	Dolostone; Grayish Orange (10YR 7/4) To Moderate Yellowish Brown (10YR 5/4)
			Intergranular, Moldic, Pinpoint; Highly (50-90%); Subhedral
			Grain Size: Microcrystalline; Range: Microcrystalline To Fine
			Good Induration
			Cement Type(s): Dolomite
			Sedimentary Structures: Laminated
			Other Features: Chalky; Medium Recrystallization
			Fossils: Fossil Molds
			More moldic interval, with chalky texture on the inside of the core in places within this interval.
345.6	-	350	Dolostone; Very Light Orange (10YR 8/2) To Grayish Brown (10YR 6/2)
			Intergranular, Pinpoint; Highly (50-90%); Anhedral
			Grain Size: Microcrystalline; Range: Microcrystalline To Very Fine
			Good Induration
			Cement Type(s): Dolomite
			Sedimentary Structures: Laminated; Mottled
			Accessory Minerals: Organics-<1%
			Fossils: Fossil Molds; Echinoid
			Laminations present with trace organics at 347.5' and 349.5'. Trace mottlings at the base of the interval. Pinpoint vugs and echinoid fossil molds throughout. Total depth of West Citrus CH-2

Appendix D. Digital Photographs of Core Samples Retrieved from the West Citrus Well Site in Citrus County, Florida Appendix D1. Digital Photographs of Core Samples Retrieved from COREHOLE 1 at the West Citrus Well Site in Citrus County, Florida

















# Appendix D1. Digital Photographs of Core Samples Retrieved from COREHOLE 2 at the West Citrus Well Site in Citrus County, Florida
























































Appendix E. Correlation Charts for Hydrostratigraphic Units Identified at the West Citrus Well Site in Citrus County, Florida

	SWFWMD	NOMENCLATURE	surficial aquifer	confining unit	
BOGGESS 1986 &	ARTHUR AND OTHERS	2008	surficial aquifer system	confining unit	
	MILLER	1980	surficial aquifer	confining unit	
	WOLANSKY	1978	unconfined aquifer	confining unit	
	LEVE	1966	shallow aquifer system	confining unit	
	CLARKE	1964	water-table aquifer	confining unit	
	LICHTLER	1960	Shallow aquifer	confining unit	
	WYRICK	1960	nonartesian aquifer	confining unit	

SWFWMD NOMENCLATURE	contining unit	Upper Floridan aquifer System Dpper Floridan aquifer Avon Park Pigh- zone zone	L Doto middle confining (J, II, or V) Lower Flower Retow middle confining unit, II,	confining unit
ARTHUR AND OTHERS 2008	confining unit	an aquifer system Poricip aquifer aquifer a	Floridan confining unit Lower Floridan aquifer	confining unit
REESE AND RICHARDSON 2007	confining unit	Lower Hawfrom producing zone zone zone zone aquifer middle unit 1 unit 1 Avon Park permeable zone	Florid <i>middle</i> <i>unit 2</i> Lower Floridan aquifer	confining unit
MILLER 1986	confining unit	tan aquifer system Popper aquifer	Llord <i>middle</i> <i>confining</i> <i>unit</i> ( <i>i</i> , <i>li</i> , <i>or v</i> ) Lower Floridan aquifer	contining unit
BUSH 1982	confining unit	ry limestone aquifer Permeabe 2 on e a b B B B	Tettia Intra-aquifer low-permeablity zone Lower permeable zone	contining unit
MILLER 1982	confining unit	prestone aquifer system Z neable z neable B	Territary lir permeable zone zone zone	confining unit
STRINGFIELD 1966	confining unit	principal artesian aquifer		
PARKER AND OTHERS 1955	confining unit	Floridan aquifer		
STRINGFIELD 1936	confining unit	chief water-bearing artesian formations		

[Terms shown are for hydrogeologic units present within the Southwest Florida Water Management District]

Figure E1. Nomenclature of (A), the surficial aquifer, (B), the Floridan aquifer system used for the West Citrus well site compared to names in previous reports.

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# Appendix F. Daily Water Levels Recorded During Exploratory Core Drilling and Testing at the West Citrus Well Site in Citrus County, Florida

[MM/DD/YYYY, month/day/year; HH:MM, hour:minute; ft, feet; bls, below land surface; btoc, below top of casing; NAVD88, North American Veritcal Datum of 1988; --, not recorded; well locations are shown in figure 3; well as-built well diagrams are in appendix B]

Date (MM/DD/ YYYY)	Time (HH:MM)	Deepest Casing Depth (ft bls)	Core Hole Total Depth (ft bls)	Core Hole Static Water Level (ft btoc)	Core Hole Static Water Level (ft bls)	Core Hole Static Water Level (ft NAVD88)	Comments
11/1/2016	8:54	80	114	6.07	3.84	4.92	stick up: 2.23 ft
11/2/2016	8:15	80	190	6.11	3.81	4.95	stick up: 2.30 ft
11/3/2016	8:35	80	200	6.31	3.9	4.86	stick up: 2.41 ft
11/4/2016	8:27	160	200	6.15	3.45	5.31	stick up: 2.70 ft
11/7/2016	9:19	160	250	6.5	3.85	4.91	stick up: 2.65 ft
11/8/2016		160	300	6.42	4.08	4.68	stick up: 2.34 ft
11/9/2016		160	350	9.85	7.49	1.27	stick up: 2.36 ft

# Appendix G. Water Quality Data Acquisition Forms for the West Citrus Well Site in Citrus County, Florida

Wellsite	ormation						1
\\/~!!	West Citrus			[	Date 11/1/2016		1
vvell	COREHOLE	2		- т	ime 13:16		
SID#	875942			Performe	d by J. Zydek, T. G	ates	
	Well [	Depth (ft bls)	150	Pack	ked Interval (ft-ft bls	s) <u>130-150</u>	
С	asing (HW) [	Depth (ft bls)	130	Packe	ed Interval (m-m ble	39.6-45.7	
Ca	asing (HW) D	iameter (in.)	3	Initial Tes	t Interval WL (ft bl	s) 3.99	
	Hole D	iameter (in.)	3	Initial	Annulus WL (ft ble	s) 7.25	
lote: 1ft = 0.304	48 m						-
Purge Volum	ie (gallons)						
1	0.38	g/ft X	130	ft (interval)	= 49	gallons	
2	0.5	g/ft X	20	ft (interval)	= 10	gallons	
-		тот	AL PURGE	VOLUME (on	<b>e) =</b> 59	gallons	
					-	-	
Pu	ump Method	3" submerist	ole pump set	@ 50' btoc (47	7' bls)		
A	irline Length	110	teet				
Discharge	Rate (gpm)	30	gpm			<b>-</b>	
Purge Volume /	Discharge Rate	2			6	minutes	+ 60 n
Collect	tion Method:	Surface Dise	charge or V	Vireline Bailer	or Nested Bailer		to rem
comments:	packer instal	led @ 12:30	pm	10C = 2.23			1400 0
	packer set W	/L = 6.21' bto	c (3.98' bls)	(	ending WL = 6.23'	btoc	added
lote: NQ=0.230	1 gal/ft; HW=0	.6528 gal/ft; ope	en hole(NQ)=0.3	3623 gal/ft	oumping WL = 19.6	b' btoc	during
							coring
est Informa	ation		000 40 47 40				(airlift
г	Multimeter S	ierial #	02D101/AB	3			23 gpr
	V	Vater Quality	During Purg	je			60 mir
	l ime	Sp. Cond.	Temp.	pH			
ļ	12:57	337	22.93	7.02		10.10	
			22.92	(.05		1.7.10	
	12:58	330	22.02	7.4.4	Start Purge _	12.43	
	12:58 12:59	336	22.92	7.14	Start Purge _	12.45	
	12:58 12:59 13:00	336 336	22.92 22.91	7.14 7.18	End Purge _	13:15	
	12:58 12:59 13:00 13:01	336 336 336	22.92 22.91 22.91	7.14 7.18 7.2	End Purge _	13:15	
	12:58 12:59 13:00 13:01 13:02	336 336 336 336 336	22.92 22.91 22.91 22.91 22.91	7.14 7.18 7.2 7.22	End Purge _ End Purge _ Sample Time _	13:15 13:16	
	12:58 12:59 13:00 13:01 13:02	336 336 336 336 336	22.92 22.91 22.91 22.91 22.91	7.14 7.18 7.2 7.22	_ End Purge _ End Purge _ Sample Time	13:15 13:16	
	12:58 12:59 13:00 13:01 13:02	336 336 336 336 336	22.92 22.91 22.91 22.91	7.14 7.18 7.2 7.22	Start Purge _ End Purge _ Sample Time _ LIMS Sample	13:15 13:16 ID: 200921773	
	12:58 12:59 13:00 13:01 13:02	336 336 336 336 336	22.92 22.91 22.91 22.91	7.14 7.18 7.2 7.22	Start Purge _ End Purge _ Sample Time _ LIMS Sample LIMS Sub ID:	13:15 13:16 ID: 200921773 100071848	
	12:58 12:59 13:00 13:01 13:02	336 336 336 336 336	22.92 22.91 22.91 22.91	7.14 7.18 7.2 7.22	Start Purge _ End Purge _ Sample Time _ LIMS Sample LIMS Sub ID:	13:15 13:16 ID: 200921773 100071848	
	12:58 12:59 13:00 13:01 13:02	336 336 336 336	22.92 22.91 22.91 22.91	7.14 7.18 7.2 7.22	Start Purge _ End Purge _ Sample Time _ LIMS Sample LIMS Sub ID:	13:15 13:16 ID: 200921773 100071848	
	12:58 12:59 13:00 13:01 13:02	336 336 336 336 336	22.92 22.91 22.91 22.91	7.14 7.18 7.2 7.22	Start Purge _ End Purge _ Sample Time _ LIMS Sample LIMS Sub ID:	13:15 13:16 ID: 200921773 100071848	
	12:58 12:59 13:00 13:01 13:02	336 336 336 336 336	22.92 22.91 22.91 22.91	7.14 7.18 7.2 7.22	Start Purge _ End Purge _ Sample Time _ LIMS Sample LIMS Sub ID:	13:15 13:16 ID: 200921773 100071848	
	12:58 12:59 13:00 13:01 13:02	336 336 336 336 336	22.92 22.91 22.91 22.91	7.14 7.18 7.2 7.22	Start Purge _ End Purge _ Sample Time _ LIMS Sample LIMS Sub ID:	13:15 13:16 ID: 200921773 100071848	
Multin	12:58 12:59 13:00 13:01 13:02 	336 336 336 336 336 	22.92 22.91 22.91 22.91	7.14 7.18 7.2 7.22 Photomet	End Purge _ End Purge _ Sample Time _ LIMS Sample LIMS Sub ID:	13:15 13:16 ID: 200921773 100071848	
Multin	12:58 12:59 13:00 13:01 13:02 	336 336 336 336 336 	22.92 22.91 22.91 22.91	7.14 7.18 7.2 7.22 	Start Purge _ End Purge _ Sample Time _ LIMS Sample LIMS Sub ID: ter Serial # <u>A09121</u>	13:15 13:16 ID: 200921773 100071848 570-d56b	
Multin Sp. Cc Temp	12:58 12:59 13:00 13:01 13:02 	336 336 336 336 336 	22.92 22.91 22.91 22.91	7.14 7.18 7.2 7.22 Photomet	Start Purge _ End Purge _ Sample Time _ LIMS Sample LIMS Sub ID: ter Serial # <u>A09121</u>	13:15 13:16 ID: 200921773 100071848 570-d56b	
Multin Sp. Cc Temp	12:58 12:59 13:00 13:01 13:02 	336 336 336 336 336 336 336 336 336 330 22.91 7.28	22.92 22.91 22.91 22.91	7.14 7.18 7.2 7.22 Photomet Chloride (n Sulfate (n	Start Purge _ End Purge _ Sample Time _ LIMS Sample LIMS Sub ID: ter Serial # <u>A09121</u> ng/I)6	13:15 13:16 ID: 200921773 100071848 570-d56b	
Multin Sp. Cc Temp	12:58 12:59 13:00 13:01 13:02 	336 336 336 336 336 336 402D1017AB 330 22.91 7.28	22.92 22.91 22.91 22.91	7.14 7.18 7.2 7.22 Photomet Chloride (n Sulfate (n pH (	Start Purge _ End Purge _ Sample Time _ LIMS Sample LIMS Sub ID: ter Serial # <u>A09121</u> ng/I) <u>4.4</u> SU)6	13:15 13:16 ID: 200921773 100071848 570-d56b	
Multin Sp. Cc Temp	12:58 12:59 13:00 13:01 13:02 	336 336 336 336 336 	22.92 22.91 22.91 22.91	7.14 7.18 7.2 7.22 Photomet Chloride (n Sulfate (n pH (	Start Purge _ End Purge _ Sample Time _ LIMS Sample LIMS Sub ID: ter Serial # <u>A09121</u> ng/I) <u>4.4</u> g/I) <u>6</u> SU)	13:15 13:16 ID: 200921773 100071848 570-d56b	

## WATER QUALITY SAMPLE ACQUISITION

Well Site Data Forms\_020415

WQ No. 24         WQ No. 24         Well Not Not Start Purge         SID# 875942       Date 11/2/2016         Well Depth (ft bis)       200         Casing (HW) Depth (ft bis)       3.6         Initial Annulus WL (ft bis)       3.29         Imital Annulus WL (ft bis)       100         Imital Annulus WL (ft bis)       100      <	WATER QUALITY SAMPLE ACQUISIT	ION		-		
Golden information       Date 11/2/2016         Well CORELPOLE 2       Performation         SID# 375942       Performation         Well Depth (fb bls)       200         Casing (HW) Depth (fb bls)       180         Casing (HW) Depth (fb bls)       100         Casing (HW) Depth (fb bls)       100         Packed Interval (ff-fb bls)       3.29         Hele Diameter (in.)       3.5         Initial Test Interval WL (fb bls)       3.29         Purge Volume (galons)       117         1       1180         1       110         Purge Volume (galons)       110         1       110         1       ft (interval) =         1       110         1       110         1       ft (interval) =         1       117         1       galons         2       galons         1       ft (interval) =         1       110         1       feet         1       10         1       10         1       feet         1       10         1       10         10       10 <t< td=""><td>Concret Information</td><td></td><td></td><td>WQ No.</td><td>2A</td><td>1</td></t<>	Concret Information			WQ No.	2A	1
Well COREHOLE 2       Time 1316         SID# 375942       Performed by J. Zydek, T. Gates         Well Depth (ft bis)       200         Casing (HW) Depth (ft bis)       180         Casing (HW) Diameter (in.)       3.06         Hole Diameter (in.)       3.06         Initial Test Interval (ft.ft bis)       3.29         Initial Test Interval WL (ft bis)       3.29         Initial Test Information       Initial Test Information         Multimeter Serial       Initial Test Information         Multimeter Serial       Initial Test Information         Multimeter Serial #       Plane         Plane       Sample Sent to District's Laboratory for Standard Complete Analysis? Y or (N)	Wellsite West Citrus			Date 11/2/2016		-
SID# <u>875942</u> Performed by J.Zydek, T. Gates         Casing (HW) Depth (ft bis)       200       Packed Interval (ft-ft bis)       180-200         Casing (HW) Diameter (in.)       3.06       Initial Test Interval (ft-ft bis)       3.29         Initial Annulus WL (ft bis)       3.29       Initial Annulus WL (ft bis)       3.29         Nete: 1ft = 0.3048 m       Initial Annulus WL (ft bis)       3.29       Initial Annulus WL (ft bis)       3.29         Purge Volume (gallons)       117       gallons       gallons       ecituation         1       10       200       ft (interval) =       117       gallons         Purge Volume (gallons)       117       minutes       rotAL PURGE VOLUME (one) =       127       gallons         Purge Volume (backarge Rate       117       minutes       rotC = 2.23       minutes         Collection Method: Storface Discharge run       Viceline Bailer       rot = 3.29' bis       rot = 2.23         WL before packer = 3.38' bis       packer set WL = 3.29' bis       sample Sent On WQ 2B sheet         Multimeter Serial       Multimeter Serial       Purge end       alarge void. Info on WQ 2B sheet         Multimeter Serial #       Photometer Serial #       Photometer Serial #         Sp. Cond. (uS/cm)       Suifate (mg/l)       uifate (mg/l)	Well COREHOLE 2			Time 13.16		-
Well Depth (ft bls)       200       Packed Interval (ft-ft bls)       180-200         Casing (HW) Depth (ft bls)       180       Initial Test Interval (ft-ft bls)       3.29         Hole Diameter (in.)       3.5       Initial Annulus WL (ft bls)       3.29         Nete: 1ft = 0.3048 m       after       setting         Purge Volume (gallons)       g/ft       X       180       ft (interval)       =       117       gallons         2       g/ft       X       180       ft (interval)       =       117       gallons         2       g/ft       X       180       ft (interval)       =       117       gallons         2       g/ft       X       180       ft (interval)       =       117       gallons         2       g/ft       X       100       growthere the theore	SID# 875942		Performe	ed by J. Zvdek. T. Ga	ates	
Well Depth (ft bis)       200       Packed Interval (ft-ft bis)       180-200         Casing (HW) Depth (ft bis)       180       initial Test Interval WL (ft bis)       3.29         Hole Diameter (in.)       3.5       Initial Annulus WL (ft bis)       3.29         Net: Ift = 0.3048 m       initial Annulus WL (ft bis)       3.29       after         Purge Volume (gallons)       g/ft X       180       ft (interval)       =       117       gallons         2       g/ft X       180       ft (interval)       =       117       gallons       excludited         Purge Volume (gallons)       g/ft X       180       ft (interval)       =       117       gallons       excludited         Purge Volume (bischarge Rate       110       feet       minutes       outload       excludited         Discharge Rate (gpm)       76 Dioc       TOC = 2.23       minutes       outload       excludited         Collection Method:       32 Discharge Rate       33 Disc       packer set WL = 3.29' bis       eacludited         Note: NO=0.201 galitt:       WL before packer = 3.38' bis       packer set WL = 3.29' bis       eacludited         Multimeter Serial       Multimeter Serial       Purge Pinper						
Purge Volume (gallons) 1 2 g/ft X 120 ft (interval) = 117 gallons 10 gallons 10 gallons 10 gallons 117 gallons 127 g	Well Depth (ft bls) _ Casing (HW) Depth (ft bls) _ Casing (HW) Diameter (in.) _ Hole Diameter (in.) _ Note: 1ft = 0.3048 m	200 180 3.06 3.5	Pac Pack Initial Te Initia	cked Interval (ft-ft bls ced Interval (m-m bls st Interval WL (ft bls al Annulus WL (ft bls	) <u>180-200</u> ) <u>55-61</u> ) <u>3.29</u> ) <u>3.29</u>	after setting
Purge Volume (gallons)       0       0       1       10       gallons       volume         1       0       0       10       10       gallons       gallons       gallons         1       0       0       10       10       gallons       gallons       gallons         1       0       0       10       10       gallons       10       gallons         1       0       110       ft (interval)       =       117       gallons       volume         1       0       10       ft (interval)       =       127       gallons       volume         1       0       10       ft (interval)       =       127       gallons       volume         1       0       ft (interval)       =       127       gallons       volume         1       ft (interval)       =       127       gallons       volume       volume         1       0       ft (interval)       interval       interval       interval       volume						packer
Pump Method       3" submerisble pump set @ 75 ptc.       purge volume         Airline Length       110       feet       minutes       feet       minutes       purge volume       calculator         Purge Volume /Discharge Rate (gpm)       117       minutes       feet       minutes	Purge Volume (gallons) 1 g/ft X 2 g/ft X TOTA	180 20 IL PURGE V	ft (interval) ft (interval) OLUME (or	= <u>117</u> = <u>10</u> ne) = <u>127</u>	gallons gallons gallons	*volume calculatec using excel
Arinine Lengin gen Purge Volume /Discharge Rate minutes X iAEEE = minutes Collection Method: {Eurface Discharge w Wireline Bailer or Nested Bailer Collection Method: {Eurface Discharge w Wireline Bailer or Nested Bailer Collection Method: {Eurface Discharge w Wireline Bailer or Nested Bailer Comments: Set punp @ 75' bito To C = 2.23 WL before packer = 3.38' bits packer set WL = 3.29' bits Note: NO=0.2301 gal/ft: HW=0.6528 gal/ft: or ue(NO)=0.3623 gal/ft Test Information Multimeter Serial // Water Quality During Purge Time Sp. Cond. Temp. pH Bander James Start Purge Bander James Start Purge Bander James Pump went dry @ this interval. Decide to set packer @ 160' above a large void. Info on WQ 2B sheet Multimeter Serial # Photometer Serial # Sp. Cond. (µS/cm) Built Chloride (mg/l) pH (SU) pH (SU) pH (SU) Samples Sent to District's Laboratory for Standard Complete Analysis? Y or (N)	Pump Method <u>3" submerisble</u>	e pump set @	0 75 0 c		_	purge
Discharge Rate (g)ning       minutes (g)ning	Airline Length <u>110</u> f	eet	e C			volume
Collection Method:       Outrace Discharge of Wreline Bailer or Nested Bailer         Comments:       Set pump @ 75' bioc       TOC = 2.23         WL before packer = 3.38' bg       packer set WL = 3.29' bls         Note: NQ=0.2301 gal/t;       HW=0.6528 gal/t;         Test Information         Multimeter Seria       Water Quality During Purge         Time       Sp. Cond.       Temp.         PH       Start Purge       End Purge         Sample Time       Sample Time       Sample Time         Multimeter Serial       Pump went dry @ this interval.       Decide to set packer @ 160' above a large void. Info on WQ 2B sheet         Multimeter Serial #       Photometer Serial #       Photometer Serial #         Sp. Cond. (µS/cm)       Chloride (mg/l)       PH (SU)         PH (SU)       PH (SU)       PH (SU)	Purge Volume /Discharge Rate 117	ninutes X	REE =		minutes	calculator
Comments:       Set pump @ 75 bloc       TOC = 2.23         WL before packer = 3.38' bloc       packer set WL = 3.29' bls         Note: NQ=0.230't gal/t;       two construction         Test Information         Multimeter Serial       Water Quality During Purge         Time       Sp. Cond.       Temp.         PH       Start Purge       End Purge         Sample Time       Sample Time       Sample Time         Multimeter Serial #       Pump went dry @ this interval.       Decide to set packer @ 160' above a large void. Info on WQ 2B sheet         Multimeter Serial #       Chloride (mg/l)       pH (SU)       pH (SU)         Temperature (°C)       pH (SU)       pH (SU)       pH (SU)	Collection Method: Surface Disch	arge or Wi	reline Bailer	or Nested Bailer		
WL before packer = 3.38' bit interval.         Note: NQ=0.2301 gal/ft; HW=0.6528 gal/ft; OPE OF	Comments: Set pump @ 75' btoc		OC = 2.23			
Note: NQ=0.2301 gal/ft:       HW=0.6528 gal/ft:         Test Information       Multimeter Serial         Water Quality During Purge	WL before packer = 3.38' b			packer set WL = 3.2	29' bls	
Test Information         Multimeter Serial         Water Quality During Purge         Time       Sp. Cond.         Temp.       pH         Grade       Start Purge         End Purge       Sample Time         Sample Time       Pump went dry @ this interval.         Decide to set packer @ 160' above a large void.       Info on WQ 2B sheet         Multimeter Serial #       Photometer Serial #         Sp. Cond. (µS/cm)       Chloride (mg/l)         pH (SU)       pH (SU)         Samples Sent to District's Laboratory for Standard Complete Analysis? Y or (N)	Note: NQ=0.2301 gal/ft; HW=0.6528 gal/ft; or	.ole(NQ)=0.362	23 gal/ft	•		
Multimeter Serial         Water Quality During Purge         Time       Sp. Cond.         Temp.       pH         Start Purge	Test Information					1
Water Quality During Purge         Time       Sp. Cond.         Temp.       pH         Start Purge	Multimeter Seria					-
Time       Sp. Cond.       Temp.       pH         Image: Sp. Cond.       Temp.       pH         Image: Sp. Cond.       Temp.       pH         Image: Sp. Cond.       Image: Start Purge       Image: Start Purge         Image: Sp. Cond.       Image: Start Purge       Image: Start Purge         Image: Sp. Cond.       Image: Start Purge       Image: Start Purge         Image: Sp. Cond.       Image: Start Purge       Image: Start Purge         Image: Start Purge       Image: Start Purge       Image: Start Purge         Image: Start Purge       Image: Start Purge       Image: Start Purge         Image: Start Purge       Image: Start Purge       Image: Start Purge         Image: Start Purge       Image: Start Purge       Image: Start Purge         Image: Start Purge       Image: Start Purge       Image: Start Purge         Image: Start Purge       Image: Start Purge       Image: Start Purge         Image: Start Purge       Image: Start Purge       Image: Start Purge         Image: Start Purge       Image: Start Purge       Image: Start Purge         Image: Start Purge       Image: Start Purge       Image: Start Purge         Image: Start Purge: Star	Water Quality D	Juring Purge		ן		
Image:	Time Sp. Cond.	Temp.	рН			
Image: Start Purge       Image: Start Purge         Image: Start Purge: Start Purge       Image: Start Purge: Start Purge: Start Purge         Image: Start Purge: Start Purge: Start Purge: Start Purge: Start Purge: Purge: Start Purge: Purge: Start Purge:				Start Burga		
Image:				Start Furge		
Sample Time         Sample Time         Sample Time         Pump went dry @ this interval.         Decide to set packer @ 160' above         a large void. Info on WQ 2B sheet         Multimeter Serial #         Sp. Cond. (µS/cm)         pH (SU)         Sulfate (mg/l)         pH (SU)         Samples Sent to District's Laboratory for Standard Complete Analysis? Y or (N)				End Purge		
Image: Sent to District's Laboratory for Standard Complete Analysis? Y or (N)       Pump went dry @ this interval. Decide to set packer @ 160' above a large void. Info on WQ 2B sheet				Sample Time		
Image: Construct s Laboratory for Standard Complete Analysis? Y or (N)						
Image: Chloride (mg/l)       Image: Chloride (mg/l)         Image: Chloride (mg/				Pump went dry @ th	nis interval.	
Multimeter Serial #				Decide to set packe	r @ 160' above	
Multimeter Serial #       Photometer Serial #         Sp. Cond. (µS/cm)       Chloride (mg/l)         Temperature (°C)       Sulfate (mg/l)         pH (SU)       PH (SU)         Samples Sent to District's Laboratory for Standard Complete Analysis? Y or (N)				a large void. Info on	WQ 2B sheet	
Multimeter Serial #       Photometer Serial #         Sp. Cond. (µS/cm)       Chloride (mg/l)         Temperature (°C)       Sulfate (mg/l)         pH (SU)       PH (SU)         Samples Sent to District's Laboratory for Standard Complete Analysis? Y or (N)						
Multimeter Serial #       Photometer Serial #         Sp. Cond. (µS/cm)       Chloride (mg/l)         Temperature (°C)       Sulfate (mg/l)         pH (SU)       pH (SU)         Samples Sent to District's Laboratory for Standard Complete Analysis? Y or (N)						
Multimeter Serial #       Photometer Serial #         Sp. Cond. (µS/cm)       Chloride (mg/l)         Temperature (°C)       Sulfate (mg/l)         pH (SU)       pH (SU)         Samples Sent to District's Laboratory for Standard Complete Analysis? Y or (N)				J		
Sp. Cond. (µS/cm) Chloride (mg/l) Sulfate (mg/l) pH (SU) pH (SU) pH (SU)	Multimeter Serial #			Photometer Serial #		
Temperature (°C)       Sulfate (mg/l)         pH (SU)       pH (SU)         Samples Sent to District's Laboratory for Standard Complete Analysis? Y or (N)	Sp. Cond. (uS/cm)		Chloride (	mg/l)	Т	
pH (SU)     pH (SU)       Samples Sent to District's Laboratory for Standard Complete Analysis? Y or N	Temperature (°C)		Sulfate (	mg/l)	4	
Samples Sent to District's Laboratory for Standard Complete Analysis? Y or N	pH (SU)		pH	(SU)	1	
Samples Sent to District's Laboratory for Standard Complete Analysis? Y or N			•	· · · •	_	
	Samples Sent to District's Laboratorv for	Standard Co	omplete An	alysis? Y or N		

	<b>WQ No.</b> 2B
General Information	
Wellsite West Citrus	Date 11/2/2016
Well COREHOLE 2	Time <u>13:30</u>
SID# <u>875942</u>	Performed by <u>J. Zydek, T. Gates</u>
Well Depth (ft bls) 200	Packed Interval (ft-ft bls) 160-200
Casing (HW) Depth (ft bls) 160	Packed Interval (m-m bls) 48.8-61
Casing (HW) Diameter (in.) 3.06	6 Initial Test Interval WL (ft bls)
Hole Diameter (in.) <u>3.5</u>	Initial Annulus WL (ft bls)
Note: 1ft = 0.3048 m	
Purge Volume (gallons)	
1 0.38 g/ft X 160	ft (interval) = 61 gallons '+160
2 0.5 g/ft X 40	ft (interval) = 20 gallons rer
	RGE VOLUME (one) = 81 gallons 289
Pump Method <u>3" jetsub set @ bls</u>	
Airline Length <u>110</u> feet	
Discharge Rate (gpm) gpm	airlift
Purge Volume /Discharge Rate 81/ minutes	minutes
Collection Method: Surface Discharge	Vireline Bailer or Nested Bailer
	100 =
	N=0.2622 col/ft pumping $M/I =$
Note: NQ=0.2301 gal/n, HW=0.6528 gal/n, opt	
Test Information	
Multimeter Seria 02D101	7AB
Water Quality During F	Purge
Time Sp. Cond. Temp	p. pH
	Start Purge
	End Durne
	End Purge
	Sample Time
	No sample today. Spent most of day
	trying to fix packer. Sample to be
	collected on 11/3/16
Multimator Social # 02D1017AB	Dhotomotor Sorial # A00121570 dEch
	Photometer Senar # AU9121570-0500
Sp. Cond. (uS/cm)	Chloride (mg/l)
Temperature (°C)	Sulfate (mg/l)
pH (SU)	pH (SU)
p(	
Samples Sent to District's Laboratory for Stand	ard Complete Analysis? Y or W

General Information           Velice West Circus           Date 11/3/2016           Time 9:00-11:00           SID# 8/75942           Performed by J. Zydek, T. Gates           Well Depth (ft bis)         150-200           Casing (HW) Depth (ft bis)         150-200           Casing (HW) Diameter (in.)         A depth (ft bis)         150-200           Packed Interval (ft-ft bis)         150-200           Casing (HW) Diameter (in.)         4         Initial Test Interval WL (ft bis)         6.632           Purge Volume (gallons)         1         7 CAL PURGE VOLUME (one) =         33         33           Purge Volume (gallons)         10         rorAL PURGE VOLUME (one) =         33         gallons           Mutimeter Serial #         021017AB           Mutimeter Serial #         02101017AB           Mutimeter Serial #         02101017AB           Mutimeter Serial #         0210107AB           Mutimeter Serial # <th colsp<="" th=""><th></th><th></th><th></th><th></th><th></th><th>WQ No.</th><th>2C</th><th></th></th>	<th></th> <th></th> <th></th> <th></th> <th></th> <th>WQ No.</th> <th>2C</th> <th></th>						WQ No.	2C	
Weisite         Date 11/3/2016 Time \$200           SID# 375942         Performed by J. Zydek, T. Gates           Weil Depth (ft bis)         200 Casing (HW) Depth (ft bis)         Packed Interval (the bis)         160-20           Casing (HW) Depth (ft bis)         150 Casing (HW) Depth (ft bis)         Packed Interval (the bis)         6.32           Hole Diameter (in.)         3.06         Initial Test Interval WL (ft bis)         6.32           Purge Volume (gallons)         1         1         6.32         6.32           1         g/ft X         180         ft (interval) =         33         gallons           2         g/ft X         180         ft (interval) =         33         gallons           Purge Volume (gallons)         1         10         fet         ft (interval) =         9         gallons           Purge Volume (bickarge Rate (gm)         20         gm         minutes         calculate         volume           Collection Method: 3' submerisble pump         10         fet         ft         ft         gallons           Outles (Nourse Rate (gm))         20         gm         minutes         calculate         gallons           Outles (Sag Rate (gm))         30         33         ft         gallons         gallons	General Inf	ormation							
Well COREHOLE 2         Time 9:00:11:00           SID# 875942         Performed by J. Zydek, T. Gates           Well Depth (ft bis)         200           Casing (HW) Depth (ft bis)         150           Casing (HW) Depth (ft bis)         150           Hole Diameter (in.)         3.06           Initial Test Interval (m-m bis)         46-61           Initial Annulus WL (ft bis)         5° casing           2         g/ft         X           2         g/ft         X           2         g/ft         X           TOTAL PURGE VOLUME (one) =         33           9         gallons           addition do 3" submerisble pump           Airline Length         110           Feet         13.5           Collection Method: Sufface Discharge-Dr:         Willene Bailer           Collection Method: Sufface Discharge-Dr:         Willine Bailer           Collection Method: Sufface Discharge-Dr:         Start Purge           9:33         361         23.23           9:43         355         23.24           9:43         355         23.24           9:43         355         23.24           9:43         355         23.24           1	Wellsite	West Citrus			_	Date 11/3/2016			
SID#         875942         Performed by J. Zydek, T. Gates           Well Depth (ft bls)         200         Packed Interval (ft-ft bls)         150-200           Casing (HW) Diameter (in.)         3.06         150         Packed Interval (m-m bls)         46-61           Initial Test Interval WL (ft bls)         6.32         initial Annulus WL (ft bls)	Well	COREHOLE	2			Time 9:00-11:00			
Well Depth (ft bis)       200       Packed Interval (ft-ft bis)       150-200         Casing (HW) Depth (ft bis)       150       Packed Interval (m-m bis)       46-61         Note: 1ft = 0.3048 m       Initial Test Interval WL (ft bis)       5° casing         Purge Volume (gallons)       1       1       1       1         1       1       2       10       10       56         Purge Volume (gallons)       1       7       7       7         1       10       feet       56       gallons         Purge Volume (gallons)       10       feet       13.5       minutes         Purge Volume (gallons)       10       feet       13.5       minutes         Purge Volume (gallons)       10       feet       13.5       minutes         Purge Volume (gallons)       20       gpm       9       gallons       gallons         Purge Volume (bichod 3'' submerisble purpe       100       feet       13.5       minutes         Collection Method: Surface Dischargae       90/20       minutes X THREE =       13.5       minutes         Collection Method: Surface Dischargae       02D1017AB       Start Purge       9:23       End Purge       9:33         9:33       361 <td>SID#</td> <td>875942</td> <td></td> <td></td> <td>Performe</td> <td>ed by J. Zydek, T. G</td> <td>Gates</td> <td></td>	SID#	875942			Performe	ed by J. Zydek, T. G	Gates		
Well Depth (ft bis)       200       Packed Interval (ft-ft bis)       150-200         Casing (HW) Dipmeter (in.)       3.06       Initial Test Interval WL (ft bis)       6.32         Note: 1ft = 0.3048 m       ft (interval)       =       33       gallons         1								_	
Purge Volume (gallons) $gft \times 20$ ft (interval) = 33 gallons $33$ gallons $axcel$ $yrge$ volume $ballons$ $yrge$ volume $ballons$ $yrge$ volume $ballons$ $axcel$	( C Note: 1ft = 0.30	Well Casing (HW) Casing (HW) [ Hole [ 148 m	Depth (ft bls) Depth (ft bls) Diameter (in.) Diameter (in.)	200 150 3.06 4	Pac Pack Initial Te Initia	ked Interval (ft-ft bls ed Interval (m-m bls st Interval WL (ft bls al Annulus WL (ft bls	s) <u>150-200</u> s) <u>46-61</u> s) <u>6.32</u> s) <u></u>	5" casing	
Purge Volume (gallons) 1 2 g/ft X 180 ft (interval) = 33 gallons g/ft X 100 ft (interval) = 33 gallons TOTAL PURGE VOLUME (one) = 39 gallons volume (acculate using Airline Length 110 feet Discharge Rate (gpm) 20 gpm Purge Volume /Discharge Rate 89/20 minutes X THREE = 13.5 minutes Collection Method: Surface Discharge or Wireline Bailer or Nested Bailer Comments: ending WL = 6.30' btoc Note: NQ=0.2301 gal/ft: HW=0.6528 gal/ft: open hole(NQ)=0.3623 gal/ft: Test Information Multimeter Serial # 02D1017AB Multimeter Serial # 02D1017AB Start Purge 9:53 Sample Time 9:53 Sample	<b>_</b>	<i>,</i> ,							
Pump Method <u>3' submensible pump</u> Airline Length <u>10</u> feet Discharge Rate (gpm) <u>20</u> gpm Purge Volume /Discharge Rate <u>89/20</u> minutes <b>X THREE</b> = <u>13.5</u> minutes Collection Method: <u>Surface Discharge</u> or Wireline Bailer or Nested Bailer Comments: ending WL = 6.30' btoc Note: NO=0.230T gal/ft. HW=0.6528 gal/ft. open hole(NQ)=0.3623 gal/ft Test Information Multimeter Serial # <u>02D1017AB</u> Water Quality During Purge Time <u>Sp. Cond.</u> Temp. <u>pH</u> 9:33 361 23.23 7.14 9:38 356 23.24 7.17 9:43 356 23.224 7.17 9:43 356 23.22 7.18 9:48 357 23.26 7.18 9:53 355 23.24 7.19 LIMS Sample ID 200922591 LIMS Sub ID 100071900 Multimeter Serial # <u>02D1017AB</u> Photometer Serial # <u>02D1017AB</u> Multimeter Serial # <u>02D1017AB</u> Sample ID 200922591 LIMS Sub ID 100071900	Purge Volun 1 2	ne (gallons)	g/ft X g/ft X TOT	180 20 AL PURGE	ft (interval) ft (interval) VOLUME (or	= <u>33</u> = <u>56</u> ne) = <u>89</u>	gallons gallons gallons	*volume calculate using excel	
Discharge Rate (gm)       100       gpm         Purge Volume /Discharge Rate       89/20       minutes X THREE =       13.5       minutes         Collection Method: Surface Discharge or Wireline Bailer or Nested Bailer       Comments:       ending ML = 6.30° btoc         Note: NQ=0.2301 gal/ft; HW=0.6528 gal/ft; open hole(NQ)=0.3623 gal/ft       Multimeter Serial #       02D1017AB         Multimeter Serial #       02D1017AB       Start Purge       9:23         Water Quality During Purge       Time       \$\$\$ \$\$ \$\$ \$\$ \$\$ \$\$ \$\$ \$\$ \$\$ \$\$ \$\$ \$\$ \$\$	P A	oump Method	3" submerisb	le pump			_	purge volume	
Purge Volume /Discharge Rate       89/20       minutes X THREE =       13.5       minutes         Collection Method:       Curface Discharge Por Wireline Bailer or Nested Bailer       Nested Bailer       Nested Bailer         Comments:       ending WL = 6.30' bloc	Discharg	e Rate (gnm)	20	anm				calculato	
Collection Method: Surface Discharge or Wireline Bailer or Nested Bailer         Comments: ending WL = 6.30' btoc         Note: NQ=0.2301 gal/ft; HW=0.6528 gal/ft; open hole(NQ)=0.3623 gal/ft         Test Information         Multimeter Serial #       02D1017AB         Yeat       366       23.23       6.34         9:38       358       23.24       7.17         9:48       357       23.26       7.18         9:48       357       23.26       7.18         9:53       355       23.24       7.19         Under Serial #       02D1017AB       End Purge       9:53         Start Purge       9:53       Safe       23.24       7.18         9:48       357       23.26       7.18       Sample Time       9:53         Sub D 100071900       UMS Sub ID 100071900       UMS Sub ID 100071900       UMS Sub ID 100071900         Multimeter Serial #02D1017AB       Photometer Serial # A09121570-d56b       Chloride (mg/l)       5.7         Sp. Cond. (µS/cm)       355       Chloride (mg/l)       5.7       Sulfate (mg/l)       -         Temperature (°C)       23.24       PH (SU)       PH (SU)       PH (SU)       Nu	Purge Volume	/Discharge Rate	89/20	minutes X T	HREE =	13.5	minutes		
Comments: ending WL = 6.30' bloc Note: NQ=0.2301 gal/ft: HW=0.6528 gal/ft: open hole(NQ)=0.3623 gal/ft: Test Information Multimeter Serial # 02D1017AB Multimeter Serial # 02D1017AB         Multimeter Serial # 02D1017AB         Yater Quality During Purge         1         9:28         3:361         9:33         3:66         9:43         9:53         9:53         9:53         9:53         9:53         9:53         9:53         9:53         9:53         9:53         9:53         9:53         9:53         9:53         9:53         9:53         9:53         9:53         10         10         10         10         11         11         11         12         13         14         15         15         16         17         18         19         110         1110         1110         1110		tion Method:	Surface Disc	harge or M	Vireline Bailer	or Nested Bailer	minutes		
Note: NQ=0.2301 gal/ft:         HW=0.6528 gal/ft:         open hole(NQ)=0.3623 gal/ft           Test Information         Multimeter Serial #         02D1017AB           9:28         372         23.23         6.34           9:33         361         23.23         7.14           9:38         356         23.24         7.17           9:43         356         23.25         7.18           9:53         355         23.24         7.19           9:53         355         23.24         7.19           9:53         355         23.24         7.19           9:53         355         23.24         7.19           9:53         355         23.24         7.19           Sample Time         9:53         Sample Time         9:53           Sufficience         9:53         LIMS Sample ID 200922591         LIMS Sub ID 100071900           Multimeter Serial #02D1017AB         Photometer Serial # A09121570-d56b         Nultimeter Serial #02D1017AB         Photometer Serial # A09121570-d56b           Sp. Cond. (µS/cm)         355         Chloride (mg/l)         5.7           Temperature (°C)         23.24         Sulfate (mg/l)         <	Comments:	ending WI =	6 30' btoc			or mested baller			
Note: NQ=0.2301 gal/ft; HW=0.6528 gal/ft; open hole(NQ)=0.3623 gal/ft         Time Serial # 02D1017AB         Water Quality During Purge         Time       Sp. Cond.         Yest and the serial state of the serial state of the series of the series for Standard Complete Application       Start Purge         9:33       361       23.23       6.34         9:33       361       23.23       7.14         9:38       356       23.24       7.17         9:43       356       23.25       7.18         9:53       355       23.24       7.19         9:53       355       23.24       7.19         9:53       355       23.24       7.19         Under the serial series of the series of t	Comments.	chung WL -	- 0.00 0.00					_	
Test Information         Multimeter Serial # 02D1017AB         Water Quality During Purge         Time Sp. Cond. Temp. pH         9:28       372       23.23       6.34         9:33       361       23.23       7.14         9:38       356       23.25       7.18         9:43       356       23.25       7.18         9:44       357       23.26       7.18         9:53       355       23.24       7.19         9:53       355       23.24       7.19         9:53       355       23.24       7.19         9:53       355       23.24       7.19         9:53       355       23.24       7.19         9:53       355       23.24       7.19         Sample Time       9:53       Sample ID 200922591         LIMS Sample ID 200922591       LIMS Sub ID 100071900         Multimeter Serial #02D1017AB       Photometer Serial # A09121570-d56b         Sp. Cond. (µS/cm)       355       Chloride (mg/l)         9H (SU)       7.19       PH (SU)	Note: NQ=0.23	01 gal/ft: HW=0	).6528 gal/ft: ope	n hole(NQ)=0.3	623 gal/ft			-	
Test Information         Multimeter Serial #       02D1017AB         Water Quality During Purge       1         Time       Sp. Cond.       Temp.       pH         9:28       372       23.23       6.34         9:33       361       23.23       7.14         9:38       358       23.24       7.17         9:43       356       23.25       7.18         9:53       355       23.24       7.19         9:53       355       23.24       7.19         9:53       355       23.24       7.19         9:53       355       23.24       7.19         9:53       355       23.24       7.19         9:53       355       23.24       7.19         Sample Time       9:53       Sample D 200922591         LIMS Sample ID 200922591       LIMS Sub ID 100071900         Multimeter Serial #02D1017AB       Photometer Serial # A09121570-d56b         Sp. Cond. (µS/cm)       355       Chloride (mg/l)         5.7       Sulfate (mg/l)          Femperature (°C)       23.24       pH (SU)         9H (SU)       7.19       pH (SU)         9H (SU)       7.1		<u> </u>		(,					
Multimeter Serial #       02D1017AB         Water Quality During Purge $pH$ 9:28       372       23.23       6.34         9:33       361       23.23       7.14         9:38       358       23.24       7.17         9:43       356       23.25       7.18         9:43       355       23.24       7.19         9:53       355       23.24       7.19         9:53       355       23.24       7.19         9:53       355       23.24       7.19         9:53       355       23.24       7.19         9:53       355       23.24       7.19         Sample Time       9:53       9:53         Sulfast (MS Sample ID 200922591       LIMS Sub ID 100071900         Multimeter Serial #02D1017AB       Photometer Serial # A09121570-d56b         Sp. Cond. (µS/cm)       355       Chloride (mg/l)       5.7         Temperature (°C)       23.24       PH (SU)       PH (SU)         PH (SU)       7.19       PH (SU)       Sulfate (mg/l)         Scored conductional point intic Laboration for Stored and Computer Amplified Conduction Computer Amplified Computer Amplified Computer Amplified Computer Amplified Computer Amplified Computer Amplified Comput	Test Inform	ation							
Water Quality During Purge         Time       Sp. Cond.       Temp.       pH         9:28       372       23.23       6.34         9:33       361       23.23       7.14         9:38       356       23.24       7.17         9:43       356       23.25       7.18         9:48       357       23.26       7.18         9:53       355       23.24       7.19         9:53       355       23.24       7.19         9:53       355       23.24       7.19         9:53       355       23.24       7.19         9:53       355       23.24       7.19         1       1       1       1         1       1       1       1         1       1       1       1         1       1       1       1         1       1       1       1         1       1       1       1         1       1       1       1         1       1       1       1         1       1       1       1         1       1       1       1 <td></td> <td>Multimeter S</td> <td>Serial #</td> <td>02D1017AB</td> <td></td> <td></td> <td></td> <td></td>		Multimeter S	Serial #	02D1017AB					
Time       Sp. Cond.       Temp.       pH         9:28       372       23.23       6.34         9:33       361       23.23       7.14         9:38       358       23.24       7.17         9:43       356       23.25       7.18         9:53       355       23.26       7.18         9:53       355       23.24       7.19         9:53       355       23.24       7.19         1       1       1       1         1       1       1       1         1       1       1       1         1       1       1       1         1       1       1       1         1       1       1       1         1       1       1       1         1       1       1       1         1       1       1       1         1       1       1       1         1       1       1       1         1       1       1       1         1       1       1       1         1       1       1       1		, N	Nater Quality	<b>During Purg</b>	е				
9:28 $372$ $23.23$ $6.34$ 9:33 $361$ $23.23$ $7.14$ 9:38 $358$ $23.24$ $7.17$ 9:43 $356$ $23.25$ $7.18$ 9:53 $355$ $23.24$ $7.19$ 9:53 $355$ $23.24$ $7.19$ 9:53 $355$ $23.24$ $7.19$ 9:53 $355$ $23.24$ $7.19$ 1       1       1       1         1       1       1       1         1       1       1       1         1       1       1       1         1       1       1       1         1       1       1       1         1       1       1       1         1       1       1       1         1       1       1       100071900         Multimeter Serial #02D1017AB       Photometer Serial # A09121570-d56b         Sp. Cond. (µS/cm) $355$ Chloride (mg/l) $5.7$ PH (SU)       7.19       PH (SU) $5.7$ PH (SU)       7.19		Time	Sp. Cond.	Temp.	pН				
9:33       361       23.23       7.14         9:38       358       23.24       7.17         9:43       356       23.25       7.18         9:48       357       23.26       7.18         9:53       355       23.24       7.19         9:53       355       23.24       7.19         9:53       355       23.24       7.19         9:53       355       23.24       7.19         9:53       355       23.24       7.19         9:53       355       23.24       7.19         9:53       355       23.24       7.19         9:53       355       23.24       7.19         9:53       100071900       100071900         Multimeter Serial #02D1017AB         Photometer Serial # A09121570-d56b         Sp. Cond. (µS/cm)       355         Temperature (°C)       23.24         pH (SU)       7.19         PH (SU)       7.19         PH (SU)       7.19         PH (SU)       7.19		9:28	372	23.23	6.34				
9:38       358       23.24       7.17         9:43       356       23.25       7.18         9:48       357       23.26       7.18         9:53       355       23.24       7.19         9:53       355       23.24       7.19         9:53       355       23.24       7.19         9:53       355       23.24       7.19         9:53       355       23.24       7.19         9:53       355       23.24       7.19         9:53       100071900       100071900         Multimeter Serial #02D1017AB         Photometer Serial # A09121570-d56b         Sp. Cond. (µS/cm)       355         7.19       Photometer Serial # A09121570-d56b         Sp. Cond. (µS/cm)       355         PH (SU)       7.19         PH (SU)       7.19         PH (SU)       7.19         Sulfate (mg/l)       5.7         Sulfate (mg/l)       <		9:33	361	23.23	7.14	Start Purge	9:23		
9:43       356       23.25       7.18         9:48       357       23.26       7.18         9:53       355       23.24       7.19         9:53       355       23.24       7.19         9:53       355       23.24       7.19         9:53       355       23.24       7.19         9:53       355       23.24       7.19         9:53       355       23.24       7.19         9:53       100071900       100071900         Multimeter Serial #02D1017AB       Photometer Serial # A09121570-d56b         Sp. Cond. (µS/cm)       355       Chloride (mg/l)         7:19       Sulfate (mg/l)          9H (SU)       7.19       PH (SU)		9:38	358	23.24	7.17	Start i uige			
9:48       357       23.26       7.18         9:53       355       23.24       7.19         Image: Sample ID 200922591       IMS Sample ID 200922591         Image: Image: Sample ID 200922591       IMS Sub ID 100071900         Image: Sample ID 200922591       IMS Sub ID 100071900         Image: Sample ID 200922591       IMS Sub ID 100071900         Multimeter Serial #02D1017AB       Photometer Serial # A09121570-d56b         Sp. Cond. (µS/cm)       355         Temperature (°C)       23.24         pH (SU)       7.19         PH (SU)       7.19         PH (SU)       7.19         Sample Sample Sample ID 200922591		9:43	356	23.25	7.18	End Purae	9:53		
9:53       355       23.24       7.19       Sample Time9:53         Image: Sample Time9:53       IMS Sample ID 200922591       LIMS Sample ID 200922591         Image: Sample Time9:53       IMS Sub ID 100071900         Multimeter Serial #02D1017AB       Photometer Serial # A09121570-d56b         Sp. Cond. (µS/cm)355       Chloride (mg/l)         Temperature (°C)23.24       Sulfate (mg/l)         pH (SU)       Time         pH (SU)       PH (SU)         Sample Time       Sample Time		9:48	357	23.26	7.18	5			
Image:		9:53	355	23.24	7.19	Sample Time	9:53		
LIMS Sample ID 200922591         LIMS Sub ID 100071900         Multimeter Serial #02D1017AB       Photometer Serial # A09121570-d56b         Sp. Cond. (µS/cm)       355         Temperature (°C)       23.24         pH (SU)       7.19         Semples Sent to District's Laboratory for Standard Complete Applying 2 (v) to N									
Image: Construction of the standard Constru							10 000000000		
Image: Start to District's Laboratory for Standard Complete Applying 2 (*) r. N						LIMS Sample	ID 200922591		
Multimeter Serial #02D1017AB     Photometer Serial # A09121570-d56b       Sp. Cond. (µS/cm)     355     Chloride (mg/l)       Temperature (°C)     23.24     Sulfate (mg/l)       PH (SU)     7.19     PH (SU)						LIMS Sub ID	100071900		
Multimeter Serial #02D1017AB       Photometer Serial # A09121570-d56b         Sp. Cond. ( $\mu$ S/cm)       355       Chloride (mg/l)         Temperature (°C)       23.24       Sulfate (mg/l)         pH (SU)       7.19       pH (SU)									
Multimeter Serial #02D1017AB       Photometer Serial # A09121570-d56b         Sp. Cond. ( $\mu$ S/cm)       355       Chloride (mg/l)         Temperature (°C)       23.24       Sulfate (mg/l)         pH (SU)       7.19       pH (SU)									
Multimeter Serial #02D1017AB       Photometer Serial # A09121570-d56b         Sp. Cond. ( $\mu$ S/cm)       355       Chloride (mg/l)         Temperature (°C)       23.24       Sulfate (mg/l)         pH (SU)       7.19       pH (SU)					}			1	
Multimeter Serial #02D1017AB     Photometer Serial # A09121570-d56b       Sp. Cond. (µS/cm)     355     Chloride (mg/l)       Temperature (°C)     23.24     Sulfate (mg/l)       pH (SU)     7.19     pH (SU)		L	I		1	l			
Sp. Cond. (µS/cm) 355 Temperature (°C) 23.24 pH (SU) 7.19 Samplas Sept to District's Laboratory for Standard Complete Applying 2 (C)r. N	Ν	Multimeter Se	rial <u>#02D1017</u>	7 <u>AB</u>	Photome	eter Serial # <u>A09121</u>	1 <u>570-d56b</u>		
Temperature (°C)     23.24     Sulfate (mg/l)       pH (SU)     7.19     pH (SU)	Sp. C	ond. (µS/cm)	355		Chloride (	mg/l) 5.7	Т		
pH (SU) 7.19 pH (SU)	Tem	perature (°C)	23.24		Sulfate (	mg/l) <<	-1		
Somples Sent to District's Laboratory for Standard Complete Applysic2 (Apr. N		nH (SU)	7 10		nH	(SU)	-	1	
Somples Sont to District's Laboratory for Standard Complete Applysics 2 (		pri (00)	7.15		PLI	(30)			
Somples Sont to District's Laboratory for Standard Complete Applysics () r. N									
Samples Sent to District's Laboratory for Standard Complete Analysis? V ØF IN	Samples Se	ent to District's	Laboratorv fo	or Standard	Complete An	alysis? 🖉 🔊 r N			

					WQ No.	3	
General Info	ormation						
Wellsite	West Citrus			_	Date 11/7/2016		
Well	COREHOLE	2		_	Time 9:55-10:56		
SID#	875942			Performe	ed by J. Zydek, T. G	Sates	
				_			
	Well	Depth (ft bls)	250	_ Pao	ked Interval (ft-ft bl	s) <u>200-250</u>	
(	Casing (HW)	Depth (ft bls)	200	Pack	ed Interval (m-m bl	s) <u>61-76</u>	
C	asing (HW) [	Diameter (in.)	3.06	_ Initial Te	est Interval WL (ft bl	s) <u>6.53' btoc</u>	
	Hole D	Diameter (in.)	4	_ Initia	al Annulus WL (ft bl	s)	_
Note: 1ft = 0.30	)48 m						-
Burgo Volun	no (gallone)						
ruige voluii 1	lie (galions)	a/ft X		ft (interval)	- 76	gallons	*volume
2		g/nt X		ft (interval)	= 70	gallons	calculated
2		19/11 X			$= \frac{300}{100}$	gallons	using exce
		101	ALFUNGE		ile) – 109	galions	purge
	ump Mothod	2" cubmorick	lo numn cot				volume
	Virling Longth	3 SUDITIETISL 170	foot			_	calculator
Discharge	e Rate (anm)	20	apm				
Discharge		5.5	minutes <b>X</b> 1	THREE =	16.5	minutos	
	/Discharge Rate	0.0		Vinalina Dailar	10.J	minutes	
Commonto:	clion Melhod:	ZE' htop: ofor		Vireline Ballei	or Nesled Baller		
Comments.	pump set @			0.00 DIOC			
		6529 gol/ft: one		ence and the			
NOLE. NQ-0.23	orgai/it, Hw-c	.0526 gai/it, Ope		025 yai/it			
Test Inform	ation						٦
	Multimeter S	Serial #	02D1017AB	8			
		Nater Quality	During Purg	le	]		
	Time	Sp. Cond.	Temp.	,c Ha			
	10:34	537	23.54	7.25			
	10:36	465	23.58	7.37	Start Purde	10:33	
	10:41	451	23.53	7.41			
	10:46	443	23.52	7.4	End Purae	10:56	
	10:51	438	23.51	7.39			
	10:56	437	23.51	7.4	Sample Time	10:56	
					LIMS Sample	ID 200922918	
					LIMS Sub ID	100071934	
					-		
Ν	Multimeter Se	rial <u>#02D101</u>	7 <u>AB</u>	Photome	eter Serial # <u>A09121</u>	570-d56b	
			1			_	
Sp. C	ond. (µS/cm)	437		Chloride (	mg/l) 30		
Tem	perature (°C)	23.51		Sulfate (	mg/l) <1		
	pH (SU)	7.4		рH	(SU)		
	,				· · ·	_	
					$\sim$		
Samples Se	ent to District's	Laboratory f	or Standard	Complete An	alysis? 🔇 🌶 N		

General Info					WQ No.	4	
	ormation						_
Wellsite	West Citrus			-	Date <u>11/8/2016</u>		
Well	COREHOLE	2			Time <u>8:40</u>		
SID#	875942			Perform	ed by <u>T. Gates</u>		_
					TOC = 2.34		-1
	Well [	Depth (ft bls)	300	Pa	cked Interval (ft-ft bls	) 250-300	
С	asing (HW) [	Depth (ft bls)	250	Pac	ked Interval (m-m bls	) 76-91	
Ca	asing (HW) D	iameter (in.)	3.06	Initial Te	est Interval WL (ft bls	6.43	inflated
	Hole D	iameter (in.)	4	Initi	al Annulus WL (ft bls	6.39	
ote: 1ft = 0.304	48 m			WLt	pefore packer inflated	6.42 BTOC	
urae Volum	e (gallons)						
1	(9)	a/ft X		ft (interval)	= 33	dallons	*volum
2		g/ft X		ft (interval)	= 75	gallons	calcula
		тот	AL PURGE		one) = 108	gallons	usina
						94.101.0	excel
Pi	ump Method	3" submerist	ole pump				purge
A	irline Lenath		feet				volume
Discharge	Rate (gpm)	5	apm				calcula
urge Volume /	Discharge Rate	108/5	minutes X T	HREE =	65	minutes	
	tion Method:	Surface Disc	harde or M	/ireline Baile	r or Nested Bailer		
omments:	WI dd = $64$	3' BTOC @ 9	·35				
-	WE dd = 04.0		.00				_
ote: NO=0 230	n=//ft· HW/=0	6528 gal/ft: one	n hole(NO)=0.3	623 gal/ft			
010.1102-0.200	- gaint, 1100-0	.0020 gaint, ope		020 guint			
est Inform:	ation						7
	Multimeter S	erial #	02D1017AB				
ſ	V	Vater Quality	During Purg	e	<b>]</b>		
	Time	Sp. Cond.	Temp.	pН	1		
	9:35	456	24.31	7.48			
	9:45	395	24.51	7.59	Stort Durgo	9:35	
ľ	9:50	388	24.59	7.61	Start Purge		
	9:55	207	~				
ľ		387	24.65	7.62	End Purge	10:43	
•	10:09	387	24.65	7.62 7.63	End Purge	10:43	
	10:09 10:18	387 397 396	24.65 24.76 24.79	7.62 7.63 7.63	End Purge _ Sample Time	10:43	
	10:09 10:18 10:26	397 396 395	24.65 24.76 24.79 24.82	7.62 7.63 7.63 7.64	End Purge _ Sample Time _	10:43 10:42	
	10:09 10:18 10:26 10:31	387 397 396 395 395	24.65 24.76 24.79 24.82 24.82	7.62 7.63 7.63 7.64 7.64	End Purge _ Sample Time _	10:43 10:42	
	10:09 10:18 10:26 10:31 10:42	387 397 396 395 395 395	24.65 24.76 24.79 24.82 24.82 24.82 24.66	7.62 7.63 7.64 7.64 7.64 7.64	End Purge _ Sample Time _ LIMS Sample ID: 20	10:43 10:42 00923320	
	10:09 10:18 10:26 10:31 10:42	387 397 396 395 395 395 395	24.65 24.76 24.79 24.82 24.82 24.82 24.66	7.62 7.63 7.64 7.64 7.64 7.64	End Purge Sample Time LIMS Sample ID: 20 LIMS Sub ID: 1000	10:43 10:42 00923320 71952	
-	10:09 10:18 10:26 10:31 10:42	387 397 396 395 395 395	24.65 24.76 24.79 24.82 24.82 24.66	7.62 7.63 7.63 7.64 7.64 7.64	End Purge Sample Time LIMS Sample ID: 20 LIMS Sub ID: 1000	10:43 10:42 00923320 71952	
	10:09 10:18 10:26 10:31 10:42	387 397 396 395 395 395	24.65 24.76 24.79 24.82 24.82 24.66	7.62 7.63 7.63 7.64 7.64 7.64	End Purge Sample Time LIMS Sample ID: 20 LIMS Sub ID: 1000	10:43 10:42 00923320 71952	
-	10:09 10:18 10:26 10:31 10:42	387 397 396 395 395 395	24.65 24.76 24.79 24.82 24.82 24.66	7.62 7.63 7.64 7.64 7.64 7.64	End Purge Sample Time LIMS Sample ID: 20 LIMS Sub ID: 1000	10:43 10:42 00923320 71952	
-	10:09 10:18 10:26 10:31 10:42	387 397 396 395 395 395 395	24.65 24.76 24.79 24.82 24.82 24.66	7.62 7.63 7.64 7.64 7.64 7.64	End Purge Sample Time LIMS Sample ID: 20 LIMS Sub ID: 1000	10:43 10:42 00923320 71952	
	10:09 10:18 10:26 10:31 10:42	387 397 396 395 395 395	24.65 24.76 24.79 24.82 24.82 24.66	7.62 7.63 7.64 7.64 7.64 7.64	End Purge Sample Time LIMS Sample ID: 20 LIMS Sub ID: 1000	10:43 10:42 00923320 71952	
M	10:09 10:18 10:26 10:31 10:42	387 397 396 395 395 395 395	24.65 24.76 24.79 24.82 24.82 24.66 7AB	7.62 7.63 7.64 7.64 7.64 7.64	End Purge Sample Time LIMS Sample ID: 20 LIMS Sub ID: 1000 eter Serial # <u>A09121</u>	10:43 10:42 00923320 71952 570-d56b	
M	10:09 10:18 10:26 10:31 10:42	387 397 396 395 395 395 395 rial <u>#02D1017</u> 05A1729/	24.65 24.76 24.79 24.82 24.82 24.66 24.66	7.62 7.63 7.64 7.64 7.64 7.64 7.64	End Purge Sample Time LIMS Sample ID: 20 LIMS Sub ID: 1000 eter Serial # <u>A09121</u>	10:43 10:42 00923320 71952 570-d56b	
M Sp. Cc	10:09 10:18 10:26 10:31 10:42 Multimeter Ser	387 397 396 395 395 395 395	24.65 24.76 24.79 24.82 24.82 24.66 24.66	7.62 7.63 7.64 7.64 7.64 7.64 7.64 Photom	End Purge Sample Time LIMS Sample ID: 20 LIMS Sub ID: 1000 eter Serial # <u>A09121</u> (mg/l)	10:43 10:42 00923320 71952 570-d56b	
M Sp. Cc Temp	10:09 10:18 10:26 10:31 10:42 Multimeter Ser ond. (μS/cm) perature (°C)	387 397 396 395 395 395 395 	24.65 24.76 24.79 24.82 24.82 24.66 7AB AF	7.62 7.63 7.64 7.64 7.64 7.64 7.64 Photom Chloride Sulfate	End Purge Sample Time LIMS Sample ID: 20 LIMS Sub ID: 1000 eter Serial # <u>A09121</u> (mg/l) <u>42</u> (mg/l) <u>0</u>	10:43 10:42 00923320 71952 570-d56b	
M Sp. Co Temp	10:09 10:18 10:26 10:31 10:42 Multimeter Ser ond. (μS/cm) perature (°C) pH (SU)	387 397 396 395 395 395 395 	24.65 24.76 24.79 24.82 24.82 24.66 7AB AF	7.62 7.63 7.64 7.64 7.64 7.64 7.64 Photom Chloride Sulfate p⊢	End Purge Sample Time LIMS Sample ID: 20 LIMS Sub ID: 1000 eter Serial # <u>A09121</u> (mg/l) <u>42</u> (mg/l) <u>0</u> I (SU)	10:43 10:42 00923320 71952 570-d56b	

	<b>WQ No.</b> 5
General Information	
Wellsite West Citrus	Date <u>11/9/2016</u>
	Lime
SID# <u>875942</u>	Performed by J. Zydek, T. Gates
Well Depth (ft bls) <u>350</u> Casing (HW) Depth (ft bls) <u>160</u> Casing (HW) Diameter (in.) <u>3</u> Hole Diameter (in.) <u>4</u>	Packed Interval (ft-ft bls) 325 Packed Interval (m-m bls) Initial Test Interval WL (ft bls) Initial Annulus WL (ft bls)
Purge Volume (gallons) 1g/ft X 2g/ft X TOTAL PURG	ft (interval) =gallons ft (interval) =gallons E VOLUME (one) =gallons
Pump Method Airline Length feet Discharge Rate (gpm) gpm Purge Volume /Discharge Rate minutes X Collection Method: Surface Discharge or Comments: Sample collected using geophysical Note: NQ=0.2301 gal/ft; HW=0.6528 gal/ft; open hole(NQ)=0	<b>( THREE =</b> minutes Wireline Bailer or Nested Bailer thief
Test Information	
Multimeter Serial # 02D1017A	AB
Water Quality During Pu	rge
Time Sp. Cond. Temp.	pH
	Start Purge <u>N/A</u>
	End Purge N/A
	Sample Time <u>13:25</u>
	LIMS Sample ID 200923570
Multimeter Serial <u>#02D1017AB</u>	Photometer Serial # <u>A09121570-d56b</u>
Sp. Cond. (μS/cm) 6318 Temperature (°C) 25.59 pH (SU) 6.99	Chloride (mg/l) 1800 Sulfate (mg/l) 170 pH (SU)
Samples Sent to District's Laboratory for Standar	d Complete Analysis? 🖌 dr N

Wel NO. 0           Wel NO. 0           Wel NO. 0           Wel Not No. 0           Wel Not	WATER QUALITY SAMPLE	ACQUISITION			6	
Unite         Unite         Use is it is i	General Information				U	1
Well CORE HOLE 2       Time       14/41         SID# 375942       Performed by J. Zydek, T. Gates         stickup = 2.36         Well Depth (ft bls)       350         Casing (HW) Diameter (in.)       3.06         Hole Diameter (in.)       4         Initial Test Interval WL (ft bls)       9.85         Purge Volume (gallons)       9ft X         1       9ft X         2       9ft X         Yourne (gallons)       9ft X         1       100         9ft X       ft (interval)         1       101         9ft X       ft (interval)         1       101         9gft X       ft (interval)         12       9ft X         14       100         9gft X       ft (interval)         12       101         14       100         15       calculated         01       1100         160       14930         170       feet         01       14030         170       feet         01       12         180       14020         190       minutes	Wellsite West Citrus			Date 11/9/2016		-
SID#         875942         Performed by J. Zydek, T. Gates           Well Depth (ft bis)         350         Packed Interval (ft.ft bis)         300-350           Casing (HW) Diameter (in.)         3.06         Packed Interval (ft.ft bis)         91-107           Casing (HW) Diameter (in.)         3.06         Initial Test Interval (ft.ft bis)         9.85           Hote Diameter (in.)         4         Initial Test Interval WL (ft bis)         9.85           Purge Volume (gallons)         1         115         gallons         eaclulated           1         gift X         ft (interval) =         115         gallons         eaclulated           1         gift X         gallons         gallons         eaclulated         using           1         gift X         gallons         gallons         eaclulated         using           Purge Volume (ballons)         170         feet         118         gallons         eaclulated           Purge Volume (ballonsing Ram         148/30         minutes X THREE =         15         minutes           Collection Method (Surface Discharga> raw         02D1017AB         Start Purge         14:52         eaclulator           Multimeter Serial # 02D1017AB         Multimeter Serial # 02D1017AB         Start Purge         1	Well CORFHOLE 2		-	Time 14:41		
Stickup = 2.36         Stickup = 2.36         Casing (HW) Depth (ft bis)         Casing (HW) Depth (ft bis)         Casing (HW) Depth (ft bis)         Note: ft = 0.3048 m         Note: ft = 0.3048 m         Purge Volume (gallons)         1       1         2       g/ft X         TOTAL PURGE VOLUME (one) =         TOTAL PURGE VOLUME (one) =         Purge Volume (gallons)         2       g/ft X         TOTAL PURGE VOLUME (one) =         Purge Volume (gallons)         Purge Volume /Decharge Rate (gpm)         Purge Volume /Decharge Rate (gpm)         Purge Volume /Decharge Rate (gpm)         Collection Method: Cscharge>or Wireine Bailer or Nested Bailer         Collection Method: Secharge>or Wireine Bailer or Nested Bailer         Collection Method: Secharge>or Wireine Bailer         Start Purge 14:52 <t< td=""><td>SID# 875942</td><td></td><td>- Performe</td><td>ed by J. Zvdek. T. G</td><td>ates</td><td></td></t<>	SID# 875942		- Performe	ed by J. Zvdek. T. G	ates	
Stickup = 2.36           Casing (HW) Depth (ft bis)         350         Packed Interval (ft-ft bis)         300-350           Casing (HW) Diameter (in.)         3.06         Initial Test Interval WL (ft bis)         get colspan="2">get colspan="2">get colspan="2">get colspan="2">Tot colspan="2">Initial Colspan="2">Colspan="2">Start Purge         Start Purge         Start Purge         Start Purge         Start Purge         Start Purge         Start Purge         14:52           Volume (gallons)         Collection Method 3* submerisble pump           Airline Length         TOTAL PURGE VOLUME (one) =         115         gallons           Purge Volume Olscharge Rate (gpm)         get colspan="2">Start Purge         14.52           Collection Method: Surface Discharge> Vir Wireline Bailer or Nested Bailer           Comments: ending packer WL = 9.95 bitoc           Multimeter Serial #         0201017AB           Multimeter Serial #         20201017AB           Multimeter Serial #         0201017AB           Multimeter Serial #         02021017AB           Mult	<u></u>		-	<u> </u>		-
Well Depth (ft bis)       350       Packed Interval (ft-ft bis)       300-91-107         Casing (HW) Depth (ft bis)       130       Packed Interval (m-m bis)       91-107         Hole Diameter (in.)       4       Initial Test Interval WL (ft bis)       9.55         Note: ft = 0.3948 m       9.95       ending packer WL         Purge Volume (gallons)       g/ft X       ft (interval) =       115       gallons         1       g/ft X       ft (interval) =       133       gallons       eacel and the context (ft bis)         Purge Volume (gallons)       g/ft X       ft (interval) =       115       gallons       eacel and the context (ft bis)       9.95         Purge Volume (gallons)       g/ft X       ft (interval) =       115       gallons       eacel and using gallons         Purge Volume (gallons)       g/ft X       ft (interval) ft (ft bis)       9.95       purge       volume         Discharge Rate (gpm)       TOTAL PURGE VOLUME (one) =       148       gallons       eacel and using eacker WL       volume         Collection Method: CSUfface Discharge Rate       148/30       minutes       ft (ft bis)       ft (ft bis) <td></td> <td></td> <td></td> <td>stickup = 2.36</td> <td></td> <td></td>				stickup = 2.36		
Casing (HW) Depth (ft bis)       160       Packed Interval (m-m bis)       91-107         Nate: 1ft = 0.3048 m       3.06       Initial Test Interval WL (ft bis)       9.55         Purge Volume (gallons)       1       1115       gallons       9.95         1	Well Dep	th (ft bls) 350	Pac	ked Interval (ft-ft bls	) 300-350	
Casing (HW) Diameter (in.) $3.06$ Initial Annulus WL (ft bis) 9.85 ending packer set Initial Annulus WL (ft bis) 9.85 ending packer WL initial An	Casing (HW) Dep	th (ft bls) 160	- Pack	ed Interval (m-m bls	) 91-107	
Hole Diameter (in.) 4Initial Annulus WL (ft bis)Note: Ift = 0.3048 m9.95Purge Volume (gallons) $1$ $9.95$ 1 $2$ $gfft \times 1$ $ff$ (interval) =1 $115$ $gallons$ 2 $gfft \times 1$ $ff$ (interval) =1 $115$ $gallons$ 2 $gfft \times 1$ $ff$ (interval) =1 $1170$ feet $1050$ $ggft \times 1$ $ff$ (interval) = $148$ $gallons$ $gallons$ $gallons$ $gallons$ $gallons$ Purp Method 3" submerisble pump Airline Length $170$ feetDischarge Rate (gpm) $ggm$ Purge Volume /Discharge Rate ( $gm$ ) $ggm$ $ggm$ $ggm$ $ggm$ $ggm$ $ggm$ $ggm$ $ggm$ <td>Casing (HW) Diam</td> <td>eter (in.) 3.06</td> <td>Initial Te</td> <td>st Interval WL (ft bls</td> <td>) 9.85</td> <td>packer set</td>	Casing (HW) Diam	eter (in.) 3.06	Initial Te	st Interval WL (ft bls	) 9.85	packer set
Nute: 11 = 0.3048 m         9.95 ending packer WL           Purge Volume (gallons)         1         1         13         gallons gallons gallons         gallons gallons           2         g/ft X         ift (interval) = 133         13         gallons gallons         gallons           Purpe Method 3" submerisble pump         itt (interval) = 148         gallons         gallons         gallons           Pump Method 3" submerisble pump         intitles V DLUME (one) = 148         gallons         gallons           Pump Method 3" submerisble pump         intitles X THREE = 15         minutes         minutes           Collection Method: Surface Discharge Nat         148/30         minutes         calculator           Collection Method: Surface Discharge Nat         02D1017AB         minutes         calculator           Note: NO=0.2301 gal/ft: HW=0.6528 gal/ft: open hole(NQ)=0.3623 gal/ft         Start Purge 14:52         is:37           Tis: 2         26844         24:34         7.01         Sample Time 9:53           15:27         26840         24:35         7.01         Sample Time 9:53           15:32         26893         24:36         7.01         LIMS Sample ID: 200923569           LIMS Sample ID: 100071976         UIM timeter Serial #02D1017AB         Sample Time 9:53	Hole Diam	eter (in.) 4	Initia	al Annulus WL (ft bls	)	
Purge Volume (gallons) 1 $2$ $g/ft \times TOTAL PURGE VOLUME (one) = 115 gallons 2 33 gallons148 gallonsPump Method 3' submerisble pumpArtificia Length 170 feetDischarge Rate (gpm)Purge Volume (Discharge Rate 148/30 minutes X THREE = 15 minutesCollection Method: Sufface Discharge>or Wireline Bailer or Nested BailerCollection Method: Sufface Discharge>or Wireline Bailer or Nested BailerNote: NQ=0.2301 gal/ft; HW=0.6528 gal/ft; open hole(NQ)=0.3623 gal/ftTime Sp. Cond. Temp. pH15:07 26625 24.29 6.9915:12 26044 24.25 6.915:12 26044 24.25 6.915:12 26040 24.35 7.0115:27 266940 24.35 7.0115:27 266940 24.35 7.0115:38 27021 24.36 7.0115:38 27021 24.36 7.0115:38 27021 24.36 7.0115:38 27021 24.36 7.0115:38 27021 24.36 7.01LIMS Sample ID: 200923569LIMS Sub ID: 100071976Multimeter Serial #02D1017ABPhotometer Serial # 0201017ABMultimeter Serial #02D1017ABMultimeter Serial #02D1017ABMultimeter Serial #02D1017ABPhotometer Serial # 0201017ABMultimeter Serial #0201017ABPhotometer Serial # 0201017ABMultimeter Serial #0201017ABMultimeter Serial #0201017ABPhotometer Serial # 009121570-d56bSp. Cond. (µS/cm) 27021Chloride (mg/l) >10000Sulfate (mg/l)pH (SU)$	Note: 1ft = 0.3048 m				9.95	ending
Purge Volume (gallons) 1 $2$ $g/ft \times $ $TOTAL PURGE VOLUME (one) = 115 gallons 148 gallons 1$						packer WI
$\frac{1}{2} \qquad g/ft \times \\ TOTAL PURGE VOLUME (one) = \underbrace{115}_{3} gallons \\ gallon \\ ga$	Purge Volume (gallons)	· · · ·	<b>]</b>		т	
$2 \underbrace{ gift X}_{TOTAL PURGE VOLUME (one)} = \underbrace{33}_{gallons}_{IA8} gallons}_{Gallons}_{Gallons}_{Gallons}_{Gallons}_{Gallons}_{Gallons}_{Gallons}_{Gallons}_{Gallons}_{IA8} gallons}$	1g/fi	X	ft (interval)	= 115	gallons	*volume
TOTAL PURGE VOLUME (one) = 148 gallons       using excel         Purp Method 3" submerisble pump         Airline Length       170       feet         Discharge Rate (gpm)       gpm       minutes X THREE = 15       minutes         Collection Method: Surface Discharge Por Wireline Bailer or Nested Bailer         Collection Method: Surface Discharge Por Wireline Bailer or Nested Bailer         Collection Method: Surface Discharge Por Wireline Bailer or Nested Bailer         Comments: ending packer WL = 9.95 bicc         Note: NQ=0.2301 gal/ft. HW=0.6528 gal/ft. open hole(NQ)=0.3623 gal/ft         Test Information         Multimeter Serial #       02D1017AB         Start Purge 14:52         15:07       26525         24.29       6.99         15:12       26708       24.31         15:22       26894       24.35         15:36       27021       24.36         15:36       27021       24.36         15:36       27021       24.36         Multimeter Serial # A09121570-d56b         Sp. Cond. (µS/cm)       27021         Volume       Sulfate (mg/l)       >10000         Sulfate (mg/l)	2 g/fi	ι Χ	ft (interval)	= 33	gallons	calculated
Pump Method <u>3" submerisble pump</u> excel           Airline Length <u>170</u> feet           Discharge Rate (gpm)         gpm         minutes X THREE = <u>15</u> Purge Volume /Discharge Rate <u>148/30</u> minutes X THREE = <u>15</u> Collection Method: <u>Surface Discharge Por Wireline Bailer or Nested Bailer</u> minutes         collection Method:           Comments:         ending packer WL = 9.95' bloc         minutes         minutes         minutes           Note: NQ=0.2301 gal/ft:         HW=0.6528 gal/ft; open hole(NQ)=0.3623 gal/ft         minutes         minutes           Start Purge <u>115:22</u> 26044         24.25         6.99           15:12         26708         24.31         7.01         End Purge <u>15:37</u> Start Purge <u>115:22</u> 26837         24.33         7.01         Sample Time         9:53           15:32         26993         24.36         7.01         LMS Sample ID: 200923569         LMS Sub ID: 100071976           Multimeter Serial #02D1017AB         Photometer Serial # <u>A09121570-d56b</u> LMS Sub ID: 100071976         Multimeter Serial #02D1017AB		TOTAL PURGE	VOLUME (or	ne) = 148	gallons	using
Pump Method <u>3' submensible pump</u> purge         Airline Length <u>170</u> feet         Discharge Rate (gpm)       gpm         Purge Volume /Discharge Rate <u>148/30</u> minutes X THREE = <u>15</u> minutes         Collection Method: Surface Discharge or Wireline Bailer or Nested Bailer       Nested Bailer         Comments:       ending packer WL = 9.95' bloc         Note: NQ=0.2301 gal/ft;       HW=0.6528 gal/ft; open hole(NQ)=0.3623 gal/ft         Test Information         Multimeter Serial #       02D1017AB         Water Quality During Purge <u>14:52</u> 15:12       26044       24.25       6.9         15:12       26708       24.31       7.01         15:27       26940       24.33       7.01         15:27       26940       24.36       7.01         15:36       27021       24.36       7.01         15:36       27021       24.36       7.01         UMS Sample ID: 200923569       LIMS Sub ID: 100071976         Multimeter Serial #02D1017AB       Photometer Serial # A09121570-d56b         Sp. Cond. (µS/cm)       27021       Chloride (mg/l)       >10000         Temperature (°C)       24.56       Sulfate (mg/l)       >10000         PH	<b></b>					excel
Airine Length       1/0       reet       youme         Discharge Rate (gpm)      gpm	Pump Method <u>3" s</u>	ubmerisble pump			_	purge
Discharge Rate (gpm)	Airline Length	<u>1/0</u> feet				volume
Purge Volume (Discharge Rate       143/30       minutes X INREE =       15       minutes         Collection Method:       Surface Discharge/or Wireline Bailer or Nested Bailer       Nested Bailer       Nested Bailer         Note: NQ=0.2301 gal/ft:       HW=0.6528 gal/ft: open hole(NQ)=0.3623 gal/ft       Nested Bailer       Nested Bailer         Test Information         Multimeter Serial #       02D1017AB         Water Quality During Purge       PH         15:07       26525       24.29       6.99         15:12       26708       24.31       7.01         15:17       26834       24.31       7.01         15:22       26894       24.34       7.01         15:32       26993       24.36       7.01         15:32       26993       24.36       7.01         15:32       26993       24.36       7.01         15:36       27021       24.36       7.01         LIMS Sample ID: 200923569       LIMS Sub ID: 100071976       Nultimeter Serial # 02D1017AB         Multimeter Serial #02D1017AB       Photometer Serial # A09121570-d56b         Sp. Cond. (µS/cm)       Z7021       Chloride (mg/l)         Temperature (°C)       24.56       Sulfate (mg/l) <td< td=""><td>Discharge Rate (gpm)</td><td>gpm</td><td></td><td></td><td><b>-</b></td><td>calculator</td></td<>	Discharge Rate (gpm)	gpm			<b>-</b>	calculator
Collection Method: $(S_{Urface Discharge})$ or Wireline Bailer or Nested Bailer Comments: ending packer WL = 9.95' btoc Note: NQ=0.2301 gal/ft: HW=0.6528 gal/ft: open hole(NQ)=0.3623 gal/ft Test Information Multimeter Serial # 02D1017AB Test Information Multimeter Serial # 02D1017AB Time Sp. Cond. Temp. pH 15:02 26044 24.25 6.9 15:07 26525 24.29 6.99 15:12 26708 24.31 7.01 15:27 26837 24.33 7.01 15:22 26894 24.34 7.01 15:22 26894 24.34 7.01 15:32 26993 24.36 7.01 15:36 27021 24.36 7.01 15:36 27021 24.36 7.01 UIMS Sample ID: 200923569 UIMS Sub ID: 100071976 Multimeter Serial #02D1017AB Photometer Serial # <u>A09121570-d56b</u> Sp. Cond. (µS/cm) <u>27021</u> Temperature (°C) <u>24.56</u> pH (SU) 7.01 Chloride (mg/l) <u>&gt;10000</u> Buffate (mg/l) pH (SU) 7.01	Purge Volume /Discharge Rate	48/30 minutes X	HREE =	15	minutes	
Comments:       ending packer WL = 9.95' btoc         Note: NQ=0.2301 gal/ft.       HW=0.6528 gal/ft.         Test Information       Multimeter Serial #       02D1017AB         Multimeter Serial #       02D1017AB         Start Purge       14:52         15:02       26044       24.25       6.9         15:07       26525       24.29       6.99         15:12       26708       24.33       7.01         15:22       26894       24.33       7.01         15:22       26894       24.35       7.01         15:22       26993       24.36       7.01         15:32       26993       24.36       7.01         15:32       26993       24.36       7.01         15:32       26993       24.36       7.01         LIMS Sample ID:       200923569         LIMS Sub ID:       100071976         Multimeter Serial #02D1017AB       Photometer Serial # A09121570-d56b         Sp. Cond. (µS/cm)       27021       Chloride (mg/l)         Temperature (°C)       24.56       pH (SU)         pH (SU)       7.01       pH (SU)	Collection Method:	rface Discharge or V	Vireline Bailer	or Nested Bailer		
Note: NQ=0.2301 gal/ft; HW=0.6528 gal/ft; open hole(NQ)=0.3623 gal/ft         Test Information         Multimeter Serial # 02D1017AB         Water Quality During Purge         Time Sp. Cond. Temp. pH         15:07       26525       24.29       6.99         15:12       26708       24.31       7.01         15:27       26894       24.33       7.01         15:27       26940       24.35       7.01         15:32       26993       24.36       7.01         15:32       26993       24.36       7.01         15:32       26993       24.36       7.01         15:32       26993       24.36       7.01         15:36       27021       24.36       7.01         LIMS Sample ID: 200923569       LIMS Sub ID: 100071976         Multimeter Serial #02D1017AB       Photometer Serial # A09121570-d56b         Sp. Cond. (µS/cm)       27021       Chloride (mg/l)       >10000         Temperature (°C)       24.56       pH (SU)       pH (SU)       pH (SU)	Comments: ending packer W	/L = 9.95' btoc				
Note: NO-0.2301 gal/ft; HW=0.6528 gal/ft; open hole(NQ)=0.3623 gal/ft         Test Information         Multimeter Serial # 02D1017AB         Water Quality During Purge         15:02       26044       24.25       6.9         15:07       26525       24.29       6.99         15:12       26708       24.31       7.01         15:12       26708       24.31       7.01         15:27       26940       24.35       7.01         15:32       26993       24.36       7.01         15:32       26993       24.36       7.01         15:32       26993       24.36       7.01         15:36       27021       24.36       7.01         LIMS Sample ID: 200923569       LIMS Sub ID: 100071976         Multimeter Serial #02D1017AB       Photometer Serial # A09121570-d56b         Sp. Cond. (µS/cm)       27021       Chloride (mg/l)         Temperature (°C)       24.56       Sulfate (mg/l)         PH (SU)       7.01       PH (SU)						-
Test Information         Multimeter Serial # 02D1017AB         Water Quality During Purge         Time       Sp. Cond.       Temp.       pH         15:02       26044       24.25       6.9         15:12       26708       24.31       7.01         15:17       26837       24.33       7.01         15:17       26837       24.33       7.01         15:22       26894       24.33       7.01         15:22       26894       24.36       7.01         15:32       26993       24.36       7.01         15:32       26993       24.36       7.01         15:36       27021       24.36       7.01         LIMS Sample Time       9:53         LIMS Sub ID: 100071976       100071976         Multimeter Serial #02D1017AB       Photometer Serial # A09121570-d56b         Sp. Cond. (µS/cm)       27021       Chloride (mg/l)         Temperature (°C)       24.56       Sulfate (mg/l)         PH (SU)       7.01       PH (SU)	Note: NQ=0.2301 gal/ft; HW=0.6528	3 gal/ft; open hole(NQ)=0.3	3623 gal/ft			
Test information         Multimeter Serial # 02D1017AB         Water Quality During Purge       pH         15:02       26044       24.25       6.9         15:07       26525       24.29       6.99         15:12       26708       24.31       7.01         15:12       26837       24.33       7.01         15:22       26894       24.33       7.01         15:27       26940       24.35       7.01         15:32       26993       24.36       7.01         15:32       26993       24.36       7.01         15:32       26993       24.36       7.01         15:32       26993       24.36       7.01         15:32       26993       24.36       7.01         LIMS Sample ID: 200923569       LIMS Sub ID: 100071976         Multimeter Serial #02D1017AB         Photometer Serial # A09121570-d56b         Sp. Cond. (µS/cm) 27021       Chloride (mg/l)         Temperature (°C)       24.56       Sulfate (mg/l)       >10000         pH (SU)       7.01       pH (SU)       >10000       pH (SU)	<b>-</b>					7
Wullimeter Serial #       02D1017AB         Water Quality During Purge         Time       \$\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	Test Information		•			
Water Guany burning runge         Time       Sp. Cond.       Temp.       pH         15:02       26044       24.25       6.9         15:07       26525       24.29       6.99         15:12       26708       24.31       7.01         15:17       26837       24.33       7.01         15:22       26994       24.35       7.01         15:32       26993       24.36       7.01         15:36       27021       24.36       7.01         15:36       27021       24.36       7.01         LIMS Sample ID: 200923569       LIMS Sub ID: 100071976         Multimeter Serial #02D1017AB       Photometer Serial # A09121570-d56b         Sp. Cond. (µS/cm)       27021       Chloride (mg/l)         Temperature (°C)       24.56       Sulfate (mg/l)         pH (SU)       7.01       PH (SU)	Wate	ar Ouality During Pure	10	Ì		
$\frac{11110}{15:02} \frac{26044}{24.25} \frac{24.29}{6.99} \frac{6.99}{15:07} \frac{14:52}{26894} \frac{24.31}{24.33} \frac{7.01}{7.01} \frac{15:12}{15:22} \frac{26708}{26894} \frac{24.34}{24.34} \frac{7.01}{7.01} \frac{15:27}{15:22} \frac{26894}{26993} \frac{24.36}{24.36} \frac{7.01}{7.01} \frac{15:36}{27021} \frac{27021}{24.36} \frac{24.36}{7.01} \frac{7.01}{15:36} \frac{115:36}{27021} \frac{27021}{24.36} \frac{1100071976}{7.01} \frac{1100071976}{100071976}$ $Multimeter Serial \#02D1017AB \qquad Photometer Serial \# A09121570-d56b$ Sp. Cond. (µS/cm) $\frac{27021}{7.01}$ Chloride (mg/l) $\frac{>10000}{pH(SU)}$	Time Sr		nH			
$\frac{10.07}{15.07} \frac{26525}{26525} \frac{24.29}{24.31} \frac{6.09}{7.01}$ $\frac{14.52}{15.12} \frac{26708}{24.31} \frac{24.33}{7.01}$ $\frac{15.17}{15.22} \frac{26894}{26993} \frac{24.36}{24.36} \frac{7.01}{7.01}$ $\frac{15.32}{15.32} \frac{26993}{26993} \frac{24.36}{24.36} \frac{7.01}{7.01}$ $\frac{15.36}{15.36} \frac{27021}{27021} \frac{24.36}{24.36} \frac{7.01}{7.01}$ $\frac{100071976}{100071976}$ $Multimeter Serial #02D1017AB$ $Photometer Serial # A09121570-d56b$ $Sp. Cond. (\muS/cm) \frac{27021}{7.01}$ $Chloride (mg/l) \frac{>10000}{pH (SU)}$ $pH (SU) \frac{7.01}{7.01}$	15:02	26044 24.25	69			
10:12       26708       24.31       7.01         15:12       26837       24.33       7.01         15:17       26837       24.34       7.01         15:22       26940       24.35       7.01         15:32       26993       24.36       7.01         15:32       26993       24.36       7.01         15:32       26993       24.36       7.01         15:36       27021       24.36       7.01         Lines       10:10071976       Lines       9:53         Multimeter Serial #02D1017AB       Photometer Serial # A09121570-d56b         Sp. Cond. (µS/cm)       27021       Chloride (mg/l)         PH (SU)       7.01       PH (SU)	15:07	26525 24.29	6.99		14.52	
$\frac{15:17}{15:22} 26894 24.33 7.01}{15:22} 26894 24.34 7.01}$ $\frac{15:27}{15:27} 26940 24.35 7.01}{15:32} 26993 24.36 7.01}$ $\frac{15:36}{15:32} 27021 24.36 7.01}{15:36} UIMS Sample ID: 200923569$ $UIMS Sub ID: 100071976$ $Multimeter Serial #02D1017AB$ $Photometer Serial # A09121570-d56b$ $Sp. Cond. (\mu S/cm) 27021 Chloride (mg/l) > 10000 Sulfate (mg/l) pH (SU) 7.01$	15:12	26708 24.31	7.01	Start Purge _	11.02	
Image: 1000 minipage       Image: 1000 minipage       Image: 1000 minipage         15:22       26894       24.34       7.01         15:27       26940       24.35       7.01         15:32       26993       24.36       7.01         15:36       27021       24.36       7.01         15:36       27021       24.36       7.01         Lims Sample Time       9:53         Lims Sample ID: 200923569       Lims Sub ID: 100071976         Multimeter Serial #02D1017AB       Photometer Serial # A09121570-d56b         Sp. Cond. (µS/cm)       27021       Chloride (mg/l)         Temperature (°C)       24.56       Sulfate (mg/l)         pH (SU)       7.01       pH (SU)	15:17	26837 24.33	7.01		15:37	
15:27       26940       24.35       7.01         15:32       26993       24.36       7.01         15:32       26993       24.36       7.01         15:36       27021       24.36       7.01         LIMS Sample ID: 200923569       LIMS Sub ID: 100071976         Multimeter Serial #02D1017AB       Photometer Serial # A09121570-d56b         Sp. Cond. (µS/cm)       27021       Chloride (mg/l)         PH (SU)       7.01       PH (SU)	15:22	26894 24.34	7.01	End Purge		
15:32       26993       24.36       7.01         15:36       27021       24.36       7.01         LIMS Sample ID: 200923569       LIMS Sub ID: 100071976         Multimeter Serial #02D1017AB       Photometer Serial # <u>A09121570-d56b</u> Sp. Cond. (µS/cm)       27021         PH (SU)       7.01         PH (SU)       7.01	15:27	26940 24.35	7.01	Sample Time	9:53	
15:36       27021       24.36       7.01         LIMS Sample ID: 200923569       LIMS Sub ID: 100071976         Multimeter Serial #02D1017AB       Photometer Serial # A09121570-d56b         Sp. Cond. (µS/cm)       27021         Temperature (°C)       24.56         pH (SU)       7.01	15:32	26993 24.36	7.01			
LIMS Sample ID: 200923569         LIMS Sub ID: 100071976         LIMS Sub ID: 100071976         Multimeter Serial #02D1017AB         Photometer Serial # <u>A09121570-d56b</u> Sp. Cond. (µS/cm)       27021         Temperature (°C)       24.56         pH (SU)       7.01	15:36	27021 24.36	7.01			
LIMS Sub iD: 100071976         LIMS Sub iD: 100071976         Multimeter Serial #02D1017AB         Photometer Serial # <u>A09121570-d56b</u> Sp. Cond. (μS/cm)       27021         Temperature (°C)       24.56         pH (SU)       7.01				LIMS Sample ID: 20	0923569	
Multimeter Serial #02D1017AB         Photometer Serial # <u>A09121570-d56b</u> Sp. Cond. (μS/cm)         27021         Chloride (mg/l)         >10000           Temperature (°C)         24.56         Sulfate (mg/l)         >10000           pH (SU)         7.01         pH (SU)         y			1	LIMS Sub ID: 10007	71976	
Multimeter Serial #02D1017AB         Photometer Serial # <u>A09121570-d56b</u> Sp. Cond. (μS/cm)         27021         Chloride (mg/l)         >10000           Temperature (°C)         24.56         Sulfate (mg/l)         >10000           pH (SU)         7.01         pH (SU)         District the base of a field of the base			1			
Multimeter Serial #02D1017AB         Photometer Serial # <u>A09121570-d56b</u> Sp. Cond. (μS/cm)         27021         Chloride (mg/l)         >10000           Temperature (°C)         24.56         Sulfate (mg/l)         >10000           pH (SU)         7.01         pH (SU)         District the base of a field of the base						
Multimeter Serial #02D1017AB         Photometer Serial # <u>A09121570-d56b</u> Sp. Cond. (μS/cm)         27021         Chloride (mg/l)         >10000           Temperature (°C)         24.56         Sulfate (mg/l)         >10000           pH (SU)         7.01         pH (SU)         0						
Multimeter Serial #02D1017AB       Photometer Serial # <u>A09121570-d56b</u> Sp. Cond. (μS/cm)       27021       Chloride (mg/l)       >10000         Temperature (°C)       24.56       Sulfate (mg/l)       pH (SU)         pH (SU)       7.01       pH (SU)       pH (SU)						
Multimeter Serial #02D1017AB         Photometer Serial # <u>A09121570-d56b</u> Sp. Cond. (µS/cm)         27021         Chloride (mg/l)         >10000           Temperature (°C)         24.56         Sulfate (mg/l)         >10000           pH (SU)         7.01         pH (SU)         0         0	<u>.</u>					
Sp. Cond. (μS/cm)       27021       Chloride (mg/l)       >10000         Temperature (°C)       24.56       Sulfate (mg/l)       pH (SU)         pH (SU)       7.01       pH (SU)       pH (SU)	Multimeter Serial	<u>#02D1017AB</u>	Photome	eter Serial # <u>A09121</u>	<u>570-d56b</u>	
Sp. Cond. $(\mu S/cm)$ 27021Chloride $(mg/l)$ >10000Temperature (°C)24.56Sulfate $(mg/l)$ pH (SU)7.01pH (SU)					_	
Temperature (°C)     24.56     Sulfate (mg/l)       pH (SU)     7.01     pH (SU)	Sp. Cond. (µS/cm)	27021	Chloride (	mg/l) >10000		
	Temperature (°C)	24.56	Sulfate (	mg/l)		
	pH (SU)	7.01	pH	(SU)	7	
	· · · / <u>-</u>		•		_	
Samples Sent to District's Laboratory for Standard Complete Analysis? V gr N	Samples Sent to District's Lat	poratory for Standard	Complete An	alysis? ( )r N		

General Information           Wellisite West Citrus           Date 11/15/2016           Time 8/42-11:41           Sign 2           Packed Interval (ft-ft bis)           300-322           Casing (HW) Depth (ft bis)         300-322           Casing (HW) Depth (ft bis)         300-322           Casing (HW) Diameter (in.)         300-322           Hole Diameter (in.)         A initial Test Interval WL (ft bis)         5.55/2.31           Note: 1ft = 0.3048 m           Purge Volume (gallons)         113         gallons           113         gallons           TOTAL PURGE VOLUME (one) =         127         gallons           Purge Volume (gallons)         127/8.6         minutes           TOTAL PURGE VOLUME (one) =         127         gallons           Purge Volume (bicharge and ft open hole(NO)=0.3623 gal/ft           Total PURGE VOLUME (one) =         127         gallons           Mutimeter Serial #         Outon Colspa Rat<					WQ No.	7	
Welsite West Cirus       Date 11/15/2016         Well COREHOLE 2       Time 8:42-11:41         SID# 875942       Performed by J. Zydek         Well Depth (ft bis)       322         Casing (HW) Depth (ft bis)       300         Casing (HW) Depth (ft bis)       300         Hole Diameter (in.)       4         Initial Test Interval WL (ft bis)       5.55/2.31         Initial Test Interval WL (ft bis)       5.55/2.31         Initial Test Interval WL (ft bis)       5.55/2.31         Initial Test Interval WL (ft bis)	General Information						
Well COREHOLE 2         Time 8:42-11:41           SID# 875942         Performed by J. Zydek           Well Depth (ft bis)         322           Casing (HW) Depth (ft bis)         300           Casing (HW) Diameter (in.)         3.06           Hole Diameter (in.)         4           Initial Test Interval (ft-ft bis)         6.55/2.31           Initial Annulus WL (ft bis)         6.5/2	Wellsite West Citrus			Da	ate 11/15/2016		
SID# 875942         Performed by J. Zydek           Well Depth (ft bis) 322         Packed Interval (ft-ft bis) 300-322           Casing (HW) Depth (ft bis) 300           Casing (HW) Diameter (in.)         3.06           Initial Test Interval WL (ft bis) 6.55/2.31           Initial Annulus WL (ft bis) 6.55/2.31           Initial Test Interval WL (ft bis) 6.55/2.31           Initial Annulus WL (ft bis) 6.57/2.31           Initial Annulus WL (ft bis) 6.57/2.31           Initial Panulus fore tols of the minutes of the minutes forminute	Well COREHOLE	2		Tir	me <u>8:42-11:41</u>		
Well Depth (ft bis)       322       Packed Interval (ft-ft bis)       300-322         Casing (HW) Depth (ft bis)       300         Hole Diameter (in.)       4         Initial Test Interval (ft-ft bis)       910-322         Initial Test Interval (ft bis)       915-98.2         Initial Test Interval WL (ft bis)         Initial Test Interval WL (ft bis)         Initial Annulus WL (ft bis)         Purpe Volume (gallons)         g/ft X       ft (interval)       =       113       gallons       gailons         Purpe Method 3* submersible pump         Airline Length       170       feet         TOTAL PURGE VOLUME (one)       =       127       gallons       gailons         Purpe Method 3* submersible pump         Airline Length       170       feet         Discharge Rate (gpm)       gpm       minutes         Collection Method:       Qurface Discharg       Start Purge       minutes         Collection Method:       Quality During Purge         Multimeter Serial #       02D1017AB         Multimeter Serial #       02D1017AB <td>SID# 875942</td> <td></td> <td></td> <td>Performed</td> <td>by J. Zydek</td> <td></td> <td></td>	SID# 875942			Performed	by J. Zydek		
Purge Volume (gallons) 1	Well I Casing (HW) I Casing (HW) D Hole D Hole D	Depth (ft bls) Depth (ft bls) iameter (in.) iameter (in.)	322 300 3.06 4	Packe Packeo Initial Test Initial /	ed Interval (ft-ft bls d Interval (m-m bls Interval WL (ft bls Annulus WL (ft bls	) <u>300-322</u> ) <u>91.5-98.2</u> ) <u>6.55/2.31</u> ) <u></u>	
Purge Volume (gallons)       1       g/ft X       ft (interval) =       113       gallons       "vo         2       g/ft X       ft (interval) =       113       gallons       usi         2       g/ft X       ft (interval) =       14       gallons       usi         2       g/ft X       ft (interval) =       14       gallons       usi         2       g/ft X       ft (interval) =       14       gallons       usi         2       g/ft X       ft (interval) =       14       gallons       usi         2       g/ft X       ft (interval) =       127       gallons       usi         2       g/ft X       ft (interval) =       127       gallons       usi         Pump Method 3" submersible pump       ft (interval) =       127       gallons       usi         Purge Volume /Discharge Rate (gpm)       gpm       gpm       voice       cele       dsi       fsi         Collection Method:       @urface Discharge or Wireline Bailer or Nested Bailer       minutes       collection       fsi       fsi       fsi       fsi         ote: NQ=02301 gal/ft. HW=0.6528 gal/ft. open hole(NQ)=0.3623 gal/ft       O2D1017AB       Start Purge 10:00       End Purge 10:00       End Purge 10:58 <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>							
Pump Method         3" submersible pump         Control feet           Discharge Rate (gpm)         gpm         gpm           Purge Volume /Discharge Rate         127/8.6         minutes X THREE =         45         minutes           Collection Method:         Qurface Discharge or Wireline Bailer or Nested Bailer         Mutimeter         Start Purge         minutes           Collection Method:         Qurface Discharge or Wireline Bailer or Nested Bailer         Mutimeter         Start Purge         minutes           Collection Method:         Qurface Discharge or Notella         Start Purge         10:00         Start Purge         10:00           Collection Method:         Start Purge         10:00         Start Purge         10:00         Start Purge         10:00           Collection         Start Purge         10:00         Start Purge         10:00	Purge Volume (gallons) 1 2	g/ft X g/ft X TOTAL	f f - PURGE V	t (interval)    = t (interval)    = OLUME (one	= <u>113</u> = <u>14</u> ) = <u>127</u>	gallons *v gallons ca gallons us pu	volumo alcula sing e urge olume
	Pump Method Airline Length Discharge Rate (gpm) urge Volume /Discharge Rate Collection Method: comments:	3" submersible 170 fea 99 127/8.6 mi Surface Discha	pump et om inutes <b>X TH</b> arge or Wir	<b>REE =</b>	45 or Nested Bailer	_ ca	alcula
det Nd=0.220 gaint         est Information         Multimeter Serial #       02D1017AB         Water Quality During Purge       pH         10:14       3335       24.03       7.84         10:21       5454       24.3       8.83         10:28       5621       24.48       8.72         10:35       5653       24.54       8.6         10:42       5696       24.56       8.6         10:49       5716       24.6       8.52         10:56       5724       24.64       8.45         10:56       5724       24.64       8.45         LIMS Sample ID 200924399       LIMS Sub ID 100072017         Multimeter Serial #02D1017AB       Photometer Serial # A09121570-d56b         Sp. Cond. (µS/cm)       5724       Chloride (mg/l)       2350	oto: NO=0 2301 gol/ft; HW=0	6528 gal/ft: open b	olo(NO)=0.362	2 gal/ft			
Time         Sp. Cond.         Temp.         pH           10:14         3335         24.03         7.84           10:21         5454         24.3         8.83           10:28         5621         24.48         8.72           10:35         5653         24.54         8.67           10:42         5696         24.56         8.6           10:49         5716         24.6         8.52           10:56         5724         24.64         8.45           10:56         5724         24.64         8.45           10:56         5724         24.64         8.45           10:56         5724         24.64         8.45           10:56         5724         24.64         8.45           10:56         5724         24.64         8.45           10:56         5724         24.64         8.45           10:57         LIMS Sample ID 200924399         LIMS Sub ID 100072017   Multimeter Serial #02D1017AB Photometer Serial # A09121570-d56b Sp. Cond. (µS/cm) 5724 Chloride (mg/l) 2350	ole. Ng=0.2501 gai/h, 110-0	0020 gaint, open no	010(110)-0.302	5 gaint			
Multimeter Serial #       02D1017AB         Water Quality During Purge	est Information		<u></u>				
Water Quality During Purge           Time         Sp. Cond.         Temp.         pH           10:14         3335         24.03         7.84           10:21         5454         24.3         8.83           10:28         5621         24.48         8.72           10:35         5653         24.54         8.67           10:42         5696         24.56         8.6           10:49         5716         24.6         8.52           10:56         5724         24.64         8.45           10:56         5724         24.64         8.45           10:56         5724         24.64         8.45           10:56         5724         24.64         8.45           10:56         5724         24.64         8.45           10:56         5724         24.64         8.45           10:57         LIMS Sample ID 200924399         LIMS Sub ID 100072017   Multimeter Serial #02D1017AB Photometer Serial # <u>A09121570-d56b</u> Sp. Cond. (µS/cm) 5724 Chloride (mg/l) 2350	Multimeter S	erial # 02	<u>D1017AB</u>				
Плие       Sp. Cond.       Гетр.       рн         10:14       3335       24.03       7.84         10:21       5454       24.3       8.83         10:28       5621       24.48       8.72         10:35       5653       24.54       8.67         10:42       5696       24.56       8.6         10:42       5696       24.64       8.45         10:56       5724       24.64       8.45         10:56       5724       24.64       8.45         10:56       5724       24.64       8.45         10:56       5724       24.64       8.45         10:56       5724       24.64       8.45         10:56       5724       24.64       8.45         10:56       5724       24.64       8.45         10:57       LIMS Sample ID 200924399       LIMS Sub ID 100072017         Multimeter Serial #02D1017AB       Photometer Serial # A09121570-d56b         Sp. Cond. (µS/cm)       5724       Chloride (mg/l)       2350	Time	Vater Quality Du					
10:14       3335       24.03       7.84         10:21       5454       24.3       8.83         10:28       5621       24.48       8.72         10:35       5653       24.54       8.67         10:42       5696       24.56       8.6         10:49       5716       24.6       8.52         10:56       5724       24.64       8.45         10:56       5724       24.64       8.45         10:56       5724       24.64       8.45         10:56       5724       24.64       8.45         10:56       5724       24.64       8.45         10:56       5724       24.64       8.45         10:57       10:0072017       LIMS Sample ID 200924399         LIMS Sub ID 100072017       LIMS Sub ID 100072017         Multimeter Serial #02D1017AB       Photometer Serial # A09121570-d56b         Sp. Cond. (µS/cm)       5724       Chloride (mg/l)       2350	1 me	Sp. Cond.	1 emp.	рн 7.04			
10:21       3434       24.3       6.83         10:28       5621       24.48       8.72         10:35       5653       24.54       8.67         10:42       5696       24.56       8.6         10:49       5716       24.6       8.52         10:56       5724       24.64       8.45         10:56       5724       24.64       8.45         10:56       5724       24.64       8.45         10:56       5724       24.64       8.45         10:56       5724       24.64       8.45         10:56       5724       24.64       8.45         10:57       10:0072017       LIMS Sample ID 200924399         LIMS Sub ID 100072017       LIMS Sub ID 100072017         Multimeter Serial #02D1017AB       Photometer Serial # A09121570-d56b         Sp. Cond. (µS/cm)       5724       Chloride (mg/l)       2350	10.14	5335	24.03	7.04		10.00	
10.20       3021       24.46       6.72         10:35       5653       24.54       8.67         10:42       5696       24.56       8.6         10:49       5716       24.6       8.52         10:56       5724       24.64       8.45         10:56       5724       24.64       8.45         10:56       5724       24.64       8.45         10:56       5724       24.64       8.45         10:56       5724       24.64       8.45         10:56       5724       24.64       8.45         10:57       100072017       LIMS Sample ID 200924399         LIMS Sub ID 100072017       UMS Sub ID 100072017         Multimeter Serial #02D1017AB       Photometer Serial # A09121570-d56b         Sp. Cond. (µS/cm)       5724       Chloride (mg/l)       2350	10.21	5601	24.3	0.03	Start Purge	10.00	
10:33       3033       24.34       0.07         10:42       5696       24.56       8.6         10:49       5716       24.6       8.52         10:56       5724       24.64       8.45         10:56       5724       24.64       8.45         10:56       5724       24.64       8.45         10:56       10:57       10:57       10:57         10:56       5724       24.64       8.45         10:56       10:0072017       LIMS Sample ID 200924399         LIMS Sub ID 100072017       LIMS Sub ID 100072017         Multimeter Serial #02D1017AB       Photometer Serial # A09121570-d56b         Sp. Cond. (µS/cm)       5724       Chloride (mg/l)       2350	10:20	5653	24.40	9.67	End Durge	10.58	
10:42       3030       24.30       0.0         10:49       5716       24.6       8.52         10:56       5724       24.64       8.45         10:56       5724       24.64       8.45         10:56       5724       24.64       8.45         10:56       5724       24.64       8.45         10:57       10:57       LIMS Sample ID 200924399         LIMS Sub ID 100072017       LIMS Sub ID 100072017         Multimeter Serial #02D1017AB       Photometer Serial # A09121570-d56b         Sp. Cond. (µS/cm)       5724       Chloride (mg/l)       2350	10:33	5696	24.54	8.6	End Purge	10.30	
10:33       3710       24.0       0.32         10:56       5724       24.64       8.45         10:56       5724       24.64       8.45         10:56       5724       24.64       8.45         10:56       5724       24.64       8.45         10:57       LIMS Sample ID 200924399       LIMS Sub ID 100072017         Multimeter Serial #02D1017AB       Photometer Serial # <u>A09121570-d56b</u> Sp. Cond. (µS/cm)       5724       Chloride (mg/l)       2350	10:42	5716	24.30	8.52	Sample Time	10.57	
LIMS Sample ID 200924399         LIMS Sub ID 100072017         LIMS Sub ID 100072017         Multimeter Serial #02D1017AB         Photometer Serial # <u>A09121570-d56b</u> Sp. Cond. (µS/cm)         5724	10:49	5724	24.64	8.45	oumpie mile	10.57	
Multimeter Serial #02D1017AB         Photometer Serial # <u>A09121570-d56b</u> Sp. Cond. (μS/cm)         5724         Chloride (mg/l)         2350					LIMS Sample LIMS Sub ID 1	ID 200924399 00072017	
Multimeter Serial #02D1017AB         Photometer Serial # <u>A09121570-d56b</u> Sp. Cond. (µS/cm)         5724         Chloride (mg/l)         2350							
Sp. Cond. (μS/cm) 5724 Chloride (mg/l) 2350	Multimeter Se	ial <u>#02D1017A</u>	<u> </u>	Photomete	er Serial # <u>A09121</u>	570-d56b	
	Sp. Cond. (µS/cm)	5724		Chloride (mg	g/l) 2350	7 I	
Temperature (°C) 24.64 Sulfate (mg/l) 100	Temperature (°C)	24.64		Sulfate (mo	g/l) 100		
pH (SU) 8.45 pH (SU)	pH (SU)	8.45		pH (S	SU)	] [	
Samples Sont to District's Laboratory for Standard Complete Apolygic Archiver N	Complex Sent to District's	Laboratory for (	Standard Ca	mploto Anch	(cic2 K dr. N		

WATER QUALITY SAMP	PLE ACQUIS	ITION		-		
				WQ No.	8	
General Information						
Wellsite West Citrus				Date <u>11/15/2016</u>		
Well COREHOLE	2			Time 11:41		
SID# <u>875942</u>			_ Performe	d by J. Zydek		_
Well Casing (HW) Casing (HW) [ Hole [	Depth (ft bls) Depth (ft bls) Diameter (in.) Diameter (in.)	322 290 3.06 4	Pac Pack Initial Te Initia	ked Interval (ft-ft bls ed Interval (m-m bls st Interval WL (ft bls I Annulus WL (ft bls	) <u>290-322</u> ) <u>88.4-98.2</u> )	-
Note: 1ft = 0.3048 m						
Purge Volume (gallons) 1 2 Pump Method Airline Length Discharge Rate (gpm)	g/ft X g/ft X <b>TO</b> 3" submerist <u>170</u> 8.6	TAL PURGE	ft (interval) ft (interval) <b>VOLUME (or</b>	= <u>111</u> = <u>21</u> ne) = <u>132</u>	gallons gallons gallons	*volume calculated using excel purge volume calculato
Purge Volume /Discharge Rate	132/8.6	minutes X	THREE =	45	minutes	
Collection Method:	Surface Dis	charge or V	Vireline Bailer	or Nested Bailer		
Note: NQ=0.2301 gal/ft; HW=0	0.6528 gal/ft; ope	en hole(NQ)=0.3	3623 gal/ft			]
Test Information						
Multimeter S	Serial #	02D101/AB	5			
Timo	vater Quality		je			
10:10	5724	24.06	μ⊓ 9.12			
12.10	5533	24.00	0.13 8.33	<b>a a</b>	12.00	
12.17	5547	24.40	8.42	Start Purge	12.00	
12:24	5605	24.63	8 32	Final Dumma	12.17	

		vater Quality							
	Time	Sp. Cond.	Temp.	pН					
	12:10	5724	24.06	8.13					
	12:17	5533	24.46	8.33	Start Purge	12:00			
	12:24	5547	24.59	8.42					
	12:33	5605	24.63	8.32	End Purge	12:47			
	12:38	5605	24.66	8.34	<u> </u>				
	12:45	5608	24.7	8.26	Sample Time	12:45			
					LIMS Sample ID: 2	00924400			
					LIMS Sub ID: 1000	72017			
					1				
N	/lultimeter Se	rial <u>#02D101</u>	7 <u>AB</u>	Photome	eter Serial # <u>A09121</u>	570-d56b			
Sp. Co	ond. (µS/cm)	5608		Chloride (	Chloride (mg/l) 1700				
Tem	oerature (°C)	24 7		Sulfate (	mg/l) 108				
	nH (SU)	8 26		nH	(SU)	-			
	pri (00)	0.20	I	pri					
Samples Se	nt to District's	s Laboratory f	or Standard (	Complete An	alvsis? Yor N				
		- Laboratory I	S. Standard (	2 5. npi 6 to 7 th					

# Appendix H. Water Quality Data for Samples Collected at the West Citrus Well Site in Citrus County, Florida

Table H1. Field data for the water quality samples collected at the West Citrus well site in Citrus County, Florida

[No., Number; SID, site identification; MM/DD/YYYY, month/day/year; HH:MM, hour:minute; ft, feet; bls, below land surface; C, degrees Celsius; SU, standard units;  $\mu$ mhos/cm, micromhos per centimeter; Cl<sup>1</sup>, chloride, mg/L, milligrams per Liter; SO<sub>4</sub><sup>2-</sup>, sulfate; >, greater than; <<, below detection]

								Major A	Anions	
Water Quality Sample No.	Monitor Well SID No.	Date (MM/ DD/YYYY)	Time (HH:MM)	Sample Interval (ft bls)	Temper- ature (°C)	pH (SU)	Specific Conduc- tance (µmhos/ cm)	Cl <sup>1-</sup> (mg/L)	SO <sub>4</sub> <sup>2-</sup> (mg/L)	Sample Collec- tion Methods/ Remarks
1	875942	11/1/2016	13:16	130-150	22.91	7.28	330	4.4	6	Surface discharge using 3-inch sub- mersible pump
2	875942	11/3/2016	9:53	150-200	23.24	7.19	355	5.7	<<	Surface discharge using 3-inch sub- mersible pump
3	875942	11/7/2016	10:56	200-250	23.51	7.4	437	30	<<	Surface discharge using 3-inch sub- mersible pump
4	875942	11/8/2016	10:43	250-300	24.66	7.64	395	42	<<	Surface discharge using 3-inch sub- mersible pump
5	875942	11/9/2016	13:25	325-350	25.59	6.99	6318	1800	17	Thief sample during geophysical log- ging
6	875942	11/9/2016	15:37	300-350	24.56	7.01	27021	>10,000	<<	Surface discharge using 3-inch sub- mersible pump
7	875942	11/15/2016	10:57	300-322	24.64	8.45	5724	2350	100	Surface discharge using 3-inch sub- mersible pump
8	875942	11/15/2016	12:46	290-322	24.7	8.26	5608	1700	108	Surface discharge using 3-inch sub- mersible pump

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#### Table H2. Laboratory data for the water quality samples collected at the West Citrus well site in Citrus County, Florida

[No., Number; SID, site identification; MM/DD/YYYY, month/day/year; HH:MM, hour:minute; ft, feet; bls, below land surface; SU, standard units; µmhos/cm, K<sup>1+</sup>, potassium; Fe<sup>2+</sup>, iron; Sr<sup>2+</sup>, strontium; si, silica; SiO<sub>2</sub>, silicon dioxide; CaCO<sub>3</sub>, calcium carbonate]

						Major Anions			
Water Quality Sample No.	Monitor Well SID No.	Date (MM/ DD/YYYY)	Time (HH:MM)	Sample Interval (ft bls)	pH (SU)	Specific Conductance (µmhos/cm)	Cl <sup>1-</sup> (mg/L)	SO <sub>4</sub> <sup>2-</sup> (mg/L)	HCO <sub>3</sub> <sup>1-</sup> (mg/L)
1	875942	11/1/2016	13:16	130-150	8.24	328	5.6	0.7	163.2
2	875942	11/3/2016	9:53	150-200	8.22	354.3	8.9	2	174.5
3	875942	11/7/2016	10:56	200-250	8.32	439.6	37.3	4.8	163.8
4	875942	11/8/2016	10:43	250-300	8.3	405.6	41.9	6.2	134.3
5	875942	11/9/2016	13:25	325-350	8.12	6299.1	1,847.92	255.52	221.5
6	875942	11/9/2016	15:37	300-350	7.96	26624.7	9,331.25	1,235.63	135.6
7	875942	11/15/2016	10:57	300-322	7.93	5693.9	1,753.69	147.47	132.9
8	875942	11/15/2016	12:46	290-322	7.95	5579.4	1,673.56	140.97	120

<sup>Q</sup> Sample was held beyond holding time. Field pH is used in analyses due to a 15 minute holding time.

<sup>U</sup> The ion was analyzed for but not detected. Value is reported as the method detection limit.

<sup>K</sup> The actual value is less than the value given.

## Table H3. The equivalent weight and percent equivalent weight for select ions and the water type for water quality

[NO., Number; ft, feet; bls, below land surface;  $Ca^{2+}$ , calcium;  $Mg^{2+}$ , magnesium;  $Na^{1+}$ , sodium;  $HCO_3^{1+}$ , bicarbonate;  $Cl^{1-}$ , chloride;  $SO_4^{-2-}$ , sulfate; meq/L, presented as HCO31- because CO32- and H2CO3 are considered negligible in groundwaters with pH less than 8.3 standard units (SU) (Hem, 1985); See tables

Water Quality	Sample Interval	Cations								
Sample No.	(It bis)	Ca <sup>2+</sup>		Mg <sup>2+</sup>		Na <sup>1+</sup>		K <sup>1+</sup>		
		meq/L	%	meq/L	%	meq/L	%	meq/L	%	
1	130-150	3.13	92.6%	0.10	3.07%	0.14	4.18%	3.58E-03	0.11%	
2	150-200	3.12	86.2%	0.29	8.12%	0.20	5.58%	4.86E-03	0.13%	
3	200-250	2.06	50.8%	1.37	33.88%	0.59	14.58%	0.03	0.74%	
4	250-300	2.06	51.0%	1.37	33.86%	0.58	14.45%	0.03	0.72%	
5	325-350	6.19	11.0%	9.05	16.08%	40.24	71.48%	0.82	1.45%	
6	300-350	22.50	8.4%	42.96	15.95%	200.10	74.30%	3.76	1.40%	
7	300-322	13.02	25.8%	5.68	11.25%	31.45	62.31%	0.32	0.64%	
8	290-322	13.57	27.1%	5.57	11.11%	30.71	61.24%	0.30	0.59%	

micromhos per cemtimeter; Cl1-, c	chloride; mg/L, milligrams per Liter; SO42-	, sulfate; HCO <sub>3</sub> <sup>1-</sup> , bicarbonate; Ca <sup>2+</sup>	<sup>+</sup> , calcium; Mg <sup>2+</sup> , magnesium; Na <sup>1+</sup> , sodium;
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		Major (	Cations						
Ca²+ (mg/L)	Mg²⁺ (mg/L)	Na¹⁺ (mg/L)	K¹⁺ (mg/L)	Fe²+ (mg/L)	Sr²+ (mg/L)	Si as SiO₂ (mg/L)	Total Dis- solved Solids (mg/L)	Total Alkalinity CaCO3 (mg/L)	Comments
62.8	1.26	3.25	0.14 <sup>I</sup>	2,220	0.08 <sup>I</sup>	6 <sup>N1</sup>	185	163.2	Surface discharge using 3-inch submersible pump
62.5	3.57	4.64	0.19 <sup>I</sup>	327	0.1	6.6 <sup>N1</sup>	203	174.5	Surface discharge using 3-inch submersible pump
41.3	16.7	13.6	1.17	22.4 <sup>I</sup>	0.29	8 <sup>N1</sup>	233	163.8	Surface discharge using 3-inch submersible pump
41.2	16.6	13.4	1.14	22.8	0.29	$11.1^{N1}$	218	134.3	Surface discharge using 3-inch submersible pump
124	110	925	32	12.4 <sup>I</sup>	1.54	6.3 <sup>N1</sup>	3530	221.5	Thief sample during geophysical logging
451	522	4,600	147	2,050	5.89	8.7 <sup>N1</sup>	17000	135.6	Surface discharge using 3-inch submersible pump
261	69	723	12.7	5.6 <sup>U</sup>	1.45	$10.8^{N1}$	3280	132.9	Surface discharge using 3-inch submersible pump
272	67.7	706	11.6	5.6 <sup>u</sup>	1.46	10.5 <sup>N1</sup>	3250	120	Surface discharge using 3-inch submersible pump

# samples collected at the West Citrus well site in Citrus County, Florida

milliequivalents per liter; %, percent; Ls., limestone; Fm., Formation; U FLDN AQ, Upper Floridan aquifer; MCU II, middle confining unit II; total alkalinity is H1 and H2 for sample site ideentification (SID) numbers]

	Anions									
•	2-	SO4		Cl <sup>1</sup>	1- 3	нсо				
Water Type	%	meq/L	%	meq/L	%	meq/L				
Calcium Bicarbonate	0.51%	0.01	5.5%	0.16	93.9%	2.67				
Calcium Bicarbonate	1.32%	0.04	8.0%	0.25	90.7%	2.86				
Calcium Bicarbonate	2.60%	0.10	27.4%	1.05	70.0%	2.68				
Calcium Bicarbonate	3.68%	0.13	33.7%	1.18	62.7%	2.20				
Sodium Chloride	8.71%	5.32	85.3%	52.13	5.9%	3.63				
Sodium Chloride	8.83%	25.73	90.4%	263.23	0.8%	2.22				
Sodium Chloride	5.61%	3.07	90.4%	49.47	4.0%	2.18				
Sodium Chloride	5.63%	2.93	90.6%	47.21	3.8%	1.97				

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### Table H4. Select molar ratios for water quality samples collected at the West Citrus well site in Citrus County, Florida

[No., number; ft, feet; bls, below land surface; Cl<sup>1-</sup>, chloride; SO<sub>4</sub><sup>2-</sup>, sulfate; Ca<sup>2+</sup>, calcium; HCO<sub>3</sub><sup>1-</sup>, bicarbonate; Mg<sup>2+</sup>, magnesium; Na<sup>1+</sup>, sodium; total alkalinity is used as HCO<sub>3</sub><sup>1-</sup> because CO<sub>3</sub><sup>2-</sup> and H<sub>2</sub>CO<sup>3</sup> are considered negligible in groundwaters with pH less than 8.3 standard units (SU) (Hem, 1985); See tables H1 and H2 for sample site identification (SID) numbers]

 Water Quality Sample No.	Open Interval (ft bls)	Cl <sup>1-</sup> :SO <sub>4</sub> <sup>2-</sup>	Ca <sup>2+</sup> :HCO <sub>3</sub> <sup>1-</sup>	SO4 <sup>2-</sup> :HCO3 <sup>1-</sup>	Ca <sup>2+</sup> :Mg <sup>2+</sup>	CI <sup>1-</sup> :HCO <sub>3</sub> <sup>1-</sup>	Na <sup>1+</sup> :HCO <sub>3</sub> <sup>1-</sup>	Na <sup>1+</sup> :Cl <sup>1-</sup>
1	130-150	21.68	0.59	0.00	30.23	0.06	0.05	0.89
2	150-200	12.06	0.55	0.01	10.62	0.09	0.07	0.80
3	200-250	21.06	0.38	0.02	1.50	0.39	0.22	0.56
4	250-300	18.31	0.47	0.03	1.51	0.54	0.26	0.49
5	325-350	19.60	0.85	0.73	0.68	14.36	11.08	0.77
6	300-350	20.46	5.06	5.79	0.52	118.44	90.03	0.76
7	300-322	32.23	2.99	0.70	2.29	22.71	14.44	0.64
8	290-322	32.17	3.45	0.75	2.44	24.00	15.61	0.65

