

# Installation and Groundwater Monitoring of the Data, Monitoring, and Investigations Team Wetland Monitoring Wells

Polk, Osceola, and Orange Counties, Florida

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*Cover Image*

Monitor Well POS-17 Field Photo

## **EXECUTIVE SUMMARY**

The South Florida Water Management District (SFWMD or District) installed 10 shallow monitoring wells in Polk, Osceola, and Orange counties near 10 wetlands identified for hydrologic monitoring by the Central Florida Water Initiative (CFWI) Data, Monitoring, and Investigations Team (DMIT) Wetlands Monitoring Program. These wells are intended to monitor the groundwater elevations of the surficial aquifer system (SAS) as part of a program to monitor the hydrologic health of the wetlands identified by the CFWI DMIT. The SFWMD performed sieving and characterization of the soil samples collected during drilling and described the relative densities of samples collected at two of the DMIT wells using blow count data obtained during drilling. During 2025, District hydrogeologists performed reconnaissance of these 10 DMIT wetland monitoring wells to verify well construction details, measure depths to groundwater, and collect water quality parameters from each well. As part of this project, groundwater elevation time-series hydrographs were created for the entire period of record for each monitor well. These hydrographs show decreasing groundwater elevation trends at each monitor well since continuous groundwater elevation monitoring began between 2018 and 2019, depending on well location and date of well construction. The water quality parameters measured during the 2025 reconnaissance indicated the presence of acidic groundwater (pH values less than 7) at all 10 wells. Based on the District's site reconnaissance observations, monitor well POS-19 is sinking into the ground due to subsidence that has developed at the site since the well was installed.



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## **ACRONYMS AND ABBREVIATIONS**

|          |                                          |
|----------|------------------------------------------|
| bls      | below land surface                       |
| CFWI     | Central Florida Water Initiative         |
| District | South Florida Water Management District  |
| DMIT     | Data Monitoring and Investigations Team  |
| ECFT     | East Central Florida Transient (model)   |
| EMT      | Environmental Measures Team              |
| ft       | foot or feet                             |
| NTU      | nephelometric turbidity unit             |
| SAS      | surficial aquifer system                 |
| SCADA    | supervisory control and data acquisition |
| SFWMD    | South Florida Water Management District  |
| SPT      | standard penetration test                |

# PROJECT BACKGROUND

## Data, Monitoring, and Investigations Team

The South Florida Water Management District (SFWMD or District) has been working cooperatively with the Southwest Florida Water Management District, St. Johns River Water Management District, Florida Department of Environmental Protection, and local stakeholders evaluating the status of traditional water supplies and planning for the future of water supply in Central Florida as part of the Central Florida Water Initiative (CFWI; <https://www.cfwewater.com>). The following is stated in the 2014 CFWI *Regional Monitoring Program Summary Report*:

Among the guiding principles of the Central Florida Water Initiative (CFWI) is the development of strategies to meet water demands that are in excess of the sustainable yield of existing traditional groundwater sources. Strategies should include optimizing the use of existing groundwater sources, implementing demand management, and identifying alternative water supplies that can be permitted and will be implemented as demands approach the sustainable yield of existing sources. Therefore, the CFWI process created the Data, Monitoring, and Investigations Team (DMIT) to address this principle.

As stated in the CFWI Guidance Document, the primary goals of the DMIT are to ensure that available hydrologic, environmental, and other pertinent data collected throughout the region are identified, inventoried, and accessible to support the CFWI technical initiatives and CFWI regulatory activities. Using the inventory of existing data collection activities, the team will collaborate with the other technical initiative teams to report on options for future regional monitoring activities. The team may also be tasked with conducting supplemental investigations or data analysis as necessary, and with retaining an inventory of data collected by the other CFWI Technical Initiative Teams. (CFWI 2014, p. 4)

The DMIT reported that additional monitoring of environmental conditions in identified wetlands of the CFWI region would improve the understanding of the relationships between various hydrologic systems (CFWI 2014). Utilizing the inventory of existing data collection sites coupled with resources developed by the other CFWI technical teams, the DMIT developed a process to identify areas where additional data collection could help clarify the relationships between hydrologic and environmentally sensitive systems.

The CFWI Hydrologic Assessment Team East Central Florida Transient (ECFT) groundwater flow model drawdown results for the surficial aquifer system (SAS), using the 2035 scenario, identified areas of greatest drawdown that should be considered for monitoring.

The following SAS and wetlands areas were identified for monitoring consideration (CFWI 2014):

- Reference monitoring in areas of little drawdown
- Areas of greatest drawdown, as identified using 2035 scenario levels
- Areas of greatest difference between ECFT model targets and observed water levels
- Areas identified by the Environmental Measures Team (EMT) as Class I wetlands likely to change from not stressed to stressed by 2035 and occurring in the greatest density
- Areas identified by the EMT as Class II wetlands that would create a larger set of Class I sites with hydrologic data

The EMT concluded that isolated wetlands are believed to be the most hydrologically sensitive wetland type (CFWI 2014). Though not always feasible or practical for regulatory purposes, from a regional monitoring perspective, the DMIT findings indicated the following three wetland hydroclasses were underrepresented in terms of monitoring data:

- 1A Depressional Mesic (Plains)
- 1B Depressional Xeric (Ridge), especially along the Lake Wales Ridge
- 2A-M Large Isolated (Plains)

Not all the prospective wetland hydroclass and physiographic province combinations selected for investigation in the early planning stages for this project were able to be established as viable sites. Many of the wetlands are located on private lands or otherwise inaccessible. The final selection of wetland sites and hydroclasses that each well monitors based on these considerations are listed in **Table 1**.

Table 1. DMIT wetland monitoring wells and corresponding wetland hydroclasses.

| Site Name              | Well ID | Physiographic Province | Hydroclass            |
|------------------------|---------|------------------------|-----------------------|
| Snell Creek East       | POS-16  | Lake Wales Ridge       | 2 A-M Large Isolated  |
| Snell Creek West       | POS-17  | Lake Wales Ridge       | 1A Depressional Mesic |
| Lake Marion Creek East | POS-18  | Lake Wales Ridge       | 1A Depressional Xeric |
| Lake Marion Creek West | POS-19  | Lake Wales Ridge       | 1C Seepage            |
| Sumica North           | POS-20  | Osceola Plain          | 1A Depressional Mesic |
| Sumica South           | POS-21  | Osceola Plain          | 2D Strands/Sloughs    |
| Shingle Creek North    | ORS-8   | Osceola Plain          | 2F Floodplain         |
| Camp Lonesome West     | OSS-1   | Osceola Plain          | 1A Depressional Mesic |
| Camp Lonesome East     | OSS-2   | Osceola Plain          | 2D Strands/Sloughs    |
| Gardner Cobb Marsh     | OSS-3   | Osceola Plain          | 1A Depressional Mesic |

In 2014, CFWI noted that because the physical hydrologic characteristics of wetlands can differ between physiographic areas, it cannot be assumed that a given hydroclass of wetland responds similarly to groundwater stresses across all physiographic regions (CFWI 2014). Therefore, a minimum number of wetland monitoring sites should be established so that there is at least one monitoring site per wetland hydroclass within each of the identified physiographic regions. This would result in the addition of a minimum of 107 wetland monitoring sites across the CFWI Planning Area (including the SFWMD, Southwest Florida Water Management District, and St. Johns River Water Management District) or an “optimum” number of 192 new wetland monitoring sites to meet a minimum of wetland sites that are monitored.

Ultimately, 19 wetland sites were planned within SFWMD’s portion of the CFWI Planning Area. To date, 15 of the planned 19 sites have been established. At 5 locations, existing wells were utilized. For sites that did not have existing SAS monitoring wells, new wells were drilled as part of this effort. A total of 10 new wetland monitoring wells were installed in Polk, Osceola, and Orange counties to monitor groundwater elevations at each CFWI-designated wetland. The status of and groundwater conditions at these wetland monitoring wells (“DMIT wetland monitoring wells”) are the subject of this report.

## ***Drilling, Monitoring Well Installation, and Surveying***

The 10 DMIT wetland monitoring wells were installed between April 2018 and April 2019 adjacent to 10 different wetlands on six properties (**Figure 1**) in Polk, Osceola, and Orange counties. Drilling was completed using hollow-stem auger drilling methods. Continuous soil sampling was performed at each boring using standard penetration testing (SPT) sampling methods; however, lithologic logs were only available for wells POS-20 and POS-21. All remaining lithologic logs and related field paperwork were lost due to storm damage at the District's Orlando Service Center where the records were stored.

All the DMIT wetland monitoring wells were installed to total depths between 27.08 (at ORS-8) and 31.74 (at OSS-1) feet below land surface (ft bls) with a 5-foot-long factory-slotted screen installed at the bottom of each well, with the exception of ORS-8. At ORS-8, a 10-foot-long screen was installed at a relatively shallower depth than at the other wells due to the fine-grained, low permeability sediments encountered in the proposed monitoring interval during drilling. Well construction details and the wetland monitored by each monitoring well are presented in **Table 2**.

Well location maps are provided in **Appendix A**. Well construction diagrams for all the DMIT wetland monitoring wells are provided in **Appendix B**. Soil sample gradation data, blow count summaries and associated soil sample densities and consistencies, and hydraulic conductivity estimates for all of the soil samples collected during the DMIT drilling were completed by the SFWMD. The methodologies used and the summary of the sieve data are included in **Appendix C**. All the DMIT wetland monitoring wells were surveyed by Pickett Surveying and Engineering in 2018 and 2019. The survey reports are included in **Appendix D**.



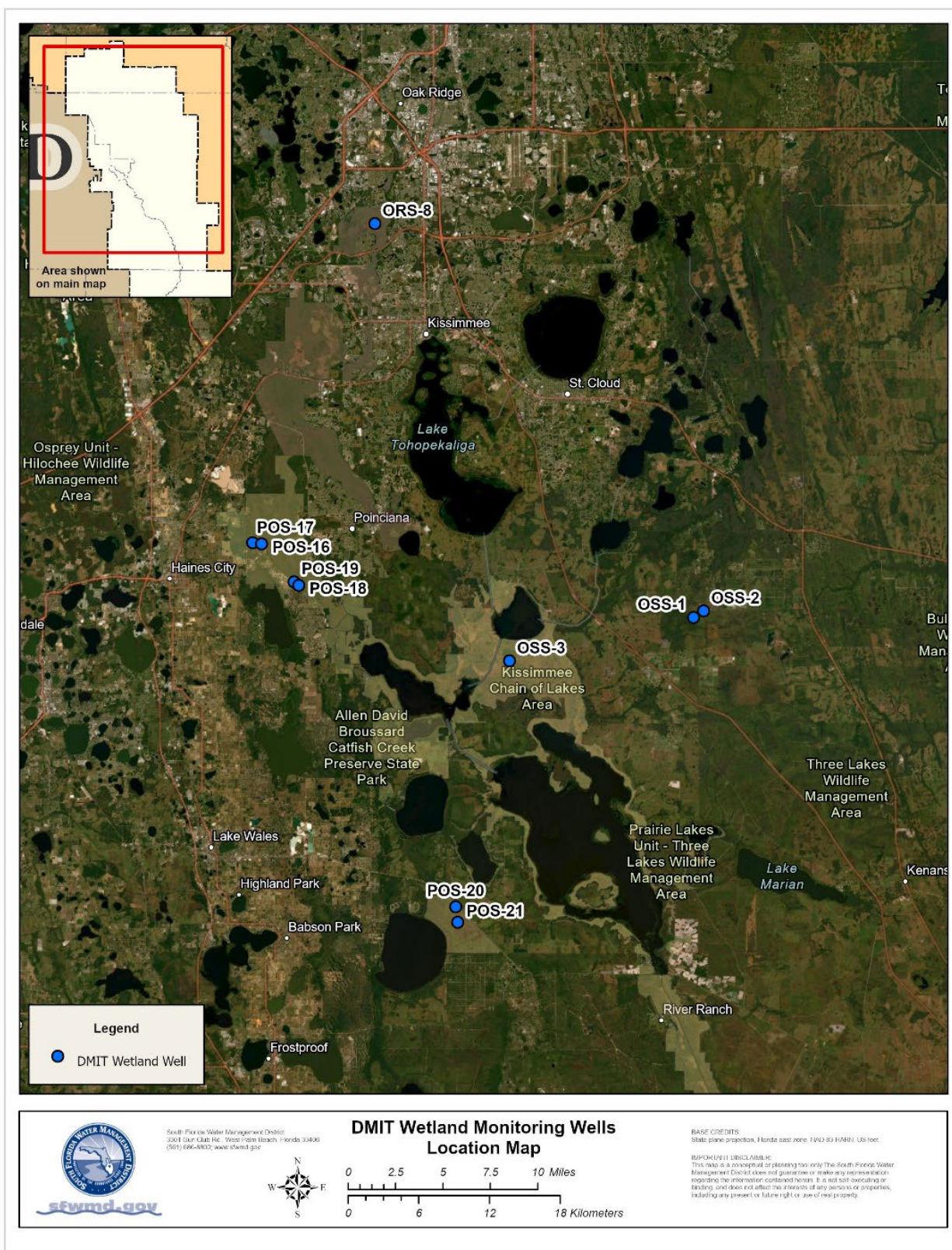


Figure 1. DMIT wetland monitoring wells map overview.



Table 2. DMIT wetland monitoring wells construction and location details.

| Well ID             | Location                                     | Location (NAD83) |                | Well Installation Date | Ground Surface Elevation (ft NAVD88) | Reference Point Elevation (ft NAVD88) | Top of Casing Stickup (ft above ground surface) | Well Screen Interval (ft bls) | Total Depth of Well (ft bls) | Well Casing Material | Screen Slot Size (inch) | Filter Pack Gradation |
|---------------------|----------------------------------------------|------------------|----------------|------------------------|--------------------------------------|---------------------------------------|-------------------------------------------------|-------------------------------|------------------------------|----------------------|-------------------------|-----------------------|
|                     |                                              | Latitude (DD)    | Longitude (DD) |                        |                                      |                                       |                                                 |                               |                              |                      |                         |                       |
| POS-16              | Snell Creek East Wetland, Polk County        | 28.133564        | -81.544002     | 04/12/18               | 75.10                                | 78.82                                 | 3.72                                            | 22.28-27.28                   | 27.28                        | 4" Dia. SCH 40 PVC   | 0.020                   | 20/30                 |
| POS-17              | Snell Creek West Wetland, Polk County        | 28.134345        | -81.551818     | 04/12/18               | 76.20                                | 80.35                                 | 4.15                                            | 21.85-26.85                   | 26.85                        | 4" Dia. SCH 40 PVC   | 0.020                   | 20/30                 |
| POS-18              | Lake Marion Creek East Wetland, Polk County  | 28.101879        | -81.511944     | 04/12/18               | 82.40                                | 86.10                                 | 3.70                                            | 22.30-27.30                   | 27.30                        | 4" Dia. SCH 40 PVC   | 0.020                   | 20/30                 |
| POS-19 <sup>a</sup> | Lake Marion Creek West Wetland, Polk County  | 28.104603        | -81.516074     | 04/12/18               | 81.00                                | 85.12                                 | 4.12                                            | 21.88-26.88                   | 26.88                        | 4" Dia. SCH 40 PVC   | 0.020                   | 20/30                 |
| POS-20              | Sumica State Park North Wetland, Polk County | 27.856350        | -81.375428     | 04/03/19               | 67.42                                | 70.63                                 | 3.21                                            | 22.79-27.79                   | 27.79                        | 4" Dia. SCH 40 PVC   | 0.020                   | 20/30                 |
| POS-21              | Sumica State Park South Wetland, Polk County | 27.844556        | -81.373667     | 04/03/19               | 68.38                                | 71.32                                 | 2.94                                            | 23.06-28.06                   | 28.06                        | 4" Dia. SCH 40 PVC   | 0.020                   | 20/30                 |
| ORS-8               | Shingle Creek North Wetland, Polk County     | 28.379000        | -81.447194     | 04/12/18               | 78.70                                | 82.20                                 | 3.50                                            | 16.00-26.00                   | 26.00                        | 4" Dia. SCH 40 PVC   | 0.020                   | 20/30                 |
| OSS-1 <sup>b</sup>  | Camp Lonesome West Wetland, Osceola County   | 28.078278        | -81.170722     | 04/02/19               | 77.49                                | 81.05                                 | 3.56                                            | 22.44-27.44                   | 27.44                        | 4" Dia. SCH 40 PVC   | 0.010                   | 20/30                 |
| OSS-2 <sup>b</sup>  | Camp Lonesome East Wetland, Osceola County   | 28.083194        | -81.162056     | 04/02/19               | 79.98                                | 84.11                                 | 4.13                                            | 21.87-26.87                   | 26.87                        | 4" Dia. SCH 40 PVC   | 0.010                   | 20/30                 |
| OSS-3               | Gardner Cobb Marsh Wetland, Osceola County   | 28.044628        | -81.329736     | 04/02/19               | 55.54                                | 58.87                                 | 3.33                                            | 22.67-27.67                   | 27.67                        | 4" Dia. SCH 40 PVC   | 0.020                   | 20/30                 |

bls = below land surface; DD = decimal degrees; Dia = diameter; ft = feet; NAD83 = North American Datum of 1983; NAVD88 = North American Vertical Datum of 1988; PVC = polyvinyl chloride.

<sup>a</sup> During the District's site reconnaissance, POS-19 was observed to be sinking into the ground due to a nearby sinkhole/depression that developed after well installation, so the reported elevations for this well are inaccurate.

<sup>b</sup> The installation dates for wells OSS-1 and OSS-2 are approximate due to loss of paperwork associated with these wells.

## Methods

The soil samples collected during construction of POS-20 and POS-21 were analyzed in accordance with ASTM International C136 (2015) for mechanical sieve analysis. Twelve-inch sections from the middle of each of the SPT soil sample intervals were placed in a pan and weighed. The samples were then dried in an oven at approximately 370°C for 3 to 4 hours and then placed in a sieve shaker for 15 minutes for optimal particle separation through each sieve. Each soil sample passed through eight successively smaller sieves (10 to #200 sieves), and particles smaller than the openings in the #200 sieve (0.075-millimeter openings) were captured in a pan at the bottom of the sieve stack. The contents of each sieve and pan were carefully transferred to a tared pan and weighed.

Hydrogeologists from the SFWMD Hydrogeology Unit visited the 10 DMIT wetland monitoring wells on April 2, April 3, and July 10, 2025 to inspect the physical condition of each well, measure total well depths, and collect depths to groundwater and water quality parameters (pH, specific conductivity, temperature, and turbidity) at each well. All 10 DMIT wetland monitoring wells are instrumented with pressure transducers that record groundwater elevations at 15-minute increments. These data are telemetered to SFWMD headquarters using the District's supervisory control and data acquisition (SCADA) system and uploaded to the District's corporate environmental database, DBHYDRO Insights, available at (<https://apps.sfwmd.gov/dbhydroInsights/>).

After arriving at each DMIT monitor well, a visual inspection of each well was completed, and the casing stickup above ground surface was measured. Next, the total depth of each well was measured using a weighted tape, and the depth to groundwater was measured using an electronic water level meter. All these measurements and the final set of groundwater parameters collected during purging were recorded on the monitoring well field verification forms included in **Appendix E**.

Next, an electrical Proactive Mini-Typhoon 2-inch-diameter submersible pump was installed in each well. Three well volumes were then pumped from each well. After three well volumes had been purged, a calibrated YSI EXO probe was used to measure groundwater parameters (pH, specific conductivity, temperature, and turbidity) every 5 minutes until parameters stabilized to take readings or until the well went dry (like at ORS-8). Turbidity was measured using a Hach turbidimeter. These water quality parameters were recorded on the chemical stability monitoring forms included in **Appendix F** and are summarized in **Table 3**.

## RESULTS

### Water Quality Parameters

The water quality parameters collected at each well indicate that all the DMIT wetland monitoring wells have acidic groundwater with pH values less than 7 (**Table 3**). The field pH measurements ranged from 4.18 at OSS-2 to 6.64 at OSS-3 (Gardner Cobb Marsh). Groundwater normally has a pH range of about 6.5 to 8 (Hem 1989). None of the DMIT monitoring wells contained groundwater with pH values equal to or greater than 7, and only wells POS-17 and OSS-3 contained groundwater with pH values between 6 and 7. These low pH waters are commonly found in the Lake Wales Ridge area. Choquette et al. (2012) stated that "The pH of groundwater in the surficial aquifer is naturally low and similar to that of rainwater, in many parts of Florida. . . . Rainwater pH for sites in the vicinity of central Florida is typically in the range 4.6 to 5.2" (p. 10). A summary of groundwater pH at each DMIT wetland monitoring site is summarized here and provided in **Table 3**:

- Snell Creek Wetland: Groundwater in POS-16 was acidic (pH of 4.34), and groundwater in POS-17 was mildly acidic (pH of 6.58).
- Lake Marion Creek: POS-18 and POS-19 both contained acidic groundwater with pH values of 4.42 and 4.30, respectively.
- Sumica State Park: POS-20 and POS-21 both contained moderately acidic groundwater with pH values of 5.77 and 5.82, respectively.
- Shingle Creek: A moderately acidic pH of 5.54 was measured at ORS-8.
- Camp Lonesome: Both wells contained acidic groundwater ranging from 4.18 at OSS-2 to 4.35 at OSS-1.
- Garner Cobb Marsh: OSS-3 contained groundwater with a nearly neutral pH of 6.64.

Specific conductivity ranged from 26.40 microsiemens per centimeter ( $\mu\text{S}/\text{cm}$ ) at POS-19 near Lake Marion Creek East to 1,339  $\mu\text{S}/\text{cm}$  at OSS-3 near Gardner Cobb Marsh.

Groundwater temperatures at all the wells ranged from 23.10 degrees Fahrenheit ( $^{\circ}\text{F}$ ) at OSS-1 to 24.26  $^{\circ}\text{F}$  at POS-20.

Turbidity ranged from 1.67 nephelometric turbidity units (NTU) at OSS-3 to 354 NTU at ORS-8.

The Florida Department of Environmental Protection produced a detailed map of physiographic regions and lake regions for the State of Florida (Griffith et al. 1997). This publication indicates that much of Lake Wales Ridge is characterized by lakes that are often, but not always, acidic. The combination of naturally occurring acidic rainwater and biological processes is the most likely explanation for the low pH values at the DMIT wetland monitoring wells. Decaying organic matter in wetlands can also cause a decrease in groundwater pH and surface water pH.

Table 3. Summary of DMIT wetland monitoring wells measurements and water quality parameters.

| Well ID | Site Name               | Measurement Date | Reference Point (RP) Description        | RP Stickup above Ground Surface (ft) | Total Depth from RP (ft) | Depth to Water (ft below RP) | Depth to Water (ft bls) | pH   | Specific Conductivity (μS/cm) | Temperature (°F) | Turbidity (NTU) |
|---------|-------------------------|------------------|-----------------------------------------|--------------------------------------|--------------------------|------------------------------|-------------------------|------|-------------------------------|------------------|-----------------|
| POS-16  | Snell Creek East        | 4/3/2025         | Black mark on north side of casing      | 3.79                                 | 35.18                    | 9.24                         | 5.45                    | 4.34 | 51.5                          | 23.31            | 3.18            |
| POS-17  | Snell Creek West        | 4/3/2025         | Black mark on north side of casing      | 4.29                                 | 32.82                    | 8.42                         | 4.13                    | 6.58 | 154                           | 23.71            | 48.9            |
| POS-18  | Lake Marion Creek East  | 4/3/2025         | Black mark on north side of casing      | 3.77                                 | 34.58                    | 10.87                        | 7.10                    | 4.42 | 31.7                          | 23.74            | 176             |
| POS-19  | Lake Marion Creek West  | 4/3/2025         | Black mark on north side of casing      | 4.00                                 | 34.49                    | 9.89                         | 5.89                    | 4.30 | 26.4                          | 24.19            | 119             |
| POS-20  | Sumica State Park North | 4/2/2025         | Black mark on north side of casing      | 3.33                                 | 34.21                    | 7.13                         | 3.80                    | 5.77 | 139.6                         | 24.26            | 2.29            |
| POS-21  | Sumica State Park South | 4/2/2025         | Black mark on north side of casing      | 3.21                                 | 34.58                    | 8.67                         | 5.46                    | 5.82 | 522                           | 23.62            | 1.95            |
| ORS-8   | Shingle Creek North     | 4/3/2025         | Black mark on north side of casing      | 3.58                                 | 30.55                    | 7.51                         | 3.93                    | 5.54 | 88.3                          | 23.61            | 354             |
| OSS-1   | Camp Lonesome West      | 7/10/2025        | "X" mark carved on north side of casing | 3.80                                 | 35.54                    | 7.40                         | 3.60                    | 4.35 | 49.3                          | 23.10            | --              |
| OSS-2   | Camp Lonesome East      | 7/10/2025        | Black mark on north side of casing      | 4.80                                 | 34.72                    | 10.81                        | 6.01                    | 4.18 | 32.9                          | 24.10            | --              |
| OSS-3   | Gardner Cobb Marsh      | 7/10/2025        | Black mark on north side of casing      | 3.63                                 | 35.31                    | 8.96                         | 5.34                    | 6.64 | 1,339                         | 23.93            | 1.67            |

°F = degrees Fahrenheit; μS/cm = microsiemens per centimeter; bls= below land surface; ft = feet; RP = reference point; NTU = nephelometric turbidity unit.

## Groundwater Elevations

Depths to groundwater measured during the site reconnaissance ranged from 3.60 ft bls at OSS-1 to 7.18 ft bls at POS-18 (**Table 3**).

Groundwater elevation time-series hydrographs were created for each DMIT wetland monitoring well (**Appendix G**). These time-series hydrographs show that the SAS at each site exhibits normal seasonal groundwater elevation fluctuations between each year's dry season and wet season. The seasonal high and low groundwater elevations recorded at all the wells (except for OSS-3) are characterized by sharp peaks and troughs. At OSS-3, however, the groundwater elevation time series has peaks and troughs that are relatively more rounded than the peaks and troughs recorded at the other wells, indicating that changes in groundwater elevation at this site occur at a slower rate than the other wetland monitoring sites.

The average groundwater elevations at all the DMIT wetland monitoring wells show a declining trend over their entire history from June 2018 to present. While the trend at OSS-2 is nearly flat, it still recorded a minor decline in groundwater elevations throughout its entire history.

The highest groundwater elevation for the entire period of history at all the monitor wells was recorded in 2022 due to Hurricane Ian. The lowest groundwater elevation for the entire period of history at all the monitor wells was recorded in 2025 at the end of the dry season (**Appendix G**).

Although POS-19 was noted to be sinking into the ground, making the groundwater elevation data at this well unreliable, the groundwater elevation data from this well does show similar seasonal trends and an overall decline in the average groundwater elevations over time as was recorded at the other monitoring wells. It is not known when this well started to sink into the ground.

## Soil Sieving

For each tested sample, the percentage of grains finer than each subsequent sieve (percent passing) were calculated and plotted on a cumulative frequency graph to create a grain size distribution graph using HydrogeoSieveXL (Devlin 2015). Because POS-20 and POS-21 were the only DMIT lithologic logs that were recovered, any plasticity descriptions applicable to the remaining borings are not available. The grain size distribution data and the coefficients of uniformity ( $C_u$ ) and curvature ( $C_c$ ) were used to assign a generalized, descriptive soil name to each sample. However, the gradation data are valuable data and are presented here for future use. Because no data are available for the plasticity of the fines in the sieved samples, the fines are simply categorized as "fines" rather than silt or clay in the soil sieving results.

Grain size distribution data obtained from sieving the soil samples of the DMIT wetland wells were entered into HydrogeoSieveXL for creation of grain size curves and generation of a range of possible hydraulic conductivities for each sample, based on the grain size distribution curves obtained by soil sieving. **Table 4** summarizes the soil sieving results and the resultant hydraulic conductivity estimate for each soil sample. Each hydraulic conductivity value presented in **Table 4** is the arithmetic mean of all the hydraulic conductivity calculations that met the criteria inherent to each analytical method for each sample. As shown in **Table 4**, the mean hydraulic conductivities of the tested sediments ranged from 14 to 46 ft/day. The classification system for assigning a relative density descriptor to coarse-grained, cohesionless soils and for assigning a consistency descriptor to fine-grained, cohesive soils is presented in **Table 4**.

**Table 5** presents the penetration resistance (N value) for each soil sample and the resultant relative densities of all the soil samples collected from POS-20 and POS-21 using the subdivisions shown in **Table 4**. At both POS-20 and POS-21, all but three of the samples were medium dense (one loose sample from 23 to 25 ft bls and two dense samples (from 9 to 11 ft bls and 13 to 15 ft bls). None of the samples were fine-grained at either site (i.e., silt or clay).

Table 4. Relative density and consistency descriptors for SPT resistance.

| Coarse-Grained Soil |                  | Fine-Grained Soil |             |
|---------------------|------------------|-------------------|-------------|
| N                   | Relative Density | N                 | Consistency |
| 0-4                 | Very Loose       | Below 2           | Very Soft   |
| 4-10                | Loose            | 2-4               | Soft        |
| 10-30               | Medium           | 4-8               | Medium      |
| 30-50               | Dense            | 8-15              | Stiff       |
| Over 50             | Very dense       | 15-30             | Very Stiff  |
|                     |                  | Over 30           | Hard        |

N = penetration resistance; SPT = standard penetration test.

Table 5. Relative densities.

| Soil Description                       | Sample Location | Depth Interval, ft bls | SPT N value (N <sub>2</sub> +N <sub>3</sub> ) | Relative Density |
|----------------------------------------|-----------------|------------------------|-----------------------------------------------|------------------|
| Moderately well-sorted sand with fines | POS-20          | 7-9                    | 15                                            | Medium           |
| Moderately well-sorted sand with fines | POS-20          | 9-11                   | 45                                            | Dense            |
| Moderately well-sorted sand with fines | POS-20          | 11-13                  | 13                                            | Medium           |
| Moderately well-sorted sand with fines | POS-20          | 13-15                  | 30                                            | Dense            |
| Poorly sorted sand with fines          | POS-20          | 15-17                  | 20                                            | Medium           |
| --                                     | POS-20          | 17-19                  | 17                                            | Medium           |
| --                                     | POS-20          | 19-21                  | 11                                            | Medium           |
| --                                     | POS-20          | 21-23                  | 12                                            | Medium           |
| --                                     | POS-20          | 23-25                  | 8                                             | Loose            |
| --                                     | POS-20          | 25-27                  | 10                                            | Medium           |
| --                                     | POS-20          | 27-29                  | 28                                            | Medium           |
| --                                     | POS-20          | 29-31                  | 24                                            | Medium           |
| Moderately well-sorted sand with fines | POS-21          | 7-9                    | 15                                            | Medium           |
| Moderately well-sorted sand with fines | POS-21          | 9-11                   | 45                                            | Dense            |
| Moderately well-sorted sand with fines | POS-21          | 11-13                  | 13                                            | Medium           |
| Moderately well-sorted sand with fines | POS-21          | 13-15                  | 30                                            | Dense            |
| Moderately well-sorted sand with fines | POS-21          | 15-17                  | 20                                            | Medium           |
| --                                     | POS-21          | 17-19                  | 17                                            | Medium           |
| --                                     | POS-21          | 19-21                  | 11                                            | Medium           |
| --                                     | POS-21          | 21-23                  | 12                                            | Medium           |
| --                                     | POS-21          | 23-25                  | 8                                             | Loose            |
| --                                     | POS-21          | 25-27                  | 10                                            | Medium           |
| --                                     | POS-21          | 27-29                  | 28                                            | Medium           |
| --                                     | POS-21          | 29-31                  | 24                                            | Medium           |

-- = no sample retained for sieving; bls= below land surface; ft = feet; N = penetration resistance; SPT = standard penetration test.



## CONCLUSIONS AND RECOMMENDATIONS

The SFWMD installed 10 monitor wells between April 2018 and April 2019 in Polk, Osceola, and Orange counties to monitor the hydrologic conditions and groundwater elevation trends at six DMIT wetland sites. Soil samples collected from each boring and later sieved by District hydrogeologists generally consist of coarse-grained (sandy) soils, except for ORS-8 which had fine-grained sediments.

The primary conclusions from the hydrograph review and site reconnaissance are that all the CFWI DMIT wetland monitoring wells have recorded decreasing groundwater elevation trends over their entire periods of record. The groundwater elevation trends at all the wells display seasonal changes in groundwater elevations typical of shallow aquifers recharged by rainfall.

The water quality parameters indicated that the groundwater at all the monitor wells was acidic with pH values less than 7 (**Table 3**). The field pH measurements ranged from 4.18 at OSS-2 to 6.64 at OSS-3. Groundwater normally has a pH range of about 6.5 to 8 (Hem 1989). According to Griffith et al. (1997) much of Lake Wales Ridge is characterized by lakes that are often, but not always, acidic. The combination of naturally occurring acidic rainwater and biological processes is the most likely explanation for the low pH values at the DMIT wetland monitoring wells. The elevated turbidity measured at POS-17, POS-19, and ORS-8 during the site reconnaissance indicates that those wells were likely not sufficiently developed and/or screened within fine-grained sediments.

Subsidence around POS-19 has caused the well to sink into the ground. It is not clear when this well began to sink into the ground. Resurveying the reference point elevation will not solve this problem as further subsidence is likely. A new monitoring well should be installed to replace POS-19.

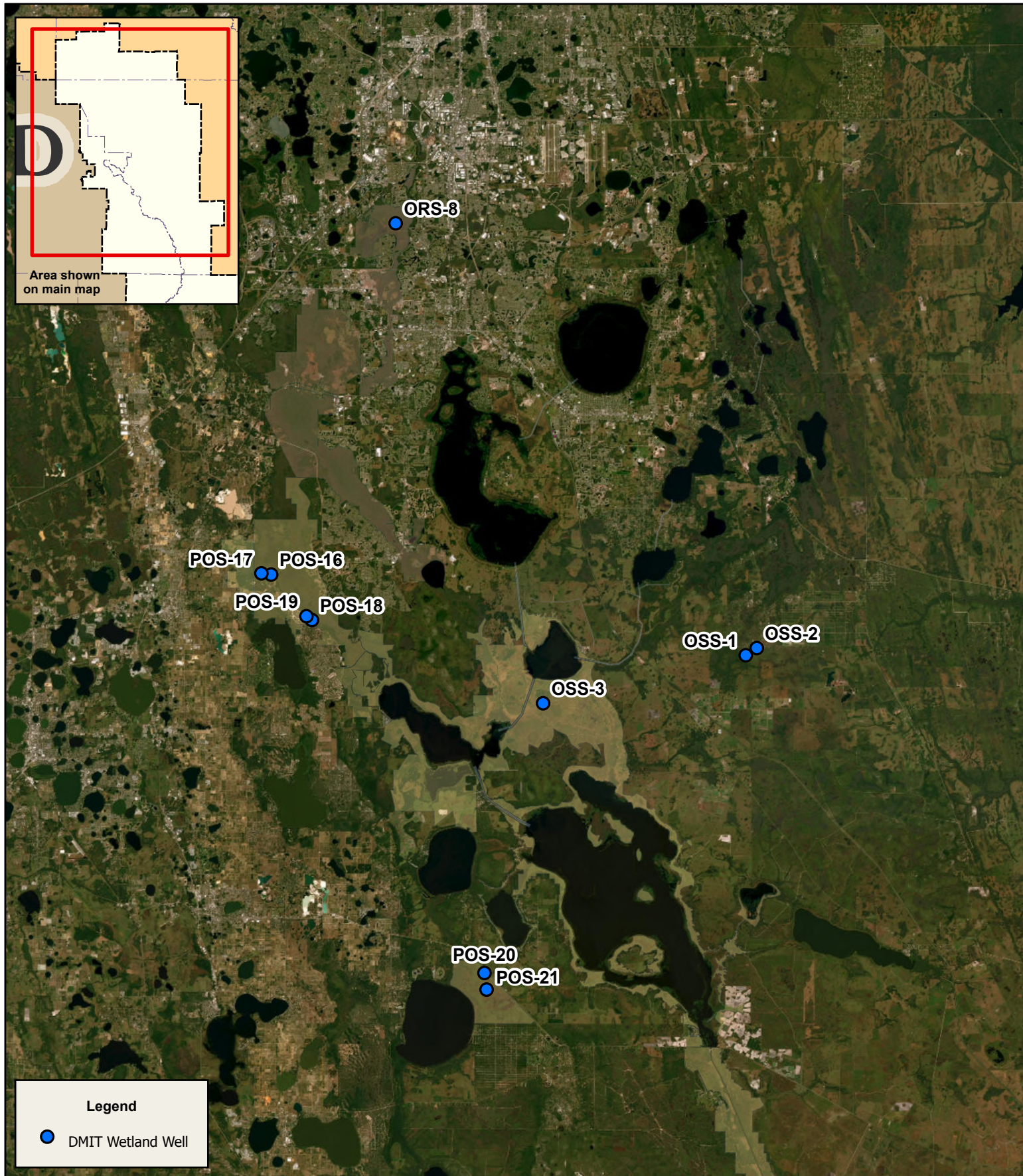
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## **APPENDICES**

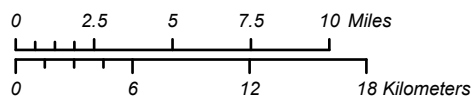
## **APPENDIX A: SITE MAPS**





South Florida Water Management District  
3301 Gun Club Rd., West Palm Beach, Florida 33406  
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## DMIT Wetland Monitoring Wells Location Map



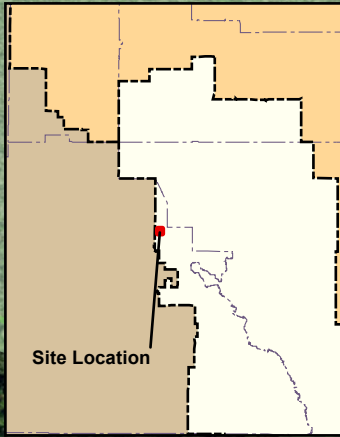
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State plane projection, Florida east zone, NAD 83-HARN, US feet.

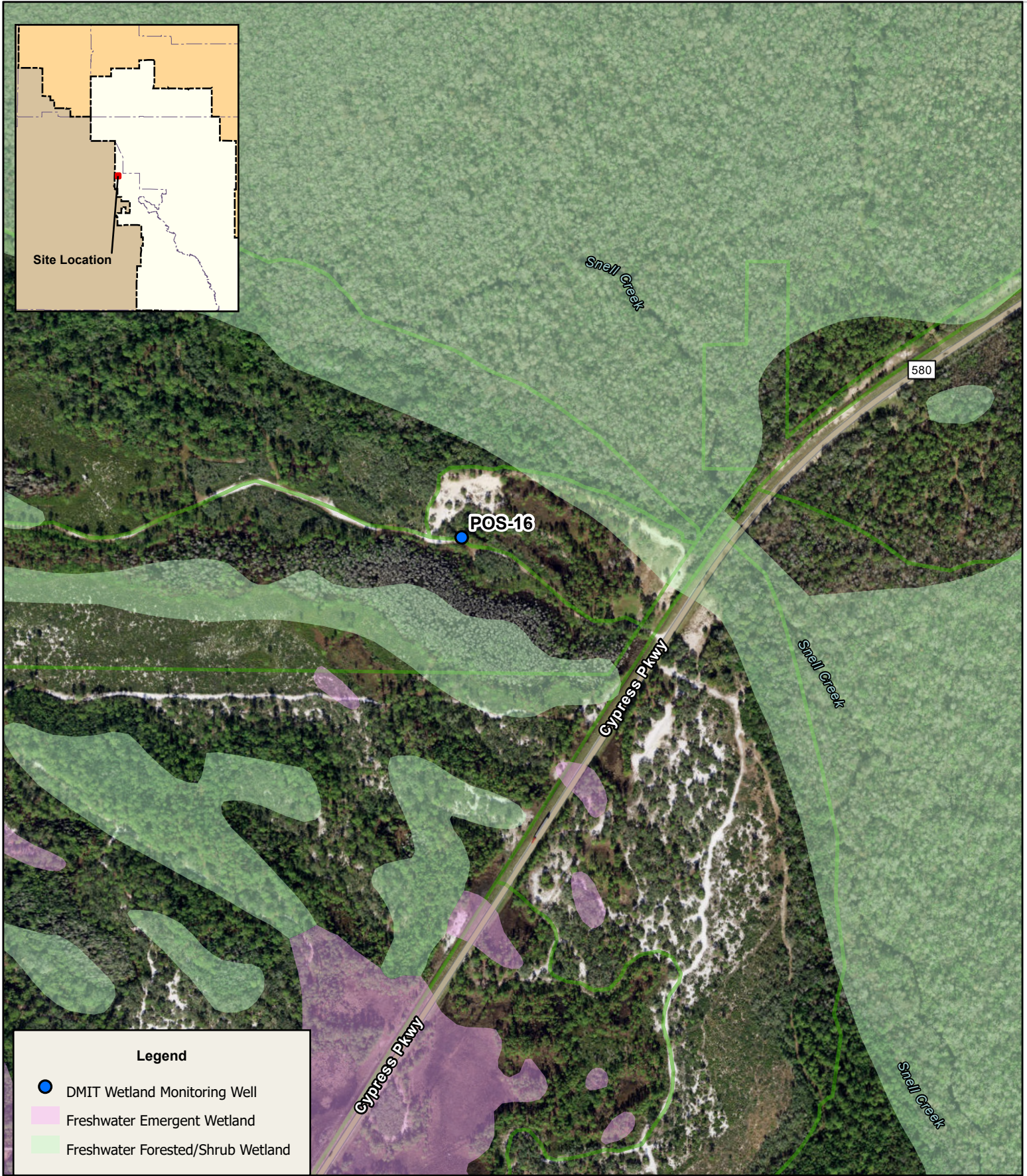
### IMPORTANT DISCLAIMER:

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Site Location



**Legend**

-  DMIT Wetland Monitoring Well
-  Freshwater Emergent Wetland
-  Freshwater Forested/Shrub Wetland



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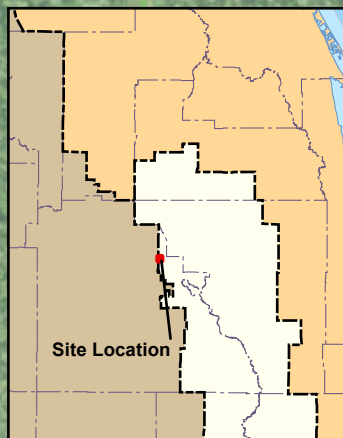
0 1,000 Feet

**POS-16 Wetland Monitoring Well Location Map  
Snell Creek East Wetland Monitoring Area**

**BASE CREDITS:**  
State plane projection, Florida east zone, NAD 83-HARN, US feet.

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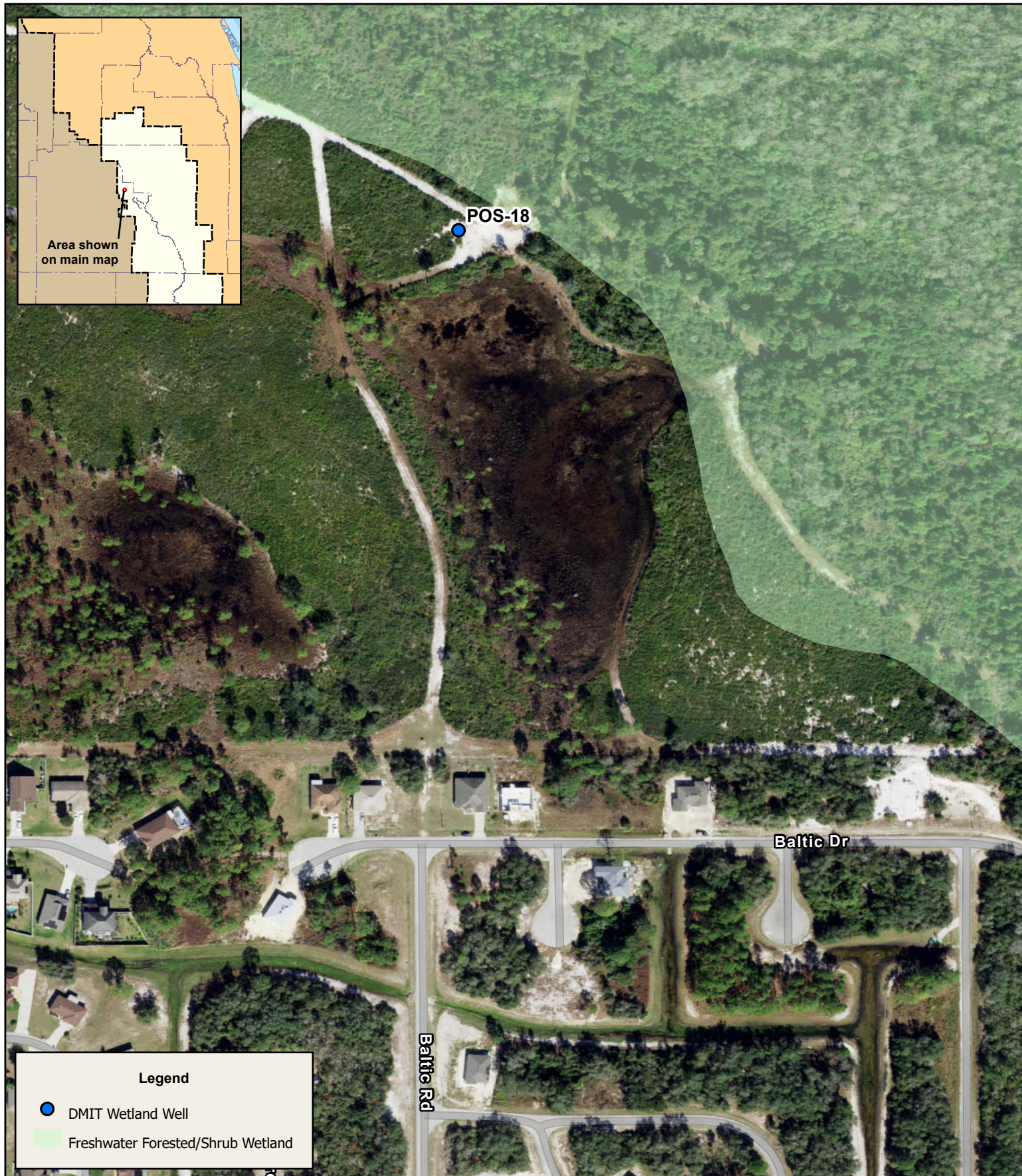




**Legend**

- DMIT Wetland Monitoring Well
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland





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0 500 Feet

## POS-18 Wetland Monitoring Well Location Map Lake Marion Creek East Wetland Area

BASE CREDITS:  
State plane projection, Florida east zone, NAD 83-HARN, US feet.

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Map Date: August 2025

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(561) 686-8800; www.sfwmd.gov



0 500 Feet

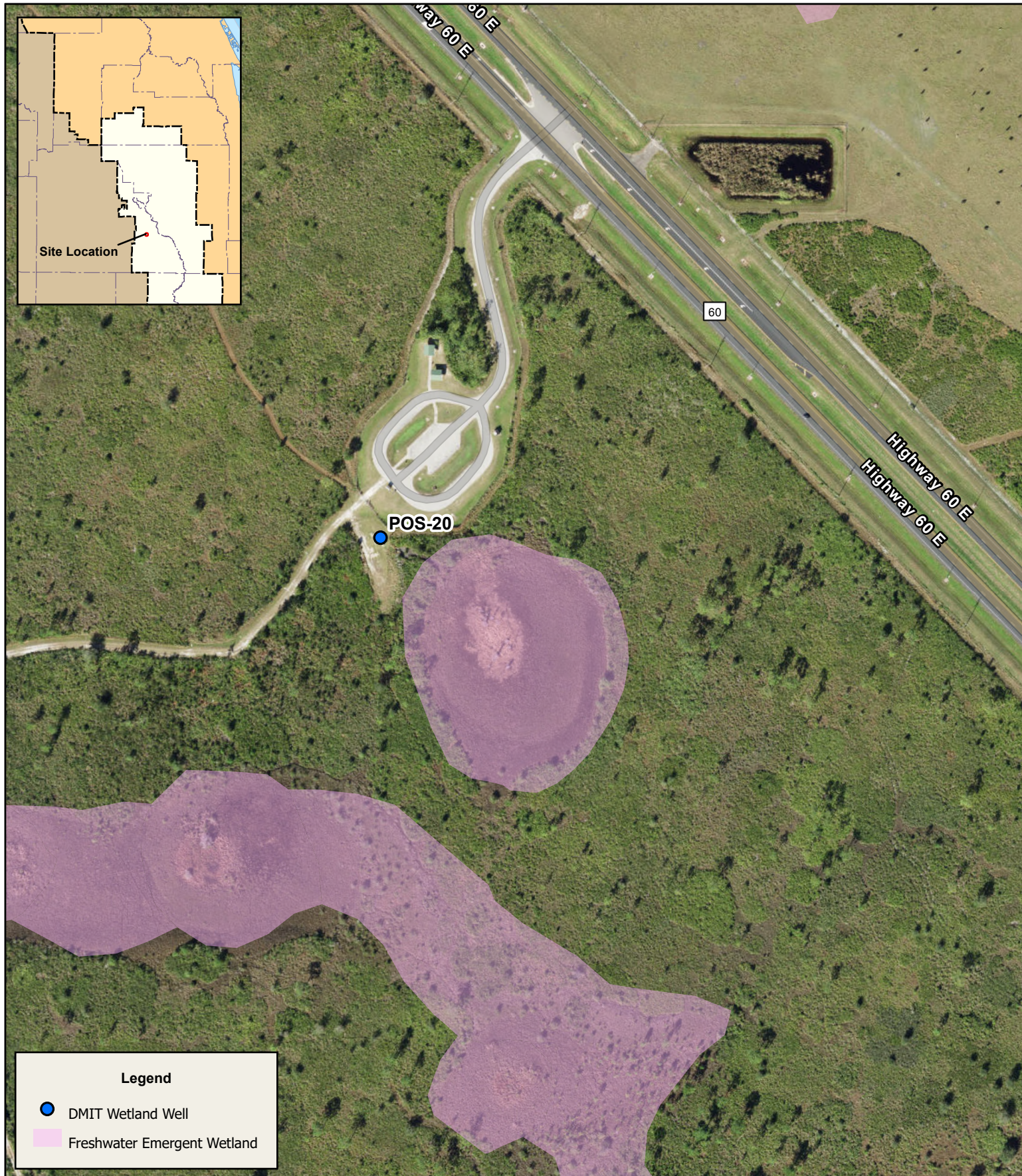
## POS-19 Wetland Monitoring Well Location Map Lake Marion Creek West Wetland Area

BASE CREDITS:  
State plane projection, Florida east zone, NAD 83-HARN, US feet.

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## POS-20 Wetland Monitoring Well Location Map Sumica North State Park Wetland Area

BASE CREDITS:  
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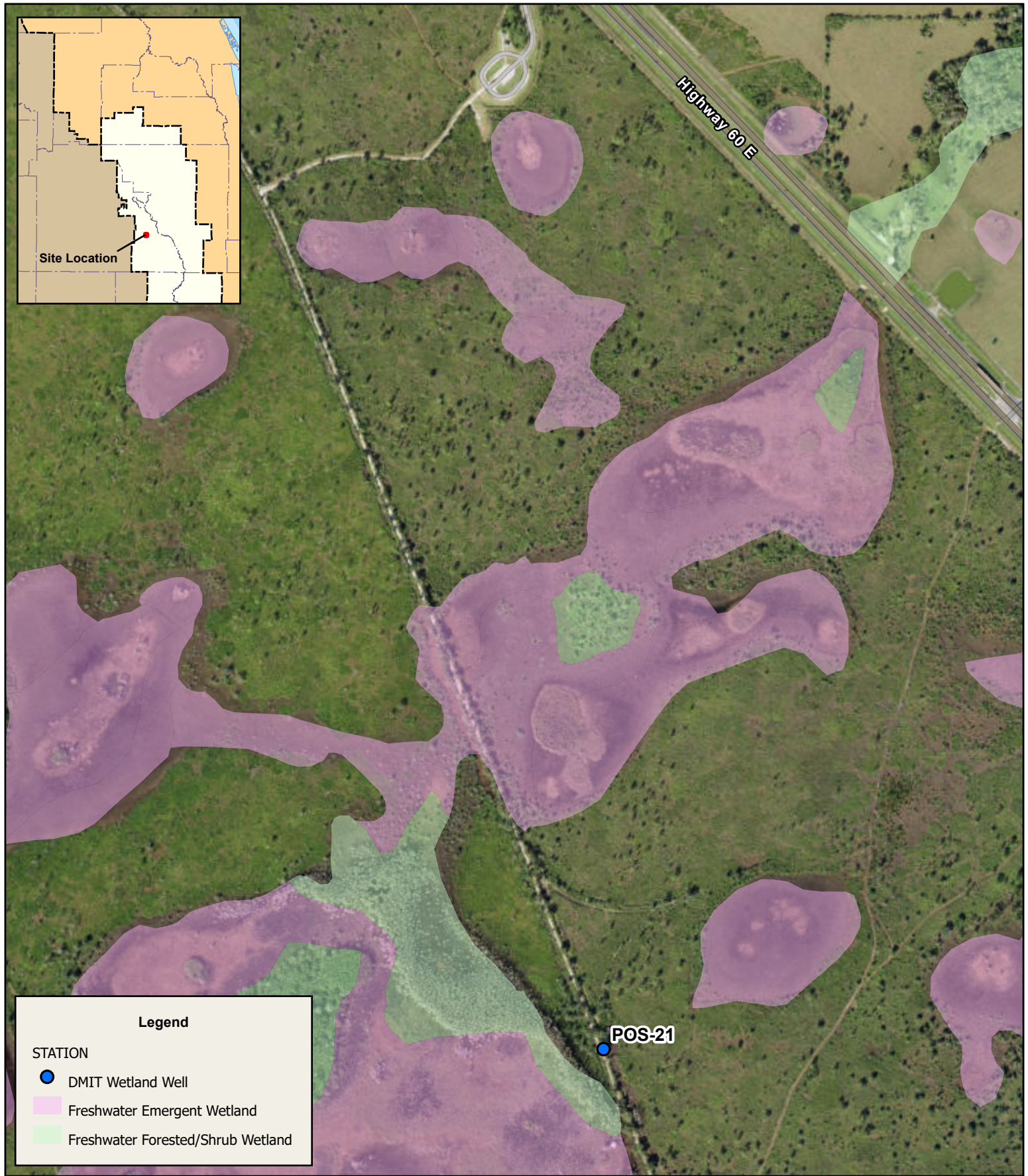
South Florida Water Management District  
3301 Gun Club Rd., West Palm Beach, Florida 33406  
(561) 886-8800; www.sfwmd.gov



0 500 Feet

[sfwmd.gov](http://sfwmd.gov)





**Legend**

**STATION**

- DMIT Wetland Well
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland





## ORS-8 Wetland Monitoring Well Location Map Shingle Creek Wetland Area



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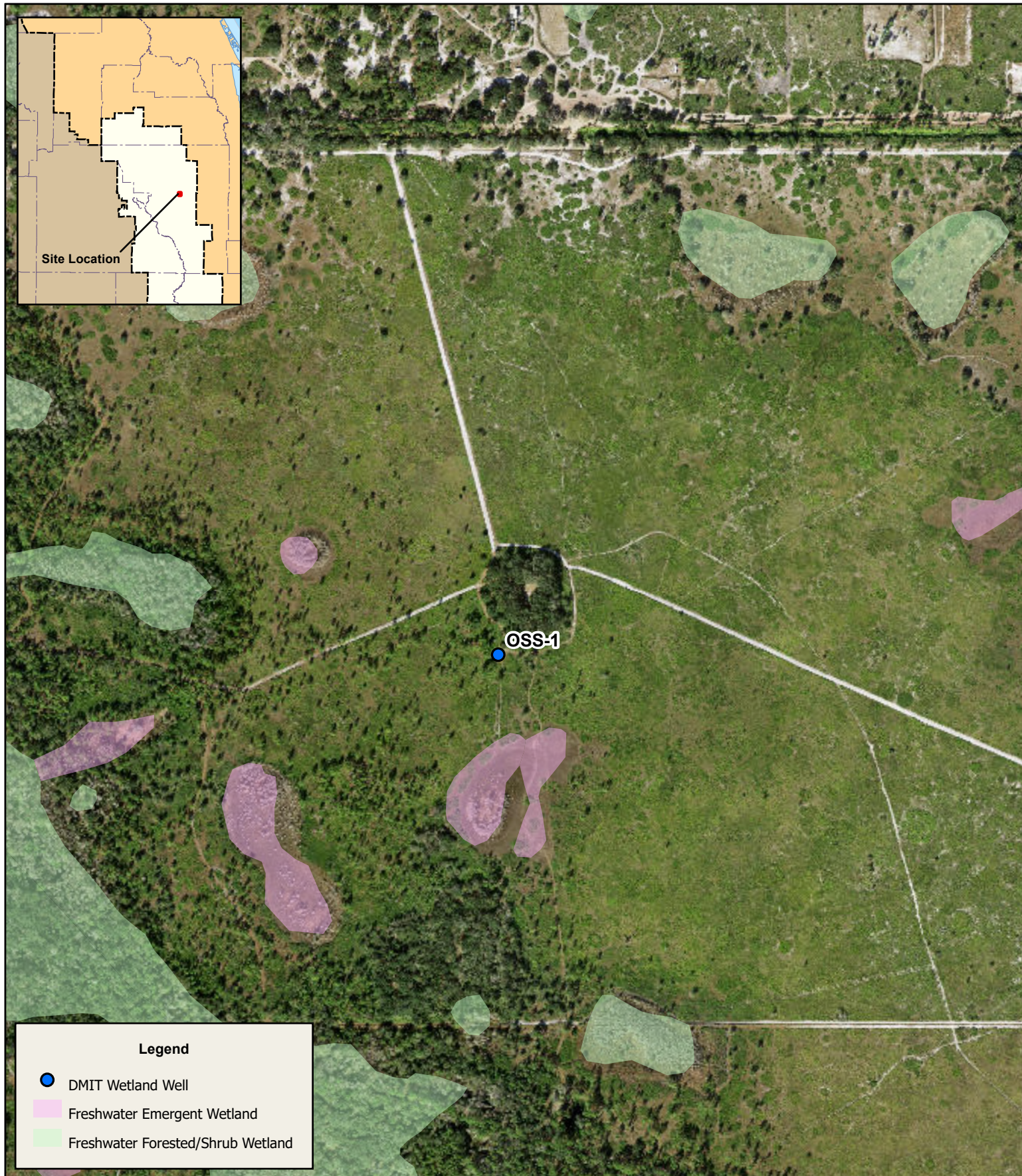


0 1,000 2,000 Feet

**BASE CREDITS:**  
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#### Legend

- DMIT Wetland Well
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland

### OSS-1 Wetland Monitoring Well Location Map Camp Lonesome West Wetland Area

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(561) 886-8800; www.sfwmd.gov



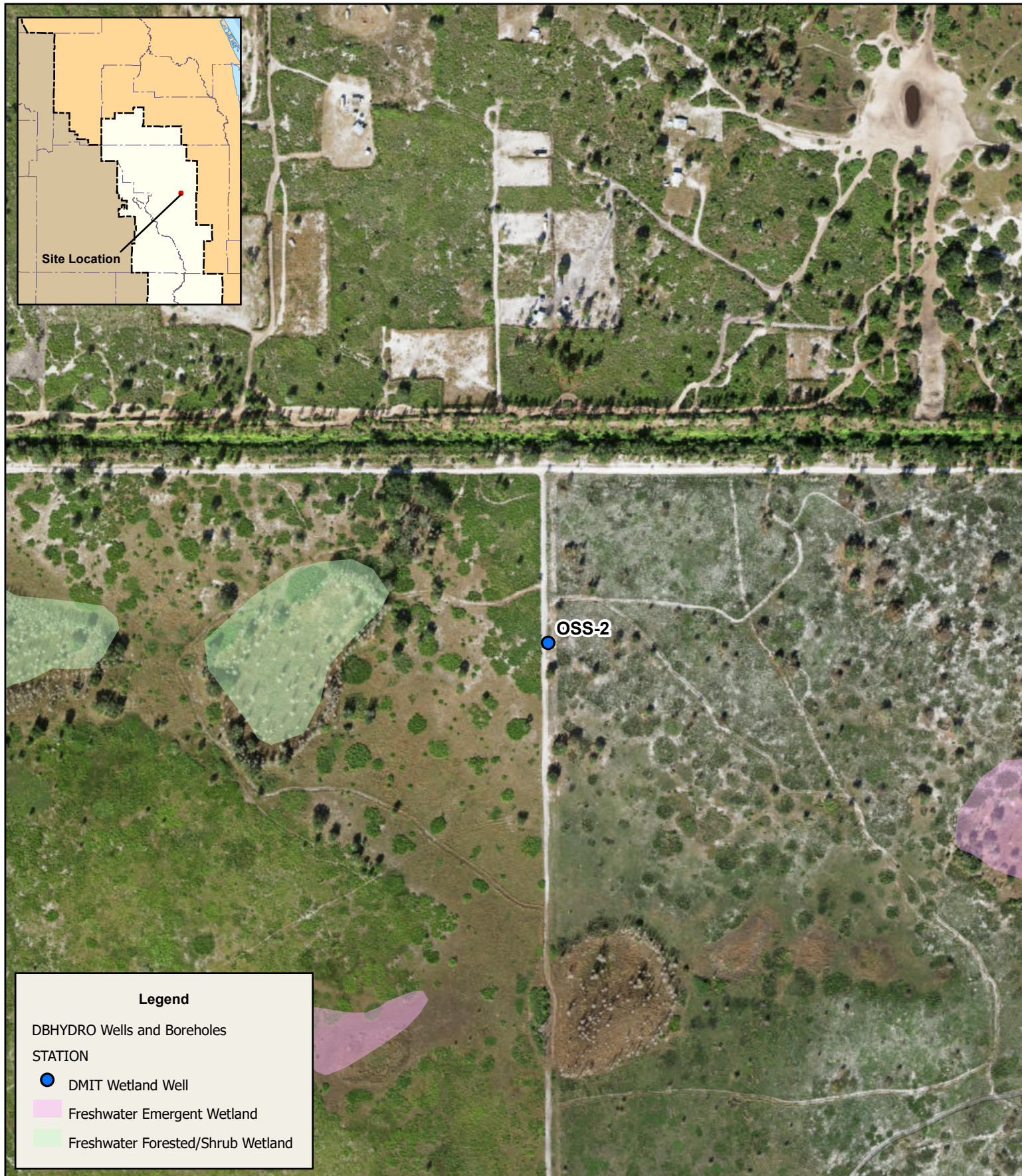
0 360 720 1,080 Feet

BASE CREDITS:  
State plane projection, Florida east zone, NAD 83-HARN, US feet.

IMPORTANT DISCLAIMER:  
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0 500 Feet

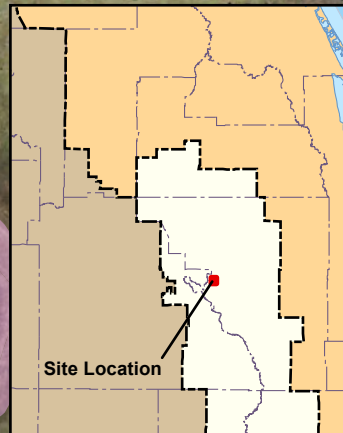
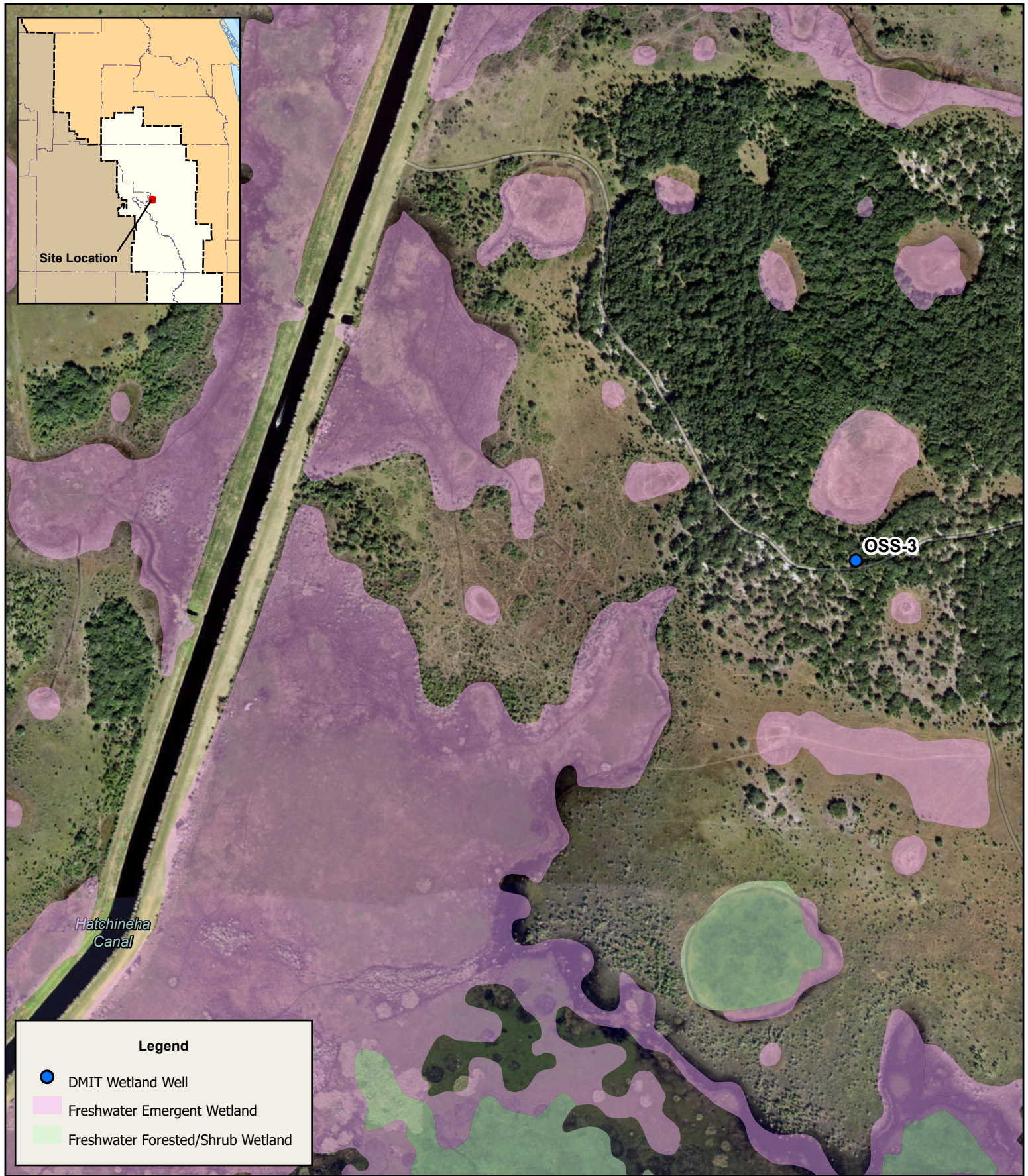
## OSS-2 Wetland Monitoring Well Location Map Camp Lonesome East Wetland Area

BASE CREDITS:  
State plane projection, Florida east zone, NAD 83-HARN, US feet.

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**Legend**

-  DMIT Wetland Well
-  Freshwater Emergent Wetland
-  Freshwater Forested/Shrub Wetland



**APPENDIX B:  
WELL CONSTRUCTION DIAGRAMS**



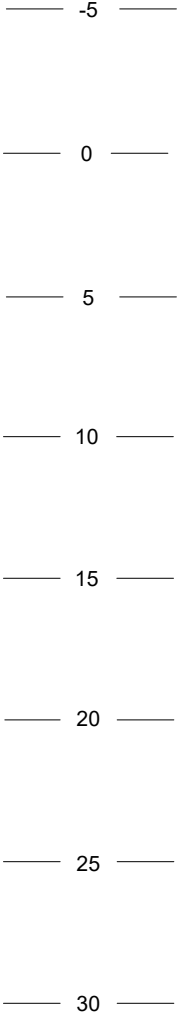
Location

County: Polk  
Latitude: 28.133564  
Longitude: -81.544002

Elevation, ft  
NAVD88

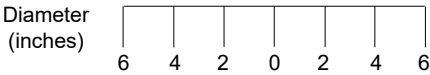
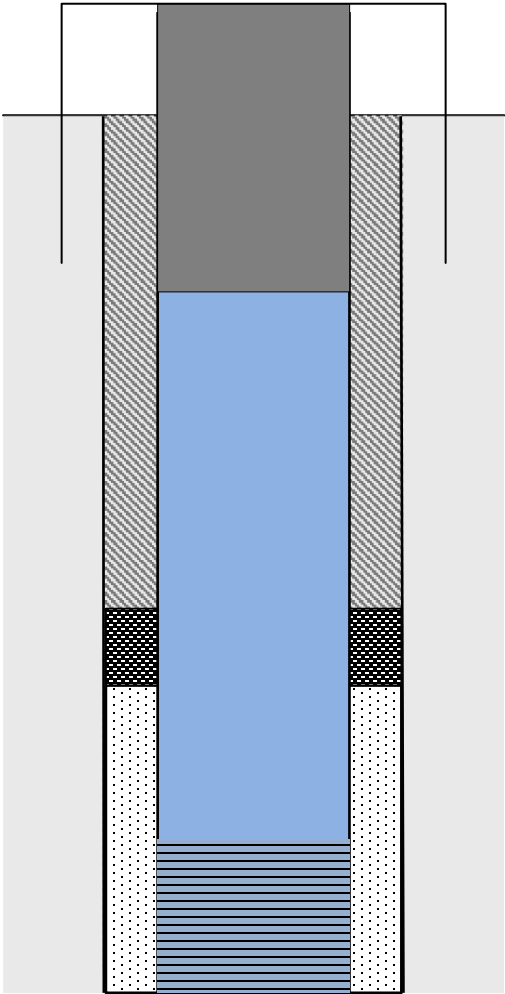
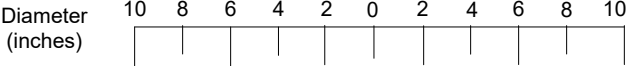
Ground Surface  
Elevation: 75.10  
Reference Point  
Elevation: 78.82

Depth  
(ft bls)



Total Depth:  
31.39 ft bls

POS-16



Well Construction  
Details

- 8-inch dia., UV-resistant SCH 80 PVC casing 5 ft bls
- 3 ft x 3 ft x 6-inch-thick concrete pad with ASTM A615 Grade 60, #5, 0.625-inch dia. reinforcing bars every 12 inches
- 4-inch dia. stainless steel threaded casing: 3.79 ft above grade to 6.21 ft bls
- 4-inch dia. SCH 40 PVC blank casing: 6.21-26.39 ft bls
- ASTM Type II neat cement grout 0-17 ft bls
- Bentonite chip transition seal 17-20 ft bls
- #20/30 filter pack sand: 20-31.39 ft bls
- 0.020-inch-diameter slotted well screen 26.39-31.39 ft bls

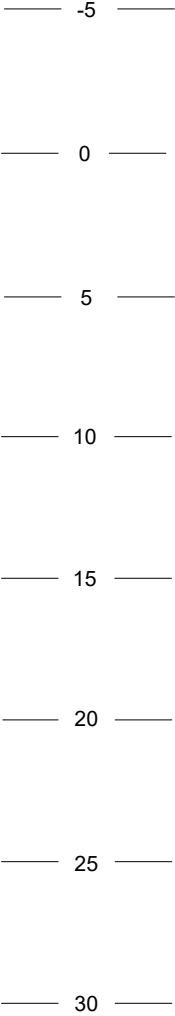
Location

County: Polk  
Latitude: 28.134345  
Longitude: -81.551818

Elevation, ft  
NAVD88

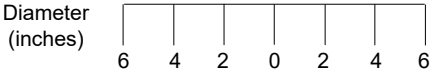
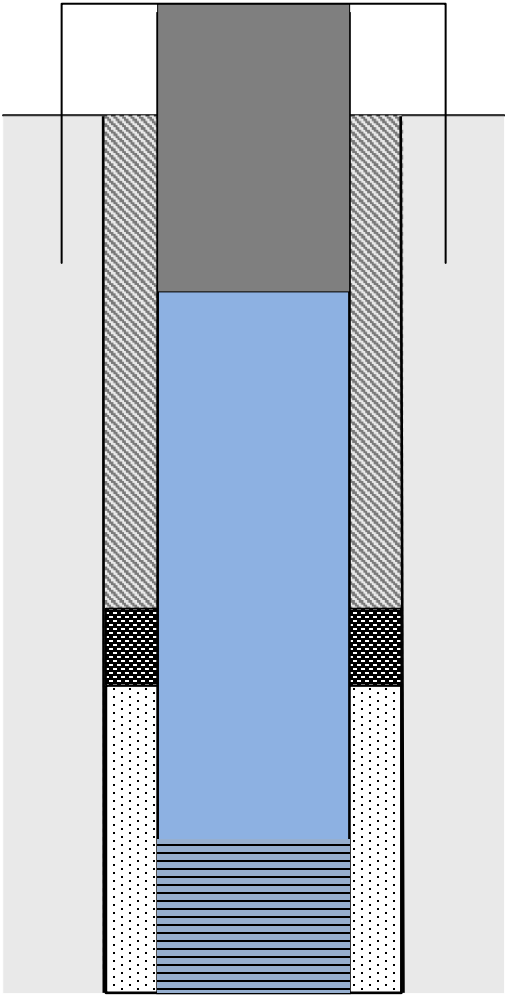
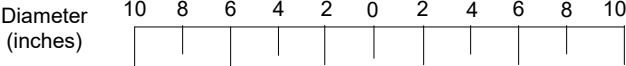
Ground Surface Elevation:  
76.20  
Reference Point  
Elevation: 80.35

Depth  
(ft bls)



Total Depth:  
28.53 ft bls

POS-17



Well Construction  
Details

- 8-inch dia., UV-resistant SCH 80 PVC casing 5 ft bls
- 3 ft x 3 ft x 6-inch-thick concrete pad with ASTM A615 Grade 60, #5, 0.625-inch dia. reinforcing bars every 12 inches
- 4-inch dia. stainless steel threaded casing: 4.29 ft above grade to 6.71 ft bls
- 4-inch dia. SCH 40 PVC blank casing: 6.71-23.53 ft bls
- ASTM Type II neat cement grout 0-17 ft bls
- Bentonite chip transition seal 17-20 ft bls
- #20/30 filter pack sand: 20-28.53 ft bls
- 0.020-inch-diameter slotted well screen 23.53-28.53 ft bls



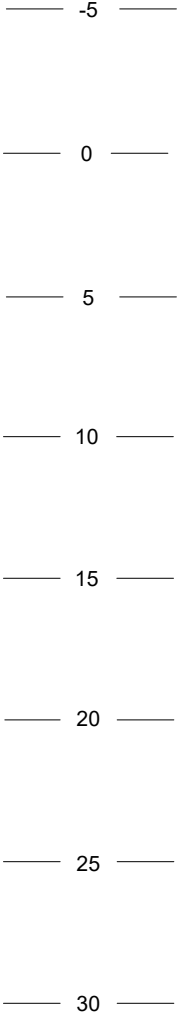
Location

County: Polk  
Latitude: 28.101879  
Longitude: -81.511944

Elevation, ft  
NAVD88

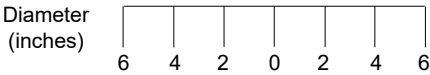
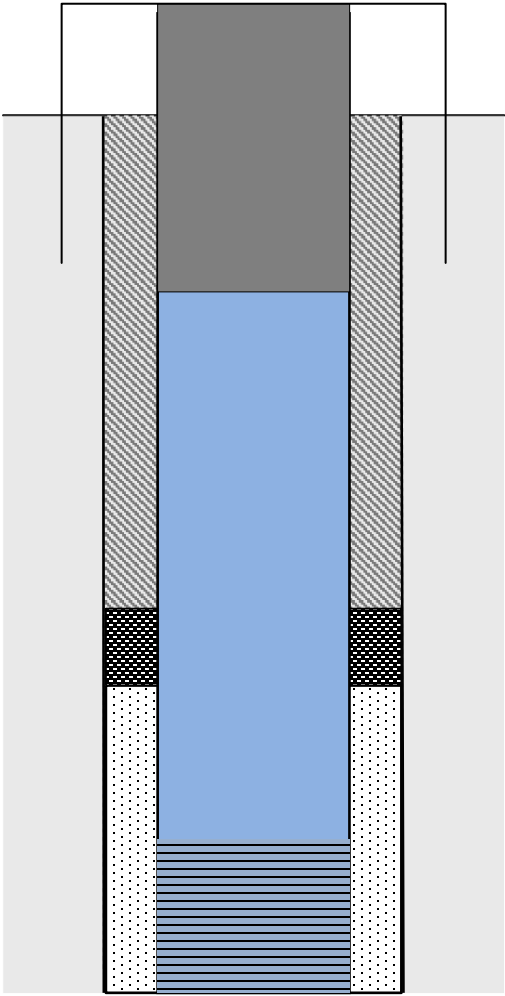
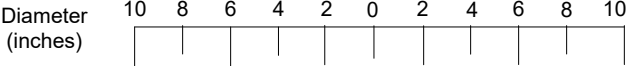
Ground Surface Elevation:  
82.40  
Reference Point  
Elevation: 86.10

Depth  
(ft bls)



Total Depth:  
30.81 ft bls

POS-18



Well Construction  
Details

- 8-inch dia., UV-resistant SCH 80 PVC casing 5 ft bls
- 3 ft x 3 ft x 6-inch-thick concrete pad with ASTM A615 Grade 60, #5, 0.625-inch dia. reinforcing bars every 12 inches
- 4-inch dia. stainless steel threaded casing: 3.77 ft above grade to 6.23 ft bls
- 4-inch dia. SCH 40 PVC blank casing 6.23-25.81 ft bls
- ASTM Type II neat cement grout 0-17 ft bls
- Bentonite chip transition seal 17-20 ft bls
- #20/30 filter pack sand: 20-30.81 ft bls
- 0.020-inch-diameter slotted well screen 25.81-30.81 ft bls

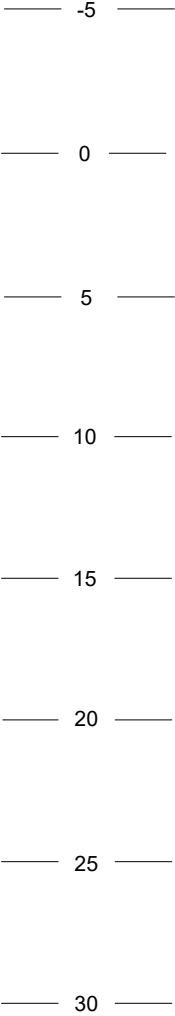
Location

County: Polk  
Latitude: 28.104603  
Longitude: -81.516074

Elevation, ft  
NAVD88

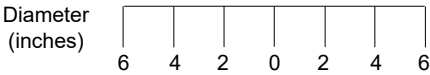
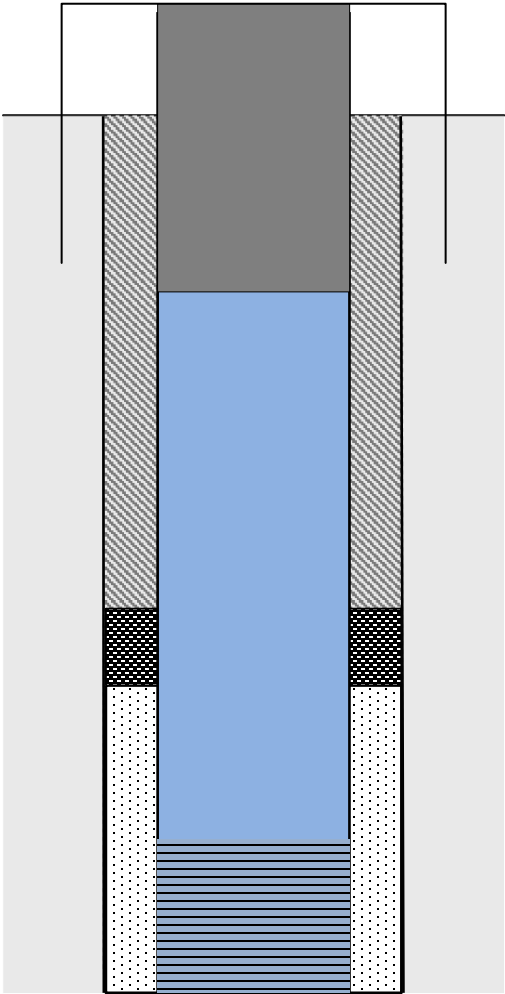
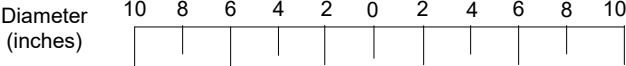
Ground Surface Elevation:  
81.00  
Reference Point  
Elevation: 85.12

Depth  
(ft bls)



Total Depth:  
30.41 ft bls

POS-19



Well Construction  
Details

- 8-inch dia., UV-resistant SCH 80 PVC casing 5 ft bls
- 3 ft x 3 ft x 6-inch-thick concrete pad with ASTM A615 Grade 60, #5, 0.625-inch dia. reinforcing bars every 12 inches
- 4-inch dia. stainless steel threaded casing: 4.08 ft above grade to 5.92 ft bls
- 4-inch dia. SCH 40 PVC blank casing 5.92-25.41 ft bls
- ASTM Type II neat cement grout 0-17 ft bls
- Bentonite chip transition seal 17-20 ft bls
- #20/30 filter pack sand: 20-30.41 ft bls
- 0.020-inch-diameter slotted well screen 25.41-30.41 ft bls



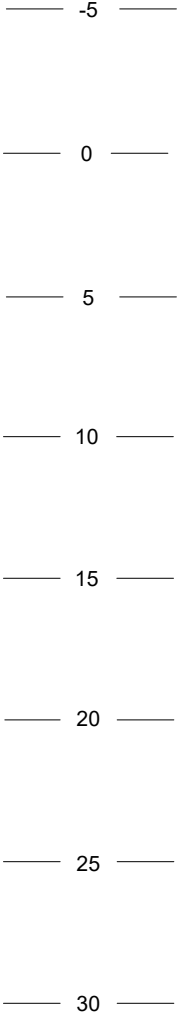
Location

County: Polk  
Latitude: 28.856350  
Longitude: -81.375428

Elevation, ft  
NAVD88

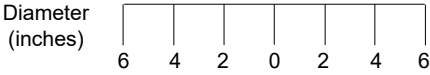
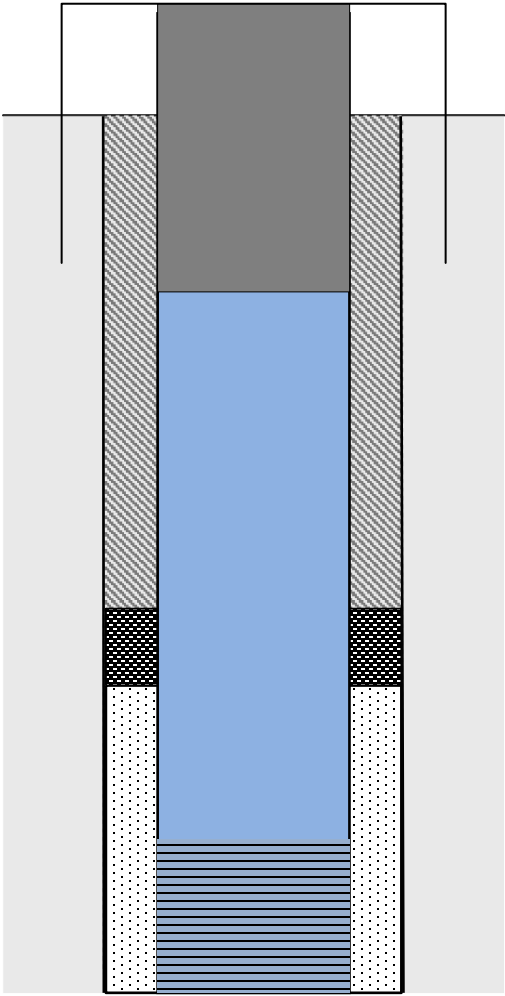
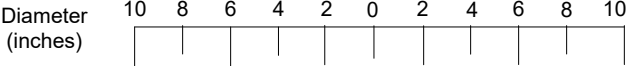
Ground Surface Elevation:  
67.42  
Reference Point  
Elevation: 70.63

Depth  
(ft bls)



Total Depth:  
30.88 ft bls

POS-20



Well Construction  
Details

- 8-inch dia., UV-resistant SCH 80 PVC casing 5 ft bls
- 3 ft x 3 ft x 6-inch-thick concrete pad with ASTM A615 Grade 60, #5, 0.625-inch dia. reinforcing bars every 12 inches
- 4-inch dia. stainless steel threaded casing. 3.3 ft above grade to 6.7 ft bls
- 4-inch dia. SCH 40 PVC blank casing 6.7-25.88 ft bls
- ASTM Type II neat cement grout 0-17 ft bls
- Bentonite chip transition seal 17-20 ft bls
- #20/30 filter pack sand: 20-30.88 ft bls
- 0.020-inch-diameter slotted well screen 26-30.88 ft bls

## Location

**Depth  
(ft bls)**Diameter  
(inches)

10    8    6    4    2    0    2    4    6    8    10

## Well Construction Details

**Elevation, ft  
NAVD88**

Ground Surface Elevation:  
68.38

Reference Point  
Elevation: 71.32

A vertical number line with tick marks at intervals of 5. The numbers are labeled on the right side of the line: -5, 0, 5, 10, 15, 20, 25, and 30.

Total Depth:  
31.37 ft bls

Diameter  
(inches)

6 4 2 0 2 4 6

8-inch dia., UV-resistant  
SCH 80 PVC casing  
5 ft bls

3 ft x 3 ft x 6-inch-thick  
concrete pad with ASTM  
A615 Grade 60, #5, 0.625-  
inch dia. reinforcing bars  
every 12 inches

4-inch dia. stainless steel  
threaded casing: 3.21 ft above  
grade to 6.79 ft bls

4-inch dia. SCH 40 PVC blank  
casing. 6.79-26.37 ft bls

ASTM Type II neat  
cement grout 0-17 ft  
bls

Bentonite chip transition seal  
17-20 ft bls

#20/30 filter pack sand: 20-  
31.37 ft bls

0.020-inch-diameter slotted  
well screen 26.37-31.37 ft bls



Diameter (inches)

10 8 6 4 2 0 2 4 6 8 10

**Depth  
(ft bls)**

— -5 — —

— 0 — —

— 5 — —

— 10 — —

— 15 — —

— 20 — —

— 25 — —

— 26 — —

Ground Surface  
Elevation: 79.4  
Reference Point  
Elevation: 85.31

Total Depth:  
27.08 ft bls

Diameter (inches)

6 4 2 0 2 4 6

8-inch dia., UV-resistant  
SCH 80 PVC casing to 5  
ft bls

3 ft x 3 ft x 6-inch-thick  
concrete pad with ASTM  
A615 Grade 60, #5, 0.625-  
inch dia. reinforcing bars  
every 12 inches

4-inch dia. stainless steel  
threaded casing: 3.58 ft above  
grade to 6.42 ft bls

4-inch dia. SCH 40 PVC blank  
casing. 6.42 ft to 17.08 ft bls

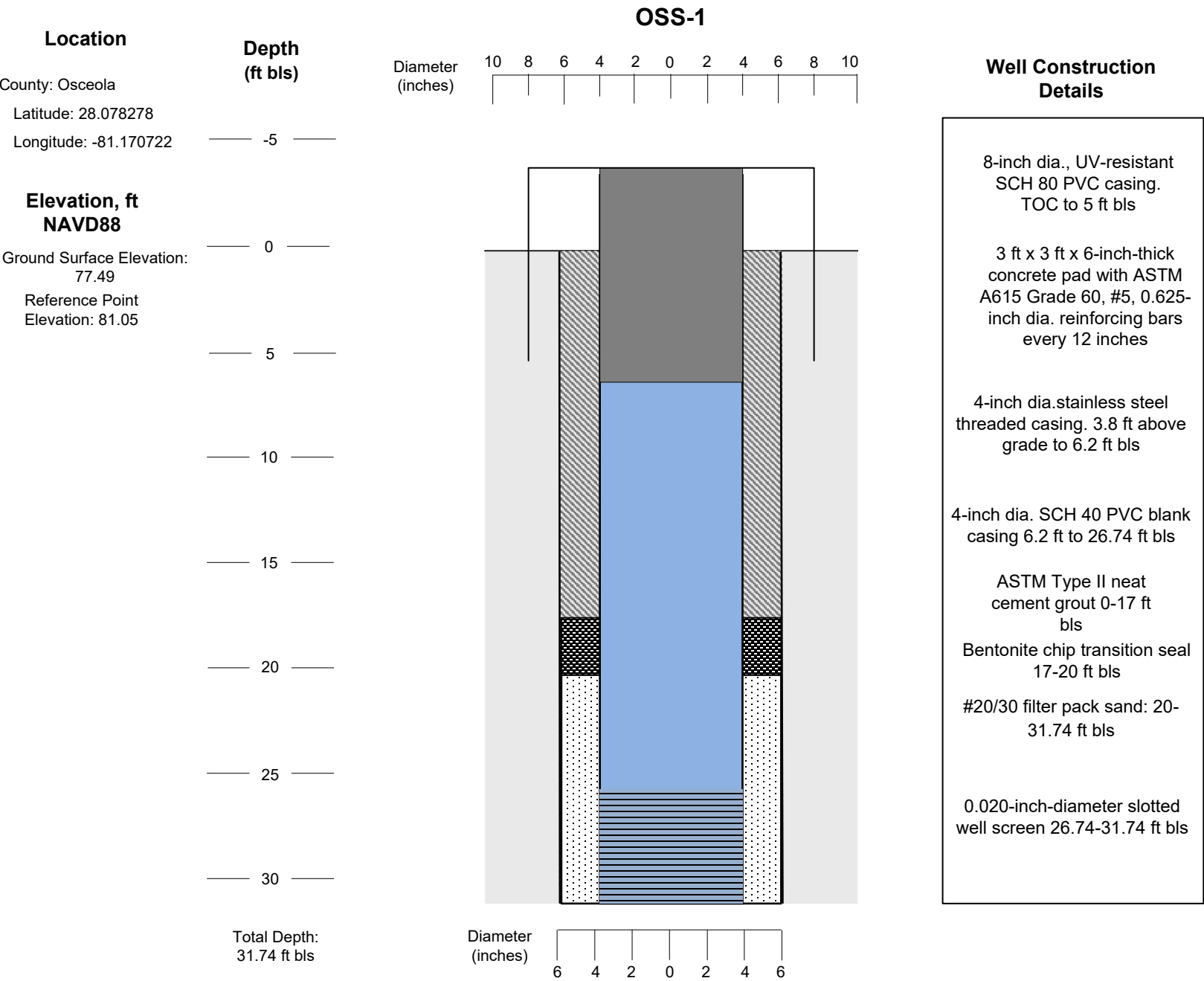
ASTM Type II neat  
cement grout 0 to 17  
ft bls

Bentonite chip transition seal  
15 to 17 ft bls

#20/30 filter pack sand: 15 to  
27.08 ft bls

0.020-inch-diameter slotted  
well screen 17.08 to 27.08 ft  
bls

0.020-inch-diameter slotted  
well screen 17.08 to 27.08 ft  
bls





8-inch dia., UV-resistant SCH 80 PVC casing. 5 ft bls

3 ft x 3 ft x 6-inch-thick concrete pad with ASTM A615 Grade 60, #5, 0.625-inch dia. reinforcing bars every 12 inches

4-inch dia. stainless steel threaded casing: 4.8 ft above grade to 5.2 ft bls

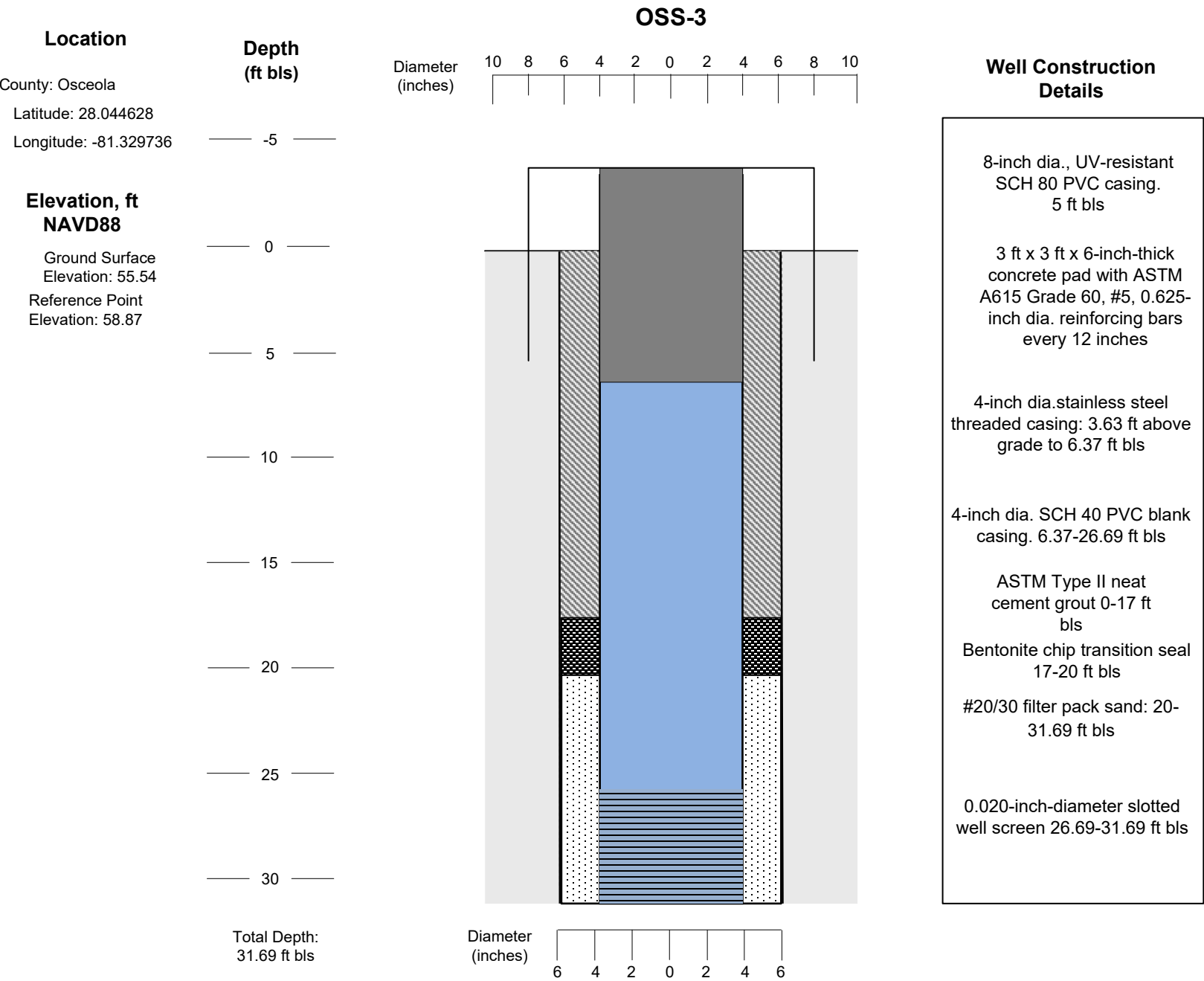
4-inch dia. SCH 40 PVC blank casing. 5.2-24.92 ft bls

ASTM Type II neat cement grout 0-17 ft bls

Bentonite chip transition seal 17-20 ft bls

#20/30 filter pack sand: 20-29.92 ft bls

0.020-inch-diameter slotted well screen 24.92-29.92 ft bls





**APPENDIX C:  
SOIL SIEVING, DENSITIES, AND K VALUES**



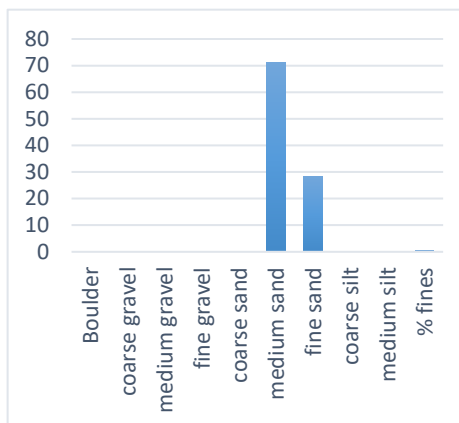
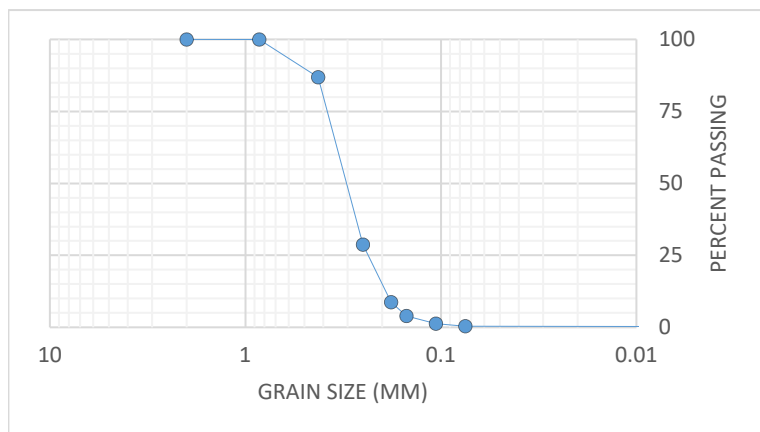
# Grain Size Analysis Report

Sample Name: POS-16 5-7 ft bls

Mass Sample (g): 317.87

T (°C) 26

## Uniform sand low in fines



| Sieve opening (ps)<br>di (mm) | Mass of retained (mr)<br>(g) | mass fraction (mf) | Percent Passing (pp) |
|-------------------------------|------------------------------|--------------------|----------------------|
| 2                             | 0.00                         | 0.00               | 100.00               |
| 0.85                          | 0.20                         | 0.00               | 99.94                |
| 0.425                         | 41.52                        | 0.13               | 86.88                |
| 0.25                          | 185.02                       | 0.58               | 28.67                |
| 0.18                          | 63.49                        | 0.20               | 8.70                 |
| 0.15                          | 15.08                        | 0.05               | 3.95                 |
| 0.106                         | 8.66                         | 0.03               | 1.23                 |
| 0.075                         | 2.68                         | 0.01               | 0.38                 |
| 0.00001                       | 1.22                         | 0.00               | 0.00                 |

| Effective Grain Diameters (mm) |       | Other Useful Parameters     |             |
|--------------------------------|-------|-----------------------------|-------------|
| d10                            | 0.185 | Uniformity Coef.            | 1.86        |
| d17                            | 0.209 | n computed                  | 0.44        |
| d20                            | 0.220 | g (cm/s <sup>2</sup> )      | 980.00      |
| d30                            | 0.254 | ρ (g/cm <sup>3</sup> )      | 0.9968      |
| d50                            | 0.314 | μ (g/cm s)                  | 0.0085      |
| d60                            | 0.344 | ρg/μ (1/cm s)               | 1.1461E+05  |
| de (Kruger)                    | 0.281 | tau (Sauerbrei)             | 1.209       |
| de (Kozeny)                    | 0.005 | d <sub>geometric mean</sub> | 0.300       |
| de (Zunker)                    | 0.021 | σ <sub>ψ</sub>              | 0.578       |
| de (Zamarin)                   | 0.252 |                             |             |
| lo (Alyameni)                  | 0.152 | 100                         | % in sample |
| mm                             |       | Boulder                     |             |
| >64                            |       | coarse gravel               |             |
| 16 - 64                        |       | medium gravel               |             |
| 8 - 16                         |       | fine gravel                 | 0           |
| 2 - 8                          |       | coarse sand                 | 0.06        |
| 0.5 - 2                        |       | medium sand                 | 71.27       |
| 0.25 - 0.5                     |       | fine sand                   | 28.29       |
| 0.063 - 0.25                   |       | coarse silt                 |             |
| 0.016 - 0.063                  |       | medium silt                 |             |
| 0.008 - 0.016                  |       |                             |             |
| 0.002 - 0.008                  |       | % fines                     | 0.38        |





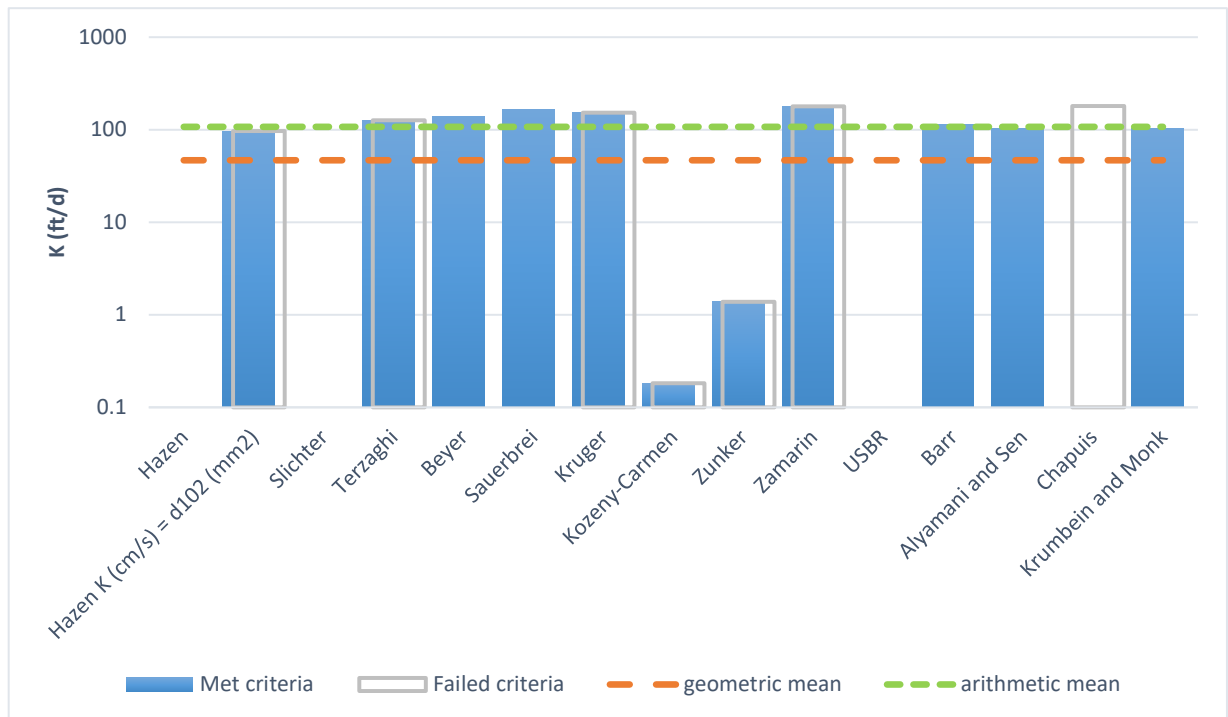
# K from Grain Size Analysis Report

Sample Name: POS-16 5-7 ft bls

Mass Sample (g): 317.87

T (°C) 26

## Uniform sand low in fines



| Estimation of Hydraulic Conductivity | cm/s    | m/s     | ft/d |
|--------------------------------------|---------|---------|------|
| Hazen                                | .64E-01 | .64E-03 | 183  |
| Hazen K (cm/s) = $d_{10}$ (mm)       | .34E-01 | .34E-03 | 97   |
| Slichter                             | .25E-01 | .25E-03 | 72   |
| Terzaghi                             | .45E-01 | .45E-03 | 127  |
| Beyer                                | .49E-01 | .49E-03 | 140  |
| Sauerbrei                            | .59E-01 | .59E-03 | 166  |
| Kruger                               | .54E-01 | .54E-03 | 152  |
| Kozeny-Carmen                        | .64E-04 | .64E-06 | 0    |
| Zunker                               | .49E-03 | .49E-05 | 1    |
| Zamarin                              | .63E-01 | .63E-03 | 178  |
| USBR                                 | .17E-01 | .17E-03 | 48   |
| Barr                                 | .41E-01 | .41E-03 | 115  |
| Alyamani and Sen                     | .36E-01 | .36E-03 | 103  |
| Chapuis                              | .64E-01 | .64E-03 | 180  |
| Krumbein and Monk                    | .36E-01 | .36E-03 | 103  |
| geometric mean                       | .17E-01 | .17E-03 | 47   |
| arithmetic mean                      | .38E-01 | .38E-03 | 107  |



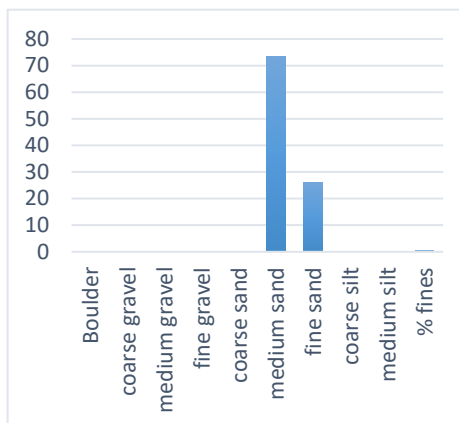
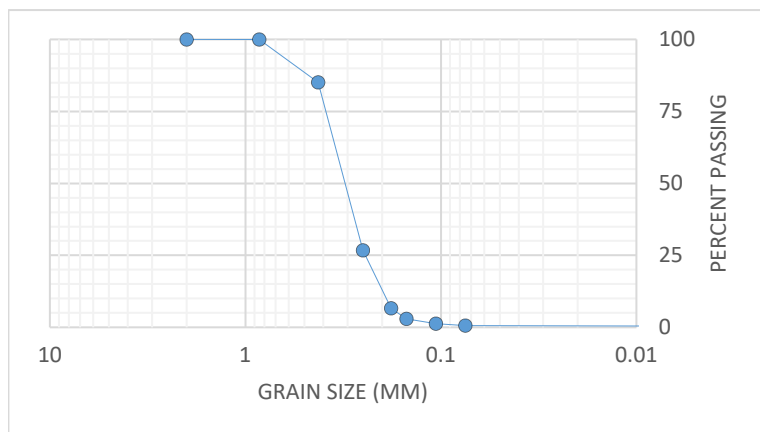
# Grain Size Analysis Report

Sample Name: POS-16 7-9 ft bls

Mass Sample (g): 273.36

T (°C) 26

## Uniform sand low in fines



| Sieve opening<br>(ps)<br>di (mm) | Mass of retained<br>(mr)<br>(g) | mass fraction<br>(mf) | Percent Passing<br>(pp) |
|----------------------------------|---------------------------------|-----------------------|-------------------------|
| 2                                | 0.00                            | 0.00                  | 100.00                  |
| 0.85                             | 0.20                            | 0.00                  | 99.93                   |
| 0.425                            | 40.68                           | 0.15                  | 85.05                   |
| 0.25                             | 159.57                          | 0.58                  | 26.67                   |
| 0.18                             | 54.91                           | 0.20                  | 6.58                    |
| 0.15                             | 10.12                           | 0.04                  | 2.88                    |
| 0.106                            | 4.38                            | 0.02                  | 1.28                    |
| 0.075                            | 1.73                            | 0.01                  | 0.65                    |
| 0.00001                          | 1.77                            | 0.01                  | 0.00                    |

| Effective Grain Diameters (mm) |       | Other Useful Parameters     |             |
|--------------------------------|-------|-----------------------------|-------------|
| d10                            | 0.192 | Uniformity Coef.            | 1.82        |
| d17                            | 0.216 | n computed                  | 0.44        |
| d20                            | 0.227 | g (cm/s <sup>2</sup> )      | 980.00      |
| d30                            | 0.260 | ρ (g/cm <sup>3</sup> )      | 0.9968      |
| d50                            | 0.320 | μ (g/cm s)                  | 0.0085      |
| d60                            | 0.350 | ρg/μ (1/cm s)               | 1.1461E+05  |
| de (Kruger)                    | 0.287 | tau (Sauerbrei)             | 1.209       |
| de (Kozeny)                    | 0.003 | d <sub>geometric mean</sub> | 0.306       |
| de (Zunker)                    | 0.013 | σ <sub>ψ</sub>              | 0.563       |
| de (Zamarin)                   | 0.241 |                             |             |
| lo (Alyameni)                  | 0.160 | 100                         | % in sample |
| mm                             |       | Boulder                     |             |
| >64                            |       | coarse gravel               |             |
| 16 - 64                        |       | medium gravel               |             |
| 8 - 16                         |       | fine gravel                 |             |
| 2 - 8                          |       | coarse sand                 | 0.07        |
| 0.5 - 2                        |       | medium sand                 | 73.26       |
| 0.25 - 0.5                     |       | fine sand                   | 26.02       |
| 0.063 - 0.25                   |       | coarse silt                 |             |
| 0.016 - 0.063                  |       | medium silt                 |             |
| 0.008 - 0.016                  |       |                             |             |
| 0.002 - 0.008                  |       | % fines                     | 0.65        |



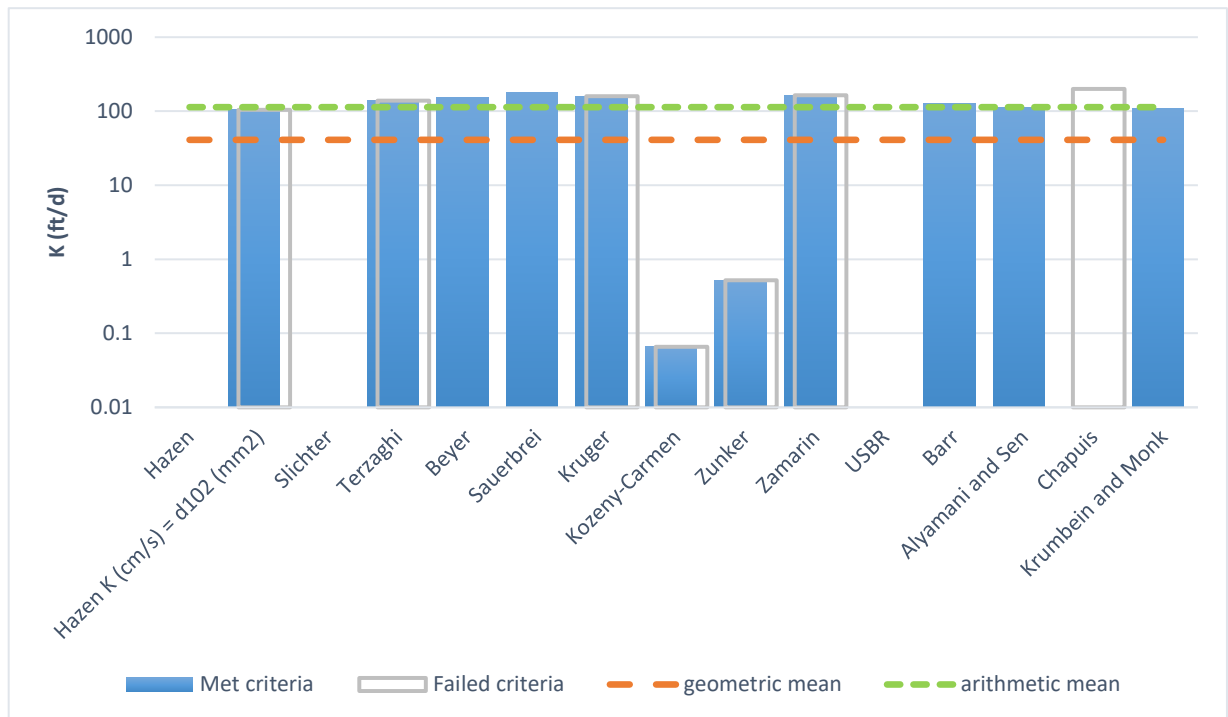
# K from Grain Size Analysis Report

Sample Name: POS-16 7-9 ft bls

Mass Sample (g): 273.36

T (°C) 26

## Uniform sand low in fines



| Estimation of Hydraulic Conductivity  | cm/s    | m/s     | ft/d |
|---------------------------------------|---------|---------|------|
| Hazen                                 | .70E-01 | .70E-03 | 198  |
| Hazen K (cm/s) = d <sub>10</sub> (mm) | .37E-01 | .37E-03 | 104  |
| Slichter                              | .28E-01 | .28E-03 | 78   |
| Terzaghi                              | .49E-01 | .49E-03 | 138  |
| Beyer                                 | .54E-01 | .54E-03 | 152  |
| Sauerbrei                             | .64E-01 | .64E-03 | 181  |
| Kruger                                | .56E-01 | .56E-03 | 160  |
| Kozeny-Carmen                         | .23E-04 | .23E-06 | 0    |
| Zunker                                | .18E-03 | .18E-05 | 1    |
| Zamarin                               | .58E-01 | .58E-03 | 165  |
| USBR                                  | .18E-01 | .18E-03 | 51   |
| Barr                                  | .44E-01 | .44E-03 | 126  |
| Alyamani and Sen                      | .40E-01 | .40E-03 | 113  |
| Chapuis                               | .71E-01 | .71E-03 | 200  |
| Krumbein and Monk                     | .39E-01 | .39E-03 | 109  |
| geometric mean                        | .14E-01 | .14E-03 | 41   |
| arithmetic mean                       | .40E-01 | .40E-03 | 113  |





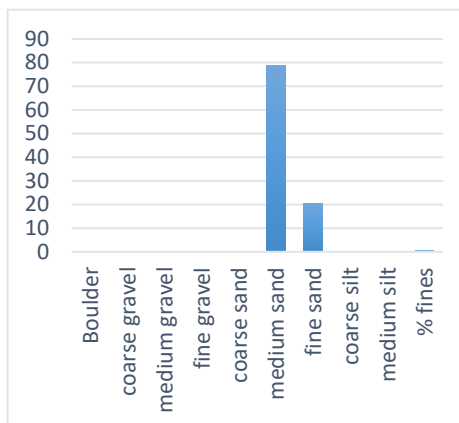
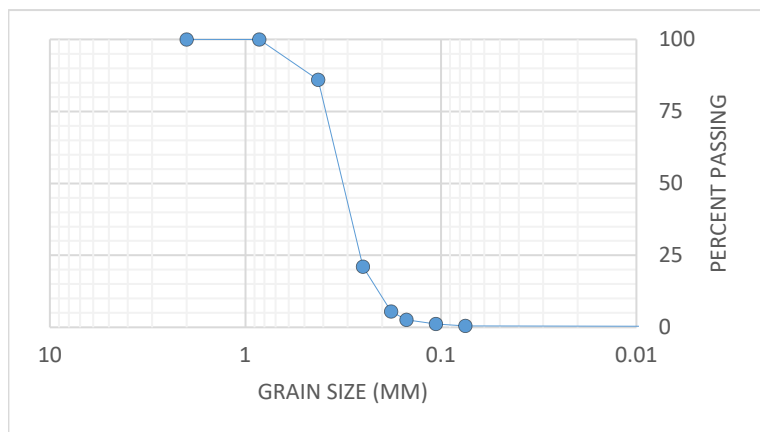
# Grain Size Analysis Report

Sample Name: POS-16 9-11 ft bls

Mass Sample (g): 314.33

T (°C) 26

## Uniform sand low in fines



| Sieve opening<br>(ps)<br>di (mm) | Mass of retained<br>(mr)<br>(g) | mass fraction<br>(mf) | Percent Passing<br>(pp) |
|----------------------------------|---------------------------------|-----------------------|-------------------------|
| 2                                | 0.00                            | 0.00                  | 100.00                  |
| 0.85                             | 0.18                            | 0.00                  | 99.94                   |
| 0.425                            | 43.95                           | 0.14                  | 85.96                   |
| 0.25                             | 204.10                          | 0.65                  | 21.03                   |
| 0.18                             | 48.74                           | 0.16                  | 5.52                    |
| 0.15                             | 9.24                            | 0.03                  | 2.58                    |
| 0.106                            | 4.57                            | 0.01                  | 1.13                    |
| 0.075                            | 1.89                            | 0.01                  | 0.53                    |
| 0.00001                          | 1.66                            | 0.01                  | 0.00                    |

| Effective Grain Diameters (mm) |       | Other Useful Parameters     |             |
|--------------------------------|-------|-----------------------------|-------------|
| d10                            | 0.200 | Uniformity Coef.            | 1.77        |
| d17                            | 0.232 | n computed                  | 0.44        |
| d20                            | 0.245 | g (cm/s <sup>2</sup> )      | 980.00      |
| d30                            | 0.274 | ρ (g/cm <sup>3</sup> )      | 0.9968      |
| d50                            | 0.328 | μ (g/cm s)                  | 0.0085      |
| d60                            | 0.355 | ρg/μ (1/cm s)               | 1.1461E+05  |
| de (Kruger)                    | 0.297 | tau (Sauerbrei)             | 1.209       |
| de (Kozeny)                    | 0.004 | d <sub>geometric mean</sub> | 0.315       |
| de (Zunker)                    | 0.016 | σ <sub>ψ</sub>              | 0.525       |
| de (Zamarin)                   | 0.256 |                             |             |
| lo (Alyameni)                  | 0.168 | 100                         | % in sample |
| mm                             |       | Boulder                     |             |
| >64                            |       | coarse gravel               |             |
| 16 - 64                        |       | medium gravel               |             |
| 8 - 16                         |       | fine gravel                 |             |
| 2 - 8                          |       | coarse sand                 | 0.06        |
| 0.5 - 2                        |       | medium sand                 | 78.91       |
| 0.25 - 0.5                     |       | fine sand                   | 20.5        |
| 0.063 - 0.25                   |       | coarse silt                 |             |
| 0.016 - 0.063                  |       | medium silt                 |             |
| 0.008 - 0.016                  |       |                             |             |
| 0.002 - 0.008                  |       | % fines                     | 0.53        |



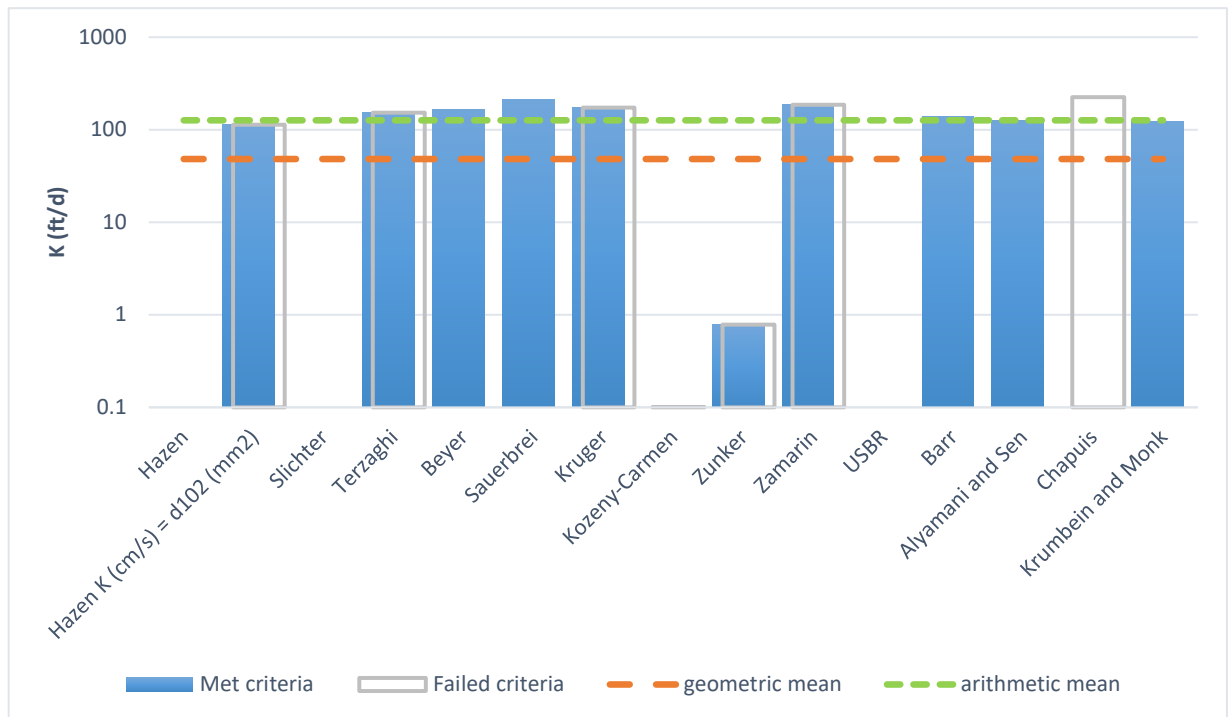
# K from Grain Size Analysis Report

Sample Name: POS-16 9-11 ft bls

Mass Sample (g): 314.33

T (°C) 26

Uniform sand low in fines



| Estimation of Hydraulic Conductivity  | cm/s    | m/s     | ft/d |
|---------------------------------------|---------|---------|------|
| Hazen                                 | .77E-01 | .77E-03 | 217  |
| Hazen K (cm/s) = d <sub>10</sub> (mm) | .40E-01 | .40E-03 | 114  |
| Slichter                              | .31E-01 | .31E-03 | 86   |
| Terzaghi                              | .54E-01 | .54E-03 | 153  |
| Beyer                                 | .59E-01 | .59E-03 | 166  |
| Sauerbrei                             | .74E-01 | .74E-03 | 211  |
| Kruger                                | .61E-01 | .61E-03 | 173  |
| Kozeny-Carmen                         | .35E-04 | .35E-06 | 0    |
| Zunker                                | .28E-03 | .28E-05 | 1    |
| Zamarin                               | .66E-01 | .66E-03 | 187  |
| USBR                                  | .22E-01 | .22E-03 | 62   |
| Barr                                  | .49E-01 | .49E-03 | 140  |
| Alyamani and Sen                      | .44E-01 | .44E-03 | 125  |
| Chapuis                               | .79E-01 | .79E-03 | 225  |
| Krumbein and Monk                     | .43E-01 | .43E-03 | 122  |
| geometric mean                        | .17E-01 | .17E-03 | 48   |
| arithmetic mean                       | .45E-01 | .45E-03 | 126  |



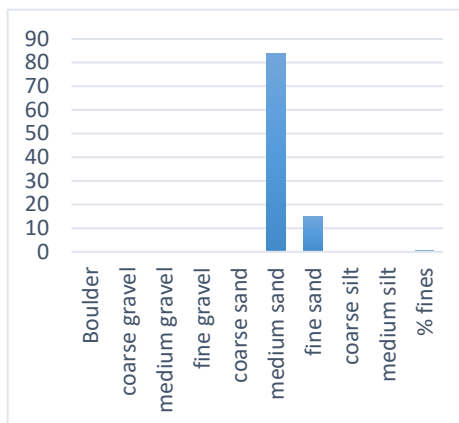
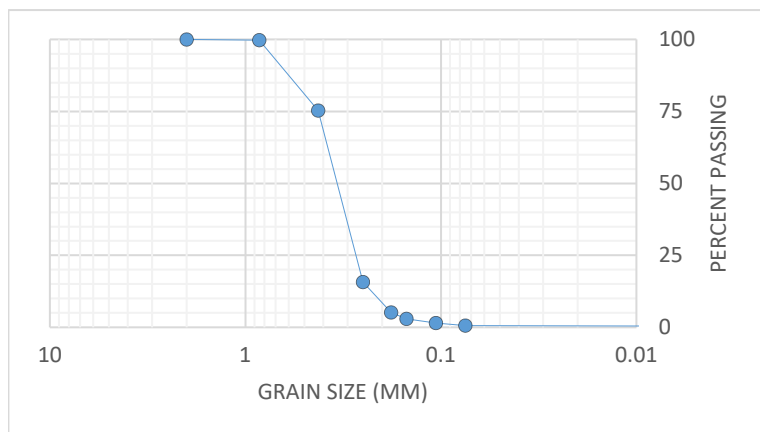
# Grain Size Analysis Report

Sample Name: POS-16 11-13 ft bls

Mass Sample (g): 311.47

T (°C) 26

## Uniform sand low in fines



| Sieve opening<br>(ps)<br>di (mm) | Mass of retained<br>(mr)<br>(g) | mass fraction<br>(mf) | Percent Passing<br>(pp) |
|----------------------------------|---------------------------------|-----------------------|-------------------------|
| 2                                | 0.00                            | 0.00                  | 100.00                  |
| 0.85                             | 0.78                            | 0.00                  | 99.75                   |
| 0.425                            | 76.20                           | 0.24                  | 75.28                   |
| 0.25                             | 185.42                          | 0.60                  | 15.75                   |
| 0.18                             | 32.97                           | 0.11                  | 5.17                    |
| 0.15                             | 6.90                            | 0.02                  | 2.95                    |
| 0.106                            | 4.42                            | 0.01                  | 1.53                    |
| 0.075                            | 2.79                            | 0.01                  | 0.64                    |
| 0.00001                          | 1.99                            | 0.01                  | 0.00                    |

| Effective Grain Diameters (mm) |       | Other Useful Parameters     |             |
|--------------------------------|-------|-----------------------------|-------------|
| d10                            | 0.212 | Uniformity Coef.            | 1.79        |
| d17                            | 0.254 | n computed                  | 0.44        |
| d20                            | 0.262 | g (cm/s <sup>2</sup> )      | 980.00      |
| d30                            | 0.292 | ρ (g/cm <sup>3</sup> )      | 0.9968      |
| d50                            | 0.351 | μ (g/cm s)                  | 0.0085      |
| d60                            | 0.380 | ρg/μ (1/cm s)               | 1.1461E+05  |
| de (Kruger)                    | 0.317 | tau (Sauerbrei)             | 1.209       |
| de (Kozeny)                    | 0.003 | d <sub>geometric mean</sub> | 0.370       |
| de (Zunker)                    | 0.013 | σ <sub>ψ</sub>              | 0.620       |
| de (Zamarin)                   | 0.263 |                             |             |
| lo (Alyameni)                  | 0.177 | 100                         | % in sample |
| mm                             |       | Boulder                     |             |
| >64                            |       | coarse gravel               |             |
| 16 - 64                        |       | medium gravel               |             |
| 8 - 16                         |       | fine gravel                 |             |
| 2 - 8                          |       | coarse sand                 | 0.25        |
| 0.5 - 2                        |       | medium sand                 | 84          |
| 0.25 - 0.5                     |       | fine sand                   | 15.12       |
| 0.063 - 0.25                   |       | coarse silt                 |             |
| 0.016 - 0.063                  |       | medium silt                 |             |
| 0.008 - 0.016                  |       |                             |             |
| 0.002 - 0.008                  |       | % fines                     | 0.64        |





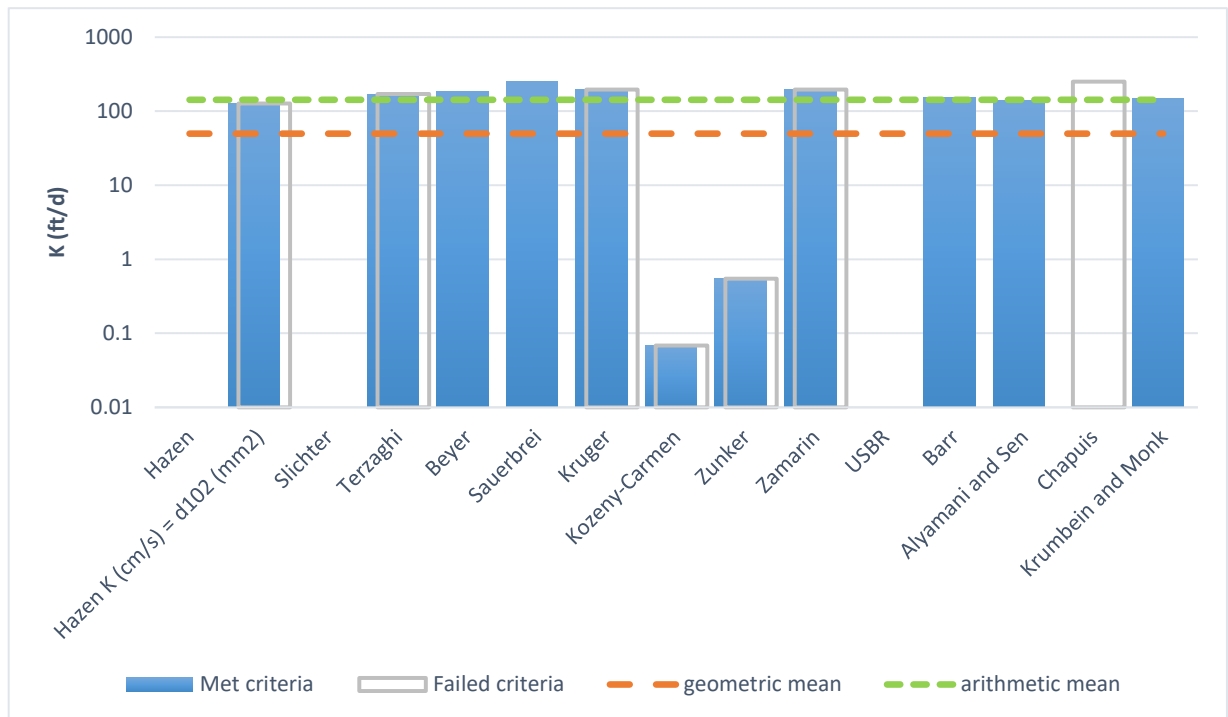
# K from Grain Size Analysis Report

Sample Name: POS-16 11-13 ft bls

Mass Sample (g): 311.47

T (°C) 26

## Uniform sand low in fines



| Estimation of Hydraulic Conductivity | cm/s    | m/s     | ft/d |
|--------------------------------------|---------|---------|------|
| Hazen                                | .86E-01 | .86E-03 | 243  |
| Hazen K (cm/s) = $d_{10}$ (mm)       | .45E-01 | .45E-03 | 127  |
| Slichter                             | .34E-01 | .34E-03 | 96   |
| Terzaghi                             | .60E-01 | .60E-03 | 170  |
| Beyer                                | .65E-01 | .65E-03 | 186  |
| Sauerbrei                            | .89E-01 | .89E-03 | 251  |
| Kruger                               | .69E-01 | .69E-03 | 196  |
| Kozeny-Carmen                        | .24E-04 | .24E-06 | 0    |
| Zunker                               | .19E-03 | .19E-05 | 1    |
| Zamarin                              | .69E-01 | .69E-03 | 196  |
| USBR                                 | .25E-01 | .25E-03 | 72   |
| Barr                                 | .55E-01 | .55E-03 | 155  |
| Alyamani and Sen                     | .49E-01 | .49E-03 | 139  |
| Chapuis                              | .89E-01 | .89E-03 | 251  |
| Krumbein and Monk                    | .52E-01 | .52E-03 | 148  |
| geometric mean                       | .18E-01 | .18E-03 | 50   |
| arithmetic mean                      | .50E-01 | .50E-03 | 143  |



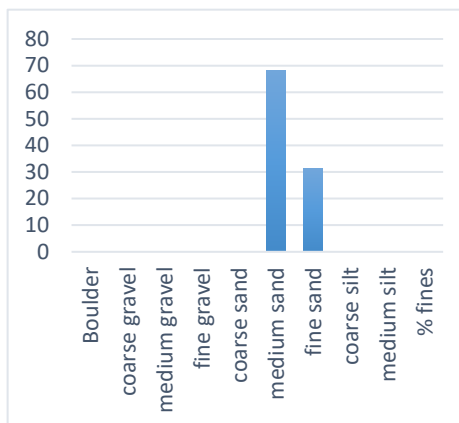
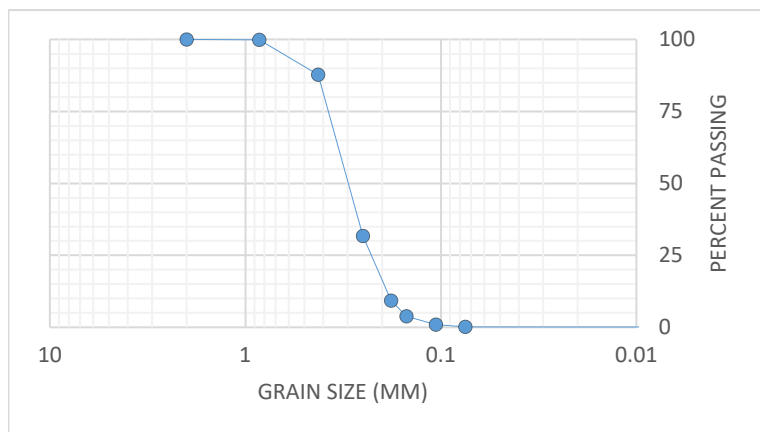
# Grain Size Analysis Report

Sample Name: POS-16 13-15 ft bls

Mass Sample (g): 339.67

T (°C) 26

## Uniform sand low in fines



| Sieve opening (ps)<br>di (mm) | Mass of retained (mr)<br>(g) | mass fraction (mf) | Percent Passing (pp) |
|-------------------------------|------------------------------|--------------------|----------------------|
| 2                             | 0.00                         | 0.00               | 100.00               |
| 0.85                          | 0.65                         | 0.00               | 99.81                |
| 0.425                         | 41.00                        | 0.12               | 87.74                |
| 0.25                          | 190.39                       | 0.56               | 31.69                |
| 0.18                          | 76.22                        | 0.22               | 9.25                 |
| 0.15                          | 18.53                        | 0.05               | 3.79                 |
| 0.106                         | 9.69                         | 0.03               | 0.94                 |
| 0.075                         | 2.55                         | 0.01               | 0.19                 |
| 0.00001                       | 0.64                         | 0.00               | 0.00                 |

| Effective Grain Diameters (mm) |       | Other Useful Parameters     |             |
|--------------------------------|-------|-----------------------------|-------------|
| d10                            | 0.182 | Uniformity Coef.            | 1.86        |
| d17                            | 0.204 | n computed                  | 0.44        |
| d20                            | 0.214 | g (cm/s <sup>2</sup> )      | 980.00      |
| d30                            | 0.245 | ρ (g/cm <sup>3</sup> )      | 0.9968      |
| d50                            | 0.307 | μ (g/cm s)                  | 0.0085      |
| d60                            | 0.338 | ρg/μ (1/cm s)               | 1.1461E+05  |
| de (Kruger)                    | 0.279 | tau (Sauerbrei)             | 1.209       |
| de (Kozeny)                    | 0.010 | d <sub>geometric mean</sub> | 0.295       |
| de (Zunker)                    | 0.040 | σ <sub>ψ</sub>              | 0.581       |
| de (Zamarin)                   | 0.262 |                             |             |
| lo (Alyameni)                  | 0.151 | 100                         | % in sample |
| mm                             |       | Boulder                     |             |
| >64                            |       | coarse gravel               |             |
| 16 - 64                        |       | medium gravel               |             |
| 8 - 16                         |       | fine gravel                 |             |
| 2 - 8                          |       | coarse sand                 | 0.19        |
| 0.5 - 2                        |       | medium sand                 | 68.12       |
| 0.25 - 0.5                     |       | fine sand                   | 31.5        |
| 0.063 - 0.25                   |       | coarse silt                 |             |
| 0.016 - 0.063                  |       | medium silt                 |             |
| 0.008 - 0.016                  |       |                             |             |
| 0.002 - 0.008                  |       | % fines                     | 0.19        |



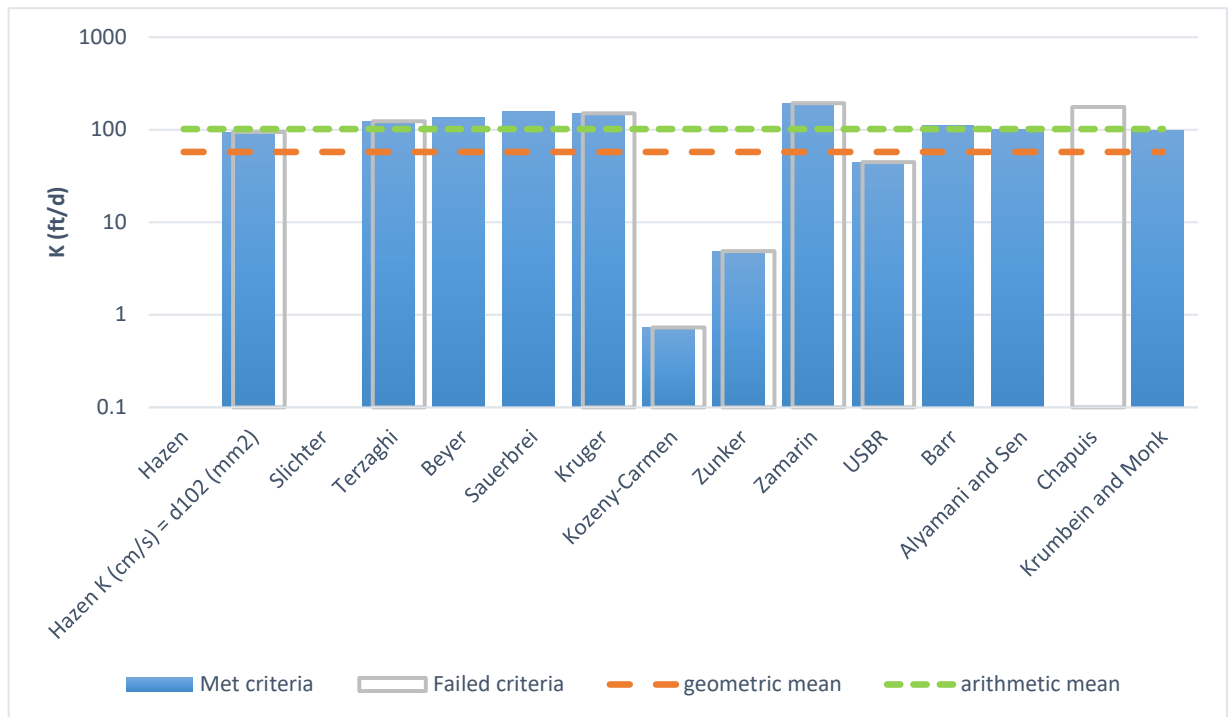
## K from Grain Size Analysis Report

Sample Name: POS-16 13-15 ft bls

Mass Sample (g): 339.67

T (°C) 26

### Uniform sand low in fines



| Estimation of Hydraulic Conductivity | cm/s    | m/s     | ft/d |
|--------------------------------------|---------|---------|------|
| Hazen                                | .63E-01 | .63E-03 | 178  |
| Hazen K (cm/s) = $d_{10}$ (mm)       | .33E-01 | .33E-03 | 94   |
| Slichter                             | .25E-01 | .25E-03 | 70   |
| Terzaghi                             | .44E-01 | .44E-03 | 124  |
| Beyer                                | .48E-01 | .48E-03 | 136  |
| Sauerbrei                            | .56E-01 | .56E-03 | 159  |
| Kruger                               | .53E-01 | .53E-03 | 150  |
| Kozeny-Carmen                        | .26E-03 | .26E-05 | 1    |
| Zunker                               | .17E-02 | .17E-04 | 5    |
| Zamarin                              | .68E-01 | .68E-03 | 193  |
| USBR                                 | .16E-01 | .16E-03 | 45   |
| Barr                                 | .40E-01 | .40E-03 | 112  |
| Alyamani and Sen                     | .36E-01 | .36E-03 | 101  |
| Chapuis                              | .62E-01 | .62E-03 | 176  |
| Krumbein and Monk                    | .35E-01 | .35E-03 | 99   |
| geometric mean                       | .20E-01 | .20E-03 | 58   |
| arithmetic mean                      | .36E-01 | .36E-03 | 102  |





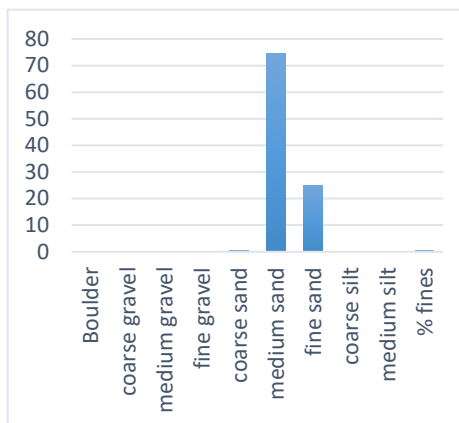
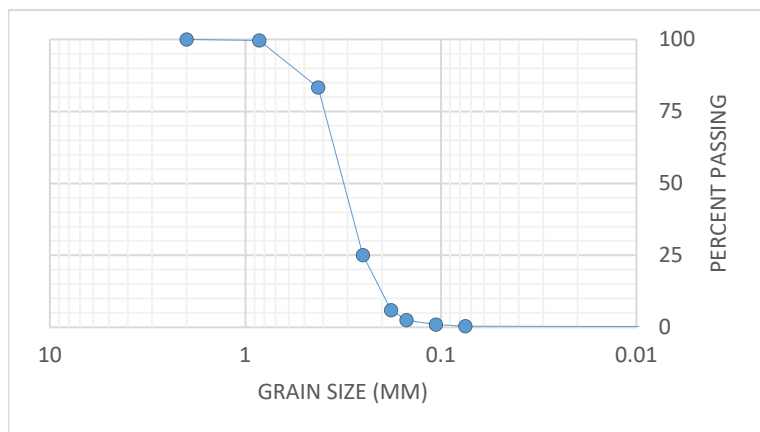
# Grain Size Analysis Report

Sample Name: POS-16 15-17 ft bls

Mass Sample (g): 330.79

T (°C) 26

## Uniform sand low in fines



| Sieve opening (ps)<br>di (mm) | Mass of retained (mr)<br>(g) | mass fraction (mf) | Percent Passing (pp) |
|-------------------------------|------------------------------|--------------------|----------------------|
| 2                             | 0.00                         | 0.00               | 100.00               |
| 0.85                          | 1.13                         | 0.00               | 99.66                |
| 0.425                         | 54.21                        | 0.16               | 83.27                |
| 0.25                          | 192.42                       | 0.58               | 25.10                |
| 0.18                          | 63.33                        | 0.19               | 5.96                 |
| 0.15                          | 11.49                        | 0.03               | 2.48                 |
| 0.106                         | 5.26                         | 0.02               | 0.89                 |
| 0.075                         | 1.77                         | 0.01               | 0.36                 |
| 0.00001                       | 1.18                         | 0.00               | 0.00                 |

| Effective Grain Diameters (mm) |       | Other Useful Parameters     |             |
|--------------------------------|-------|-----------------------------|-------------|
| d10                            | 0.195 | Uniformity Coef.            | 1.82        |
| d17                            | 0.220 | n computed                  | 0.44        |
| d20                            | 0.231 | g (cm/s <sup>2</sup> )      | 980.00      |
| d30                            | 0.265 | ρ (g/cm <sup>3</sup> )      | 0.9968      |
| d50                            | 0.325 | μ (g/cm s)                  | 0.0085      |
| d60                            | 0.355 | ρg/μ (1/cm s)               | 1.1461E+05  |
| de (Kruger)                    | 0.297 | tau (Sauerbrei)             | 1.209       |
| de (Kozeny)                    | 0.005 | d <sub>geometric mean</sub> | 0.315       |
| de (Zunker)                    | 0.023 | σ <sub>ψ</sub>              | 0.575       |
| de (Zamarin)                   | 0.266 |                             |             |
| lo (Alyameni)                  | 0.162 | 100                         | % in sample |
| mm                             |       | Boulder                     |             |
| >64                            |       | coarse gravel               |             |
| 16 - 64                        |       | medium gravel               |             |
| 8 - 16                         |       | fine gravel                 |             |
| 2 - 8                          |       | coarse sand                 | 0.34        |
| 0.5 - 2                        |       | medium sand                 | 74.56       |
| 0.25 - 0.5                     |       | fine sand                   | 24.74       |
| 0.063 - 0.25                   |       | coarse silt                 |             |
| 0.016 - 0.063                  |       | medium silt                 |             |
| 0.008 - 0.016                  |       |                             |             |
| 0.002 - 0.008                  |       | % fines                     | 0.36        |



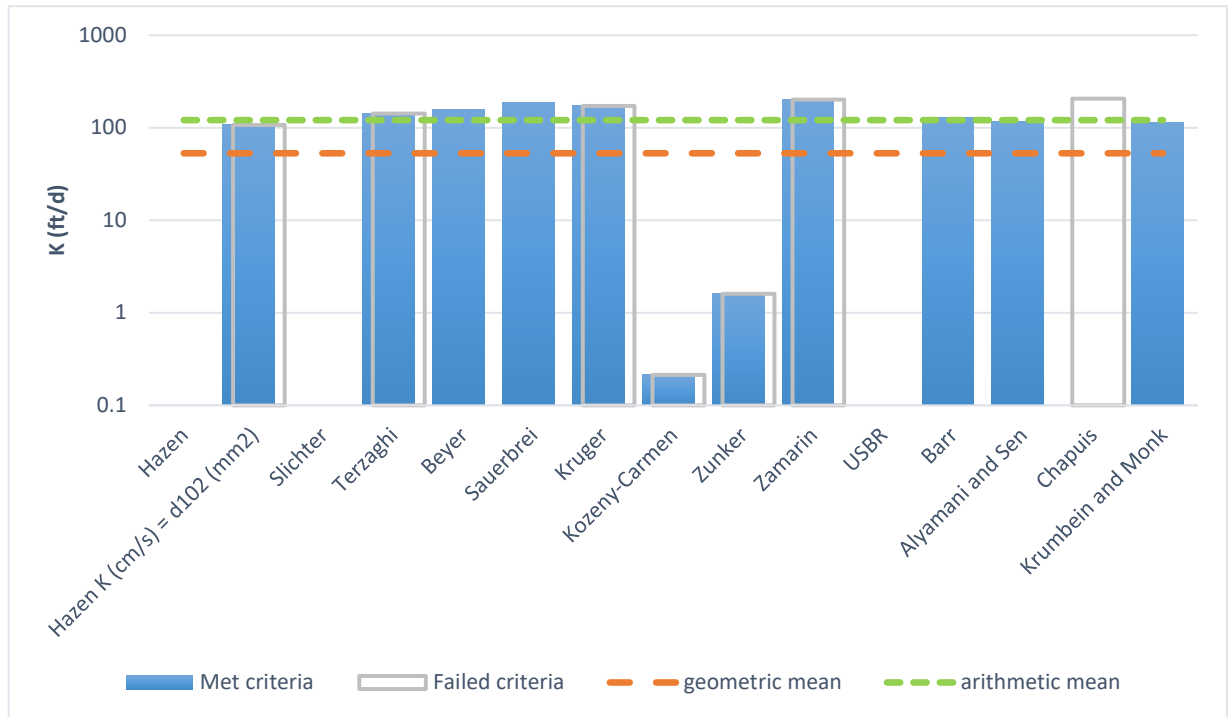
# K from Grain Size Analysis Report

Sample Name: POS-16 15-17 ft bls

Mass Sample (g): 330.79

T (°C) 26

## Uniform sand low in fines



| Estimation of Hydraulic Conductivity | cm/s    | m/s     | ft/d |
|--------------------------------------|---------|---------|------|
| Hazen                                | .72E-01 | .72E-03 | 205  |
| Hazen K (cm/s) = $d_{10}$ (mm)       | .38E-01 | .38E-03 | 108  |
| Slichter                             | .29E-01 | .29E-03 | 81   |
| Terzaghi                             | .50E-01 | .50E-03 | 143  |
| Beyer                                | .55E-01 | .55E-03 | 156  |
| Sauerbrei                            | .66E-01 | .66E-03 | 188  |
| Kruger                               | .61E-01 | .61E-03 | 172  |
| Kozeny-Carmen                        | .75E-04 | .75E-06 | 0    |
| Zunker                               | .57E-03 | .57E-05 | 2    |
| Zamarin                              | .71E-01 | .71E-03 | 201  |
| USBR                                 | .19E-01 | .19E-03 | 54   |
| Barr                                 | .46E-01 | .46E-03 | 130  |
| Alyamani and Sen                     | .41E-01 | .41E-03 | 117  |
| Chapuis                              | .73E-01 | .73E-03 | 207  |
| Krumbein and Monk                    | .40E-01 | .40E-03 | 114  |
| geometric mean                       | .19E-01 | .19E-03 | 53   |
| arithmetic mean                      | .43E-01 | .43E-03 | 121  |



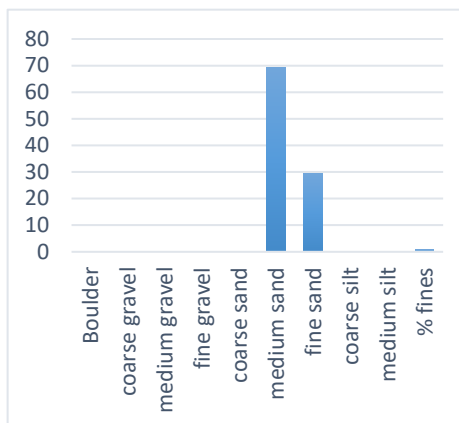
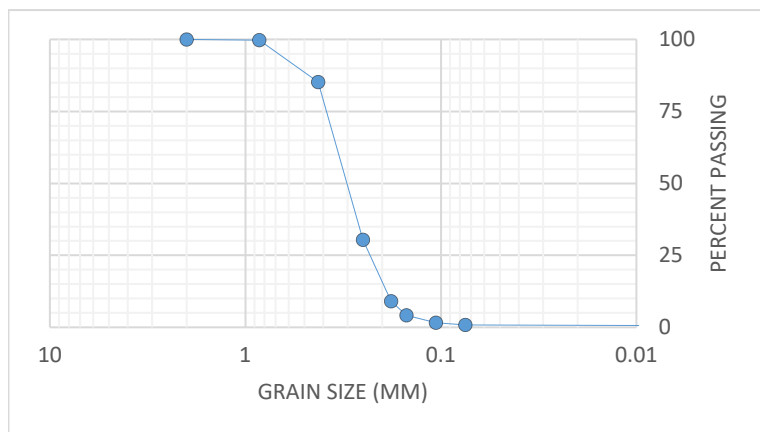
# Grain Size Analysis Report

Sample Name: POS-16 17-19 ft bls

Mass Sample (g): 342.9

T (°C) 26

## Uniform sand low in fines



| Sieve opening<br>(ps)<br>di (mm) | Mass of retained<br>(mr)<br>(g) | mass fraction<br>(mf) | Percent Passing<br>(pp) |
|----------------------------------|---------------------------------|-----------------------|-------------------------|
| 2                                | 0.00                            | 0.00                  | 100.00                  |
| 0.85                             | 0.81                            | 0.00                  | 99.76                   |
| 0.425                            | 50.01                           | 0.15                  | 85.18                   |
| 0.25                             | 188.00                          | 0.55                  | 30.35                   |
| 0.18                             | 72.97                           | 0.21                  | 9.07                    |
| 0.15                             | 17.02                           | 0.05                  | 4.11                    |
| 0.106                            | 8.64                            | 0.03                  | 1.59                    |
| 0.075                            | 2.69                            | 0.01                  | 0.80                    |
| 0.00001                          | 2.76                            | 0.01                  | 0.00                    |

| Effective Grain Diameters (mm) |       | Other Useful Parameters     |             |
|--------------------------------|-------|-----------------------------|-------------|
| d10                            | 0.183 | Uniformity Coef.            | 1.88        |
| d17                            | 0.206 | n computed                  | 0.43        |
| d20                            | 0.216 | g (cm/s <sup>2</sup> )      | 980.00      |
| d30                            | 0.249 | ρ (g/cm <sup>3</sup> )      | 0.9968      |
| d50                            | 0.313 | μ (g/cm s)                  | 0.0085      |
| d60                            | 0.345 | ρg/μ (1/cm s)               | 1.1461E+05  |
| de (Kruger)                    | 0.274 | tau (Sauerbrei)             | 1.209       |
| de (Kozeny)                    | 0.002 | d <sub>geometric mean</sub> | 0.299       |
| de (Zunker)                    | 0.011 | σ <sub>ψ</sub>              | 0.596       |
| de (Zamarin)                   | 0.225 |                             |             |
| lo (Alyameni)                  | 0.151 | 100                         | % in sample |
| mm                             |       | Boulder                     |             |
| >64                            |       | coarse gravel               |             |
| 16 - 64                        |       | medium gravel               |             |
| 8 - 16                         |       | fine gravel                 |             |
| 2 - 8                          |       | coarse sand                 | 0.24        |
| 0.5 - 2                        |       | medium sand                 | 69.41       |
| 0.25 - 0.5                     |       | fine sand                   | 29.55       |
| 0.063 - 0.25                   |       | coarse silt                 |             |
| 0.016 - 0.063                  |       | medium silt                 |             |
| 0.008 - 0.016                  |       |                             |             |
| 0.002 - 0.008                  |       | % fines                     | 0.8         |





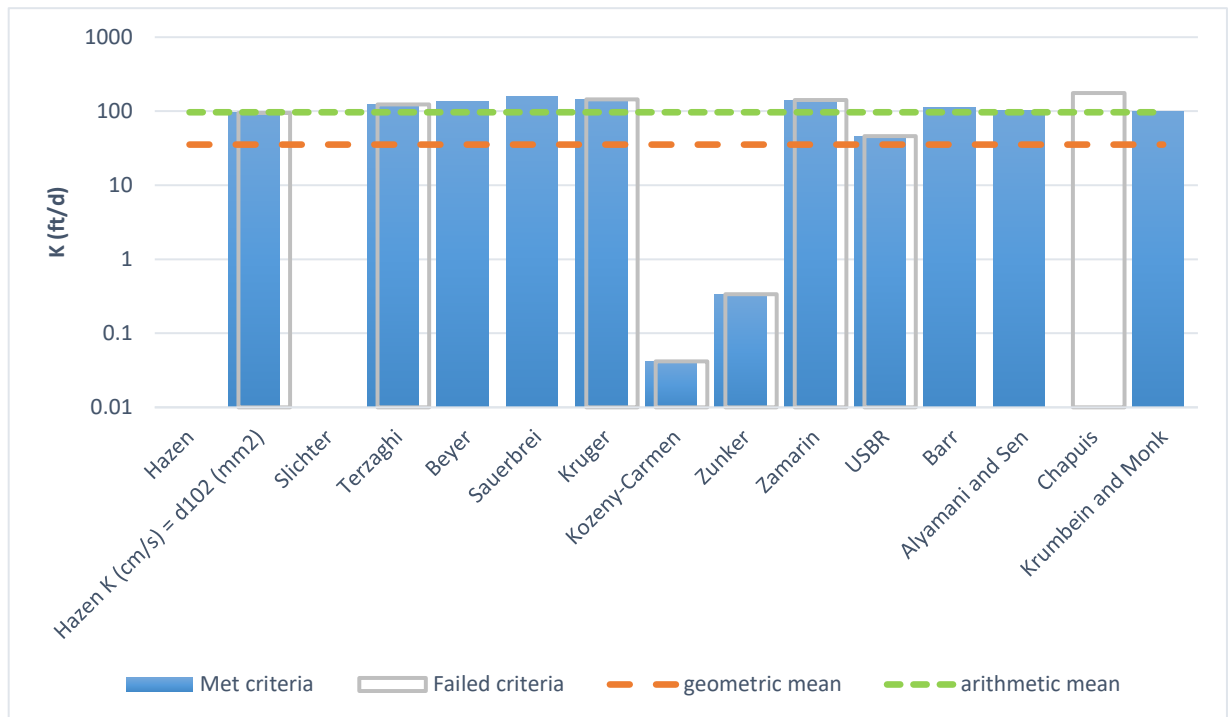
# K from Grain Size Analysis Report

Sample Name: POS-16 17-19 ft bls

Mass Sample (g): 342.9

T (°C) 26

## Uniform sand low in fines



| Estimation of Hydraulic Conductivity  | cm/s    | m/s     | ft/d |
|---------------------------------------|---------|---------|------|
| Hazen                                 | .63E-01 | .63E-03 | 179  |
| Hazen K (cm/s) = d <sub>10</sub> (mm) | .34E-01 | .34E-03 | 95   |
| Slichter                              | .25E-01 | .25E-03 | 70   |
| Terzaghi                              | .44E-01 | .44E-03 | 124  |
| Beyer                                 | .48E-01 | .48E-03 | 137  |
| Sauerbrei                             | .57E-01 | .57E-03 | 161  |
| Kruger                                | .51E-01 | .51E-03 | 145  |
| Kozeny-Carmen                         | .15E-04 | .15E-06 | 0    |
| Zunker                                | .12E-03 | .12E-05 | 0    |
| Zamarin                               | .50E-01 | .50E-03 | 142  |
| USBR                                  | .16E-01 | .16E-03 | 46   |
| Barr                                  | .40E-01 | .40E-03 | 112  |
| Alyamani and Sen                      | .36E-01 | .36E-03 | 101  |
| Chapuis                               | .62E-01 | .62E-03 | 175  |
| Krumbein and Monk                     | .35E-01 | .35E-03 | 100  |
| geometric mean                        | .13E-01 | .13E-03 | 35   |
| arithmetic mean                       | .34E-01 | .34E-03 | 97   |



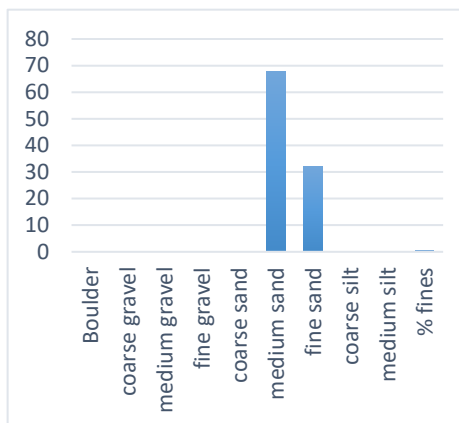
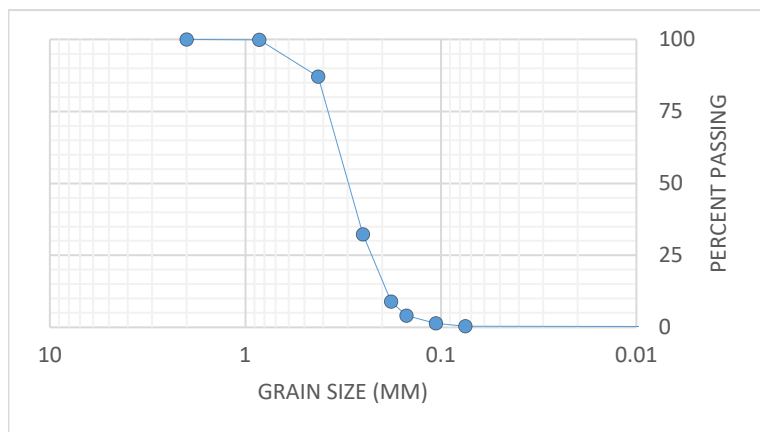
# Grain Size Analysis Report

Sample Name: POS-16 19-21 ft bls

Mass Sample (g): 341.2

T (°C) 26

## Uniform sand low in fines



| Sieve opening (ps)<br>di (mm) | Mass of retained (mr)<br>(g) | mass fraction (mf) | Percent Passing (pp) |
|-------------------------------|------------------------------|--------------------|----------------------|
| 2                             | 0.00                         | 0.00               | 100.00               |
| 0.85                          | 0.37                         | 0.00               | 99.89                |
| 0.425                         | 43.80                        | 0.13               | 87.05                |
| 0.25                          | 186.92                       | 0.55               | 32.27                |
| 0.18                          | 79.63                        | 0.23               | 8.93                 |
| 0.15                          | 16.51                        | 0.05               | 4.09                 |
| 0.106                         | 9.14                         | 0.03               | 1.42                 |
| 0.075                         | 3.53                         | 0.01               | 0.38                 |
| 0.00001                       | 1.30                         | 0.00               | 0.00                 |

| Effective Grain Diameters (mm) |       | Other Useful Parameters     |             |
|--------------------------------|-------|-----------------------------|-------------|
| d10                            | 0.183 | Uniformity Coef.            | 1.85        |
| d17                            | 0.204 | n computed                  | 0.44        |
| d20                            | 0.213 | g (cm/s <sup>2</sup> )      | 980.00      |
| d30                            | 0.243 | ρ (g/cm <sup>3</sup> )      | 0.9968      |
| d50                            | 0.307 | μ (g/cm s)                  | 0.0085      |
| d60                            | 0.339 | ρg/μ (1/cm s)               | 1.1461E+05  |
| de (Kruger)                    | 0.276 | tau (Sauerbrei)             | 1.209       |
| de (Kozeny)                    | 0.005 | d <sub>geometric mean</sub> | 0.295       |
| de (Zunker)                    | 0.022 | σ <sub>ψ</sub>              | 0.586       |
| de (Zamarin)                   | 0.247 |                             |             |
| lo (Alyameni)                  | 0.152 | 100                         | % in sample |
| mm                             |       | Boulder                     |             |
| >64                            |       | coarse gravel               |             |
| 16 - 64                        |       | medium gravel               |             |
| 8 - 16                         |       | fine gravel                 |             |
| 2 - 8                          |       | coarse sand                 | 0.11        |
| 0.5 - 2                        |       | medium sand                 | 67.62       |
| 0.25 - 0.5                     |       | fine sand                   | 31.89       |
| 0.063 - 0.25                   |       | coarse silt                 |             |
| 0.016 - 0.063                  |       | medium silt                 |             |
| 0.008 - 0.016                  |       |                             |             |
| 0.002 - 0.008                  |       | % fines                     | 0.38        |



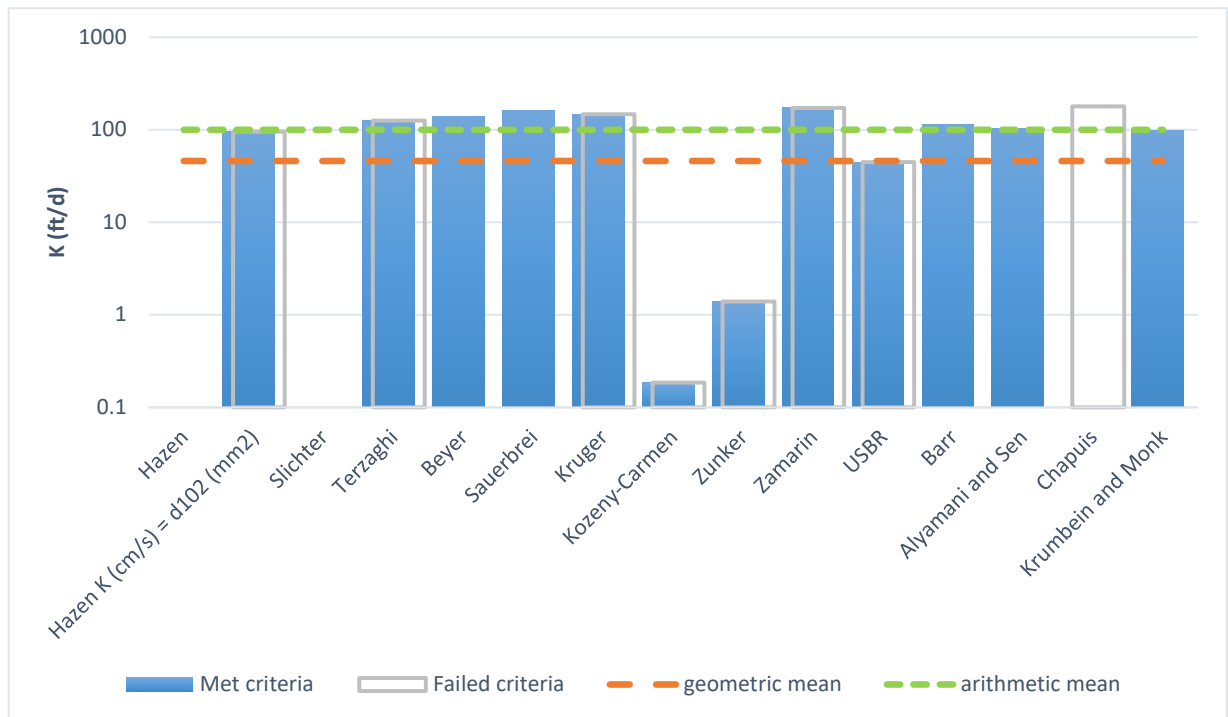
# K from Grain Size Analysis Report

Sample Name: POS-16 19-21 ft bls

Mass Sample (g): 341.2

T (°C) 26

## Uniform sand low in fines



| Estimation of Hydraulic Conductivity  | cm/s    | m/s     | ft/d |
|---------------------------------------|---------|---------|------|
| Hazen                                 | .64E-01 | .64E-03 | 180  |
| Hazen K (cm/s) = d <sub>10</sub> (mm) | .34E-01 | .34E-03 | 95   |
| Slichter                              | .25E-01 | .25E-03 | 71   |
| Terzaghi                              | .44E-01 | .44E-03 | 125  |
| Beyer                                 | .49E-01 | .49E-03 | 138  |
| Sauerbrei                             | .56E-01 | .56E-03 | 160  |
| Kruger                                | .52E-01 | .52E-03 | 147  |
| Kozeny-Carmen                         | .65E-04 | .65E-06 | 0    |
| Zunker                                | .49E-03 | .49E-05 | 1    |
| Zamarin                               | .61E-01 | .61E-03 | 173  |
| USB                                   | .16E-01 | .16E-03 | 45   |
| Barr                                  | .40E-01 | .40E-03 | 114  |
| Alyamani and Sen                      | .36E-01 | .36E-03 | 103  |
| Chapuis                               | .63E-01 | .63E-03 | 179  |
| Krumbein and Monk                     | .35E-01 | .35E-03 | 98   |
| geometric mean                        | .16E-01 | .16E-03 | 46   |
| arithmetic mean                       | .35E-01 | .35E-03 | 100  |





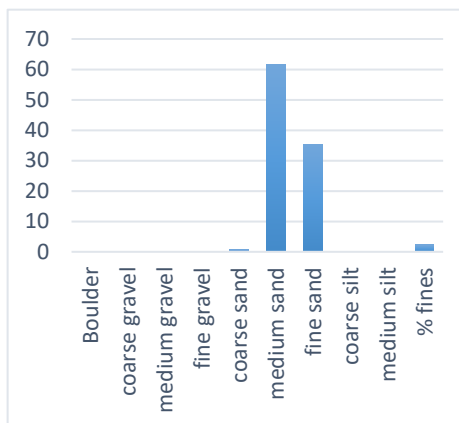
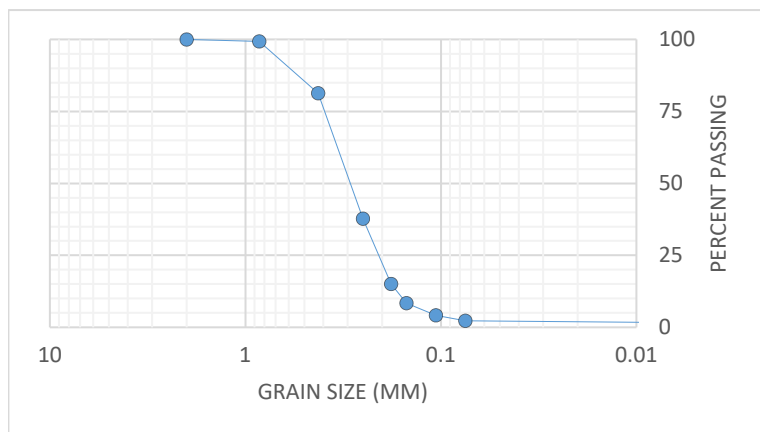
# Grain Size Analysis Report

Sample Name: POS-16 21-23 ft bls

Mass Sample (g): 379.17

T (°C) 26

Moderately well sorted sand low in fines



| Sieve opening<br>(ps)<br>di (mm) | Mass of retained<br>(mr)<br>(g) | mass fraction<br>(mf) | Percent Passing<br>(pp) |
|----------------------------------|---------------------------------|-----------------------|-------------------------|
| 2                                | 0.00                            | 0.00                  | 100.00                  |
| 0.85                             | 2.46                            | 0.01                  | 99.35                   |
| 0.425                            | 68.65                           | 0.18                  | 81.25                   |
| 0.25                             | 165.09                          | 0.44                  | 37.71                   |
| 0.18                             | 85.97                           | 0.23                  | 15.03                   |
| 0.15                             | 25.07                           | 0.07                  | 8.42                    |
| 0.106                            | 16.27                           | 0.04                  | 4.13                    |
| 0.075                            | 7.12                            | 0.02                  | 2.25                    |
| 0.00001                          | 8.54                            | 0.02                  | 0.00                    |

| Effective Grain Diameters (mm) |       | Other Useful Parameters     |             |
|--------------------------------|-------|-----------------------------|-------------|
| d10                            | 0.157 | Uniformity Coef.            | 2.16        |
| d17                            | 0.186 | n computed                  | 0.43        |
| d20                            | 0.195 | g (cm/s <sup>2</sup> )      | 980.00      |
| d30                            | 0.226 | ρ (g/cm <sup>3</sup> )      | 0.9968      |
| d50                            | 0.299 | μ (g/cm s)                  | 0.0085      |
| d60                            | 0.340 | ρg/μ (1/cm s)               | 1.1461E+05  |
| de (Kruger)                    | 0.239 | tau (Sauerbrei)             | 1.209       |
| de (Kozeny)                    | 0.001 | d <sub>geometric mean</sub> | 0.299       |
| de (Zunker)                    | 0.004 | σ <sub>ψ</sub>              | 0.764       |
| de (Zamarin)                   | 0.158 |                             |             |
| lo (Alyameni)                  | 0.122 | 100                         | % in sample |
| mm                             |       | Boulder                     |             |
| >64                            |       | coarse gravel               |             |
| 16 - 64                        |       | medium gravel               |             |
| 8 - 16                         |       | fine gravel                 |             |
| 2 - 8                          |       | coarse sand                 | 0.65        |
| 0.5 - 2                        |       | medium sand                 | 61.65       |
| 0.25 - 0.5                     |       | fine sand                   | 35.45       |
| 0.063 - 0.25                   |       | coarse silt                 |             |
| 0.016 - 0.063                  |       | medium silt                 |             |
| 0.008 - 0.016                  |       |                             |             |
| 0.002 - 0.008                  |       | % fines                     | 2.25        |



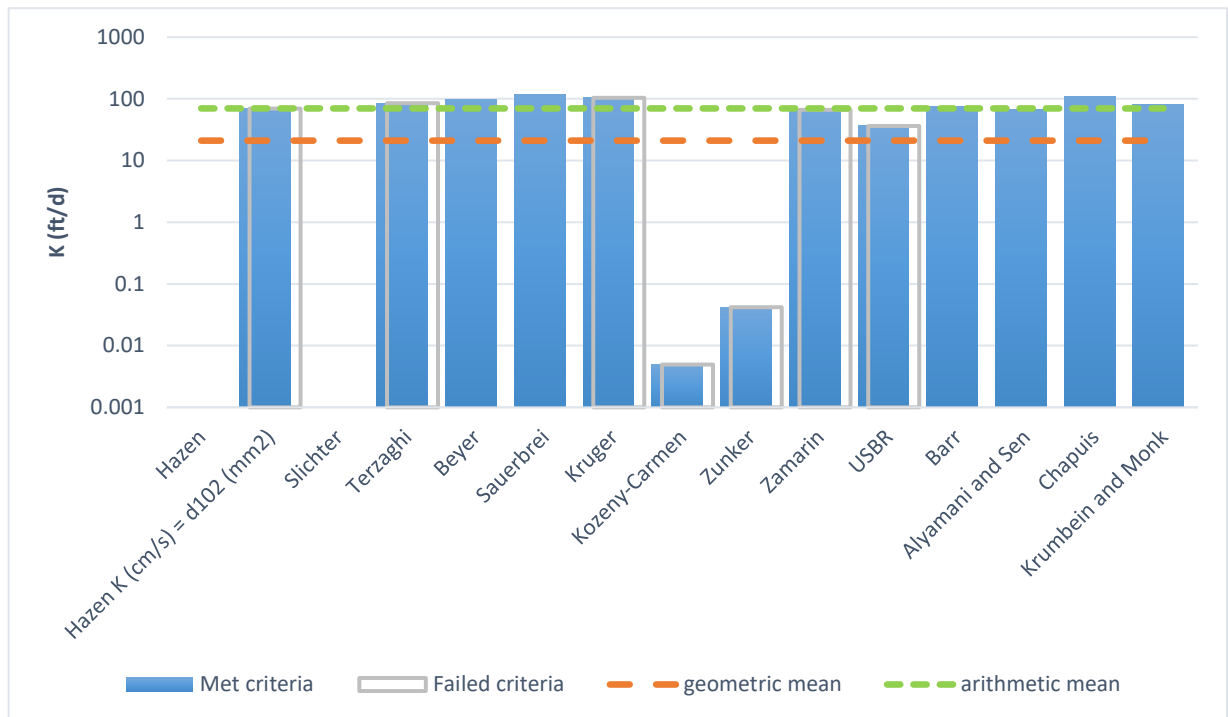
# K from Grain Size Analysis Report

Sample Name: POS-16 21-23 ft bls

Mass Sample (g): 379.17

T (°C) 26

Moderately well sorted sand low in fines



| Estimation of Hydraulic Conductivity  | cm/s    | m/s     | ft/d |
|---------------------------------------|---------|---------|------|
| Hazen                                 | .45E-01 | .45E-03 | 128  |
| Hazen K (cm/s) = d <sub>10</sub> (mm) | .25E-01 | .25E-03 | 70   |
| Slichter                              | .17E-01 | .17E-03 | 48   |
| Terzaghi                              | .30E-01 | .30E-03 | 85   |
| Beyer                                 | .35E-01 | .35E-03 | 99   |
| Sauerbrei                             | .42E-01 | .42E-03 | 119  |
| Kruger                                | .37E-01 | .37E-03 | 104  |
| Kozeny-Carmen                         | .17E-05 | .17E-07 | 0    |
| Zunker                                | .15E-04 | .15E-06 | 0    |
| Zamarin                               | .24E-01 | .24E-03 | 67   |
| USBR                                  | .13E-01 | .13E-03 | 36   |
| Barr                                  | .27E-01 | .27E-03 | 75   |
| Alyamani and Sen                      | .24E-01 | .24E-03 | 67   |
| Chapuis                               | .38E-01 | .38E-03 | 108  |
| Krumbein and Monk                     | .28E-01 | .28E-03 | 80   |
| geometric mean                        | .74E-02 | .74E-04 | 21   |
| arithmetic mean                       | .25E-01 | .25E-03 | 70   |



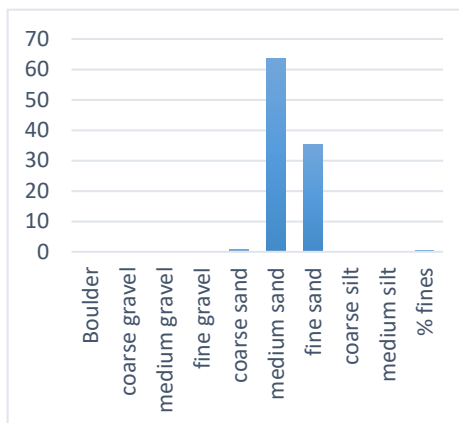
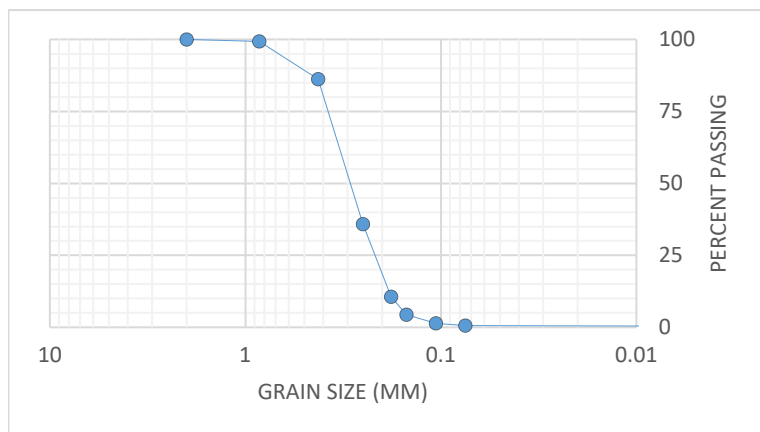
# Grain Size Analysis Report

Sample Name: POS-16 23-25 ft bls

Mass Sample (g): 345.24

T (°C) 26

## Uniform sand low in fines



| Sieve opening<br>(ps)<br>di (mm) | Mass of retained<br>(mr)<br>(g) | mass fraction<br>(mf) | Percent Passing<br>(pp) |
|----------------------------------|---------------------------------|-----------------------|-------------------------|
| 2                                | 0.00                            | 0.00                  | 100.00                  |
| 0.85                             | 2.40                            | 0.01                  | 99.30                   |
| 0.425                            | 45.36                           | 0.13                  | 86.17                   |
| 0.25                             | 173.62                          | 0.50                  | 35.88                   |
| 0.18                             | 87.36                           | 0.25                  | 10.57                   |
| 0.15                             | 21.34                           | 0.06                  | 4.39                    |
| 0.106                            | 10.41                           | 0.03                  | 1.38                    |
| 0.075                            | 2.81                            | 0.01                  | 0.56                    |
| 0.00001                          | 1.94                            | 0.01                  | 0.00                    |

| Effective Grain Diameters (mm) |       | Other Useful Parameters     |             |
|--------------------------------|-------|-----------------------------|-------------|
| d10                            | 0.177 | Uniformity Coef.            | 1.88        |
| d17                            | 0.198 | n computed                  | 0.43        |
| d20                            | 0.206 | g (cm/s <sup>2</sup> )      | 980.00      |
| d30                            | 0.234 | ρ (g/cm <sup>3</sup> )      | 0.9968      |
| d50                            | 0.299 | μ (g/cm s)                  | 0.0085      |
| d60                            | 0.334 | ρg/μ (1/cm s)               | 1.1461E+05  |
| de (Kruger)                    | 0.268 | tau (Sauerbrei)             | 1.209       |
| de (Kozeny)                    | 0.004 | d <sub>geometric mean</sub> | 0.290       |
| de (Zunker)                    | 0.015 | σ <sub>ψ</sub>              | 0.610       |
| de (Zamarin)                   | 0.232 |                             |             |
| lo (Alyameni)                  | 0.147 | 100                         | % in sample |
| mm                             |       | Boulder                     |             |
| >64                            |       | coarse gravel               |             |
| 16 - 64                        |       | medium gravel               |             |
| 8 - 16                         |       | fine gravel                 |             |
| 2 - 8                          |       | coarse sand                 | 0.7         |
| 0.5 - 2                        |       | medium sand                 | 63.43       |
| 0.25 - 0.5                     |       | fine sand                   | 35.31       |
| 0.063 - 0.25                   |       | coarse silt                 |             |
| 0.016 - 0.063                  |       | medium silt                 |             |
| 0.008 - 0.016                  |       |                             |             |
| 0.002 - 0.008                  |       | % fines                     | 0.56        |





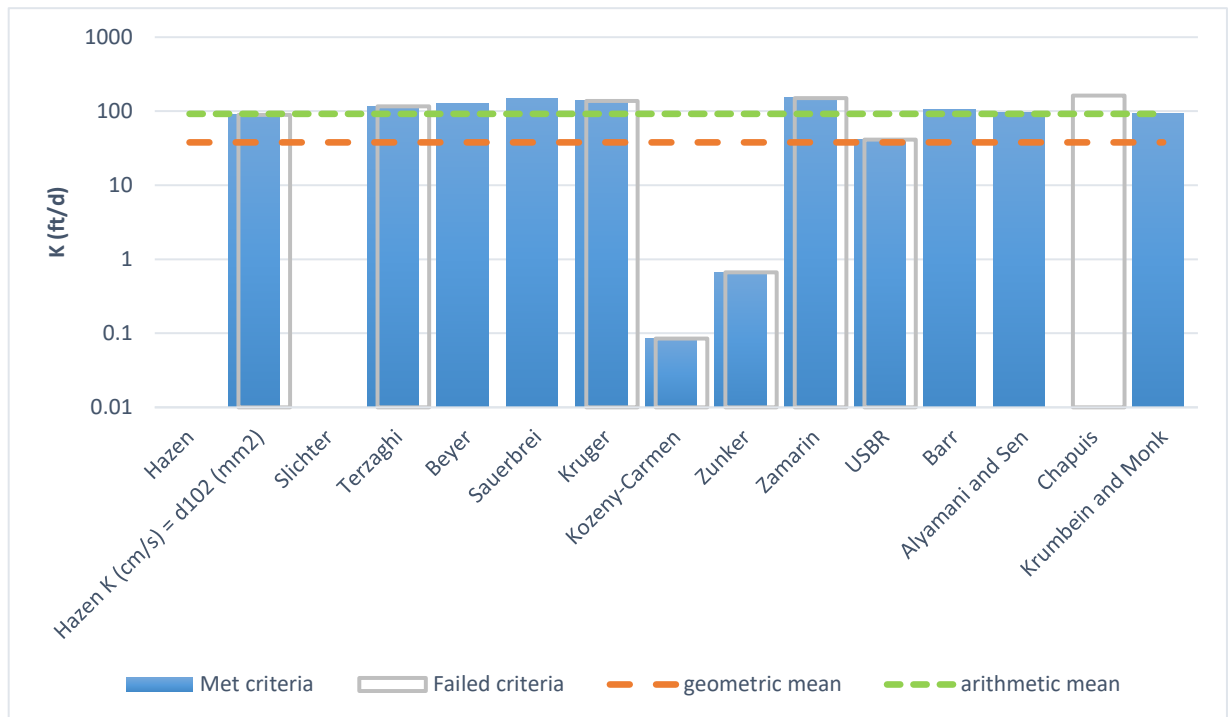
# K from Grain Size Analysis Report

Sample Name: POS-16 23-25 ft bls

Mass Sample (g): 345.24

T (°C) 26

## Uniform sand low in fines



| Estimation of Hydraulic Conductivity  | cm/s    | m/s     | ft/d |
|---------------------------------------|---------|---------|------|
| Hazen                                 | .59E-01 | .59E-03 | 168  |
| Hazen K (cm/s) = d <sub>10</sub> (mm) | .31E-01 | .31E-03 | 89   |
| Slichter                              | .23E-01 | .23E-03 | 66   |
| Terzaghi                              | .41E-01 | .41E-03 | 116  |
| Beyer                                 | .45E-01 | .45E-03 | 129  |
| Sauerbrei                             | .52E-01 | .52E-03 | 148  |
| Kruger                                | .49E-01 | .49E-03 | 138  |
| Kozeny-Carmen                         | .30E-04 | .30E-06 | 0    |
| Zunker                                | .24E-03 | .24E-05 | 1    |
| Zamarin                               | .53E-01 | .53E-03 | 151  |
| USBR                                  | .15E-01 | .15E-03 | 41   |
| Barr                                  | .37E-01 | .37E-03 | 105  |
| Alyamani and Sen                      | .34E-01 | .34E-03 | 96   |
| Chapuis                               | .58E-01 | .58E-03 | 164  |
| Krumbein and Monk                     | .32E-01 | .32E-03 | 92   |
| geometric mean                        | .13E-01 | .13E-03 | 38   |
| arithmetic mean                       | .33E-01 | .33E-03 | 92   |



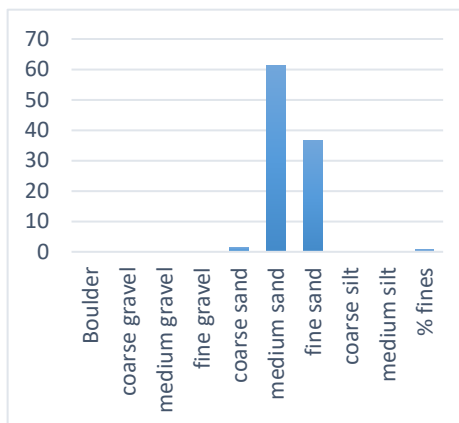
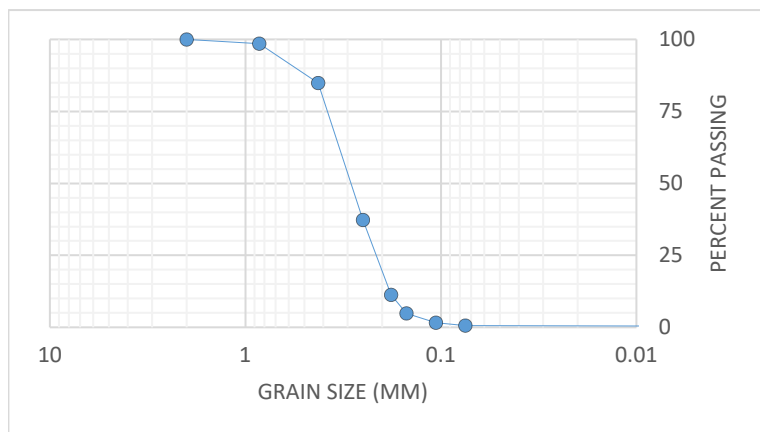
# Grain Size Analysis Report

Sample Name: POS-16 25-27 ft bls

Mass Sample (g): 369.25

T (°C) 26

## Uniform sand low in fines



| Sieve opening<br>(ps)<br>di (mm) | Mass of retained<br>(mr)<br>(g) | mass fraction<br>(mf) | Percent Passing<br>(pp) |
|----------------------------------|---------------------------------|-----------------------|-------------------------|
| 2                                | 0.00                            | 0.00                  | 100.00                  |
| 0.85                             | 5.61                            | 0.02                  | 98.48                   |
| 0.425                            | 50.16                           | 0.14                  | 84.90                   |
| 0.25                             | 175.67                          | 0.48                  | 37.32                   |
| 0.18                             | 96.17                           | 0.26                  | 11.28                   |
| 0.15                             | 23.90                           | 0.06                  | 4.80                    |
| 0.106                            | 11.84                           | 0.03                  | 1.60                    |
| 0.075                            | 3.59                            | 0.01                  | 0.63                    |
| 0.00001                          | 2.31                            | 0.01                  | 0.00                    |

| Effective Grain Diameters (mm) |       | Other Useful Parameters     |             |
|--------------------------------|-------|-----------------------------|-------------|
| d10                            | 0.174 | Uniformity Coef.            | 1.92        |
| d17                            | 0.195 | n computed                  | 0.43        |
| d20                            | 0.203 | g (cm/s <sup>2</sup> )      | 980.00      |
| d30                            | 0.230 | ρ (g/cm <sup>3</sup> )      | 0.9968      |
| d50                            | 0.297 | μ (g/cm s)                  | 0.0085      |
| d60                            | 0.333 | ρg/μ (1/cm s)               | 1.1461E+05  |
| de (Kruger)                    | 0.266 | tau (Sauerbrei)             | 1.209       |
| de (Kozeny)                    | 0.003 | d <sub>geometric mean</sub> | 0.289       |
| de (Zunker)                    | 0.014 | σ <sub>ψ</sub>              | 0.630       |
| de (Zamarin)                   | 0.227 |                             |             |
| lo (Alyameni)                  | 0.143 | 100                         | % in sample |
| mm                             |       | Boulder                     |             |
| >64                            |       | coarse gravel               |             |
| 16 - 64                        |       | medium gravel               |             |
| 8 - 16                         |       | fine gravel                 |             |
| 2 - 8                          |       | coarse sand                 | 1.52        |
| 0.5 - 2                        |       | medium sand                 | 61.16       |
| 0.25 - 0.5                     |       | fine sand                   | 36.7        |
| 0.063 - 0.25                   |       | coarse silt                 |             |
| 0.016 - 0.063                  |       | medium silt                 |             |
| 0.008 - 0.016                  |       |                             |             |
| 0.002 - 0.008                  |       | % fines                     | 0.63        |



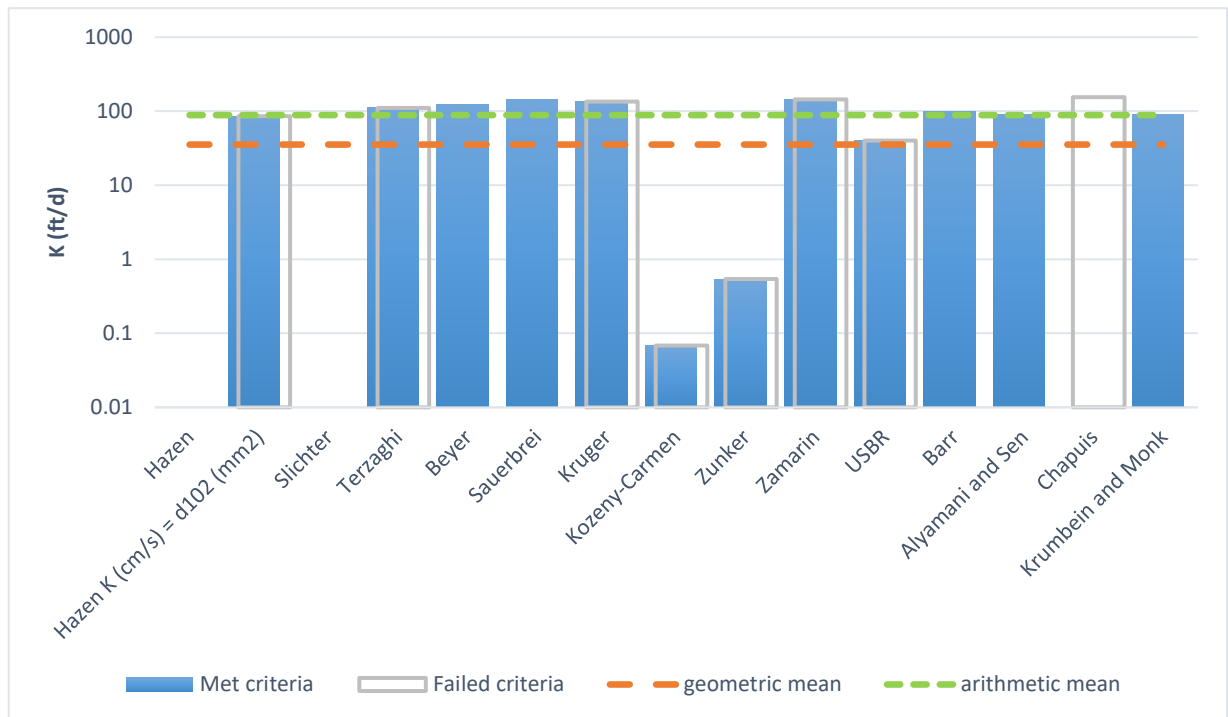
# K from Grain Size Analysis Report

Sample Name: POS-16 25-27 ft bls

Mass Sample (g): 369.25

T (°C) 26

## Uniform sand low in fines



| Estimation of Hydraulic Conductivity  | cm/s    | m/s     | ft/d |
|---------------------------------------|---------|---------|------|
| Hazen                                 | .57E-01 | .57E-03 | 161  |
| Hazen K (cm/s) = d <sub>10</sub> (mm) | .30E-01 | .30E-03 | 86   |
| Slichter                              | .22E-01 | .22E-03 | 63   |
| Terzaghi                              | .39E-01 | .39E-03 | 111  |
| Beyer                                 | .44E-01 | .44E-03 | 124  |
| Sauerbrei                             | .50E-01 | .50E-03 | 143  |
| Kruger                                | .48E-01 | .48E-03 | 135  |
| Kozeny-Carmen                         | .24E-04 | .24E-06 | 0    |
| Zunker                                | .19E-03 | .19E-05 | 1    |
| Zamarin                               | .51E-01 | .51E-03 | 144  |
| USBR                                  | .14E-01 | .14E-03 | 40   |
| Barr                                  | .35E-01 | .35E-03 | 100  |
| Alyamani and Sen                      | .32E-01 | .32E-03 | 92   |
| Chapuis                               | .55E-01 | .55E-03 | 155  |
| Krumbein and Monk                     | .31E-01 | .31E-03 | 89   |
| geometric mean                        | .13E-01 | .13E-03 | 35   |
| arithmetic mean                       | .31E-01 | .31E-03 | 89   |



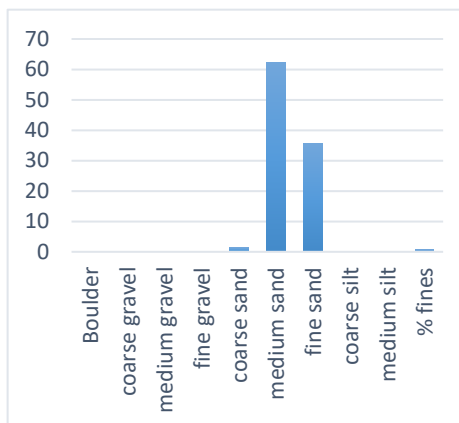
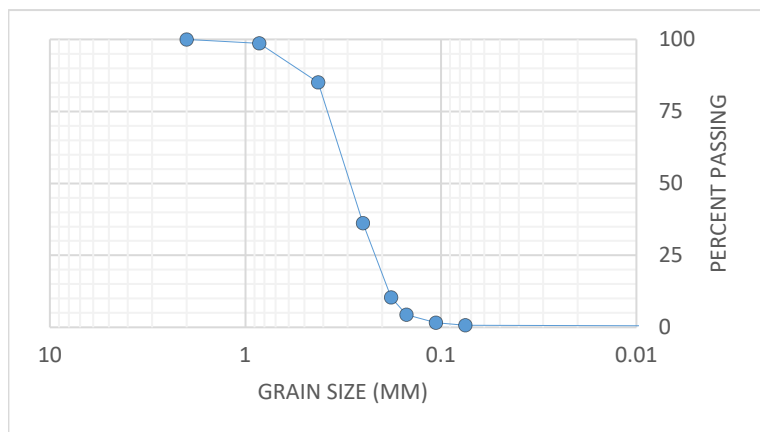
# Grain Size Analysis Report

Sample Name: POS-16 27-29 ft bls

Mass Sample (g): 344.03

T (°C) 26

## Uniform sand low in fines



| Sieve opening<br>(ps)<br>di (mm) | Mass of retained<br>(mr)<br>(g) | mass fraction<br>(mf) | Percent Passing<br>(pp) |
|----------------------------------|---------------------------------|-----------------------|-------------------------|
| 2                                | 0.00                            | 0.00                  | 100.00                  |
| 0.85                             | 4.84                            | 0.01                  | 98.59                   |
| 0.425                            | 46.59                           | 0.14                  | 85.05                   |
| 0.25                             | 168.06                          | 0.49                  | 36.20                   |
| 0.18                             | 88.80                           | 0.26                  | 10.39                   |
| 0.15                             | 20.54                           | 0.06                  | 4.42                    |
| 0.106                            | 9.80                            | 0.03                  | 1.57                    |
| 0.075                            | 3.06                            | 0.01                  | 0.68                    |
| 0.00001                          | 2.34                            | 0.01                  | 0.00                    |

| Effective Grain Diameters (mm) |       | Other Useful Parameters     |             |
|--------------------------------|-------|-----------------------------|-------------|
| d10                            | 0.178 | Uniformity Coef.            | 1.88        |
| d17                            | 0.198 | n computed                  | 0.43        |
| d20                            | 0.206 | g (cm/s <sup>2</sup> )      | 980.00      |
| d30                            | 0.233 | ρ (g/cm <sup>3</sup> )      | 0.9968      |
| d50                            | 0.299 | μ (g/cm s)                  | 0.0085      |
| d60                            | 0.335 | ρg/μ (1/cm s)               | 1.1461E+05  |
| de (Kruger)                    | 0.268 | tau (Sauerbrei)             | 1.209       |
| de (Kozeny)                    | 0.003 | d <sub>geometric mean</sub> | 0.291       |
| de (Zunker)                    | 0.013 | σ <sub>ψ</sub>              | 0.621       |
| de (Zamarin)                   | 0.226 |                             |             |
| lo (Alyameni)                  | 0.148 | 100                         | % in sample |
| mm                             |       | Boulder                     |             |
| >64                            |       | coarse gravel               |             |
| 16 - 64                        |       | medium gravel               |             |
| 8 - 16                         |       | fine gravel                 |             |
| 2 - 8                          |       | coarse sand                 | 1.41        |
| 0.5 - 2                        |       | medium sand                 | 62.39       |
| 0.25 - 0.5                     |       | fine sand                   | 35.52       |
| 0.063 - 0.25                   |       | coarse silt                 |             |
| 0.016 - 0.063                  |       | medium silt                 |             |
| 0.008 - 0.016                  |       |                             |             |
| 0.002 - 0.008                  |       | % fines                     | 0.68        |





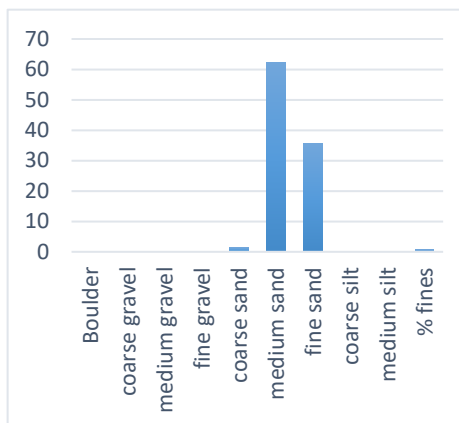
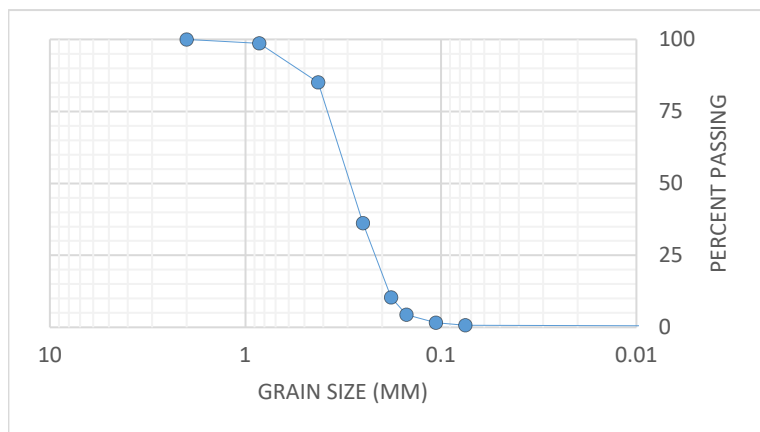
# Grain Size Analysis Report

Sample Name: POS-16 27-29 ft bls

Mass Sample (g): 344.03

T (°C) 26

## Uniform sand low in fines



| Sieve opening<br>(ps)<br>di (mm) | Mass of retained<br>(mr)<br>(g) | mass fraction<br>(mf) | Percent Passing<br>(pp) |
|----------------------------------|---------------------------------|-----------------------|-------------------------|
| 2                                | 0.00                            | 0.00                  | 100.00                  |
| 0.85                             | 4.84                            | 0.01                  | 98.59                   |
| 0.425                            | 46.59                           | 0.14                  | 85.05                   |
| 0.25                             | 168.06                          | 0.49                  | 36.20                   |
| 0.18                             | 88.80                           | 0.26                  | 10.39                   |
| 0.15                             | 20.54                           | 0.06                  | 4.42                    |
| 0.106                            | 9.80                            | 0.03                  | 1.57                    |
| 0.075                            | 3.06                            | 0.01                  | 0.68                    |
| 0.00001                          | 2.34                            | 0.01                  | 0.00                    |

| Effective Grain Diameters (mm) |       | Other Useful Parameters     |             |
|--------------------------------|-------|-----------------------------|-------------|
| d10                            | 0.178 | Uniformity Coef.            | 1.88        |
| d17                            | 0.198 | n computed                  | 0.43        |
| d20                            | 0.206 | g (cm/s <sup>2</sup> )      | 980.00      |
| d30                            | 0.233 | ρ (g/cm <sup>3</sup> )      | 0.9968      |
| d50                            | 0.299 | μ (g/cm s)                  | 0.0085      |
| d60                            | 0.335 | ρg/μ (1/cm s)               | 1.1461E+05  |
| de (Kruger)                    | 0.268 | tau (Sauerbrei)             | 1.209       |
| de (Kozeny)                    | 0.003 | d <sub>geometric mean</sub> | 0.291       |
| de (Zunker)                    | 0.013 | σ <sub>ψ</sub>              | 0.621       |
| de (Zamarin)                   | 0.226 |                             |             |
| lo (Alyameni)                  | 0.148 | 100                         | % in sample |
| mm                             |       | Boulder                     |             |
| >64                            |       | coarse gravel               |             |
| 16 - 64                        |       | medium gravel               |             |
| 8 - 16                         |       | fine gravel                 |             |
| 2 - 8                          |       | coarse sand                 | 1.41        |
| 0.5 - 2                        |       | medium sand                 | 62.39       |
| 0.25 - 0.5                     |       | fine sand                   | 35.52       |
| 0.063 - 0.25                   |       | coarse silt                 |             |
| 0.016 - 0.063                  |       | medium silt                 |             |
| 0.008 - 0.016                  |       |                             |             |
| 0.002 - 0.008                  |       | % fines                     | 0.68        |



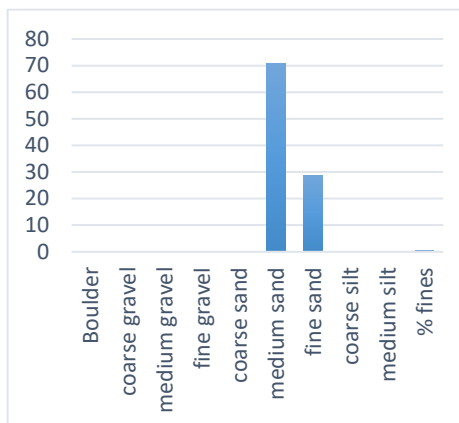
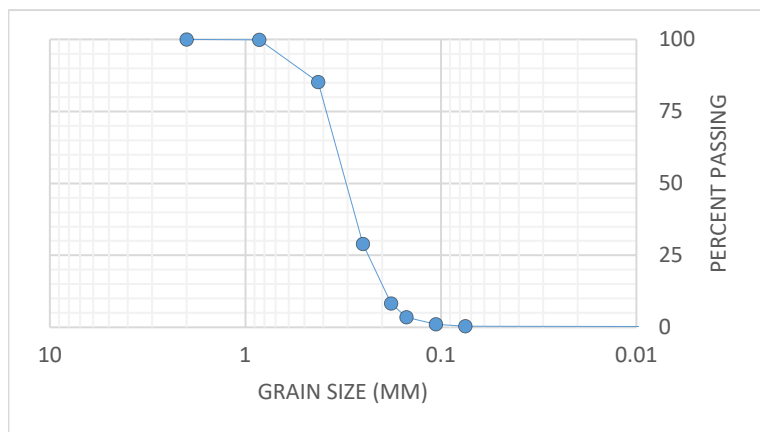
# Grain Size Analysis Report

Sample Name: POS-17 5-7 ft bls

Mass Sample (g): 377.29

T (°C) 26

## Uniform sand low in fines



| Sieve opening (ps)<br>di (mm) | Mass of retained (mr)<br>(g) | mass fraction (mf) | Percent Passing (pp) |
|-------------------------------|------------------------------|--------------------|----------------------|
| 2                             | 0.00                         | 0.00               | 100.00               |
| 0.85                          | 0.44                         | 0.00               | 99.88                |
| 0.425                         | 55.49                        | 0.15               | 85.18                |
| 0.25                          | 212.04                       | 0.56               | 28.98                |
| 0.18                          | 78.12                        | 0.21               | 8.27                 |
| 0.15                          | 18.13                        | 0.05               | 3.46                 |
| 0.106                         | 8.96                         | 0.02               | 1.09                 |
| 0.075                         | 2.59                         | 0.01               | 0.40                 |
| 0.00001                       | 1.52                         | 0.00               | 0.00                 |

| Effective Grain Diameters (mm) |       | Other Useful Parameters     |             |
|--------------------------------|-------|-----------------------------|-------------|
| d10                            | 0.186 | Uniformity Coef.            | 1.86        |
| d17                            | 0.210 | n computed                  | 0.44        |
| d20                            | 0.220 | g (cm/s <sup>2</sup> )      | 980.00      |
| d30                            | 0.253 | ρ (g/cm <sup>3</sup> )      | 0.9968      |
| d50                            | 0.315 | μ (g/cm s)                  | 0.0085      |
| d60                            | 0.347 | ρg/μ (1/cm s)               | 1.1461E+05  |
| de (Kruger)                    | 0.284 | tau (Sauerbrei)             | 1.209       |
| de (Kozeny)                    | 0.005 | d <sub>geometric mean</sub> | 0.302       |
| de (Zunker)                    | 0.021 | σ <sub>ψ</sub>              | 0.584       |
| de (Zamarin)                   | 0.253 |                             |             |
| lo (Alyameni)                  | 0.153 | 100                         | % in sample |
| mm                             |       | Boulder                     |             |
| >64                            |       | coarse gravel               |             |
| 16 - 64                        |       | medium gravel               |             |
| 8 - 16                         |       | fine gravel                 |             |
| 2 - 8                          |       | coarse sand                 | 0.12        |
| 0.5 - 2                        |       | medium sand                 | 70.91       |
| 0.25 - 0.5                     |       | fine sand                   | 28.57       |
| 0.063 - 0.25                   |       | coarse silt                 |             |
| 0.016 - 0.063                  |       | medium silt                 |             |
| 0.008 - 0.016                  |       |                             |             |
| 0.002 - 0.008                  |       | % fines                     | 0.4         |



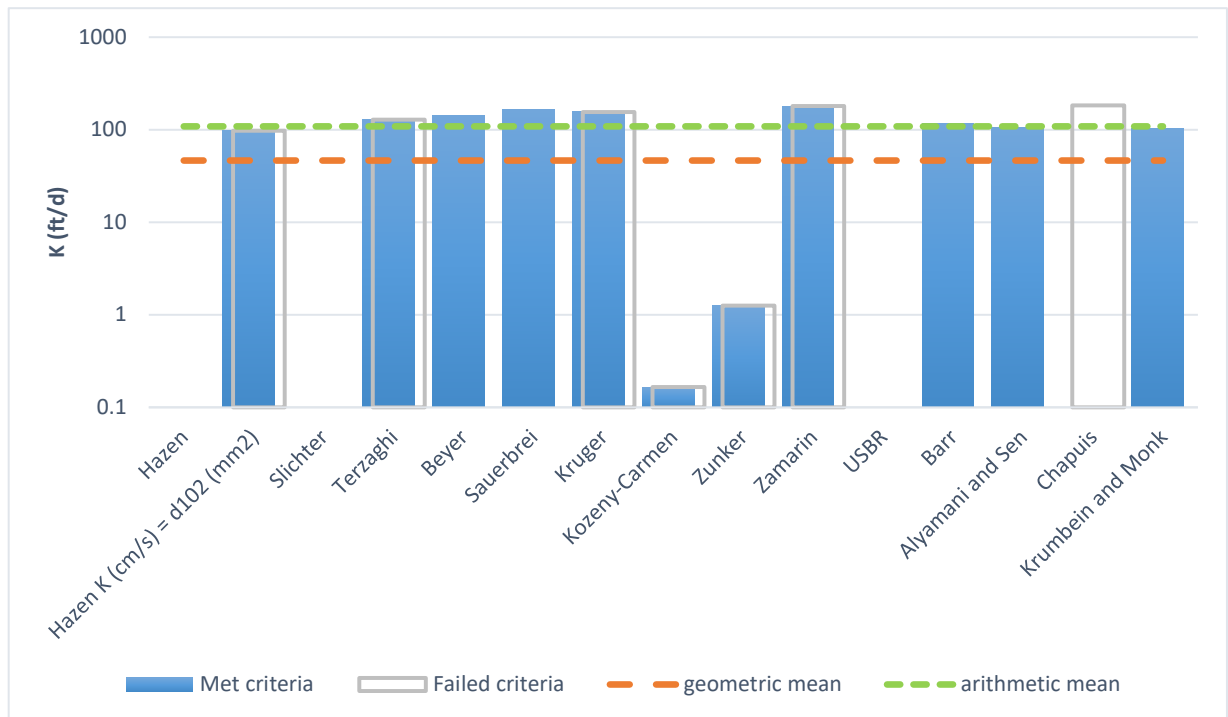
## K from Grain Size Analysis Report

Sample Name: POS-17 5-7 ft bls

Mass Sample (g): 377.29

T (°C) 26

### Uniform sand low in fines



| Estimation of Hydraulic Conductivity  | cm/s    | m/s     | ft/d |
|---------------------------------------|---------|---------|------|
| Hazen                                 | .65E-01 | .65E-03 | 185  |
| Hazen K (cm/s) = d <sub>10</sub> (mm) | .35E-01 | .35E-03 | 98   |
| Slichter                              | .26E-01 | .26E-03 | 73   |
| Terzaghi                              | .45E-01 | .45E-03 | 128  |
| Beyer                                 | .50E-01 | .50E-03 | 142  |
| Sauerbrei                             | .59E-01 | .59E-03 | 167  |
| Kruger                                | .55E-01 | .55E-03 | 156  |
| Kozeny-Carmen                         | .58E-04 | .58E-06 | 0    |
| Zunker                                | .44E-03 | .44E-05 | 1    |
| Zamarin                               | .63E-01 | .63E-03 | 180  |
| USBR                                  | .17E-01 | .17E-03 | 48   |
| Barr                                  | .41E-01 | .41E-03 | 116  |
| Alyamani and Sen                      | .37E-01 | .37E-03 | 105  |
| Chapuis                               | .64E-01 | .64E-03 | 183  |
| Krumbein and Monk                     | .36E-01 | .36E-03 | 103  |
| geometric mean                        | .16E-01 | .16E-03 | 46   |
| arithmetic mean                       | .38E-01 | .38E-03 | 109  |



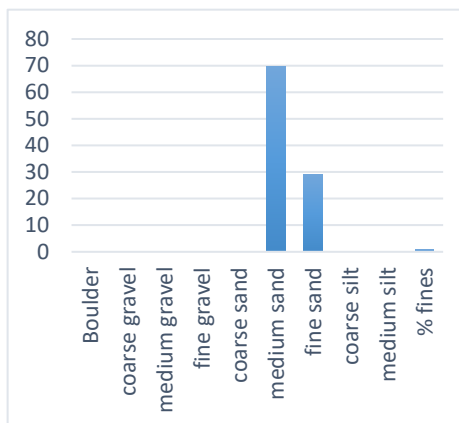
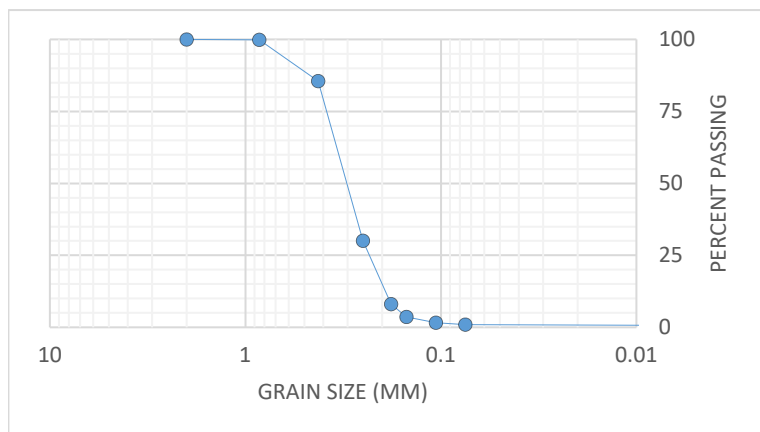
# Grain Size Analysis Report

Sample Name: POS-17 7-9 ft bls

Mass Sample (g): 379.3

T (°C) 26

## Uniform sand low in fines



| Sieve opening<br>(ps)<br>di (mm) | Mass of retained<br>(mr)<br>(g) | mass fraction<br>(mf) | Percent Passing<br>(pp) |
|----------------------------------|---------------------------------|-----------------------|-------------------------|
| 2                                | 0.00                            | 0.00                  | 100.00                  |
| 0.85                             | 0.47                            | 0.00                  | 99.88                   |
| 0.425                            | 54.54                           | 0.14                  | 85.50                   |
| 0.25                             | 210.19                          | 0.55                  | 30.08                   |
| 0.18                             | 83.70                           | 0.22                  | 8.01                    |
| 0.15                             | 16.86                           | 0.04                  | 3.57                    |
| 0.106                            | 7.30                            | 0.02                  | 1.65                    |
| 0.075                            | 2.75                            | 0.01                  | 0.92                    |
| 0.00001                          | 3.49                            | 0.01                  | 0.00                    |

| Effective Grain Diameters (mm) |       | Other Useful Parameters     |             |
|--------------------------------|-------|-----------------------------|-------------|
| d10                            | 0.186 | Uniformity Coef.            | 1.85        |
| d17                            | 0.209 | n computed                  | 0.44        |
| d20                            | 0.218 | g (cm/s <sup>2</sup> )      | 980.00      |
| d30                            | 0.250 | ρ (g/cm <sup>3</sup> )      | 0.9968      |
| d50                            | 0.313 | μ (g/cm s)                  | 0.0085      |
| d60                            | 0.344 | ρg/μ (1/cm s)               | 1.1461E+05  |
| de (Kruger)                    | 0.275 | tau (Sauerbrei)             | 1.209       |
| de (Kozeny)                    | 0.002 | d <sub>geometric mean</sub> | 0.300       |
| de (Zunker)                    | 0.009 | σ <sub>ψ</sub>              | 0.583       |
| de (Zamarin)                   | 0.220 |                             |             |
| lo (Alyameni)                  | 0.155 | 100                         | % in sample |
| mm                             |       | Boulder                     |             |
| >64                            |       | coarse gravel               |             |
| 16 - 64                        |       | medium gravel               |             |
| 8 - 16                         |       | fine gravel                 |             |
| 2 - 8                          |       | coarse sand                 | 0.12        |
| 0.5 - 2                        |       | medium sand                 | 69.79       |
| 0.25 - 0.5                     |       | fine sand                   | 29.16       |
| 0.063 - 0.25                   |       | coarse silt                 |             |
| 0.016 - 0.063                  |       | medium silt                 |             |
| 0.008 - 0.016                  |       |                             |             |
| 0.002 - 0.008                  |       | % fines                     | 0.92        |





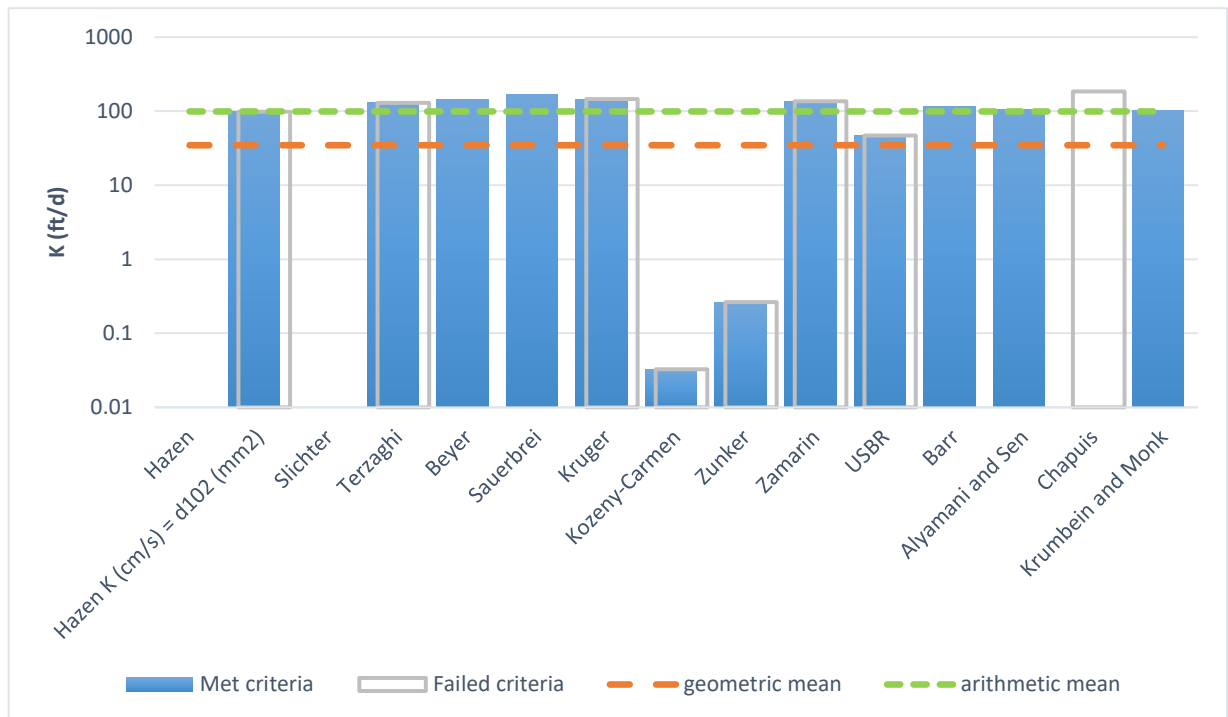
# K from Grain Size Analysis Report

Sample Name: POS-17 7-9 ft bls

Mass Sample (g): 379.3

T (°C) 26

## Uniform sand low in fines



| Estimation of Hydraulic Conductivity  | cm/s    | m/s     | ft/d |
|---------------------------------------|---------|---------|------|
| Hazen                                 | .66E-01 | .66E-03 | 186  |
| Hazen K (cm/s) = d <sub>10</sub> (mm) | .35E-01 | .35E-03 | 98   |
| Slichter                              | .26E-01 | .26E-03 | 73   |
| Terzaghi                              | .46E-01 | .46E-03 | 130  |
| Beyer                                 | .50E-01 | .50E-03 | 143  |
| Sauerbrei                             | .59E-01 | .59E-03 | 166  |
| Kruger                                | .51E-01 | .51E-03 | 146  |
| Kozeny-Carmen                         | .11E-04 | .11E-06 | 0    |
| Zunker                                | .93E-04 | .93E-06 | 0    |
| Zamarin                               | .48E-01 | .48E-03 | 136  |
| USBR                                  | .17E-01 | .17E-03 | 47   |
| Barr                                  | .42E-01 | .42E-03 | 118  |
| Alyamani and Sen                      | .37E-01 | .37E-03 | 106  |
| Chapuis                               | .65E-01 | .65E-03 | 185  |
| Krumbein and Monk                     | .36E-01 | .36E-03 | 102  |
| geometric mean                        | .12E-01 | .12E-03 | 35   |
| arithmetic mean                       | .35E-01 | .35E-03 | 99   |



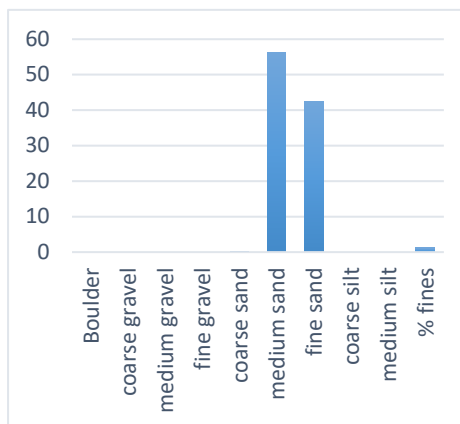
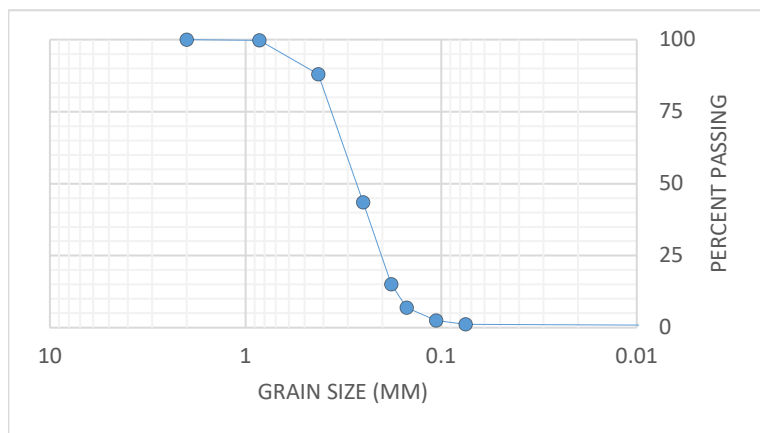
# Grain Size Analysis Report

Sample Name: POS-17 9-11 ft bls

Mass Sample (g): 332.93

T (°C) 26

## Uniform sand low in fines



| Sieve opening (ps) di (mm) | Mass of retained (mr) (g) | mass fraction (mf) | Percent Passing (pp) |
|----------------------------|---------------------------|--------------------|----------------------|
| 2                          | 0.00                      | 0.00               | 100.00               |
| 0.85                       | 0.88                      | 0.00               | 99.74                |
| 0.425                      | 39.33                     | 0.12               | 87.92                |
| 0.25                       | 147.77                    | 0.44               | 43.54                |
| 0.18                       | 94.93                     | 0.29               | 15.02                |
| 0.15                       | 27.08                     | 0.08               | 6.89                 |
| 0.106                      | 14.46                     | 0.04               | 2.55                 |
| 0.075                      | 4.51                      | 0.01               | 1.19                 |
| 0.00001                    | 3.97                      | 0.01               | 0.00                 |

| Effective Grain Diameters (mm) |       | Other Useful Parameters     |             |
|--------------------------------|-------|-----------------------------|-------------|
| d10                            | 0.161 | Uniformity Coef.            | 1.95        |
| d17                            | 0.185 | n computed                  | 0.43        |
| d20                            | 0.192 | g (cm/s <sup>2</sup> )      | 980.00      |
| d30                            | 0.217 | ρ (g/cm <sup>3</sup> )      | 0.9968      |
| d50                            | 0.275 | μ (g/cm s)                  | 0.0085      |
| d60                            | 0.315 | ρg/μ (1/cm s)               | 1.1461E+05  |
| de (Kruger)                    | 0.242 | tau (Sauerbrei)             | 1.209       |
| de (Kozeny)                    | 0.002 | d <sub>geometric mean</sub> | 0.274       |
| de (Zunker)                    | 0.007 | σ <sub>ψ</sub>              | 0.652       |
| de (Zamarin)                   | 0.189 |                             |             |
| lo (Alyameni)                  | 0.133 | 100                         | % in sample |
| mm                             |       | Boulder                     |             |
| >64                            |       | coarse gravel               |             |
| 16 - 64                        |       | medium gravel               |             |
| 8 - 16                         |       | fine gravel                 |             |
| 2 - 8                          |       | coarse sand                 | 0.26        |
| 0.5 - 2                        |       | medium sand                 | 56.2        |
| 0.25 - 0.5                     |       | fine sand                   | 42.35       |
| 0.063 - 0.25                   |       | coarse silt                 |             |
| 0.016 - 0.063                  |       | medium silt                 |             |
| 0.008 - 0.016                  |       |                             |             |
| 0.002 - 0.008                  |       | % fines                     | 1.19        |



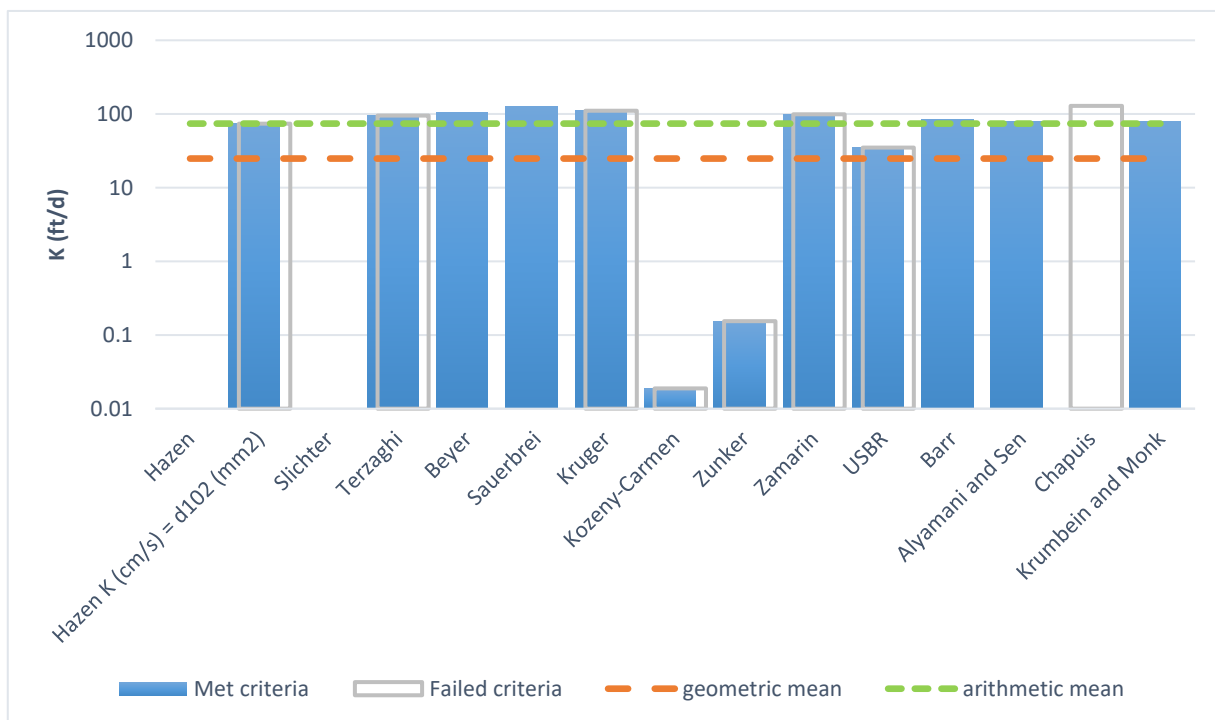
# K from Grain Size Analysis Report

Sample Name: POS-17 9-11 ft bls

Mass Sample (g): 332.93

T (°C) 26

## Uniform sand low in fines



| Estimation of Hydraulic Conductivity  | cm/s    | m/s     | ft/d |
|---------------------------------------|---------|---------|------|
| Hazen                                 | .49E-01 | .49E-03 | 138  |
| Hazen K (cm/s) = d <sub>10</sub> (mm) | .26E-01 | .26E-03 | 74   |
| Slichter                              | .19E-01 | .19E-03 | 54   |
| Terzaghi                              | .33E-01 | .33E-03 | 95   |
| Beyer                                 | .37E-01 | .37E-03 | 106  |
| Sauerbrei                             | .45E-01 | .45E-03 | 126  |
| Kruger                                | .39E-01 | .39E-03 | 111  |
| Kozeny-Carmen                         | .66E-05 | .66E-07 | 0    |
| Zunker                                | .54E-04 | .54E-06 | 0    |
| Zamarin                               | .35E-01 | .35E-03 | 99   |
| USBR                                  | .12E-01 | .12E-03 | 35   |
| Barr                                  | .30E-01 | .30E-03 | 85   |
| Alyamani and Sen                      | .28E-01 | .28E-03 | 79   |
| Chapuis                               | .46E-01 | .46E-03 | 129  |
| Krumbein and Monk                     | .28E-01 | .28E-03 | 78   |
| geometric mean                        | .88E-02 | .88E-04 | 25   |
| arithmetic mean                       | .26E-01 | .26E-03 | 74   |



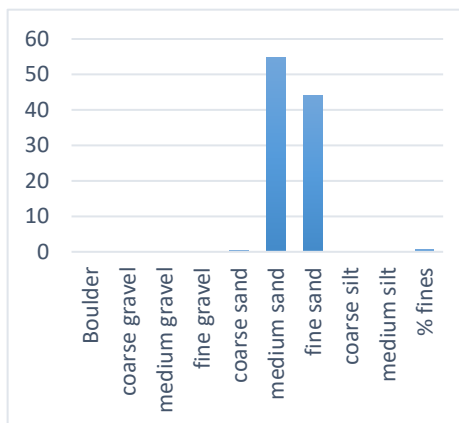
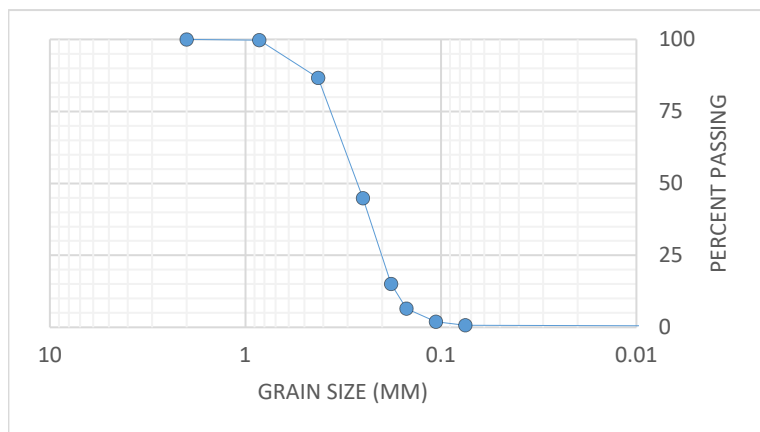
# Grain Size Analysis Report

Sample Name: POS-17 11-13 ft bls

Mass Sample (g): 326.74

T (°C) 26

## Uniform sand low in fines



| Sieve opening<br>(ps)<br>di (mm) | Mass of retained<br>(mr)<br>(g) | mass fraction<br>(mf) | Percent Passing<br>(pp) |
|----------------------------------|---------------------------------|-----------------------|-------------------------|
| 2                                | 0.00                            | 0.00                  | 100.00                  |
| 0.85                             | 0.86                            | 0.00                  | 99.74                   |
| 0.425                            | 42.66                           | 0.13                  | 86.68                   |
| 0.25                             | 136.63                          | 0.42                  | 44.86                   |
| 0.18                             | 97.44                           | 0.30                  | 15.04                   |
| 0.15                             | 28.08                           | 0.09                  | 6.45                    |
| 0.106                            | 14.90                           | 0.05                  | 1.89                    |
| 0.075                            | 3.72                            | 0.01                  | 0.75                    |
| 0.00001                          | 2.45                            | 0.01                  | 0.00                    |

| Effective Grain Diameters (mm) |       | Other Useful Parameters     |             |
|--------------------------------|-------|-----------------------------|-------------|
| d10                            | 0.162 | Uniformity Coef.            | 1.93        |
| d17                            | 0.185 | n computed                  | 0.43        |
| d20                            | 0.192 | g (cm/s <sup>2</sup> )      | 980.00      |
| d30                            | 0.215 | ρ (g/cm <sup>3</sup> )      | 0.9968      |
| d50                            | 0.271 | μ (g/cm s)                  | 0.0085      |
| d60                            | 0.313 | ρg/μ (1/cm s)               | 1.1461E+05  |
| de (Kruger)                    | 0.248 | tau (Sauerbrei)             | 1.209       |
| de (Kozeny)                    | 0.003 | d <sub>geometric mean</sub> | 0.274       |
| de (Zunker)                    | 0.011 | σ <sub>ψ</sub>              | 0.653       |
| de (Zamarin)                   | 0.209 |                             |             |
| lo (Alyameni)                  | 0.135 | 100                         | % in sample |
| mm                             |       | Boulder                     |             |
| >64                            |       | coarse gravel               |             |
| 16 - 64                        |       | medium gravel               |             |
| 8 - 16                         |       | fine gravel                 |             |
| 2 - 8                          |       | coarse sand                 | 0.26        |
| 0.5 - 2                        |       | medium sand                 | 54.87       |
| 0.25 - 0.5                     |       | fine sand                   | 44.11       |
| 0.063 - 0.25                   |       | coarse silt                 |             |
| 0.016 - 0.063                  |       | medium silt                 |             |
| 0.008 - 0.016                  |       |                             |             |
| 0.002 - 0.008                  |       | % fines                     | 0.75        |





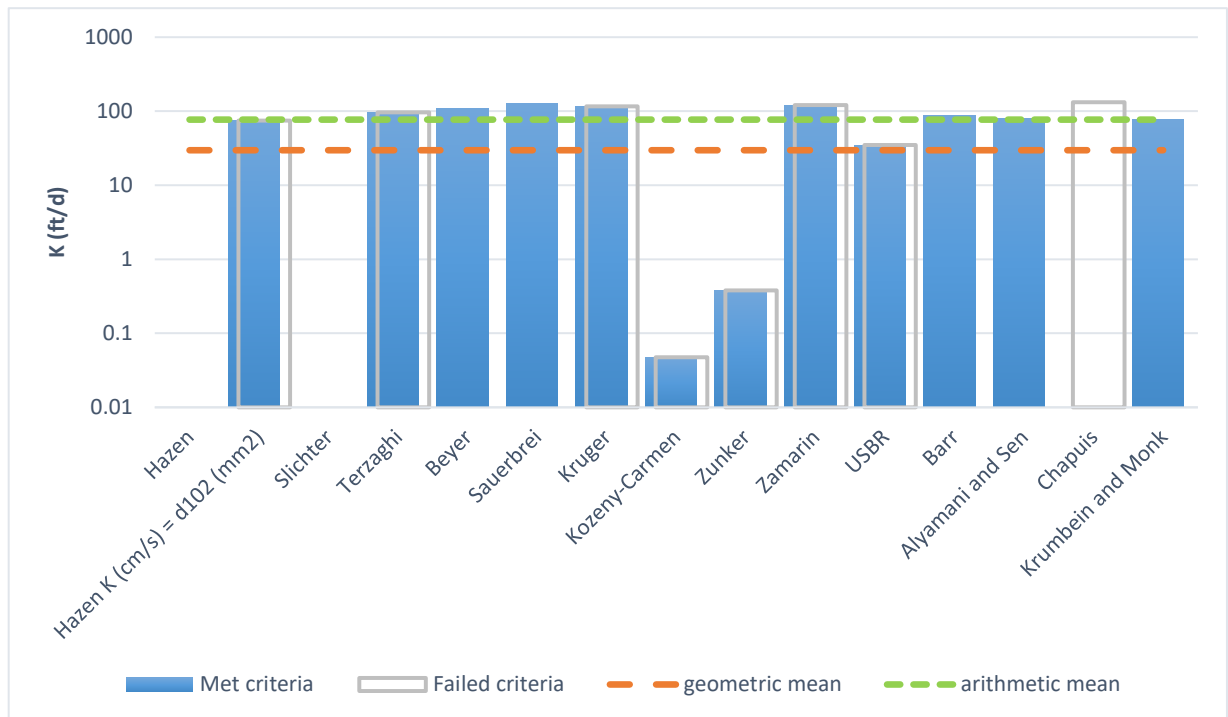
# K from Grain Size Analysis Report

Sample Name: POS-17 11-13 ft bls

Mass Sample (g): 326.74

T (°C) 26

## Uniform sand low in fines



| Estimation of Hydraulic Conductivity  | cm/s    | m/s     | ft/d |
|---------------------------------------|---------|---------|------|
| Hazen                                 | .50E-01 | .50E-03 | 140  |
| Hazen K (cm/s) = d <sub>10</sub> (mm) | .26E-01 | .26E-03 | 75   |
| Slichter                              | .19E-01 | .19E-03 | 55   |
| Terzaghi                              | .34E-01 | .34E-03 | 96   |
| Beyer                                 | .38E-01 | .38E-03 | 108  |
| Sauerbrei                             | .45E-01 | .45E-03 | 127  |
| Kruger                                | .41E-01 | .41E-03 | 117  |
| Kozeny-Carmen                         | .17E-04 | .17E-06 | 0    |
| Zunker                                | .13E-03 | .13E-05 | 0    |
| Zamarin                               | .43E-01 | .43E-03 | 121  |
| USBR                                  | .12E-01 | .12E-03 | 35   |
| Barr                                  | .31E-01 | .31E-03 | 87   |
| Alyamani and Sen                      | .29E-01 | .29E-03 | 81   |
| Chapuis                               | .47E-01 | .47E-03 | 132  |
| Krumbein and Monk                     | .27E-01 | .27E-03 | 78   |
| geometric mean                        | .10E-01 | .10E-03 | 30   |
| arithmetic mean                       | .27E-01 | .27E-03 | 77   |



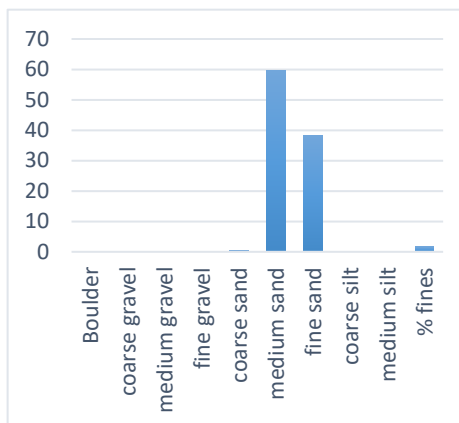
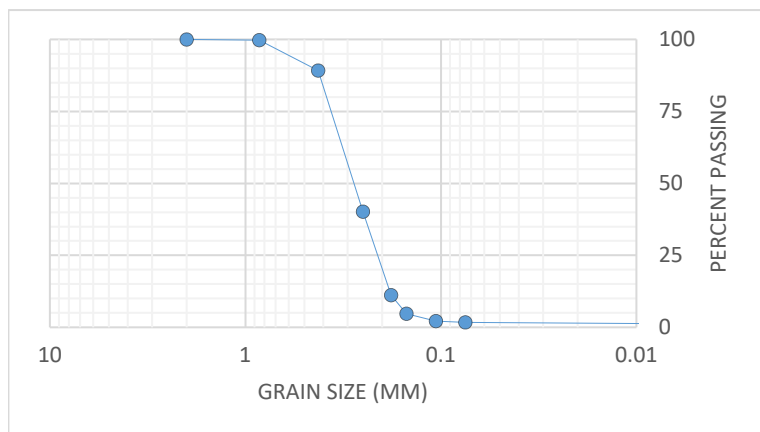
# Grain Size Analysis Report

Sample Name: POS-17 13-15 ft bls

Mass Sample (g): 343.64

T (°C) 26

## Uniform sand low in fines



| Sieve opening<br>(ps)<br>di (mm) | Mass of retained<br>(mr)<br>(g) | mass fraction<br>(mf) | Percent Passing<br>(pp) |
|----------------------------------|---------------------------------|-----------------------|-------------------------|
| 2                                | 0.00                            | 0.00                  | 100.00                  |
| 0.85                             | 0.96                            | 0.00                  | 99.72                   |
| 0.425                            | 36.14                           | 0.11                  | 89.20                   |
| 0.25                             | 168.67                          | 0.49                  | 40.12                   |
| 0.18                             | 99.49                           | 0.29                  | 11.17                   |
| 0.15                             | 22.10                           | 0.06                  | 4.74                    |
| 0.106                            | 8.73                            | 0.03                  | 2.20                    |
| 0.075                            | 1.71                            | 0.00                  | 1.70                    |
| 0.00001                          | 5.84                            | 0.02                  | 0.00                    |

| Effective Grain Diameters (mm) |       | Other Useful Parameters     |             |
|--------------------------------|-------|-----------------------------|-------------|
| d10                            | 0.175 | Uniformity Coef.            | 1.84        |
| d17                            | 0.194 | n computed                  | 0.44        |
| d20                            | 0.201 | g (cm/s <sup>2</sup> )      | 980.00      |
| d30                            | 0.226 | ρ (g/cm <sup>3</sup> )      | 0.9968      |
| d50                            | 0.285 | μ (g/cm s)                  | 0.0085      |
| d60                            | 0.321 | ρg/μ (1/cm s)               | 1.1461E+05  |
| de (Kruger)                    | 0.246 | tau (Sauerbrei)             | 1.209       |
| de (Kozeny)                    | 0.001 | d <sub>geometric mean</sub> | 0.281       |
| de (Zunker)                    | 0.005 | σ <sub>ψ</sub>              | 0.593       |
| de (Zamarin)                   | 0.176 |                             |             |
| lo (Alyameni)                  | 0.147 | 100                         | % in sample |
| mm                             |       | Boulder                     |             |
| >64                            |       | coarse gravel               |             |
| 16 - 64                        |       | medium gravel               |             |
| 8 - 16                         |       | fine gravel                 |             |
| 2 - 8                          |       | coarse sand                 | 0.28        |
| 0.5 - 2                        |       | medium sand                 | 59.6        |
| 0.25 - 0.5                     |       | fine sand                   | 38.42       |
| 0.063 - 0.25                   |       | coarse silt                 |             |
| 0.016 - 0.063                  |       | medium silt                 |             |
| 0.008 - 0.016                  |       |                             |             |
| 0.002 - 0.008                  |       | % fines                     | 1.7         |



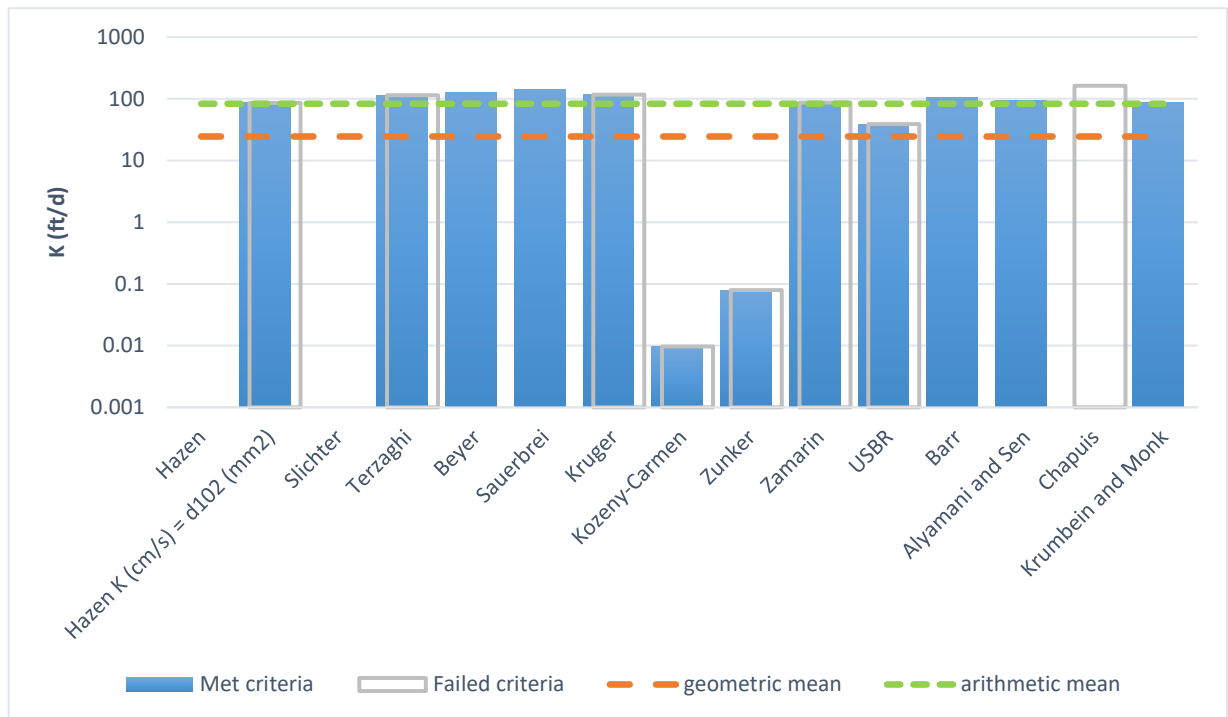
## K from Grain Size Analysis Report

Sample Name: POS-17 13-15 ft bls

Mass Sample (g): 343.64

T (°C) 26

### Uniform sand low in fines



| Estimation of Hydraulic Conductivity | cm/s    | m/s     | ft/d |
|--------------------------------------|---------|---------|------|
| Hazen                                | .58E-01 | .58E-03 | 164  |
| Hazen K (cm/s) = $d_{10}$ (mm)       | .30E-01 | .30E-03 | 86   |
| Slichter                             | .23E-01 | .23E-03 | 65   |
| Terzaghi                             | .40E-01 | .40E-03 | 114  |
| Beyer                                | .44E-01 | .44E-03 | 125  |
| Sauerbrei                            | .51E-01 | .51E-03 | 145  |
| Kruger                               | .41E-01 | .41E-03 | 117  |
| Kozeny-Carmen                        | .34E-05 | .34E-07 | 0    |
| Zunker                               | .28E-04 | .28E-06 | 0    |
| Zamarin                              | .31E-01 | .31E-03 | 87   |
| USBR                                 | .14E-01 | .14E-03 | 39   |
| Barr                                 | .37E-01 | .37E-03 | 104  |
| Alyamani and Sen                     | .34E-01 | .34E-03 | 95   |
| Chapuis                              | .57E-01 | .57E-03 | 163  |
| Krumbein and Monk                    | .31E-01 | .31E-03 | 89   |
| geometric mean                       | .87E-02 | .87E-04 | 25   |
| arithmetic mean                      | .29E-01 | .29E-03 | 83   |



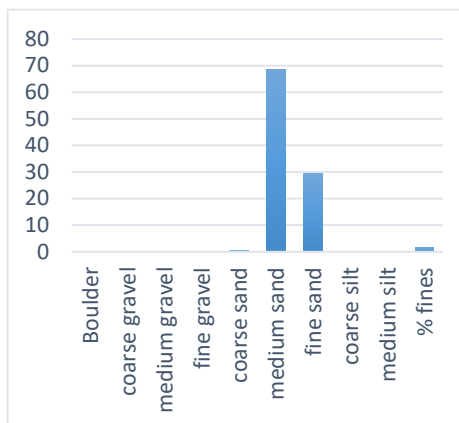
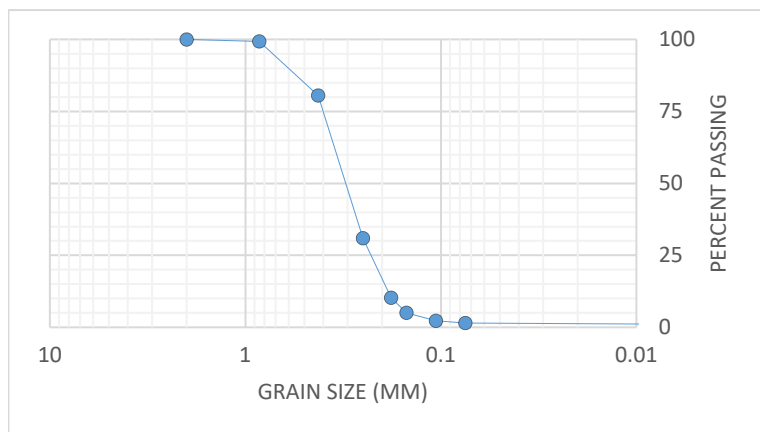
# Grain Size Analysis Report

Sample Name: POS-17 15-17 ft bls

Mass Sample (g): 313.75

T (°C) 26

## Uniform sand low in fines



| Sieve opening (ps)<br>di (mm) | Mass of retained (mr)<br>(g) | mass fraction (mf) | Percent Passing (pp) |
|-------------------------------|------------------------------|--------------------|----------------------|
| 2                             | 0.00                         | 0.00               | 100.00               |
| 0.85                          | 2.05                         | 0.01               | 99.35                |
| 0.425                         | 59.13                        | 0.19               | 80.50                |
| 0.25                          | 155.58                       | 0.50               | 30.91                |
| 0.18                          | 64.63                        | 0.21               | 10.31                |
| 0.15                          | 16.48                        | 0.05               | 5.06                 |
| 0.106                         | 8.78                         | 0.03               | 2.26                 |
| 0.075                         | 2.33                         | 0.01               | 1.52                 |
| 0.00001                       | 4.77                         | 0.02               | 0.00                 |

| Effective Grain Diameters (mm) |       | Other Useful Parameters     |             |
|--------------------------------|-------|-----------------------------|-------------|
| d10                            | 0.178 | Uniformity Coef.            | 1.98        |
| d17                            | 0.203 | n computed                  | 0.43        |
| d20                            | 0.213 | g (cm/s <sup>2</sup> )      | 980.00      |
| d30                            | 0.247 | ρ (g/cm <sup>3</sup> )      | 0.9968      |
| d50                            | 0.317 | μ (g/cm s)                  | 0.0085      |
| d60                            | 0.353 | ρg/μ (1/cm s)               | 1.1461E+05  |
| de (Kruger)                    | 0.267 | tau (Sauerbrei)             | 1.209       |
| de (Kozeny)                    | 0.001 | d <sub>geometric mean</sub> | 0.317       |
| de (Zunker)                    | 0.006 | σ <sub>ψ</sub>              | 0.688       |
| de (Zamarin)                   | 0.192 |                             |             |
| lo (Alyameni)                  | 0.143 | 100                         | % in sample |
| mm                             |       | Boulder                     |             |
| >64                            |       | coarse gravel               |             |
| 16 - 64                        |       | medium gravel               |             |
| 8 - 16                         |       | fine gravel                 |             |
| 2 - 8                          |       | coarse sand                 | 0.65        |
| 0.5 - 2                        |       | medium sand                 | 68.43       |
| 0.25 - 0.5                     |       | fine sand                   | 29.39       |
| 0.063 - 0.25                   |       | coarse silt                 |             |
| 0.016 - 0.063                  |       | medium silt                 |             |
| 0.008 - 0.016                  |       |                             |             |
| 0.002 - 0.008                  |       | % fines                     | 1.52        |





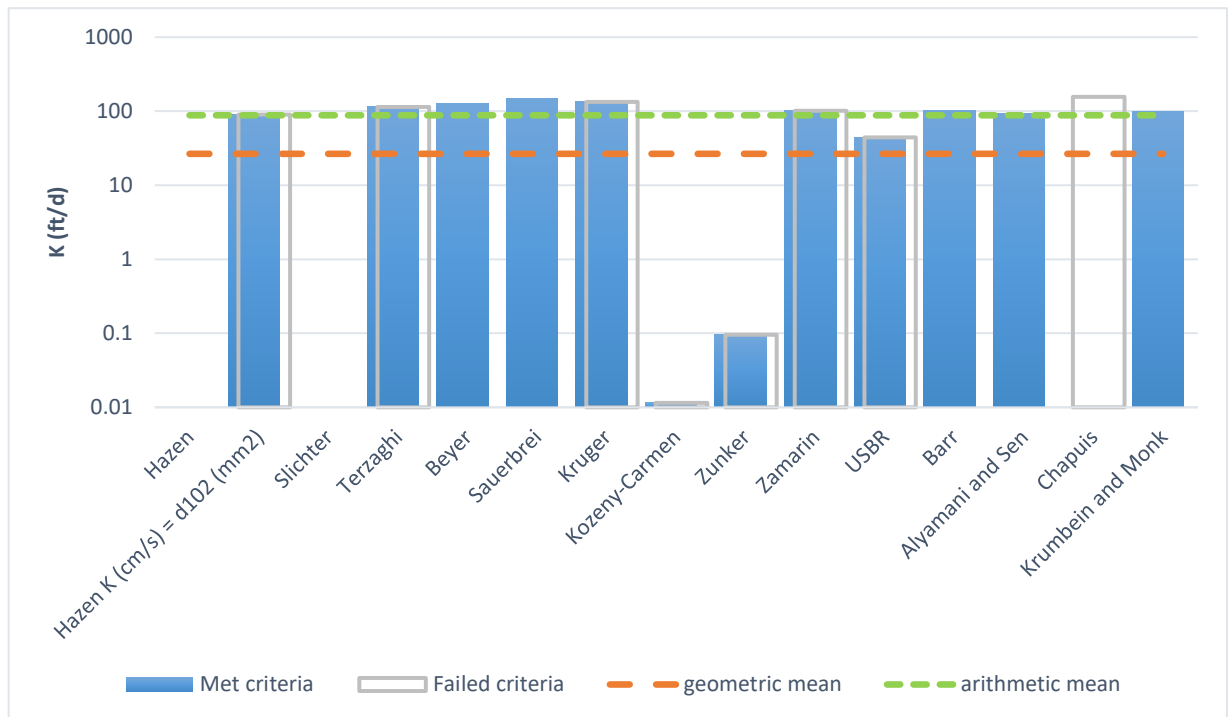
# K from Grain Size Analysis Report

Sample Name: POS-17 15-17 ft bls

Mass Sample (g): 313.75

T (°C) 26

## Uniform sand low in fines



| Estimation of Hydraulic Conductivity  | cm/s    | m/s     | ft/d |
|---------------------------------------|---------|---------|------|
| Hazen                                 | .59E-01 | .59E-03 | 168  |
| Hazen K (cm/s) = d <sub>10</sub> (mm) | .32E-01 | .32E-03 | 90   |
| Slichter                              | .23E-01 | .23E-03 | 65   |
| Terzaghi                              | .40E-01 | .40E-03 | 115  |
| Beyer                                 | .45E-01 | .45E-03 | 129  |
| Sauerbrei                             | .53E-01 | .53E-03 | 150  |
| Kruger                                | .47E-01 | .47E-03 | 134  |
| Kozeny-Carmen                         | .40E-05 | .40E-07 | 0    |
| Zunker                                | .34E-04 | .34E-06 | 0    |
| Zamarin                               | .36E-01 | .36E-03 | 101  |
| USBR                                  | .16E-01 | .16E-03 | 44   |
| Barr                                  | .36E-01 | .36E-03 | 103  |
| Alyamani and Sen                      | .32E-01 | .32E-03 | 92   |
| Chapuis                               | .55E-01 | .55E-03 | 157  |
| Krumbein and Monk                     | .35E-01 | .35E-03 | 99   |
| geometric mean                        | .94E-02 | .94E-04 | 27   |
| arithmetic mean                       | .31E-01 | .31E-03 | 88   |



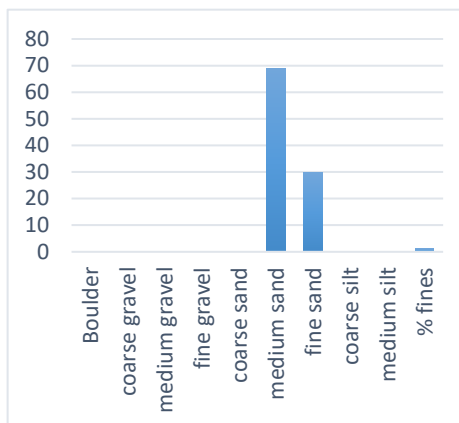
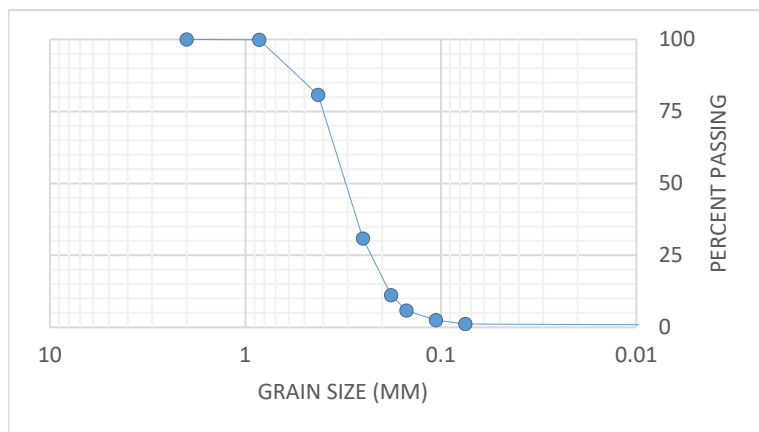
# Grain Size Analysis Report

Sample Name: POS-17 17-19 ft bls

Mass Sample (g): 362.28

T (°C) 26

Moderately well sorted sand low in fines



| Sieve opening (ps)<br>di (mm) | Mass of retained (mr)<br>(g) | mass fraction (mf) | Percent Passing (pp) |
|-------------------------------|------------------------------|--------------------|----------------------|
| 2                             | 0.00                         | 0.00               | 100.00               |
| 0.85                          | 0.61                         | 0.00               | 99.83                |
| 0.425                         | 69.31                        | 0.19               | 80.70                |
| 0.25                          | 180.63                       | 0.50               | 30.84                |
| 0.18                          | 71.49                        | 0.20               | 11.11                |
| 0.15                          | 19.09                        | 0.05               | 5.84                 |
| 0.106                         | 12.09                        | 0.03               | 2.50                 |
| 0.075                         | 4.86                         | 0.01               | 1.16                 |
| 0.00001                       | 4.20                         | 0.01               | 0.00                 |

| Effective Grain Diameters (mm) |       | Other Useful Parameters     |             |
|--------------------------------|-------|-----------------------------|-------------|
| d10                            | 0.174 | Uniformity Coef.            | 2.03        |
| d17                            | 0.201 | n computed                  | 0.43        |
| d20                            | 0.212 | g (cm/s <sup>2</sup> )      | 980.00      |
| d30                            | 0.247 | ρ (g/cm <sup>3</sup> )      | 0.9968      |
| d50                            | 0.317 | μ (g/cm s)                  | 0.0085      |
| d60                            | 0.352 | ρg/μ (1/cm s)               | 1.1461E+05  |
| de (Kruger)                    | 0.268 | tau (Sauerbrei)             | 1.209       |
| de (Kozeny)                    | 0.002 | d <sub>geometric mean</sub> | 0.315       |
| de (Zunker)                    | 0.007 | σ <sub>ψ</sub>              | 0.700       |
| de (Zamarin)                   | 0.206 |                             |             |
| lo (Alyameni)                  | 0.138 | 100                         | % in sample |
| mm                             |       | Boulder                     |             |
| >64                            |       | coarse gravel               |             |
| 16 - 64                        |       | medium gravel               |             |
| 8 - 16                         |       | fine gravel                 |             |
| 2 - 8                          |       | coarse sand                 | 0.17        |
| 0.5 - 2                        |       | medium sand                 | 68.99       |
| 0.25 - 0.5                     |       | fine sand                   | 29.68       |
| 0.063 - 0.25                   |       | coarse silt                 |             |
| 0.016 - 0.063                  |       | medium silt                 |             |
| 0.008 - 0.016                  |       |                             |             |
| 0.002 - 0.008                  |       | % fines                     | 1.16        |



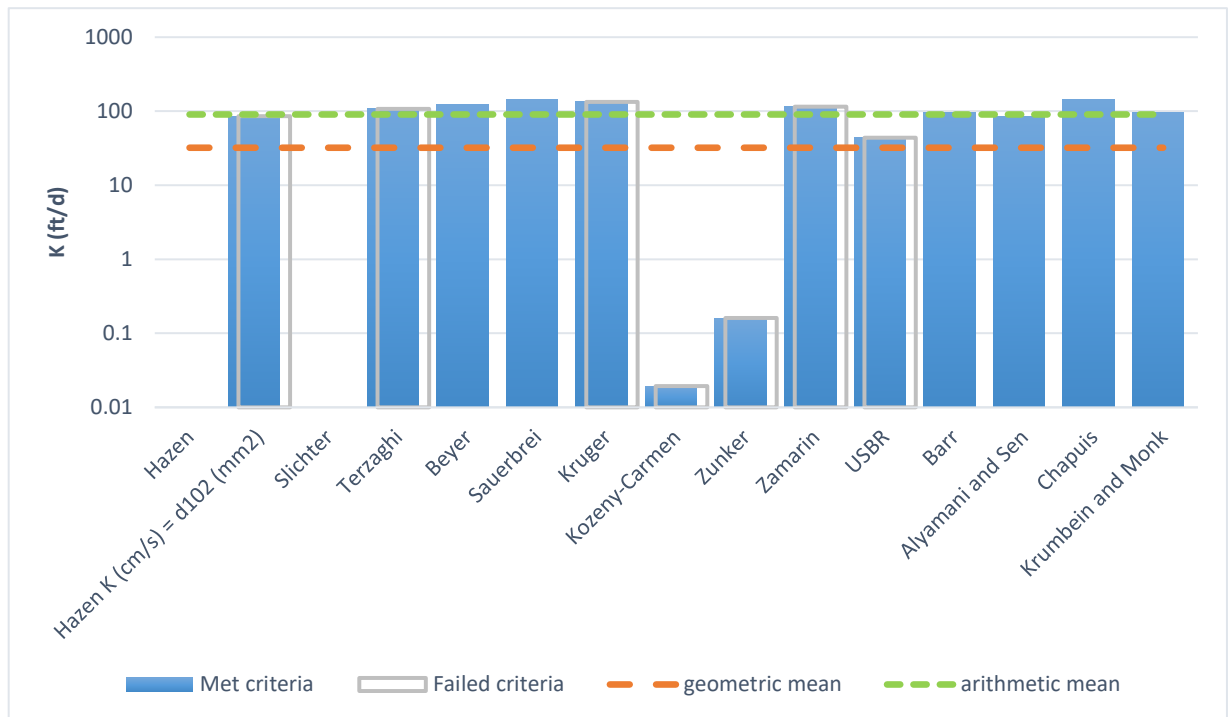
# K from Grain Size Analysis Report

Sample Name: POS-17 17-19 ft bls

Mass Sample (g): 362.28

T (°C) 26

Moderately well sorted sand low in fines



| Estimation of Hydraulic Conductivity  | cm/s    | m/s     | ft/d |
|---------------------------------------|---------|---------|------|
| Hazen                                 | .56E-01 | .56E-03 | 159  |
| Hazen K (cm/s) = d <sub>10</sub> (mm) | .30E-01 | .30E-03 | 86   |
| Slichter                              | .22E-01 | .22E-03 | 61   |
| Terzaghi                              | .38E-01 | .38E-03 | 108  |
| Beyer                                 | .43E-01 | .43E-03 | 122  |
| Sauerbrei                             | .51E-01 | .51E-03 | 145  |
| Kruger                                | .47E-01 | .47E-03 | 134  |
| Kozeny-Carmen                         | .68E-05 | .68E-07 | 0    |
| Zunker                                | .57E-04 | .57E-06 | 0    |
| Zamarin                               | .41E-01 | .41E-03 | 115  |
| USBR                                  | .15E-01 | .15E-03 | 44   |
| Barr                                  | .34E-01 | .34E-03 | 96   |
| Alyamani and Sen                      | .30E-01 | .30E-03 | 85   |
| Chapuis                               | .51E-01 | .51E-03 | 145  |
| Krumbein and Monk                     | .34E-01 | .34E-03 | 97   |
| geometric mean                        | .11E-01 | .11E-03 | 32   |
| arithmetic mean                       | .32E-01 | .32E-03 | 90   |



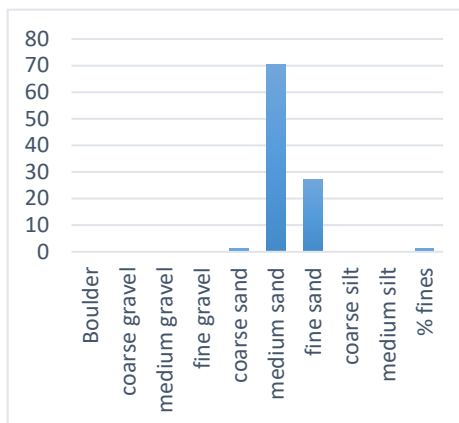
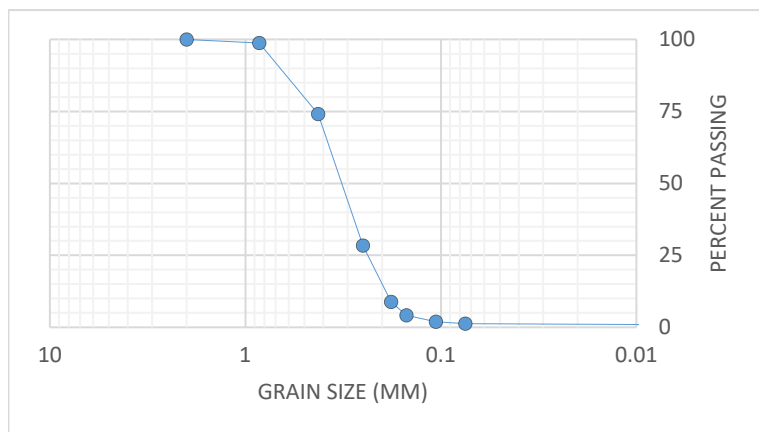
# Grain Size Analysis Report

Sample Name: POS-17 19-21 ft bls

Mass Sample (g): 327.4

T (°C) 26

Moderately well sorted sand low in fines



| Sieve opening (ps)<br>di (mm) | Mass of retained (mr)<br>(g) | mass fraction (mf) | Percent Passing (pp) |
|-------------------------------|------------------------------|--------------------|----------------------|
| 2                             | 0.06                         | 0.00               | 99.98                |
| 0.85                          | 3.99                         | 0.01               | 98.76                |
| 0.425                         | 81.01                        | 0.25               | 74.02                |
| 0.25                          | 149.24                       | 0.46               | 28.44                |
| 0.18                          | 64.16                        | 0.20               | 8.84                 |
| 0.15                          | 15.50                        | 0.05               | 4.11                 |
| 0.106                         | 6.93                         | 0.02               | 1.99                 |
| 0.075                         | 2.40                         | 0.01               | 1.26                 |
| 0.00001                       | 4.11                         | 0.01               | 0.00                 |

| Effective Grain Diameters (mm) |       | Other Useful Parameters     |             |
|--------------------------------|-------|-----------------------------|-------------|
| d10                            | 0.184 | Uniformity Coef.            | 2.02        |
| d17                            | 0.209 | n computed                  | 0.43        |
| d20                            | 0.220 | g (cm/s <sup>2</sup> )      | 980.00      |
| d30                            | 0.256 | ρ (g/cm <sup>3</sup> )      | 0.9968      |
| d50                            | 0.333 | μ (g/cm s)                  | 0.0085      |
| d60                            | 0.371 | ρg/μ (1/cm s)               | 1.1461E+05  |
| de (Kruger)                    | 0.284 | tau (Sauerbrei)             | 1.209       |
| de (Kozeny)                    | 0.002 | d <sub>geometric mean</sub> | 0.344       |
| de (Zunker)                    | 0.007 | σ <sub>ψ</sub>              | 0.738       |
| de (Zamarin)                   | 0.211 |                             |             |
| lo (Alyameni)                  | 0.147 | 100                         | % in sample |
| mm                             |       | Boulder                     |             |
| >64                            |       | coarse gravel               |             |
| 16 - 64                        |       | medium gravel               |             |
| 8 - 16                         |       | fine gravel                 | 0.02        |
| 2 - 8                          |       | coarse sand                 | 1.22        |
| 0.5 - 2                        |       | medium sand                 | 70.33       |
| 0.25 - 0.5                     |       | fine sand                   | 27.18       |
| 0.063 - 0.25                   |       | coarse silt                 |             |
| 0.016 - 0.063                  |       | medium silt                 |             |
| 0.008 - 0.016                  |       |                             |             |
| 0.002 - 0.008                  |       | % fines                     | 1.26        |





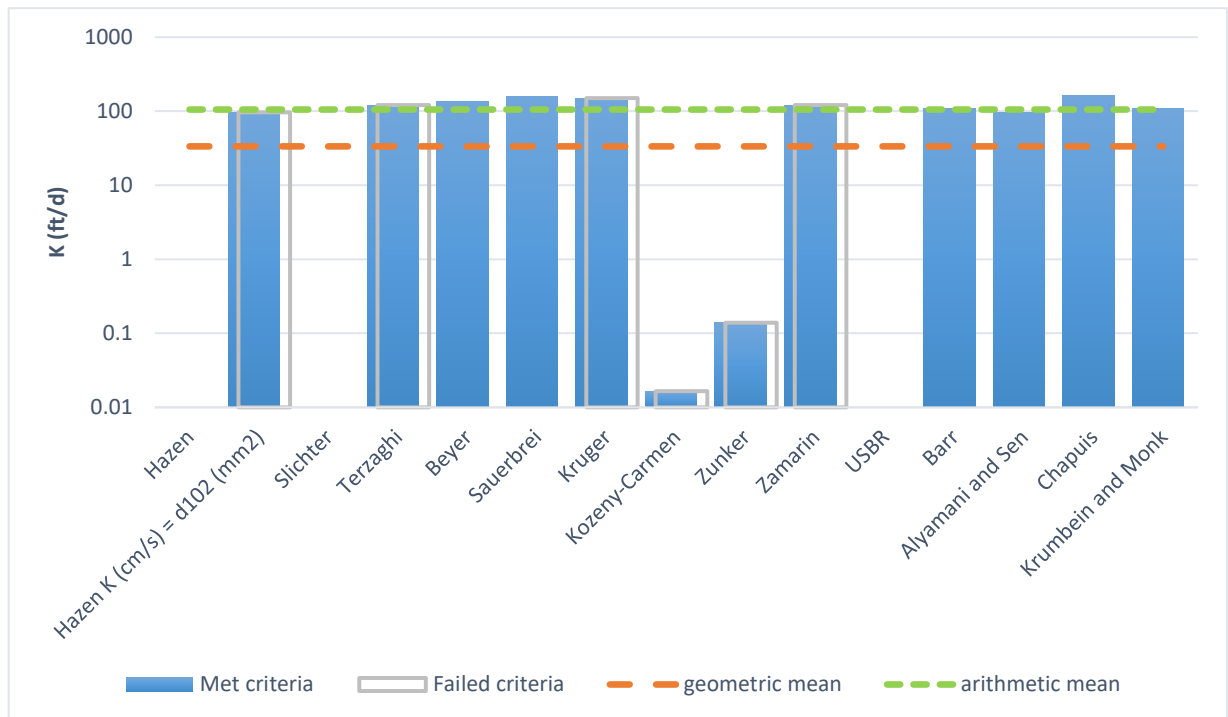
## K from Grain Size Analysis Report

Sample Name: POS-17 19-21 ft bls

Mass Sample (g): 327.4

T (°C) 26

**Moderately well sorted sand low in fines**



| Estimation of Hydraulic Conductivity  | cm/s    | m/s     | ft/d |
|---------------------------------------|---------|---------|------|
| Hazen                                 | .63E-01 | .63E-03 | 179  |
| Hazen K (cm/s) = d <sub>10</sub> (mm) | .34E-01 | .34E-03 | 96   |
| Slichter                              | .24E-01 | .24E-03 | 69   |
| Terzaghi                              | .43E-01 | .43E-03 | 121  |
| Beyer                                 | .48E-01 | .48E-03 | 137  |
| Sauerbrei                             | .56E-01 | .56E-03 | 158  |
| Kruger                                | .53E-01 | .53E-03 | 150  |
| Kozeny-Carmen                         | .59E-05 | .59E-07 | 0    |
| Zunker                                | .49E-04 | .49E-06 | 0    |
| Zamarin                               | .43E-01 | .43E-03 | 121  |
| USBR                                  | .17E-01 | .17E-03 | 48   |
| Barr                                  | .38E-01 | .38E-03 | 109  |
| Alyamani and Sen                      | .34E-01 | .34E-03 | 97   |
| Chapuis                               | .58E-01 | .58E-03 | 165  |
| Krumbein and Monk                     | .39E-01 | .39E-03 | 110  |
| geometric mean                        | .12E-01 | .12E-03 | 34   |
| arithmetic mean                       | .37E-01 | .37E-03 | 105  |



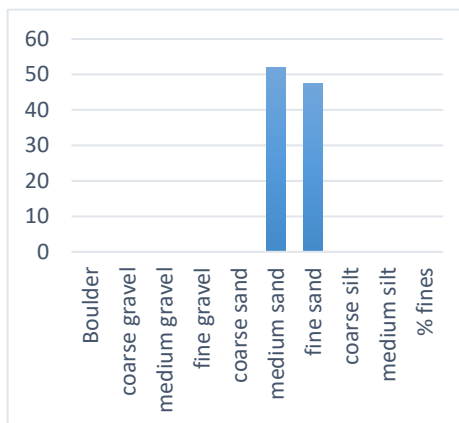
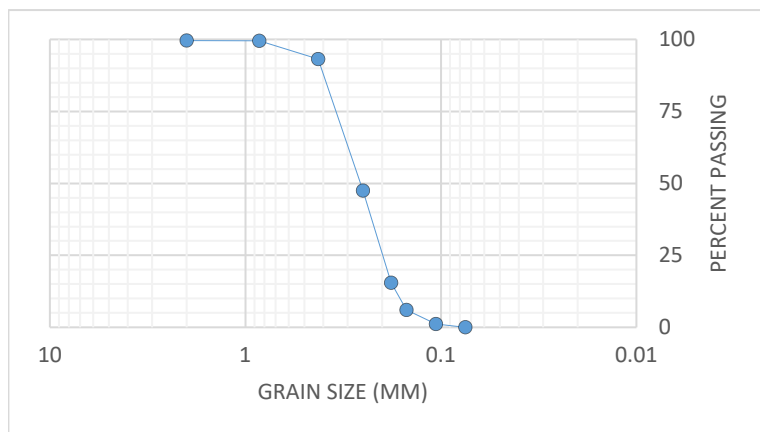
# Grain Size Analysis Report

Sample Name: POS-17 21-23 ft bls

Mass Sample (g): 324.61

T (°C) 26

## Uniform sand low in fines



| Sieve opening (ps)<br>di (mm) | Mass of retained (mr)<br>(g) | mass fraction (mf) | Percent Passing (pp) |
|-------------------------------|------------------------------|--------------------|----------------------|
| 2                             | 0.00                         | 0.00               | 99.59                |
| 0.85                          | 0.17                         | 0.00               | 99.54                |
| 0.425                         | 20.57                        | 0.06               | 93.20                |
| 0.25                          | 148.29                       | 0.46               | 47.52                |
| 0.18                          | 103.81                       | 0.32               | 15.54                |
| 0.15                          | 30.82                        | 0.09               | 6.04                 |
| 0.106                         | 15.99                        | 0.05               | 1.12                 |
| 0.075                         | 3.63                         | 0.01               | 0.00                 |
|                               | 1.33                         |                    |                      |

| Effective Grain Diameters (mm) |       | Other Useful Parameters     |             |
|--------------------------------|-------|-----------------------------|-------------|
| d10                            | 0.162 | Uniformity Coef.            | 1.83        |
| d17                            | 0.183 | n computed                  | 0.44        |
| d20                            | 0.190 | g (cm/s <sup>2</sup> )      | 980.00      |
| d30                            | 0.212 | ρ (g/cm <sup>3</sup> )      | 0.9968      |
| d50                            | 0.260 | μ (g/cm s)                  | 0.0085      |
| d60                            | 0.298 | ρg/μ (1/cm s)               | 1.1461E+05  |
| de (Kruger)                    | 0.248 | tau (Sauerbrei)             | 1.209       |
| de (Kozeny)                    | 0.238 | d <sub>geometric mean</sub> | 0.264       |
| de (Zunker)                    | 0.242 | σ <sub>ψ</sub>              | 0.573       |
| de (Zamarin)                   | 0.245 |                             |             |
| lo (Alyameni)                  | 0.138 | 99.59027756                 | % in sample |
| mm                             |       | Boulder                     |             |
| >64                            |       | coarse gravel               |             |
| 16 - 64                        |       | medium gravel               |             |
| 8 - 16                         |       | fine gravel                 |             |
| 2 - 8                          |       | coarse sand                 | 0.05        |
| 0.5 - 2                        |       | medium sand                 | 52.02       |
| 0.25 - 0.5                     |       | fine sand                   | 47.52       |
| 0.063 - 0.25                   |       | coarse silt                 |             |
| 0.016 - 0.063                  |       | medium silt                 |             |
| 0.008 - 0.016                  |       |                             |             |
| 0.002 - 0.008                  |       | % fines                     |             |



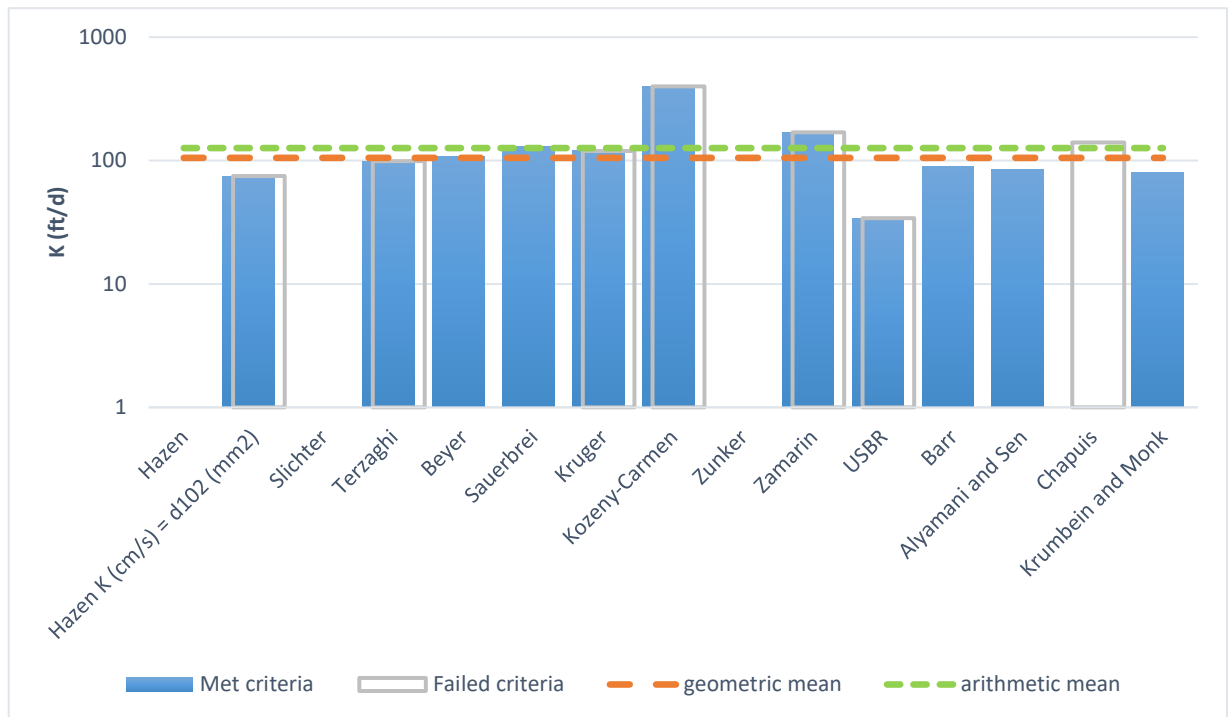
# K from Grain Size Analysis Report

Sample Name: POS-17 21-23 ft bls

Mass Sample (g): 324.61

T (°C) 26

Uniform sand low in fines



| Estimation of Hydraulic Conductivity  | cm/s    | m/s     | ft/d |
|---------------------------------------|---------|---------|------|
| Hazen                                 | .50E-01 | .50E-03 | 142  |
| Hazen K (cm/s) = d <sub>10</sub> (mm) | .26E-01 | .26E-03 | 75   |
| Slichter                              | .20E-01 | .20E-03 | 56   |
| Terzaghi                              | .35E-01 | .35E-03 | 99   |
| Beyer                                 | .38E-01 | .38E-03 | 109  |
| Sauerbrei                             | .46E-01 | .46E-03 | 129  |
| Kruger                                | .42E-01 | .42E-03 | 120  |
| Kozeny-Carmen                         | .14E+00 | .14E-02 | 400  |
| Zunker                                | .62E-01 | .62E-03 | 176  |
| Zamarin                               | .60E-01 | .60E-03 | 170  |
| USBR                                  | .12E-01 | .12E-03 | 34   |
| Barr                                  | .32E-01 | .32E-03 | 90   |
| Alyamani and Sen                      | .30E-01 | .30E-03 | 84   |
| Chapuis                               | .50E-01 | .50E-03 | 140  |
| Krumbein and Monk                     | .28E-01 | .28E-03 | 80   |
| geometric mean                        | .37E-01 | .37E-03 | 105  |
| arithmetic mean                       | .45E-01 | .45E-03 | 126  |



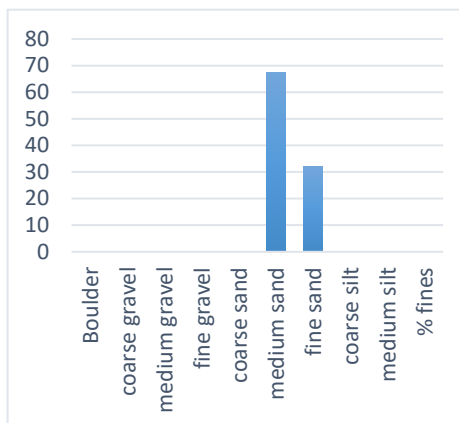
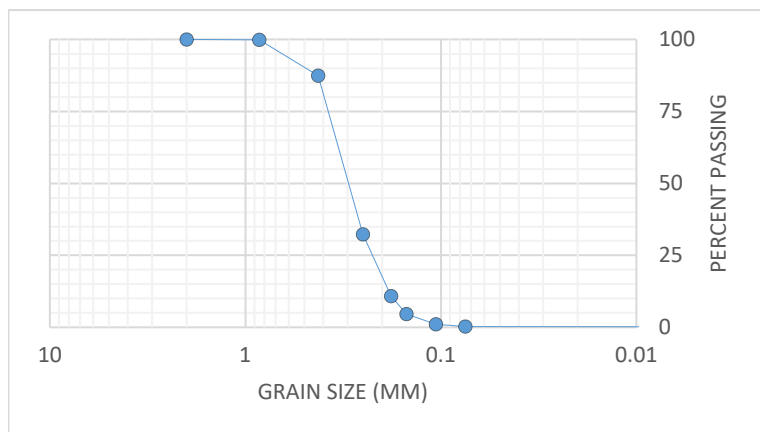
# Grain Size Analysis Report

Sample Name: POS-17 23-25 ft bls

Mass Sample (g): 323.93

T (°C) 26

## Uniform sand low in fines



| Sieve opening (ps)<br>di (mm) | Mass of retained (mr)<br>(g) | mass fraction (mf) | Percent Passing (pp) |
|-------------------------------|------------------------------|--------------------|----------------------|
| 2                             | 0.00                         | 0.00               | 100.00               |
| 0.85                          | 0.63                         | 0.00               | 99.81                |
| 0.425                         | 40.11                        | 0.12               | 87.42                |
| 0.25                          | 178.74                       | 0.55               | 32.24                |
| 0.18                          | 69.55                        | 0.21               | 10.77                |
| 0.15                          | 19.84                        | 0.06               | 4.65                 |
| 0.106                         | 11.53                        | 0.04               | 1.09                 |
| 0.075                         | 2.79                         | 0.01               | 0.23                 |
| 0.00001                       | 0.74                         | 0.00               | 0.00                 |

| Effective Grain Diameters (mm) |       | Other Useful Parameters     |             |
|--------------------------------|-------|-----------------------------|-------------|
| d10                            | 0.176 | Uniformity Coef.            | 1.92        |
| d17                            | 0.200 | n computed                  | 0.43        |
| d20                            | 0.210 | g (cm/s <sup>2</sup> )      | 980.00      |
| d30                            | 0.243 | ρ (g/cm <sup>3</sup> )      | 0.9968      |
| d50                            | 0.306 | μ (g/cm s)                  | 0.0085      |
| d60                            | 0.338 | ρg/μ (1/cm s)               | 1.1461E+05  |
| de (Kruger)                    | 0.275 | tau (Sauerbrei)             | 1.209       |
| de (Kozeny)                    | 0.008 | d <sub>geometric mean</sub> | 0.292       |
| de (Zunker)                    | 0.034 | σ <sub>ψ</sub>              | 0.597       |
| de (Zamarin)                   | 0.256 |                             |             |
| lo (Alyameni)                  | 0.144 | 99.77155558                 | % in sample |
| mm                             |       | Boulder                     |             |
| >64                            |       | coarse gravel               |             |
| 16 - 64                        |       | medium gravel               |             |
| 8 - 16                         |       | fine gravel                 | 0           |
| 2 - 8                          |       | coarse sand                 | 0.19        |
| 0.5 - 2                        |       | medium sand                 | 67.56       |
| 0.25 - 0.5                     |       | fine sand                   | 32.02       |
| 0.063 - 0.25                   |       | coarse silt                 |             |
| 0.016 - 0.063                  |       | medium silt                 |             |
| 0.008 - 0.016                  |       |                             |             |
| 0.002 - 0.008                  |       | % fines                     |             |





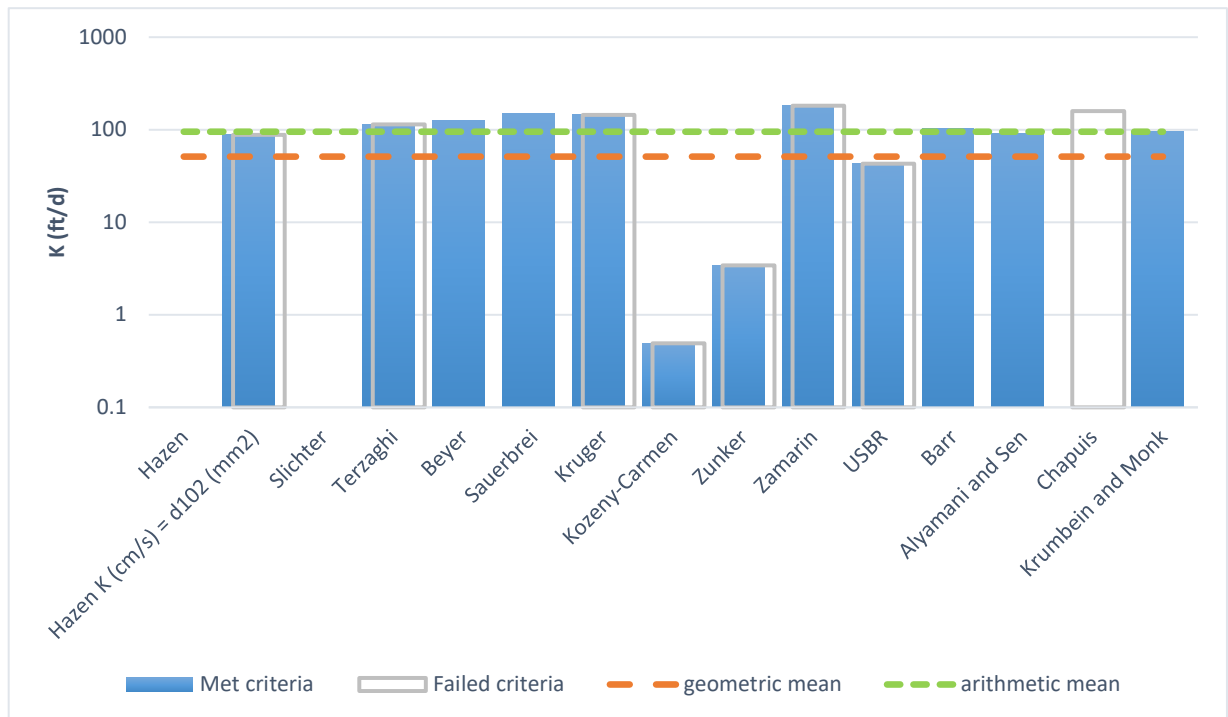
# K from Grain Size Analysis Report

Sample Name: POS-17 23-25 ft bls

Mass Sample (g): 323.93

T (°C) 26

## Uniform sand low in fines



| Estimation of Hydraulic Conductivity  | cm/s    | m/s     | ft/d |
|---------------------------------------|---------|---------|------|
| Hazen                                 | .64E-01 | .58E-03 | 165  |
| Hazen K (cm/s) = d <sub>10</sub> (mm) | .34E-01 | .31E-03 | 88   |
| Slichter                              | .25E-01 | .23E-03 | 65   |
| Terzaghi                              | .44E-01 | .40E-03 | 114  |
| Beyer                                 | .49E-01 | .45E-03 | 127  |
| Sauerbrei                             | .58E-01 | .53E-03 | 150  |
| Kruger                                | .57E-01 | .51E-03 | 144  |
| Kozeny-Carmen                         | .92E-03 | .17E-05 | 0    |
| Zunker                                | .51E-02 | .12E-04 | 3    |
| Zamarin                               | .76E-01 | .64E-03 | 182  |
| USBR                                  | .17E-01 | .15E-03 | 43   |
| Barr                                  | .40E-01 | .36E-03 | 103  |
| Alyamani and Sen                      | .36E-01 | .32E-03 | 92   |
| Chapuis                               | .63E-01 | .56E-03 | 158  |
| Krumbein and Monk                     | .36E-01 | .34E-03 | 95   |
| geometric mean                        | .27E-01 | .27E-03 | 75   |
| arithmetic mean                       | .40E-01 | .40E-03 | 113  |



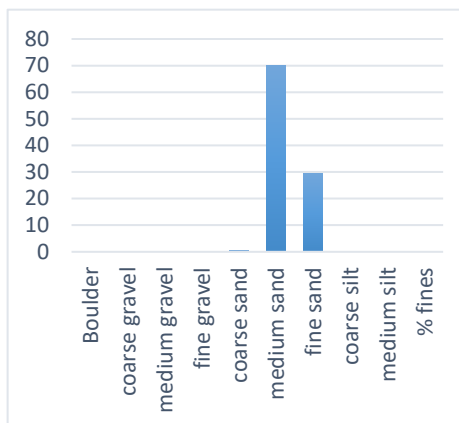
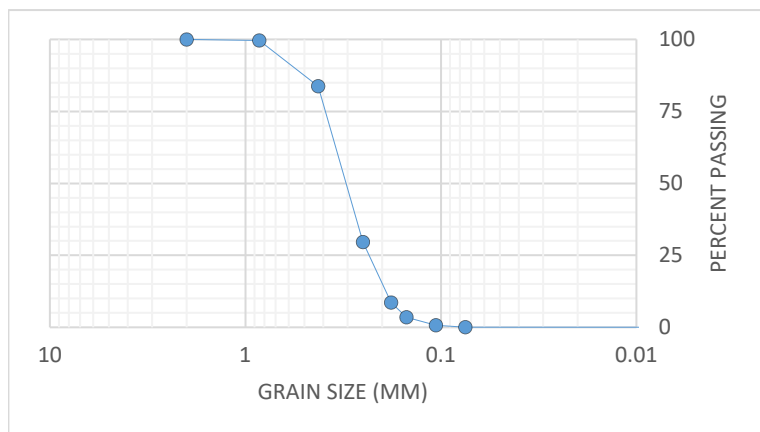
# Grain Size Analysis Report

Sample Name: POS-17 25-27 ft bls

Mass Sample (g): 365.8

T (°C) 26

## Uniform sand low in fines



| Sieve opening (ps)<br>di (mm) | Mass of retained (mr)<br>(g) | mass fraction (mf) | Percent Passing (pp) |
|-------------------------------|------------------------------|--------------------|----------------------|
| 2                             | 0.00                         | 0.00               | 100.00               |
| 0.85                          | 1.53                         | 0.00               | 99.58                |
| 0.425                         | 58.06                        | 0.16               | 83.71                |
| 0.25                          | 198.08                       | 0.54               | 29.56                |
| 0.18                          | 76.58                        | 0.21               | 8.62                 |
| 0.15                          | 18.91                        | 0.05               | 3.46                 |
| 0.106                         | 10.11                        | 0.03               | 0.69                 |
| 0.075                         | 2.18                         | 0.01               | 0.10                 |
| 0.00001                       | 0.35                         | 0.00               | 0.00                 |

| Effective Grain Diameters (mm) |       | Other Useful Parameters     |             |
|--------------------------------|-------|-----------------------------|-------------|
| d10                            | 0.185 | Uniformity Coef.            | 1.89        |
| d17                            | 0.208 | n computed                  | 0.43        |
| d20                            | 0.218 | g (cm/s <sup>2</sup> )      | 980.00      |
| d30                            | 0.251 | ρ (g/cm <sup>3</sup> )      | 0.9968      |
| d50                            | 0.316 | μ (g/cm s)                  | 0.0085      |
| d60                            | 0.348 | ρg/μ (1/cm s)               | 1.1461E+05  |
| de (Kruger)                    | 0.290 | tau (Sauerbrei)             | 1.209       |
| de (Kozeny)                    | 0.019 | d <sub>geometric mean</sub> | 0.304       |
| de (Zunker)                    | 0.070 | σ <sub>ψ</sub>              | 0.603       |
| de (Zamarin)                   | 0.278 |                             |             |
| lo (Alyameni)                  | 0.152 | 100                         | % in sample |
| mm                             |       | Boulder                     |             |
| >64                            |       | coarse gravel               |             |
| 16 - 64                        |       | medium gravel               |             |
| 8 - 16                         |       | fine gravel                 |             |
| 2 - 8                          |       | coarse sand                 | 0.42        |
| 0.5 - 2                        |       | medium sand                 | 70.02       |
| 0.25 - 0.5                     |       | fine sand                   | 29.46       |
| 0.063 - 0.25                   |       | coarse silt                 |             |
| 0.016 - 0.063                  |       | medium silt                 |             |
| 0.008 - 0.016                  |       |                             |             |
| 0.002 - 0.008                  |       | % fines                     | 0.1         |



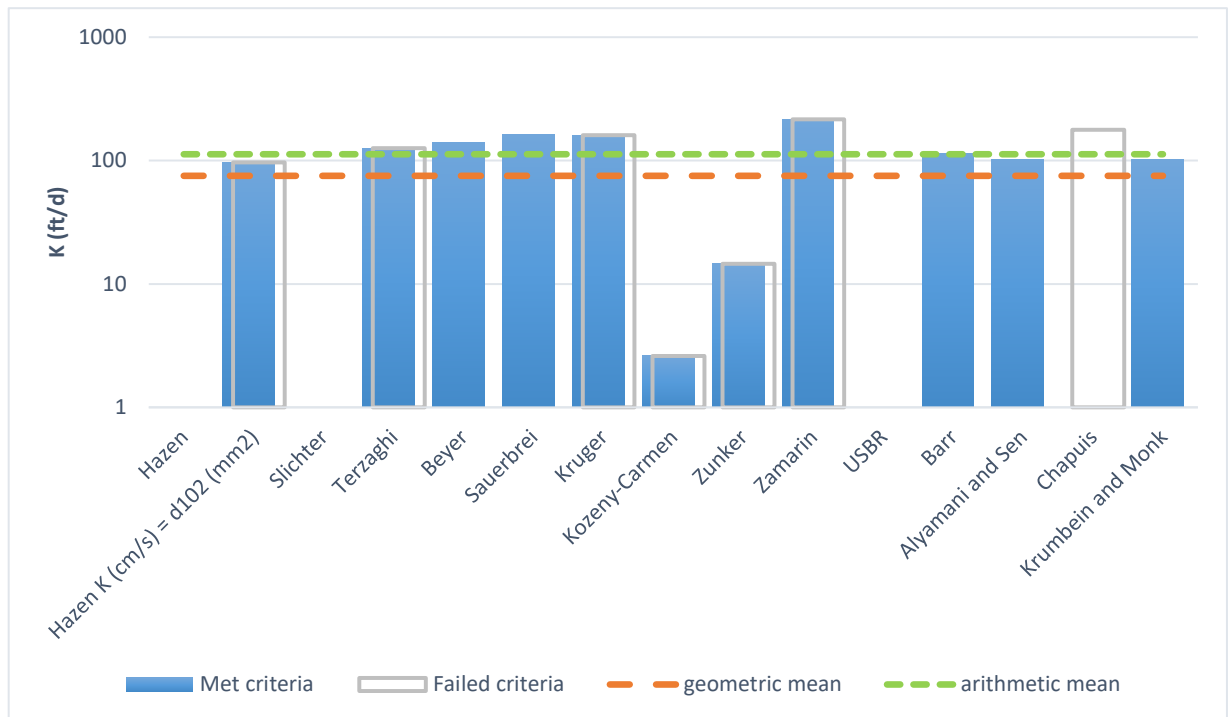
# K from Grain Size Analysis Report

Sample Name: POS-17 25-27 ft bls

Mass Sample (g): 365.8

T (°C) 26

## Uniform sand low in fines



| Estimation of Hydraulic Conductivity  | cm/s    | m/s     | ft/d |
|---------------------------------------|---------|---------|------|
| Hazen                                 | .64E-01 | .64E-03 | 182  |
| Hazen K (cm/s) = d <sub>10</sub> (mm) | .34E-01 | .34E-03 | 97   |
| Slichter                              | .25E-01 | .25E-03 | 71   |
| Terzaghi                              | .44E-01 | .44E-03 | 126  |
| Beyer                                 | .49E-01 | .49E-03 | 139  |
| Sauerbrei                             | .58E-01 | .58E-03 | 163  |
| Kruger                                | .57E-01 | .57E-03 | 161  |
| Kozeny-Carmen                         | .92E-03 | .92E-05 | 3    |
| Zunker                                | .51E-02 | .51E-04 | 15   |
| Zamarin                               | .76E-01 | .76E-03 | 216  |
| USBR                                  | .17E-01 | .17E-03 | 47   |
| Barr                                  | .40E-01 | .40E-03 | 114  |
| Alyamani and Sen                      | .36E-01 | .36E-03 | 102  |
| Chapuis                               | .63E-01 | .63E-03 | 178  |
| Krumbein and Monk                     | .36E-01 | .36E-03 | 102  |
| geometric mean                        | .27E-01 | .27E-03 | 75   |
| arithmetic mean                       | .40E-01 | .40E-03 | 113  |



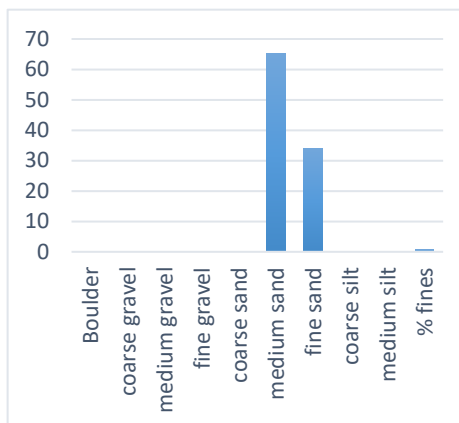
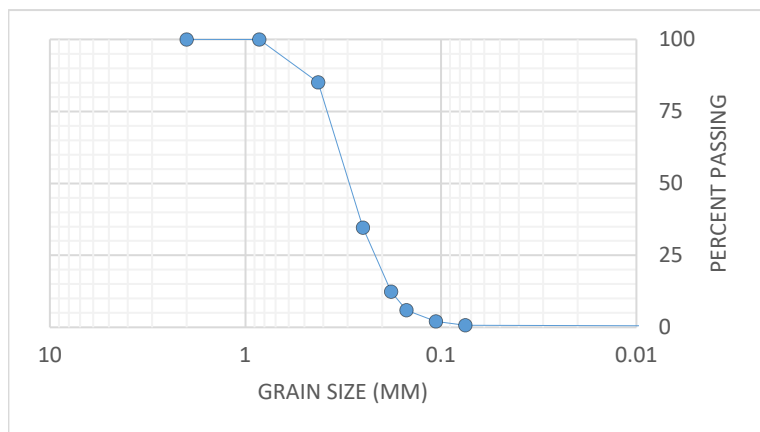
# Grain Size Analysis Report

Sample Name: POS-17 27-29 ft bls

Mass Sample (g): 280.45

T (°C) 26

## Uniform sand low in fines



| Sieve opening<br>(ps)<br>di (mm) | Mass of retained<br>(mr)<br>(g) | mass fraction<br>(mf) | Percent Passing<br>(pp) |
|----------------------------------|---------------------------------|-----------------------|-------------------------|
| 2                                | 0.00                            | 0.00                  | 100.00                  |
| 0.85                             | 0.25                            | 0.00                  | 99.91                   |
| 0.425                            | 41.47                           | 0.15                  | 85.12                   |
| 0.25                             | 141.74                          | 0.51                  | 34.58                   |
| 0.18                             | 62.39                           | 0.22                  | 12.34                   |
| 0.15                             | 17.89                           | 0.06                  | 5.96                    |
| 0.106                            | 11.11                           | 0.04                  | 2.00                    |
| 0.075                            | 3.63                            | 0.01                  | 0.70                    |
| 0.00001                          | 1.97                            | 0.01                  | 0.00                    |

| Effective Grain Diameters (mm) |       | Other Useful Parameters     |             |
|--------------------------------|-------|-----------------------------|-------------|
| d10                            | 0.169 | Uniformity Coef.            | 2.00        |
| d17                            | 0.195 | n computed                  | 0.43        |
| d20                            | 0.204 | g (cm/s <sup>2</sup> )      | 980.00      |
| d30                            | 0.236 | ρ (g/cm <sup>3</sup> )      | 0.9968      |
| d50                            | 0.303 | μ (g/cm s)                  | 0.0085      |
| d60                            | 0.338 | ρg/μ (1/cm s)               | 1.1461E+05  |
| de (Kruger)                    | 0.264 | tau (Sauerbrei)             | 1.209       |
| de (Kozeny)                    | 0.003 | d <sub>geometric mean</sub> | 0.290       |
| de (Zunker)                    | 0.012 | σ <sub>ψ</sub>              | 0.640       |
| de (Zamarin)                   | 0.222 |                             |             |
| lo (Alyameni)                  | 0.135 | 100                         | % in sample |
| mm                             |       | Boulder                     |             |
| >64                            |       | coarse gravel               |             |
| 16 - 64                        |       | medium gravel               |             |
| 8 - 16                         |       | fine gravel                 |             |
| 2 - 8                          |       | coarse sand                 | 0.09        |
| 0.5 - 2                        |       | medium sand                 | 65.33       |
| 0.25 - 0.5                     |       | fine sand                   | 33.88       |
| 0.063 - 0.25                   |       | coarse silt                 |             |
| 0.016 - 0.063                  |       | medium silt                 |             |
| 0.008 - 0.016                  |       |                             |             |
| 0.002 - 0.008                  |       | % fines                     | 0.7         |





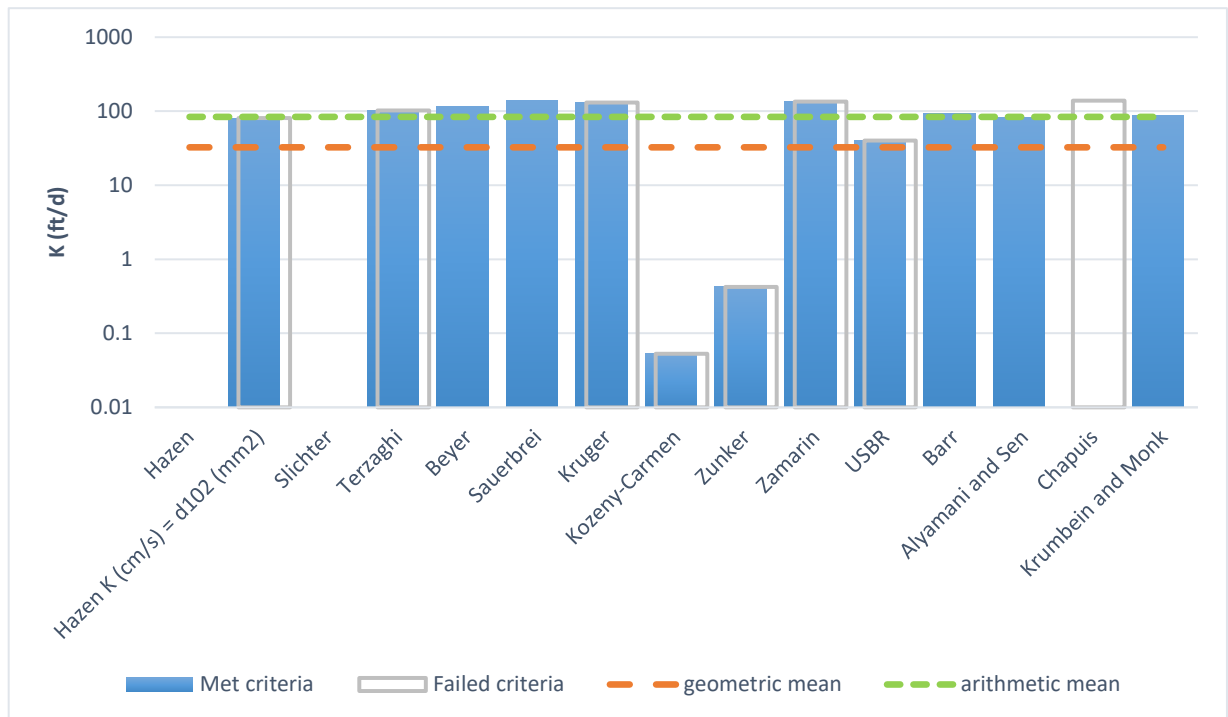
# K from Grain Size Analysis Report

Sample Name: POS-17 27-29 ft bls

Mass Sample (g): 280.45

T (°C) 26

## Uniform sand low in fines



| Estimation of Hydraulic Conductivity  | cm/s    | m/s     | ft/d |
|---------------------------------------|---------|---------|------|
| Hazen                                 | .53E-01 | .53E-03 | 151  |
| Hazen K (cm/s) = d <sub>10</sub> (mm) | .29E-01 | .29E-03 | 81   |
| Slichter                              | .21E-01 | .21E-03 | 58   |
| Terzaghi                              | .36E-01 | .36E-03 | 103  |
| Beyer                                 | .41E-01 | .41E-03 | 116  |
| Sauerbrei                             | .49E-01 | .49E-03 | 138  |
| Kruger                                | .46E-01 | .46E-03 | 131  |
| Kozeny-Carmen                         | .19E-04 | .19E-06 | 0    |
| Zunker                                | .15E-03 | .15E-05 | 0    |
| Zamarin                               | .48E-01 | .48E-03 | 135  |
| USBR                                  | .14E-01 | .14E-03 | 40   |
| Barr                                  | .32E-01 | .32E-03 | 92   |
| Alyamani and Sen                      | .29E-01 | .29E-03 | 82   |
| Chapuis                               | .49E-01 | .49E-03 | 139  |
| Krumbein and Monk                     | .31E-01 | .31E-03 | 89   |
| geometric mean                        | .11E-01 | .11E-03 | 33   |
| arithmetic mean                       | .30E-01 | .30E-03 | 84   |



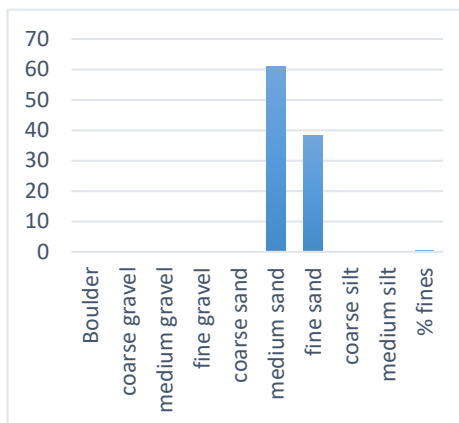
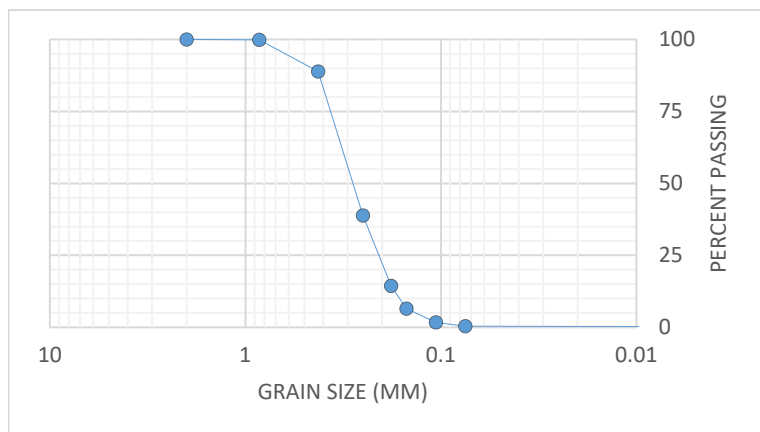
# Grain Size Analysis Report

Sample Name: POS-17 29-31 ft bls

Mass Sample (g): 311.11

T (°C) 26

## Uniform sand low in fines



| Sieve opening<br>(ps)<br>di (mm) | Mass of retained<br>(mr)<br>(g) | mass fraction<br>(mf) | Percent Passing<br>(pp) |
|----------------------------------|---------------------------------|-----------------------|-------------------------|
| 2                                | 0.00                            | 0.00                  | 100.00                  |
| 0.85                             | 0.52                            | 0.00                  | 99.83                   |
| 0.425                            | 34.15                           | 0.11                  | 88.86                   |
| 0.25                             | 155.74                          | 0.50                  | 38.80                   |
| 0.18                             | 75.84                           | 0.24                  | 14.42                   |
| 0.15                             | 24.49                           | 0.08                  | 6.55                    |
| 0.106                            | 15.11                           | 0.05                  | 1.69                    |
| 0.075                            | 4.04                            | 0.01                  | 0.39                    |
| 0.00001                          | 1.22                            | 0.00                  | 0.00                    |

| Effective Grain Diameters (mm) |       | Other Useful Parameters     |             |
|--------------------------------|-------|-----------------------------|-------------|
| d10                            | 0.163 | Uniformity Coef.            | 1.99        |
| d17                            | 0.187 | n computed                  | 0.43        |
| d20                            | 0.196 | g (cm/s <sup>2</sup> )      | 980.00      |
| d30                            | 0.225 | ρ (g/cm <sup>3</sup> )      | 0.9968      |
| d50                            | 0.289 | μ (g/cm s)                  | 0.0085      |
| d60                            | 0.324 | ρg/μ (1/cm s)               | 1.1461E+05  |
| de (Kruger)                    | 0.257 | tau (Sauerbrei)             | 1.209       |
| de (Kozeny)                    | 0.005 | d <sub>geometric mean</sub> | 0.279       |
| de (Zunker)                    | 0.021 | σ <sub>ψ</sub>              | 0.632       |
| de (Zamarin)                   | 0.232 |                             |             |
| lo (Alyameni)                  | 0.132 | 100                         | % in sample |
| mm                             |       | Boulder                     |             |
| >64                            |       | coarse gravel               |             |
| 16 - 64                        |       | medium gravel               |             |
| 8 - 16                         |       | fine gravel                 | 0           |
| 2 - 8                          |       | coarse sand                 | 0.17        |
| 0.5 - 2                        |       | medium sand                 | 61.04       |
| 0.25 - 0.5                     |       | fine sand                   | 38.4        |
| 0.063 - 0.25                   |       | coarse silt                 |             |
| 0.016 - 0.063                  |       | medium silt                 |             |
| 0.008 - 0.016                  |       |                             |             |
| 0.002 - 0.008                  |       | % fines                     | 0.39        |



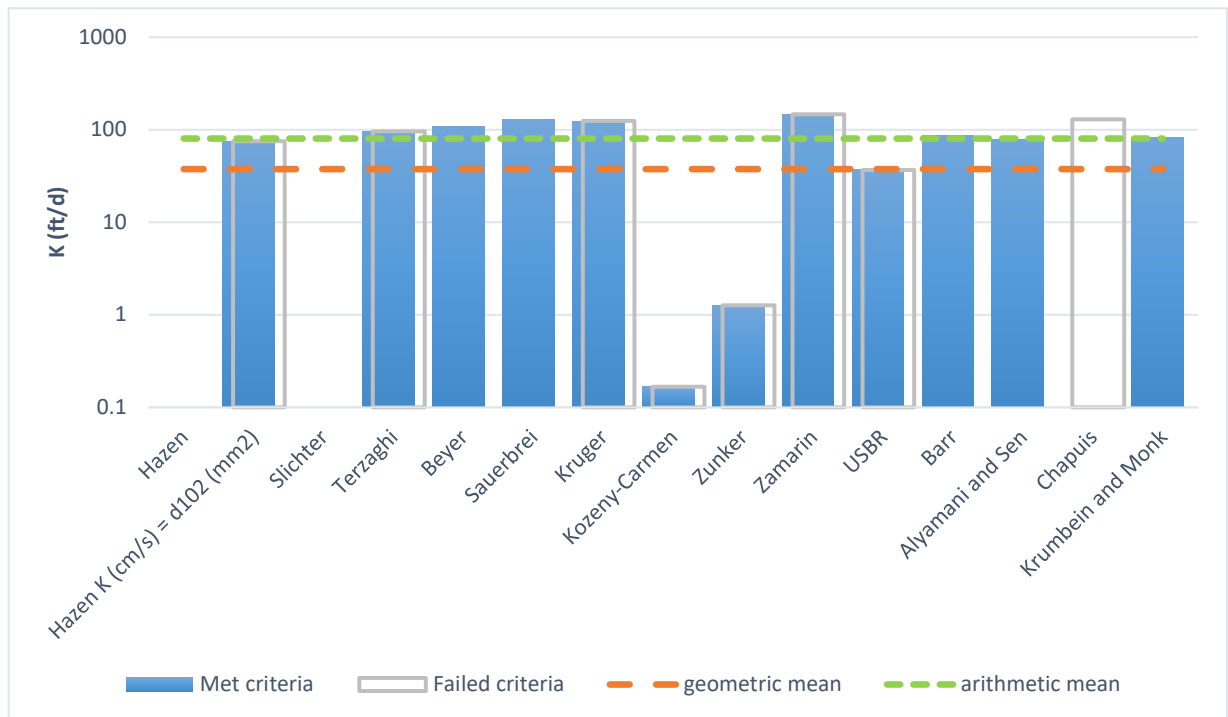
## K from Grain Size Analysis Report

Sample Name: POS-17 29-31 ft bls

Mass Sample (g): 311.11

T (°C) 26

### Uniform sand low in fines



| Estimation of Hydraulic Conductivity  | cm/s    | m/s     | ft/d |
|---------------------------------------|---------|---------|------|
| Hazen                                 | .50E-01 | .50E-03 | 141  |
| Hazen K (cm/s) = d <sub>10</sub> (mm) | .27E-01 | .27E-03 | 75   |
| Slichter                              | .19E-01 | .19E-03 | 54   |
| Terzaghi                              | .34E-01 | .34E-03 | 96   |
| Beyer                                 | .38E-01 | .38E-03 | 108  |
| Sauerbrei                             | .45E-01 | .45E-03 | 128  |
| Kruger                                | .44E-01 | .44E-03 | 124  |
| Kozeny-Carmen                         | .59E-04 | .59E-06 | 0    |
| Zunker                                | .45E-03 | .45E-05 | 1    |
| Zamarin                               | .52E-01 | .52E-03 | 147  |
| USBR                                  | .13E-01 | .13E-03 | 37   |
| Barr                                  | .30E-01 | .30E-03 | 86   |
| Alyamani and Sen                      | .27E-01 | .27E-03 | 77   |
| Chapuis                               | .46E-01 | .46E-03 | 129  |
| Krumbein and Monk                     | .29E-01 | .29E-03 | 83   |
| geometric mean                        | .13E-01 | .13E-03 | 38   |
| arithmetic mean                       | .28E-01 | .28E-03 | 80   |



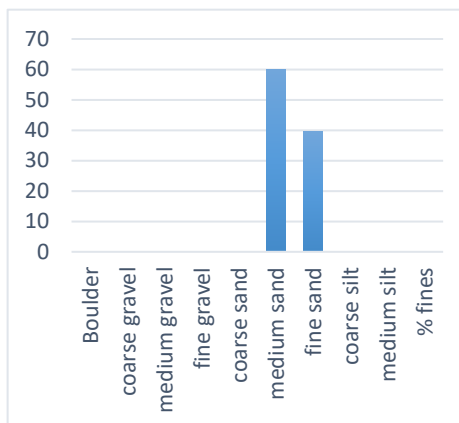
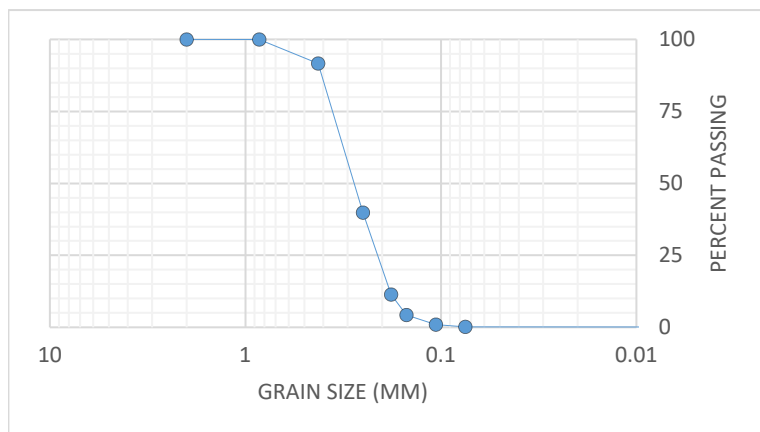
# Grain Size Analysis Report

Sample Name: POS-18 5-7 ft bls

Mass Sample (g): 309.79

T (°C) 26

## Uniform sand low in fines



| Sieve opening (ps) di (mm) | Mass of retained (mr) (g) | mass fraction (mf) | Percent Passing (pp) |
|----------------------------|---------------------------|--------------------|----------------------|
| 2                          | 0.00                      | 0.00               | 100.00               |
| 0.85                       | 0.09                      | 0.00               | 99.97                |
| 0.425                      | 25.70                     | 0.08               | 91.68                |
| 0.25                       | 160.50                    | 0.52               | 39.87                |
| 0.18                       | 88.38                     | 0.29               | 11.34                |
| 0.15                       | 21.94                     | 0.07               | 4.25                 |
| 0.106                      | 10.39                     | 0.03               | 0.90                 |
| 0.075                      | 2.23                      | 0.01               | 0.18                 |
| 0.00001                    | 0.56                      | 0.00               | 0.00                 |

| Effective Grain Diameters (mm) |       | Other Useful Parameters     |             |
|--------------------------------|-------|-----------------------------|-------------|
| d10                            | 0.174 | Uniformity Coef.            | 1.82        |
| d17                            | 0.194 | n computed                  | 0.44        |
| d20                            | 0.201 | g (cm/s <sup>2</sup> )      | 980.00      |
| d30                            | 0.226 | ρ (g/cm <sup>3</sup> )      | 0.9968      |
| d50                            | 0.284 | μ (g/cm s)                  | 0.0085      |
| d60                            | 0.318 | ρg/μ (1/cm s)               | 1.1461E+05  |
| de (Kruger)                    | 0.262 | tau (Sauerbrei)             | 1.209       |
| de (Kozeny)                    | 0.011 | d <sub>geometric mean</sub> | 0.279       |
| de (Zunker)                    | 0.041 | σ <sub>ψ</sub>              | 0.562       |
| de (Zamarin)                   | 0.248 |                             |             |
| lo (Alyameni)                  | 0.147 | 100                         | % in sample |
| mm                             |       | Boulder                     |             |
| >64                            |       | coarse gravel               |             |
| 16 - 64                        |       | medium gravel               |             |
| 8 - 16                         |       | fine gravel                 |             |
| 2 - 8                          |       | coarse sand                 | 0.03        |
| 0.5 - 2                        |       | medium sand                 | 60.11       |
| 0.25 - 0.5                     |       | fine sand                   | 39.68       |
| 0.063 - 0.25                   |       | coarse silt                 |             |
| 0.016 - 0.063                  |       | medium silt                 |             |
| 0.008 - 0.016                  |       |                             |             |
| 0.002 - 0.008                  |       | % fines                     | 0.18        |



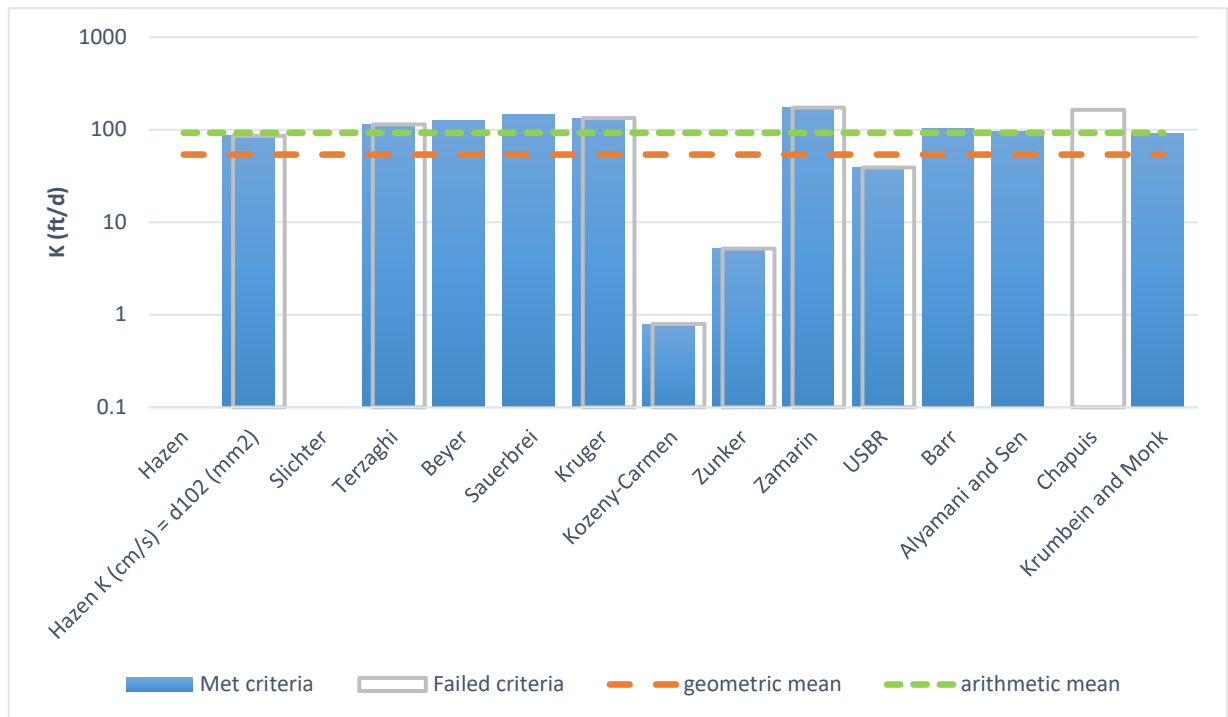
# K from Grain Size Analysis Report

Sample Name: POS-18 5-7 ft bls

Mass Sample (g): 309.79

T (°C) 26

## Uniform sand low in fines



| Estimation of Hydraulic Conductivity  | cm/s    | m/s     | ft/d |
|---------------------------------------|---------|---------|------|
| Hazen                                 | .58E-01 | .58E-03 | 164  |
| Hazen K (cm/s) = d <sub>10</sub> (mm) | .30E-01 | .30E-03 | 86   |
| Slichter                              | .23E-01 | .23E-03 | 65   |
| Terzaghi                              | .40E-01 | .40E-03 | 114  |
| Beyer                                 | .44E-01 | .44E-03 | 125  |
| Sauerbrei                             | .51E-01 | .51E-03 | 145  |
| Kruger                                | .47E-01 | .47E-03 | 134  |
| Kozeny-Carmen                         | .28E-03 | .28E-05 | 1    |
| Zunker                                | .18E-02 | .18E-04 | 5    |
| Zamarin                               | .61E-01 | .61E-03 | 174  |
| USBR                                  | .14E-01 | .14E-03 | 39   |
| Barr                                  | .37E-01 | .37E-03 | 104  |
| Alyamani and Sen                      | .34E-01 | .34E-03 | 95   |
| Chapuis                               | .58E-01 | .58E-03 | 164  |
| Krumbein and Monk                     | .32E-01 | .32E-03 | 91   |
| geometric mean                        | .19E-01 | .19E-03 | 54   |
| arithmetic mean                       | .33E-01 | .33E-03 | 93   |





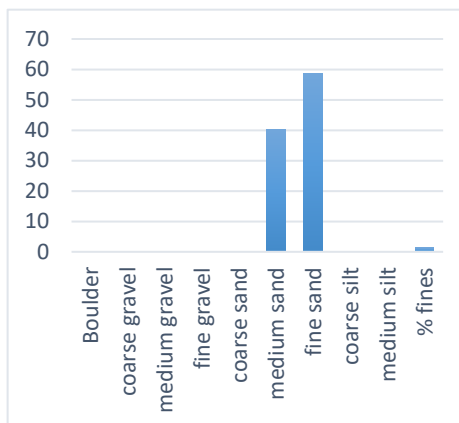
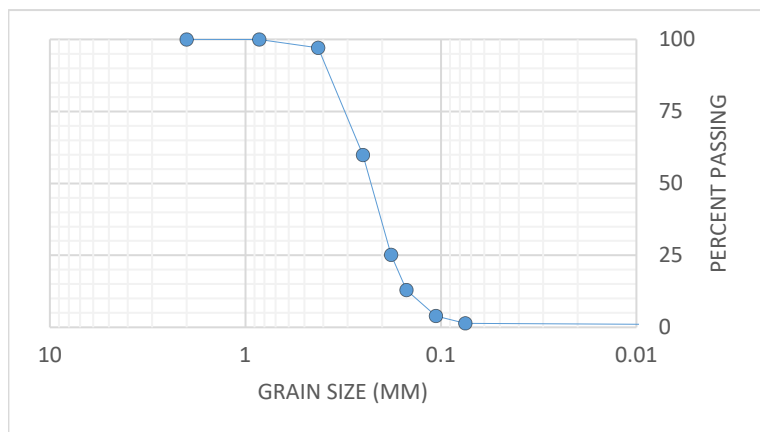
# Grain Size Analysis Report

Sample Name: POS-18 7-9 ft bls

Mass Sample (g): 289.58

T (°C) 26

## Uniform sand low in fines



| Sieve opening (ps)<br>di (mm) | Mass of retained (mr)<br>(g) | mass fraction (mf) | Percent Passing (pp) |
|-------------------------------|------------------------------|--------------------|----------------------|
| 2                             | 0.00                         | 0.00               | 100.00               |
| 0.85                          | 0.01                         | 0.00               | 100.00               |
| 0.425                         | 8.59                         | 0.03               | 97.03                |
| 0.25                          | 107.56                       | 0.37               | 59.89                |
| 0.18                          | 100.44                       | 0.35               | 25.20                |
| 0.15                          | 35.47                        | 0.12               | 12.95                |
| 0.106                         | 26.08                        | 0.09               | 3.95                 |
| 0.075                         | 7.48                         | 0.03               | 1.36                 |
| 0.00001                       | 3.95                         | 0.01               | 0.00                 |

| Effective Grain Diameters (mm) |       | Other Useful Parameters     |             |
|--------------------------------|-------|-----------------------------|-------------|
| d10                            | 0.136 | Uniformity Coef.            | 1.85        |
| d17                            | 0.160 | n computed                  | 0.44        |
| d20                            | 0.167 | g (cm/s <sup>2</sup> )      | 980.00      |
| d30                            | 0.190 | ρ (g/cm <sup>3</sup> )      | 0.9968      |
| d50                            | 0.230 | μ (g/cm s)                  | 0.0085      |
| d60                            | 0.251 | ρg/μ (1/cm s)               | 1.1461E+05  |
| de (Kruger)                    | 0.206 | tau (Sauerbrei)             | 1.209       |
| de (Kozeny)                    | 0.001 | d <sub>geometric mean</sub> | 0.236       |
| de (Zunker)                    | 0.006 | σ <sub>ψ</sub>              | 0.590       |
| de (Zamarin)                   | 0.162 |                             |             |
| lo (Alyameni)                  | 0.112 | 100                         | % in sample |
| mm                             |       | Boulder                     |             |
| >64                            |       | coarse gravel               |             |
| 16 - 64                        |       | medium gravel               |             |
| 8 - 16                         |       | fine gravel                 |             |
| 2 - 8                          |       | coarse sand                 | 0           |
| 0.5 - 2                        |       | medium sand                 | 40.11       |
| 0.25 - 0.5                     |       | fine sand                   | 58.52       |
| 0.063 - 0.25                   |       | coarse silt                 |             |
| 0.016 - 0.063                  |       | medium silt                 |             |
| 0.008 - 0.016                  |       |                             |             |
| 0.002 - 0.008                  |       | % fines                     | 1.36        |



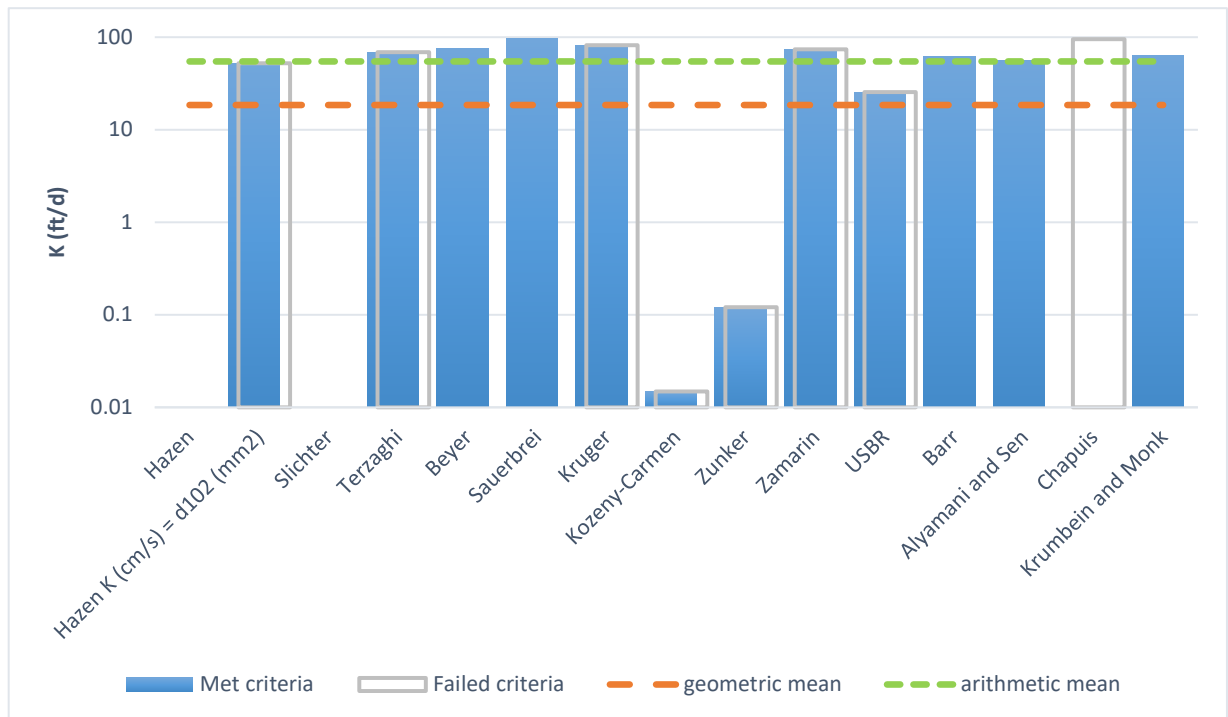
## K from Grain Size Analysis Report

Sample Name: POS-18 7-9 ft bls

Mass Sample (g): 289.58

T (°C) 26

### Uniform sand low in fines



| Estimation of Hydraulic Conductivity  | cm/s    | m/s     | ft/d |
|---------------------------------------|---------|---------|------|
| Hazen                                 | .35E-01 | .35E-03 | 99   |
| Hazen K (cm/s) = d <sub>10</sub> (mm) | .18E-01 | .18E-03 | 52   |
| Slichter                              | .14E-01 | .14E-03 | 39   |
| Terzaghi                              | .24E-01 | .24E-03 | 69   |
| Beyer                                 | .27E-01 | .27E-03 | 76   |
| Sauerbrei                             | .35E-01 | .35E-03 | 98   |
| Kruger                                | .29E-01 | .29E-03 | 82   |
| Kozeny-Carmen                         | .52E-05 | .52E-07 | 0    |
| Zunker                                | .43E-04 | .43E-06 | 0    |
| Zamarin                               | .26E-01 | .26E-03 | 74   |
| USBR                                  | .90E-02 | .90E-04 | 26   |
| Barr                                  | .22E-01 | .22E-03 | 62   |
| Alyamani and Sen                      | .20E-01 | .20E-03 | 56   |
| Chapuis                               | .33E-01 | .33E-03 | 95   |
| Krumbein and Monk                     | .22E-01 | .22E-03 | 63   |
| geometric mean                        | .65E-02 | .65E-04 | 18   |
| arithmetic mean                       | .19E-01 | .19E-03 | 55   |



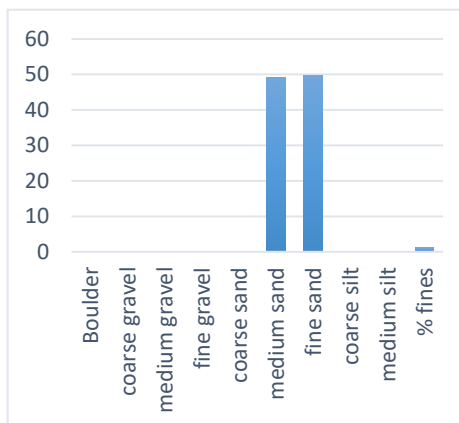
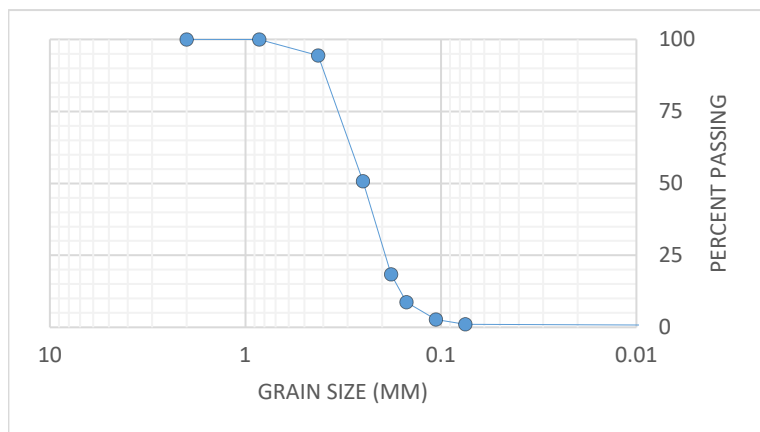
# Grain Size Analysis Report

Sample Name: POS-18 9-11 ft bls

Mass Sample (g): 354.99

T (°C) 26

## Uniform sand low in fines



| Sieve opening<br>(ps)<br>di (mm) | Mass of retained<br>(mr)<br>(g) | mass fraction<br>(mf) | Percent Passing<br>(pp) |
|----------------------------------|---------------------------------|-----------------------|-------------------------|
| 2                                | 0.00                            | 0.00                  | 100.00                  |
| 0.85                             | 0.09                            | 0.00                  | 99.97                   |
| 0.425                            | 19.69                           | 0.06                  | 94.43                   |
| 0.25                             | 155.24                          | 0.44                  | 50.70                   |
| 0.18                             | 114.70                          | 0.32                  | 18.39                   |
| 0.15                             | 34.29                           | 0.10                  | 8.73                    |
| 0.106                            | 21.19                           | 0.06                  | 2.76                    |
| 0.075                            | 5.95                            | 0.02                  | 1.08                    |
| 0.00001                          | 3.84                            | 0.01                  | 0.00                    |

| Effective Grain Diameters (mm) |       | Other Useful Parameters     |             |
|--------------------------------|-------|-----------------------------|-------------|
| d10                            | 0.154 | Uniformity Coef.            | 1.87        |
| d17                            | 0.176 | n computed                  | 0.44        |
| d20                            | 0.183 | g (cm/s <sup>2</sup> )      | 980.00      |
| d30                            | 0.205 | ρ (g/cm <sup>3</sup> )      | 0.9968      |
| d50                            | 0.248 | μ (g/cm s)                  | 0.0085      |
| d60                            | 0.287 | ρg/μ (1/cm s)               | 1.1461E+05  |
| de (Kruger)                    | 0.227 | tau (Sauerbrei)             | 1.209       |
| de (Kozeny)                    | 0.002 | d <sub>geometric mean</sub> | 0.254       |
| de (Zunker)                    | 0.008 | σ <sub>ψ</sub>              | 0.581       |
| de (Zamarin)                   | 0.183 |                             |             |
| lo (Alyameni)                  | 0.130 | 100                         | % in sample |
| mm                             |       | Boulder                     |             |
| >64                            |       | coarse gravel               |             |
| 16 - 64                        |       | medium gravel               |             |
| 8 - 16                         |       | fine gravel                 |             |
| 2 - 8                          |       | coarse sand                 | 0.03        |
| 0.5 - 2                        |       | medium sand                 | 49.28       |
| 0.25 - 0.5                     |       | fine sand                   | 49.62       |
| 0.063 - 0.25                   |       | coarse silt                 |             |
| 0.016 - 0.063                  |       | medium silt                 |             |
| 0.008 - 0.016                  |       |                             |             |
| 0.002 - 0.008                  |       | % fines                     | 1.08        |



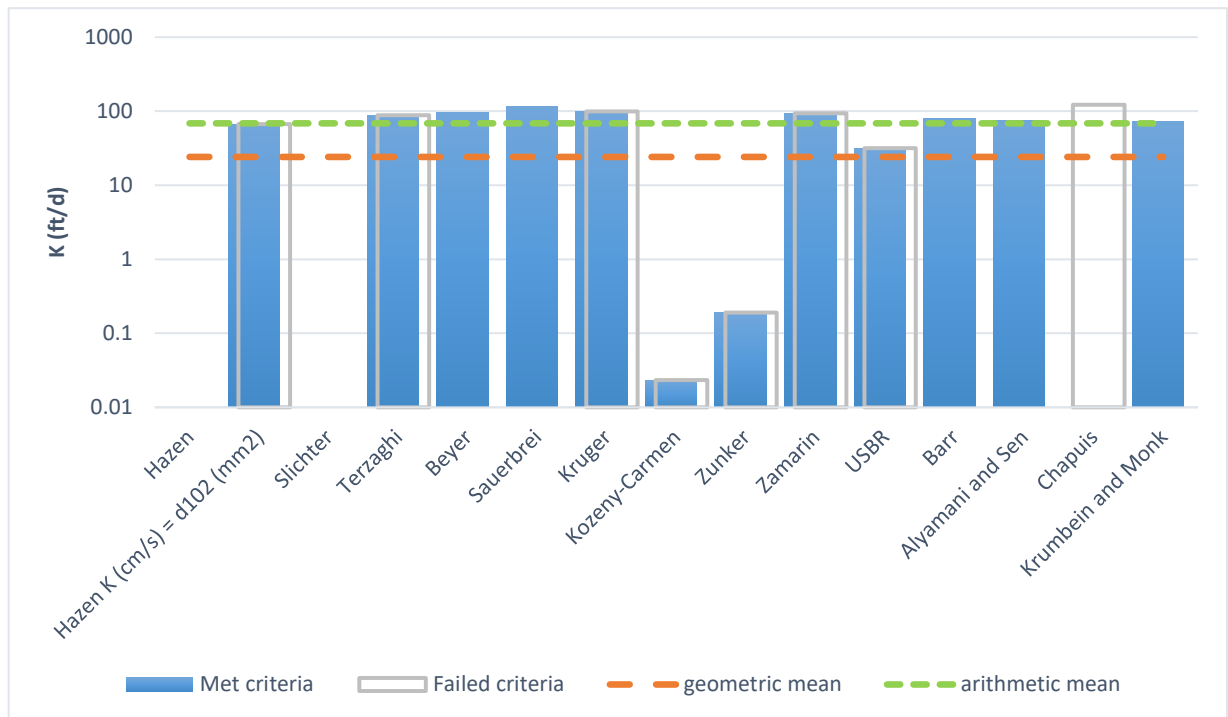
# K from Grain Size Analysis Report

Sample Name: POS-18 9-11 ft bls

Mass Sample (g): 354.99

T (°C) 26

## Uniform sand low in fines



| Estimation of Hydraulic Conductivity  | cm/s    | m/s     | ft/d |
|---------------------------------------|---------|---------|------|
| Hazen                                 | .45E-01 | .45E-03 | 127  |
| Hazen K (cm/s) = d <sub>10</sub> (mm) | .24E-01 | .24E-03 | 67   |
| Slichter                              | .18E-01 | .18E-03 | 50   |
| Terzaghi                              | .31E-01 | .31E-03 | 88   |
| Beyer                                 | .34E-01 | .34E-03 | 97   |
| Sauerbrei                             | .41E-01 | .41E-03 | 117  |
| Kruger                                | .35E-01 | .35E-03 | 99   |
| Kozeny-Carmen                         | .83E-05 | .83E-07 | 0    |
| Zunker                                | .67E-04 | .67E-06 | 0    |
| Zamarin                               | .33E-01 | .33E-03 | 94   |
| USBR                                  | .11E-01 | .11E-03 | 32   |
| Barr                                  | .28E-01 | .28E-03 | 80   |
| Alyamani and Sen                      | .26E-01 | .26E-03 | 75   |
| Chapuis                               | .43E-01 | .43E-03 | 123  |
| Krumbein and Monk                     | .26E-01 | .26E-03 | 74   |
| geometric mean                        | .85E-02 | .85E-04 | 24   |
| arithmetic mean                       | .24E-01 | .24E-03 | 69   |



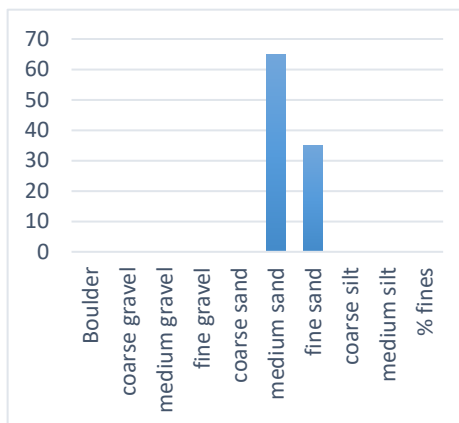
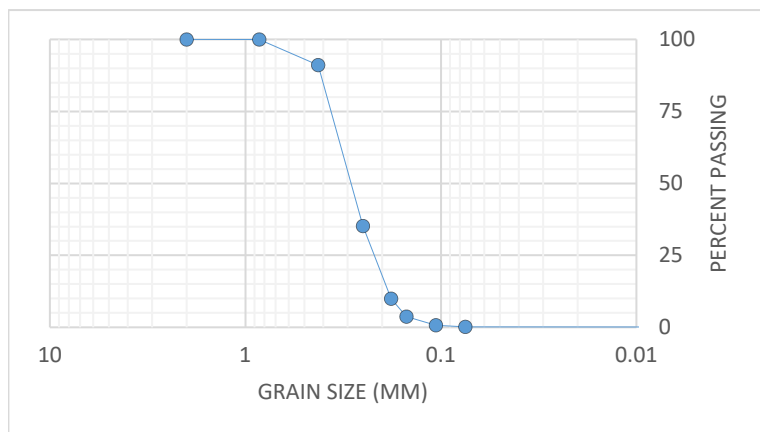
## Grain Size Analysis Report

Sample Name: POS-18 11-13 ft bls

Mass Sample (g): 341.44

T (°C) 26

### Uniform sand low in fines



| Sieve opening (ps)<br>di (mm) | Mass of retained (mr)<br>(g) | mass fraction (mf) | Percent Passing (pp) |
|-------------------------------|------------------------------|--------------------|----------------------|
| 2                             | 0.00                         | 0.00               | 100.00               |
| 0.85                          | 0.09                         | 0.00               | 99.97                |
| 0.425                         | 30.54                        | 0.09               | 91.03                |
| 0.25                          | 190.60                       | 0.56               | 35.21                |
| 0.18                          | 86.36                        | 0.25               | 9.91                 |
| 0.15                          | 21.09                        | 0.06               | 3.74                 |
| 0.106                         | 10.23                        | 0.03               | 0.74                 |
| 0.075                         | 2.12                         | 0.01               | 0.12                 |
| 0.00001                       | 0.41                         | 0.00               | 0.00                 |

| Effective Grain Diameters (mm) |       | Other Useful Parameters     |             |
|--------------------------------|-------|-----------------------------|-------------|
| d10                            | 0.180 | Uniformity Coef.            | 1.82        |
| d17                            | 0.200 | n computed                  | 0.44        |
| d20                            | 0.208 | g (cm/s <sup>2</sup> )      | 980.00      |
| d30                            | 0.236 | ρ (g/cm <sup>3</sup> )      | 0.9968      |
| d50                            | 0.296 | μ (g/cm s)                  | 0.0085      |
| d60                            | 0.328 | ρg/μ (1/cm s)               | 1.1461E+05  |
| de (Kruger)                    | 0.272 | tau (Sauerbrei)             | 1.209       |
| de (Kozeny)                    | 0.016 | d <sub>geometric mean</sub> | 0.287       |
| de (Zunker)                    | 0.058 | σ <sub>ψ</sub>              | 0.558       |
| de (Zamarin)                   | 0.260 |                             |             |
| lo (Alyameni)                  | 0.151 | 100                         | % in sample |
| mm                             |       | Boulder                     |             |
| >64                            |       | coarse gravel               |             |
| 16 - 64                        |       | medium gravel               |             |
| 8 - 16                         |       | fine gravel                 |             |
| 2 - 8                          |       | coarse sand                 | 0.03        |
| 0.5 - 2                        |       | medium sand                 | 64.77       |
| 0.25 - 0.5                     |       | fine sand                   | 35.09       |
| 0.063 - 0.25                   |       | coarse silt                 |             |
| 0.016 - 0.063                  |       | medium silt                 |             |
| 0.008 - 0.016                  |       |                             |             |
| 0.002 - 0.008                  |       | % fines                     | 0.12        |





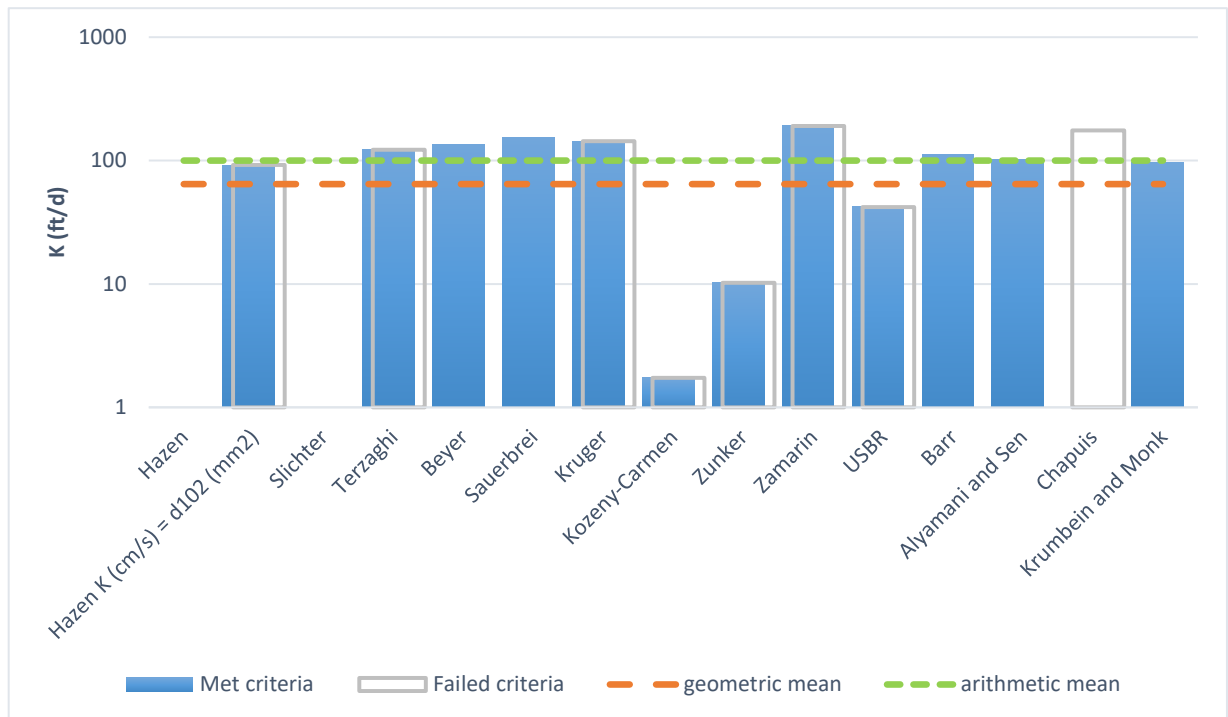
# K from Grain Size Analysis Report

Sample Name: POS-18 11-13 ft bls

Mass Sample (g): 341.44

T (°C) 26

## Uniform sand low in fines



| Estimation of Hydraulic Conductivity | cm/s    | m/s     | ft/d |
|--------------------------------------|---------|---------|------|
| Hazen                                | .62E-01 | .62E-03 | 175  |
| Hazen K (cm/s) = $d_{10}$ (mm)       | .32E-01 | .32E-03 | 92   |
| Slichter                             | .24E-01 | .24E-03 | 69   |
| Terzaghi                             | .43E-01 | .43E-03 | 122  |
| Beyer                                | .47E-01 | .47E-03 | 134  |
| Sauerbrei                            | .54E-01 | .54E-03 | 154  |
| Kruger                               | .51E-01 | .51E-03 | 144  |
| Kozeny-Carmen                        | .61E-03 | .61E-05 | 2    |
| Zunker                               | .36E-02 | .36E-04 | 10   |
| Zamarin                              | .67E-01 | .67E-03 | 191  |
| USBR                                 | .15E-01 | .15E-03 | 42   |
| Barr                                 | .39E-01 | .39E-03 | 111  |
| Alyamani and Sen                     | .36E-01 | .36E-03 | 101  |
| Chapuis                              | .62E-01 | .62E-03 | 176  |
| Krumbein and Monk                    | .34E-01 | .34E-03 | 96   |
| geometric mean                       | .23E-01 | .23E-03 | 64   |
| arithmetic mean                      | .35E-01 | .35E-03 | 100  |



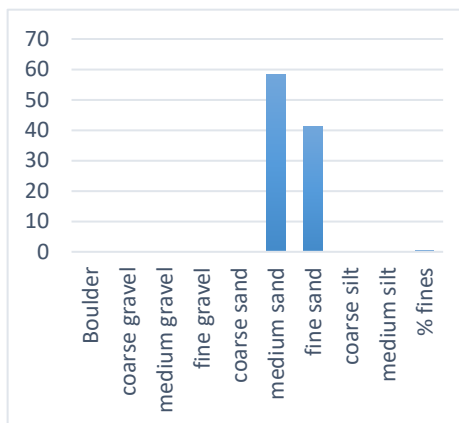
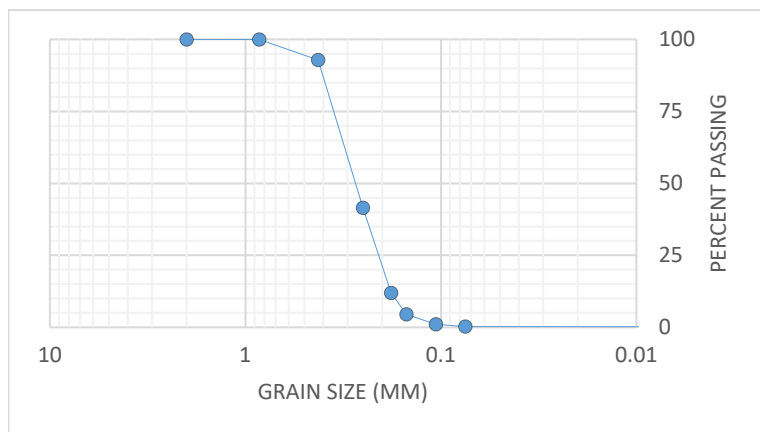
# Grain Size Analysis Report

Sample Name: POS-18 13-15 ft bls

Mass Sample (g): 311.12

T (°C) 26

## Uniform sand low in fines



| Sieve opening (ps) di (mm) | Mass of retained (mr) (g) | mass fraction (mf) | Percent Passing (pp) |
|----------------------------|---------------------------|--------------------|----------------------|
| 2                          | 0.00                      | 0.00               | 100.00               |
| 0.85                       | 0.09                      | 0.00               | 99.97                |
| 0.425                      | 22.27                     | 0.07               | 92.81                |
| 0.25                       | 159.59                    | 0.51               | 41.52                |
| 0.18                       | 92.16                     | 0.30               | 11.90                |
| 0.15                       | 23.14                     | 0.07               | 4.46                 |
| 0.106                      | 10.68                     | 0.03               | 1.03                 |
| 0.075                      | 2.29                      | 0.01               | 0.29                 |
| 0.00001                    | 0.90                      | 0.00               | 0.00                 |

| Effective Grain Diameters (mm) |       | Other Useful Parameters     |             |
|--------------------------------|-------|-----------------------------|-------------|
| d10                            | 0.172 | Uniformity Coef.            | 1.82        |
| d17                            | 0.192 | n computed                  | 0.44        |
| d20                            | 0.199 | g (cm/s <sup>2</sup> )      | 980.00      |
| d30                            | 0.223 | ρ (g/cm <sup>3</sup> )      | 0.9968      |
| d50                            | 0.279 | μ (g/cm s)                  | 0.0085      |
| d60                            | 0.313 | ρg/μ (1/cm s)               | 1.1461E+05  |
| de (Kruger)                    | 0.257 | tau (Sauerbrei)             | 1.209       |
| de (Kozeny)                    | 0.007 | d <sub>geometric mean</sub> | 0.276       |
| de (Zunker)                    | 0.028 | σ <sub>ψ</sub>              | 0.547       |
| de (Zamarin)                   | 0.237 |                             |             |
| lo (Alyameni)                  | 0.146 | 100                         | % in sample |
| mm                             |       | Boulder                     |             |
| >64                            |       | coarse gravel               |             |
| 16 - 64                        |       | medium gravel               |             |
| 8 - 16                         |       | fine gravel                 |             |
| 2 - 8                          |       | coarse sand                 | 0.03        |
| 0.5 - 2                        |       | medium sand                 | 58.45       |
| 0.25 - 0.5                     |       | fine sand                   | 41.23       |
| 0.063 - 0.25                   |       | coarse silt                 |             |
| 0.016 - 0.063                  |       | medium silt                 |             |
| 0.008 - 0.016                  |       |                             |             |
| 0.002 - 0.008                  |       | % fines                     | 0.29        |



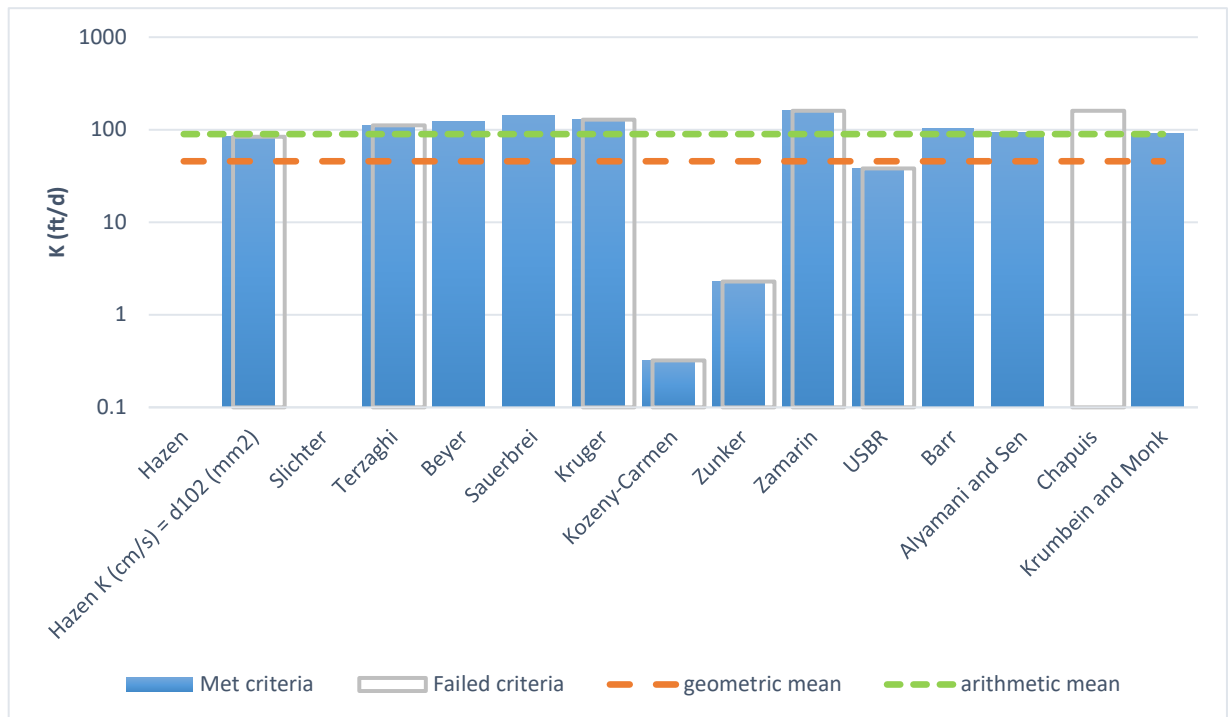
## K from Grain Size Analysis Report

Sample Name: POS-18 13-15 ft bls

Mass Sample (g): 311.12

T (°C) 26

### Uniform sand low in fines



| Estimation of Hydraulic Conductivity | cm/s    | m/s     | ft/d |
|--------------------------------------|---------|---------|------|
| Hazen                                | .57E-01 | .57E-03 | 160  |
| Hazen K (cm/s) = $d_{10}$ (mm)       | .30E-01 | .30E-03 | 84   |
| Slichter                             | .22E-01 | .22E-03 | 63   |
| Terzaghi                             | .39E-01 | .39E-03 | 112  |
| Beyer                                | .43E-01 | .43E-03 | 122  |
| Sauerbrei                            | .50E-01 | .50E-03 | 143  |
| Kruger                               | .45E-01 | .45E-03 | 129  |
| Kozeny-Carmen                        | .11E-03 | .11E-05 | 0    |
| Zunker                               | .81E-03 | .81E-05 | 2    |
| Zamarin                              | .56E-01 | .56E-03 | 160  |
| USBR                                 | .13E-01 | .13E-03 | 38   |
| Barr                                 | .36E-01 | .36E-03 | 102  |
| Alyamani and Sen                     | .33E-01 | .33E-03 | 94   |
| Chapuis                              | .57E-01 | .57E-03 | 160  |
| Krumbein and Monk                    | .32E-01 | .32E-03 | 90   |
| geometric mean                       | .16E-01 | .16E-03 | 46   |
| arithmetic mean                      | .32E-01 | .32E-03 | 90   |



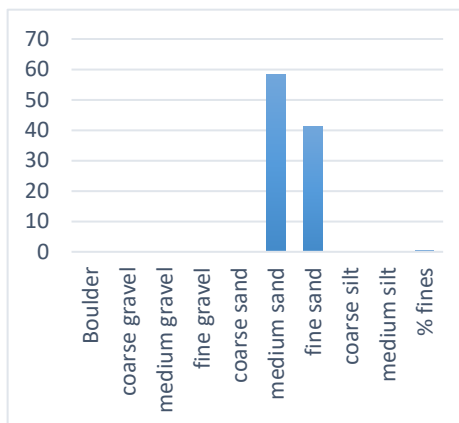
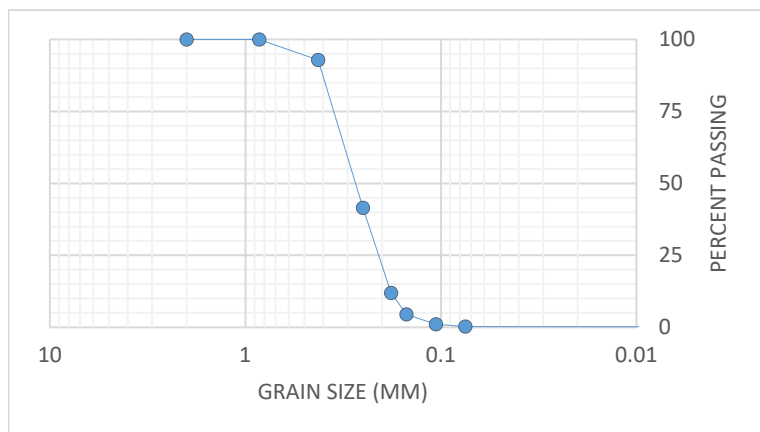
# Grain Size Analysis Report

Sample Name: POS-18 15-17 ft bls

Mass Sample (g): 311.12

T (°C) 26

## Uniform sand low in fines



| Sieve opening<br>(ps)<br>di (mm) | Mass of retained<br>(mr)<br>(g) | mass fraction<br>(mf) | Percent Passing<br>(pp) |
|----------------------------------|---------------------------------|-----------------------|-------------------------|
| 2                                | 0.00                            | 0.00                  | 100.00                  |
| 0.85                             | 0.09                            | 0.00                  | 99.97                   |
| 0.425                            | 22.27                           | 0.07                  | 92.81                   |
| 0.25                             | 159.59                          | 0.51                  | 41.52                   |
| 0.18                             | 92.16                           | 0.30                  | 11.90                   |
| 0.15                             | 23.14                           | 0.07                  | 4.46                    |
| 0.106                            | 10.68                           | 0.03                  | 1.03                    |
| 0.075                            | 2.29                            | 0.01                  | 0.29                    |
| 0.00001                          | 0.90                            | 0.00                  | 0.00                    |

| Effective Grain Diameters (mm) |       | Other Useful Parameters     |             |
|--------------------------------|-------|-----------------------------|-------------|
| d10                            | 0.172 | Uniformity Coef.            | 1.82        |
| d17                            | 0.192 | n computed                  | 0.44        |
| d20                            | 0.199 | g (cm/s <sup>2</sup> )      | 980.00      |
| d30                            | 0.223 | ρ (g/cm <sup>3</sup> )      | 0.9968      |
| d50                            | 0.279 | μ (g/cm s)                  | 0.0085      |
| d60                            | 0.313 | ρg/μ (1/cm s)               | 1.1461E+05  |
| de (Kruger)                    | 0.257 | tau (Sauerbrei)             | 1.209       |
| de (Kozeny)                    | 0.007 | d <sub>geometric mean</sub> | 0.276       |
| de (Zunker)                    | 0.028 | σ <sub>ψ</sub>              | 0.547       |
| de (Zamarin)                   | 0.237 |                             |             |
| lo (Alyameni)                  | 0.146 | 100                         | % in sample |
| mm                             |       | Boulder                     |             |
| >64                            |       | coarse gravel               |             |
| 16 - 64                        |       | medium gravel               |             |
| 8 - 16                         |       | fine gravel                 |             |
| 2 - 8                          |       | coarse sand                 | 0.03        |
| 0.5 - 2                        |       | medium sand                 | 58.45       |
| 0.25 - 0.5                     |       | fine sand                   | 41.23       |
| 0.063 - 0.25                   |       | coarse silt                 |             |
| 0.016 - 0.063                  |       | medium silt                 |             |
| 0.008 - 0.016                  |       |                             |             |
| 0.002 - 0.008                  |       | % fines                     | 0.29        |



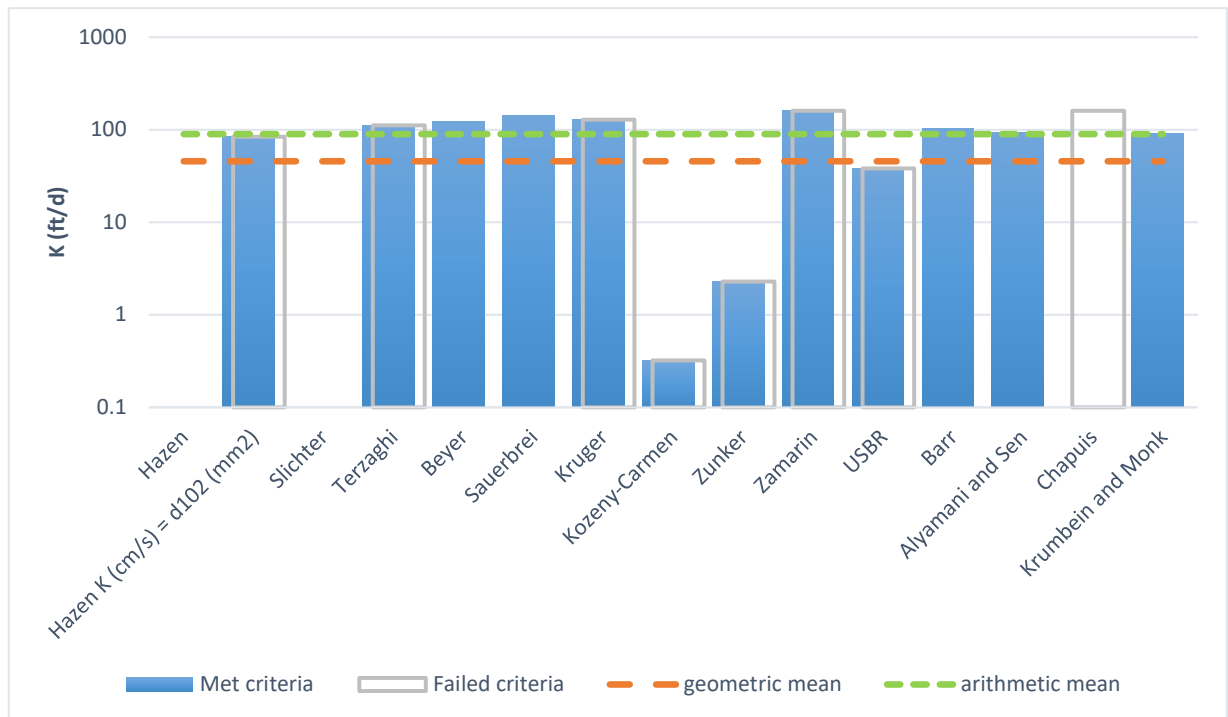
# K from Grain Size Analysis Report

Sample Name: POS-18 15-17 ft bls

Mass Sample (g): 311.12

T (°C) 26

Uniform sand low in fines



| Estimation of Hydraulic Conductivity  | cm/s    | m/s     | ft/d |
|---------------------------------------|---------|---------|------|
| Hazen                                 | .57E-01 | .57E-03 | 160  |
| Hazen K (cm/s) = d <sub>10</sub> (mm) | .30E-01 | .30E-03 | 84   |
| Slichter                              | .22E-01 | .22E-03 | 63   |
| Terzaghi                              | .39E-01 | .39E-03 | 112  |
| Beyer                                 | .43E-01 | .43E-03 | 122  |
| Sauerbrei                             | .50E-01 | .50E-03 | 143  |
| Kruger                                | .45E-01 | .45E-03 | 129  |
| Kozeny-Carmen                         | .11E-03 | .11E-05 | 0    |
| Zunker                                | .81E-03 | .81E-05 | 2    |
| Zamarin                               | .56E-01 | .56E-03 | 160  |
| USBR                                  | .13E-01 | .13E-03 | 38   |
| Barr                                  | .36E-01 | .36E-03 | 102  |
| Alyamani and Sen                      | .33E-01 | .33E-03 | 94   |
| Chapuis                               | .57E-01 | .57E-03 | 160  |
| Krumbein and Monk                     | .32E-01 | .32E-03 | 90   |
| geometric mean                        | .16E-01 | .16E-03 | 46   |
| arithmetic mean                       | .32E-01 | .32E-03 | 90   |





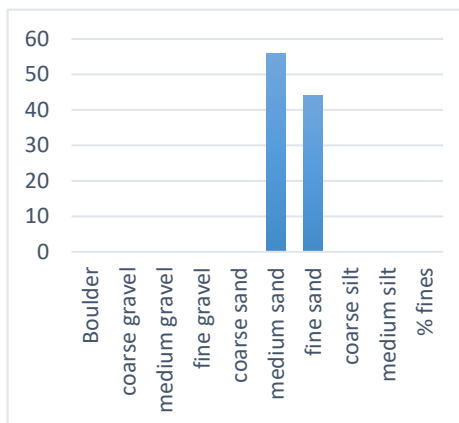
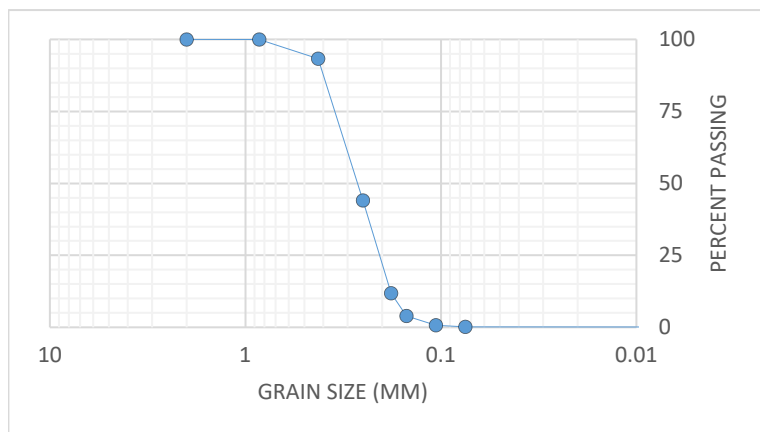
# Grain Size Analysis Report

Sample Name: POS-18 17-19 ft bls

Mass Sample (g): 332.16

T (°C) 26

## Uniform sand low in fines



| Sieve opening (ps)<br>di (mm) | Mass of retained (mr)<br>(g) | mass fraction (mf) | Percent Passing (pp) |
|-------------------------------|------------------------------|--------------------|----------------------|
| 2                             | 0.00                         | 0.00               | 100.00               |
| 0.85                          | 0.14                         | 0.00               | 99.96                |
| 0.425                         | 22.03                        | 0.07               | 93.33                |
| 0.25                          | 163.69                       | 0.49               | 44.05                |
| 0.18                          | 107.00                       | 0.32               | 11.83                |
| 0.15                          | 26.25                        | 0.08               | 3.93                 |
| 0.106                         | 10.67                        | 0.03               | 0.72                 |
| 0.075                         | 2.01                         | 0.01               | 0.11                 |
| 0.00001                       | 0.37                         | 0.00               | 0.00                 |

| Effective Grain Diameters (mm) |       | Other Useful Parameters     |             |
|--------------------------------|-------|-----------------------------|-------------|
| d10                            | 0.173 | Uniformity Coef.            | 1.77        |
| d17                            | 0.191 | n computed                  | 0.44        |
| d20                            | 0.198 | g (cm/s <sup>2</sup> )      | 980.00      |
| d30                            | 0.219 | ρ (g/cm <sup>3</sup> )      | 0.9968      |
| d50                            | 0.271 | μ (g/cm s)                  | 0.0085      |
| d60                            | 0.307 | ρg/μ (1/cm s)               | 1.1461E+05  |
| de (Kruger)                    | 0.257 | tau (Sauerbrei)             | 1.209       |
| de (Kozeny)                    | 0.017 | d <sub>geometric mean</sub> | 0.272       |
| de (Zunker)                    | 0.061 | σ <sub>ψ</sub>              | 0.534       |
| de (Zamarin)                   | 0.247 |                             |             |
| lo (Alyameni)                  | 0.149 | 100                         | % in sample |
| mm                             |       | Boulder                     |             |
| >64                            |       | coarse gravel               |             |
| 16 - 64                        |       | medium gravel               |             |
| 8 - 16                         |       | fine gravel                 |             |
| 2 - 8                          |       | coarse sand                 | 0.04        |
| 0.5 - 2                        |       | medium sand                 | 55.91       |
| 0.25 - 0.5                     |       | fine sand                   | 43.93       |
| 0.063 - 0.25                   |       | coarse silt                 |             |
| 0.016 - 0.063                  |       | medium silt                 |             |
| 0.008 - 0.016                  |       |                             |             |
| 0.002 - 0.008                  |       | % fines                     | 0.11        |



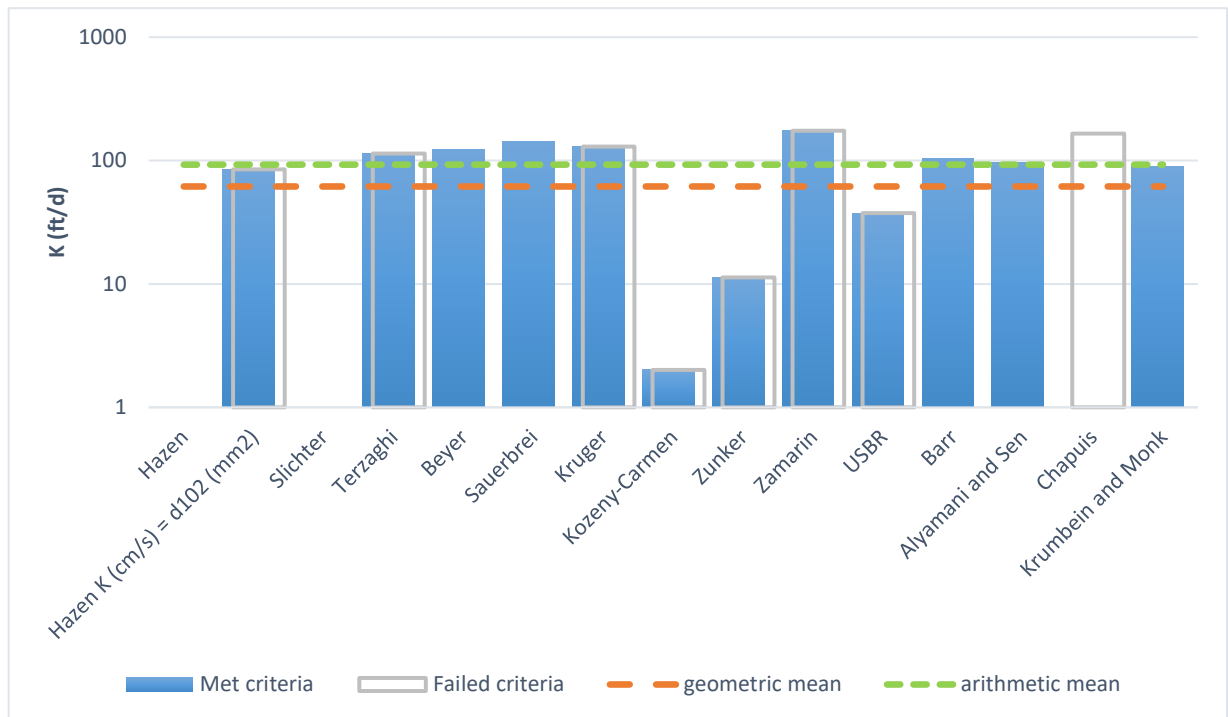
# K from Grain Size Analysis Report

Sample Name: POS-18 17-19 ft bls

Mass Sample (g): 332.16

T (°C) 26

Uniform sand low in fines



| Estimation of Hydraulic Conductivity  | cm/s    | m/s     | ft/d |
|---------------------------------------|---------|---------|------|
| Hazen                                 | .57E-01 | .57E-03 | 162  |
| Hazen K (cm/s) = d <sub>10</sub> (mm) | .30E-01 | .30E-03 | 85   |
| Slichter                              | .23E-01 | .23E-03 | 65   |
| Terzaghi                              | .40E-01 | .40E-03 | 114  |
| Beyer                                 | .44E-01 | .44E-03 | 124  |
| Sauerbrei                             | .51E-01 | .51E-03 | 144  |
| Kruger                                | .46E-01 | .46E-03 | 130  |
| Kozeny-Carmen                         | .71E-03 | .71E-05 | 2    |
| Zunker                                | .40E-02 | .40E-04 | 11   |
| Zamarin                               | .62E-01 | .62E-03 | 174  |
| USBR                                  | .13E-01 | .13E-03 | 37   |
| Barr                                  | .37E-01 | .37E-03 | 104  |
| Alyamani and Sen                      | .34E-01 | .34E-03 | 97   |
| Chapuis                               | .59E-01 | .59E-03 | 166  |
| Krumbein and Monk                     | .32E-01 | .32E-03 | 90   |
| geometric mean                        | .22E-01 | .22E-03 | 62   |
| arithmetic mean                       | .33E-01 | .33E-03 | 93   |



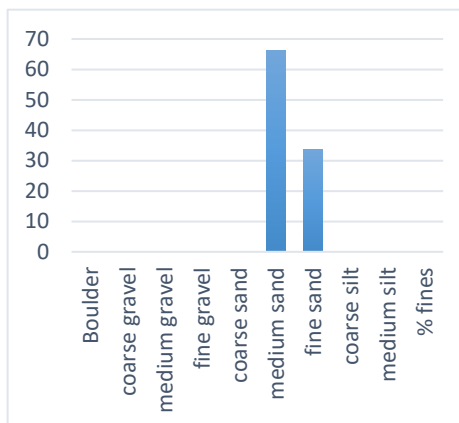
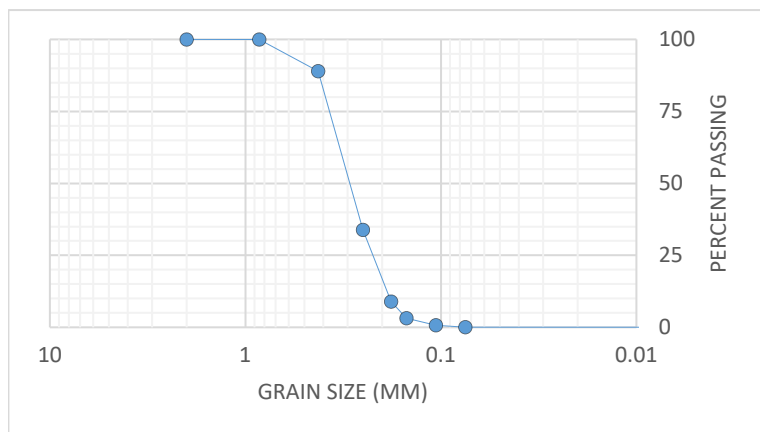
# Grain Size Analysis Report

Sample Name: POS-18 19-21 ft bls

Mass Sample (g): 311.77

T (°C) 26

## Uniform sand low in fines



| Sieve opening (ps)<br>di (mm) | Mass of retained (mr)<br>(g) | mass fraction (mf) | Percent Passing (pp) |
|-------------------------------|------------------------------|--------------------|----------------------|
| 2                             | 0.02                         | 0.00               | 99.99                |
| 0.85                          | 0.23                         | 0.00               | 99.92                |
| 0.425                         | 34.03                        | 0.11               | 89.00                |
| 0.25                          | 172.01                       | 0.55               | 33.83                |
| 0.18                          | 77.66                        | 0.25               | 8.92                 |
| 0.15                          | 17.90                        | 0.06               | 3.18                 |
| 0.106                         | 7.83                         | 0.03               | 0.67                 |
| 0.075                         | 1.77                         | 0.01               | 0.10                 |
| 0.00001                       | 0.32                         | 0.00               | 0.00                 |

| Effective Grain Diameters (mm) |       | Other Useful Parameters     |             |
|--------------------------------|-------|-----------------------------|-------------|
| d10                            | 0.183 | Uniformity Coef.            | 1.82        |
| d17                            | 0.203 | n computed                  | 0.44        |
| d20                            | 0.211 | g (cm/s <sup>2</sup> )      | 980.00      |
| d30                            | 0.239 | ρ (g/cm <sup>3</sup> )      | 0.9968      |
| d50                            | 0.301 | μ (g/cm s)                  | 0.0085      |
| d60                            | 0.333 | ρg/μ (1/cm s)               | 1.1461E+05  |
| de (Kruger)                    | 0.278 | tau (Sauerbrei)             | 1.209       |
| de (Kozeny)                    | 0.018 | d <sub>geometric mean</sub> | 0.291       |
| de (Zunker)                    | 0.066 | σ <sub>ψ</sub>              | 0.568       |
| de (Zamarin)                   | 0.266 |                             |             |
| lo (Alyameni)                  | 0.153 | 100                         | % in sample |
| mm                             |       | Boulder                     |             |
| >64                            |       | coarse gravel               |             |
| 16 - 64                        |       | medium gravel               |             |
| 8 - 16                         |       | fine gravel                 | 0.01        |
| 2 - 8                          |       | coarse sand                 | 0.07        |
| 0.5 - 2                        |       | medium sand                 | 66.09       |
| 0.25 - 0.5                     |       | fine sand                   | 33.73       |
| 0.063 - 0.25                   |       | coarse silt                 |             |
| 0.016 - 0.063                  |       | medium silt                 |             |
| 0.008 - 0.016                  |       |                             |             |
| 0.002 - 0.008                  |       | % fines                     | 0.1         |



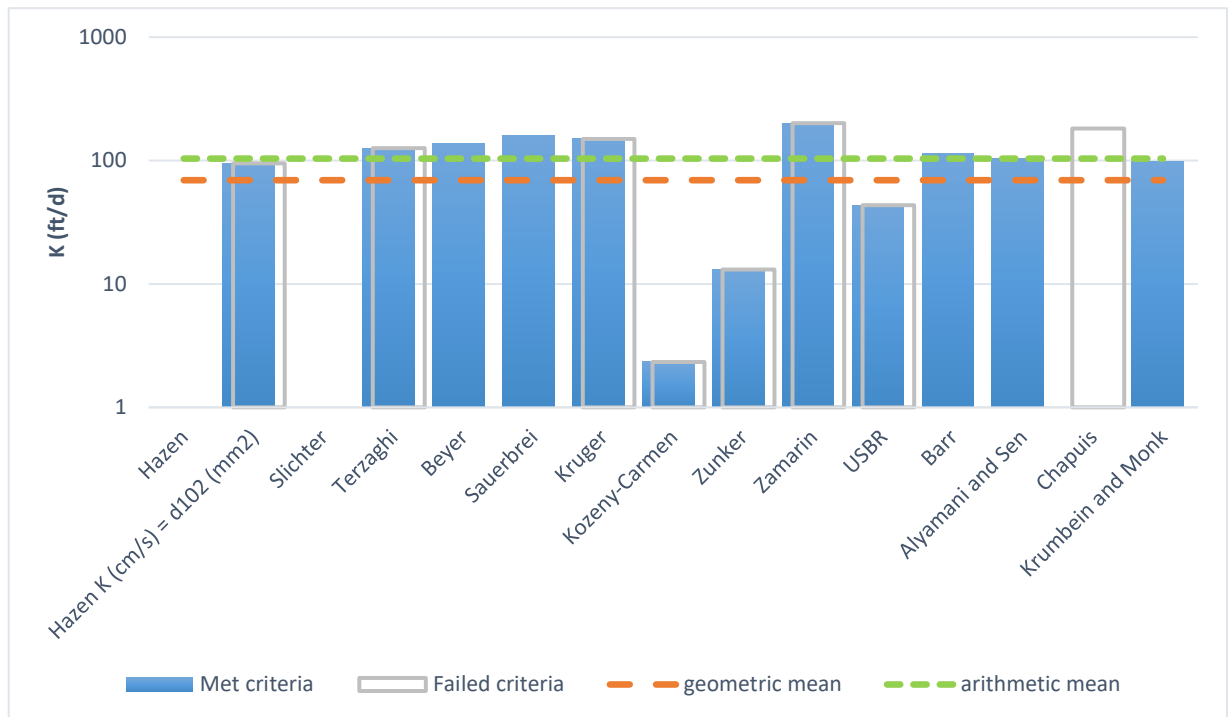
# K from Grain Size Analysis Report

Sample Name: POS-18 19-21 ft bls

Mass Sample (g): 311.77

T (°C) 26

Uniform sand low in fines



| Estimation of Hydraulic Conductivity  | cm/s    | m/s     | ft/d |
|---------------------------------------|---------|---------|------|
| Hazen                                 | .64E-01 | .64E-03 | 181  |
| Hazen K (cm/s) = d <sub>10</sub> (mm) | .33E-01 | .33E-03 | 95   |
| Slichter                              | .25E-01 | .25E-03 | 71   |
| Terzaghi                              | .44E-01 | .44E-03 | 126  |
| Beyer                                 | .49E-01 | .49E-03 | 138  |
| Sauerbrei                             | .56E-01 | .56E-03 | 159  |
| Kruger                                | .53E-01 | .53E-03 | 150  |
| Kozeny-Carmen                         | .82E-03 | .82E-05 | 2    |
| Zunker                                | .46E-02 | .46E-04 | 13   |
| Zamarin                               | .71E-01 | .71E-03 | 201  |
| USBR                                  | .15E-01 | .15E-03 | 44   |
| Barr                                  | .40E-01 | .40E-03 | 115  |
| Alyamani and Sen                      | .37E-01 | .37E-03 | 104  |
| Chapuis                               | .64E-01 | .64E-03 | 182  |
| Krumbein and Monk                     | .35E-01 | .35E-03 | 98   |
| geometric mean                        | .24E-01 | .24E-03 | 69   |
| arithmetic mean                       | .37E-01 | .37E-03 | 104  |



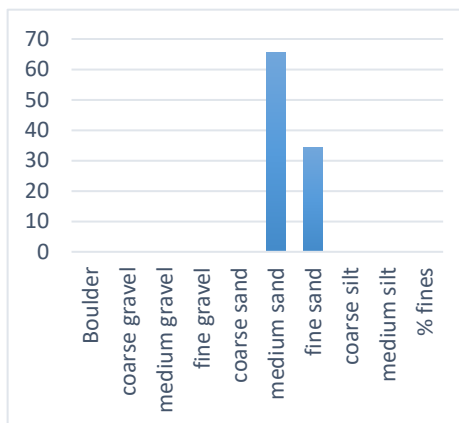
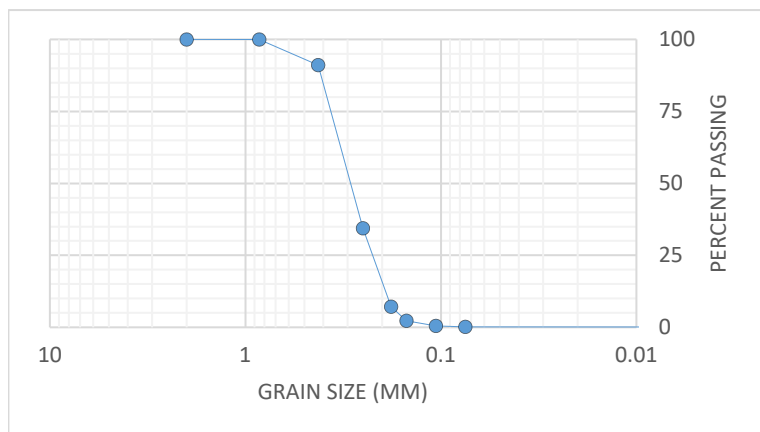
# Grain Size Analysis Report

Sample Name: POS-18 21-23 ft bls

Mass Sample (g): 334.54

T (°C) 26

## Uniform sand low in fines



| Sieve opening (ps)<br>di (mm) | Mass of retained (mr)<br>(g) | mass fraction (mf) | Percent Passing (pp) |
|-------------------------------|------------------------------|--------------------|----------------------|
| 2                             | 0.00                         | 0.00               | 100.00               |
| 0.85                          | 0.26                         | 0.00               | 99.92                |
| 0.425                         | 29.75                        | 0.09               | 91.03                |
| 0.25                          | 189.50                       | 0.57               | 34.38                |
| 0.18                          | 90.95                        | 0.27               | 7.20                 |
| 0.15                          | 16.67                        | 0.05               | 2.21                 |
| 0.106                         | 5.77                         | 0.02               | 0.49                 |
| 0.075                         | 1.16                         | 0.00               | 0.14                 |
| 0.00001                       | 0.48                         | 0.00               | 0.00                 |

| Effective Grain Diameters (mm) |       | Other Useful Parameters     |             |
|--------------------------------|-------|-----------------------------|-------------|
| d10                            | 0.187 | Uniformity Coef.            | 1.76        |
| d17                            | 0.205 | n computed                  | 0.44        |
| d20                            | 0.213 | g (cm/s <sup>2</sup> )      | 980.00      |
| d30                            | 0.239 | ρ (g/cm <sup>3</sup> )      | 0.9968      |
| d50                            | 0.298 | μ (g/cm s)                  | 0.0085      |
| d60                            | 0.329 | ρg/μ (1/cm s)               | 1.1461E+05  |
| de (Kruger)                    | 0.278 | tau (Sauerbrei)             | 1.209       |
| de (Kozeny)                    | 0.013 | d <sub>geometric mean</sub> | 0.290       |
| de (Zunker)                    | 0.051 | σ <sub>ψ</sub>              | 0.533       |
| de (Zamarin)                   | 0.264 |                             |             |
| lo (Alyameni)                  | 0.159 | 100                         | % in sample |
| mm                             |       | Boulder                     |             |
| >64                            |       | coarse gravel               |             |
| 16 - 64                        |       | medium gravel               |             |
| 8 - 16                         |       | fine gravel                 |             |
| 2 - 8                          |       | coarse sand                 | 0.08        |
| 0.5 - 2                        |       | medium sand                 | 65.54       |
| 0.25 - 0.5                     |       | fine sand                   | 34.24       |
| 0.063 - 0.25                   |       | coarse silt                 |             |
| 0.016 - 0.063                  |       | medium silt                 |             |
| 0.008 - 0.016                  |       |                             |             |
| 0.002 - 0.008                  |       | % fines                     | 0.14        |





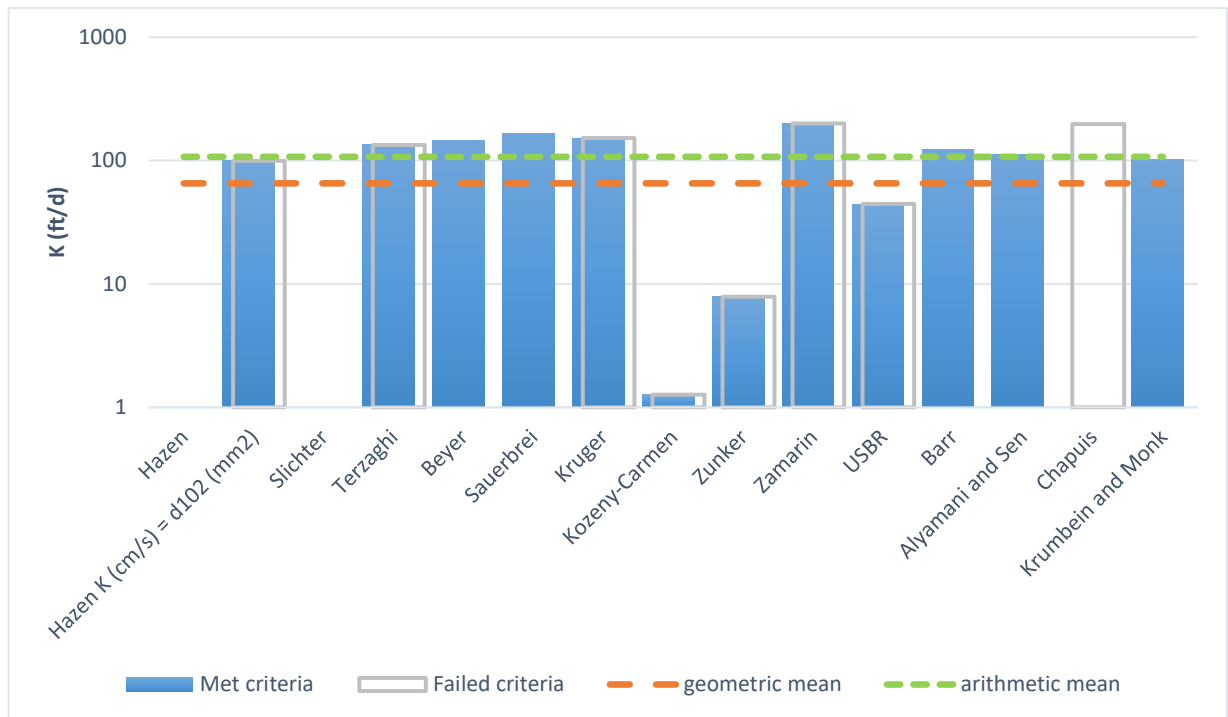
# K from Grain Size Analysis Report

Sample Name: POS-18 21-23 ft bls

Mass Sample (g): 334.54

T (°C) 26

## Uniform sand low in fines



| Estimation of Hydraulic Conductivity  | cm/s    | m/s     | ft/d |
|---------------------------------------|---------|---------|------|
| Hazen                                 | .67E-01 | .67E-03 | 190  |
| Hazen K (cm/s) = d <sub>10</sub> (mm) | .35E-01 | .35E-03 | 99   |
| Slichter                              | .27E-01 | .27E-03 | 76   |
| Terzaghi                              | .47E-01 | .47E-03 | 134  |
| Beyer                                 | .51E-01 | .51E-03 | 145  |
| Sauerbrei                             | .59E-01 | .59E-03 | 166  |
| Kruger                                | .54E-01 | .54E-03 | 152  |
| Kozeny-Carmen                         | .45E-03 | .45E-05 | 1    |
| Zunker                                | .28E-02 | .28E-04 | 8    |
| Zamarin                               | .71E-01 | .71E-03 | 200  |
| USBR                                  | .16E-01 | .16E-03 | 44   |
| Barr                                  | .43E-01 | .43E-03 | 123  |
| Alyamani and Sen                      | .40E-01 | .40E-03 | 112  |
| Chapuis                               | .70E-01 | .70E-03 | 197  |
| Krumbein and Monk                     | .36E-01 | .36E-03 | 102  |
| geometric mean                        | .23E-01 | .23E-03 | 65   |
| arithmetic mean                       | .38E-01 | .38E-03 | 107  |



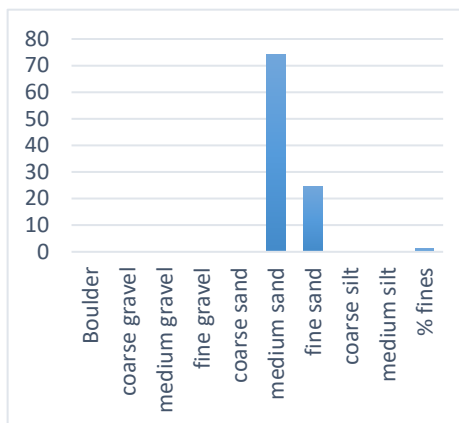
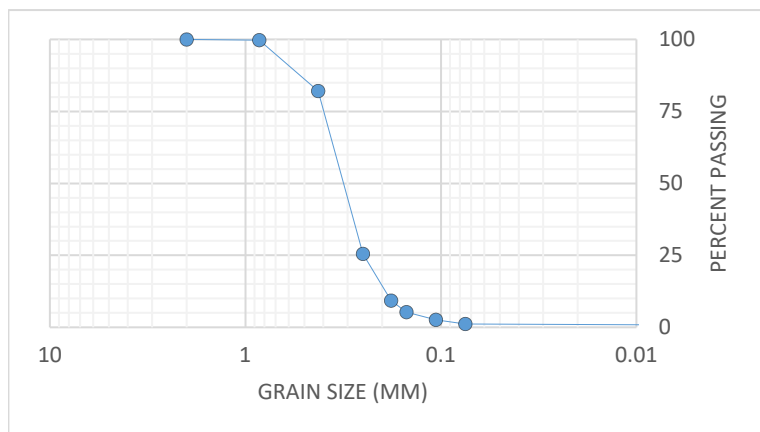
# Grain Size Analysis Report

Sample Name: POS-18 23-25 ft bls

Mass Sample (g): 365.17

T (°C) 26

## Uniform sand low in fines



| Sieve opening<br>(ps)<br>di (mm) | Mass of retained<br>(mr)<br>(g) | mass fraction<br>(mf) | Percent Passing<br>(pp) |
|----------------------------------|---------------------------------|-----------------------|-------------------------|
| 2                                | 0.00                            | 0.00                  | 100.00                  |
| 0.85                             | 0.96                            | 0.00                  | 99.74                   |
| 0.425                            | 64.41                           | 0.18                  | 82.10                   |
| 0.25                             | 206.52                          | 0.57                  | 25.54                   |
| 0.18                             | 59.50                           | 0.16                  | 9.25                    |
| 0.15                             | 14.34                           | 0.04                  | 5.32                    |
| 0.106                            | 9.94                            | 0.03                  | 2.60                    |
| 0.075                            | 5.35                            | 0.01                  | 1.14                    |
| 0.00001                          | 4.15                            | 0.01                  | 0.00                    |

| Effective Grain Diameters (mm) |       | Other Useful Parameters     |             |
|--------------------------------|-------|-----------------------------|-------------|
| d10                            | 0.183 | Uniformity Coef.            | 1.95        |
| d17                            | 0.213 | n computed                  | 0.43        |
| d20                            | 0.226 | g (cm/s <sup>2</sup> )      | 980.00      |
| d30                            | 0.264 | ρ (g/cm <sup>3</sup> )      | 0.9968      |
| d50                            | 0.326 | μ (g/cm s)                  | 0.0085      |
| d60                            | 0.357 | ρg/μ (1/cm s)               | 1.1461E+05  |
| de (Kruger)                    | 0.276 | tau (Sauerbrei)             | 1.209       |
| de (Kozeny)                    | 0.002 | d <sub>geometric mean</sub> | 0.318       |
| de (Zunker)                    | 0.008 | σ <sub>ψ</sub>              | 0.648       |
| de (Zamarin)                   | 0.211 |                             |             |
| lo (Alyameni)                  | 0.148 | 100                         | % in sample |
| mm                             |       | Boulder                     |             |
| >64                            |       | coarse gravel               |             |
| 16 - 64                        |       | medium gravel               |             |
| 8 - 16                         |       | fine gravel                 |             |
| 2 - 8                          |       | coarse sand                 | 0.26        |
| 0.5 - 2                        |       | medium sand                 | 74.19       |
| 0.25 - 0.5                     |       | fine sand                   | 24.41       |
| 0.063 - 0.25                   |       | coarse silt                 |             |
| 0.016 - 0.063                  |       | medium silt                 |             |
| 0.008 - 0.016                  |       |                             |             |
| 0.002 - 0.008                  |       | % fines                     | 1.14        |



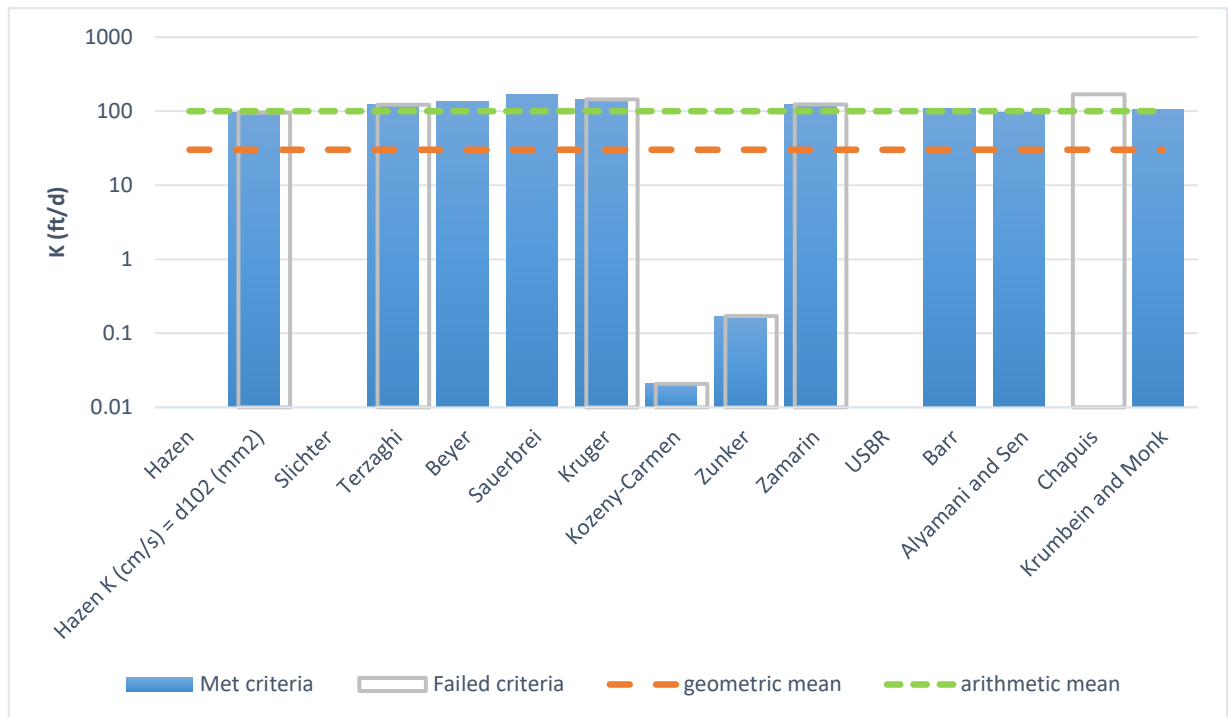
# K from Grain Size Analysis Report

Sample Name: POS-18 23-25 ft bls

Mass Sample (g): 365.17

T (°C) 26

## Uniform sand low in fines



| Estimation of Hydraulic Conductivity  | cm/s    | m/s     | ft/d |
|---------------------------------------|---------|---------|------|
| Hazen                                 | .63E-01 | .63E-03 | 178  |
| Hazen K (cm/s) = d <sub>10</sub> (mm) | .34E-01 | .34E-03 | 95   |
| Slichter                              | .24E-01 | .24E-03 | 69   |
| Terzaghi                              | .43E-01 | .43E-03 | 122  |
| Beyer                                 | .48E-01 | .48E-03 | 137  |
| Sauerbrei                             | .59E-01 | .59E-03 | 168  |
| Kruger                                | .51E-01 | .51E-03 | 144  |
| Kozeny-Carmen                         | .73E-05 | .73E-07 | 0    |
| Zunker                                | .60E-04 | .60E-06 | 0    |
| Zamarin                               | .43E-01 | .43E-03 | 123  |
| USBR                                  | .18E-01 | .18E-03 | 51   |
| Barr                                  | .39E-01 | .39E-03 | 110  |
| Alyamani and Sen                      | .34E-01 | .34E-03 | 97   |
| Chapuis                               | .60E-01 | .60E-03 | 169  |
| Krumbein and Monk                     | .37E-01 | .37E-03 | 105  |
| geometric mean                        | .11E-01 | .11E-03 | 30   |
| arithmetic mean                       | .35E-01 | .35E-03 | 100  |



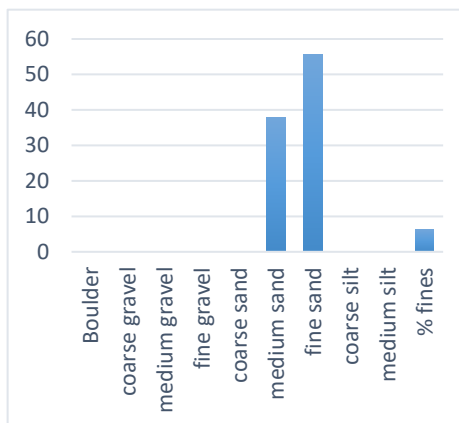
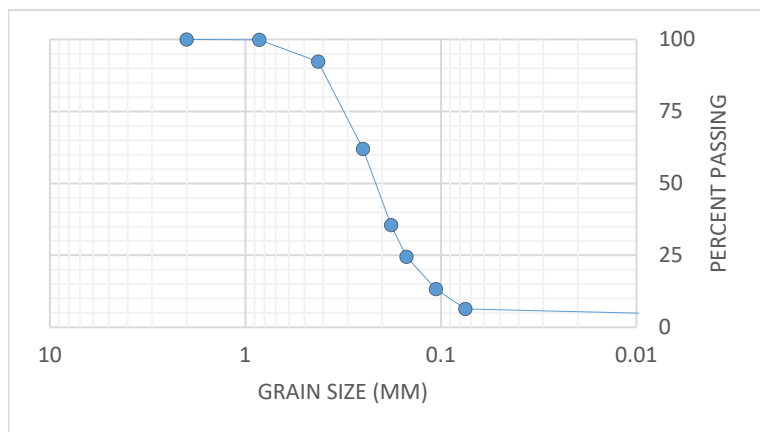
# Grain Size Analysis Report

Sample Name: POS-18 25-27 ft bls

Mass Sample (g): 361.56

T (°C) 26

## Moderately well sorted sand with fines



| Sieve opening (ps)<br>di (mm) | Mass of retained (mr)<br>(g) | mass fraction (mf) | Percent Passing (pp) |
|-------------------------------|------------------------------|--------------------|----------------------|
| 2                             | 0.00                         | 0.00               | 100.00               |
| 0.85                          | 0.69                         | 0.00               | 99.81                |
| 0.425                         | 27.06                        | 0.07               | 92.32                |
| 0.25                          | 109.70                       | 0.30               | 61.98                |
| 0.18                          | 95.59                        | 0.26               | 35.55                |
| 0.15                          | 40.01                        | 0.11               | 24.48                |
| 0.106                         | 40.48                        | 0.11               | 13.28                |
| 0.075                         | 25.08                        | 0.07               | 6.35                 |
| 0.00001                       | 22.95                        | 0.06               | 0.00                 |

| Effective Grain Diameters (mm) |       | Other Useful Parameters     |            |
|--------------------------------|-------|-----------------------------|------------|
| d10                            | 0.091 | Uniformity Coef.            | 2.68       |
| d17                            | 0.121 | n computed                  | 0.41       |
| d20                            | 0.132 | g (cm/s <sup>2</sup> )      | 980.00     |
| d30                            | 0.165 | ρ (g/cm <sup>3</sup> )      | 0.9968     |
| d50                            | 0.218 | μ (g/cm s)                  | 0.0085     |
| d60                            | 0.245 | ρg/μ (1/cm s)               | 1.1461E+05 |
| de (Kruger)                    | 0.160 | tau (Sauerbrei)             | 1.209      |
| de (Kozeny)                    | 0.000 | d <sub>geometric mean</sub> | 0.213      |
| de (Zunker)                    | 0.001 | σ <sub>ψ</sub>              | 0.921      |
| de (Zamarin)                   | 0.082 | 100 % in sample             |            |
| lo (Alyameni)                  | 0.060 |                             |            |
| mm                             |       | Boulder                     |            |
| >64                            |       | coarse gravel               |            |
| 16 - 64                        |       | medium gravel               |            |
| 8 - 16                         |       | fine gravel                 |            |
| 2 - 8                          |       | coarse sand                 | 0.19       |
| 0.5 - 2                        |       | medium sand                 | 37.82      |
| 0.25 - 0.5                     |       | fine sand                   | 55.64      |
| 0.063 - 0.25                   |       | coarse silt                 |            |
| 0.016 - 0.063                  |       | medium silt                 |            |
| 0.008 - 0.016                  |       |                             |            |
| 0.002 - 0.008                  |       | % fines                     | 6.35       |



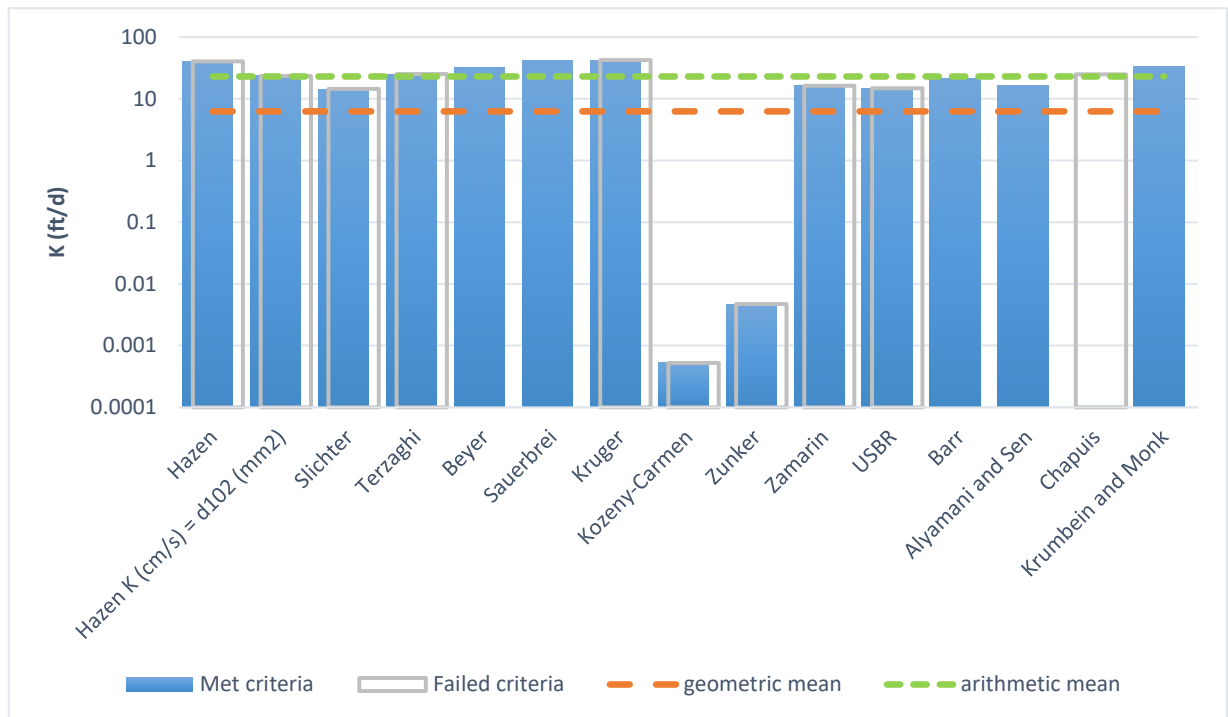
# K from Grain Size Analysis Report

Sample Name: POS-18 25-27 ft bls

Mass Sample (g): 361.56

T (°C) 26

Moderately well sorted sand with fines



| Estimation of Hydraulic Conductivity  | cm/s    | m/s     | ft/d |
|---------------------------------------|---------|---------|------|
| Hazen                                 | .14E-01 | .14E-03 | 41   |
| Hazen K (cm/s) = d <sub>10</sub> (mm) | .83E-02 | .83E-04 | 24   |
| Slichter                              | .51E-02 | .51E-04 | 14   |
| Terzaghi                              | .89E-02 | .89E-04 | 25   |
| Beyer                                 | .11E-01 | .11E-03 | 32   |
| Sauerbrei                             | .15E-01 | .15E-03 | 42   |
| Kruger                                | .15E-01 | .15E-03 | 43   |
| Kozeny-Carmen                         | .19E-06 | .19E-08 | 0    |
| Zunker                                | .17E-05 | .17E-07 | 0    |
| Zamarin                               | .58E-02 | .58E-04 | 16   |
| USBR                                  | .53E-02 | .53E-04 | 15   |
| Barr                                  | .76E-02 | .76E-04 | 22   |
| Alyamani and Sen                      | .59E-02 | .59E-04 | 17   |
| Chapuis                               | .88E-02 | .88E-04 | 25   |
| Krumbein and Monk                     | .12E-01 | .12E-03 | 33   |
| geometric mean                        | .22E-02 | .22E-04 | 6    |
| arithmetic mean                       | .81E-02 | .81E-04 | 23   |





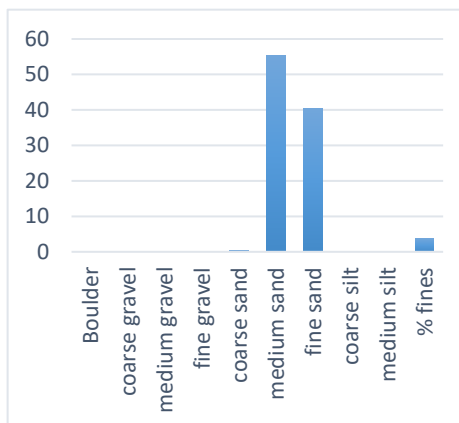
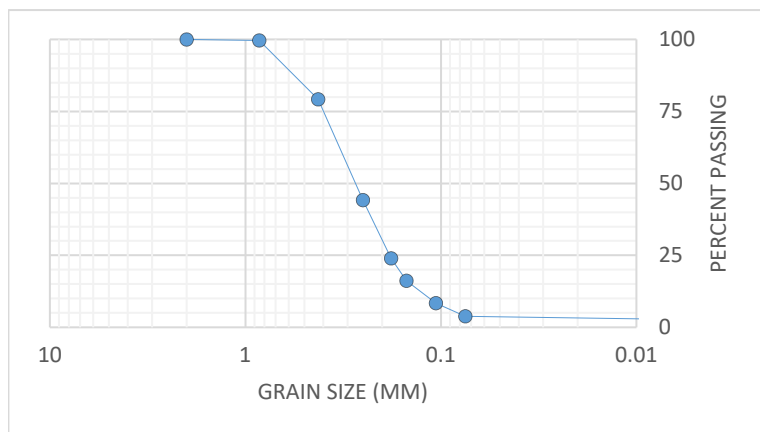
# Grain Size Analysis Report

Sample Name: POS-18 27-29 ft bls

Mass Sample (g): 338.91

T (°C) 26

## Moderately well sorted sand with fines



| Sieve opening<br>(ps)<br>di (mm) | Mass of retained<br>(mr)<br>(g) | mass fraction<br>(mf) | Percent Passing<br>(pp) |
|----------------------------------|---------------------------------|-----------------------|-------------------------|
| 2                                | 0.00                            | 0.00                  | 100.00                  |
| 0.85                             | 1.36                            | 0.00                  | 99.60                   |
| 0.425                            | 69.19                           | 0.20                  | 79.18                   |
| 0.25                             | 118.68                          | 0.35                  | 44.17                   |
| 0.18                             | 68.61                           | 0.20                  | 23.92                   |
| 0.15                             | 26.30                           | 0.08                  | 16.16                   |
| 0.106                            | 26.42                           | 0.08                  | 8.37                    |
| 0.075                            | 15.22                           | 0.04                  | 3.87                    |
| 0.00001                          | 13.13                           | 0.04                  | 0.00                    |

| Effective Grain Diameters (mm) |       | Other Useful Parameters     |             |
|--------------------------------|-------|-----------------------------|-------------|
| d10                            | 0.115 | Uniformity Coef.            | 2.86        |
| d17                            | 0.153 | n computed                  | 0.40        |
| d20                            | 0.165 | g (cm/s <sup>2</sup> )      | 980.00      |
| d30                            | 0.201 | ρ (g/cm <sup>3</sup> )      | 0.9968      |
| d50                            | 0.279 | μ (g/cm s)                  | 0.0085      |
| d60                            | 0.329 | ρg/μ (1/cm s)               | 1.1461E+05  |
| de (Kruger)                    | 0.204 | tau (Sauerbrei)             | 1.209       |
| de (Kozeny)                    | 0.001 | d <sub>geometric mean</sub> | 0.280       |
| de (Zunker)                    | 0.002 | σ <sub>ψ</sub>              | 0.937       |
| de (Zamarin)                   | 0.117 |                             |             |
| lo (Alyameni)                  | 0.074 | 100                         | % in sample |
| mm                             |       | Boulder                     |             |
| >64                            |       | coarse gravel               |             |
| 16 - 64                        |       | medium gravel               |             |
| 8 - 16                         |       | fine gravel                 |             |
| 2 - 8                          |       | coarse sand                 | 0.4         |
| 0.5 - 2                        |       | medium sand                 | 55.43       |
| 0.25 - 0.5                     |       | fine sand                   | 40.29       |
| 0.063 - 0.25                   |       | coarse silt                 |             |
| 0.016 - 0.063                  |       | medium silt                 |             |
| 0.008 - 0.016                  |       |                             |             |
| 0.002 - 0.008                  |       | % fines                     | 3.87        |



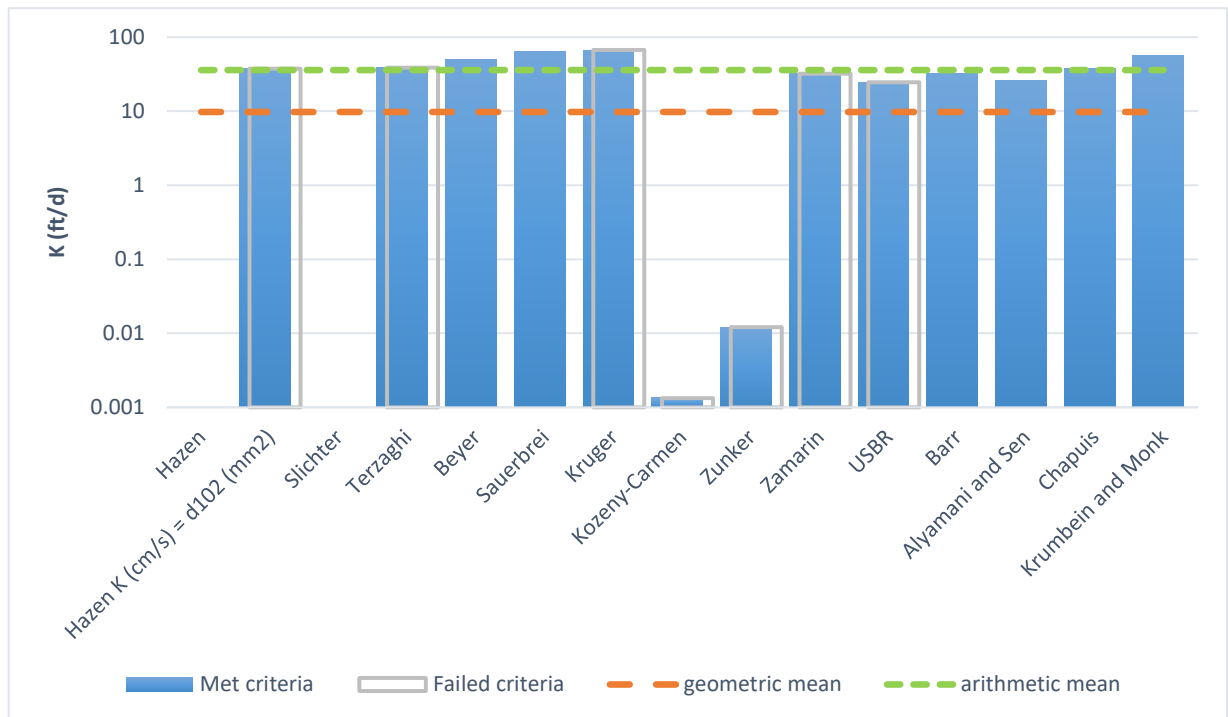
# K from Grain Size Analysis Report

Sample Name: POS-18 27-29 ft bls

Mass Sample (g): 338.91

T (°C) 26

Moderately well sorted sand with fines



| Estimation of Hydraulic Conductivity  | cm/s    | m/s     | ft/d |
|---------------------------------------|---------|---------|------|
| Hazen                                 | .22E-01 | .22E-03 | 63   |
| Hazen K (cm/s) = d <sub>10</sub> (mm) | .13E-01 | .13E-03 | 38   |
| Slichter                              | .78E-02 | .78E-04 | 22   |
| Terzaghi                              | .14E-01 | .14E-03 | 39   |
| Beyer                                 | .18E-01 | .18E-03 | 50   |
| Sauerbrei                             | .23E-01 | .23E-03 | 65   |
| Kruger                                | .24E-01 | .24E-03 | 67   |
| Kozeny-Carmen                         | .47E-06 | .47E-08 | 0    |
| Zunker                                | .43E-05 | .43E-07 | 0    |
| Zamarin                               | .11E-01 | .11E-03 | 32   |
| USBR                                  | .87E-02 | .87E-04 | 25   |
| Barr                                  | .11E-01 | .11E-03 | 32   |
| Alyamani and Sen                      | .92E-02 | .92E-04 | 26   |
| Chapuis                               | .13E-01 | .13E-03 | 38   |
| Krumbein and Monk                     | .20E-01 | .20E-03 | 56   |
| geometric mean                        | .34E-02 | .34E-04 | 10   |
| arithmetic mean                       | .13E-01 | .13E-03 | 36   |



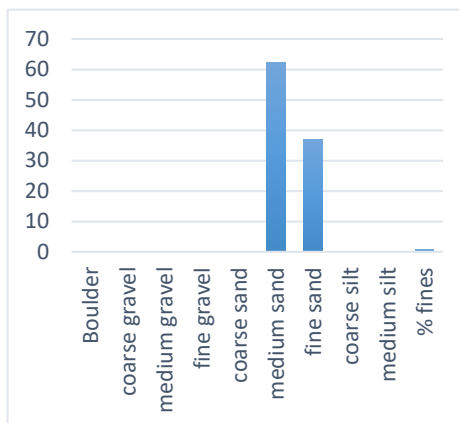
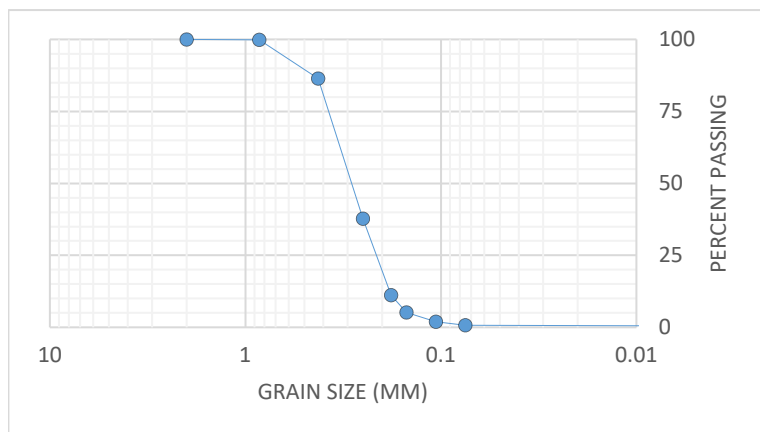
# Grain Size Analysis Report

Sample Name: POS-18 29-31 ft bls

Mass Sample (g): 282.96

T (°C) 26

## Uniform sand low in fines



| Sieve opening<br>(ps)<br>di (mm) | Mass of retained<br>(mr)<br>(g) | mass fraction<br>(mf) | Percent Passing<br>(pp) |
|----------------------------------|---------------------------------|-----------------------|-------------------------|
| 2                                | 0.00                            | 0.00                  | 100.00                  |
| 0.85                             | 0.51                            | 0.00                  | 99.82                   |
| 0.425                            | 38.08                           | 0.13                  | 86.36                   |
| 0.25                             | 137.70                          | 0.49                  | 37.70                   |
| 0.18                             | 74.95                           | 0.26                  | 11.21                   |
| 0.15                             | 17.08                           | 0.06                  | 5.17                    |
| 0.106                            | 9.13                            | 0.03                  | 1.95                    |
| 0.075                            | 3.41                            | 0.01                  | 0.74                    |
| 0.00001                          | 2.10                            | 0.01                  | 0.00                    |

| Effective Grain Diameters (mm) |       | Other Useful Parameters     |             |
|--------------------------------|-------|-----------------------------|-------------|
| d10                            | 0.174 | Uniformity Coef.            | 1.90        |
| d17                            | 0.195 | n computed                  | 0.43        |
| d20                            | 0.203 | g (cm/s <sup>2</sup> )      | 980.00      |
| d30                            | 0.230 | ρ (g/cm <sup>3</sup> )      | 0.9968      |
| d50                            | 0.294 | μ (g/cm s)                  | 0.0085      |
| d60                            | 0.330 | ρg/μ (1/cm s)               | 1.1461E+05  |
| de (Kruger)                    | 0.261 | tau (Sauerbrei)             | 1.209       |
| de (Kozeny)                    | 0.003 | d <sub>geometric mean</sub> | 0.287       |
| de (Zunker)                    | 0.012 | σ <sub>ψ</sub>              | 0.618       |
| de (Zamarin)                   | 0.218 |                             |             |
| lo (Alyameni)                  | 0.144 | 100                         | % in sample |
| mm                             |       | Boulder                     |             |
| >64                            |       | coarse gravel               |             |
| 16 - 64                        |       | medium gravel               |             |
| 8 - 16                         |       | fine gravel                 |             |
| 2 - 8                          |       | coarse sand                 | 0.18        |
| 0.5 - 2                        |       | medium sand                 | 62.12       |
| 0.25 - 0.5                     |       | fine sand                   | 36.96       |
| 0.063 - 0.25                   |       | coarse silt                 |             |
| 0.016 - 0.063                  |       | medium silt                 |             |
| 0.008 - 0.016                  |       |                             |             |
| 0.002 - 0.008                  |       | % fines                     | 0.74        |



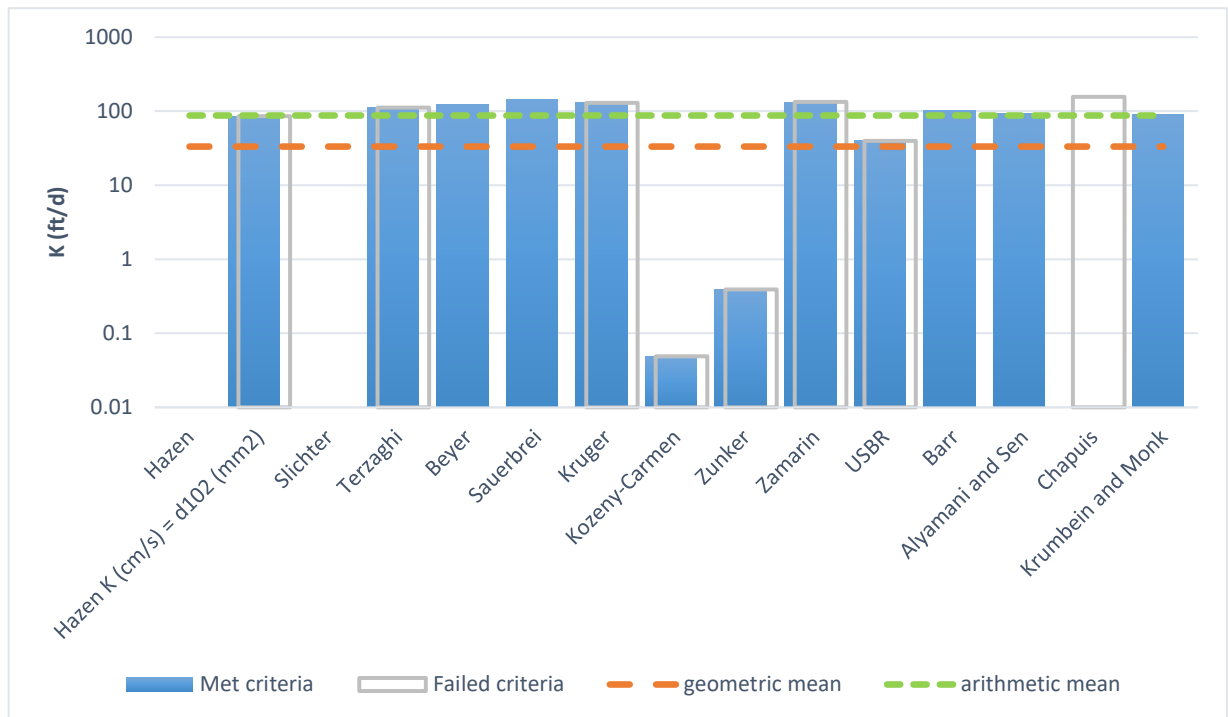
# K from Grain Size Analysis Report

Sample Name: POS-18 29-31 ft bls

Mass Sample (g): 282.96

T (°C) 26

## Uniform sand low in fines



| Estimation of Hydraulic Conductivity  | cm/s    | m/s     | ft/d |
|---------------------------------------|---------|---------|------|
| Hazen                                 | .57E-01 | .57E-03 | 162  |
| Hazen K (cm/s) = d <sub>10</sub> (mm) | .30E-01 | .30E-03 | 86   |
| Slichter                              | .22E-01 | .22E-03 | 63   |
| Terzaghi                              | .39E-01 | .39E-03 | 112  |
| Beyer                                 | .44E-01 | .44E-03 | 124  |
| Sauerbrei                             | .51E-01 | .51E-03 | 143  |
| Kruger                                | .46E-01 | .46E-03 | 130  |
| Kozeny-Carmen                         | .17E-04 | .17E-06 | 0    |
| Zunker                                | .14E-03 | .14E-05 | 0    |
| Zamarin                               | .47E-01 | .47E-03 | 133  |
| USBR                                  | .14E-01 | .14E-03 | 40   |
| Barr                                  | .36E-01 | .36E-03 | 101  |
| Alyamani and Sen                      | .32E-01 | .32E-03 | 92   |
| Chapuis                               | .55E-01 | .55E-03 | 156  |
| Krumbein and Monk                     | .32E-01 | .32E-03 | 89   |
| geometric mean                        | .12E-01 | .12E-03 | 33   |
| arithmetic mean                       | .31E-01 | .31E-03 | 88   |



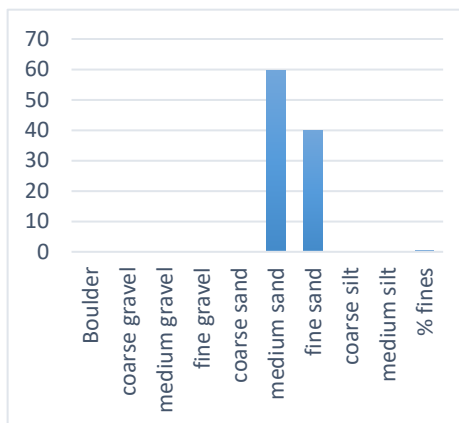
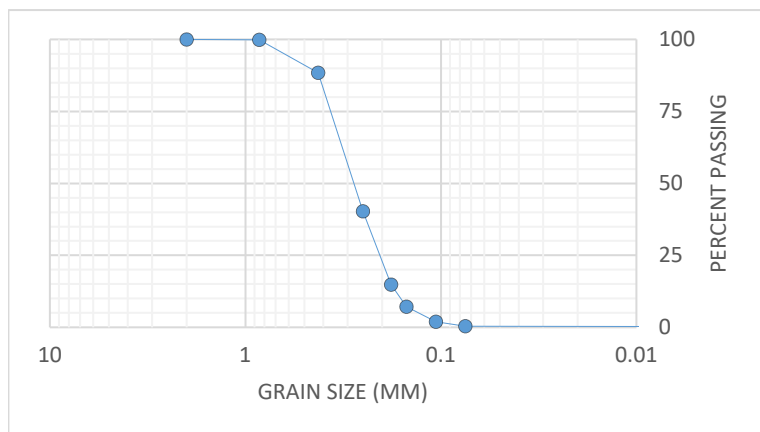
# Grain Size Analysis Report

Sample Name: POS-19 5-7.5 ft bls

Mass Sample (g): 433.32

T (°C) 26

## Uniform sand low in fines



| Sieve opening (ps)<br>di (mm) | Mass of retained (mr)<br>(g) | mass fraction (mf) | Percent Passing (pp) |
|-------------------------------|------------------------------|--------------------|----------------------|
| 2                             | 0.01                         | 0.00               | 100.00               |
| 0.85                          | 0.59                         | 0.00               | 99.86                |
| 0.425                         | 49.67                        | 0.11               | 88.40                |
| 0.25                          | 208.35                       | 0.48               | 40.32                |
| 0.18                          | 110.51                       | 0.26               | 14.81                |
| 0.15                          | 33.00                        | 0.08               | 7.20                 |
| 0.106                         | 22.92                        | 0.05               | 1.91                 |
| 0.075                         | 6.75                         | 0.02               | 0.35                 |
| 0.00001                       | 1.52                         | 0.00               | 0.00                 |

| Effective Grain Diameters (mm) |       | Other Useful Parameters     |             |
|--------------------------------|-------|-----------------------------|-------------|
| d10                            | 0.161 | Uniformity Coef.            | 2.00        |
| d17                            | 0.186 | n computed                  | 0.43        |
| d20                            | 0.194 | g (cm/s <sup>2</sup> )      | 980.00      |
| d30                            | 0.222 | ρ (g/cm <sup>3</sup> )      | 0.9968      |
| d50                            | 0.285 | μ (g/cm s)                  | 0.0085      |
| d60                            | 0.322 | ρg/μ (1/cm s)               | 1.1461E+05  |
| de (Kruger)                    | 0.254 | tau (Sauerbrei)             | 1.209       |
| de (Kozeny)                    | 0.006 | d <sub>geometric mean</sub> | 0.278       |
| de (Zunker)                    | 0.023 | σ <sub>ψ</sub>              | 0.645       |
| de (Zamarin)                   | 0.232 |                             |             |
| lo (Alyameni)                  | 0.130 | 99.99769224                 | % in sample |
| mm                             |       | Boulder                     |             |
| >64                            |       | coarse gravel               |             |
| 16 - 64                        |       | medium gravel               |             |
| 8 - 16                         |       | fine gravel                 |             |
| 2 - 8                          |       | coarse sand                 | 0.14        |
| 0.5 - 2                        |       | medium sand                 | 59.54       |
| 0.25 - 0.5                     |       | fine sand                   | 39.97       |
| 0.063 - 0.25                   |       | coarse silt                 |             |
| 0.016 - 0.063                  |       | medium silt                 |             |
| 0.008 - 0.016                  |       |                             |             |
| 0.002 - 0.008                  |       | % fines                     | 0.35        |





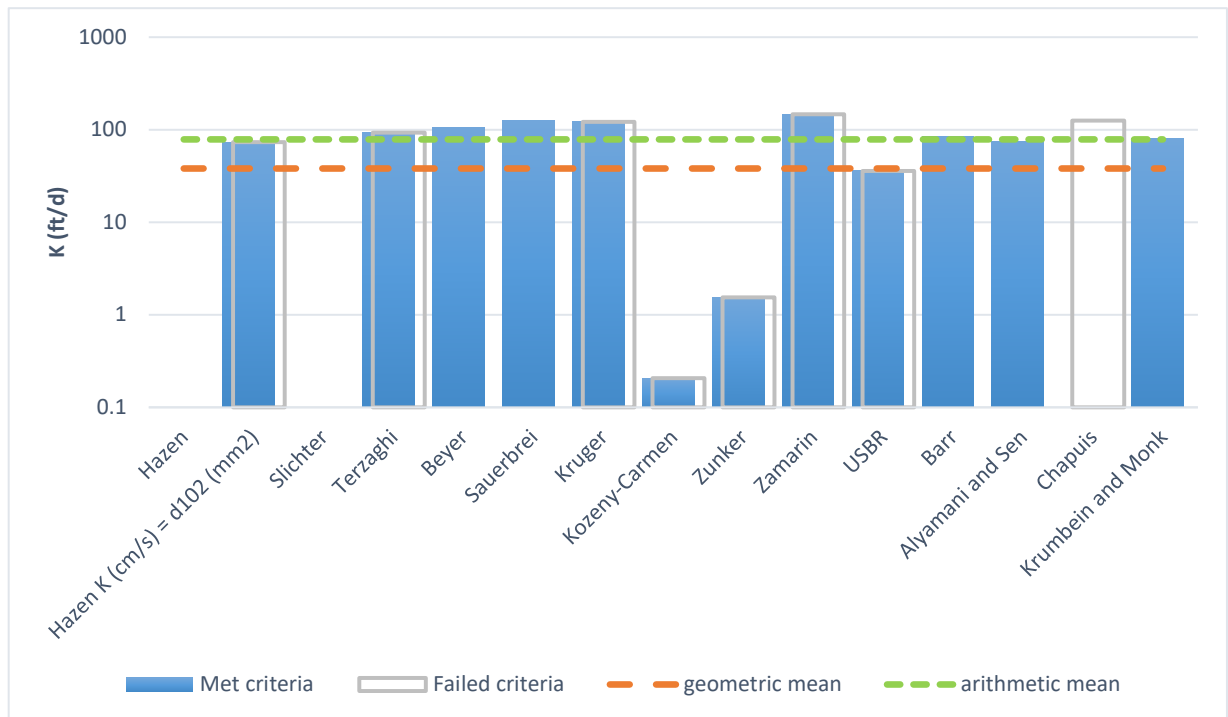
## K from Grain Size Analysis Report

Sample Name: POS-19 5-7.5 ft bls

Mass Sample (g): 433.32

T (°C) 26

### Uniform sand low in fines



| Estimation of Hydraulic Conductivity | cm/s    | m/s     | ft/d |
|--------------------------------------|---------|---------|------|
| Hazen                                | .48E-01 | .48E-03 | 137  |
| Hazen K (cm/s) = $d_{10}$ (mm)       | .26E-01 | .26E-03 | 73   |
| Slichter                             | .19E-01 | .19E-03 | 53   |
| Terzaghi                             | .33E-01 | .33E-03 | 93   |
| Beyer                                | .37E-01 | .37E-03 | 105  |
| Sauerbrei                            | .44E-01 | .44E-03 | 126  |
| Kruger                               | .43E-01 | .43E-03 | 121  |
| Kozeny-Carmen                        | .73E-04 | .73E-06 | 0    |
| Zunker                               | .54E-03 | .54E-05 | 2    |
| Zamarin                              | .52E-01 | .52E-03 | 147  |
| USBR                                 | .13E-01 | .13E-03 | 36   |
| Barr                                 | .29E-01 | .29E-03 | 84   |
| Alyamani and Sen                     | .27E-01 | .27E-03 | 76   |
| Chapuis                              | .44E-01 | .44E-03 | 125  |
| Krumbein and Monk                    | .28E-01 | .28E-03 | 81   |
| geometric mean                       | .13E-01 | .13E-03 | 38   |
| arithmetic mean                      | .28E-01 | .28E-03 | 79   |



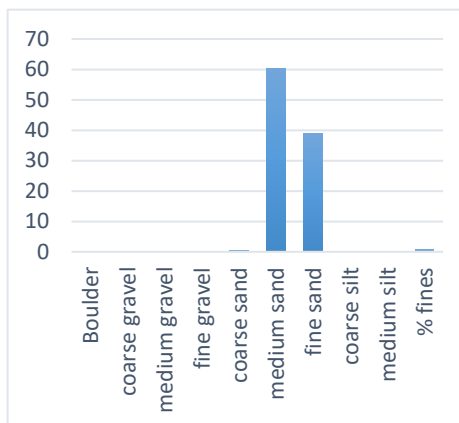
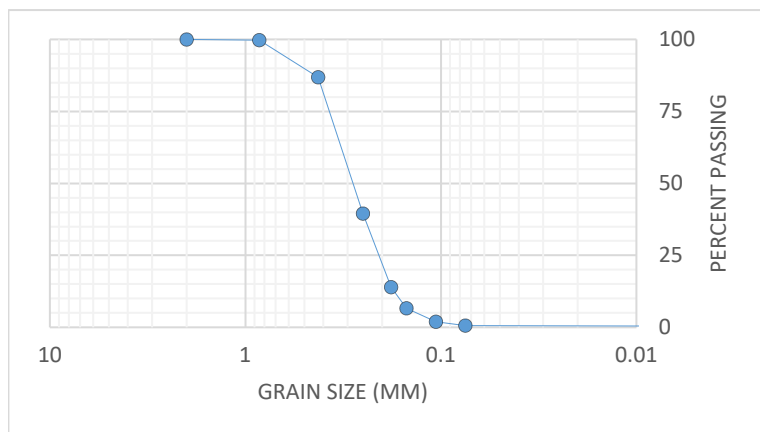
# Grain Size Analysis Report

Sample Name: POS-19 7.5-10 ft bls

Mass Sample (g): 396.59

T (°C) 26

## Uniform sand low in fines



| Sieve opening (ps)<br>di (mm) | Mass of retained (mr)<br>(g) | mass fraction (mf) | Percent Passing (pp) |
|-------------------------------|------------------------------|--------------------|----------------------|
| 2                             | 0.00                         | 0.00               | 100.00               |
| 0.85                          | 1.11                         | 0.00               | 99.72                |
| 0.425                         | 51.01                        | 0.13               | 86.86                |
| 0.25                          | 187.97                       | 0.47               | 39.46                |
| 0.18                          | 101.25                       | 0.26               | 13.93                |
| 0.15                          | 28.92                        | 0.07               | 6.64                 |
| 0.106                         | 18.61                        | 0.05               | 1.95                 |
| 0.075                         | 5.34                         | 0.01               | 0.60                 |
| 0.00001                       | 2.38                         | 0.01               | 0.00                 |

| Effective Grain Diameters (mm) |       | Other Useful Parameters     |             |
|--------------------------------|-------|-----------------------------|-------------|
| d10                            | 0.164 | Uniformity Coef.            | 1.99        |
| d17                            | 0.188 | n computed                  | 0.43        |
| d20                            | 0.197 | g (cm/s <sup>2</sup> )      | 980.00      |
| d30                            | 0.224 | ρ (g/cm <sup>3</sup> )      | 0.9968      |
| d50                            | 0.289 | μ (g/cm s)                  | 0.0085      |
| d60                            | 0.326 | ρg/μ (1/cm s)               | 1.1461E+05  |
| de (Kruger)                    | 0.256 | tau (Sauerbrei)             | 1.209       |
| de (Kozeny)                    | 0.003 | d <sub>geometric mean</sub> | 0.281       |
| de (Zunker)                    | 0.014 | σ <sub>ψ</sub>              | 0.648       |
| de (Zamarin)                   | 0.221 |                             |             |
| lo (Alyameni)                  | 0.133 | 100                         | % in sample |
| mm                             |       | Boulder                     |             |
| >64                            |       | coarse gravel               |             |
| 16 - 64                        |       | medium gravel               |             |
| 8 - 16                         |       | fine gravel                 |             |
| 2 - 8                          |       | coarse sand                 | 0.28        |
| 0.5 - 2                        |       | medium sand                 | 60.26       |
| 0.25 - 0.5                     |       | fine sand                   | 38.86       |
| 0.063 - 0.25                   |       | coarse silt                 |             |
| 0.016 - 0.063                  |       | medium silt                 |             |
| 0.008 - 0.016                  |       |                             |             |
| 0.002 - 0.008                  |       | % fines                     | 0.6         |



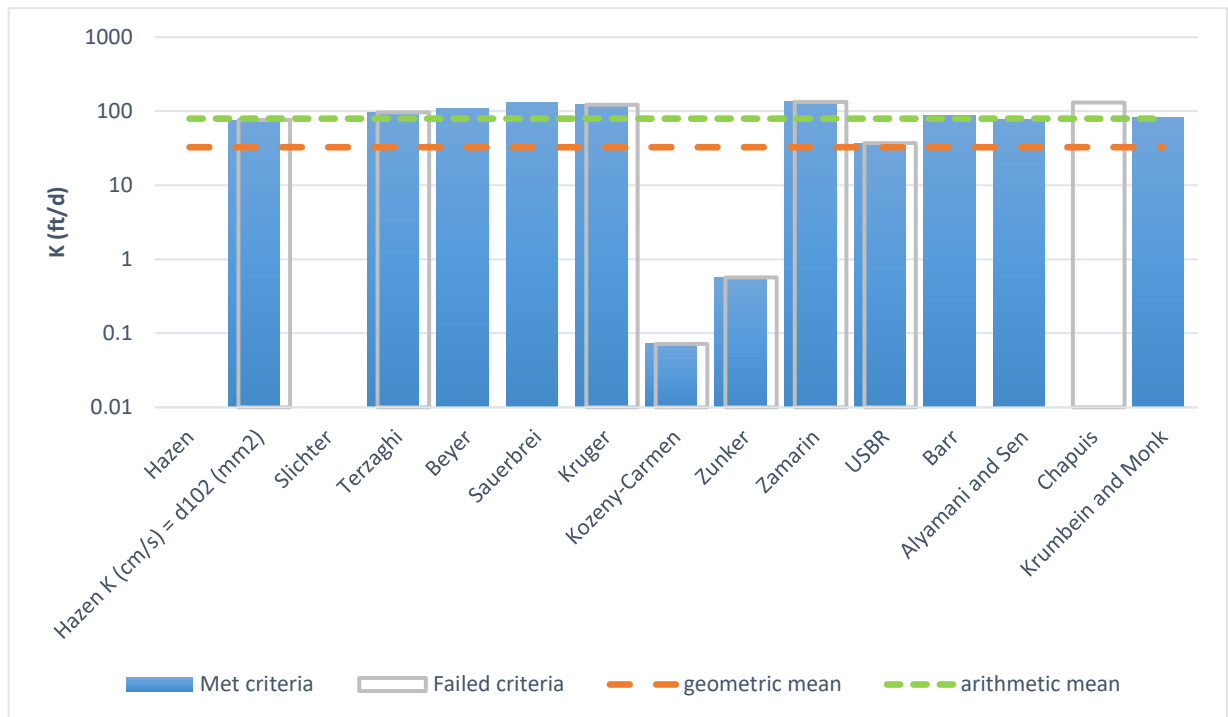
## K from Grain Size Analysis Report

Sample Name: POS-19 7.5-10 ft bls

Mass Sample (g): 396.59

T (°C) 26

### Uniform sand low in fines



| Estimation of Hydraulic Conductivity  | cm/s    | m/s     | ft/d |
|---------------------------------------|---------|---------|------|
| Hazen                                 | .50E-01 | .50E-03 | 142  |
| Hazen K (cm/s) = d <sub>10</sub> (mm) | .27E-01 | .27E-03 | 76   |
| Slichter                              | .19E-01 | .19E-03 | 55   |
| Terzaghi                              | .34E-01 | .34E-03 | 97   |
| Beyer                                 | .38E-01 | .38E-03 | 109  |
| Sauerbrei                             | .46E-01 | .46E-03 | 129  |
| Kruger                                | .43E-01 | .43E-03 | 123  |
| Kozeny-Carmen                         | .25E-04 | .25E-06 | 0    |
| Zunker                                | .20E-03 | .20E-05 | 1    |
| Zamarin                               | .47E-01 | .47E-03 | 134  |
| USBR                                  | .13E-01 | .13E-03 | 37   |
| Barr                                  | .31E-01 | .31E-03 | 87   |
| Alyamani and Sen                      | .28E-01 | .28E-03 | 79   |
| Chapuis                               | .46E-01 | .46E-03 | 130  |
| Krumbein and Monk                     | .29E-01 | .29E-03 | 82   |
| geometric mean                        | .12E-01 | .12E-03 | 33   |
| arithmetic mean                       | .28E-01 | .28E-03 | 79   |



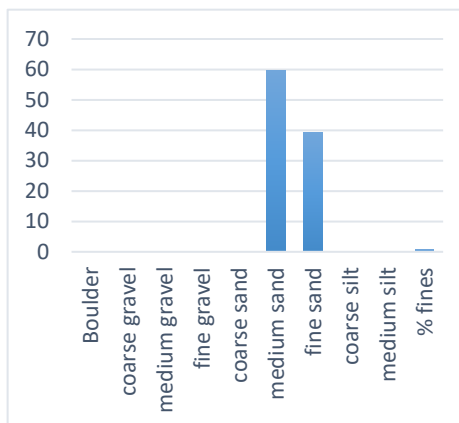
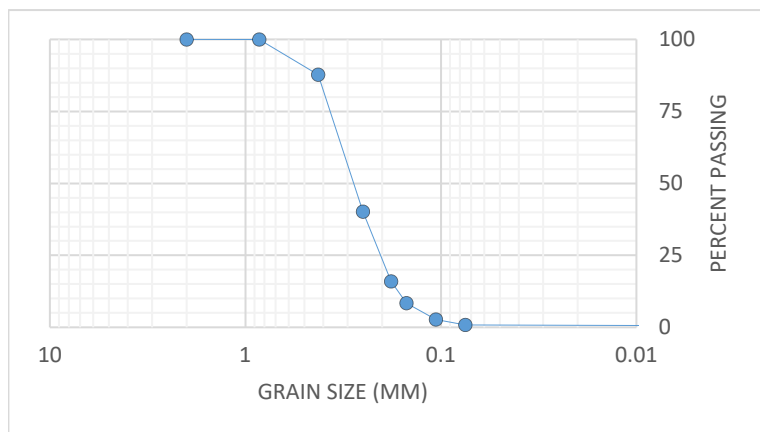
# Grain Size Analysis Report

Sample Name: POS-19 10-12.5 ft bls

Mass Sample (g): 390.4

T (°C) 26

Moderately well sorted sand low in fines



| Sieve opening<br>(ps)<br>di (mm) | Mass of retained<br>(mr)<br>(g) | mass fraction<br>(mf) | Percent Passing<br>(pp) |
|----------------------------------|---------------------------------|-----------------------|-------------------------|
| 2                                | 0.00                            | 0.00                  | 100.00                  |
| 0.85                             | 0.26                            | 0.00                  | 99.93                   |
| 0.425                            | 47.74                           | 0.12                  | 87.70                   |
| 0.25                             | 185.69                          | 0.48                  | 40.14                   |
| 0.18                             | 94.57                           | 0.24                  | 15.92                   |
| 0.15                             | 29.37                           | 0.08                  | 8.39                    |
| 0.106                            | 21.98                           | 0.06                  | 2.76                    |
| 0.075                            | 7.56                            | 0.02                  | 0.83                    |
| 0.00001                          | 3.23                            | 0.01                  | 0.00                    |

| Effective Grain Diameters (mm) |       | Other Useful Parameters     |             |
|--------------------------------|-------|-----------------------------|-------------|
| d10                            | 0.156 | Uniformity Coef.            | 2.07        |
| d17                            | 0.183 | n computed                  | 0.43        |
| d20                            | 0.192 | g (cm/s <sup>2</sup> )      | 980.00      |
| d30                            | 0.221 | ρ (g/cm <sup>3</sup> )      | 0.9968      |
| d50                            | 0.286 | μ (g/cm s)                  | 0.0085      |
| d60                            | 0.323 | ρg/μ (1/cm s)               | 1.1461E+05  |
| de (Kruger)                    | 0.246 | tau (Sauerbrei)             | 1.209       |
| de (Kozeny)                    | 0.002 | d <sub>geometric mean</sub> | 0.277       |
| de (Zunker)                    | 0.010 | σ <sub>ψ</sub>              | 0.670       |
| de (Zamarin)                   | 0.205 |                             |             |
| lo (Alyameni)                  | 0.124 | 100                         | % in sample |
| mm                             |       | Boulder                     |             |
| >64                            |       | coarse gravel               |             |
| 16 - 64                        |       | medium gravel               |             |
| 8 - 16                         |       | fine gravel                 |             |
| 2 - 8                          |       | coarse sand                 | 0.07        |
| 0.5 - 2                        |       | medium sand                 | 59.79       |
| 0.25 - 0.5                     |       | fine sand                   | 39.31       |
| 0.063 - 0.25                   |       | coarse silt                 |             |
| 0.016 - 0.063                  |       | medium silt                 |             |
| 0.008 - 0.016                  |       |                             |             |
| 0.002 - 0.008                  |       | % fines                     | 0.83        |



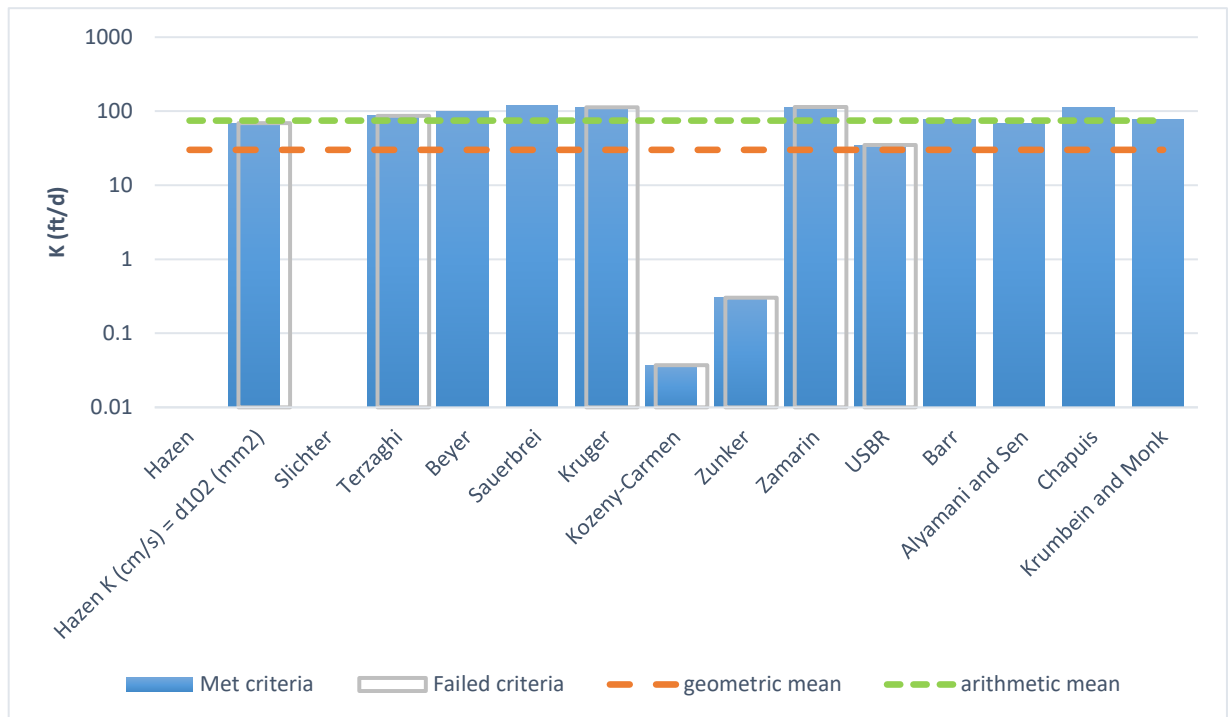
# K from Grain Size Analysis Report

Sample Name: POS-19 10-12.5 ft bls

Mass Sample (g): 390.4

T (°C) 26

**Moderately well sorted sand low in fines**



| Estimation of Hydraulic Conductivity  | cm/s    | m/s     | ft/d |
|---------------------------------------|---------|---------|------|
| Hazen                                 | .45E-01 | .45E-03 | 128  |
| Hazen K (cm/s) = d <sub>10</sub> (mm) | .24E-01 | .24E-03 | 69   |
| Slichter                              | .17E-01 | .17E-03 | 49   |
| Terzaghi                              | .30E-01 | .30E-03 | 86   |
| Beyer                                 | .35E-01 | .35E-03 | 98   |
| Sauerbrei                             | .42E-01 | .42E-03 | 119  |
| Kruger                                | .40E-01 | .40E-03 | 113  |
| Kozeny-Carmen                         | .13E-04 | .13E-06 | 0    |
| Zunker                                | .11E-03 | .11E-05 | 0    |
| Zamarin                               | .40E-01 | .40E-03 | 114  |
| USBR                                  | .12E-01 | .12E-03 | 35   |
| Barr                                  | .27E-01 | .27E-03 | 77   |
| Alyamani and Sen                      | .24E-01 | .24E-03 | 69   |
| Chapuis                               | .40E-01 | .40E-03 | 113  |
| Krumbein and Monk                     | .27E-01 | .27E-03 | 78   |
| geometric mean                        | .11E-01 | .11E-03 | 30   |
| arithmetic mean                       | .26E-01 | .26E-03 | 75   |



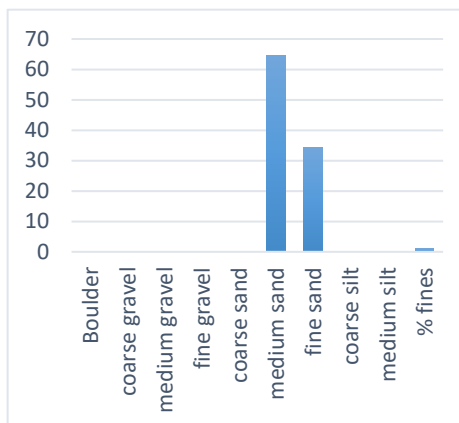
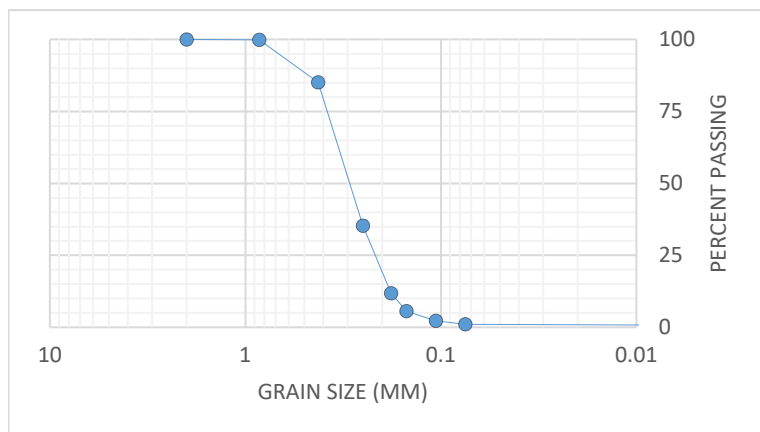
# Grain Size Analysis Report

Sample Name: POS-19 12.5-15 ft bls

Mass Sample (g): 377.34

T (°C) 26

## Uniform sand low in fines



| Sieve opening<br>(ps)<br>di (mm) | Mass of retained<br>(mr)<br>(g) | mass fraction<br>(mf) | Percent Passing<br>(pp) |
|----------------------------------|---------------------------------|-----------------------|-------------------------|
| 2                                | 0.00                            | 0.00                  | 100.00                  |
| 0.85                             | 0.37                            | 0.00                  | 99.90                   |
| 0.425                            | 55.83                           | 0.15                  | 85.11                   |
| 0.25                             | 187.90                          | 0.50                  | 35.31                   |
| 0.18                             | 88.67                           | 0.23                  | 11.81                   |
| 0.15                             | 23.45                           | 0.06                  | 5.60                    |
| 0.106                            | 12.51                           | 0.03                  | 2.28                    |
| 0.075                            | 4.80                            | 0.01                  | 1.01                    |
| 0.00001                          | 3.81                            | 0.01                  | 0.00                    |

| Effective Grain Diameters (mm) |       | Other Useful Parameters     |             |
|--------------------------------|-------|-----------------------------|-------------|
| d10                            | 0.171 | Uniformity Coef.            | 1.97        |
| d17                            | 0.195 | n computed                  | 0.43        |
| d20                            | 0.204 | g (cm/s <sup>2</sup> )      | 980.00      |
| d30                            | 0.234 | ρ (g/cm <sup>3</sup> )      | 0.9968      |
| d50                            | 0.302 | μ (g/cm s)                  | 0.0085      |
| d60                            | 0.337 | ρg/μ (1/cm s)               | 1.1461E+05  |
| de (Kruger)                    | 0.260 | tau (Sauerbrei)             | 1.209       |
| de (Kozeny)                    | 0.002 | d <sub>geometric mean</sub> | 0.290       |
| de (Zunker)                    | 0.009 | σ <sub>ψ</sub>              | 0.634       |
| de (Zamarin)                   | 0.207 |                             |             |
| lo (Alyameni)                  | 0.139 | 100                         | % in sample |
| mm                             |       | Boulder                     |             |
| >64                            |       | coarse gravel               |             |
| 16 - 64                        |       | medium gravel               |             |
| 8 - 16                         |       | fine gravel                 |             |
| 2 - 8                          |       | coarse sand                 | 0.1         |
| 0.5 - 2                        |       | medium sand                 | 64.59       |
| 0.25 - 0.5                     |       | fine sand                   | 34.3        |
| 0.063 - 0.25                   |       | coarse silt                 |             |
| 0.016 - 0.063                  |       | medium silt                 |             |
| 0.008 - 0.016                  |       |                             |             |
| 0.002 - 0.008                  |       | % fines                     | 1.01        |





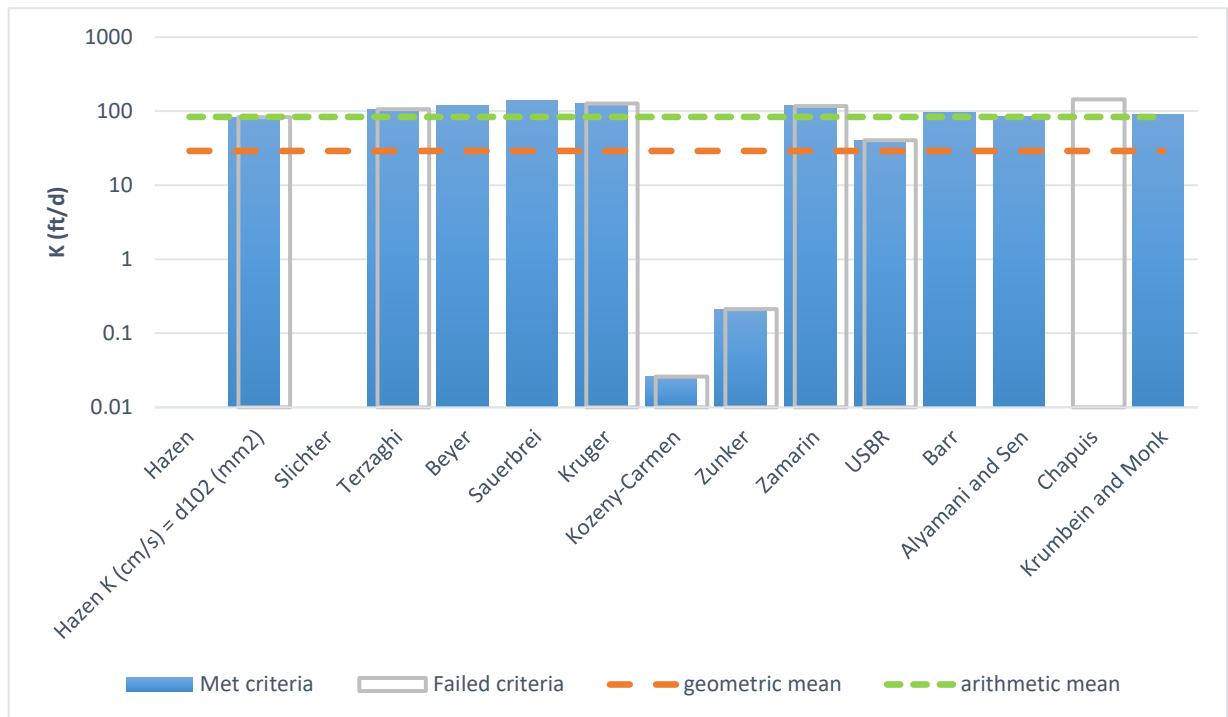
# K from Grain Size Analysis Report

Sample Name: POS-19 12.5-15 ft bls

Mass Sample (g): 377.34

T (°C) 26

## Uniform sand low in fines



| Estimation of Hydraulic Conductivity  | cm/s    | m/s     | ft/d |
|---------------------------------------|---------|---------|------|
| Hazen                                 | .55E-01 | .55E-03 | 155  |
| Hazen K (cm/s) = d <sub>10</sub> (mm) | .29E-01 | .29E-03 | 83   |
| Slichter                              | .21E-01 | .21E-03 | 60   |
| Terzaghi                              | .37E-01 | .37E-03 | 106  |
| Beyer                                 | .42E-01 | .42E-03 | 119  |
| Sauerbrei                             | .49E-01 | .49E-03 | 140  |
| Kruger                                | .45E-01 | .45E-03 | 128  |
| Kozeny-Carmen                         | .92E-05 | .92E-07 | 0    |
| Zunker                                | .75E-04 | .75E-06 | 0    |
| Zamarin                               | .42E-01 | .42E-03 | 118  |
| USBR                                  | .14E-01 | .14E-03 | 40   |
| Barr                                  | .34E-01 | .34E-03 | 95   |
| Alyamani and Sen                      | .30E-01 | .30E-03 | 86   |
| Chapuis                               | .51E-01 | .51E-03 | 145  |
| Krumbein and Monk                     | .32E-01 | .32E-03 | 90   |
| geometric mean                        | .10E-01 | .10E-03 | 29   |
| arithmetic mean                       | .30E-01 | .30E-03 | 84   |



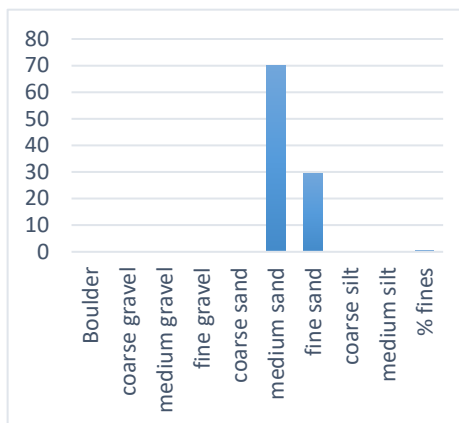
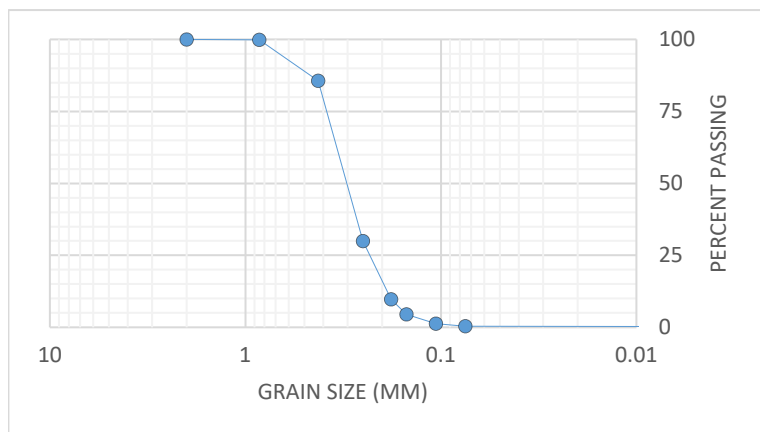
# Grain Size Analysis Report

Sample Name: POS-19 15-17.5 ft bls

Mass Sample (g): 390.94

T (°C) 26

## Uniform sand low in fines



| Sieve opening (ps)<br>di (mm) | Mass of retained (mr)<br>(g) | mass fraction (mf) | Percent Passing (pp) |
|-------------------------------|------------------------------|--------------------|----------------------|
| 2                             | 0.00                         | 0.00               | 100.00               |
| 0.85                          | 0.44                         | 0.00               | 99.89                |
| 0.425                         | 55.97                        | 0.14               | 85.57                |
| 0.25                          | 217.48                       | 0.56               | 29.94                |
| 0.18                          | 78.86                        | 0.20               | 9.77                 |
| 0.15                          | 20.47                        | 0.05               | 4.53                 |
| 0.106                         | 12.67                        | 0.03               | 1.29                 |
| 0.075                         | 3.45                         | 0.01               | 0.41                 |
| 0.00001                       | 1.60                         | 0.00               | 0.00                 |

| Effective Grain Diameters (mm) |       | Other Useful Parameters     |             |
|--------------------------------|-------|-----------------------------|-------------|
| d10                            | 0.181 | Uniformity Coef.            | 1.91        |
| d17                            | 0.205 | n computed                  | 0.43        |
| d20                            | 0.216 | g (cm/s <sup>2</sup> )      | 980.00      |
| d30                            | 0.250 | ρ (g/cm <sup>3</sup> )      | 0.9968      |
| d50                            | 0.313 | μ (g/cm s)                  | 0.0085      |
| d60                            | 0.345 | ρg/μ (1/cm s)               | 1.1461E+05  |
| de (Kruger)                    | 0.279 | tau (Sauerbrei)             | 1.209       |
| de (Kozeny)                    | 0.005 | d <sub>geometric mean</sub> | 0.298       |
| de (Zunker)                    | 0.020 | σ <sub>ψ</sub>              | 0.599       |
| de (Zamarin)                   | 0.248 |                             |             |
| lo (Alyameni)                  | 0.148 | 100                         | % in sample |
| mm                             |       | Boulder                     |             |
| >64                            |       | coarse gravel               |             |
| 16 - 64                        |       | medium gravel               |             |
| 8 - 16                         |       | fine gravel                 |             |
| 2 - 8                          |       | coarse sand                 | 0.11        |
| 0.5 - 2                        |       | medium sand                 | 69.95       |
| 0.25 - 0.5                     |       | fine sand                   | 29.53       |
| 0.063 - 0.25                   |       | coarse silt                 |             |
| 0.016 - 0.063                  |       | medium silt                 |             |
| 0.008 - 0.016                  |       |                             |             |
| 0.002 - 0.008                  |       | % fines                     | 0.41        |



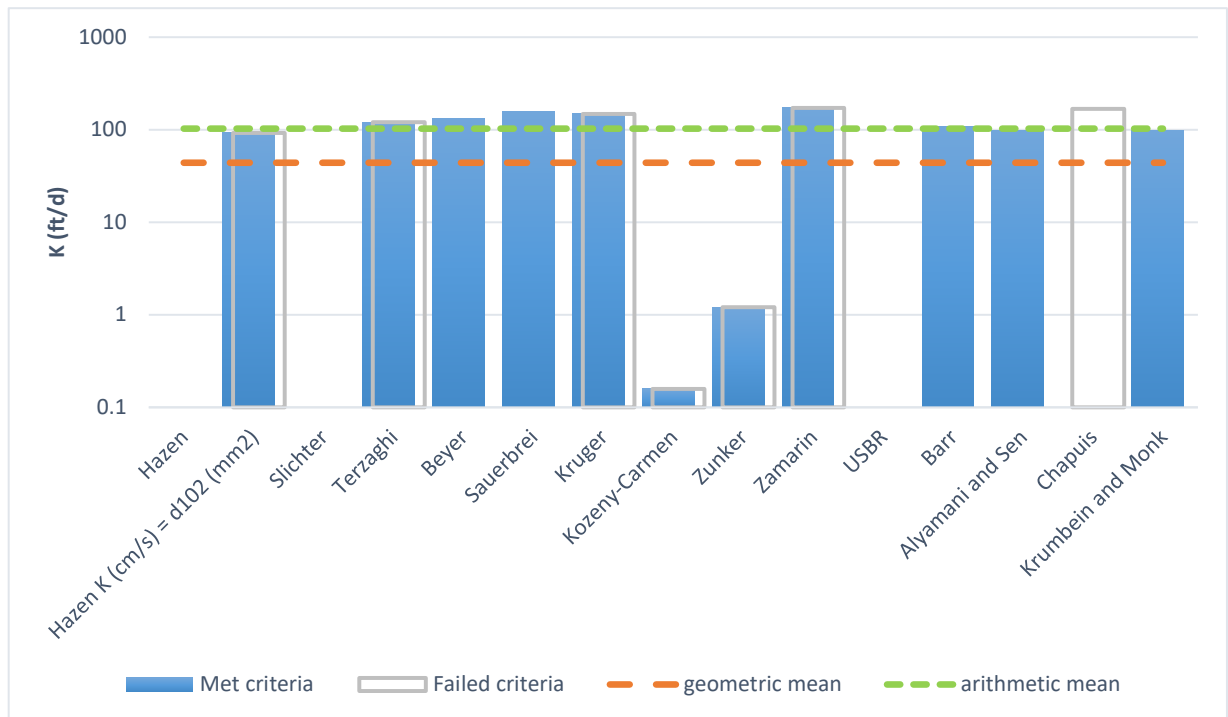
# K from Grain Size Analysis Report

Sample Name: POS-19 15-17.5 ft bls

Mass Sample (g): 390.94

T (°C) 26

## Uniform sand low in fines



| Estimation of Hydraulic Conductivity  | cm/s    | m/s     | ft/d |
|---------------------------------------|---------|---------|------|
| Hazen                                 | .62E-01 | .62E-03 | 174  |
| Hazen K (cm/s) = d <sub>10</sub> (mm) | .33E-01 | .33E-03 | 93   |
| Slichter                              | .24E-01 | .24E-03 | 68   |
| Terzaghi                              | .42E-01 | .42E-03 | 120  |
| Beyer                                 | .47E-01 | .47E-03 | 134  |
| Sauerbrei                             | .56E-01 | .56E-03 | 158  |
| Kruger                                | .52E-01 | .52E-03 | 148  |
| Kozeny-Carmen                         | .56E-04 | .56E-06 | 0    |
| Zunker                                | .43E-03 | .43E-05 | 1    |
| Zamarin                               | .61E-01 | .61E-03 | 172  |
| USBR                                  | .16E-01 | .16E-03 | 46   |
| Barr                                  | .38E-01 | .38E-03 | 109  |
| Alyamani and Sen                      | .34E-01 | .34E-03 | 97   |
| Chapuis                               | .59E-01 | .59E-03 | 169  |
| Krumbein and Monk                     | .35E-01 | .35E-03 | 99   |
| geometric mean                        | .16E-01 | .16E-03 | 44   |
| arithmetic mean                       | .36E-01 | .36E-03 | 103  |



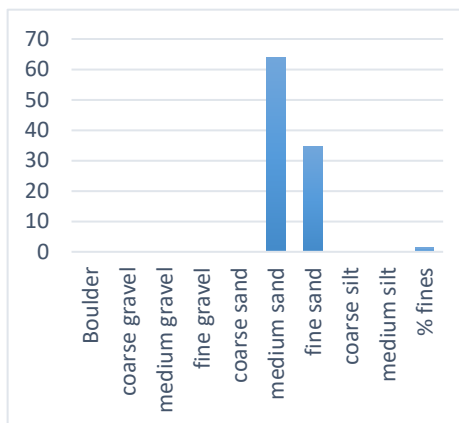
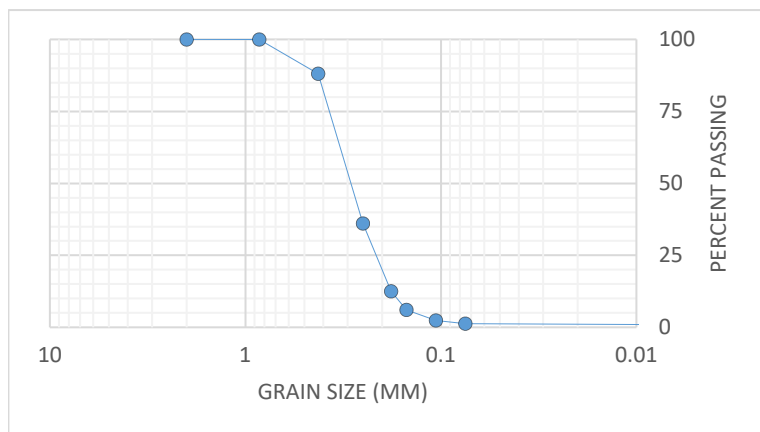
# Grain Size Analysis Report

Sample Name: POS-19 17.5-20 ft bls

Mass Sample (g): 415.39

T (°C) 26

## Uniform sand low in fines



| Sieve opening<br>(ps)<br>di (mm) | Mass of retained<br>(mr)<br>(g) | mass fraction<br>(mf) | Percent Passing<br>(pp) |
|----------------------------------|---------------------------------|-----------------------|-------------------------|
| 2                                | 0.00                            | 0.00                  | 100.00                  |
| 0.85                             | 0.21                            | 0.00                  | 99.95                   |
| 0.425                            | 49.17                           | 0.12                  | 88.11                   |
| 0.25                             | 216.44                          | 0.52                  | 36.01                   |
| 0.18                             | 97.72                           | 0.24                  | 12.48                   |
| 0.15                             | 26.54                           | 0.06                  | 6.09                    |
| 0.106                            | 15.46                           | 0.04                  | 2.37                    |
| 0.075                            | 4.63                            | 0.01                  | 1.26                    |
| 0.00001                          | 5.22                            | 0.01                  | 0.00                    |

| Effective Grain Diameters (mm) |       | Other Useful Parameters     |             |
|--------------------------------|-------|-----------------------------|-------------|
| d10                            | 0.168 | Uniformity Coef.            | 1.96        |
| d17                            | 0.193 | n computed                  | 0.43        |
| d20                            | 0.202 | g (cm/s <sup>2</sup> )      | 980.00      |
| d30                            | 0.232 | ρ (g/cm <sup>3</sup> )      | 0.9968      |
| d50                            | 0.297 | μ (g/cm s)                  | 0.0085      |
| d60                            | 0.331 | ρg/μ (1/cm s)               | 1.1461E+05  |
| de (Kruger)                    | 0.253 | tau (Sauerbrei)             | 1.209       |
| de (Kozeny)                    | 0.002 | d <sub>geometric mean</sub> | 0.286       |
| de (Zunker)                    | 0.007 | σ <sub>ψ</sub>              | 0.625       |
| de (Zamarin)                   | 0.193 |                             |             |
| lo (Alyameni)                  | 0.136 | 100                         | % in sample |
| mm                             |       | Boulder                     |             |
| >64                            |       | coarse gravel               |             |
| 16 - 64                        |       | medium gravel               |             |
| 8 - 16                         |       | fine gravel                 |             |
| 2 - 8                          |       | coarse sand                 | 0.05        |
| 0.5 - 2                        |       | medium sand                 | 63.94       |
| 0.25 - 0.5                     |       | fine sand                   | 34.75       |
| 0.063 - 0.25                   |       | coarse silt                 |             |
| 0.016 - 0.063                  |       | medium silt                 |             |
| 0.008 - 0.016                  |       |                             |             |
| 0.002 - 0.008                  |       | % fines                     | 1.26        |



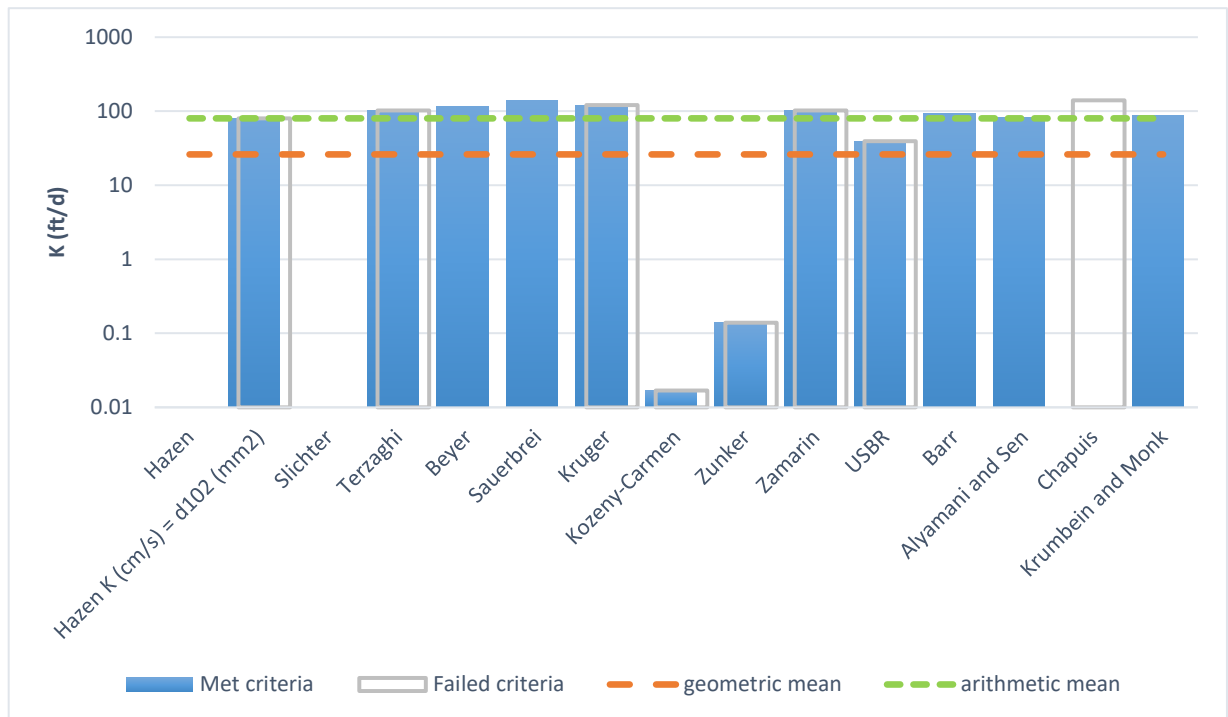
## K from Grain Size Analysis Report

Sample Name: POS-19 17.5-20 ft bls

Mass Sample (g): 415.39

T (°C) 26

### Uniform sand low in fines



| Estimation of Hydraulic Conductivity | cm/s    | m/s     | ft/d |
|--------------------------------------|---------|---------|------|
| Hazen                                | .53E-01 | .53E-03 | 150  |
| Hazen K (cm/s) = $d_{10}^2$ (mm)     | .28E-01 | .28E-03 | 80   |
| Slichter                             | .21E-01 | .21E-03 | 58   |
| Terzaghi                             | .36E-01 | .36E-03 | 103  |
| Beyer                                | .41E-01 | .41E-03 | 115  |
| Sauerbrei                            | .49E-01 | .49E-03 | 138  |
| Kruger                               | .43E-01 | .43E-03 | 121  |
| Kozeny-Carmen                        | .59E-05 | .59E-07 | 0    |
| Zunker                               | .49E-04 | .49E-06 | 0    |
| Zamarin                              | .36E-01 | .36E-03 | 103  |
| USBR                                 | .14E-01 | .14E-03 | 40   |
| Barr                                 | .33E-01 | .33E-03 | 92   |
| Alyamani and Sen                     | .29E-01 | .29E-03 | 83   |
| Chapuis                              | .49E-01 | .49E-03 | 140  |
| Krumbein and Monk                    | .31E-01 | .31E-03 | 88   |
| geometric mean                       | .92E-02 | .92E-04 | 26   |
| arithmetic mean                      | .28E-01 | .28E-03 | 80   |



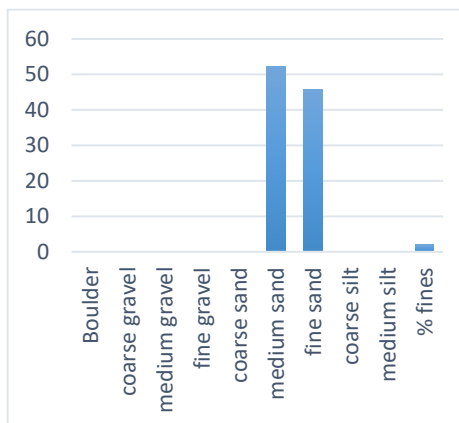
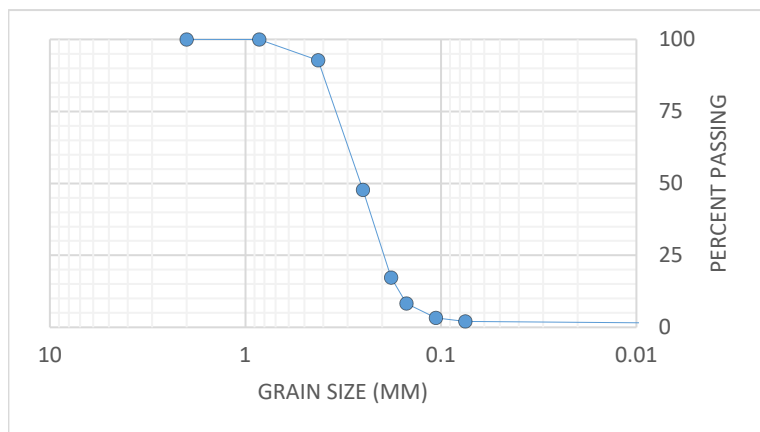
# Grain Size Analysis Report

Sample Name: POS-19 20-22.5 ft bls

Mass Sample (g): 377.34

T (°C) 26

## Uniform sand low in fines



| Sieve opening<br>(ps)<br>di (mm) | Mass of retained<br>(mr)<br>(g) | mass fraction<br>(mf) | Percent Passing<br>(pp) |
|----------------------------------|---------------------------------|-----------------------|-------------------------|
| 2                                | 0.00                            | 0.00                  | 100.00                  |
| 0.85                             | 0.20                            | 0.00                  | 99.95                   |
| 0.425                            | 27.36                           | 0.07                  | 92.70                   |
| 0.25                             | 169.75                          | 0.45                  | 47.71                   |
| 0.18                             | 115.02                          | 0.30                  | 17.23                   |
| 0.15                             | 33.97                           | 0.09                  | 8.23                    |
| 0.106                            | 18.75                           | 0.05                  | 3.26                    |
| 0.075                            | 4.64                            | 0.01                  | 2.03                    |
| 0.00001                          | 7.65                            | 0.02                  | 0.00                    |

| Effective Grain Diameters (mm) |       | Other Useful Parameters     |             |
|--------------------------------|-------|-----------------------------|-------------|
| d10                            | 0.156 | Uniformity Coef.            | 1.91        |
| d17                            | 0.179 | n computed                  | 0.43        |
| d20                            | 0.186 | g (cm/s <sup>2</sup> )      | 980.00      |
| d30                            | 0.209 | ρ (g/cm <sup>3</sup> )      | 0.9968      |
| d50                            | 0.259 | μ (g/cm s)                  | 0.0085      |
| d60                            | 0.298 | ρg/μ (1/cm s)               | 1.1461E+05  |
| de (Kruger)                    | 0.223 | tau (Sauerbrei)             | 1.209       |
| de (Kozeny)                    | 0.001 | d <sub>geometric mean</sub> | 0.261       |
| de (Zunker)                    | 0.004 | σ <sub>ψ</sub>              | 0.622       |
| de (Zamarin)                   | 0.156 |                             |             |
| lo (Alyameni)                  | 0.130 | 100                         | % in sample |
| mm                             |       | Boulder                     |             |
| >64                            |       | coarse gravel               |             |
| 16 - 64                        |       | medium gravel               |             |
| 8 - 16                         |       | fine gravel                 |             |
| 2 - 8                          |       | coarse sand                 | 0.05        |
| 0.5 - 2                        |       | medium sand                 | 52.24       |
| 0.25 - 0.5                     |       | fine sand                   | 45.68       |
| 0.063 - 0.25                   |       | coarse silt                 |             |
| 0.016 - 0.063                  |       | medium silt                 |             |
| 0.008 - 0.016                  |       |                             |             |
| 0.002 - 0.008                  |       | % fines                     | 2.03        |





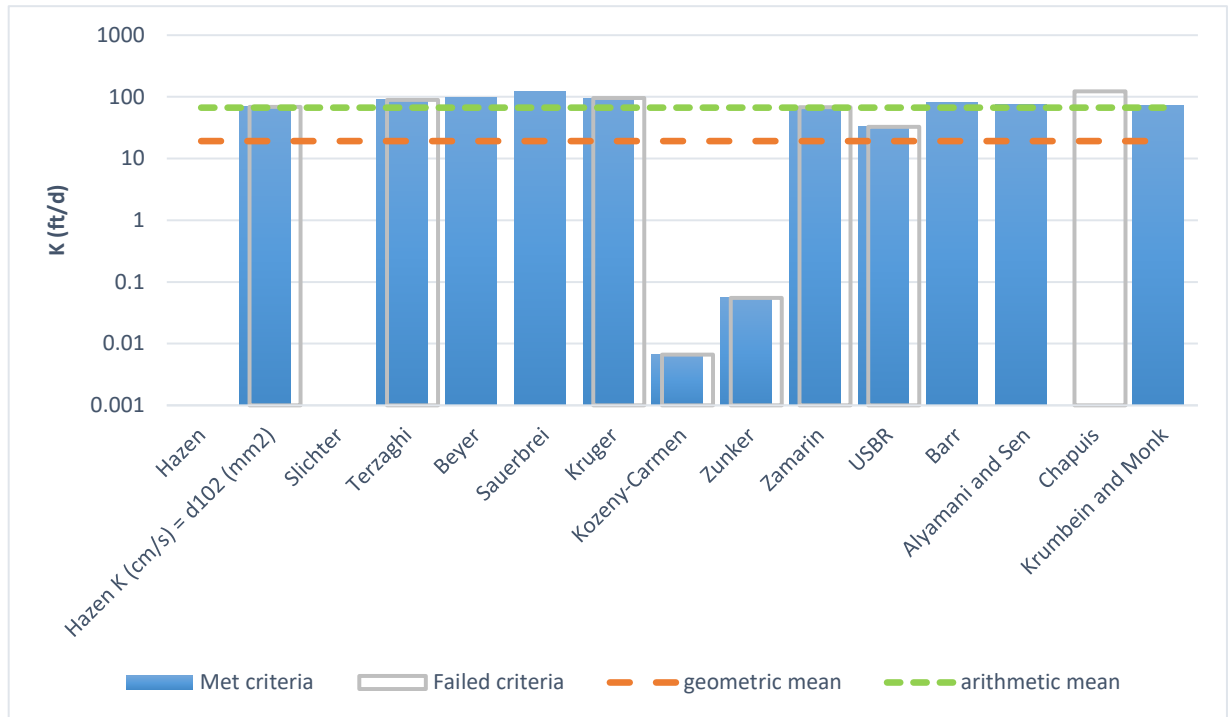
# K from Grain Size Analysis Report

Sample Name: POS-19 20-22.5 ft bls

Mass Sample (g): 377.34

T (°C) 26

## Uniform sand low in fines



| Estimation of Hydraulic Conductivity  | cm/s    | m/s     | ft/d |
|---------------------------------------|---------|---------|------|
| Hazen                                 | .46E-01 | .46E-03 | 130  |
| Hazen K (cm/s) = d <sub>10</sub> (mm) | .24E-01 | .24E-03 | 69   |
| Slichter                              | .18E-01 | .18E-03 | 51   |
| Terzaghi                              | .32E-01 | .32E-03 | 89   |
| Beyer                                 | .35E-01 | .35E-03 | 99   |
| Sauerbrei                             | .42E-01 | .42E-03 | 120  |
| Kruger                                | .34E-01 | .34E-03 | 95   |
| Kozeny-Carmen                         | .23E-05 | .23E-07 | 0    |
| Zunker                                | .19E-04 | .19E-06 | 0    |
| Zamarin                               | .24E-01 | .24E-03 | 68   |
| USBR                                  | .12E-01 | .12E-03 | 33   |
| Barr                                  | .28E-01 | .28E-03 | 81   |
| Alyamani and Sen                      | .27E-01 | .27E-03 | 75   |
| Chapuis                               | .43E-01 | .43E-03 | 123  |
| Krumbein and Monk                     | .26E-01 | .26E-03 | 74   |
| geometric mean                        | .68E-02 | .68E-04 | 19   |
| arithmetic mean                       | .24E-01 | .24E-03 | 67   |



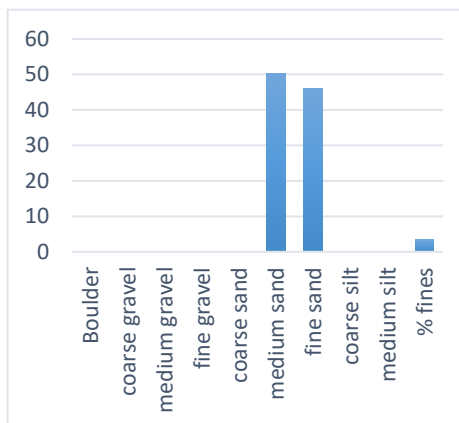
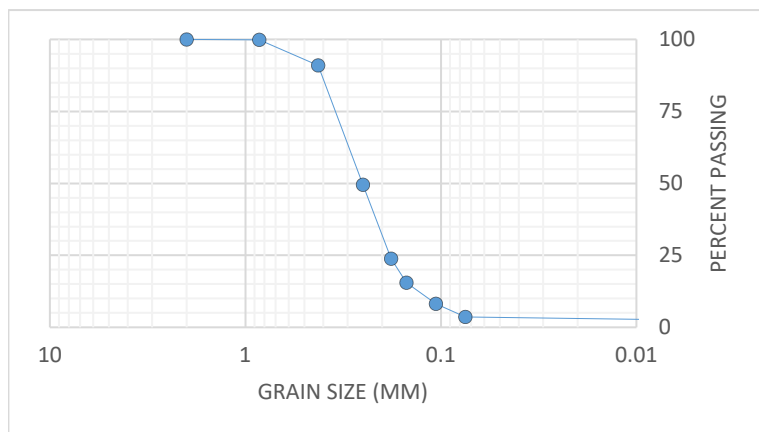
# Grain Size Analysis Report

Sample Name: POS-19 22.5-25 ft bls

Mass Sample (g): 383.91

T (°C) 26

## Moderately well sorted sand with fines



| Sieve opening<br>(ps)<br>di (mm) | Mass of retained<br>(mr)<br>(g) | mass fraction<br>(mf) | Percent Passing<br>(pp) |
|----------------------------------|---------------------------------|-----------------------|-------------------------|
| 2                                | 0.00                            | 0.00                  | 100.00                  |
| 0.85                             | 0.39                            | 0.00                  | 99.90                   |
| 0.425                            | 34.30                           | 0.09                  | 90.96                   |
| 0.25                             | 159.24                          | 0.41                  | 49.49                   |
| 0.18                             | 98.65                           | 0.26                  | 23.79                   |
| 0.15                             | 31.70                           | 0.08                  | 15.53                   |
| 0.106                            | 28.29                           | 0.07                  | 8.16                    |
| 0.075                            | 17.70                           | 0.05                  | 3.55                    |
| 0.00001                          | 13.64                           | 0.04                  | 0.00                    |

| Effective Grain Diameters (mm) |       | Other Useful Parameters     |             |
|--------------------------------|-------|-----------------------------|-------------|
| d10                            | 0.117 | Uniformity Coef.            | 2.52        |
| d17                            | 0.155 | n computed                  | 0.41        |
| d20                            | 0.166 | g (cm/s <sup>2</sup> )      | 980.00      |
| d30                            | 0.197 | ρ (g/cm <sup>3</sup> )      | 0.9968      |
| d50                            | 0.252 | μ (g/cm s)                  | 0.0085      |
| d60                            | 0.294 | ρg/μ (1/cm s)               | 1.1461E+05  |
| de (Kruger)                    | 0.196 | tau (Sauerbrei)             | 1.209       |
| de (Kozeny)                    | 0.001 | d <sub>geometric mean</sub> | 0.247       |
| de (Zunker)                    | 0.002 | σ <sub>ψ</sub>              | 0.780       |
| de (Zamarin)                   | 0.119 |                             |             |
| lo (Alyameni)                  | 0.083 | 100                         | % in sample |
| mm                             |       | Boulder                     |             |
| >64                            |       | coarse gravel               |             |
| 16 - 64                        |       | medium gravel               |             |
| 8 - 16                         |       | fine gravel                 |             |
| 2 - 8                          |       | coarse sand                 | 0.1         |
| 0.5 - 2                        |       | medium sand                 | 50.41       |
| 0.25 - 0.5                     |       | fine sand                   | 45.93       |
| 0.063 - 0.25                   |       | coarse silt                 |             |
| 0.016 - 0.063                  |       | medium silt                 |             |
| 0.008 - 0.016                  |       |                             |             |
| 0.002 - 0.008                  |       | % fines                     | 3.55        |



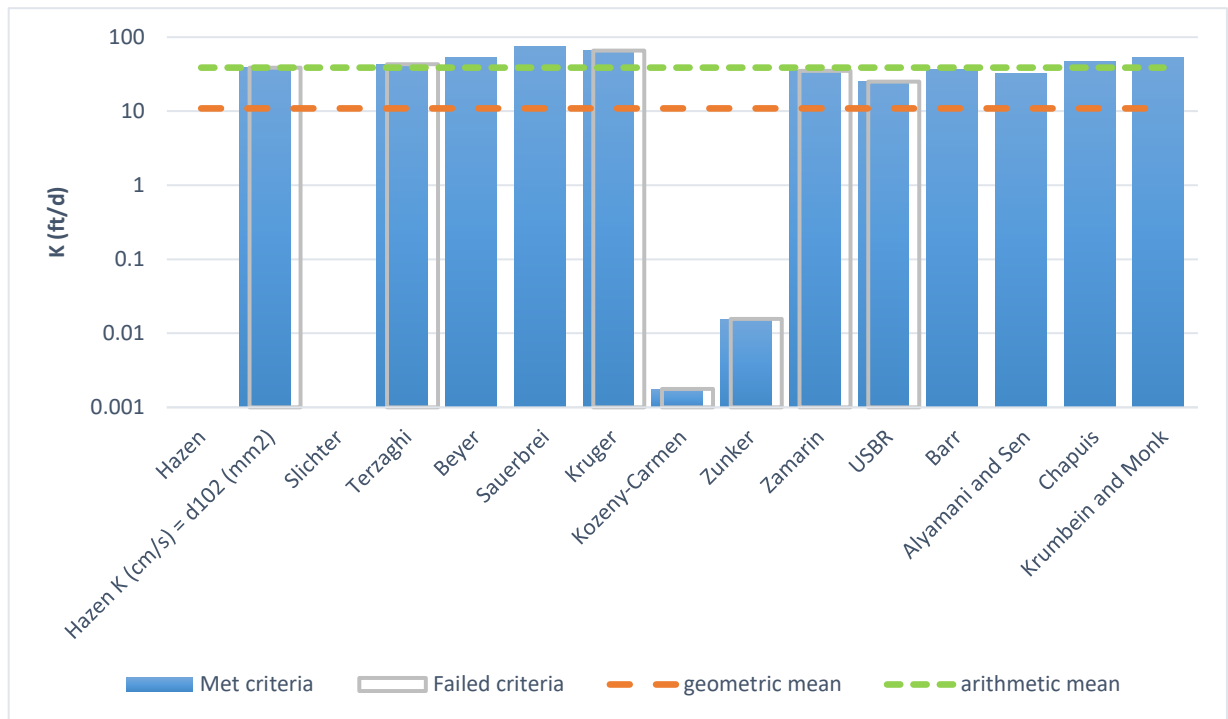
# K from Grain Size Analysis Report

Sample Name: POS-19 22.5-25 ft bls

Mass Sample (g): 383.91

T (°C) 26

Moderately well sorted sand with fines



| Estimation of Hydraulic Conductivity  | cm/s    | m/s     | ft/d |
|---------------------------------------|---------|---------|------|
| Hazen                                 | .24E-01 | .24E-03 | 68   |
| Hazen K (cm/s) = d <sub>10</sub> (mm) | .14E-01 | .14E-03 | 39   |
| Slichter                              | .87E-02 | .87E-04 | 25   |
| Terzaghi                              | .15E-01 | .15E-03 | 43   |
| Beyer                                 | .19E-01 | .19E-03 | 53   |
| Sauerbrei                             | .26E-01 | .26E-03 | 74   |
| Kruger                                | .23E-01 | .23E-03 | 66   |
| Kozeny-Carmen                         | .62E-06 | .62E-08 | 0    |
| Zunker                                | .55E-05 | .55E-07 | 0    |
| Zamarin                               | .12E-01 | .12E-03 | 35   |
| USBR                                  | .89E-02 | .89E-04 | 25   |
| Barr                                  | .13E-01 | .13E-03 | 37   |
| Alyamani and Sen                      | .11E-01 | .11E-03 | 32   |
| Chapuis                               | .17E-01 | .17E-03 | 47   |
| Krumbein and Monk                     | .19E-01 | .19E-03 | 54   |
| geometric mean                        | .39E-02 | .39E-04 | 11   |
| arithmetic mean                       | .14E-01 | .14E-03 | 39   |



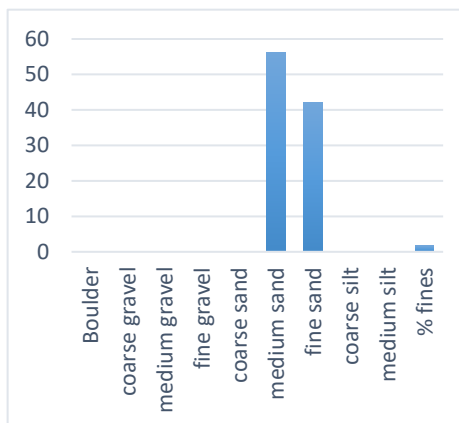
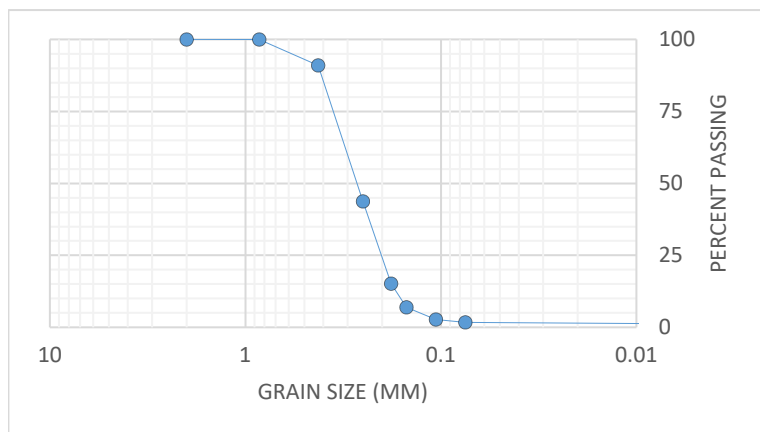
# Grain Size Analysis Report

Sample Name: POS-19 25-27.5 ft bls

Mass Sample (g): 353.84

T (°C) 26

## Uniform sand low in fines



| Sieve opening<br>(ps)<br>di (mm) | Mass of retained<br>(mr)<br>(g) | mass fraction<br>(mf) | Percent Passing<br>(pp) |
|----------------------------------|---------------------------------|-----------------------|-------------------------|
| 2                                | 0.00                            | 0.00                  | 100.00                  |
| 0.85                             | 0.21                            | 0.00                  | 99.94                   |
| 0.425                            | 31.75                           | 0.09                  | 90.97                   |
| 0.25                             | 167.13                          | 0.47                  | 43.73                   |
| 0.18                             | 101.03                          | 0.29                  | 15.18                   |
| 0.15                             | 29.20                           | 0.08                  | 6.93                    |
| 0.106                            | 15.08                           | 0.04                  | 2.67                    |
| 0.075                            | 3.24                            | 0.01                  | 1.75                    |
| 0.00001                          | 6.20                            | 0.02                  | 0.00                    |

| Effective Grain Diameters (mm) |       | Other Useful Parameters     |             |
|--------------------------------|-------|-----------------------------|-------------|
| d10                            | 0.161 | Uniformity Coef.            | 1.93        |
| d17                            | 0.184 | n computed                  | 0.43        |
| d20                            | 0.192 | g (cm/s <sup>2</sup> )      | 980.00      |
| d30                            | 0.216 | ρ (g/cm <sup>3</sup> )      | 0.9968      |
| d50                            | 0.273 | μ (g/cm s)                  | 0.0085      |
| d60                            | 0.310 | ρg/μ (1/cm s)               | 1.1461E+05  |
| de (Kruger)                    | 0.234 | tau (Sauerbrei)             | 1.209       |
| de (Kozeny)                    | 0.001 | d <sub>geometric mean</sub> | 0.271       |
| de (Zunker)                    | 0.005 | σ <sub>ψ</sub>              | 0.623       |
| de (Zamarin)                   | 0.168 |                             |             |
| lo (Alyameni)                  | 0.133 | 100                         | % in sample |
| mm                             |       | Boulder                     |             |
| >64                            |       | coarse gravel               |             |
| 16 - 64                        |       | medium gravel               |             |
| 8 - 16                         |       | fine gravel                 |             |
| 2 - 8                          |       | coarse sand                 | 0.06        |
| 0.5 - 2                        |       | medium sand                 | 56.21       |
| 0.25 - 0.5                     |       | fine sand                   | 41.98       |
| 0.063 - 0.25                   |       | coarse silt                 |             |
| 0.016 - 0.063                  |       | medium silt                 |             |
| 0.008 - 0.016                  |       |                             |             |
| 0.002 - 0.008                  |       | % fines                     | 1.75        |



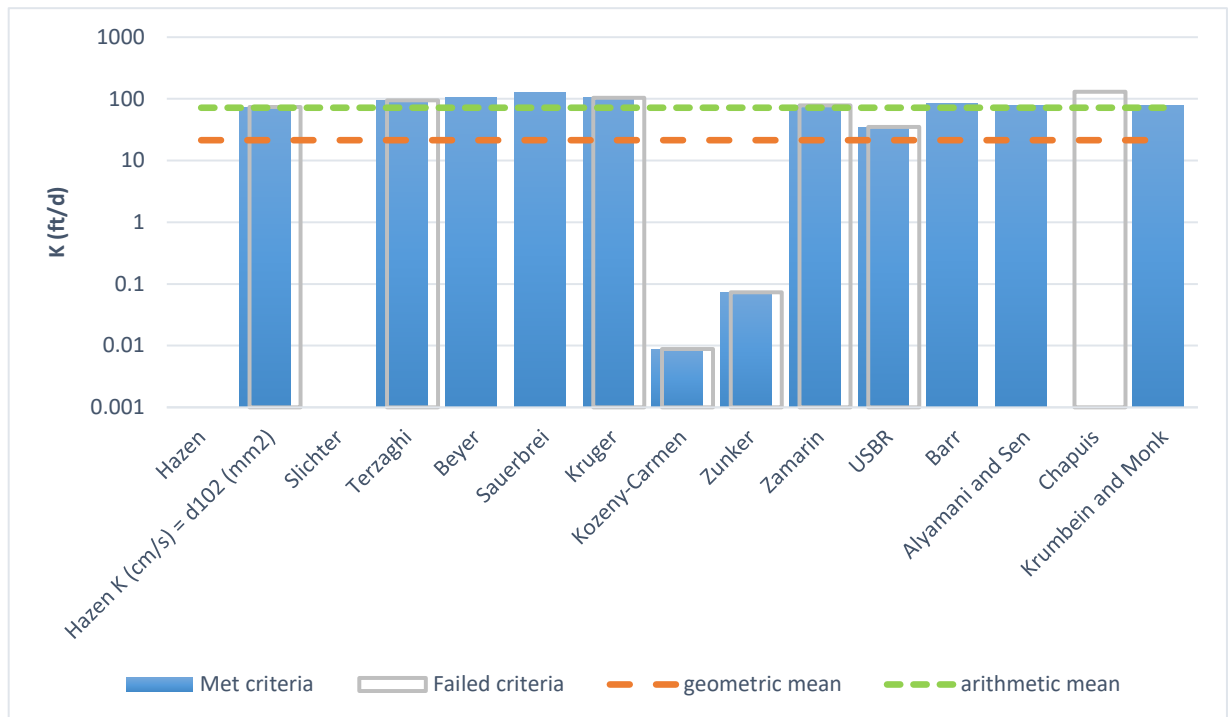
## K from Grain Size Analysis Report

Sample Name: POS-19 25-27.5 ft bls

Mass Sample (g): 353.84

T (°C) 26

### Uniform sand low in fines



| Estimation of Hydraulic Conductivity  | cm/s    | m/s     | ft/d |
|---------------------------------------|---------|---------|------|
| Hazen                                 | .49E-01 | .49E-03 | 138  |
| Hazen K (cm/s) = d <sub>10</sub> (mm) | .26E-01 | .26E-03 | 74   |
| Slichter                              | .19E-01 | .19E-03 | 54   |
| Terzaghi                              | .34E-01 | .34E-03 | 95   |
| Beyer                                 | .37E-01 | .37E-03 | 106  |
| Sauerbrei                             | .45E-01 | .45E-03 | 127  |
| Kruger                                | .37E-01 | .37E-03 | 104  |
| Kozeny-Carmen                         | .31E-05 | .31E-07 | 0    |
| Zunker                                | .26E-04 | .26E-06 | 0    |
| Zamarin                               | .28E-01 | .28E-03 | 79   |
| USBR                                  | .12E-01 | .12E-03 | 35   |
| Barr                                  | .30E-01 | .30E-03 | 86   |
| Alyamani and Sen                      | .28E-01 | .28E-03 | 79   |
| Chapuis                               | .46E-01 | .46E-03 | 131  |
| Krumbein and Monk                     | .28E-01 | .28E-03 | 79   |
| geometric mean                        | .76E-02 | .76E-04 | 21   |
| arithmetic mean                       | .25E-01 | .25E-03 | 72   |



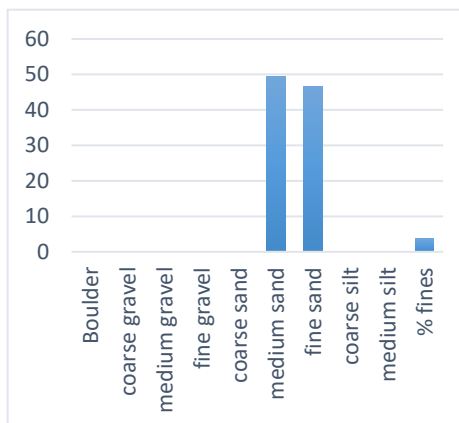
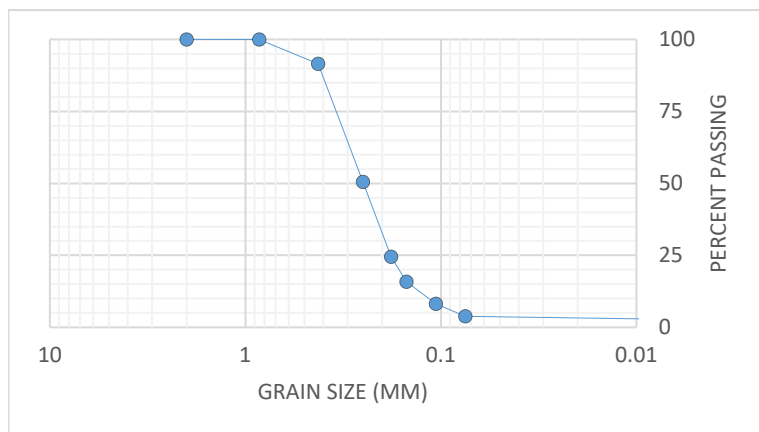
# Grain Size Analysis Report

Sample Name: POS-19 27.5-30 ft bls

Mass Sample (g): 365.89

T (°C) 26

## Moderately well sorted sand with fines



| Sieve opening (ps)<br>di (mm) | Mass of retained (mr)<br>(g) | mass fraction (mf) | Percent Passing (pp) |
|-------------------------------|------------------------------|--------------------|----------------------|
| 2                             | 0.00                         | 0.00               | 100.00               |
| 0.85                          | 0.31                         | 0.00               | 99.92                |
| 0.425                         | 30.92                        | 0.08               | 91.46                |
| 0.25                          | 149.91                       | 0.41               | 50.49                |
| 0.18                          | 95.12                        | 0.26               | 24.50                |
| 0.15                          | 31.90                        | 0.09               | 15.78                |
| 0.106                         | 27.81                        | 0.08               | 8.18                 |
| 0.075                         | 15.89                        | 0.04               | 3.83                 |
| 0.00001                       | 14.03                        | 0.04               | 0.00                 |

| Effective Grain Diameters (mm) |       | Other Useful Parameters     |             |
|--------------------------------|-------|-----------------------------|-------------|
| d10                            | 0.117 | Uniformity Coef.            | 2.49        |
| d17                            | 0.154 | n computed                  | 0.42        |
| d20                            | 0.165 | g (cm/s <sup>2</sup> )      | 980.00      |
| d30                            | 0.195 | ρ (g/cm <sup>3</sup> )      | 0.9968      |
| d50                            | 0.249 | μ (g/cm s)                  | 0.0085      |
| d60                            | 0.291 | ρg/μ (1/cm s)               | 1.1461E+05  |
| de (Kruger)                    | 0.193 | tau (Sauerbrei)             | 1.209       |
| de (Kozeny)                    | 0.001 | d <sub>geometric mean</sub> | 0.245       |
| de (Zunker)                    | 0.002 | σ <sub>ψ</sub>              | 0.778       |
| de (Zamarin)                   | 0.114 |                             |             |
| lo (Alyameni)                  | 0.084 | 100                         | % in sample |
| mm                             |       | Boulder                     |             |
| >64                            |       | coarse gravel               |             |
| 16 - 64                        |       | medium gravel               |             |
| 8 - 16                         |       | fine gravel                 |             |
| 2 - 8                          |       | coarse sand                 | 0.08        |
| 0.5 - 2                        |       | medium sand                 | 49.42       |
| 0.25 - 0.5                     |       | fine sand                   | 46.66       |
| 0.063 - 0.25                   |       | coarse silt                 |             |
| 0.016 - 0.063                  |       | medium silt                 |             |
| 0.008 - 0.016                  |       |                             |             |
| 0.002 - 0.008                  |       | % fines                     | 3.83        |





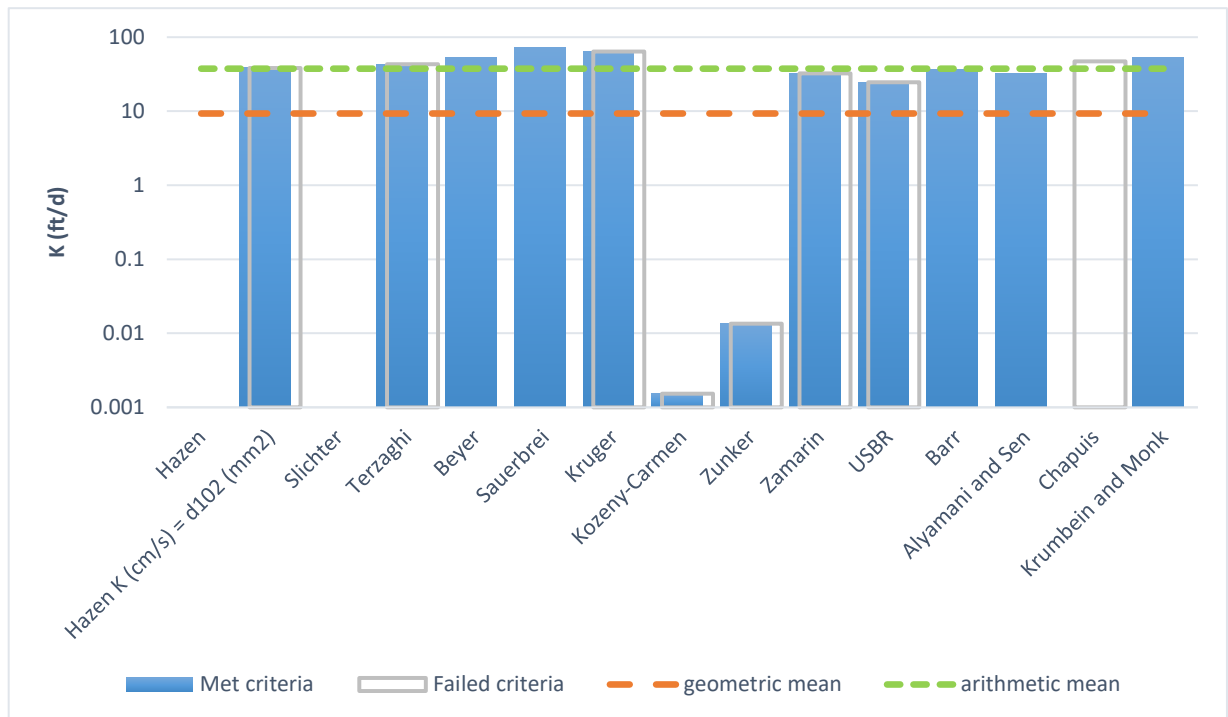
## K from Grain Size Analysis Report

Sample Name: POS-19 27.5-30 ft bls

Mass Sample (g): 365.89

T (°C) 26

**Moderately well sorted sand with fines**



| Estimation of Hydraulic Conductivity  | cm/s    | m/s     | ft/d |
|---------------------------------------|---------|---------|------|
| Hazen                                 | .24E-01 | .24E-03 | 68   |
| Hazen K (cm/s) = d <sub>10</sub> (mm) | .14E-01 | .14E-03 | 39   |
| Slichter                              | .87E-02 | .87E-04 | 25   |
| Terzaghi                              | .15E-01 | .15E-03 | 43   |
| Beyer                                 | .19E-01 | .19E-03 | 53   |
| Sauerbrei                             | .26E-01 | .26E-03 | 73   |
| Kruger                                | .23E-01 | .23E-03 | 64   |
| Kozeny-Carmen                         | .54E-06 | .54E-08 | 0    |
| Zunker                                | .48E-05 | .48E-07 | 0    |
| Zamarin                               | .11E-01 | .11E-03 | 32   |
| USBR                                  | .87E-02 | .87E-04 | 25   |
| Barr                                  | .13E-01 | .13E-03 | 37   |
| Alyamani and Sen                      | .11E-01 | .11E-03 | 32   |
| Chapuis                               | .17E-01 | .17E-03 | 47   |
| Krumbein and Monk                     | .19E-01 | .19E-03 | 53   |
| geometric mean                        | .33E-02 | .33E-04 | 9    |
| arithmetic mean                       | .13E-01 | .13E-03 | 38   |

# SFWMD Split-spoon Drilling Form

|                                 |                           |                              |                   |                            |                   |
|---------------------------------|---------------------------|------------------------------|-------------------|----------------------------|-------------------|
| Date: 4/3/19 Page 1 of 2        |                           | Drilling Equipment / Methods |                   |                            |                   |
| Well Name<br>POS-20             | Spoon I.D.                | Spoon O.D.                   | Liner<br>Yes / No | Drill Fluid<br>Mud / Water | Drill Rod Length: |
| Contractor/Driller<br>EDS       | Rig Type: CMB-750 ATV     |                              |                   | Water Table                |                   |
| Site Geologist<br>Kris Esterson | Hammer Type:              |                              |                   | Time                       | Ft BLS            |
| Starting Depth<br>0             | Hammer Weight [lb] 140 lb |                              |                   |                            |                   |
| Ending Depth<br>31 ft           | Hammer Drop [in] 24 "     |                              |                   |                            |                   |
| Drilling Notes: SUMICAN site    |                           |                              |                   |                            |                   |
| 6.25" ID HSA                    |                           |                              |                   |                            |                   |

| Start Depth | End Depth | N <sub>1</sub> | N <sub>2</sub> | N <sub>3</sub> | N <sub>4</sub> | N Value (N <sub>2</sub> +N <sub>3</sub> ) | Percent Recovery | Notes: Lithology, # wraps on cat-head etc.   |
|-------------|-----------|----------------|----------------|----------------|----------------|-------------------------------------------|------------------|----------------------------------------------|
| 0           | 5         | -              | -              | -              | -              | -                                         | -                | Post hole to 5 ft. Water seeping at 5 ft.    |
| 5           | 7         | 3              | 3              | 4              | 7              |                                           | 100              | Tan sand w/ some clay                        |
| 7           | 9         | 4              | 7              | 8              | 9              |                                           | 80               | Tan sand                                     |
| 9           | 11        | 19             | 20             | 25             | 25             |                                           | 60               | Tan sand                                     |
| 11          | 13        | 5              | 6              | 7              | 5              |                                           | 60               | Tan sand                                     |
| 13          | 15        | 9              | 15             | 15             | 15             |                                           | 100              | Grey sand                                    |
| 15          | 17        | 7              | 10             | 10             | 10             |                                           | 100              | Grey sand                                    |
| 17          | 19        | 6              | 7              | 10             | 15             |                                           | 100              | Tan sand w/ minor clay stringer              |
| 19          | 21        | 5              | 7              | 4              | 2              |                                           | 50               | Light tan sand * might be heaved in material |
| 21          | 23        | 4              | 6              | 6              | 13             |                                           | 25               | Light tan sand w/ clay content "cohesive"    |

N = Blow counts for ea 6" interval.

N Value = sum N<sub>2</sub> + N<sub>3</sub>

(1)

# SFWMD Split-spoon Drilling Form

|                                 |                    |                              |                   |                            |                   |
|---------------------------------|--------------------|------------------------------|-------------------|----------------------------|-------------------|
| Date: 4/3/19 Page 2 of 2        |                    | Drilling Equipment / Methods |                   |                            |                   |
| Well Name                       | Spoon I.D.         | Spoon O.D.                   | Liner<br>Yes / No | Drill Fluid<br>Mud / Water | Drill Rod Length: |
| Contractor/Driller<br>EDS       | Rig Type:          |                              |                   | Water Table                |                   |
| Site Geologist<br>Kris Esterson | Hammer Type:       |                              |                   | Time                       | Ft BLS            |
| Starting Depth<br>0             | Hammer Weight [lb] |                              |                   |                            |                   |
| Ending Depth<br>31 ft           | Hammer Drop [in]   |                              |                   |                            |                   |

Drilling Notes: SUMICAN site

| Start Depth | End Depth | N <sub>1</sub> | N <sub>2</sub> | N <sub>3</sub> | N <sub>4</sub> | N Value<br>(N <sub>2</sub> +N <sub>3</sub> ) | Percent Recovery | Notes: Lithology, # wraps on cat-head etc. |
|-------------|-----------|----------------|----------------|----------------|----------------|----------------------------------------------|------------------|--------------------------------------------|
| 23          | 25        | 5              | 5              | 3              | 5              |                                              | 50               | Buff colored silty-sand                    |
| 25          | 27        | 5              | 5              | 5              | 5              |                                              | 20               | Buff colored silty-sand                    |
| 27          | 29        | 8              | 8              | 20             | 20             |                                              | 70               | Buff colored silty-sand                    |
| 29          | 31        | 10             | 10             | 14             | 15             |                                              | 70               | Buff colored silty-sand                    |
| end         |           |                |                |                |                |                                              |                  |                                            |
|             |           |                |                |                |                |                                              |                  |                                            |
|             |           |                |                |                |                |                                              |                  |                                            |
|             |           |                |                |                |                |                                              |                  |                                            |
|             |           |                |                |                |                |                                              |                  |                                            |
|             |           |                |                |                |                |                                              |                  |                                            |
|             |           |                |                |                |                |                                              |                  |                                            |

N = Blow counts for ea 6" interval.

N Value = sum N<sub>2</sub> + N<sub>3</sub>



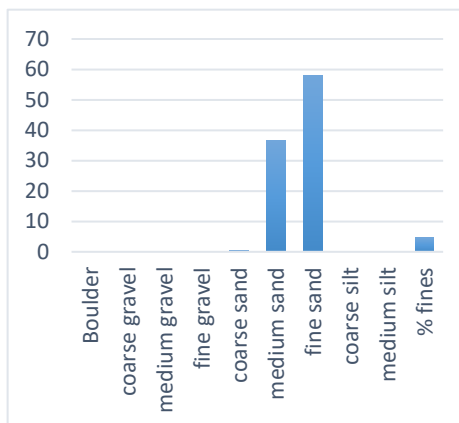
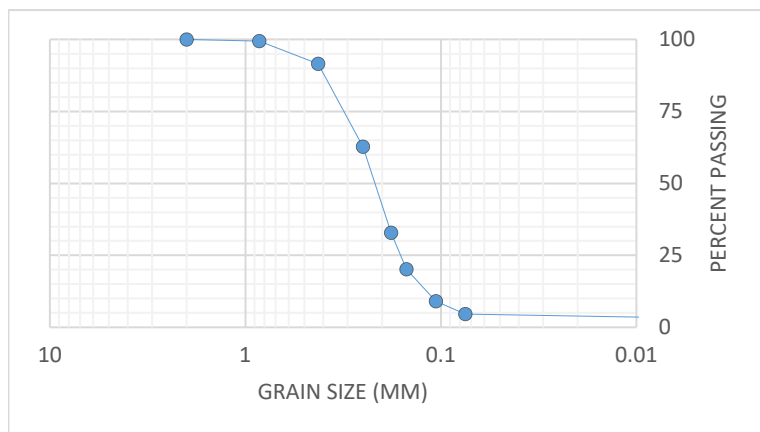
# Grain Size Analysis Report

Sample Name: POS-20 5-7 ft bls

Mass Sample (g): 374.84

T (°C) 26

## Moderately well sorted sand with fines



| Sieve opening<br>(ps)<br>di (mm) | Mass of retained<br>(mr)<br>(g) | mass fraction<br>(mf) | Percent Passing<br>(pp) |
|----------------------------------|---------------------------------|-----------------------|-------------------------|
| 2                                | 0.01                            | 0.00                  | 100.00                  |
| 0.85                             | 2.18                            | 0.01                  | 99.42                   |
| 0.425                            | 29.61                           | 0.08                  | 91.52                   |
| 0.25                             | 107.94                          | 0.29                  | 62.72                   |
| 0.18                             | 111.91                          | 0.30                  | 32.86                   |
| 0.15                             | 47.62                           | 0.13                  | 20.16                   |
| 0.106                            | 41.49                           | 0.11                  | 9.09                    |
| 0.075                            | 16.83                           | 0.04                  | 4.60                    |
| 0.00001                          | 17.25                           | 0.05                  | 0.00                    |

| Effective Grain Diameters (mm) |       | Other Useful Parameters     |             |
|--------------------------------|-------|-----------------------------|-------------|
| d10                            | 0.110 | Uniformity Coef.            | 2.22        |
| d17                            | 0.137 | n computed                  | 0.42        |
| d20                            | 0.149 | g (cm/s <sup>2</sup> )      | 980.00      |
| d30                            | 0.173 | ρ (g/cm <sup>3</sup> )      | 0.9968      |
| d50                            | 0.220 | μ (g/cm s)                  | 0.0085      |
| d60                            | 0.244 | ρg/μ (1/cm s)               | 1.1461E+05  |
| de (Kruger)                    | 0.175 | tau (Sauerbrei)             | 1.209       |
| de (Kozeny)                    | 0.000 | d <sub>geometric mean</sub> | 0.223       |
| de (Zunker)                    | 0.002 | σ <sub>ψ</sub>              | 0.828       |
| de (Zamarin)                   | 0.100 |                             |             |
| lo (Alyameni)                  | 0.082 | 99.9973322                  | % in sample |
| mm                             |       | Boulder                     |             |
| >64                            |       | coarse gravel               |             |
| 16 - 64                        |       | medium gravel               |             |
| 8 - 16                         |       | fine gravel                 |             |
| 2 - 8                          |       | coarse sand                 | 0.58        |
| 0.5 - 2                        |       | medium sand                 | 36.7        |
| 0.25 - 0.5                     |       | fine sand                   | 58.12       |
| 0.063 - 0.25                   |       | coarse silt                 |             |
| 0.016 - 0.063                  |       | medium silt                 |             |
| 0.008 - 0.016                  |       |                             |             |
| 0.002 - 0.008                  |       | % fines                     | 4.6         |



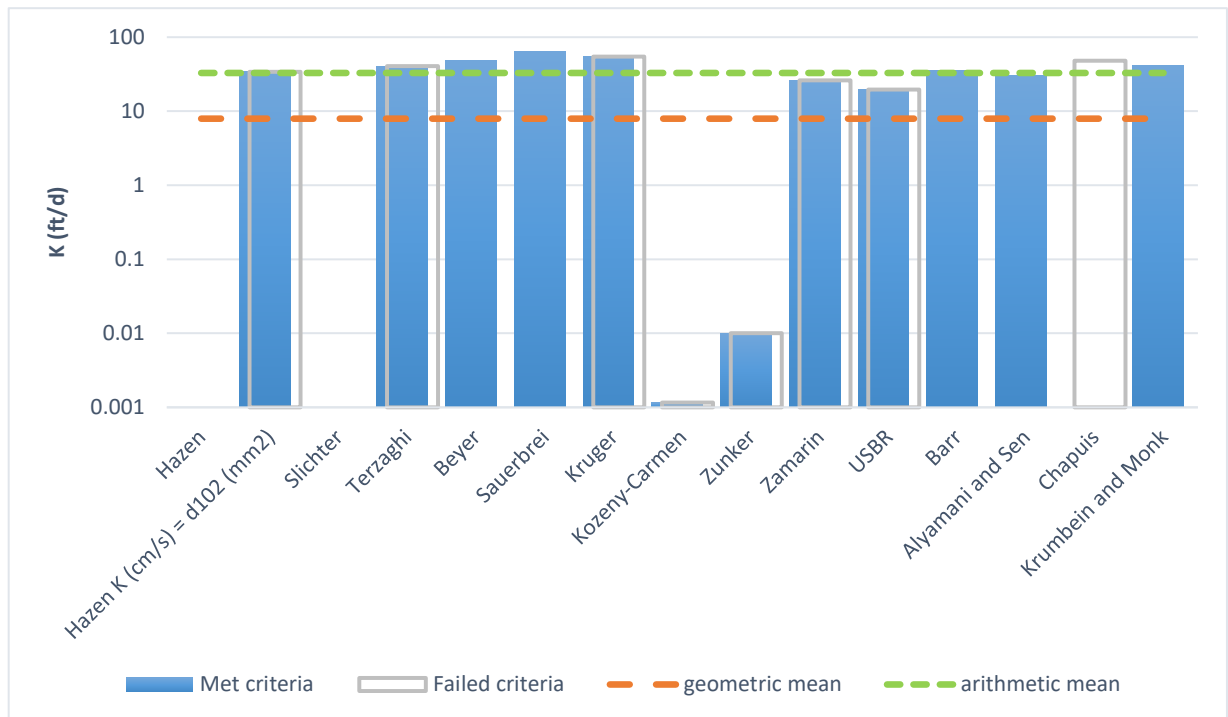
## K from Grain Size Analysis Report

Sample Name: POS-20 5-7 ft bls

Mass Sample (g): 374.84

T (°C) 26

**Moderately well sorted sand with fines**



| Estimation of Hydraulic Conductivity  | cm/s    | m/s     | ft/d |
|---------------------------------------|---------|---------|------|
| Hazen                                 | .22E-01 | .22E-03 | 62   |
| Hazen K (cm/s) = d <sub>10</sub> (mm) | .12E-01 | .12E-03 | 34   |
| Slichter                              | .82E-02 | .82E-04 | 23   |
| Terzaghi                              | .14E-01 | .14E-03 | 41   |
| Beyer                                 | .17E-01 | .17E-03 | 48   |
| Sauerbrei                             | .22E-01 | .22E-03 | 64   |
| Kruger                                | .19E-01 | .19E-03 | 55   |
| Kozeny-Carmen                         | .41E-06 | .41E-08 | 0    |
| Zunker                                | .35E-05 | .35E-07 | 0    |
| Zamarin                               | .92E-02 | .92E-04 | 26   |
| USBR                                  | .69E-02 | .69E-04 | 20   |
| Barr                                  | .13E-01 | .13E-03 | 36   |
| Alyamani and Sen                      | .11E-01 | .11E-03 | 31   |
| Chapuis                               | .17E-01 | .17E-03 | 48   |
| Krumbein and Monk                     | .15E-01 | .15E-03 | 41   |
| geometric mean                        | .28E-02 | .28E-04 | 8    |
| arithmetic mean                       | .12E-01 | .12E-03 | 33   |



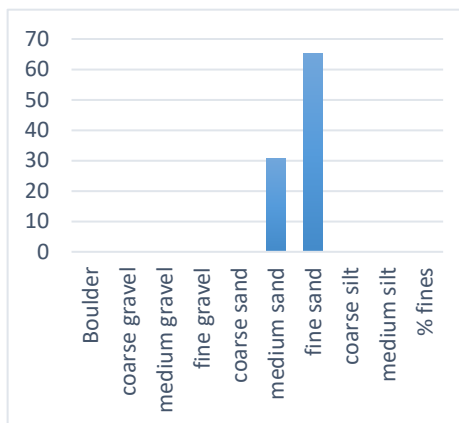
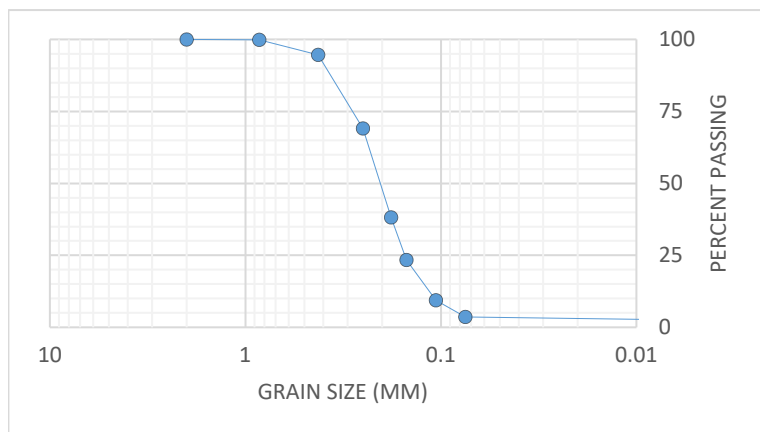
# Grain Size Analysis Report

Sample Name: POS-20 7-9 ft bls

Mass Sample (g): 354.38

T (°C) 26

## Moderately well sorted sand with fines



| Sieve opening (ps)<br>di (mm) | Mass of retained (mr)<br>(g) | mass fraction (mf) | Percent Passing (pp) |
|-------------------------------|------------------------------|--------------------|----------------------|
| 2                             | 0.00                         | 0.00               | 100.00               |
| 0.85                          | 0.59                         | 0.00               | 99.83                |
| 0.425                         | 18.63                        | 0.05               | 94.58                |
| 0.25                          | 90.59                        | 0.26               | 69.01                |
| 0.18                          | 109.30                       | 0.31               | 38.17                |
| 0.15                          | 52.45                        | 0.15               | 23.37                |
| 0.106                         | 49.73                        | 0.14               | 9.34                 |
| 0.075                         | 20.18                        | 0.06               | 3.64                 |
| 0.00001                       | 12.91                        | 0.04               | 0.00                 |

| Effective Grain Diameters (mm) |       | Other Useful Parameters     |             |
|--------------------------------|-------|-----------------------------|-------------|
| d10                            | 0.108 | Uniformity Coef.            | 2.12        |
| d17                            | 0.130 | n computed                  | 0.43        |
| d20                            | 0.139 | g (cm/s <sup>2</sup> )      | 980.00      |
| d30                            | 0.163 | ρ (g/cm <sup>3</sup> )      | 0.9968      |
| d50                            | 0.207 | μ (g/cm s)                  | 0.0085      |
| d60                            | 0.230 | ρg/μ (1/cm s)               | 1.1461E+05  |
| de (Kruger)                    | 0.170 | tau (Sauerbrei)             | 1.209       |
| de (Kozeny)                    | 0.001 | d <sub>geometric mean</sub> | 0.210       |
| de (Zunker)                    | 0.002 | σ <sub>ψ</sub>              | 0.744       |
| de (Zamarin)                   | 0.108 |                             |             |
| lo (Alyameni)                  | 0.083 | 96.35701789                 | % in sample |
| mm                             |       | Boulder                     |             |
| >64                            |       | coarse gravel               |             |
| 16 - 64                        |       | medium gravel               |             |
| 8 - 16                         |       | fine gravel                 |             |
| 2 - 8                          |       | coarse sand                 | 0.17        |
| 0.5 - 2                        |       | medium sand                 | 30.82       |
| 0.25 - 0.5                     |       | fine sand                   | 65.37       |
| 0.063 - 0.25                   |       | coarse silt                 |             |
| 0.016 - 0.063                  |       | medium silt                 |             |
| 0.008 - 0.016                  |       |                             |             |
| 0.002 - 0.008                  |       | % fines                     |             |





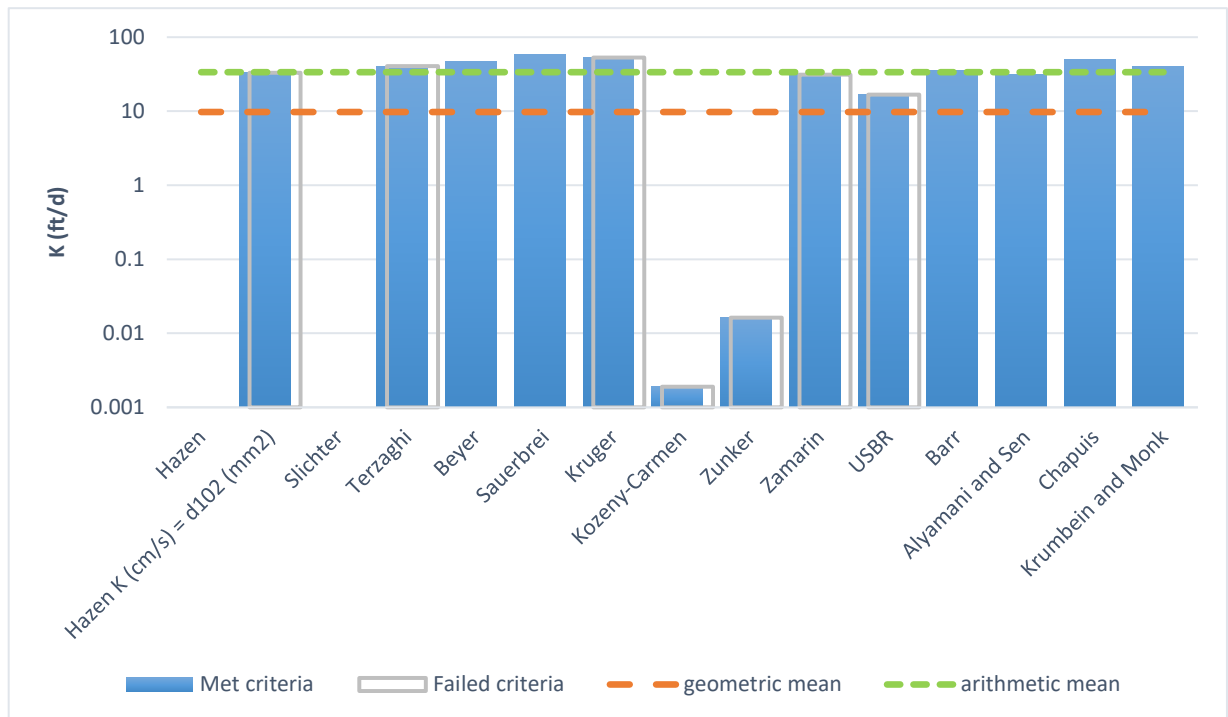
# K from Grain Size Analysis Report

Sample Name: POS-20 7-9 ft bls

Mass Sample (g): 354.38

T (°C) 26

Moderately well sorted sand with fines



| Estimation of Hydraulic Conductivity  | cm/s    | m/s     | ft/d |
|---------------------------------------|---------|---------|------|
| Hazen                                 | .21E-01 | .21E-03 | 61   |
| Hazen K (cm/s) = d <sub>10</sub> (mm) | .12E-01 | .12E-03 | 33   |
| Slichter                              | .81E-02 | .81E-04 | 23   |
| Terzaghi                              | .14E-01 | .14E-03 | 41   |
| Beyer                                 | .17E-01 | .17E-03 | 47   |
| Sauerbrei                             | .21E-01 | .21E-03 | 59   |
| Kruger                                | .19E-01 | .19E-03 | 53   |
| Kozeny-Carmen                         | .67E-06 | .67E-08 | 0    |
| Zunker                                | .58E-05 | .58E-07 | 0    |
| Zamarin                               | .11E-01 | .11E-03 | 31   |
| USBR                                  | .59E-02 | .59E-04 | 17   |
| Barr                                  | .13E-01 | .13E-03 | 36   |
| Alyamani and Sen                      | .11E-01 | .11E-03 | 31   |
| Chapuis                               | .17E-01 | .17E-03 | 50   |
| Krumbein and Monk                     | .14E-01 | .14E-03 | 41   |
| geometric mean                        | .34E-02 | .34E-04 | 10   |
| arithmetic mean                       | .12E-01 | .12E-03 | 34   |



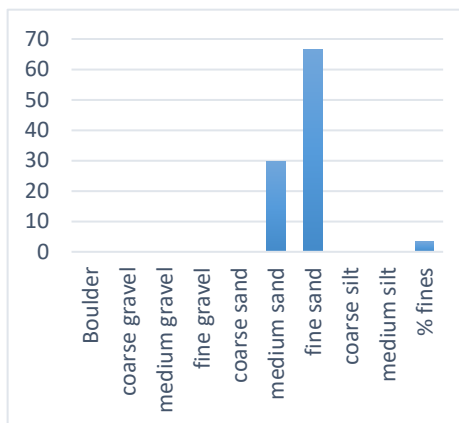
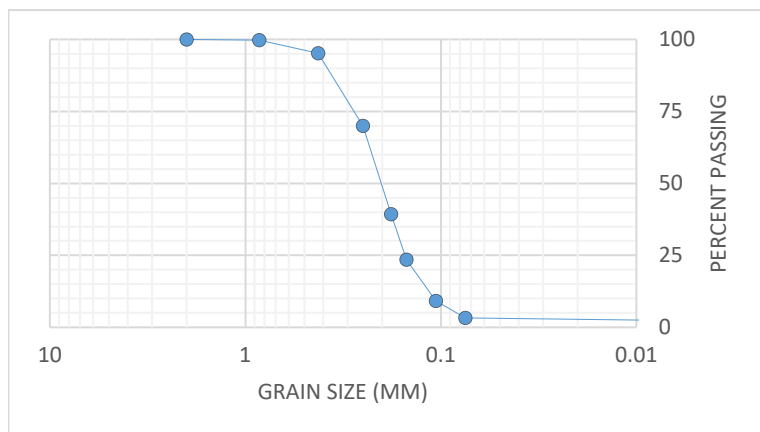
# Grain Size Analysis Report

Sample Name: POS-20 9-11 ft bls

Mass Sample (g): 329.21

T (°C) 26

## Moderately well sorted sand with fines



| Sieve opening (ps)<br>di (mm) | Mass of retained (mr)<br>(g) | mass fraction (mf) | Percent Passing (pp) |
|-------------------------------|------------------------------|--------------------|----------------------|
| 2                             | 0.00                         | 0.00               | 100.00               |
| 0.85                          | 0.73                         | 0.00               | 99.78                |
| 0.425                         | 15.29                        | 0.05               | 95.13                |
| 0.25                          | 82.87                        | 0.25               | 69.96                |
| 0.18                          | 100.99                       | 0.31               | 39.28                |
| 0.15                          | 51.88                        | 0.16               | 23.53                |
| 0.106                         | 47.24                        | 0.14               | 9.18                 |
| 0.075                         | 19.29                        | 0.06               | 3.32                 |
| 0.00001                       | 10.92                        | 0.03               | 0.00                 |

| Effective Grain Diameters (mm) |       | Other Useful Parameters     |             |
|--------------------------------|-------|-----------------------------|-------------|
| d10                            | 0.109 | Uniformity Coef.            | 2.09        |
| d17                            | 0.130 | n computed                  | 0.43        |
| d20                            | 0.139 | g (cm/s <sup>2</sup> )      | 980.00      |
| d30                            | 0.162 | ρ (g/cm <sup>3</sup> )      | 0.9968      |
| d50                            | 0.204 | μ (g/cm s)                  | 0.0085      |
| d60                            | 0.227 | ρg/μ (1/cm s)               | 1.1461E+05  |
| de (Kruger)                    | 0.171 | tau (Sauerbrei)             | 1.209       |
| de (Kozeny)                    | 0.001 | d <sub>geometric mean</sub> | 0.208       |
| de (Zunker)                    | 0.003 | σ <sub>ψ</sub>              | 0.718       |
| de (Zamarin)                   | 0.111 |                             |             |
| lo (Alyameni)                  | 0.085 | 100                         | % in sample |
| mm                             |       | Boulder                     |             |
| >64                            |       | coarse gravel               |             |
| 16 - 64                        |       | medium gravel               |             |
| 8 - 16                         |       | fine gravel                 |             |
| 2 - 8                          |       | coarse sand                 | 0.22        |
| 0.5 - 2                        |       | medium sand                 | 29.82       |
| 0.25 - 0.5                     |       | fine sand                   | 66.64       |
| 0.063 - 0.25                   |       | coarse silt                 |             |
| 0.016 - 0.063                  |       | medium silt                 |             |
| 0.008 - 0.016                  |       |                             |             |
| 0.002 - 0.008                  |       | % fines                     | 3.32        |



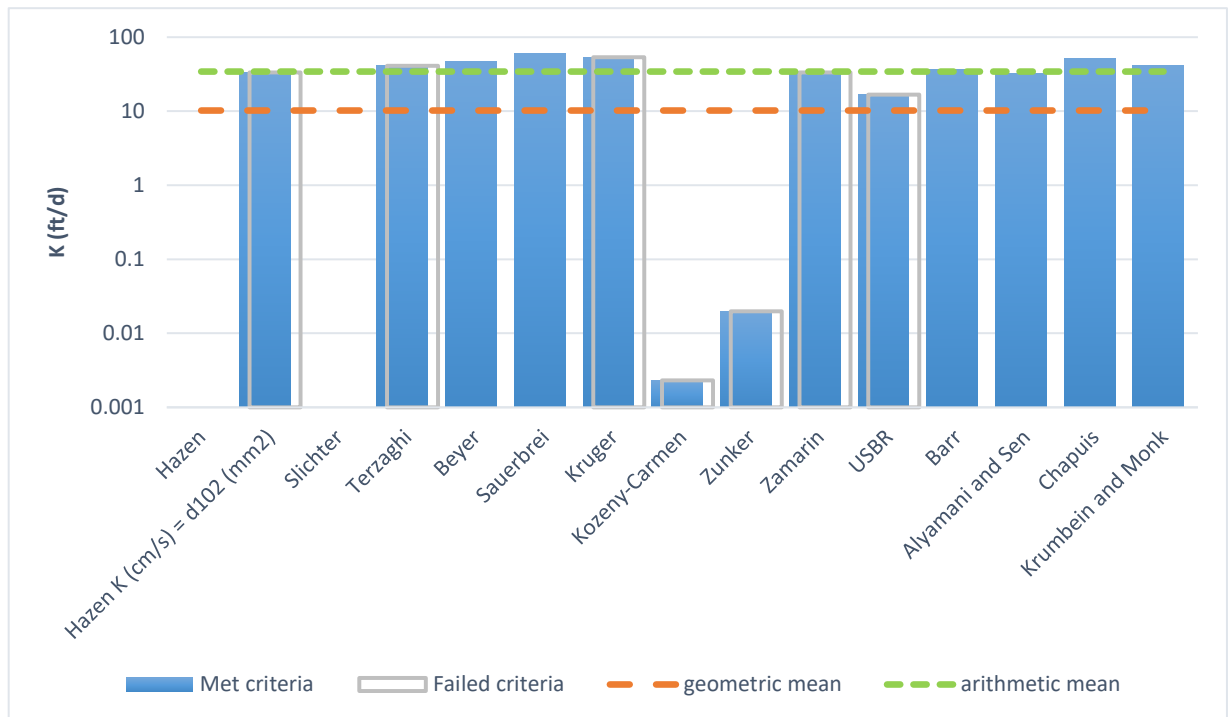
# K from Grain Size Analysis Report

Sample Name: POS-20 9-11 ft bls

Mass Sample (g): 329.21

T (°C) 26

Moderately well sorted sand with fines



| Estimation of Hydraulic Conductivity  | cm/s    | m/s     | ft/d |
|---------------------------------------|---------|---------|------|
| Hazen                                 | .22E-01 | .22E-03 | 61   |
| Hazen K (cm/s) = d <sub>10</sub> (mm) | .12E-01 | .12E-03 | 33   |
| Slichter                              | .83E-02 | .83E-04 | 23   |
| Terzaghi                              | .15E-01 | .15E-03 | 41   |
| Beyer                                 | .17E-01 | .17E-03 | 47   |
| Sauerbrei                             | .21E-01 | .21E-03 | 59   |
| Kruger                                | .19E-01 | .19E-03 | 54   |
| Kozeny-Carmen                         | .82E-06 | .82E-08 | 0    |
| Zunker                                | .70E-05 | .70E-07 | 0    |
| Zamarin                               | .12E-01 | .12E-03 | 33   |
| USBR                                  | .59E-02 | .59E-04 | 17   |
| Barr                                  | .13E-01 | .13E-03 | 37   |
| Alyamani and Sen                      | .11E-01 | .11E-03 | 32   |
| Chapuis                               | .18E-01 | .18E-03 | 51   |
| Krumbein and Monk                     | .15E-01 | .15E-03 | 41   |
| geometric mean                        | .36E-02 | .36E-04 | 10   |
| arithmetic mean                       | .12E-01 | .12E-03 | 34   |



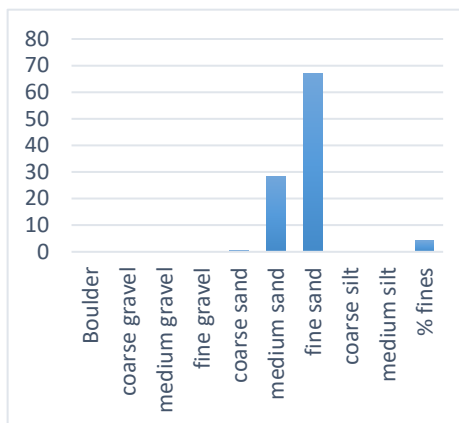
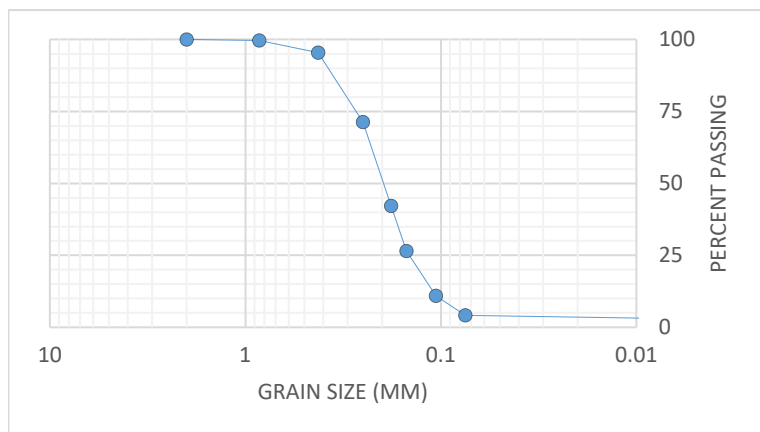
# Grain Size Analysis Report

Sample Name: POS-20 11-13 ft bls

Mass Sample (g): 337.95

T (°C) 26

## Moderately well sorted sand with fines



| Sieve opening<br>(ps)<br>di (mm) | Mass of retained<br>(mr)<br>(g) | mass fraction<br>(mf) | Percent Passing<br>(pp) |
|----------------------------------|---------------------------------|-----------------------|-------------------------|
| 2                                | 0.00                            | 0.00                  | 100.00                  |
| 0.85                             | 1.15                            | 0.00                  | 99.66                   |
| 0.425                            | 14.28                           | 0.04                  | 95.43                   |
| 0.25                             | 81.42                           | 0.24                  | 71.34                   |
| 0.18                             | 98.48                           | 0.29                  | 42.20                   |
| 0.15                             | 52.93                           | 0.16                  | 26.54                   |
| 0.106                            | 52.70                           | 0.16                  | 10.95                   |
| 0.075                            | 22.97                           | 0.07                  | 4.15                    |
| 0.00001                          | 14.02                           | 0.04                  | 0.00                    |

| Effective Grain Diameters (mm) |       | Other Useful Parameters     |             |
|--------------------------------|-------|-----------------------------|-------------|
| d10                            | 0.102 | Uniformity Coef.            | 2.19        |
| d17                            | 0.123 | n computed                  | 0.42        |
| d20                            | 0.132 | g (cm/s <sup>2</sup> )      | 980.00      |
| d30                            | 0.157 | ρ (g/cm <sup>3</sup> )      | 0.9968      |
| d50                            | 0.199 | μ (g/cm s)                  | 0.0085      |
| d60                            | 0.223 | ρg/μ (1/cm s)               | 1.1461E+05  |
| de (Kruger)                    | 0.162 | tau (Sauerbrei)             | 1.209       |
| de (Kozeny)                    | 0.000 | d <sub>geometric mean</sub> | 0.202       |
| de (Zunker)                    | 0.002 | σ <sub>ψ</sub>              | 0.743       |
| de (Zamarin)                   | 0.100 |                             |             |
| lo (Alyameni)                  | 0.077 | 100                         | % in sample |
| mm                             |       | Boulder                     |             |
| >64                            |       | coarse gravel               |             |
| 16 - 64                        |       | medium gravel               |             |
| 8 - 16                         |       | fine gravel                 |             |
| 2 - 8                          |       | coarse sand                 | 0.34        |
| 0.5 - 2                        |       | medium sand                 | 28.32       |
| 0.25 - 0.5                     |       | fine sand                   | 67.19       |
| 0.063 - 0.25                   |       | coarse silt                 |             |
| 0.016 - 0.063                  |       | medium silt                 |             |
| 0.008 - 0.016                  |       |                             |             |
| 0.002 - 0.008                  |       | % fines                     | 4.15        |



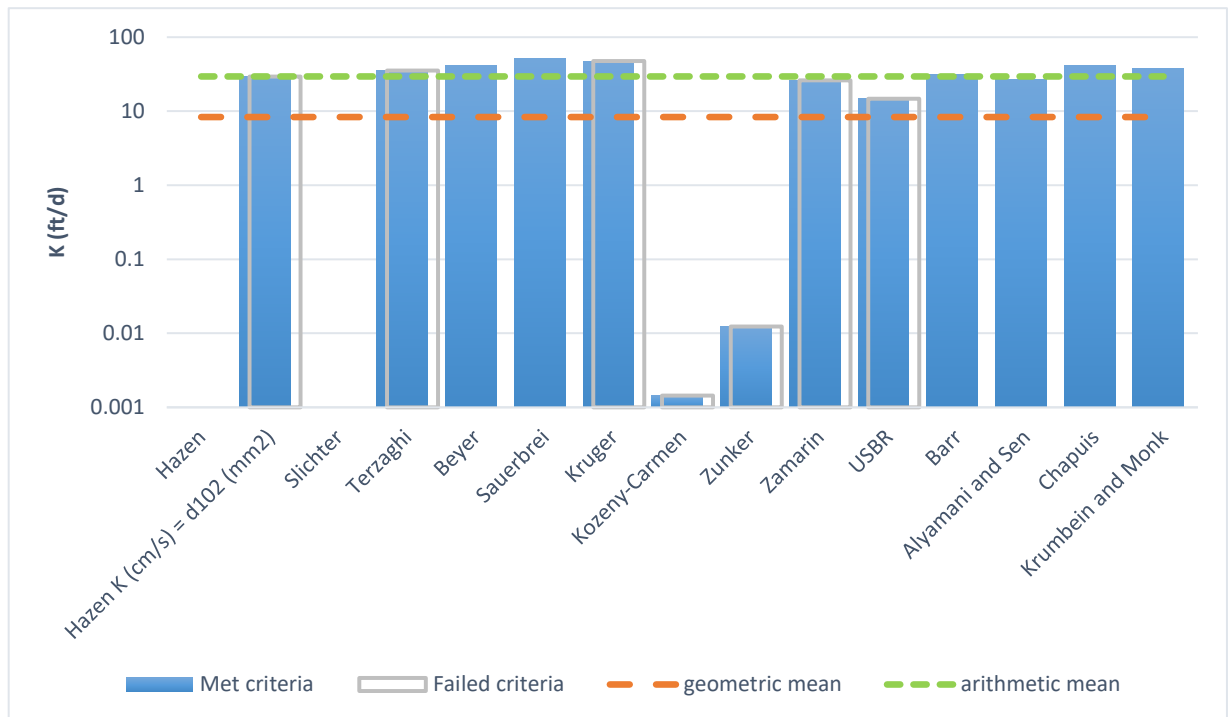
# K from Grain Size Analysis Report

Sample Name: POS-20 11-13 ft bls

Mass Sample (g): 337.95

T (°C) 26

Moderately well sorted sand with fines



| Estimation of Hydraulic Conductivity  | cm/s    | m/s     | ft/d |
|---------------------------------------|---------|---------|------|
| Hazen                                 | .19E-01 | .19E-03 | 53   |
| Hazen K (cm/s) = d <sub>10</sub> (mm) | .10E-01 | .10E-03 | 29   |
| Slichter                              | .71E-02 | .71E-04 | 20   |
| Terzaghi                              | .12E-01 | .12E-03 | 35   |
| Beyer                                 | .15E-01 | .15E-03 | 41   |
| Sauerbrei                             | .18E-01 | .18E-03 | 52   |
| Kruger                                | .17E-01 | .17E-03 | 48   |
| Kozeny-Carmen                         | .51E-06 | .51E-08 | 0    |
| Zunker                                | .44E-05 | .44E-07 | 0    |
| Zamarin                               | .92E-02 | .92E-04 | 26   |
| USBR                                  | .52E-02 | .52E-04 | 15   |
| Barr                                  | .11E-01 | .11E-03 | 31   |
| Alyamani and Sen                      | .96E-02 | .96E-04 | 27   |
| Chapuis                               | .15E-01 | .15E-03 | 42   |
| Krumbein and Monk                     | .13E-01 | .13E-03 | 37   |
| geometric mean                        | .29E-02 | .29E-04 | 8    |
| arithmetic mean                       | .10E-01 | .10E-03 | 29   |



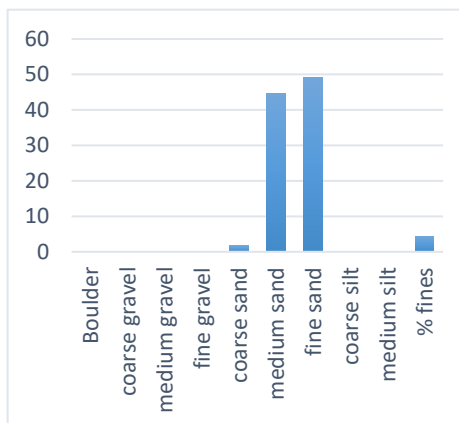
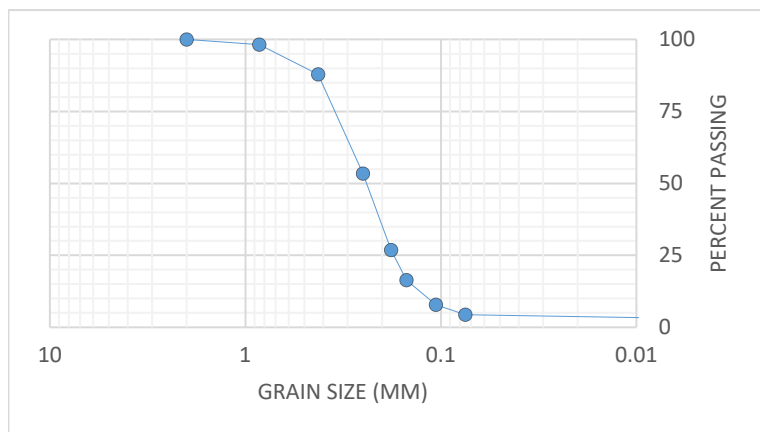
# Grain Size Analysis Report

Sample Name: POS-20 13-15 ft bls

Mass Sample (g): 342.93

T (°C) 26

## Moderately well sorted sand with fines



| Sieve opening<br>(ps)<br>di (mm) | Mass of retained<br>(mr)<br>(g) | mass fraction<br>(mf) | Percent Passing<br>(pp) |
|----------------------------------|---------------------------------|-----------------------|-------------------------|
| 2                                | 0.00                            | 0.00                  | 100.00                  |
| 0.85                             | 6.24                            | 0.02                  | 98.18                   |
| 0.425                            | 35.27                           | 0.10                  | 87.90                   |
| 0.25                             | 118.14                          | 0.34                  | 53.45                   |
| 0.18                             | 91.44                           | 0.27                  | 26.78                   |
| 0.15                             | 35.69                           | 0.10                  | 16.37                   |
| 0.106                            | 29.42                           | 0.09                  | 7.79                    |
| 0.075                            | 11.68                           | 0.03                  | 4.39                    |
| 0.00001                          | 15.05                           | 0.04                  | 0.00                    |

| Effective Grain Diameters (mm) |       | Other Useful Parameters     |             |
|--------------------------------|-------|-----------------------------|-------------|
| d10                            | 0.117 | Uniformity Coef.            | 2.41        |
| d17                            | 0.152 | n computed                  | 0.42        |
| d20                            | 0.160 | g (cm/s <sup>2</sup> )      | 980.00      |
| d30                            | 0.188 | ρ (g/cm <sup>3</sup> )      | 0.9968      |
| d50                            | 0.241 | μ (g/cm s)                  | 0.0085      |
| d60                            | 0.283 | ρg/μ (1/cm s)               | 1.1461E+05  |
| de (Kruger)                    | 0.189 | tau (Sauerbrei)             | 1.209       |
| de (Kozeny)                    | 0.000 | d <sub>geometric mean</sub> | 0.244       |
| de (Zunker)                    | 0.002 | σ <sub>ψ</sub>              | 0.841       |
| de (Zamarin)                   | 0.107 |                             |             |
| lo (Alyameni)                  | 0.086 | 100                         | % in sample |
| mm                             |       | Boulder                     |             |
| >64                            |       | coarse gravel               |             |
| 16 - 64                        |       | medium gravel               |             |
| 8 - 16                         |       | fine gravel                 |             |
| 2 - 8                          |       | coarse sand                 | 1.82        |
| 0.5 - 2                        |       | medium sand                 | 44.74       |
| 0.25 - 0.5                     |       | fine sand                   | 49.06       |
| 0.063 - 0.25                   |       | coarse silt                 |             |
| 0.016 - 0.063                  |       | medium silt                 |             |
| 0.008 - 0.016                  |       |                             |             |
| 0.002 - 0.008                  |       | % fines                     | 4.39        |





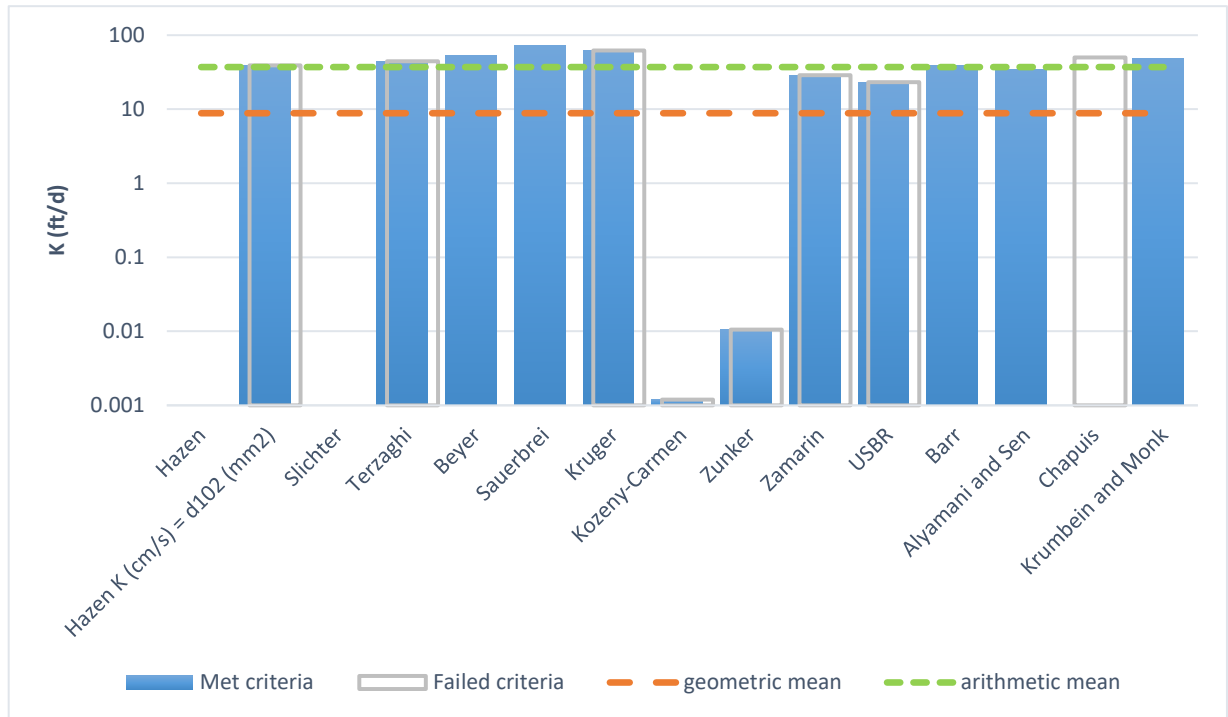
# K from Grain Size Analysis Report

Sample Name: POS-20 13-15 ft bls

Mass Sample (g): 342.93

T (°C) 26

Moderately well sorted sand with fines



| Estimation of Hydraulic Conductivity  | cm/s    | m/s     | ft/d |
|---------------------------------------|---------|---------|------|
| Hazen                                 | .24E-01 | .24E-03 | 69   |
| Hazen K (cm/s) = d <sub>10</sub> (mm) | .14E-01 | .14E-03 | 39   |
| Slichter                              | .89E-02 | .89E-04 | 25   |
| Terzaghi                              | .16E-01 | .16E-03 | 45   |
| Beyer                                 | .19E-01 | .19E-03 | 54   |
| Sauerbrei                             | .26E-01 | .26E-03 | 73   |
| Kruger                                | .22E-01 | .22E-03 | 62   |
| Kozeny-Carmen                         | .42E-06 | .42E-08 | 0    |
| Zunker                                | .37E-05 | .37E-07 | 0    |
| Zamarin                               | .10E-01 | .10E-03 | 29   |
| USBR                                  | .82E-02 | .82E-04 | 23   |
| Barr                                  | .14E-01 | .14E-03 | 39   |
| Alyamani and Sen                      | .12E-01 | .12E-03 | 34   |
| Chapuis                               | .18E-01 | .18E-03 | 50   |
| Krumbein and Monk                     | .17E-01 | .17E-03 | 48   |
| geometric mean                        | .31E-02 | .31E-04 | 9    |
| arithmetic mean                       | .13E-01 | .13E-03 | 37   |



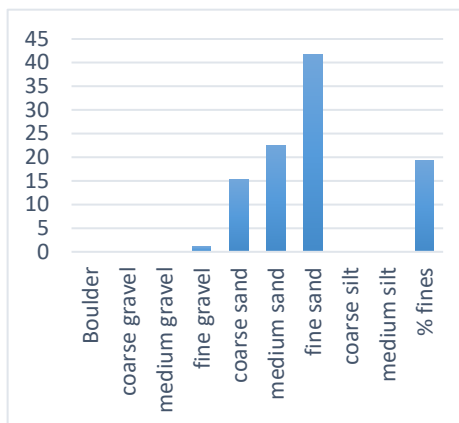
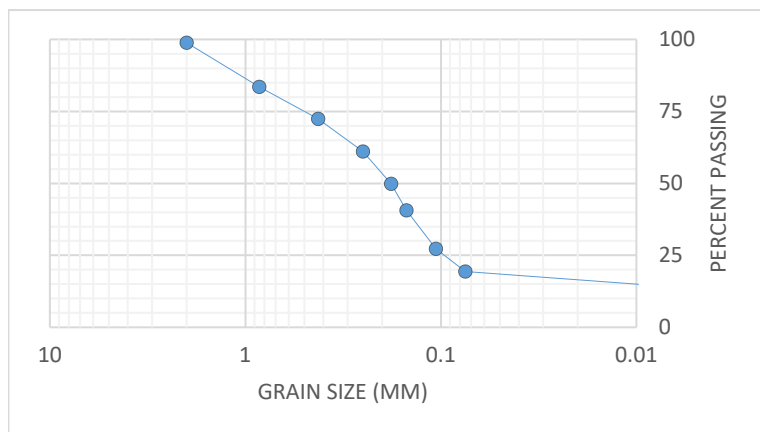
# Grain Size Analysis Report

Sample Name: POS-20 15-17 ft bls

Mass Sample (g): 295.62

T (°C) 26

## Poorly sorted sand with fines



| Sieve opening (ps)<br>di (mm) | Mass of retained (mr)<br>(g) | mass fraction (mf) | Percent Passing (pp) |
|-------------------------------|------------------------------|--------------------|----------------------|
| 2                             | 3.34                         | 0.01               | 98.87                |
| 0.85                          | 45.27                        | 0.15               | 83.56                |
| 0.425                         | 32.93                        | 0.11               | 72.42                |
| 0.25                          | 33.52                        | 0.11               | 61.08                |
| 0.18                          | 33.32                        | 0.11               | 49.81                |
| 0.15                          | 27.11                        | 0.09               | 40.64                |
| 0.106                         | 39.49                        | 0.13               | 27.28                |
| 0.075                         | 23.36                        | 0.08               | 19.38                |
| 0.00001                       | 57.28                        | 0.19               | 0.00                 |

| Effective Grain Diameters (mm) |       | Other Useful Parameters     |             |
|--------------------------------|-------|-----------------------------|-------------|
| d10                            | 0.039 | Uniformity Coef.            | 6.28        |
| d17                            | 0.066 | n computed                  | 0.33        |
| d20                            | 0.077 | g (cm/s <sup>2</sup> )      | 980.00      |
| d30                            | 0.115 | ρ (g/cm <sup>3</sup> )      | 0.9968      |
| d50                            | 0.181 | μ (g/cm s)                  | 0.0085      |
| d60                            | 0.243 | ρg/μ (1/cm s)               | 1.1461E+05  |
| de (Kruger)                    | 0.114 | tau (Sauerbrei)             | 1.209       |
| de (Kozeny)                    | 0.000 | d <sub>geometric mean</sub> | 0.215       |
| de (Zunker)                    | 0.000 | σ <sub>ψ</sub>              | 1.938       |
| de (Zamarin)                   | 0.037 |                             |             |
| lo (Alyameni)                  | 0.003 | 100                         | % in sample |
| mm                             |       | Boulder                     |             |
| >64                            |       | coarse gravel               |             |
| 16 - 64                        |       | medium gravel               |             |
| 8 - 16                         |       | fine gravel                 | 1.13        |
| 2 - 8                          |       | coarse sand                 | 15.31       |
| 0.5 - 2                        |       | medium sand                 | 22.48       |
| 0.25 - 0.5                     |       | fine sand                   | 41.7        |
| 0.063 - 0.25                   |       | coarse silt                 |             |
| 0.016 - 0.063                  |       | medium silt                 |             |
| 0.008 - 0.016                  |       |                             |             |
| 0.002 - 0.008                  |       | % fines                     | 19.38       |



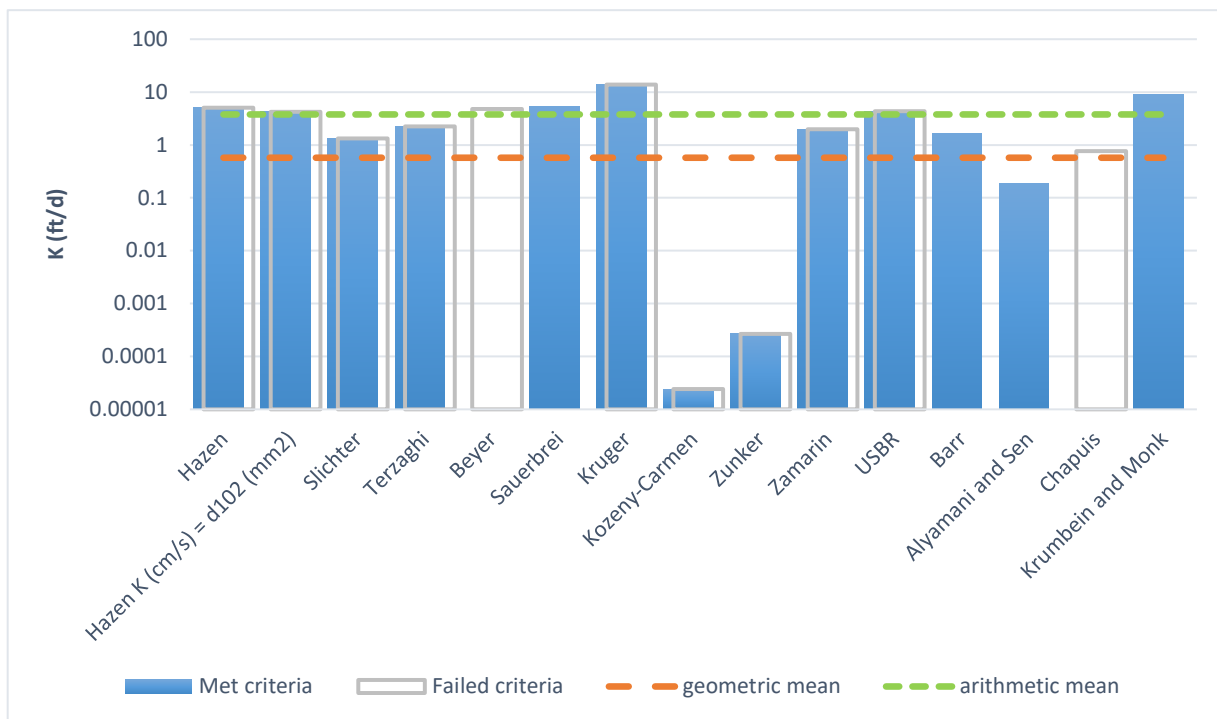
# K from Grain Size Analysis Report

Sample Name: POS-20 15-17 ft bls

Mass Sample (g): 295.62

T (°C) 26

Poorly sorted sand with fines



| Estimation of Hydraulic Conductivity  | cm/s    | m/s     | ft/d |
|---------------------------------------|---------|---------|------|
| Hazen                                 | .18E-02 | .18E-04 | 5    |
| Hazen K (cm/s) = d <sub>10</sub> (mm) | .15E-02 | .15E-04 | 4    |
| Slichter                              | .47E-03 | .47E-05 | 1    |
| Terzaghi                              | .79E-03 | .79E-05 | 2    |
| Beyer                                 | .17E-02 | .17E-04 | 5    |
| Sauerbrei                             | .19E-02 | .19E-04 | 5    |
| Kruger                                | .49E-02 | .49E-04 | 14   |
| Kozeny-Carmen                         | .85E-08 | .85E-10 | 0    |
| Zunker                                | .94E-07 | .94E-09 | 0    |
| Zamarin                               | .70E-03 | .70E-05 | 2    |
| USBR                                  | .15E-02 | .15E-04 | 4    |
| Barr                                  | .58E-03 | .58E-05 | 2    |
| Alyamani and Sen                      | .67E-04 | .67E-06 | 0    |
| Chapuis                               | .27E-03 | .27E-05 | 1    |
| Krumbein and Monk                     | .31E-02 | .31E-04 | 9    |
| geometric mean                        | .20E-03 | .20E-05 | 1    |
| arithmetic mean                       | .13E-02 | .13E-04 | 4    |

# SFWMD Split-spoon Drilling Form

|                                  |                           |                              |                                |                            |                   |
|----------------------------------|---------------------------|------------------------------|--------------------------------|----------------------------|-------------------|
| Date: _____                      | Page <u>1</u> of <u>2</u> | Drilling Equipment / Methods |                                |                            |                   |
| Well Name<br><u>POS-21</u>       | Spoon I.D.                | Spoon O.D.                   | Liner<br>Yes / No<br><u>  </u> | Drill Fluid<br>Mud / Water | Drill Rod Length: |
| Contractor/Driller<br><u>EDS</u> | Rig Type:                 |                              |                                | Water Table                |                   |
| Site Geologist                   | Hammer Type:              |                              |                                | Time                       | Ft BLS            |
| Starting Depth                   | Hammer Weight [lb]        |                              |                                |                            |                   |
| Ending Depth                     | Hammer Drop [in]          |                              |                                |                            |                   |

Drilling Notes: Post hole to 5'. No water table encountered.

| Start Depth | End Depth | N <sub>1</sub> | N <sub>2</sub> | N <sub>3</sub> | N <sub>4</sub> | N Value<br>(N <sub>2</sub> +N <sub>3</sub> ) | Percent Recovery | Notes: Lithology, # wraps on cat-head etc.                       |
|-------------|-----------|----------------|----------------|----------------|----------------|----------------------------------------------|------------------|------------------------------------------------------------------|
| 5           | 7         | 4              | 5              | 10             | 11             |                                              | 60               | Water table at about 6 ft<br>Med. sand. Light tan                |
| 7           | 9         | 8              | 8              | 10             | 19             |                                              | 0                | Bad sample. Little recovery w leaves<br>from surface             |
| 9           | 11        | 6              | 8              | 10             | 11             |                                              | 90               | Lt. grey med. sand                                               |
| 11          | 13        | 20             | 20             | 17             | 15             |                                              | 90               | " "                                                              |
| 13          | 15        | 10             | 15             | 15             | 11             |                                              | 100              | Fine sand, Lt. grey. Brown silty clay<br>at 15'                  |
| 15          | 17        | 11             | 14             | 15             | 15             |                                              | 70               | Brown silty clay ends. Transition to fine<br>sand.               |
| 17          | 19        | 9              | 10             | 9              | 8              |                                              | 100              | Sandy to silty clay                                              |
| 19          | 21        | 5              | 7              | 20             | 18             |                                              | 100              | Fine sand with sharp contact to<br>dark Brown sandy clay @ 20 ft |
| 21          | 23        | 4              | 7              | 9              | 9              |                                              | 100              | Clay w/ fine sand transitioning to<br>clean med. sand            |
| 23          | 25        | 8              | 20             | 24             | 20             |                                              | 90               | Clay/sand mix transition to<br>clean white med sand.             |

N = Blow counts for ea 6" interval.

N Value = sum N<sub>2</sub> + N<sub>3</sub>

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# SFWMD Split-spoon Drilling Form

|                            |                           |                              |                   |                            |                   |
|----------------------------|---------------------------|------------------------------|-------------------|----------------------------|-------------------|
| Date:                      | Page <u>2</u> of <u>2</u> | Drilling Equipment / Methods |                   |                            |                   |
| Well Name<br><u>POS-21</u> | Spoon I.D.                | Spoon O.D.                   | Liner<br>Yes / No | Drill Fluid<br>Mud / Water | Drill Rod Length: |
| Contractor/Driller         | Rig Type:                 |                              |                   | Water Table                |                   |
| Site Geologist             | Hammer Type:              |                              |                   | Time                       | Ft BLS            |
| Starting Depth             | Hammer Weight [lb]        |                              |                   |                            |                   |
| Ending Depth               | Hammer Drop [in]          |                              |                   |                            |                   |

Drilling Notes:

| Start Depth | End Depth | N <sub>1</sub> | N <sub>2</sub> | N <sub>3</sub> | N <sub>4</sub> | N Value (N <sub>2</sub> +N <sub>3</sub> ) | Percent Recovery | Notes: Lithology, # wraps on cat-head etc.                                                       |
|-------------|-----------|----------------|----------------|----------------|----------------|-------------------------------------------|------------------|--------------------------------------------------------------------------------------------------|
| 25          | 27        | 5              | 7              | 11             | 11             |                                           |                  | Fine to med sand with thin clay inclusions.                                                      |
| 27          | 29        | 12             | 12             | 19             | 22             |                                           |                  | Multi-colored clay (green-grey, brown, <sup>grey</sup> dark) inclusions w/ inter-bedded med sand |
| 29          | 31        | 6              | 8              | 8              | 12             |                                           |                  | Blue-green clay at 29' (thin) transitioning to fine to medium sand.                              |
| - end SPT - |           |                |                |                |                |                                           |                  |                                                                                                  |
|             |           |                |                |                |                |                                           |                  |                                                                                                  |
|             |           |                |                |                |                |                                           |                  |                                                                                                  |
|             |           |                |                |                |                |                                           |                  |                                                                                                  |
|             |           |                |                |                |                |                                           |                  |                                                                                                  |
|             |           |                |                |                |                |                                           |                  |                                                                                                  |
|             |           |                |                |                |                |                                           |                  |                                                                                                  |
|             |           |                |                |                |                |                                           |                  |                                                                                                  |
|             |           |                |                |                |                |                                           |                  |                                                                                                  |

N = Blow counts for ea 6" interval.

N Value = sum N<sub>2</sub> + N<sub>3</sub>



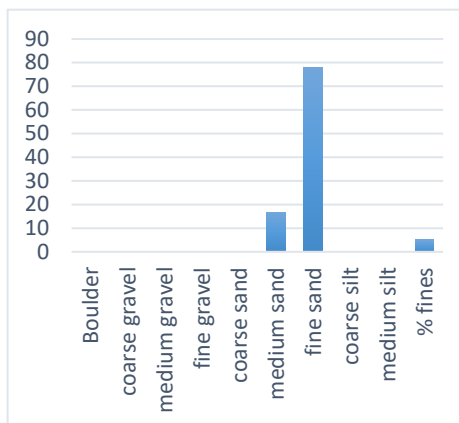
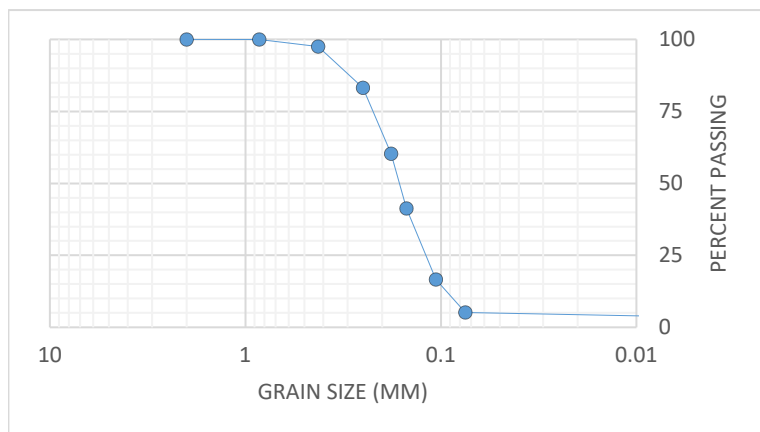
# Grain Size Analysis Report

Sample Name: POS-21 5-7 ft bls

Mass Sample (g): 316.35

T (°C) 26

## Moderately well sorted sand with fines



| Sieve opening (ps)<br>di (mm) | Mass of retained (mr)<br>(g) | mass fraction (mf) | Percent Passing (pp) |
|-------------------------------|------------------------------|--------------------|----------------------|
| 2                             | 0.00                         | 0.00               | 100.00               |
| 0.85                          | 0.26                         | 0.00               | 99.92                |
| 0.425                         | 7.55                         | 0.02               | 97.53                |
| 0.25                          | 45.30                        | 0.14               | 83.21                |
| 0.18                          | 72.44                        | 0.23               | 60.31                |
| 0.15                          | 60.30                        | 0.19               | 41.25                |
| 0.106                         | 77.89                        | 0.25               | 16.63                |
| 0.075                         | 36.23                        | 0.11               | 5.18                 |
| 0.00001                       | 16.38                        | 0.05               | 0.00                 |

| Effective Grain Diameters (mm) |       | Other Useful Parameters     |             |
|--------------------------------|-------|-----------------------------|-------------|
| d10                            | 0.088 | Uniformity Coef.            | 2.04        |
| d17                            | 0.107 | n computed                  | 0.43        |
| d20                            | 0.112 | g (cm/s <sup>2</sup> )      | 980.00      |
| d30                            | 0.130 | ρ (g/cm <sup>3</sup> )      | 0.9968      |
| d50                            | 0.164 | μ (g/cm s)                  | 0.0085      |
| d60                            | 0.180 | ρg/μ (1/cm s)               | 1.1461E+05  |
| de (Kruger)                    | 0.138 | tau (Sauerbrei)             | 1.209       |
| de (Kozeny)                    | 0.000 | d <sub>geometric mean</sub> | 0.164       |
| de (Zunker)                    | 0.002 | σ <sub>ψ</sub>              | 0.699       |
| de (Zamarin)                   | 0.083 |                             |             |
| lo (Alyameni)                  | 0.069 | 100                         | % in sample |
| mm                             |       | Boulder                     |             |
| >64                            |       | coarse gravel               |             |
| 16 - 64                        |       | medium gravel               |             |
| 8 - 16                         |       | fine gravel                 |             |
| 2 - 8                          |       | coarse sand                 | 0.08        |
| 0.5 - 2                        |       | medium sand                 | 16.71       |
| 0.25 - 0.5                     |       | fine sand                   | 78.03       |
| 0.063 - 0.25                   |       | coarse silt                 |             |
| 0.016 - 0.063                  |       | medium silt                 |             |
| 0.008 - 0.016                  |       |                             |             |
| 0.002 - 0.008                  |       | % fines                     | 5.18        |





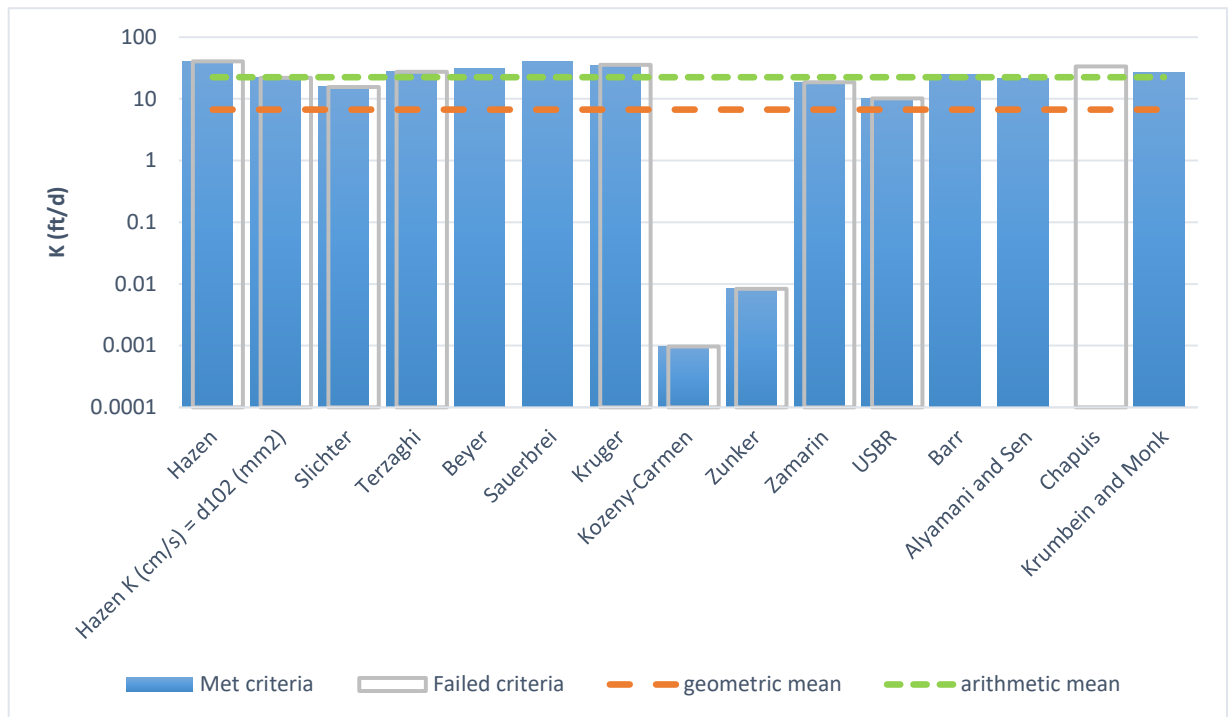
# K from Grain Size Analysis Report

Sample Name: POS-21 5-7 ft bls

Mass Sample (g): 316.35

T (°C) 26

Moderately well sorted sand with fines



| Estimation of Hydraulic Conductivity  | cm/s    | m/s     | ft/d |
|---------------------------------------|---------|---------|------|
| Hazen                                 | .14E-01 | .14E-03 | 41   |
| Hazen K (cm/s) = d <sub>10</sub> (mm) | .78E-02 | .78E-04 | 22   |
| Slichter                              | .55E-02 | .55E-04 | 16   |
| Terzaghi                              | .97E-02 | .97E-04 | 28   |
| Beyer                                 | .11E-01 | .11E-03 | 31   |
| Sauerbrei                             | .14E-01 | .14E-03 | 41   |
| Kruger                                | .13E-01 | .13E-03 | 35   |
| Kozeny-Carmen                         | .34E-06 | .34E-08 | 0    |
| Zunker                                | .29E-05 | .29E-07 | 0    |
| Zamarin                               | .66E-02 | .66E-04 | 19   |
| USBR                                  | .36E-02 | .36E-04 | 10   |
| Barr                                  | .87E-02 | .87E-04 | 25   |
| Alyamani and Sen                      | .76E-02 | .76E-04 | 22   |
| Chapuis                               | .12E-01 | .12E-03 | 34   |
| Krumbein and Monk                     | .93E-02 | .93E-04 | 26   |
| geometric mean                        | .24E-02 | .24E-04 | 7    |
| arithmetic mean                       | .79E-02 | .79E-04 | 22   |



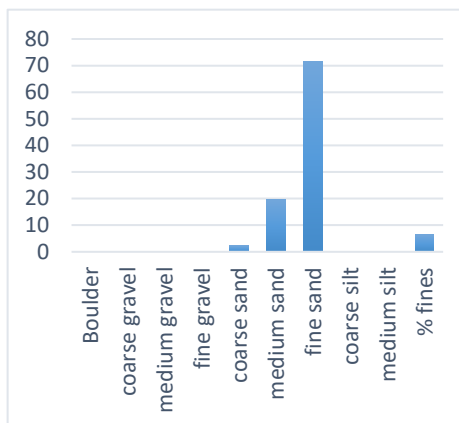
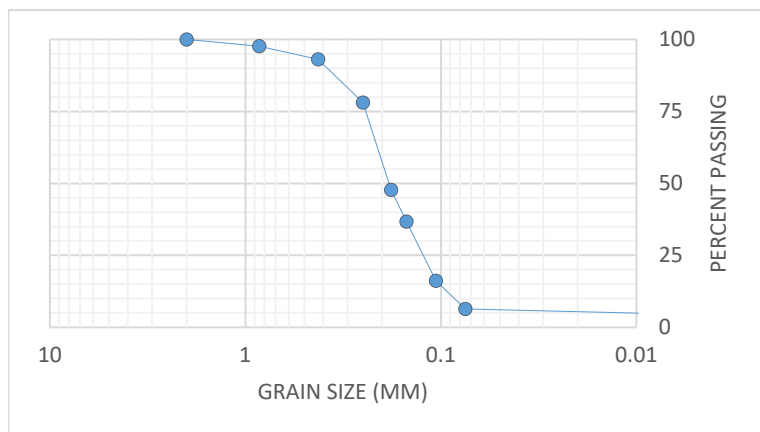
# Grain Size Analysis Report

Sample Name: POS-21 9-11 ft bls

Mass Sample (g): 332.28

T (°C) 26

## Moderately well sorted sand with fines



| Sieve opening (ps)<br>di (mm) | Mass of retained (mr)<br>(g) | mass fraction (mf) | Percent Passing (pp) |
|-------------------------------|------------------------------|--------------------|----------------------|
| 2                             | 0.00                         | 0.00               | 100.00               |
| 0.85                          | 7.98                         | 0.02               | 97.60                |
| 0.425                         | 15.07                        | 0.05               | 93.06                |
| 0.25                          | 49.84                        | 0.15               | 78.06                |
| 0.18                          | 100.85                       | 0.30               | 47.71                |
| 0.15                          | 36.50                        | 0.11               | 36.73                |
| 0.106                         | 68.25                        | 0.21               | 16.19                |
| 0.075                         | 32.71                        | 0.10               | 6.34                 |
| 0.00001                       | 21.08                        | 0.06               | 0.00                 |

| Effective Grain Diameters (mm) |       | Other Useful Parameters     |             |
|--------------------------------|-------|-----------------------------|-------------|
| d10                            | 0.087 | Uniformity Coef.            | 2.41        |
| d17                            | 0.108 | n computed                  | 0.42        |
| d20                            | 0.114 | g (cm/s <sup>2</sup> )      | 980.00      |
| d30                            | 0.136 | ρ (g/cm <sup>3</sup> )      | 0.9968      |
| d50                            | 0.185 | μ (g/cm s)                  | 0.0085      |
| d60                            | 0.208 | ρg/μ (1/cm s)               | 1.1461E+05  |
| de (Kruger)                    | 0.143 | tau (Sauerbrei)             | 1.209       |
| de (Kozeny)                    | 0.000 | d <sub>geometric mean</sub> | 0.184       |
| de (Zunker)                    | 0.001 | σ <sub>ψ</sub>              | 0.909       |
| de (Zamarin)                   | 0.077 |                             |             |
| lo (Alyameni)                  | 0.062 | 100                         | % in sample |
| mm                             |       | Boulder                     |             |
| >64                            |       | coarse gravel               |             |
| 16 - 64                        |       | medium gravel               |             |
| 8 - 16                         |       | fine gravel                 |             |
| 2 - 8                          |       | coarse sand                 | 2.4         |
| 0.5 - 2                        |       | medium sand                 | 19.53       |
| 0.25 - 0.5                     |       | fine sand                   | 71.72       |
| 0.063 - 0.25                   |       | coarse silt                 |             |
| 0.016 - 0.063                  |       | medium silt                 |             |
| 0.008 - 0.016                  |       |                             |             |
| 0.002 - 0.008                  |       | % fines                     | 6.34        |



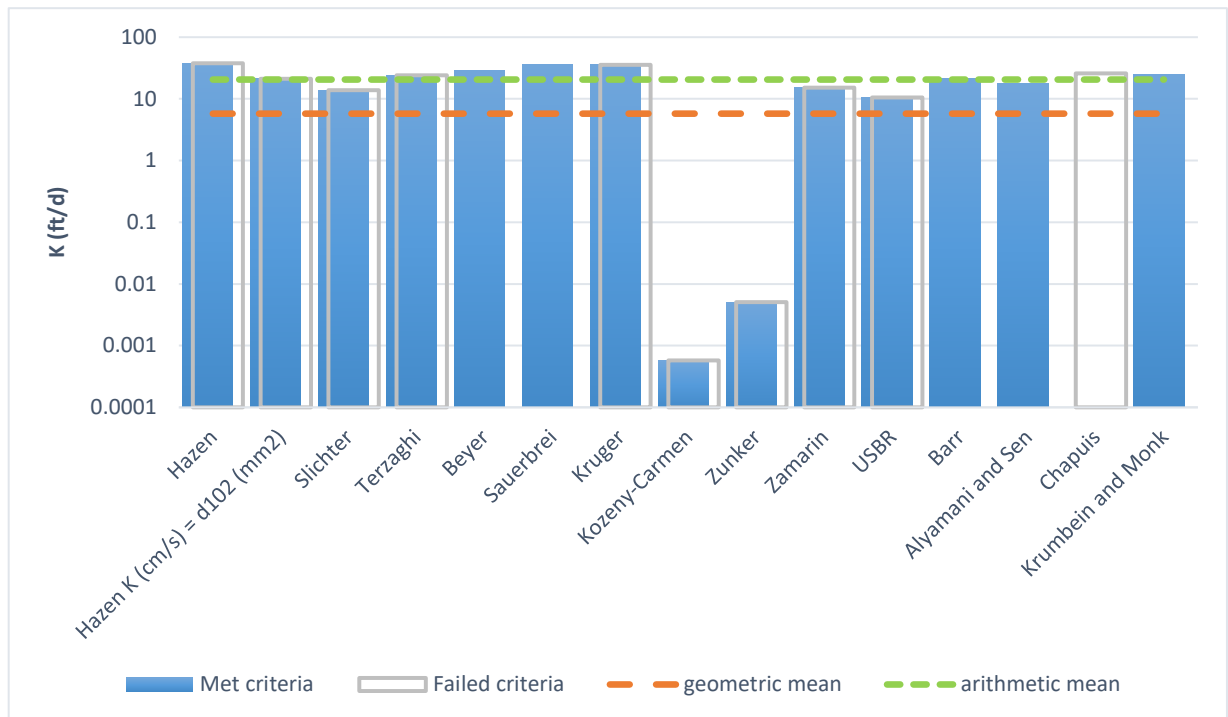
# K from Grain Size Analysis Report

Sample Name: POS-21 9-11 ft bls

Mass Sample (g): 332.28

T (°C) 26

Moderately well sorted sand with fines



| Estimation of Hydraulic Conductivity  | cm/s    | m/s     | ft/d |
|---------------------------------------|---------|---------|------|
| Hazen                                 | .13E-01 | .13E-03 | 38   |
| Hazen K (cm/s) = d <sub>10</sub> (mm) | .75E-02 | .75E-04 | 21   |
| Slichter                              | .49E-02 | .49E-04 | 14   |
| Terzaghi                              | .86E-02 | .86E-04 | 24   |
| Beyer                                 | .10E-01 | .10E-03 | 29   |
| Sauerbrei                             | .13E-01 | .13E-03 | 37   |
| Kruger                                | .13E-01 | .13E-03 | 36   |
| Kozeny-Carmen                         | .20E-06 | .20E-08 | 0    |
| Zunker                                | .18E-05 | .18E-07 | 0    |
| Zamarin                               | .54E-02 | .54E-04 | 15   |
| USBR                                  | .37E-02 | .37E-04 | 11   |
| Barr                                  | .74E-02 | .74E-04 | 21   |
| Alyamani and Sen                      | .62E-02 | .62E-04 | 18   |
| Chapuis                               | .91E-02 | .91E-04 | 26   |
| Krumbein and Monk                     | .89E-02 | .89E-04 | 25   |
| geometric mean                        | .20E-02 | .20E-04 | 6    |
| arithmetic mean                       | .73E-02 | .73E-04 | 21   |



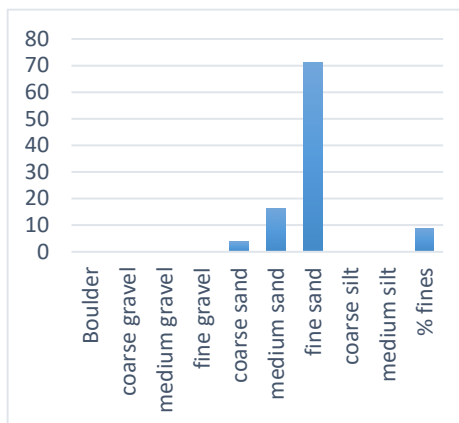
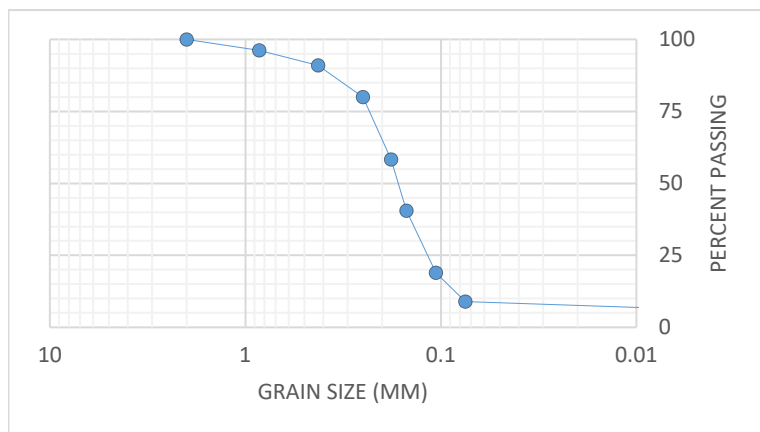
# Grain Size Analysis Report

Sample Name: POS-21 11-13 ft bls

Mass Sample (g): 332.35

T (°C) 26

## Moderately well sorted sand with fines



| Sieve opening (ps)<br>di (mm) | Mass of retained (mr)<br>(g) | mass fraction (mf) | Percent Passing (pp) |
|-------------------------------|------------------------------|--------------------|----------------------|
| 2                             | 0.00                         | 0.00               | 100.00               |
| 0.85                          | 12.50                        | 0.04               | 96.24                |
| 0.425                         | 17.58                        | 0.05               | 90.95                |
| 0.25                          | 36.55                        | 0.11               | 79.95                |
| 0.18                          | 71.95                        | 0.22               | 58.30                |
| 0.15                          | 59.29                        | 0.18               | 40.46                |
| 0.106                         | 71.64                        | 0.22               | 18.91                |
| 0.075                         | 33.13                        | 0.10               | 8.94                 |
| 0.00001                       | 29.71                        | 0.09               | 0.00                 |

| Effective Grain Diameters (mm) |       | Other Useful Parameters     |             |
|--------------------------------|-------|-----------------------------|-------------|
| d10                            | 0.078 | Uniformity Coef.            | 2.37        |
| d17                            | 0.100 | n computed                  | 0.42        |
| d20                            | 0.108 | g (cm/s <sup>2</sup> )      | 980.00      |
| d30                            | 0.129 | ρ (g/cm <sup>3</sup> )      | 0.9968      |
| d50                            | 0.166 | μ (g/cm s)                  | 0.0085      |
| d60                            | 0.185 | ρg/μ (1/cm s)               | 1.1461E+05  |
| de (Kruger)                    | 0.130 | tau (Sauerbrei)             | 1.209       |
| de (Kozeny)                    | 0.000 | d <sub>geometric mean</sub> | 0.172       |
| de (Zunker)                    | 0.001 | σ <sub>ψ</sub>              | 1.055       |
| de (Zamarin)                   | 0.063 |                             |             |
| lo (Alyameni)                  | 0.056 | 100                         | % in sample |
| mm                             |       | Boulder                     |             |
| >64                            |       | coarse gravel               |             |
| 16 - 64                        |       | medium gravel               |             |
| 8 - 16                         |       | fine gravel                 | 0           |
| 2 - 8                          |       | coarse sand                 | 3.76        |
| 0.5 - 2                        |       | medium sand                 | 16.29       |
| 0.25 - 0.5                     |       | fine sand                   | 71.01       |
| 0.063 - 0.25                   |       | coarse silt                 |             |
| 0.016 - 0.063                  |       | medium silt                 |             |
| 0.008 - 0.016                  |       |                             |             |
| 0.002 - 0.008                  |       | % fines                     | 8.94        |



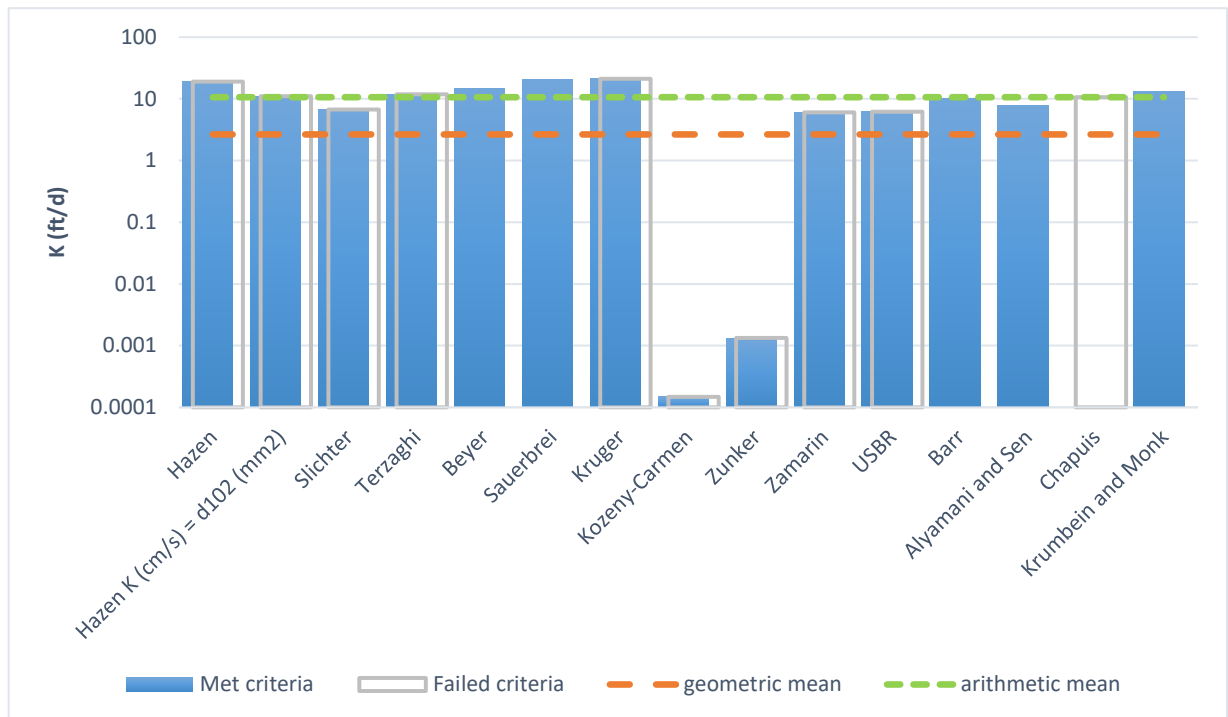
# K from Grain Size Analysis Report

Sample Name: POS-21 13-15 ft bls

Mass Sample (g): 338.96

T (°C) 26

Moderately well sorted sand with fines



| Estimation of Hydraulic Conductivity  | cm/s    | m/s     | ft/d |
|---------------------------------------|---------|---------|------|
| Hazen                                 | .67E-02 | .67E-04 | 19   |
| Hazen K (cm/s) = d <sub>10</sub> (mm) | .39E-02 | .39E-04 | 11   |
| Slichter                              | .24E-02 | .24E-04 | 7    |
| Terzaghi                              | .42E-02 | .42E-04 | 12   |
| Beyer                                 | .53E-02 | .53E-04 | 15   |
| Sauerbrei                             | .73E-02 | .73E-04 | 21   |
| Kruger                                | .74E-02 | .74E-04 | 21   |
| Kozeny-Carmen                         | .52E-07 | .52E-09 | 0    |
| Zunker                                | .47E-06 | .47E-08 | 0    |
| Zamarin                               | .21E-02 | .21E-04 | 6    |
| USBR                                  | .22E-02 | .22E-04 | 6    |
| Barr                                  | .35E-02 | .35E-04 | 10   |
| Alyamani and Sen                      | .28E-02 | .28E-04 | 8    |
| Chapuis                               | .38E-02 | .38E-04 | 11   |
| Krumbein and Monk                     | .47E-02 | .47E-04 | 13   |
| geometric mean                        | .94E-03 | .94E-05 | 3    |
| arithmetic mean                       | .38E-02 | .38E-04 | 11   |



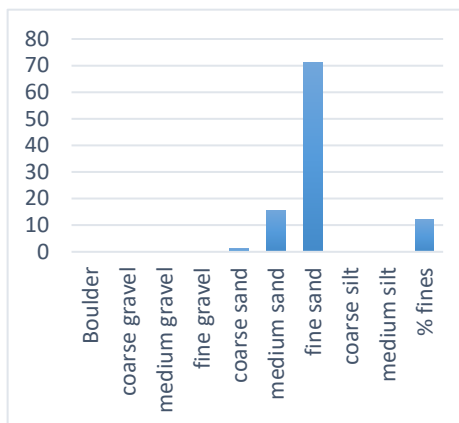
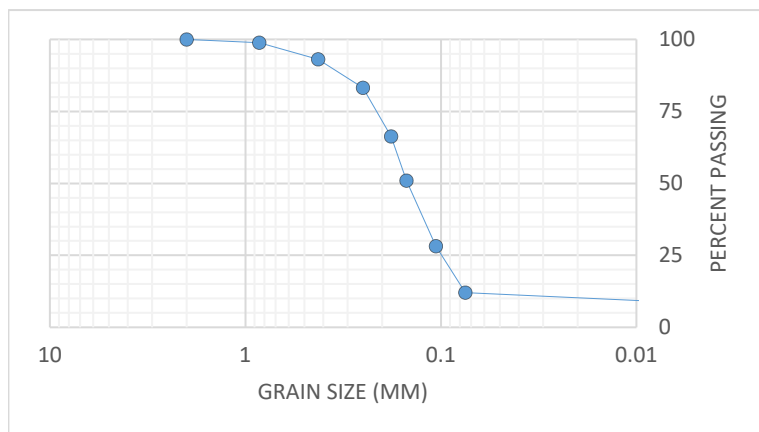
# Grain Size Analysis Report

Sample Name: POS-21 13-15 ft bls

Mass Sample (g): 338.96

T (°C) 26

## Moderately well sorted sand with fines



| Sieve opening (ps)<br>di (mm) | Mass of retained (mr)<br>(g) | mass fraction (mf) | Percent Passing (pp) |
|-------------------------------|------------------------------|--------------------|----------------------|
| 2                             | 0.00                         | 0.00               | 100.00               |
| 0.85                          | 4.08                         | 0.01               | 98.80                |
| 0.425                         | 19.35                        | 0.06               | 93.09                |
| 0.25                          | 33.42                        | 0.10               | 83.23                |
| 0.18                          | 57.33                        | 0.17               | 66.31                |
| 0.15                          | 51.96                        | 0.15               | 50.99                |
| 0.106                         | 77.17                        | 0.23               | 28.22                |
| 0.075                         | 54.96                        | 0.16               | 12.00                |
| 0.00001                       | 40.69                        | 0.12               | 0.00                 |

| Effective Grain Diameters (mm) |       | Other Useful Parameters     |             |
|--------------------------------|-------|-----------------------------|-------------|
| d10                            | 0.062 | Uniformity Coef.            | 2.68        |
| d17                            | 0.085 | n computed                  | 0.41        |
| d20                            | 0.090 | g (cm/s <sup>2</sup> )      | 980.00      |
| d30                            | 0.109 | ρ (g/cm <sup>3</sup> )      | 0.9968      |
| d50                            | 0.148 | μ (g/cm s)                  | 0.0085      |
| d60                            | 0.168 | ρg/μ (1/cm s)               | 1.1461E+05  |
| de (Kruger)                    | 0.113 | tau (Sauerbrei)             | 1.209       |
| de (Kozeny)                    | 0.000 | d <sub>geometric mean</sub> | 0.148       |
| de (Zunker)                    | 0.001 | σ <sub>ψ</sub>              | 1.052       |
| de (Zamarin)                   | 0.050 |                             |             |
| lo (Alyameni)                  | 0.041 | 100                         | % in sample |
| mm                             |       | Boulder                     |             |
| >64                            |       | coarse gravel               |             |
| 16 - 64                        |       | medium gravel               |             |
| 8 - 16                         |       | fine gravel                 |             |
| 2 - 8                          |       | coarse sand                 | 1.2         |
| 0.5 - 2                        |       | medium sand                 | 15.57       |
| 0.25 - 0.5                     |       | fine sand                   | 71.22       |
| 0.063 - 0.25                   |       | coarse silt                 |             |
| 0.016 - 0.063                  |       | medium silt                 |             |
| 0.008 - 0.016                  |       |                             |             |
| 0.002 - 0.008                  |       | % fines                     | 12          |





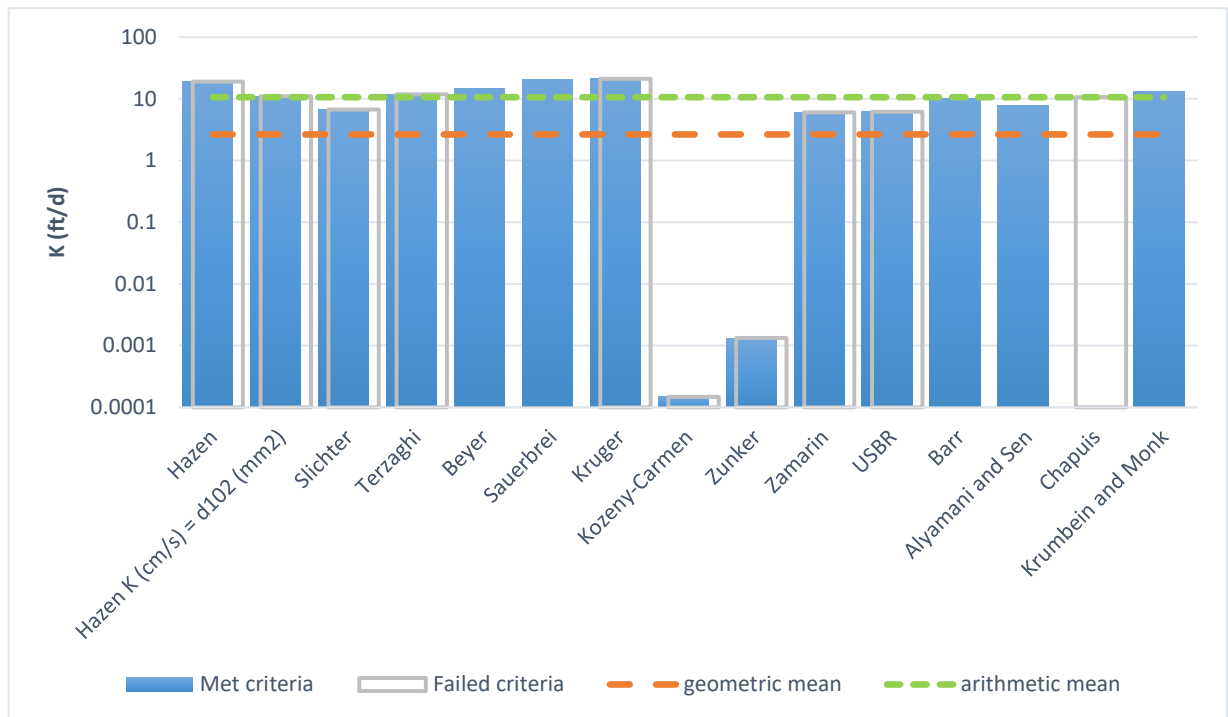
# K from Grain Size Analysis Report

Sample Name: POS-21 13-15 ft bls

Mass Sample (g): 338.96

T (°C) 26

Moderately well sorted sand with fines



| Estimation of Hydraulic Conductivity  | cm/s    | m/s     | ft/d |
|---------------------------------------|---------|---------|------|
| Hazen                                 | .67E-02 | .67E-04 | 19   |
| Hazen K (cm/s) = d <sub>10</sub> (mm) | .39E-02 | .39E-04 | 11   |
| Slichter                              | .24E-02 | .24E-04 | 7    |
| Terzaghi                              | .42E-02 | .42E-04 | 12   |
| Beyer                                 | .53E-02 | .53E-04 | 15   |
| Sauerbrei                             | .73E-02 | .73E-04 | 21   |
| Kruger                                | .74E-02 | .74E-04 | 21   |
| Kozeny-Carmen                         | .52E-07 | .52E-09 | 0    |
| Zunker                                | .47E-06 | .47E-08 | 0    |
| Zamarin                               | .21E-02 | .21E-04 | 6    |
| USBR                                  | .22E-02 | .22E-04 | 6    |
| Barr                                  | .35E-02 | .35E-04 | 10   |
| Alyamani and Sen                      | .28E-02 | .28E-04 | 8    |
| Chapuis                               | .38E-02 | .38E-04 | 11   |
| Krumbein and Monk                     | .47E-02 | .47E-04 | 13   |
| geometric mean                        | .94E-03 | .94E-05 | 3    |
| arithmetic mean                       | .38E-02 | .38E-04 | 11   |



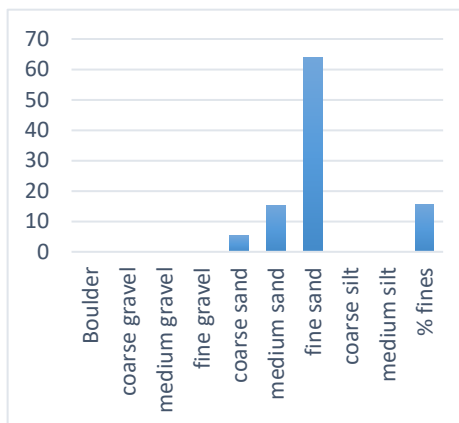
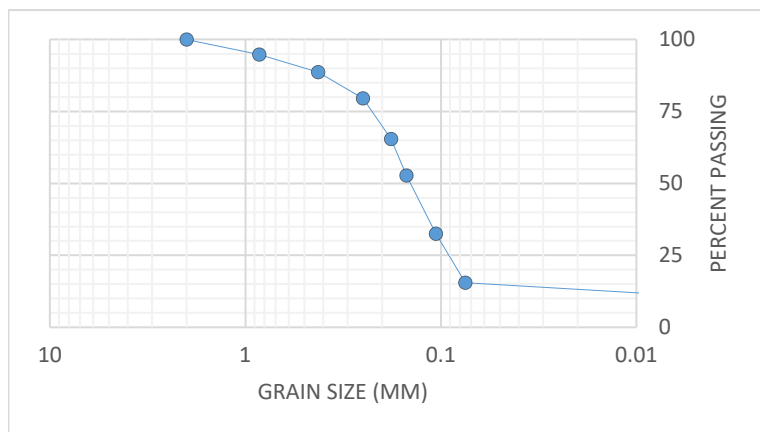
# Grain Size Analysis Report

Sample Name: POS-20 13-15 ft bls

Mass Sample (g): 322.46

T (°C) 26

## Moderately well sorted sand with fines



| Sieve opening (ps) di (mm) | Mass of retained (mr) (g) | mass fraction (mf) | Percent Passing (pp) |
|----------------------------|---------------------------|--------------------|----------------------|
| 2                          | 0.19                      | 0.00               | 99.94                |
| 0.85                       | 16.91                     | 0.05               | 94.70                |
| 0.425                      | 19.63                     | 0.06               | 88.61                |
| 0.25                       | 29.22                     | 0.09               | 79.55                |
| 0.18                       | 45.53                     | 0.14               | 65.43                |
| 0.15                       | 41.03                     | 0.13               | 52.70                |
| 0.106                      | 65.32                     | 0.20               | 32.45                |
| 0.075                      | 54.55                     | 0.17               | 15.53                |
| 0.00001                    | 50.08                     | 0.16               | 0.00                 |

| Effective Grain Diameters (mm) |       | Other Useful Parameters     |             |
|--------------------------------|-------|-----------------------------|-------------|
| d10                            | 0.048 | Uniformity Coef.            | 3.46        |
| d17                            | 0.078 | n computed                  | 0.39        |
| d20                            | 0.083 | g (cm/s <sup>2</sup> )      | 980.00      |
| d30                            | 0.102 | ρ (g/cm <sup>3</sup> )      | 0.9968      |
| d50                            | 0.144 | μ (g/cm s)                  | 0.0085      |
| d60                            | 0.167 | ρg/μ (1/cm s)               | 1.1461E+05  |
| de (Kruger)                    | 0.106 | tau (Sauerbrei)             | 1.209       |
| de (Kozeny)                    | 0.000 | d <sub>geometric mean</sub> | 0.154       |
| de (Zunker)                    | 0.001 | σ <sub>ψ</sub>              | 1.332       |
| de (Zamarin)                   | 0.042 |                             |             |
| lo (Alyameni)                  | 0.024 | 100                         | % in sample |
| mm                             |       | Boulder                     |             |
| >64                            |       | coarse gravel               |             |
| 16 - 64                        |       | medium gravel               |             |
| 8 - 16                         |       | fine gravel                 | 0.06        |
| 2 - 8                          |       | coarse sand                 | 5.24        |
| 0.5 - 2                        |       | medium sand                 | 15.15       |
| 0.25 - 0.5                     |       | fine sand                   | 64.02       |
| 0.063 - 0.25                   |       | coarse silt                 |             |
| 0.016 - 0.063                  |       | medium silt                 |             |
| 0.008 - 0.016                  |       |                             |             |
| 0.002 - 0.008                  |       | % fines                     | 15.53       |



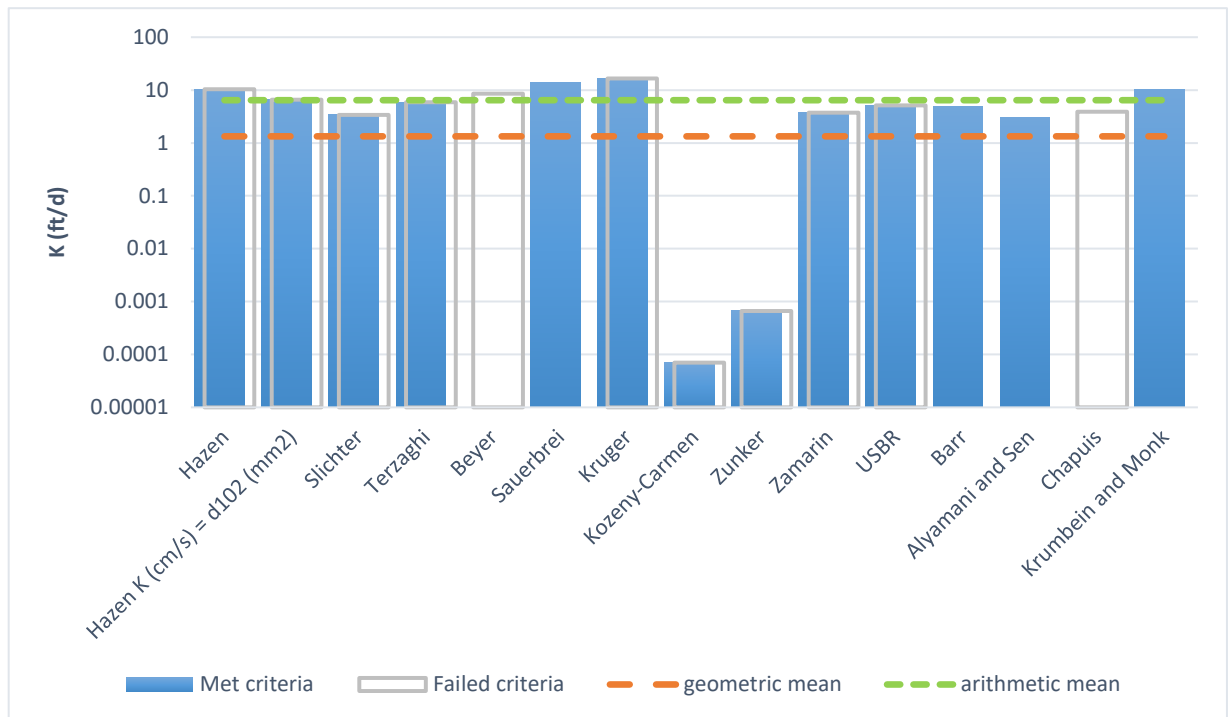
# K from Grain Size Analysis Report

Sample Name: POS-20 15-17 ft bls

Mass Sample (g): 322.46

T (°C) 26

Moderately well sorted sand with fines



| Estimation of Hydraulic Conductivity  | cm/s    | m/s     | ft/d |
|---------------------------------------|---------|---------|------|
| Hazen                                 | .37E-02 | .37E-04 | 10   |
| Hazen K (cm/s) = d <sub>10</sub> (mm) | .23E-02 | .23E-04 | 7    |
| Slichter                              | .12E-02 | .12E-04 | 3    |
| Terzaghi                              | .21E-02 | .21E-04 | 6    |
| Beyer                                 | .30E-02 | .30E-04 | 9    |
| Sauerbrei                             | .49E-02 | .49E-04 | 14   |
| Kruger                                | .58E-02 | .58E-04 | 17   |
| Kozeny-Carmen                         | .25E-07 | .25E-09 | 0    |
| Zunker                                | .24E-06 | .24E-08 | 0    |
| Zamarin                               | .13E-02 | .13E-04 | 4    |
| USBR                                  | .18E-02 | .18E-04 | 5    |
| Barr                                  | .17E-02 | .17E-04 | 5    |
| Alyamani and Sen                      | .11E-02 | .11E-04 | 3    |
| Chapuis                               | .14E-02 | .14E-04 | 4    |
| Krumbein and Monk                     | .36E-02 | .36E-04 | 10   |
| geometric mean                        | .47E-03 | .47E-05 | 1    |
| arithmetic mean                       | .23E-02 | .23E-04 | 6    |



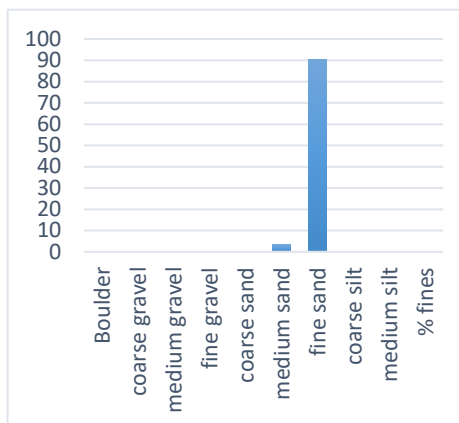
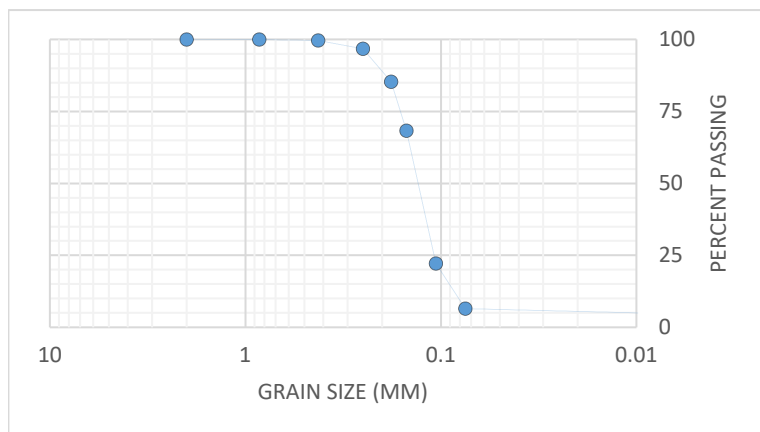
# Grain Size Analysis Report

Sample Name: ORS-8 5-7 ft bls

Mass Sample (g): 261.04

T (°C) 26

## Uniform sand with fines



| Sieve opening<br>(ps)<br>di (mm) | Mass of retained<br>(mr)<br>(g) | mass fraction<br>(mf) | Percent Passing<br>(pp) |
|----------------------------------|---------------------------------|-----------------------|-------------------------|
| 2                                | 0.00                            | 0.00                  | 100.00                  |
| 0.85                             | 0.03                            | 0.00                  | 99.99                   |
| 0.425                            | 0.84                            | 0.00                  | 99.67                   |
| 0.25                             | 7.72                            | 0.03                  | 96.71                   |
| 0.18                             | 29.66                           | 0.11                  | 85.35                   |
| 0.15                             | 44.64                           | 0.17                  | 68.25                   |
| 0.106                            | 120.20                          | 0.46                  | 22.20                   |
| 0.075                            | 41.04                           | 0.16                  | 6.48                    |
| 0.00001                          | 16.91                           | 0.06                  | 0.00                    |

| Effective Grain Diameters (mm) |       | Other Useful Parameters     |             |
|--------------------------------|-------|-----------------------------|-------------|
| d10                            | 0.082 | Uniformity Coef.            | 1.73        |
| d17                            | 0.096 | n computed                  | 0.44        |
| d20                            | 0.102 | g (cm/s <sup>2</sup> )      | 980.00      |
| d30                            | 0.113 | ρ (g/cm <sup>3</sup> )      | 0.9968      |
| d50                            | 0.133 | μ (g/cm s)                  | 0.0085      |
| d60                            | 0.142 | ρg/μ (1/cm s)               | 1.1461E+05  |
| de (Kruger)                    | 0.115 | tau (Sauerbrei)             | 1.209       |
| de (Kozeny)                    | 0.000 | d <sub>geometric mean</sub> | 0.130       |
| de (Zunker)                    | 0.001 | σ <sub>ψ</sub>              | 0.541       |
| de (Zamarin)                   | 0.068 |                             |             |
| lo (Alyameni)                  | 0.069 | 93.52206558                 | % in sample |
| mm                             |       | Boulder                     |             |
| >64                            |       | coarse gravel               |             |
| 16 - 64                        |       | medium gravel               |             |
| 8 - 16                         |       | fine gravel                 | 0           |
| 2 - 8                          |       | coarse sand                 | 0.01        |
| 0.5 - 2                        |       | medium sand                 | 3.28        |
| 0.25 - 0.5                     |       | fine sand                   | 90.23       |
| 0.063 - 0.25                   |       | coarse silt                 |             |
| 0.016 - 0.063                  |       | medium silt                 |             |
| 0.008 - 0.016                  |       |                             |             |
| 0.002 - 0.008                  |       | % fines                     |             |



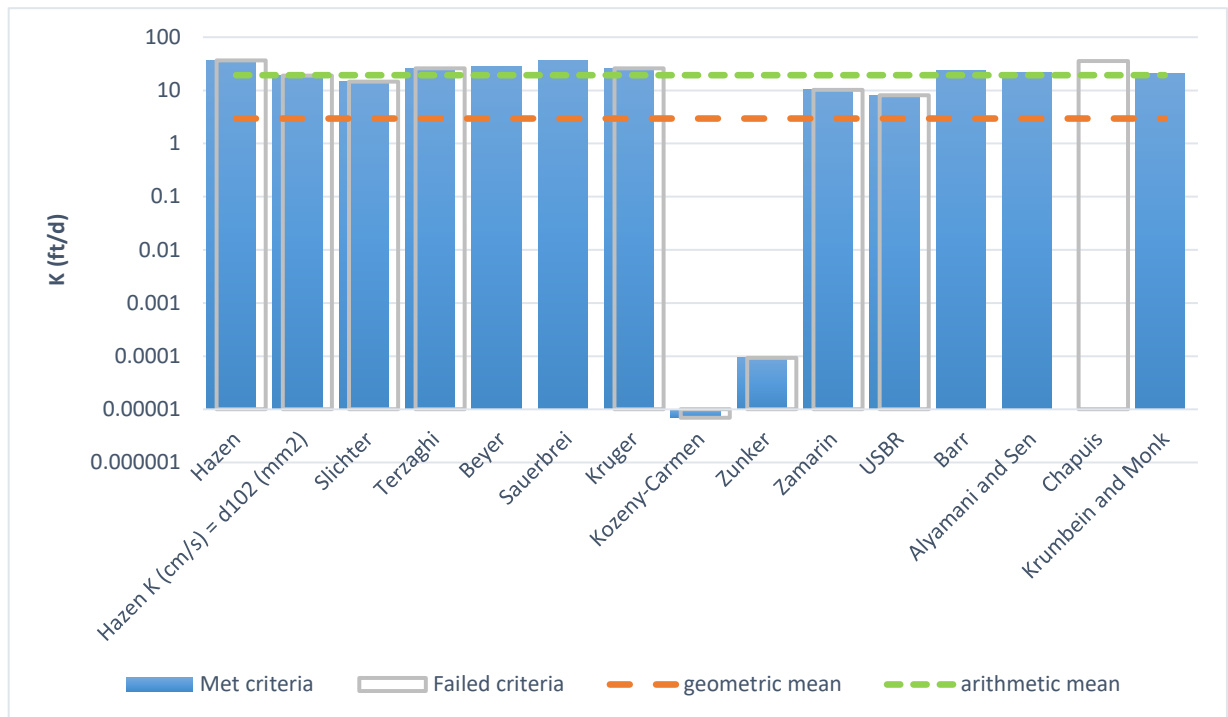
# K from Grain Size Analysis Report

Sample Name: ORS-8 5-7 ft bls

Mass Sample (g): 261.04

T (°C) 26

## Uniform sand with fines



| Estimation of Hydraulic Conductivity | cm/s    | m/s     | ft/d |
|--------------------------------------|---------|---------|------|
| Hazen                                | .13E-01 | .13E-03 | 37   |
| Hazen K (cm/s) = $d_{10}^2$ (mm)     | .67E-02 | .67E-04 | 19   |
| Slichter                             | .52E-02 | .52E-04 | 15   |
| Terzaghi                             | .91E-02 | .91E-04 | 26   |
| Beyer                                | .98E-02 | .98E-04 | 28   |
| Sauerbrei                            | .13E-01 | .13E-03 | 37   |
| Kruger                               | .92E-02 | .92E-04 | 26   |
| Kozeny-Carmen                        | .25E-08 | .25E-10 | 0    |
| Zunker                               | .33E-07 | .33E-09 | 0    |
| Zamarin                              | .36E-02 | .36E-04 | 10   |
| USBR                                 | .29E-02 | .29E-04 | 8    |
| Barr                                 | .84E-02 | .84E-04 | 24   |
| Alyamani and Sen                     | .75E-02 | .75E-04 | 21   |
| Chapuis                              | .13E-01 | .13E-03 | 36   |
| Krumbein and Monk                    | .72E-02 | .72E-04 | 20   |
| geometric mean                       | .10E-02 | .10E-04 | 3    |
| arithmetic mean                      | .68E-02 | .68E-04 | 19   |



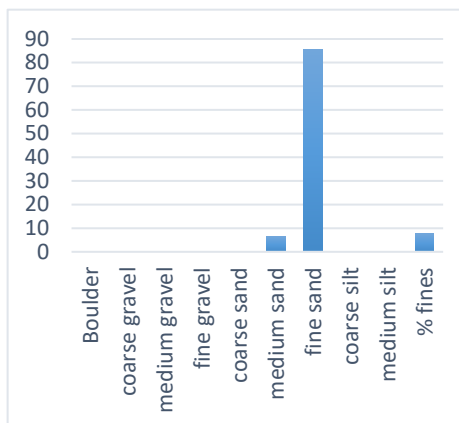
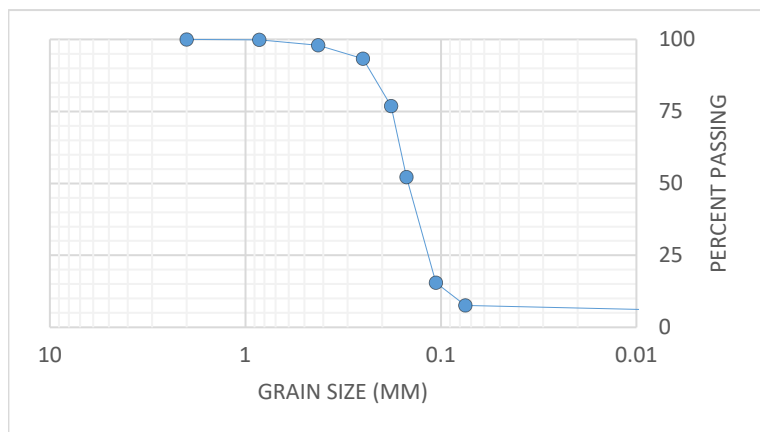
# Grain Size Analysis Report

Sample Name: ORS-8 7-9 ft bls

Mass Sample (g): 359.22

T (°C) 26

## Uniform sand with fines



| Sieve opening (ps)<br>di (mm) | Mass of retained (mr)<br>(g) | mass fraction (mf) | Percent Passing (pp) |
|-------------------------------|------------------------------|--------------------|----------------------|
| 2                             | 0.00                         | 0.00               | 100.00               |
| 0.85                          | 0.64                         | 0.00               | 99.82                |
| 0.425                         | 6.87                         | 0.02               | 97.91                |
| 0.25                          | 16.63                        | 0.05               | 93.28                |
| 0.18                          | 59.14                        | 0.16               | 76.82                |
| 0.15                          | 88.55                        | 0.25               | 52.17                |
| 0.106                         | 131.59                       | 0.37               | 15.53                |
| 0.075                         | 28.38                        | 0.08               | 7.63                 |
| 0.000001                      | 27.42                        | 0.08               | 0.00                 |

| Effective Grain Diameters (mm) |       | Other Useful Parameters     |             |
|--------------------------------|-------|-----------------------------|-------------|
| d10                            | 0.084 | Uniformity Coef.            | 1.89        |
| d17                            | 0.108 | n computed                  | 0.43        |
| d20                            | 0.111 | g (cm/s <sup>2</sup> )      | 980.00      |
| d30                            | 0.123 | ρ (g/cm <sup>3</sup> )      | 0.9968      |
| d50                            | 0.147 | μ (g/cm s)                  | 0.0085      |
| d60                            | 0.160 | ρg/μ (1/cm s)               | 1.1461E+05  |
| de (Kruger)                    | 0.122 | tau (Sauerbrei)             | 1.209       |
| de (Kozeny)                    | 0.000 | d <sub>geometric mean</sub> | 0.149       |
| de (Zunker)                    | 0.000 | σ <sub>ψ</sub>              | 0.652       |
| de (Zamarin)                   | 0.057 |                             |             |
| lo (Alyameni)                  | 0.069 | 100                         | % in sample |
| mm                             |       | Boulder                     |             |
| >64                            |       | coarse gravel               |             |
| 16 - 64                        |       | medium gravel               |             |
| 8 - 16                         |       | fine gravel                 |             |
| 2 - 8                          |       | coarse sand                 | 0.18        |
| 0.5 - 2                        |       | medium sand                 | 6.54        |
| 0.25 - 0.5                     |       | fine sand                   | 85.65       |
| 0.063 - 0.25                   |       | coarse silt                 |             |
| 0.016 - 0.063                  |       | medium silt                 |             |
| 0.008 - 0.016                  |       |                             |             |
| 0.002 - 0.008                  |       | % fines                     | 7.63        |





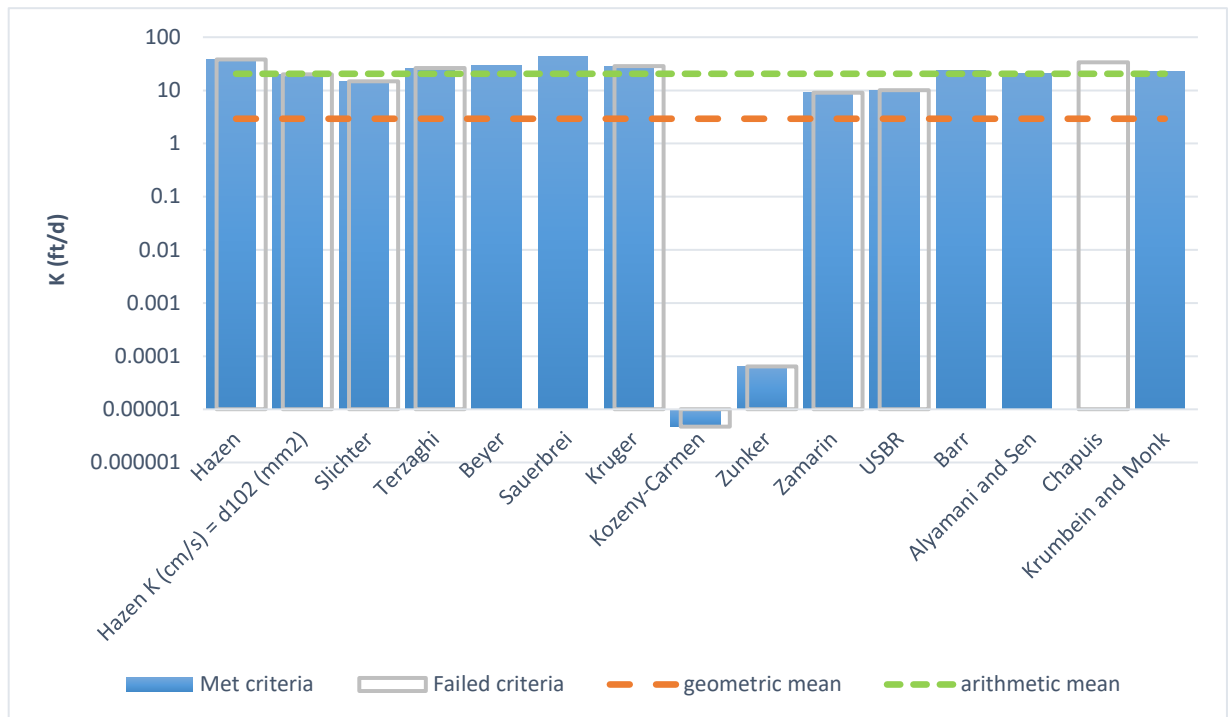
# K from Grain Size Analysis Report

Sample Name: ORS-8 7-9 ft bls

Mass Sample (g): 359.22

T (°C) 26

## Uniform sand with fines



| Estimation of Hydraulic Conductivity | cm/s    | m/s     | ft/d |
|--------------------------------------|---------|---------|------|
| Hazen                                | .13E-01 | .13E-03 | 38   |
| Hazen K (cm/s) = $d_{10}^2$ (mm)     | .71E-02 | .71E-04 | 20   |
| Slichter                             | .52E-02 | .52E-04 | 15   |
| Terzaghi                             | .93E-02 | .93E-04 | 26   |
| Beyer                                | .10E-01 | .10E-03 | 29   |
| Sauerbrei                            | .15E-01 | .15E-03 | 44   |
| Kruger                               | .10E-01 | .10E-03 | 29   |
| Kozeny-Carmen                        | .17E-08 | .17E-10 | 0    |
| Zunker                               | .23E-07 | .23E-09 | 0    |
| Zamarin                              | .32E-02 | .32E-04 | 9    |
| USBR                                 | .35E-02 | .35E-04 | 10   |
| Barr                                 | .84E-02 | .84E-04 | 24   |
| Alyamani and Sen                     | .74E-02 | .74E-04 | 21   |
| Chapuis                              | .12E-01 | .12E-03 | 34   |
| Krumbein and Monk                    | .81E-02 | .81E-04 | 23   |
| geometric mean                       | .10E-02 | .10E-04 | 3    |
| arithmetic mean                      | .72E-02 | .72E-04 | 21   |



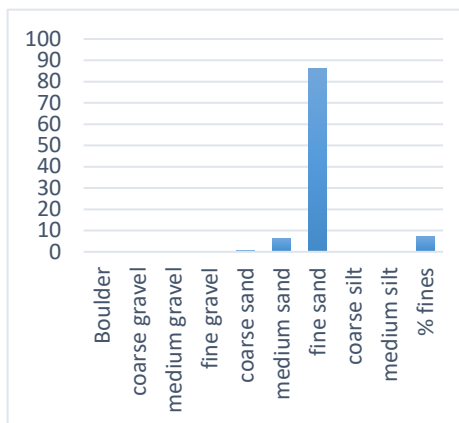
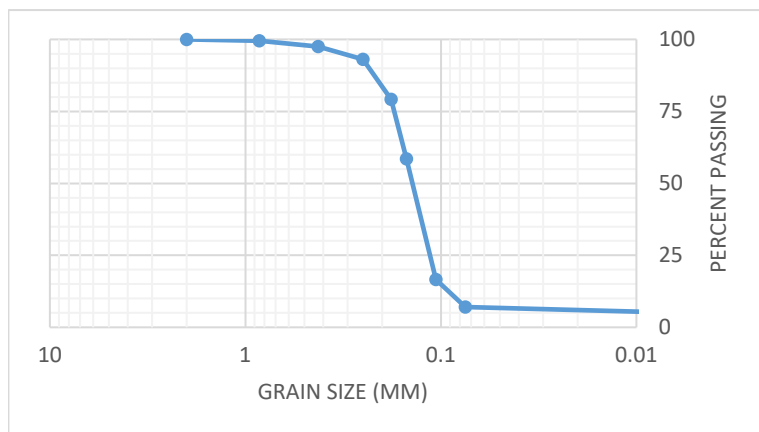
# Grain Size Analysis Report

Sample Name: ORS-8 9-11 ft bls

Mass Sample (g): 328.14

T (°C) 26

## Uniform sand with fines



| Sieve opening<br>(ps)<br>di (mm) | Mass of retained<br>(mr)<br>(g) | mass fraction<br>(mf) | Percent Passing<br>(pp) |
|----------------------------------|---------------------------------|-----------------------|-------------------------|
| 2                                | 0.00                            | 0.00                  | 100.00                  |
| 0.85                             | 1.67                            | 0.01                  | 99.49                   |
| 0.425                            | 6.61                            | 0.02                  | 97.48                   |
| 0.25                             | 14.38                           | 0.04                  | 93.09                   |
| 0.18                             | 45.65                           | 0.14                  | 79.18                   |
| 0.15                             | 67.99                           | 0.21                  | 58.46                   |
| 0.106                            | 137.52                          | 0.42                  | 16.55                   |
| 0.075                            | 31.09                           | 0.09                  | 7.08                    |
| 0.00001                          | 23.23                           | 0.07                  | 0.00                    |

| Effective Grain Diameters (mm) |       | Other Useful Parameters     |             |
|--------------------------------|-------|-----------------------------|-------------|
| d10                            | 0.085 | Uniformity Coef.            | 1.80        |
| d17                            | 0.106 | n computed                  | 0.44        |
| d20                            | 0.110 | g (cm/s <sup>2</sup> )      | 980.00      |
| d30                            | 0.120 | ρ (g/cm <sup>3</sup> )      | 0.9968      |
| d50                            | 0.141 | μ (g/cm s)                  | 0.0085      |
| d60                            | 0.152 | ρg/μ (1/cm s)               | 1.1461E+05  |
| de (Kruger)                    | 0.121 | tau (Sauerbrei)             | 1.209       |
| de (Kozeny)                    | 0.000 | d <sub>geometric mean</sub> | 0.144       |
| de (Zunker)                    | 0.001 | σ <sub>ψ</sub>              | 0.640       |
| de (Zamarin)                   | 0.067 |                             |             |
| lo (Alyameni)                  | 0.070 | 100                         | % in sample |
| mm                             |       | Boulder                     |             |
| >64                            |       | coarse gravel               |             |
| 16 - 64                        |       | medium gravel               |             |
| 8 - 16                         |       | fine gravel                 |             |
| 2 - 8                          |       | coarse sand                 | 0.51        |
| 0.5 - 2                        |       | medium sand                 | 6.4         |
| 0.25 - 0.5                     |       | fine sand                   | 86.02       |
| 0.063 - 0.25                   |       | coarse silt                 |             |
| 0.016 - 0.063                  |       | medium silt                 |             |
| 0.008 - 0.016                  |       |                             |             |
| 0.002 - 0.008                  |       | % fines                     | 7.08        |



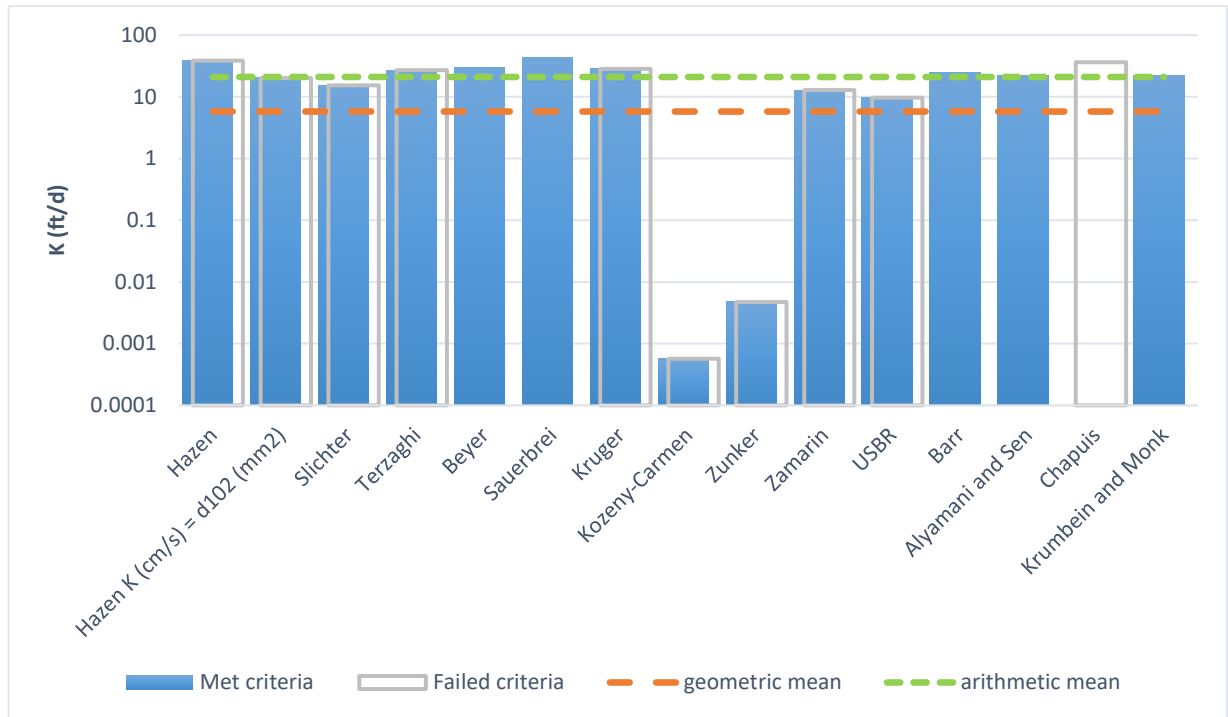
# K from Grain Size Analysis Report

Sample Name: ORS-8 9-11 ft bls

Mass Sample (g): 328.14

T (°C) 26

## Uniform sand with fines



| Estimation of Hydraulic Conductivity  | cm/s    | m/s     | ft/d |
|---------------------------------------|---------|---------|------|
| Hazen                                 | .14E-01 | .14E-03 | 39   |
| Hazen K (cm/s) = d <sub>10</sub> (mm) | .71E-02 | .71E-04 | 20   |
| Slichter                              | .54E-02 | .54E-04 | 15   |
| Terzaghi                              | .95E-02 | .95E-04 | 27   |
| Beyer                                 | .10E-01 | .10E-03 | 30   |
| Sauerbrei                             | .16E-01 | .16E-03 | 44   |
| Kruger                                | .10E-01 | .10E-03 | 28   |
| Kozeny-Carmen                         | .20E-06 | .20E-08 | 0    |
| Zunker                                | .17E-05 | .17E-07 | 0    |
| Zamarin                               | .45E-02 | .45E-04 | 13   |
| USBR                                  | .34E-02 | .34E-04 | 10   |
| Barr                                  | .87E-02 | .87E-04 | 25   |
| Alyamani and Sen                      | .78E-02 | .78E-04 | 22   |
| Chapuis                               | .13E-01 | .13E-03 | 36   |
| Krumbein and Monk                     | .77E-02 | .77E-04 | 22   |
| geometric mean                        | .20E-02 | .20E-04 | 6    |
| arithmetic mean                       | .74E-02 | .74E-04 | 21   |



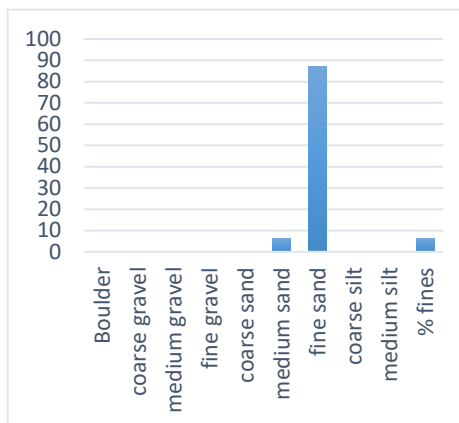
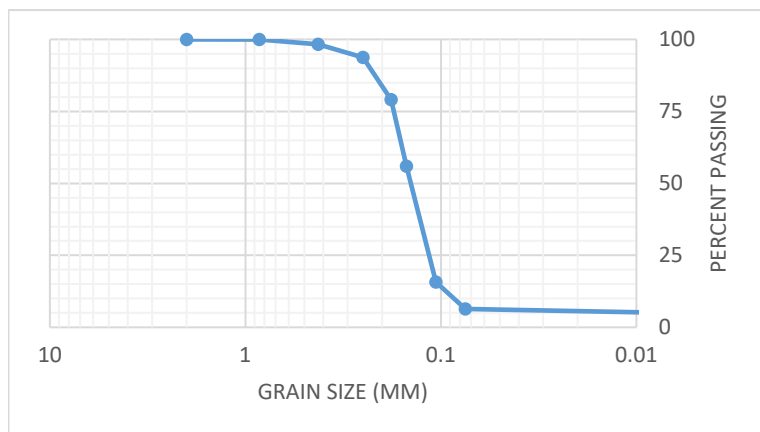
# Grain Size Analysis Report

Sample Name: ORS-8 11-13 ft bls

Mass Sample (g): 317.2

T (°C) 26

## Uniform sand with fines



| Sieve opening<br>(ps)<br>di (mm) | Mass of retained<br>(mr)<br>(g) | mass fraction<br>(mf) | Percent Passing<br>(pp) |
|----------------------------------|---------------------------------|-----------------------|-------------------------|
| 2                                | 0.00                            | 0.00                  | 100.00                  |
| 0.85                             | 0.22                            | 0.00                  | 99.93                   |
| 0.425                            | 5.08                            | 0.02                  | 98.33                   |
| 0.25                             | 14.58                           | 0.05                  | 93.73                   |
| 0.18                             | 46.44                           | 0.15                  | 79.09                   |
| 0.15                             | 73.40                           | 0.23                  | 55.95                   |
| 0.106                            | 127.76                          | 0.40                  | 15.67                   |
| 0.075                            | 29.36                           | 0.09                  | 6.42                    |
| 0.000001                         | 20.36                           | 0.06                  | 0.00                    |

| Effective Grain Diameters (mm) |       | Other Useful Parameters     |             |
|--------------------------------|-------|-----------------------------|-------------|
| d10                            | 0.087 | Uniformity Coef.            | 1.78        |
| d17                            | 0.107 | n computed                  | 0.44        |
| d20                            | 0.111 | g (cm/s <sup>2</sup> )      | 980.00      |
| d30                            | 0.122 | ρ (g/cm <sup>3</sup> )      | 0.9968      |
| d50                            | 0.143 | μ (g/cm s)                  | 0.0085      |
| d60                            | 0.155 | ρg/μ (1/cm s)               | 1.1461E+05  |
| de (Kruger)                    | 0.123 | tau (Sauerbrei)             | 1.209       |
| de (Kozeny)                    | 0.000 | d <sub>geometric mean</sub> | 0.146       |
| de (Zunker)                    | 0.000 | σ <sub>ψ</sub>              | 0.590       |
| de (Zamarin)                   | 0.062 |                             |             |
| lo (Alyameni)                  | 0.073 | 100                         | % in sample |
| mm                             |       | Boulder                     |             |
| >64                            |       | coarse gravel               |             |
| 16 - 64                        |       | medium gravel               |             |
| 8 - 16                         |       | fine gravel                 |             |
| 2 - 8                          |       | coarse sand                 | 0.07        |
| 0.5 - 2                        |       | medium sand                 | 6.2         |
| 0.25 - 0.5                     |       | fine sand                   | 87.31       |
| 0.063 - 0.25                   |       | coarse silt                 |             |
| 0.016 - 0.063                  |       | medium silt                 |             |
| 0.008 - 0.016                  |       |                             |             |
| 0.002 - 0.008                  |       | % fines                     | 6.42        |



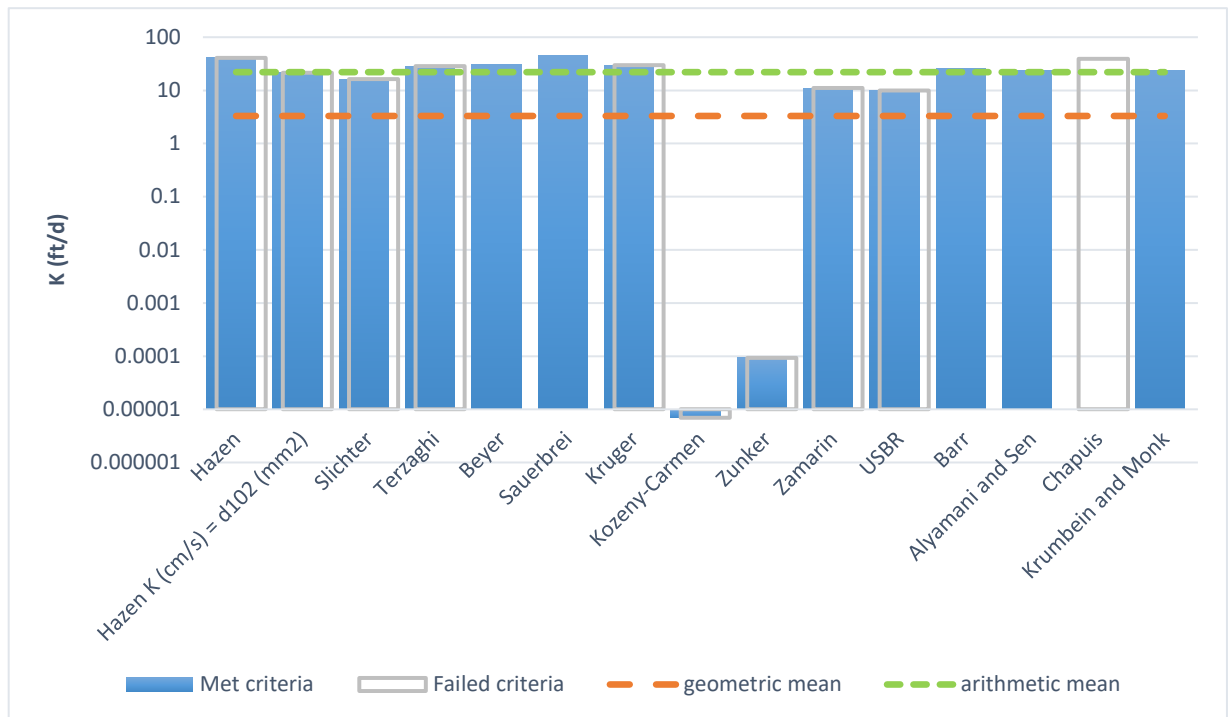
# K from Grain Size Analysis Report

Sample Name: ORS-8 11-13 ft bls

Mass Sample (g): 317.2

T (°C) 26

## Uniform sand with fines



| Estimation of Hydraulic Conductivity  | cm/s    | m/s     | ft/d |
|---------------------------------------|---------|---------|------|
| Hazen                                 | .14E-01 | .14E-03 | 41   |
| Hazen K (cm/s) = d <sub>10</sub> (mm) | .76E-02 | .76E-04 | 21   |
| Slichter                              | .57E-02 | .57E-04 | 16   |
| Terzaghi                              | .10E-01 | .10E-03 | 29   |
| Beyer                                 | .11E-01 | .11E-03 | 31   |
| Sauerbrei                             | .16E-01 | .16E-03 | 45   |
| Kruger                                | .10E-01 | .10E-03 | 30   |
| Kozeny-Carmen                         | .25E-08 | .25E-10 | 0    |
| Zunker                                | .33E-07 | .33E-09 | 0    |
| Zamarin                               | .39E-02 | .39E-04 | 11   |
| USBR                                  | .35E-02 | .35E-04 | 10   |
| Barr                                  | .93E-02 | .93E-04 | 26   |
| Alyamani and Sen                      | .83E-02 | .83E-04 | 24   |
| Chapuis                               | .14E-01 | .14E-03 | 39   |
| Krumbein and Monk                     | .85E-02 | .85E-04 | 24   |
| geometric mean                        | .12E-02 | .12E-04 | 3    |
| arithmetic mean                       | .78E-02 | .78E-04 | 22   |



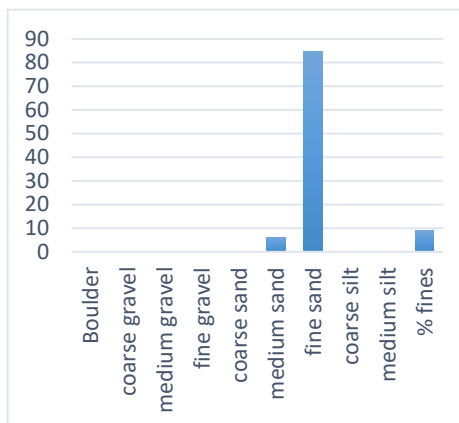
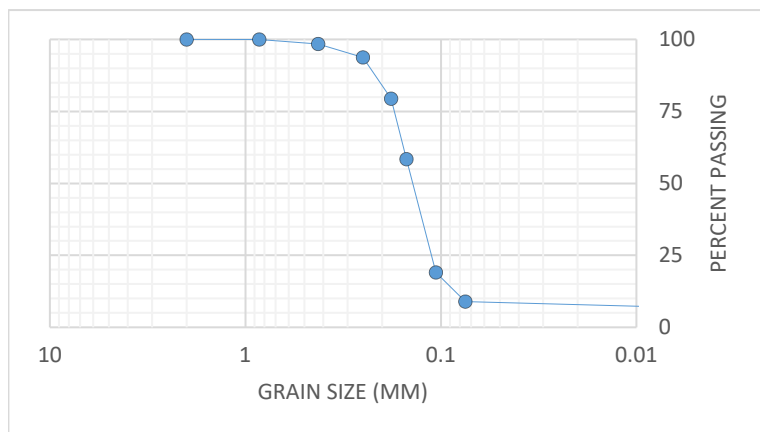
# Grain Size Analysis Report

Sample Name: ORS-8 13-15 ft bls

Mass Sample (g): 313.99

T (°C) 26

## Uniform sand with fines



| Sieve opening<br>(ps)<br>di (mm) | Mass of retained<br>(mr)<br>(g) | mass fraction<br>(mf) | Percent Passing<br>(pp) |
|----------------------------------|---------------------------------|-----------------------|-------------------------|
| 2                                | 0.00                            | 0.00                  | 100.00                  |
| 0.85                             | 0.21                            | 0.00                  | 99.93                   |
| 0.425                            | 4.76                            | 0.02                  | 98.42                   |
| 0.25                             | 14.86                           | 0.05                  | 93.68                   |
| 0.18                             | 44.84                           | 0.14                  | 79.40                   |
| 0.15                             | 66.10                           | 0.21                  | 58.35                   |
| 0.106                            | 123.44                          | 0.39                  | 19.04                   |
| 0.075                            | 31.61                           | 0.10                  | 8.97                    |
| 0.000001                         | 28.17                           | 0.09                  | 0.00                    |

| Effective Grain Diameters (mm) |       | Other Useful Parameters     |             |
|--------------------------------|-------|-----------------------------|-------------|
| d10                            | 0.078 | Uniformity Coef.            | 1.95        |
| d17                            | 0.100 | n computed                  | 0.43        |
| d20                            | 0.107 | g (cm/s <sup>2</sup> )      | 980.00      |
| d30                            | 0.118 | ρ (g/cm <sup>3</sup> )      | 0.9968      |
| d50                            | 0.141 | μ (g/cm s)                  | 0.0085      |
| d60                            | 0.152 | ρg/μ (1/cm s)               | 1.1461E+05  |
| de (Kruger)                    | 0.115 | tau (Sauerbrei)             | 1.209       |
| de (Kozeny)                    | 0.000 | d <sub>geometric mean</sub> | 0.140       |
| de (Zunker)                    | 0.000 | σ <sub>ψ</sub>              | 0.697       |
| de (Zamarin)                   | 0.051 |                             |             |
| lo (Alyameni)                  | 0.063 | 100                         | % in sample |
| mm                             |       | Boulder                     |             |
| >64                            |       | coarse gravel               |             |
| 16 - 64                        |       | medium gravel               |             |
| 8 - 16                         |       | fine gravel                 |             |
| 2 - 8                          |       | coarse sand                 | 0.07        |
| 0.5 - 2                        |       | medium sand                 | 6.25        |
| 0.25 - 0.5                     |       | fine sand                   | 84.71       |
| 0.063 - 0.25                   |       | coarse silt                 |             |
| 0.016 - 0.063                  |       | medium silt                 |             |
| 0.008 - 0.016                  |       |                             |             |
| 0.002 - 0.008                  |       | % fines                     | 8.97        |



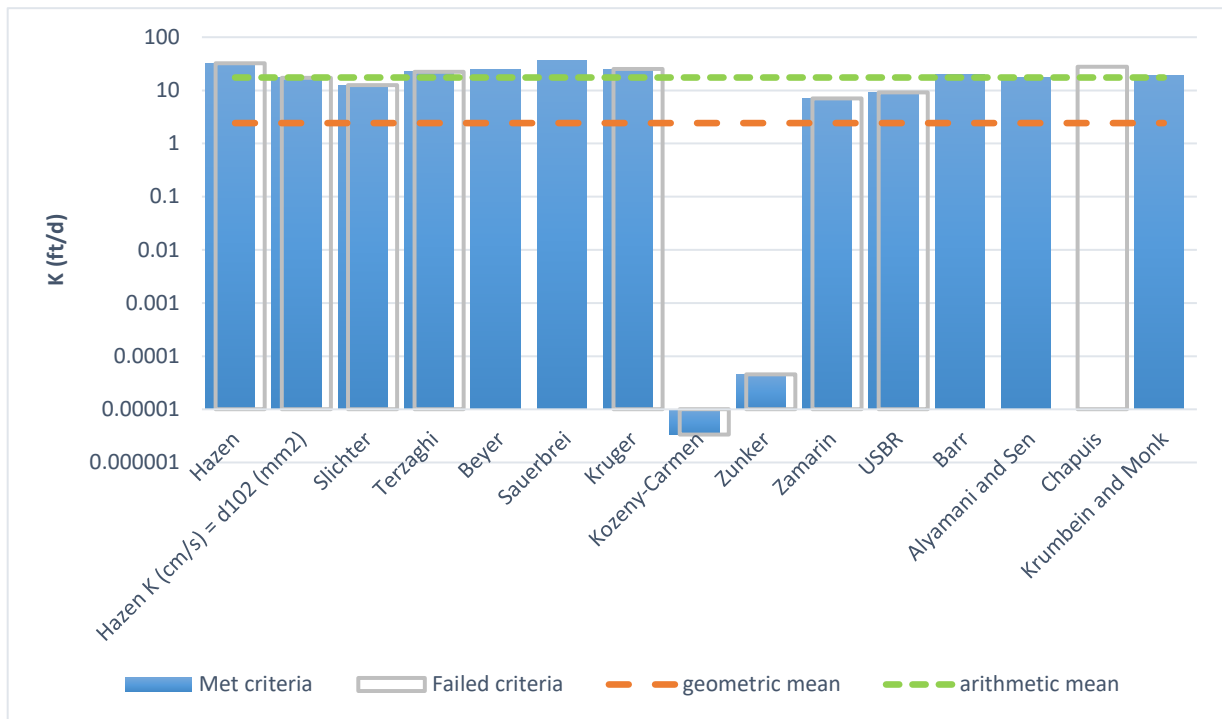
# K from Grain Size Analysis Report

Sample Name: ORS-8 13-15 ft bls

Mass Sample (g): 313.99

T (°C) 26

## Uniform sand with fines



| Estimation of Hydraulic Conductivity | cm/s    | m/s     | ft/d |
|--------------------------------------|---------|---------|------|
| Hazen                                | .11E-01 | .11E-03 | 32   |
| Hazen K (cm/s) = $d_{10}^2$ (mm)     | .61E-02 | .61E-04 | 17   |
| Slichter                             | .44E-02 | .44E-04 | 13   |
| Terzaghi                             | .78E-02 | .78E-04 | 22   |
| Beyer                                | .88E-02 | .88E-04 | 25   |
| Sauerbrei                            | .13E-01 | .13E-03 | 37   |
| Kruger                               | .89E-02 | .89E-04 | 25   |
| Kozeny-Carmen                        | .12E-08 | .12E-10 | 0    |
| Zunker                               | .16E-07 | .16E-09 | 0    |
| Zamarin                              | .25E-02 | .25E-04 | 7    |
| USBR                                 | .32E-02 | .32E-04 | 9    |
| Barr                                 | .71E-02 | .71E-04 | 20   |
| Alyamani and Sen                     | .62E-02 | .62E-04 | 18   |
| Chapuis                              | .98E-02 | .98E-04 | 28   |
| Krumbein and Monk                    | .68E-02 | .68E-04 | 19   |
| geometric mean                       | .86E-03 | .86E-05 | 2    |
| arithmetic mean                      | .62E-02 | .62E-04 | 17   |





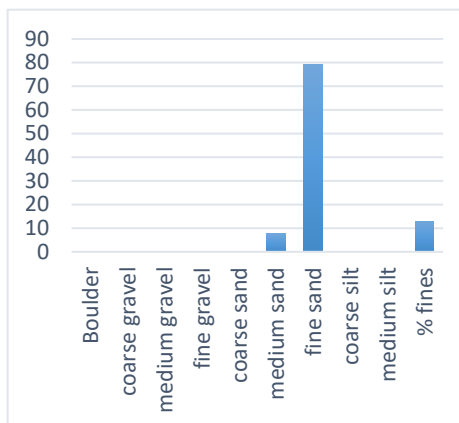
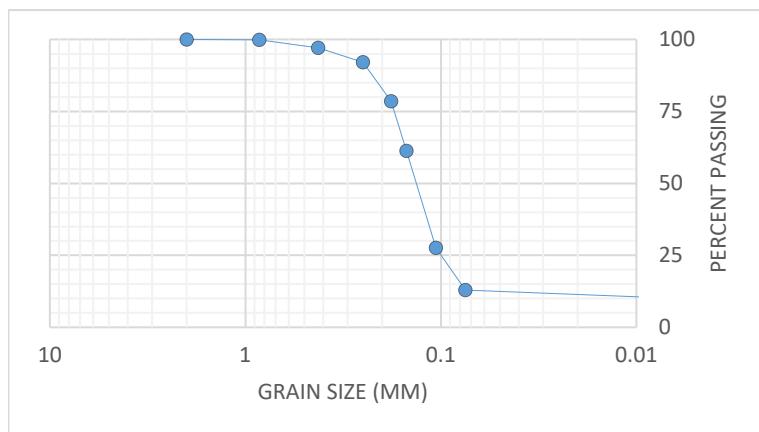
# Grain Size Analysis Report

Sample Name: ORS-8 15-17 ft bls

Mass Sample (g): 339.93

T (°C) 26

## Moderately well sorted sand with fines



| Sieve opening<br>(ps)<br>di (mm) | Mass of retained<br>(mr)<br>(g) | mass fraction<br>(mf) | Percent Passing<br>(pp) |
|----------------------------------|---------------------------------|-----------------------|-------------------------|
| 2                                | 0.00                            | 0.00                  | 100.00                  |
| 0.85                             | 0.47                            | 0.00                  | 99.86                   |
| 0.425                            | 9.40                            | 0.03                  | 97.10                   |
| 0.25                             | 17.23                           | 0.05                  | 92.03                   |
| 0.18                             | 45.99                           | 0.14                  | 78.50                   |
| 0.15                             | 58.49                           | 0.17                  | 61.29                   |
| 0.106                            | 114.38                          | 0.34                  | 27.64                   |
| 0.075                            | 49.83                           | 0.15                  | 12.99                   |
| 0.000001                         | 44.14                           | 0.13                  | 0.00                    |

| Effective Grain Diameters (mm) |       | Other Useful Parameters     |             |
|--------------------------------|-------|-----------------------------|-------------|
| d10                            | 0.058 | Uniformity Coef.            | 2.57        |
| d17                            | 0.083 | n computed                  | 0.41        |
| d20                            | 0.090 | g (cm/s <sup>2</sup> )      | 980.00      |
| d30                            | 0.109 | ρ (g/cm <sup>3</sup> )      | 0.9968      |
| d50                            | 0.135 | μ (g/cm s)                  | 0.0085      |
| d60                            | 0.148 | ρg/μ (1/cm s)               | 1.1461E+05  |
| de (Kruger)                    | 0.104 | tau (Sauerbrei)             | 1.209       |
| de (Kozeny)                    | 0.000 | d <sub>geometric mean</sub> | 0.132       |
| de (Zunker)                    | 0.000 | σ <sub>ψ</sub>              | 0.886       |
| de (Zamarin)                   | 0.039 |                             |             |
| lo (Alyameni)                  | 0.038 | 100                         | % in sample |
| mm                             |       | Boulder                     |             |
| >64                            |       | coarse gravel               |             |
| 16 - 64                        |       | medium gravel               |             |
| 8 - 16                         |       | fine gravel                 |             |
| 2 - 8                          |       | coarse sand                 | 0.14        |
| 0.5 - 2                        |       | medium sand                 | 7.83        |
| 0.25 - 0.5                     |       | fine sand                   | 79.04       |
| 0.063 - 0.25                   |       | coarse silt                 |             |
| 0.016 - 0.063                  |       | medium silt                 |             |
| 0.008 - 0.016                  |       |                             |             |
| 0.002 - 0.008                  |       | % fines                     | 12.99       |



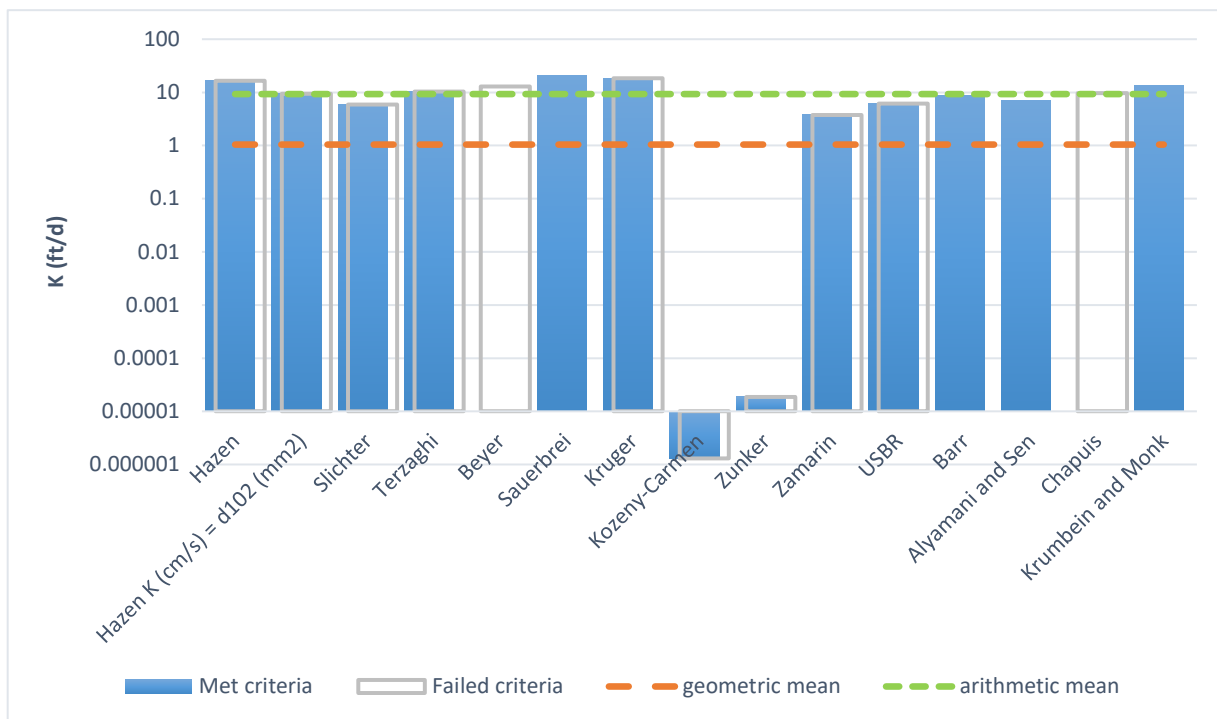
## K from Grain Size Analysis Report

Sample Name: ORS-8 15-17 ft bls

Mass Sample (g): 339.93

T (°C) 26

Moderately well sorted sand with fines



| Estimation of Hydraulic Conductivity  | cm/s    | m/s     | ft/d |
|---------------------------------------|---------|---------|------|
| Hazen                                 | .58E-02 | .58E-04 | 16   |
| Hazen K (cm/s) = d <sub>10</sub> (mm) | .33E-02 | .33E-04 | 9    |
| Slichter                              | .21E-02 | .21E-04 | 6    |
| Terzaghi                              | .37E-02 | .37E-04 | 10   |
| Beyer                                 | .46E-02 | .46E-04 | 13   |
| Sauerbrei                             | .74E-02 | .74E-04 | 21   |
| Kruger                                | .65E-02 | .65E-04 | 18   |
| Kozeny-Carmen                         | .46E-09 | .46E-11 | 0    |
| Zunker                                | .66E-08 | .66E-10 | 0    |
| Zamarin                               | .13E-02 | .13E-04 | 4    |
| USBR                                  | .22E-02 | .22E-04 | 6    |
| Barr                                  | .31E-02 | .31E-04 | 9    |
| Alyamani and Sen                      | .24E-02 | .24E-04 | 7    |
| Chapuis                               | .34E-02 | .34E-04 | 10   |
| Krumbein and Monk                     | .47E-02 | .47E-04 | 13   |
| geometric mean                        | .37E-03 | .37E-05 | 1    |
| arithmetic mean                       | .33E-02 | .33E-04 | 9    |



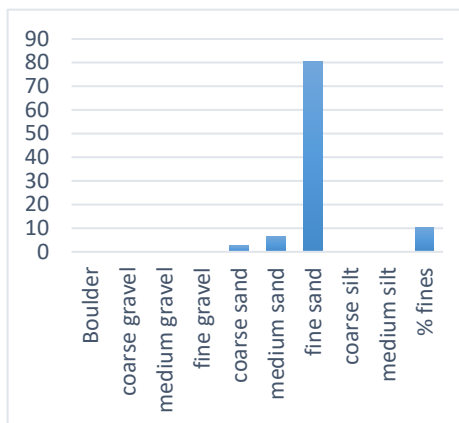
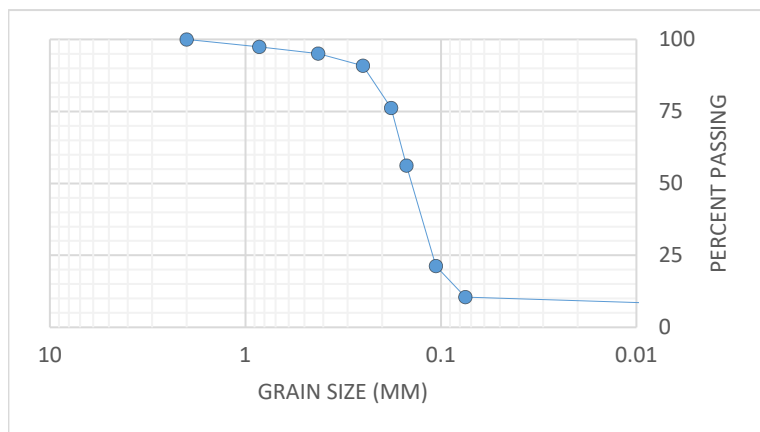
# Grain Size Analysis Report

Sample Name: ORS-8 17-19 ft bls

Mass Sample (g): 378.97

T (°C) 26

## Moderately well sorted sand with fines



| Sieve opening<br>(ps)<br>di (mm) | Mass of retained<br>(mr)<br>(g) | mass fraction<br>(mf) | Percent Passing<br>(pp) |
|----------------------------------|---------------------------------|-----------------------|-------------------------|
| 2                                | 0.00                            | 0.00                  | 100.00                  |
| 0.85                             | 9.64                            | 0.03                  | 97.46                   |
| 0.425                            | 8.95                            | 0.02                  | 95.09                   |
| 0.25                             | 16.05                           | 0.04                  | 90.86                   |
| 0.18                             | 55.48                           | 0.15                  | 76.22                   |
| 0.15                             | 76.17                           | 0.20                  | 56.12                   |
| 0.106                            | 131.96                          | 0.35                  | 21.30                   |
| 0.075                            | 40.95                           | 0.11                  | 10.49                   |
| 0.000001                         | 39.77                           | 0.10                  | 0.00                    |

| Effective Grain Diameters (mm) |       | Other Useful Parameters     |             |
|--------------------------------|-------|-----------------------------|-------------|
| d10                            | 0.071 | Uniformity Coef.            | 2.18        |
| d17                            | 0.094 | n computed                  | 0.42        |
| d20                            | 0.102 | g (cm/s <sup>2</sup> )      | 980.00      |
| d30                            | 0.117 | ρ (g/cm <sup>3</sup> )      | 0.9968      |
| d50                            | 0.142 | μ (g/cm s)                  | 0.0085      |
| d60                            | 0.156 | ρg/μ (1/cm s)               | 1.1461E+05  |
| de (Kruger)                    | 0.114 | tau (Sauerbrei)             | 1.209       |
| de (Kozeny)                    | 0.000 | d <sub>geometric mean</sub> | 0.141       |
| de (Zunker)                    | 0.000 | σ <sub>ψ</sub>              | 0.854       |
| de (Zamarin)                   | 0.046 |                             |             |
| lo (Alyameni)                  | 0.054 | 100                         | % in sample |
| mm                             |       | Boulder                     |             |
| >64                            |       | coarse gravel               |             |
| 16 - 64                        |       | medium gravel               |             |
| 8 - 16                         |       | fine gravel                 |             |
| 2 - 8                          |       | coarse sand                 | 2.54        |
| 0.5 - 2                        |       | medium sand                 | 6.6         |
| 0.25 - 0.5                     |       | fine sand                   | 80.37       |
| 0.063 - 0.25                   |       | coarse silt                 |             |
| 0.016 - 0.063                  |       | medium silt                 |             |
| 0.008 - 0.016                  |       |                             |             |
| 0.002 - 0.008                  |       | % fines                     | 10.49       |



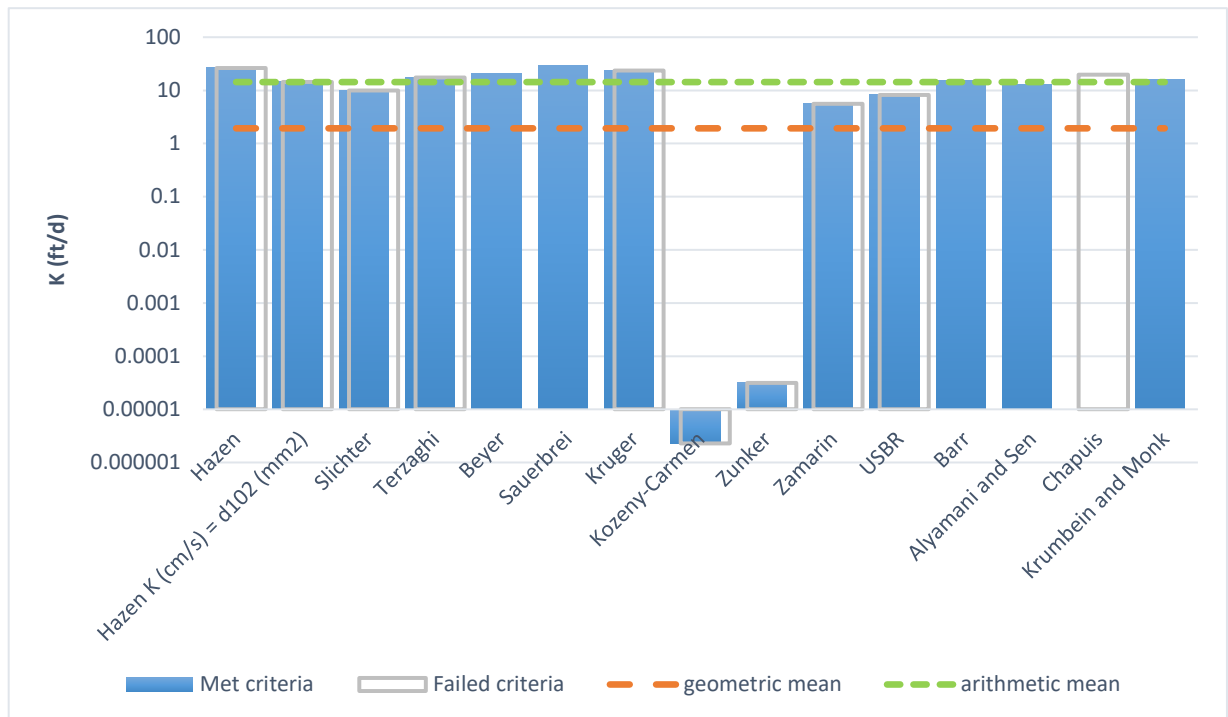
# K from Grain Size Analysis Report

Sample Name: ORS-8 17-19 ft bls

Mass Sample (g): 378.97

T (°C) 26

Moderately well sorted sand with fines



| Estimation of Hydraulic Conductivity  | cm/s    | m/s     | ft/d |
|---------------------------------------|---------|---------|------|
| Hazen                                 | .93E-02 | .93E-04 | 26   |
| Hazen K (cm/s) = d <sub>10</sub> (mm) | .51E-02 | .51E-04 | 14   |
| Slichter                              | .35E-02 | .35E-04 | 10   |
| Terzaghi                              | .62E-02 | .62E-04 | 18   |
| Beyer                                 | .72E-02 | .72E-04 | 20   |
| Sauerbrei                             | .11E-01 | .11E-03 | 30   |
| Kruger                                | .83E-02 | .83E-04 | 23   |
| Kozeny-Carmen                         | .80E-09 | .80E-11 | 0    |
| Zunker                                | .11E-07 | .11E-09 | 0    |
| Zamarin                               | .20E-02 | .20E-04 | 6    |
| USBR                                  | .29E-02 | .29E-04 | 8    |
| Barr                                  | .55E-02 | .55E-04 | 15   |
| Alyamani and Sen                      | .46E-02 | .46E-04 | 13   |
| Chapuis                               | .69E-02 | .69E-04 | 20   |
| Krumbein and Monk                     | .56E-02 | .56E-04 | 16   |
| geometric mean                        | .68E-03 | .68E-05 | 2    |
| arithmetic mean                       | .51E-02 | .51E-04 | 14   |



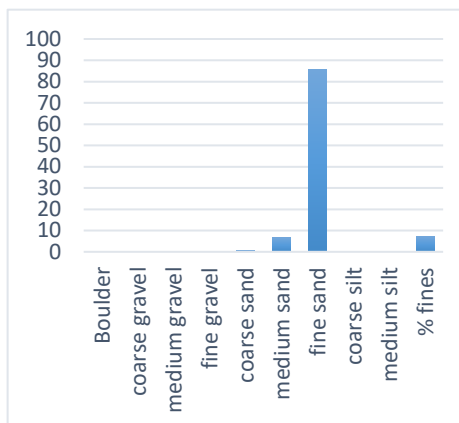
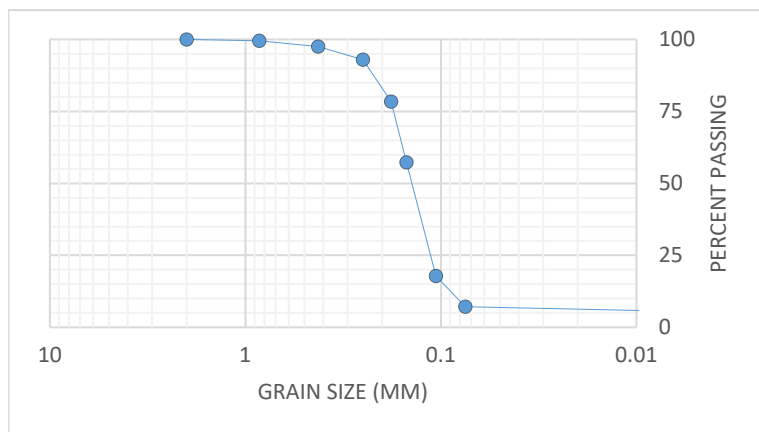
# Grain Size Analysis Report

Sample Name: ORS-8 19-21 ft bls

Mass Sample (g): 366.15

T (°C) 26

## Uniform sand with fines



| Sieve opening<br>(ps)<br>di (mm) | Mass of retained<br>(mr)<br>(g) | mass fraction<br>(mf) | Percent Passing<br>(pp) |
|----------------------------------|---------------------------------|-----------------------|-------------------------|
| 2                                | 0.00                            | 0.00                  | 100.00                  |
| 0.85                             | 1.57                            | 0.00                  | 99.57                   |
| 0.425                            | 7.44                            | 0.02                  | 97.54                   |
| 0.25                             | 16.69                           | 0.05                  | 92.98                   |
| 0.18                             | 53.23                           | 0.15                  | 78.44                   |
| 0.15                             | 77.30                           | 0.21                  | 57.33                   |
| 0.106                            | 144.52                          | 0.39                  | 17.86                   |
| 0.075                            | 39.09                           | 0.11                  | 7.19                    |
| 0.000001                         | 26.31                           | 0.07                  | 0.00                    |

| Effective Grain Diameters (mm) |       | Other Useful Parameters     |            |
|--------------------------------|-------|-----------------------------|------------|
| d10                            | 0.083 | Uniformity Coef.            | 1.85       |
| d17                            | 0.103 | n computed                  | 0.44       |
| d20                            | 0.108 | g (cm/s <sup>2</sup> )      | 980.00     |
| d30                            | 0.120 | ρ (g/cm <sup>3</sup> )      | 0.9968     |
| d50                            | 0.142 | μ (g/cm s)                  | 0.0085     |
| d60                            | 0.154 | ρg/μ (1/cm s)               | 1.1461E+05 |
| de (Kruger)                    | 0.120 | tau (Sauerbrei)             | 1.209      |
| de (Kozeny)                    | 0.000 | d <sub>geometric mean</sub> | 0.143      |
| de (Zunker)                    | 0.000 | σ <sub>ψ</sub>              | 0.661      |
| de (Zamarin)                   | 0.058 | 100 % in sample             |            |
| lo (Alyameni)                  | 0.069 |                             |            |
| mm                             |       | Boulder                     |            |
| >64                            |       | coarse gravel               |            |
| 16 - 64                        |       | medium gravel               |            |
| 8 - 16                         |       | fine gravel                 |            |
| 2 - 8                          |       | coarse sand                 | 0.43       |
| 0.5 - 2                        |       | medium sand                 | 6.59       |
| 0.25 - 0.5                     |       | fine sand                   | 85.8       |
| 0.063 - 0.25                   |       | coarse silt                 |            |
| 0.016 - 0.063                  |       | medium silt                 |            |
| 0.008 - 0.016                  |       |                             |            |
| 0.002 - 0.008                  |       | % fines                     | 7.19       |



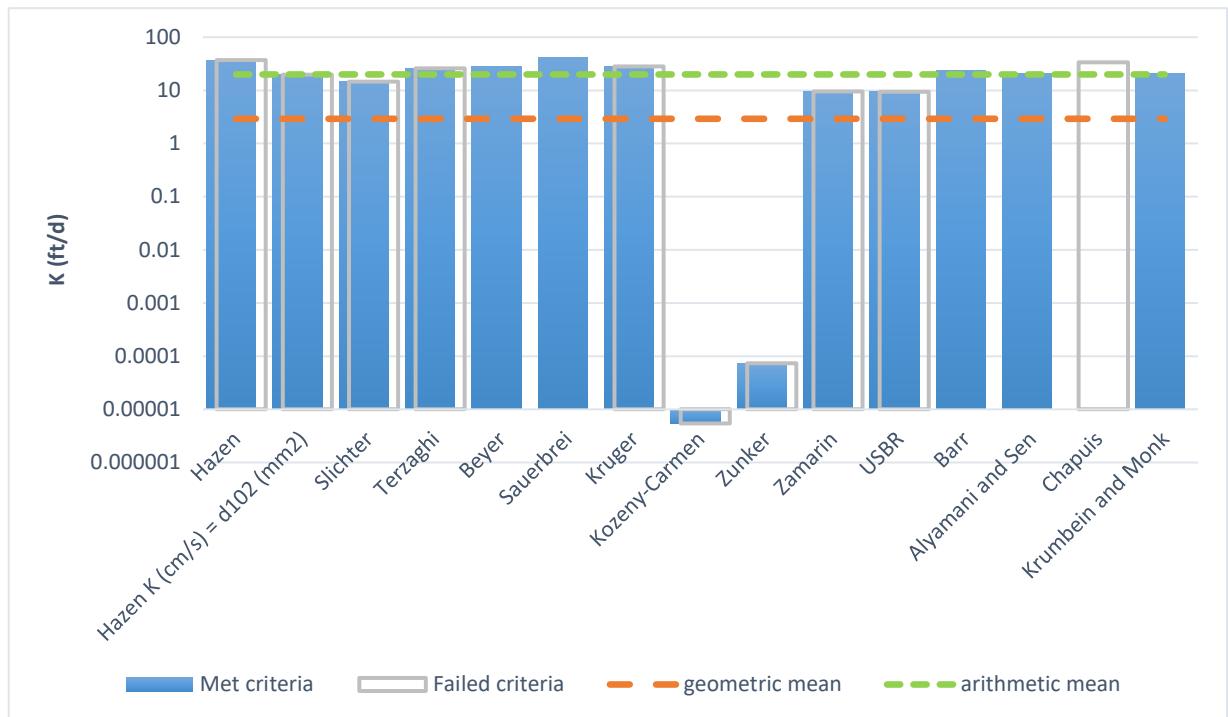
## K from Grain Size Analysis Report

Sample Name: ORS-8 19-21 ft bls

Mass Sample (g): 366.15

T (°C) 26

### Uniform sand with fines



| Estimation of Hydraulic Conductivity | cm/s    | m/s     | ft/d |
|--------------------------------------|---------|---------|------|
| Hazen                                | .13E-01 | .13E-03 | 37   |
| Hazen K (cm/s) = $d_{10}^2$ (mm)     | .69E-02 | .69E-04 | 20   |
| Slichter                             | .52E-02 | .52E-04 | 15   |
| Terzaghi                             | .91E-02 | .91E-04 | 26   |
| Beyer                                | .10E-01 | .10E-03 | 28   |
| Sauerbrei                            | .14E-01 | .14E-03 | 41   |
| Kruger                               | .99E-02 | .99E-04 | 28   |
| Kozeny-Carmen                        | .19E-08 | .19E-10 | 0    |
| Zunker                               | .26E-07 | .26E-09 | 0    |
| Zamarin                              | .34E-02 | .34E-04 | 10   |
| USBR                                 | .33E-02 | .33E-04 | 9    |
| Barr                                 | .83E-02 | .83E-04 | 23   |
| Alyamani and Sen                     | .74E-02 | .74E-04 | 21   |
| Chapuis                              | .12E-01 | .12E-03 | 34   |
| Krumbein and Monk                    | .74E-02 | .74E-04 | 21   |
| geometric mean                       | .10E-02 | .10E-04 | 3    |
| arithmetic mean                      | .70E-02 | .70E-04 | 20   |



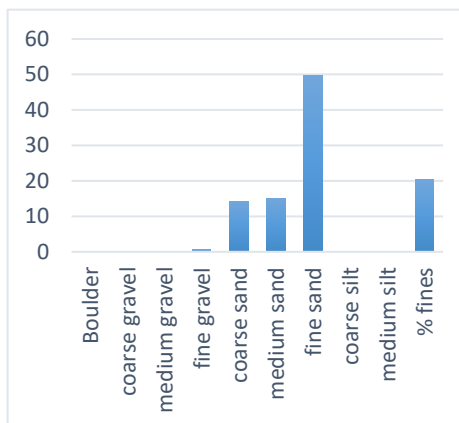
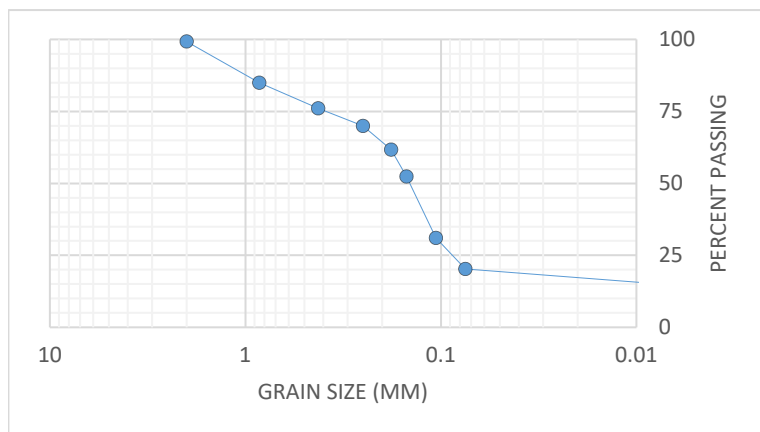
# Grain Size Analysis Report

Sample Name: ORS-8 21-23 ft bls

Mass Sample (g): 302.53

T (°C) 26

## Moderately well sorted sand with fines



| Sieve opening<br>(ps)<br>di (mm) | Mass of retained<br>(mr)<br>(g) | mass fraction<br>(mf) | Percent Passing<br>(pp) |
|----------------------------------|---------------------------------|-----------------------|-------------------------|
| 2                                | 2.25                            | 0.01                  | 99.26                   |
| 0.85                             | 43.14                           | 0.14                  | 85.00                   |
| 0.425                            | 27.14                           | 0.09                  | 76.03                   |
| 0.25                             | 18.36                           | 0.06                  | 69.96                   |
| 0.18                             | 24.91                           | 0.08                  | 61.72                   |
| 0.15                             | 28.26                           | 0.09                  | 52.38                   |
| 0.106                            | 64.52                           | 0.21                  | 31.05                   |
| 0.075                            | 32.68                           | 0.11                  | 20.25                   |
| 0.00001                          | 61.27                           | 0.20                  | 0.00                    |

| Effective Grain Diameters (mm) |       | Other Useful Parameters     |             |
|--------------------------------|-------|-----------------------------|-------------|
| d10                            | 0.037 | Uniformity Coef.            | 4.71        |
| d17                            | 0.063 | n computed                  | 0.36        |
| d20                            | 0.074 | g (cm/s <sup>2</sup> )      | 980.00      |
| d30                            | 0.103 | ρ (g/cm <sup>3</sup> )      | 0.9968      |
| d50                            | 0.145 | μ (g/cm s)                  | 0.0085      |
| d60                            | 0.174 | ρg/μ (1/cm s)               | 1.1461E+05  |
| de (Kruger)                    | 0.104 | tau (Sauerbrei)             | 1.209       |
| de (Kozeny)                    | 0.000 | d <sub>geometric mean</sub> | 0.190       |
| de (Zunker)                    | 0.000 | σ <sub>ψ</sub>              | 1.922       |
| de (Zamarin)                   | 0.035 |                             |             |
| lo (Alyameni)                  | 0.010 | 100                         | % in sample |
| mm                             |       | Boulder                     |             |
| >64                            |       | coarse gravel               |             |
| 16 - 64                        |       | medium gravel               |             |
| 8 - 16                         |       | fine gravel                 | 0.74        |
| 2 - 8                          |       | coarse sand                 | 14.26       |
| 0.5 - 2                        |       | medium sand                 | 15.04       |
| 0.25 - 0.5                     |       | fine sand                   | 49.7        |
| 0.063 - 0.25                   |       | coarse silt                 |             |
| 0.016 - 0.063                  |       | medium silt                 |             |
| 0.008 - 0.016                  |       |                             |             |
| 0.002 - 0.008                  |       | % fines                     | 20.25       |





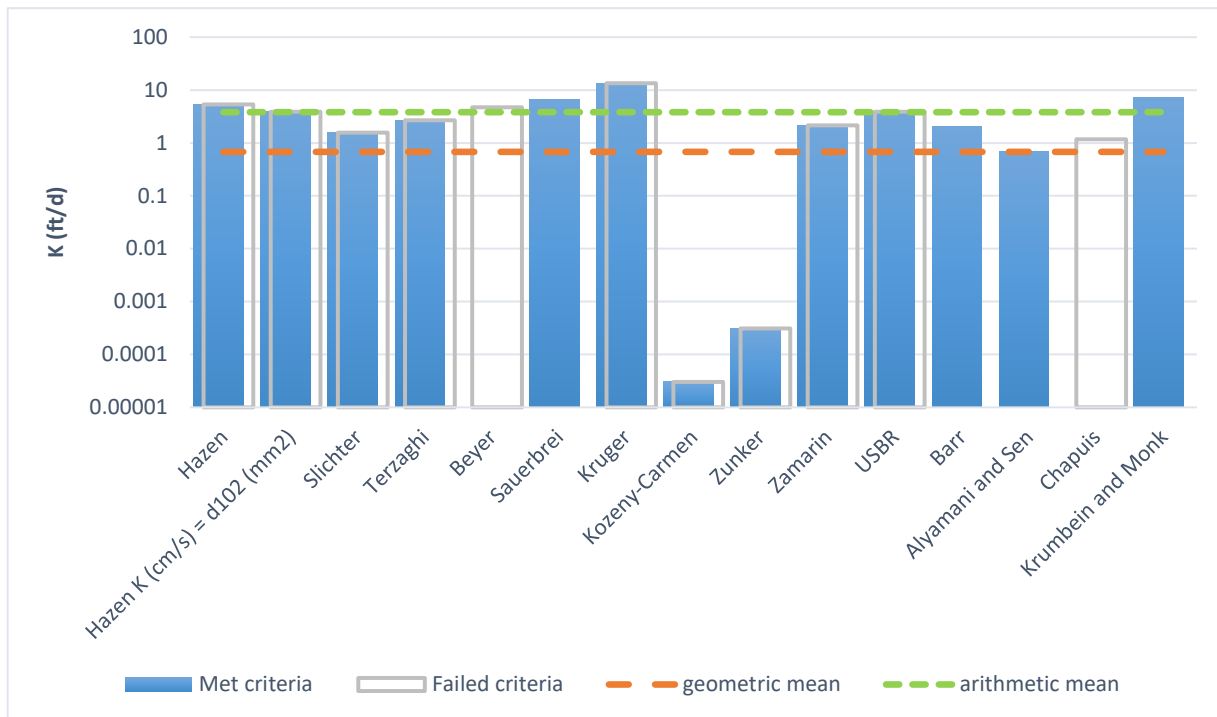
# K from Grain Size Analysis Report

Sample Name: ORS-8 21-23 ft bls

Mass Sample (g): 302.53

T (°C) 26

Moderately well sorted sand with fines



| Estimation of Hydraulic Conductivity  | cm/s    | m/s     | ft/d |
|---------------------------------------|---------|---------|------|
| Hazen                                 | .19E-02 | .19E-04 | 5    |
| Hazen K (cm/s) = d <sub>10</sub> (mm) | .14E-02 | .14E-04 | 4    |
| Slichter                              | .55E-03 | .55E-05 | 2    |
| Terzaghi                              | .95E-03 | .95E-05 | 3    |
| Beyer                                 | .17E-02 | .17E-04 | 5    |
| Sauerbrei                             | .24E-02 | .24E-04 | 7    |
| Kruger                                | .48E-02 | .48E-04 | 13   |
| Kozeny-Carmen                         | .11E-07 | .11E-09 | 0    |
| Zunker                                | .11E-06 | .11E-08 | 0    |
| Zamarin                               | .76E-03 | .76E-05 | 2    |
| USBR                                  | .14E-02 | .14E-04 | 4    |
| Barr                                  | .73E-03 | .73E-05 | 2    |
| Alyamani and Sen                      | .24E-03 | .24E-05 | 1    |
| Chapuis                               | .41E-03 | .41E-05 | 1    |
| Krumbein and Monk                     | .25E-02 | .25E-04 | 7    |
| geometric mean                        | .24E-03 | .24E-05 | 1    |
| arithmetic mean                       | .13E-02 | .13E-04 | 4    |



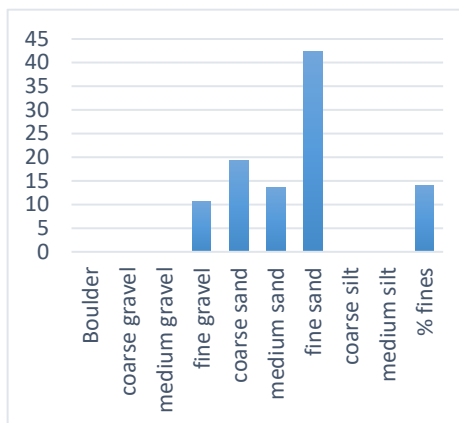
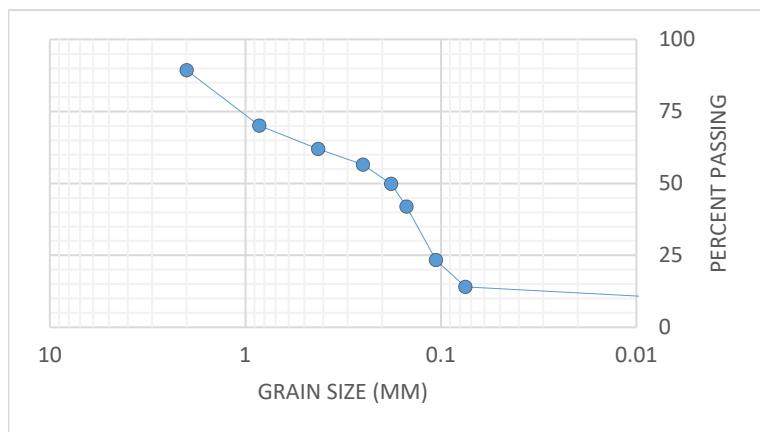
# Grain Size Analysis Report

Sample Name: ORS-8 23-25 ft bls

Mass Sample (g): 292.83

T (°C) 26

## Poorly sorted gravelly sand with fines



| Sieve opening<br>(ps)<br>di (mm) | Mass of retained<br>(mr)<br>(g) | mass fraction<br>(mf) | Percent Passing<br>(pp) |
|----------------------------------|---------------------------------|-----------------------|-------------------------|
| 2                                | 31.25                           | 0.11                  | 89.33                   |
| 0.85                             | 56.37                           | 0.19                  | 70.08                   |
| 0.425                            | 23.81                           | 0.08                  | 61.95                   |
| 0.25                             | 15.86                           | 0.05                  | 56.53                   |
| 0.18                             | 19.76                           | 0.07                  | 49.78                   |
| 0.15                             | 23.08                           | 0.08                  | 41.90                   |
| 0.106                            | 54.14                           | 0.18                  | 23.41                   |
| 0.075                            | 27.36                           | 0.09                  | 14.07                   |
| 0.00001                          | 41.20                           | 0.14                  | 0.00                    |

| Effective Grain Diameters (mm) |       | Other Useful Parameters     |             |
|--------------------------------|-------|-----------------------------|-------------|
| d10                            | 0.053 | Uniformity Coef.            | 6.79        |
| d17                            | 0.085 | n computed                  | 0.33        |
| d20                            | 0.095 | g (cm/s <sup>2</sup> )      | 980.00      |
| d30                            | 0.122 | ρ (g/cm <sup>3</sup> )      | 0.9968      |
| d50                            | 0.182 | μ (g/cm s)                  | 0.0085      |
| d60                            | 0.362 | ρg/μ (1/cm s)               | 1.1461E+05  |
| de (Kruger)                    | 0.134 | tau (Sauerbrei)             | 1.209       |
| de (Kozeny)                    | 0.000 | d <sub>geometric mean</sub> | 0.292       |
| de (Zunker)                    | 0.001 | σ <sub>ψ</sub>              | 2.049       |
| de (Zamarin)                   | 0.049 |                             |             |
| lo (Alyameni)                  | 0.021 | 100                         | % in sample |
| mm                             |       | Boulder                     |             |
| >64                            |       | coarse gravel               |             |
| 16 - 64                        |       | medium gravel               |             |
| 8 - 16                         |       | fine gravel                 | 10.67       |
| 2 - 8                          |       | coarse sand                 | 19.25       |
| 0.5 - 2                        |       | medium sand                 | 13.55       |
| 0.25 - 0.5                     |       | fine sand                   | 42.46       |
| 0.063 - 0.25                   |       | coarse silt                 |             |
| 0.016 - 0.063                  |       | medium silt                 |             |
| 0.008 - 0.016                  |       |                             |             |
| 0.002 - 0.008                  |       | % fines                     | 14.07       |



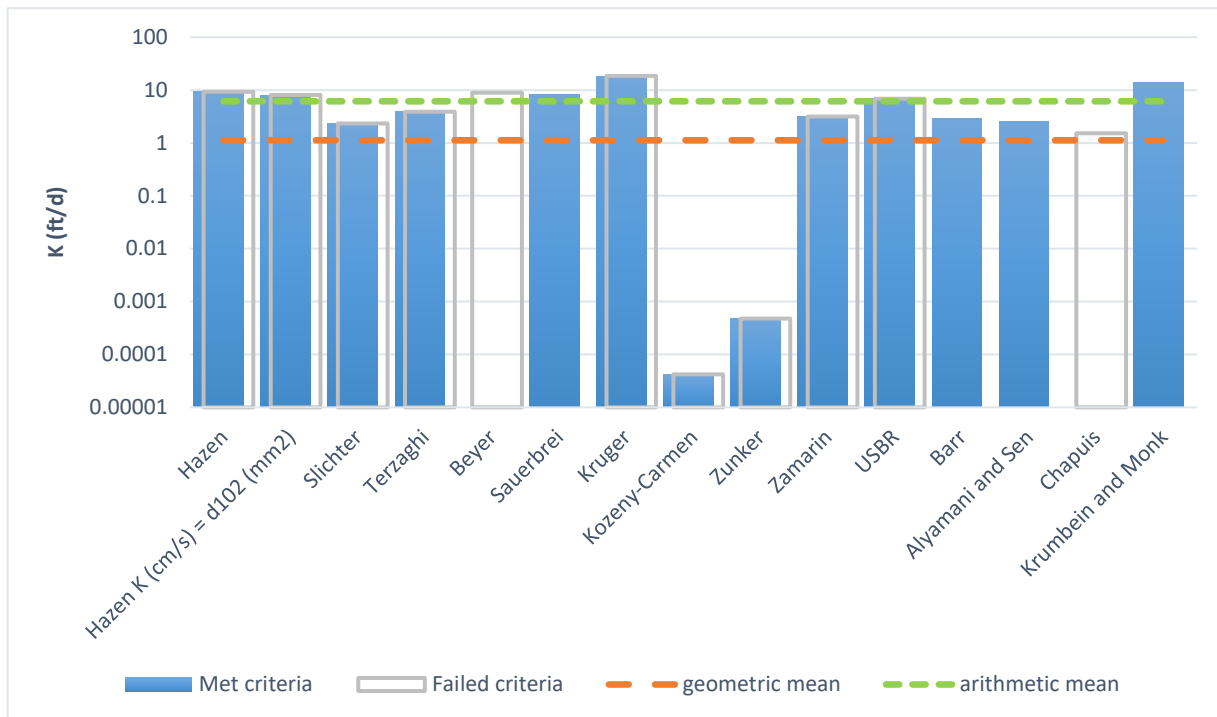
# K from Grain Size Analysis Report

Sample Name: ORS-8 23-25 ft bls

Mass Sample (g): 292.83

T (°C) 26

Poorly sorted gravelly sand with fines



| Estimation of Hydraulic Conductivity  | cm/s    | m/s     | ft/d |
|---------------------------------------|---------|---------|------|
| Hazen                                 | .33E-02 | .33E-04 | 9    |
| Hazen K (cm/s) = d <sub>10</sub> (mm) | .28E-02 | .28E-04 | 8    |
| Slichter                              | .83E-03 | .83E-05 | 2    |
| Terzaghi                              | .14E-02 | .14E-04 | 4    |
| Beyer                                 | .32E-02 | .32E-04 | 9    |
| Sauerbrei                             | .29E-02 | .29E-04 | 8    |
| Kruger                                | .65E-02 | .65E-04 | 18   |
| Kozeny-Carmen                         | .15E-07 | .15E-09 | 0    |
| Zunker                                | .17E-06 | .17E-08 | 0    |
| Zamarin                               | .11E-02 | .11E-04 | 3    |
| USBR                                  | .24E-02 | .24E-04 | 7    |
| Barr                                  | .10E-02 | .10E-04 | 3    |
| Alyamani and Sen                      | .89E-03 | .89E-05 | 3    |
| Chapuis                               | .53E-03 | .53E-05 | 2    |
| Krumbein and Monk                     | .50E-02 | .50E-04 | 14   |
| geometric mean                        | .40E-03 | .40E-05 | 1    |
| arithmetic mean                       | .22E-02 | .22E-04 | 6    |



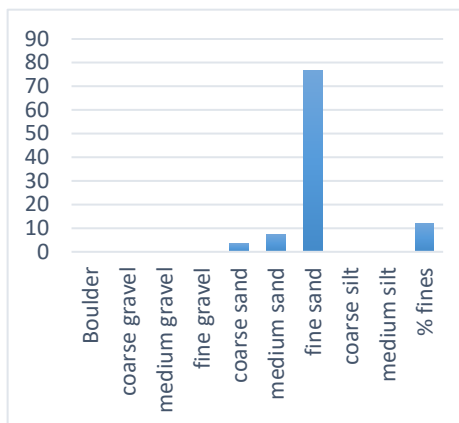
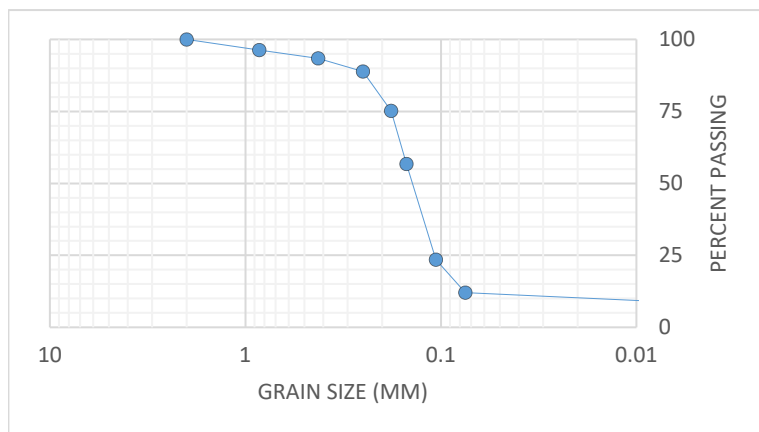
# Grain Size Analysis Report

Sample Name: ORS-8 25-27 ft bls

Mass Sample (g): 348.97

T (°C) 26

## Moderately well sorted sand with fines



| Sieve opening<br>(ps)<br>di (mm) | Mass of retained<br>(mr)<br>(g) | mass fraction<br>(mf) | Percent Passing<br>(pp) |
|----------------------------------|---------------------------------|-----------------------|-------------------------|
| 2                                | 0.00                            | 0.00                  | 100.00                  |
| 0.85                             | 12.76                           | 0.04                  | 96.34                   |
| 0.425                            | 10.27                           | 0.03                  | 93.40                   |
| 0.25                             | 15.71                           | 0.05                  | 88.90                   |
| 0.18                             | 47.81                           | 0.14                  | 75.20                   |
| 0.15                             | 64.35                           | 0.18                  | 56.76                   |
| 0.106                            | 116.21                          | 0.33                  | 23.46                   |
| 0.075                            | 39.84                           | 0.11                  | 12.04                   |
| 0.00001                          | 42.02                           | 0.12                  | 0.00                    |

| Effective Grain Diameters (mm) |       | Other Useful Parameters     |             |
|--------------------------------|-------|-----------------------------|-------------|
| d10                            | 0.062 | Uniformity Coef.            | 2.49        |
| d17                            | 0.088 | n computed                  | 0.42        |
| d20                            | 0.097 | g (cm/s <sup>2</sup> )      | 980.00      |
| d30                            | 0.115 | ρ (g/cm <sup>3</sup> )      | 0.9968      |
| d50                            | 0.141 | μ (g/cm s)                  | 0.0085      |
| d60                            | 0.155 | ρg/μ (1/cm s)               | 1.1461E+05  |
| de (Kruger)                    | 0.111 | tau (Sauerbrei)             | 1.209       |
| de (Kozeny)                    | 0.000 | d <sub>geometric mean</sub> | 0.140       |
| de (Zunker)                    | 0.001 | σ <sub>ψ</sub>              | 1.014       |
| de (Zamarin)                   | 0.049 |                             |             |
| lo (Alyameni)                  | 0.043 | 100                         | % in sample |
| mm                             |       | Boulder                     |             |
| >64                            |       | coarse gravel               |             |
| 16 - 64                        |       | medium gravel               |             |
| 8 - 16                         |       | fine gravel                 |             |
| 2 - 8                          |       | coarse sand                 | 3.66        |
| 0.5 - 2                        |       | medium sand                 | 7.44        |
| 0.25 - 0.5                     |       | fine sand                   | 76.86       |
| 0.063 - 0.25                   |       | coarse silt                 |             |
| 0.016 - 0.063                  |       | medium silt                 |             |
| 0.008 - 0.016                  |       |                             |             |
| 0.002 - 0.008                  |       | % fines                     | 12.04       |



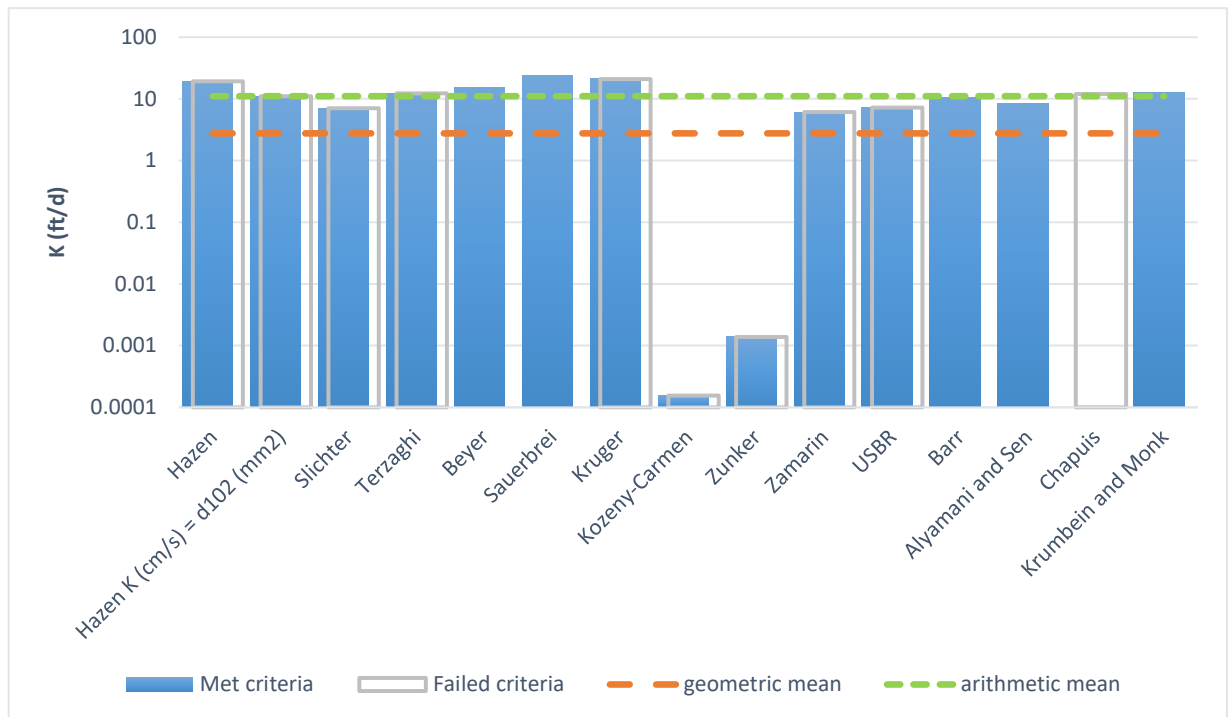
# K from Grain Size Analysis Report

Sample Name: ORS-8 25-27 ft bls

Mass Sample (g): 348.97

T (°C) 26

Moderately well sorted sand with fines



| Estimation of Hydraulic Conductivity  | cm/s    | m/s     | ft/d |
|---------------------------------------|---------|---------|------|
| Hazen                                 | .68E-02 | .68E-04 | 19   |
| Hazen K (cm/s) = d <sub>10</sub> (mm) | .39E-02 | .39E-04 | 11   |
| Slichter                              | .25E-02 | .25E-04 | 7    |
| Terzaghi                              | .43E-02 | .43E-04 | 12   |
| Beyer                                 | .53E-02 | .53E-04 | 15   |
| Sauerbrei                             | .85E-02 | .85E-04 | 24   |
| Kruger                                | .74E-02 | .74E-04 | 21   |
| Kozeny-Carmen                         | .55E-07 | .55E-09 | 0    |
| Zunker                                | .49E-06 | .49E-08 | 0    |
| Zamarin                               | .22E-02 | .22E-04 | 6    |
| USBR                                  | .25E-02 | .25E-04 | 7    |
| Barr                                  | .37E-02 | .37E-04 | 11   |
| Alyamani and Sen                      | .30E-02 | .30E-04 | 8    |
| Chapuis                               | .42E-02 | .42E-04 | 12   |
| Krumbein and Monk                     | .44E-02 | .44E-04 | 13   |
| geometric mean                        | .97E-03 | .97E-05 | 3    |
| arithmetic mean                       | .39E-02 | .39E-04 | 11   |



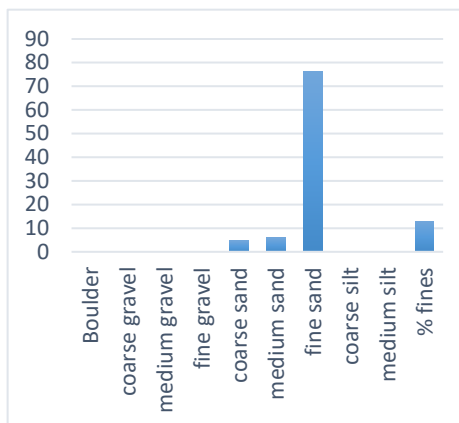
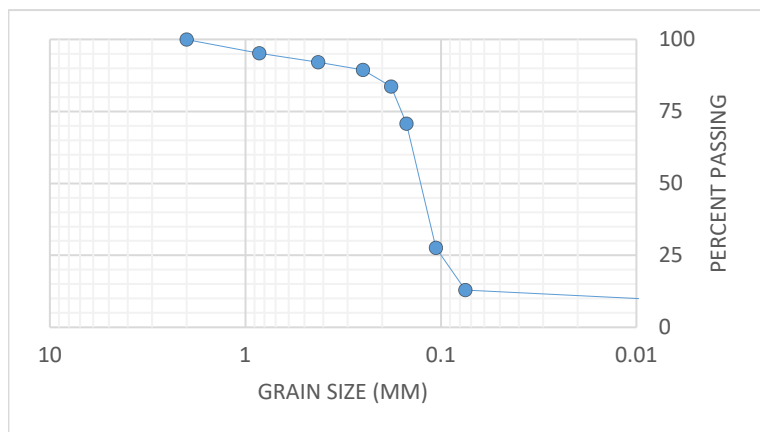
# Grain Size Analysis Report

Sample Name: ORS-8 27-29 ft bls

Mass Sample (g): 337.13

T (°C) 26

## Moderately well sorted sand with fines



| Sieve opening<br>(ps)<br>di (mm) | Mass of retained<br>(mr)<br>(g) | mass fraction<br>(mf) | Percent Passing<br>(pp) |
|----------------------------------|---------------------------------|-----------------------|-------------------------|
| 2                                | 0.22                            | 0.00                  | 99.93                   |
| 0.85                             | 15.91                           | 0.05                  | 95.22                   |
| 0.425                            | 10.77                           | 0.03                  | 92.02                   |
| 0.25                             | 9.00                            | 0.03                  | 89.35                   |
| 0.18                             | 19.42                           | 0.06                  | 83.59                   |
| 0.15                             | 43.36                           | 0.13                  | 70.73                   |
| 0.106                            | 145.55                          | 0.43                  | 27.56                   |
| 0.075                            | 49.30                           | 0.15                  | 12.93                   |
| 0.00001                          | 43.60                           | 0.13                  | 0.00                    |

| Effective Grain Diameters (mm) |       | Other Useful Parameters     |             |
|--------------------------------|-------|-----------------------------|-------------|
| d10                            | 0.058 | Uniformity Coef.            | 2.40        |
| d17                            | 0.084 | n computed                  | 0.42        |
| d20                            | 0.090 | g (cm/s <sup>2</sup> )      | 980.00      |
| d30                            | 0.108 | ρ (g/cm <sup>3</sup> )      | 0.9968      |
| d50                            | 0.129 | μ (g/cm s)                  | 0.0085      |
| d60                            | 0.139 | ρg/μ (1/cm s)               | 1.1461E+05  |
| de (Kruger)                    | 0.104 | tau (Sauerbrei)             | 1.209       |
| de (Kozeny)                    | 0.000 | d <sub>geometric mean</sub> | 0.125       |
| de (Zunker)                    | 0.001 | σ <sub>ψ</sub>              | 1.026       |
| de (Zamarin)                   | 0.046 |                             |             |
| lo (Alyameni)                  | 0.040 | 100                         | % in sample |
| mm                             |       | Boulder                     |             |
| >64                            |       | coarse gravel               |             |
| 16 - 64                        |       | medium gravel               |             |
| 8 - 16                         |       | fine gravel                 | 0.07        |
| 2 - 8                          |       | coarse sand                 | 4.72        |
| 0.5 - 2                        |       | medium sand                 | 5.86        |
| 0.25 - 0.5                     |       | fine sand                   | 76.42       |
| 0.063 - 0.25                   |       | coarse silt                 |             |
| 0.016 - 0.063                  |       | medium silt                 |             |
| 0.008 - 0.016                  |       |                             |             |
| 0.002 - 0.008                  |       | % fines                     | 12.93       |



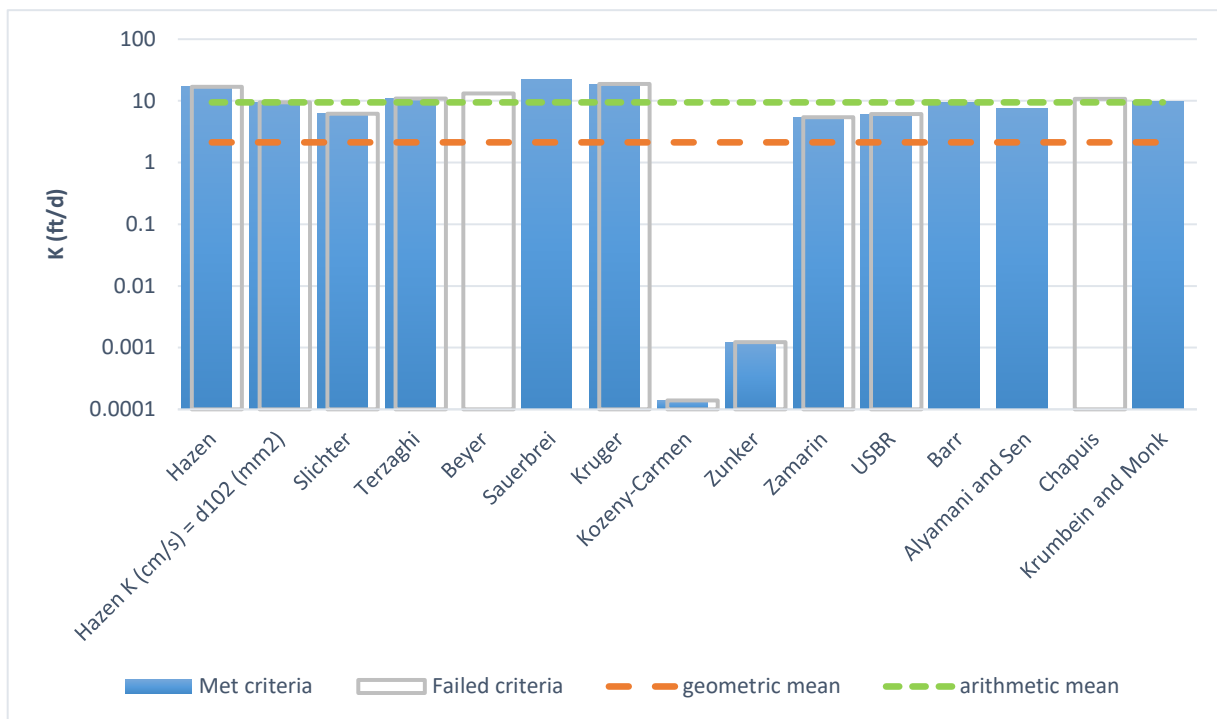
## K from Grain Size Analysis Report

Sample Name: ORS-8 27-29 ft bls

Mass Sample (g): 337.13

T (°C) 26

**Moderately well sorted sand with fines**



| Estimation of Hydraulic Conductivity | cm/s    | m/s     | ft/d |
|--------------------------------------|---------|---------|------|
| Hazen                                | .60E-02 | .60E-04 | 17   |
| Hazen K (cm/s) = $d_{10}$ (mm)       | .34E-02 | .34E-04 | 10   |
| Slichter                             | .22E-02 | .22E-04 | 6    |
| Terzaghi                             | .39E-02 | .39E-04 | 11   |
| Beyer                                | .46E-02 | .46E-04 | 13   |
| Sauerbrei                            | .78E-02 | .78E-04 | 22   |
| Kruger                               | .66E-02 | .66E-04 | 19   |
| Kozeny-Carmen                        | .49E-07 | .49E-09 | 0    |
| Zunker                               | .43E-06 | .43E-08 | 0    |
| Zamarin                              | .19E-02 | .19E-04 | 5    |
| USBR                                 | .22E-02 | .22E-04 | 6    |
| Barr                                 | .33E-02 | .33E-04 | 9    |
| Alyamani and Sen                     | .27E-02 | .27E-04 | 8    |
| Chapuis                              | .38E-02 | .38E-04 | 11   |
| Krumbein and Monk                    | .35E-02 | .35E-04 | 10   |
| geometric mean                       | .75E-03 | .75E-05 | 2    |
| arithmetic mean                      | .33E-02 | .33E-04 | 9    |





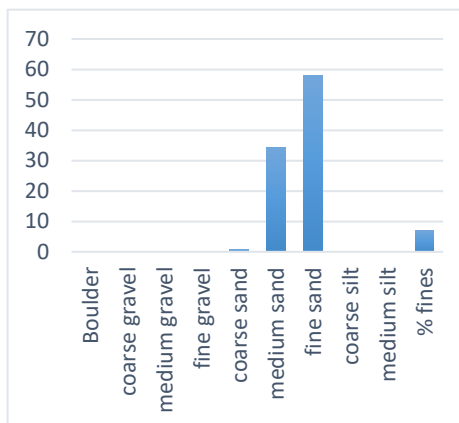
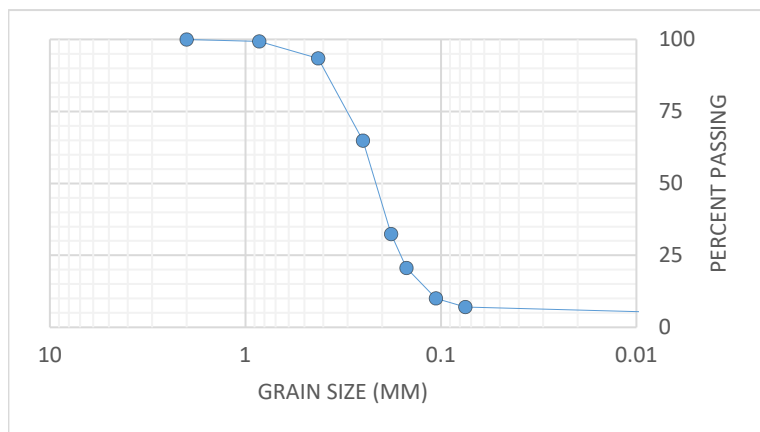
# Grain Size Analysis Report

Sample Name: OSS-3 5-7 ft bls

Mass Sample (g): 393.71

T (°C) 26

## Moderately well sorted sand with fines



| Sieve opening<br>(ps)<br>di (mm) | Mass of retained<br>(mr)<br>(g) | mass fraction<br>(mf) | Percent Passing<br>(pp) |
|----------------------------------|---------------------------------|-----------------------|-------------------------|
| 2                                | 0.09                            | 0.00                  | 99.98                   |
| 0.85                             | 2.88                            | 0.01                  | 99.25                   |
| 0.425                            | 23.11                           | 0.06                  | 93.38                   |
| 0.25                             | 112.14                          | 0.28                  | 64.89                   |
| 0.18                             | 128.06                          | 0.33                  | 32.37                   |
| 0.15                             | 46.37                           | 0.12                  | 20.59                   |
| 0.106                            | 41.46                           | 0.11                  | 10.06                   |
| 0.075                            | 11.99                           | 0.03                  | 7.01                    |
| 0.00001                          | 27.61                           | 0.07                  | 0.00                    |

| Effective Grain Diameters (mm) |       | Other Useful Parameters     |             |
|--------------------------------|-------|-----------------------------|-------------|
| d10                            | 0.105 | Uniformity Coef.            | 2.27        |
| d17                            | 0.135 | n computed                  | 0.42        |
| d20                            | 0.148 | g (cm/s <sup>2</sup> )      | 980.00      |
| d30                            | 0.174 | ρ (g/cm <sup>3</sup> )      | 0.9968      |
| d50                            | 0.218 | μ (g/cm s)                  | 0.0085      |
| d60                            | 0.239 | ρg/μ (1/cm s)               | 1.1461E+05  |
| de (Kruger)                    | 0.161 | tau (Sauerbrei)             | 1.209       |
| de (Kozeny)                    | 0.000 | d <sub>geometric mean</sub> | 0.219       |
| de (Zunker)                    | 0.001 | σ <sub>ψ</sub>              | 0.879       |
| de (Zamarin)                   | 0.079 |                             |             |
| lo (Alyameni)                  | 0.077 | 100                         | % in sample |
| mm                             |       | Boulder                     |             |
| >64                            |       | coarse gravel               |             |
| 16 - 64                        |       | medium gravel               |             |
| 8 - 16                         |       | fine gravel                 | 0.02        |
| 2 - 8                          |       | coarse sand                 | 0.73        |
| 0.5 - 2                        |       | medium sand                 | 34.35       |
| 0.25 - 0.5                     |       | fine sand                   | 57.88       |
| 0.063 - 0.25                   |       | coarse silt                 |             |
| 0.016 - 0.063                  |       | medium silt                 |             |
| 0.008 - 0.016                  |       |                             |             |
| 0.002 - 0.008                  |       | % fines                     | 7.01        |



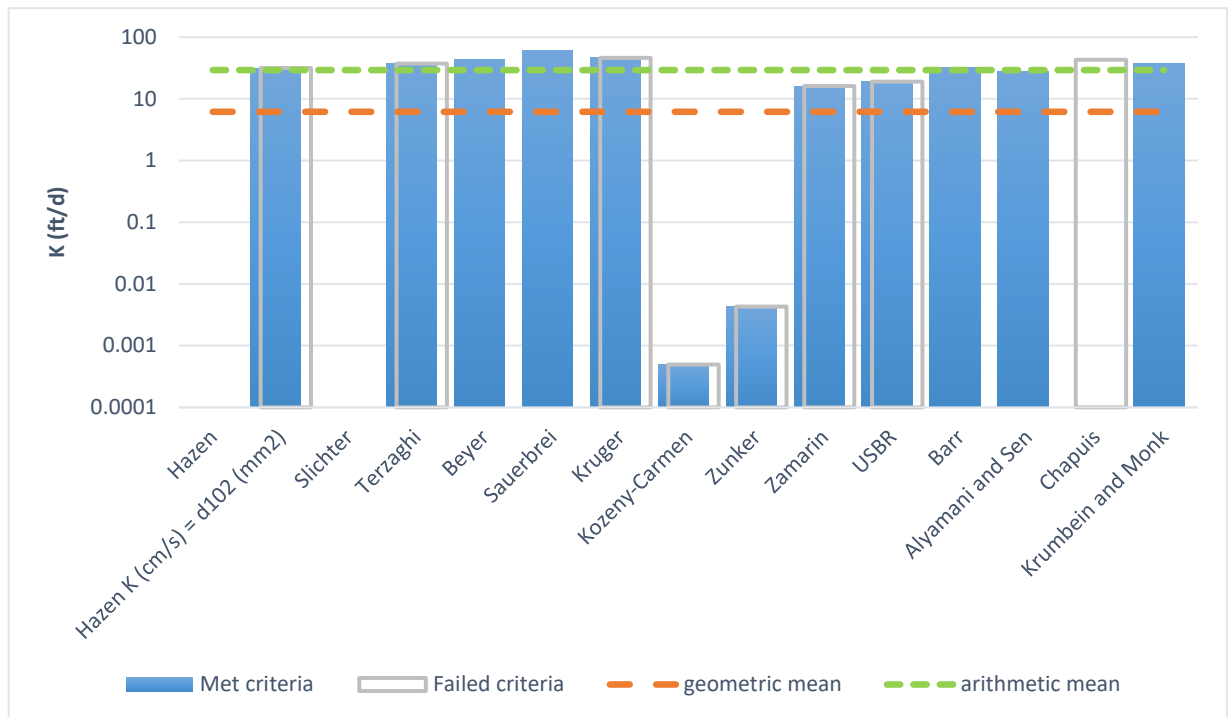
# K from Grain Size Analysis Report

Sample Name: OSS-3 5-7 ft bls

Mass Sample (g): 393.71

T (°C) 26

Moderately well sorted sand with fines



| Estimation of Hydraulic Conductivity  | cm/s    | m/s     | ft/d |
|---------------------------------------|---------|---------|------|
| Hazen                                 | .20E-01 | .20E-03 | 57   |
| Hazen K (cm/s) = d <sub>10</sub> (mm) | .11E-01 | .11E-03 | 31   |
| Slichter                              | .75E-02 | .75E-04 | 21   |
| Terzaghi                              | .13E-01 | .13E-03 | 37   |
| Beyer                                 | .16E-01 | .16E-03 | 44   |
| Sauerbrei                             | .21E-01 | .21E-03 | 60   |
| Kruger                                | .16E-01 | .16E-03 | 46   |
| Kozeny-Carmen                         | .17E-06 | .17E-08 | 0    |
| Zunker                                | .15E-05 | .15E-07 | 0    |
| Zamarin                               | .57E-02 | .57E-04 | 16   |
| USBR                                  | .67E-02 | .67E-04 | 19   |
| Barr                                  | .12E-01 | .12E-03 | 33   |
| Alyamani and Sen                      | .97E-02 | .97E-04 | 27   |
| Chapuis                               | .15E-01 | .15E-03 | 43   |
| Krumbein and Monk                     | .13E-01 | .13E-03 | 37   |
| geometric mean                        | .22E-02 | .22E-04 | 6    |
| arithmetic mean                       | .10E-01 | .10E-03 | 29   |



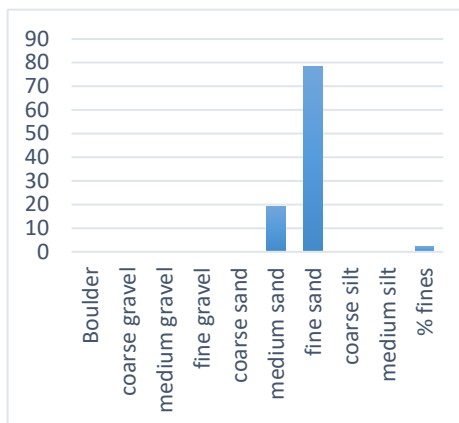
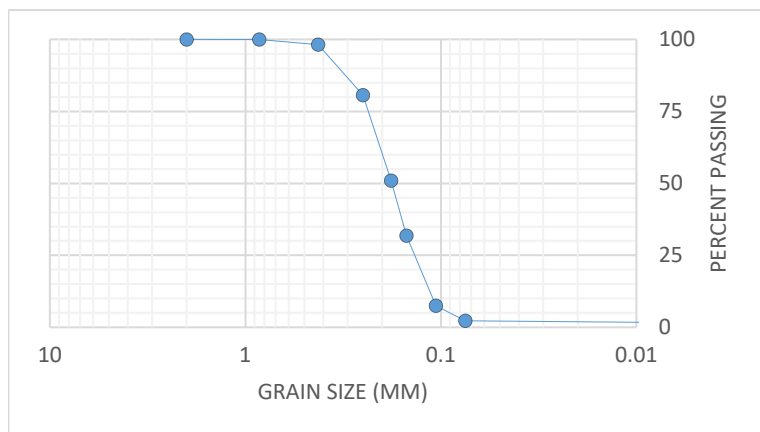
# Grain Size Analysis Report

Sample Name: OSS-3 7-9 ft bls

Mass Sample (g): 364.7

T (°C) 26

## Uniform sand low in fines



| Sieve opening<br>(ps)<br>di (mm) | Mass of retained<br>(mr)<br>(g) | mass fraction<br>(mf) | Percent Passing<br>(pp) |
|----------------------------------|---------------------------------|-----------------------|-------------------------|
| 2                                | 0.00                            | 0.00                  | 100.00                  |
| 0.85                             | 0.10                            | 0.00                  | 99.97                   |
| 0.425                            | 6.72                            | 0.02                  | 98.13                   |
| 0.25                             | 63.75                           | 0.17                  | 80.65                   |
| 0.18                             | 108.35                          | 0.30                  | 50.94                   |
| 0.15                             | 69.77                           | 0.19                  | 31.81                   |
| 0.106                            | 88.85                           | 0.24                  | 7.45                    |
| 0.075                            | 18.97                           | 0.05                  | 2.25                    |
| 0.00001                          | 8.19                            | 0.02                  | 0.00                    |

| Effective Grain Diameters (mm) |       | Other Useful Parameters     |             |
|--------------------------------|-------|-----------------------------|-------------|
| d10                            | 0.111 | Uniformity Coef.            | 1.82        |
| d17                            | 0.123 | n computed                  | 0.44        |
| d20                            | 0.129 | g (cm/s <sup>2</sup> )      | 980.00      |
| d30                            | 0.147 | ρ (g/cm <sup>3</sup> )      | 0.9968      |
| d50                            | 0.179 | μ (g/cm s)                  | 0.0085      |
| d60                            | 0.201 | ρg/μ (1/cm s)               | 1.1461E+05  |
| de (Kruger)                    | 0.162 | tau (Sauerbrei)             | 1.209       |
| de (Kozeny)                    | 0.001 | d <sub>geometric mean</sub> | 0.183       |
| de (Zunker)                    | 0.004 | σ <sub>ψ</sub>              | 0.625       |
| de (Zamarin)                   | 0.121 |                             |             |
| lo (Alyameni)                  | 0.094 | 100                         | % in sample |
| mm                             |       | Boulder                     |             |
| >64                            |       | coarse gravel               |             |
| 16 - 64                        |       | medium gravel               |             |
| 8 - 16                         |       | fine gravel                 |             |
| 2 - 8                          |       | coarse sand                 | 0.03        |
| 0.5 - 2                        |       | medium sand                 | 19.32       |
| 0.25 - 0.5                     |       | fine sand                   | 78.4        |
| 0.063 - 0.25                   |       | coarse silt                 |             |
| 0.016 - 0.063                  |       | medium silt                 |             |
| 0.008 - 0.016                  |       |                             |             |
| 0.002 - 0.008                  |       | % fines                     | 2.25        |



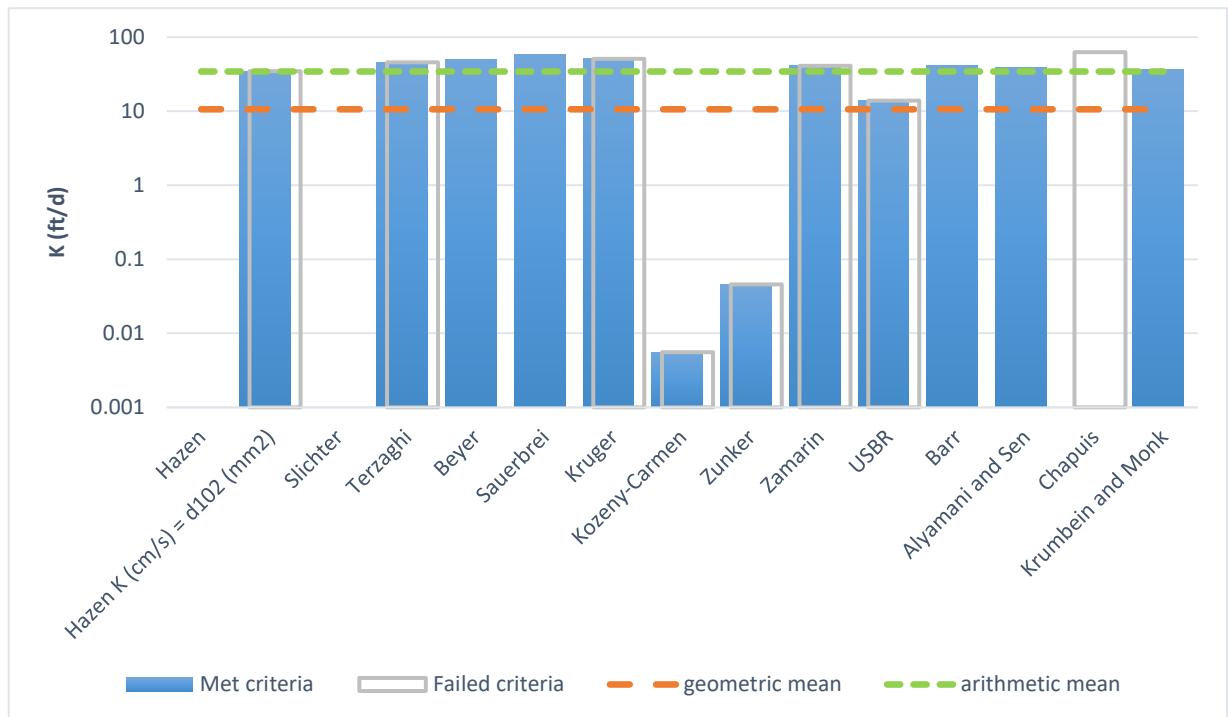
## K from Grain Size Analysis Report

Sample Name: OSS-3 7-9 ft bls

Mass Sample (g): 364.7

T (°C) 26

### Uniform sand low in fines



| Estimation of Hydraulic Conductivity  | cm/s    | m/s     | ft/d |
|---------------------------------------|---------|---------|------|
| Hazen                                 | .23E-01 | .23E-03 | 66   |
| Hazen K (cm/s) = d <sub>10</sub> (mm) | .12E-01 | .12E-03 | 35   |
| Slichter                              | .92E-02 | .92E-04 | 26   |
| Terzaghi                              | .16E-01 | .16E-03 | 46   |
| Beyer                                 | .18E-01 | .18E-03 | 50   |
| Sauerbrei                             | .21E-01 | .21E-03 | 59   |
| Kruger                                | .18E-01 | .18E-03 | 51   |
| Kozeny-Carmen                         | .20E-05 | .20E-07 | 0    |
| Zunker                                | .16E-04 | .16E-06 | 0    |
| Zamarin                               | .15E-01 | .15E-03 | 41   |
| USBR                                  | .49E-02 | .49E-04 | 14   |
| Barr                                  | .15E-01 | .15E-03 | 42   |
| Alyamani and Sen                      | .14E-01 | .14E-03 | 39   |
| Chapuis                               | .22E-01 | .22E-03 | 63   |
| Krumbein and Monk                     | .13E-01 | .13E-03 | 36   |
| geometric mean                        | .37E-02 | .37E-04 | 11   |
| arithmetic mean                       | .12E-01 | .12E-03 | 34   |



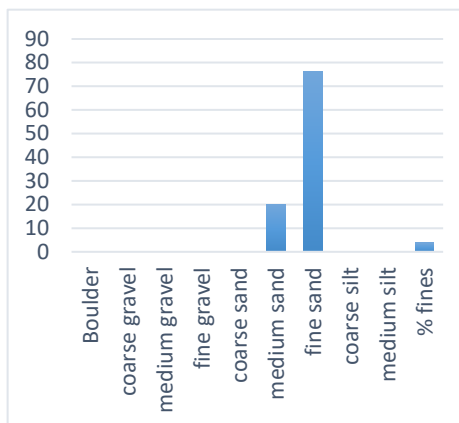
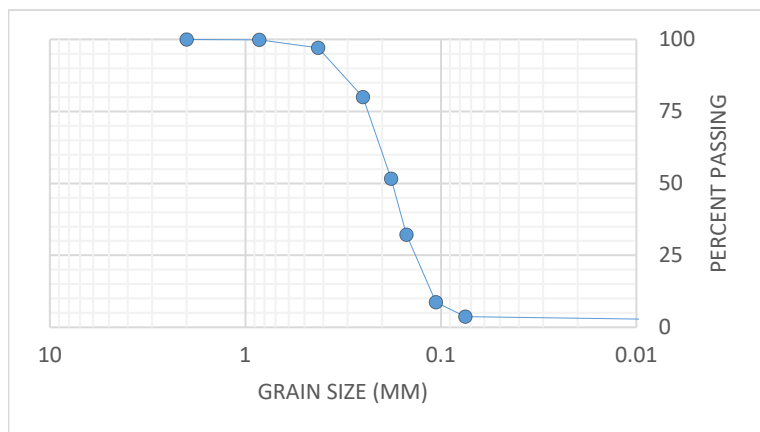
# Grain Size Analysis Report

Sample Name: OSS-3 9-11 ft bls

Mass Sample (g): 357.86

T (°C) 26

## Uniform sand with fines



| Sieve opening<br>(ps)<br>di (mm) | Mass of retained<br>(mr)<br>(g) | mass fraction<br>(mf) | Percent Passing<br>(pp) |
|----------------------------------|---------------------------------|-----------------------|-------------------------|
| 2                                | 0.04                            | 0.00                  | 99.99                   |
| 0.85                             | 0.39                            | 0.00                  | 99.88                   |
| 0.425                            | 10.23                           | 0.03                  | 97.02                   |
| 0.25                             | 61.04                           | 0.17                  | 79.96                   |
| 0.18                             | 101.58                          | 0.28                  | 51.58                   |
| 0.15                             | 69.50                           | 0.19                  | 32.16                   |
| 0.106                            | 83.93                           | 0.23                  | 8.70                    |
| 0.075                            | 17.75                           | 0.05                  | 3.74                    |
| 0.00001                          | 13.40                           | 0.04                  | 0.00                    |

| Effective Grain Diameters (mm) |       | Other Useful Parameters     |             |
|--------------------------------|-------|-----------------------------|-------------|
| d10                            | 0.108 | Uniformity Coef.            | 1.85        |
| d17                            | 0.122 | n computed                  | 0.44        |
| d20                            | 0.127 | g (cm/s <sup>2</sup> )      | 980.00      |
| d30                            | 0.146 | ρ (g/cm <sup>3</sup> )      | 0.9968      |
| d50                            | 0.178 | μ (g/cm s)                  | 0.0085      |
| d60                            | 0.201 | ρg/μ (1/cm s)               | 1.1461E+05  |
| de (Kruger)                    | 0.156 | tau (Sauerbrei)             | 1.209       |
| de (Kozeny)                    | 0.001 | d <sub>geometric mean</sub> | 0.184       |
| de (Zunker)                    | 0.002 | σ <sub>ψ</sub>              | 0.667       |
| de (Zamarin)                   | 0.101 |                             |             |
| lo (Alyameni)                  | 0.091 | 100                         | % in sample |
| mm                             |       | Boulder                     |             |
| >64                            |       | coarse gravel               |             |
| 16 - 64                        |       | medium gravel               |             |
| 8 - 16                         |       | fine gravel                 | 0.01        |
| 2 - 8                          |       | coarse sand                 | 0.11        |
| 0.5 - 2                        |       | medium sand                 | 19.92       |
| 0.25 - 0.5                     |       | fine sand                   | 76.22       |
| 0.063 - 0.25                   |       | coarse silt                 |             |
| 0.016 - 0.063                  |       | medium silt                 |             |
| 0.008 - 0.016                  |       |                             |             |
| 0.002 - 0.008                  |       | % fines                     | 3.74        |



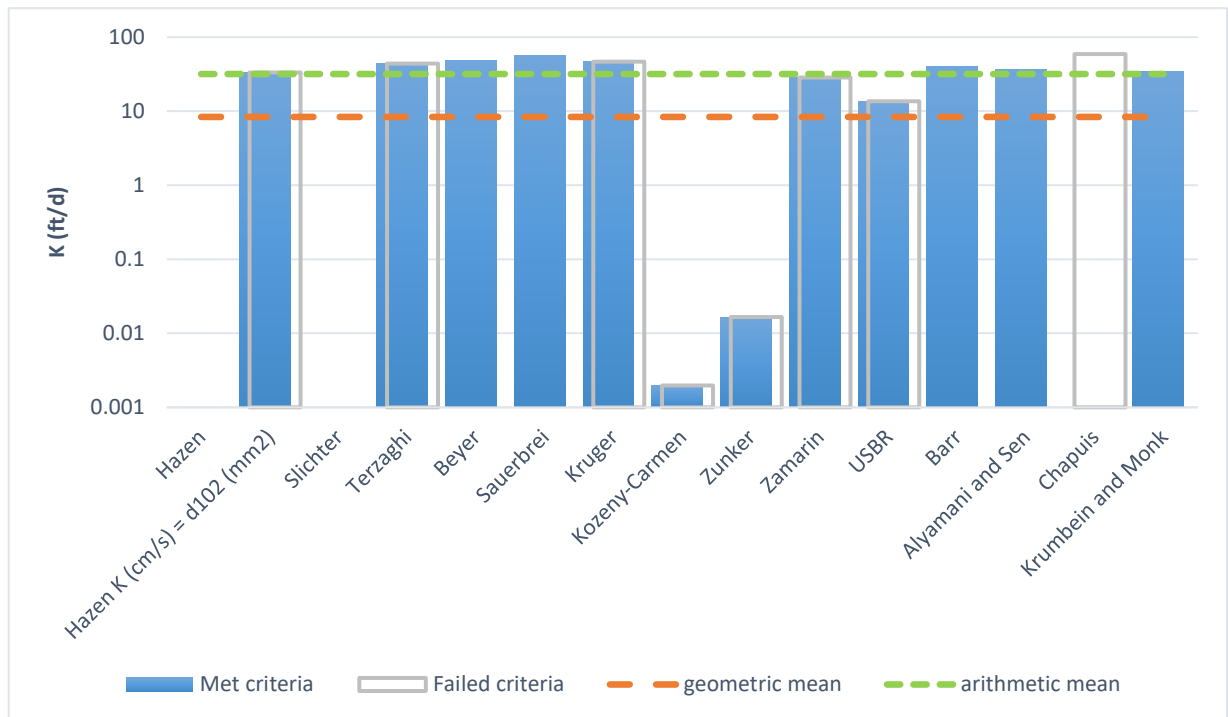
# K from Grain Size Analysis Report

Sample Name: OSS-3 9-11 ft bls

Mass Sample (g): 357.86

T (°C) 26

## Uniform sand with fines



| Estimation of Hydraulic Conductivity  | cm/s    | m/s     | ft/d |
|---------------------------------------|---------|---------|------|
| Hazen                                 | .22E-01 | .22E-03 | 63   |
| Hazen K (cm/s) = d <sub>10</sub> (mm) | .12E-01 | .12E-03 | 33   |
| Slichter                              | .88E-02 | .88E-04 | 25   |
| Terzaghi                              | .15E-01 | .15E-03 | 44   |
| Beyer                                 | .17E-01 | .17E-03 | 48   |
| Sauerbrei                             | .20E-01 | .20E-03 | 56   |
| Kruger                                | .17E-01 | .17E-03 | 47   |
| Kozeny-Carmen                         | .70E-06 | .70E-08 | 0    |
| Zunker                                | .59E-05 | .59E-07 | 0    |
| Zamarin                               | .10E-01 | .10E-03 | 29   |
| USBR                                  | .48E-02 | .48E-04 | 14   |
| Barr                                  | .14E-01 | .14E-03 | 40   |
| Alyamani and Sen                      | .13E-01 | .13E-03 | 37   |
| Chapuis                               | .21E-01 | .21E-03 | 59   |
| Krumbein and Monk                     | .12E-01 | .12E-03 | 34   |
| geometric mean                        | .30E-02 | .30E-04 | 8    |
| arithmetic mean                       | .11E-01 | .11E-03 | 32   |



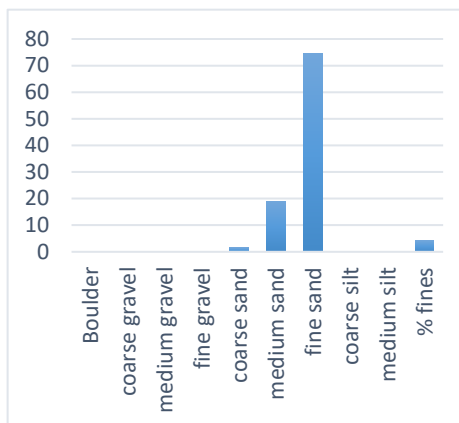
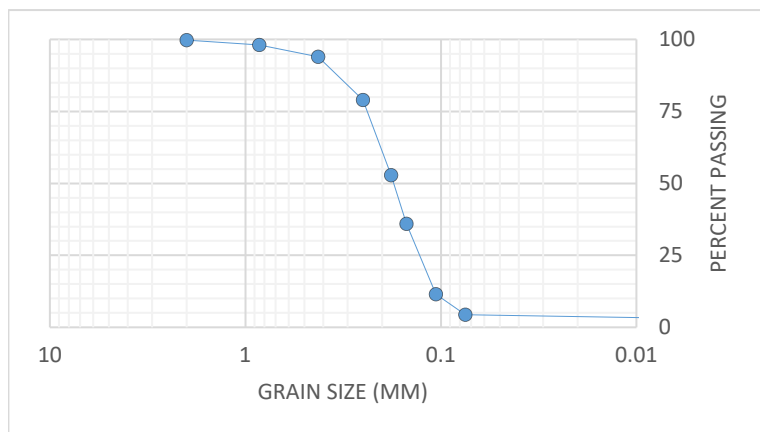
# Grain Size Analysis Report

Sample Name: OSS-3 11-13 ft bls

Mass Sample (g): 353.66

T (°C) 26

## Moderately well sorted sand with fines



| Sieve opening<br>(ps)<br>di (mm) | Mass of retained<br>(mr)<br>(g) | mass fraction<br>(mf) | Percent Passing<br>(pp) |
|----------------------------------|---------------------------------|-----------------------|-------------------------|
| 2                                | 0.87                            | 0.00                  | 99.75                   |
| 0.85                             | 5.88                            | 0.02                  | 98.09                   |
| 0.425                            | 14.64                           | 0.04                  | 93.95                   |
| 0.25                             | 52.87                           | 0.15                  | 79.00                   |
| 0.18                             | 92.55                           | 0.26                  | 52.83                   |
| 0.15                             | 59.91                           | 0.17                  | 35.89                   |
| 0.106                            | 86.22                           | 0.24                  | 11.51                   |
| 0.075                            | 25.28                           | 0.07                  | 4.37                    |
| 0.00001                          | 15.44                           | 0.04                  | 0.00                    |

| Effective Grain Diameters (mm) |       | Other Useful Parameters     |             |
|--------------------------------|-------|-----------------------------|-------------|
| d10                            | 0.099 | Uniformity Coef.            | 2.00        |
| d17                            | 0.116 | n computed                  | 0.43        |
| d20                            | 0.121 | g (cm/s <sup>2</sup> )      | 980.00      |
| d30                            | 0.139 | ρ (g/cm <sup>3</sup> )      | 0.9981      |
| d50                            | 0.175 | μ (g/cm s)                  | 0.0098      |
| d60                            | 0.199 | ρg/μ (1/cm s)               | 9.9327E+04  |
| de (Kruger)                    | 0.151 | tau (Sauerbrei)             | 1.053       |
| de (Kozeny)                    | 0.000 | d <sub>geometric mean</sub> | 0.183       |
| de (Zunker)                    | 0.002 | σ <sub>ψ</sub>              | 0.779       |
| de (Zamarin)                   | 0.093 |                             |             |
| lo (Alyameni)                  | 0.081 | 100                         | % in sample |
| mm                             |       | Boulder                     |             |
| >64                            |       | coarse gravel               |             |
| 16 - 64                        |       | medium gravel               |             |
| 8 - 16                         |       | fine gravel                 | 0.25        |
| 2 - 8                          |       | coarse sand                 | 1.66        |
| 0.5 - 2                        |       | medium sand                 | 19.09       |
| 0.25 - 0.5                     |       | fine sand                   | 74.64       |
| 0.063 - 0.25                   |       | coarse silt                 |             |
| 0.016 - 0.063                  |       | medium silt                 |             |
| 0.008 - 0.016                  |       |                             |             |
| 0.002 - 0.008                  |       | % fines                     | 4.37        |





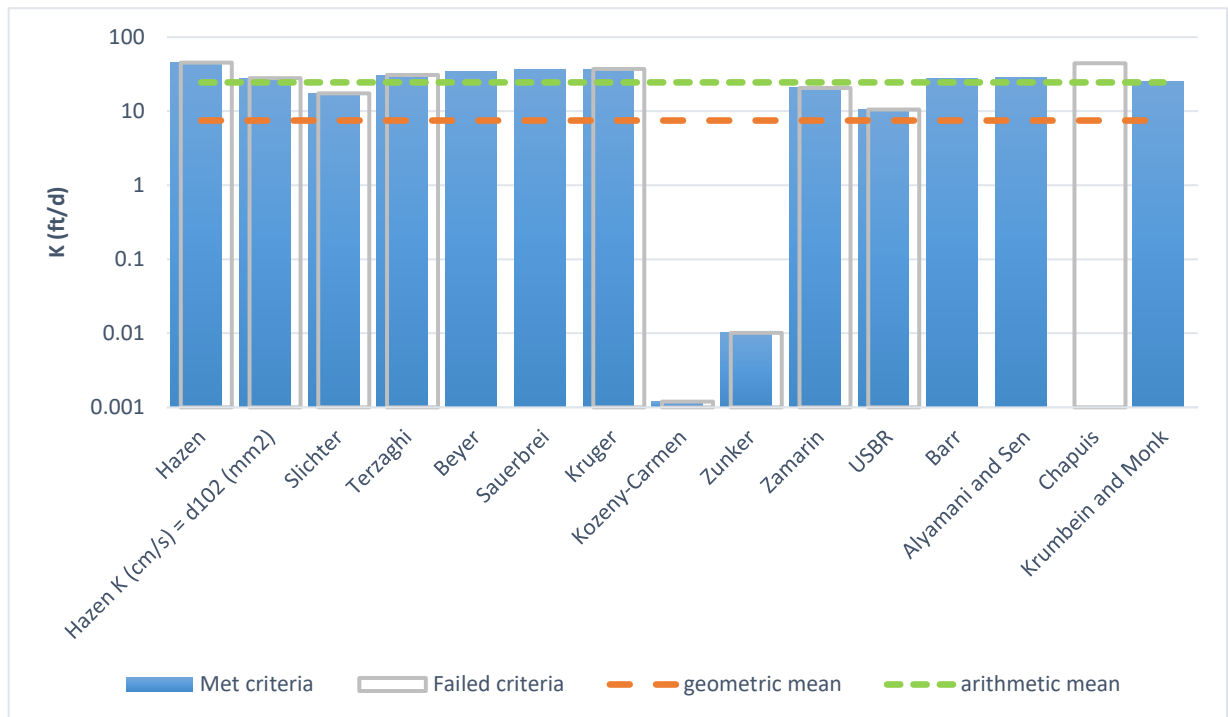
## K from Grain Size Analysis Report

Sample Name: OSS-3 11-13 ft bls

Mass Sample (g): 353.66

T (°C) 26

**Moderately well sorted sand with fines**



| Estimation of Hydraulic Conductivity | cm/s    | m/s     | ft/d |
|--------------------------------------|---------|---------|------|
| Hazen                                | .16E-01 | .16E-03 | 45   |
| Hazen K (cm/s) = $d_{10}^2$ (mm)     | .99E-02 | .99E-04 | 28   |
| Slichter                             | .62E-02 | .62E-04 | 17   |
| Terzaghi                             | .11E-01 | .11E-03 | 31   |
| Beyer                                | .12E-01 | .12E-03 | 35   |
| Sauerbrei                            | .13E-01 | .13E-03 | 37   |
| Kruger                               | .13E-01 | .13E-03 | 37   |
| Kozeny-Carmen                        | .42E-06 | .42E-08 | 0    |
| Zunker                               | .36E-05 | .36E-07 | 0    |
| Zamarin                              | .73E-02 | .73E-04 | 21   |
| USBR                                 | .37E-02 | .37E-04 | 11   |
| Barr                                 | .97E-02 | .97E-04 | 28   |
| Alyamani and Sen                     | .10E-01 | .10E-03 | 29   |
| Chapuis                              | .16E-01 | .16E-03 | 45   |
| Krumbein and Monk                    | .90E-02 | .90E-04 | 26   |
| geometric mean                       | .26E-02 | .26E-04 | 7    |
| arithmetic mean                      | .87E-02 | .87E-04 | 25   |



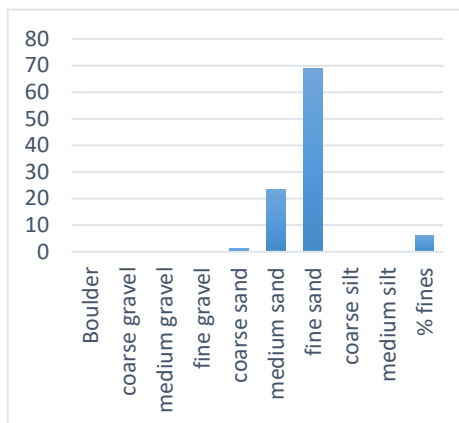
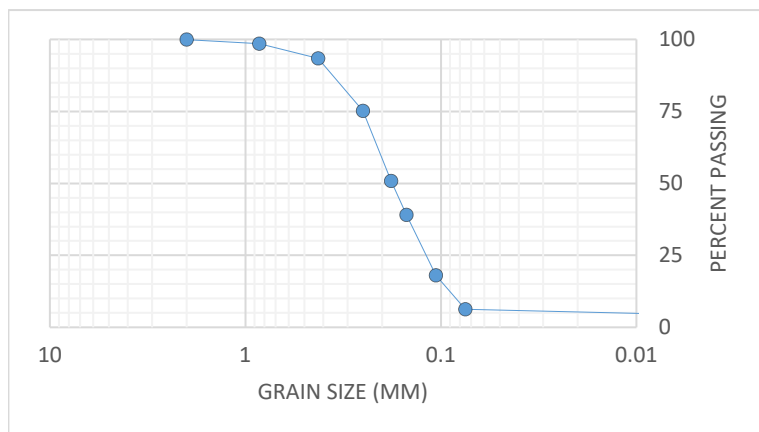
# Grain Size Analysis Report

Sample Name: OSS-3 13-15 ft bls

Mass Sample (g): 341.93

T (°C) 26

## Moderately well sorted sand with fines



| Sieve opening<br>(ps)<br>di (mm) | Mass of retained<br>(mr)<br>(g) | mass fraction<br>(mf) | Percent Passing<br>(pp) |
|----------------------------------|---------------------------------|-----------------------|-------------------------|
| 2                                | 0.29                            | 0.00                  | 99.92                   |
| 0.85                             | 4.68                            | 0.01                  | 98.55                   |
| 0.425                            | 17.55                           | 0.05                  | 93.41                   |
| 0.25                             | 62.47                           | 0.18                  | 75.14                   |
| 0.18                             | 83.13                           | 0.24                  | 50.83                   |
| 0.15                             | 40.38                           | 0.12                  | 39.02                   |
| 0.106                            | 71.60                           | 0.21                  | 18.08                   |
| 0.075                            | 40.30                           | 0.12                  | 6.30                    |
| 0.00001                          | 21.53                           | 0.06                  | 0.00                    |

| Effective Grain Diameters (mm) |       | Other Useful Parameters     |             |
|--------------------------------|-------|-----------------------------|-------------|
| d10                            | 0.085 | Uniformity Coef.            | 2.44        |
| d17                            | 0.103 | n computed                  | 0.42        |
| d20                            | 0.110 | g (cm/s <sup>2</sup> )      | 980.00      |
| d30                            | 0.131 | ρ (g/cm <sup>3</sup> )      | 0.9968      |
| d50                            | 0.178 | μ (g/cm s)                  | 0.0085      |
| d60                            | 0.206 | ρg/μ (1/cm s)               | 1.1461E+05  |
| de (Kruger)                    | 0.141 | tau (Sauerbrei)             | 1.209       |
| de (Kozeny)                    | 0.000 | d <sub>geometric mean</sub> | 0.182       |
| de (Zunker)                    | 0.001 | σ <sub>ψ</sub>              | 0.922       |
| de (Zamarin)                   | 0.077 |                             |             |
| lo (Alyameni)                  | 0.061 | 100                         | % in sample |
| mm                             |       | Boulder                     |             |
| >64                            |       | coarse gravel               |             |
| 16 - 64                        |       | medium gravel               |             |
| 8 - 16                         |       | fine gravel                 | 0.08        |
| 2 - 8                          |       | coarse sand                 | 1.37        |
| 0.5 - 2                        |       | medium sand                 | 23.4        |
| 0.25 - 0.5                     |       | fine sand                   | 68.85       |
| 0.063 - 0.25                   |       | coarse silt                 |             |
| 0.016 - 0.063                  |       | medium silt                 |             |
| 0.008 - 0.016                  |       |                             |             |
| 0.002 - 0.008                  |       | % fines                     | 6.3         |



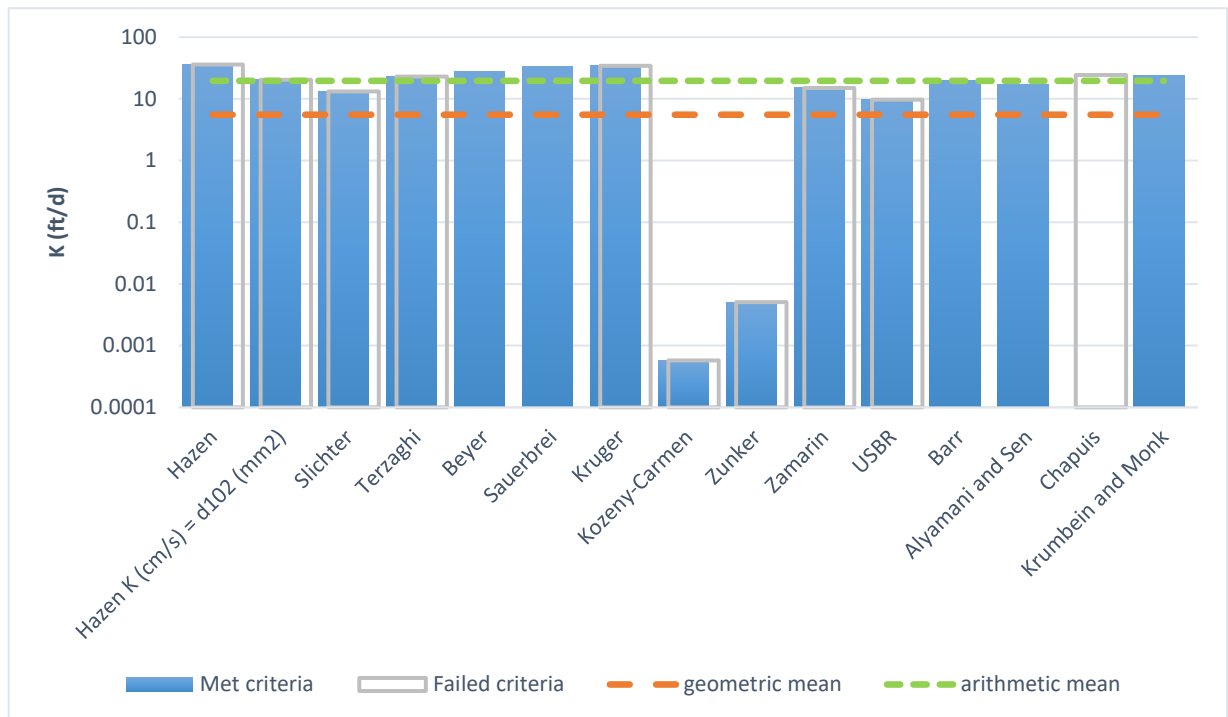
## K from Grain Size Analysis Report

Sample Name: OSS-3 13-15 ft bls

Mass Sample (g): 341.93

T (°C) 26

**Moderately well sorted sand with fines**



| Estimation of Hydraulic Conductivity | cm/s    | m/s     | ft/d |
|--------------------------------------|---------|---------|------|
| Hazen                                | .13E-01 | .13E-03 | 36   |
| Hazen K (cm/s) = $d_{10}$ (mm)       | .72E-02 | .72E-04 | 20   |
| Slichter                             | .46E-02 | .46E-04 | 13   |
| Terzaghi                             | .82E-02 | .82E-04 | 23   |
| Beyer                                | .99E-02 | .99E-04 | 28   |
| Sauerbrei                            | .12E-01 | .12E-03 | 33   |
| Kruger                               | .12E-01 | .12E-03 | 34   |
| Kozeny-Carmen                        | .20E-06 | .20E-08 | 0    |
| Zunker                               | .18E-05 | .18E-07 | 0    |
| Zamarin                              | .53E-02 | .53E-04 | 15   |
| USBR                                 | .34E-02 | .34E-04 | 10   |
| Barr                                 | .71E-02 | .71E-04 | 20   |
| Alyamani and Sen                     | .61E-02 | .61E-04 | 17   |
| Chapuis                              | .86E-02 | .86E-04 | 24   |
| Krumbein and Monk                    | .85E-02 | .85E-04 | 24   |
| geometric mean                       | .20E-02 | .20E-04 | 6    |
| arithmetic mean                      | .69E-02 | .69E-04 | 20   |



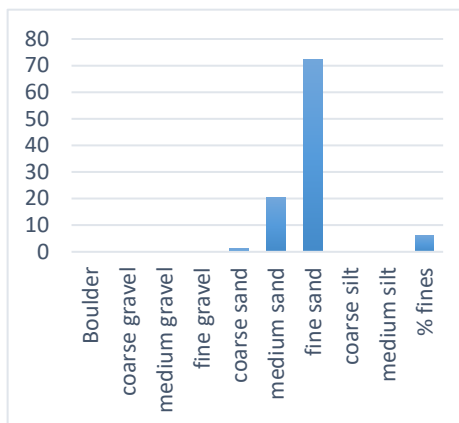
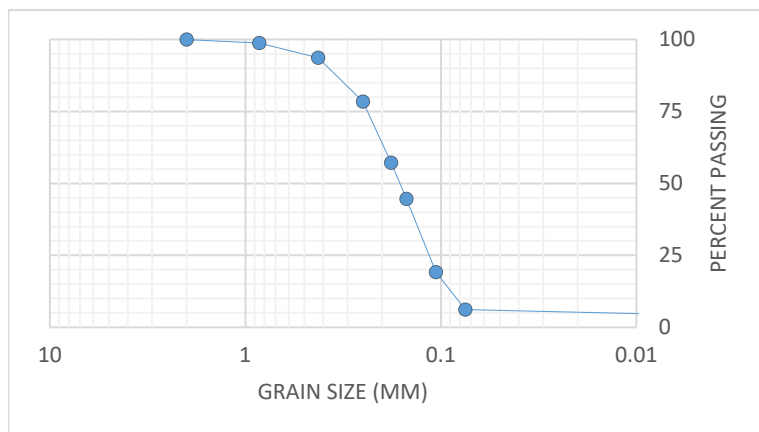
# Grain Size Analysis Report

Sample Name: OSS-3 15-17 ft bls

Mass Sample (g): 336.45

T (°C) 26

## Moderately well sorted sand with fines



| Sieve opening<br>(ps)<br>di (mm) | Mass of retained<br>(mr)<br>(g) | mass fraction<br>(mf) | Percent Passing<br>(pp) |
|----------------------------------|---------------------------------|-----------------------|-------------------------|
| 2                                | 0.26                            | 0.00                  | 99.92                   |
| 0.85                             | 3.80                            | 0.01                  | 98.79                   |
| 0.425                            | 17.21                           | 0.05                  | 93.68                   |
| 0.25                             | 51.34                           | 0.15                  | 78.42                   |
| 0.18                             | 71.33                           | 0.21                  | 57.22                   |
| 0.15                             | 42.42                           | 0.13                  | 44.61                   |
| 0.106                            | 85.59                           | 0.25                  | 19.17                   |
| 0.075                            | 43.69                           | 0.13                  | 6.19                    |
| 0.00001                          | 20.81                           | 0.06                  | 0.00                    |

| Effective Grain Diameters (mm) |       | Other Useful Parameters     |             |
|--------------------------------|-------|-----------------------------|-------------|
| d10                            | 0.084 | Uniformity Coef.            | 2.25        |
| d17                            | 0.101 | n computed                  | 0.42        |
| d20                            | 0.107 | g (cm/s <sup>2</sup> )      | 980.00      |
| d30                            | 0.125 | ρ (g/cm <sup>3</sup> )      | 0.9968      |
| d50                            | 0.163 | μ (g/cm s)                  | 0.0085      |
| d60                            | 0.189 | ρg/μ (1/cm s)               | 1.1461E+05  |
| de (Kruger)                    | 0.136 | tau (Sauerbrei)             | 1.209       |
| de (Kozeny)                    | 0.000 | d <sub>geometric mean</sub> | 0.171       |
| de (Zunker)                    | 0.001 | σ <sub>ψ</sub>              | 0.894       |
| de (Zamarin)                   | 0.076 |                             |             |
| lo (Alyameni)                  | 0.064 | 100                         | % in sample |
| mm                             |       | Boulder                     |             |
| >64                            |       | coarse gravel               |             |
| 16 - 64                        |       | medium gravel               |             |
| 8 - 16                         |       | fine gravel                 | 0.08        |
| 2 - 8                          |       | coarse sand                 | 1.13        |
| 0.5 - 2                        |       | medium sand                 | 20.37       |
| 0.25 - 0.5                     |       | fine sand                   | 72.23       |
| 0.063 - 0.25                   |       | coarse silt                 |             |
| 0.016 - 0.063                  |       | medium silt                 |             |
| 0.008 - 0.016                  |       |                             |             |
| 0.002 - 0.008                  |       | % fines                     | 6.19        |



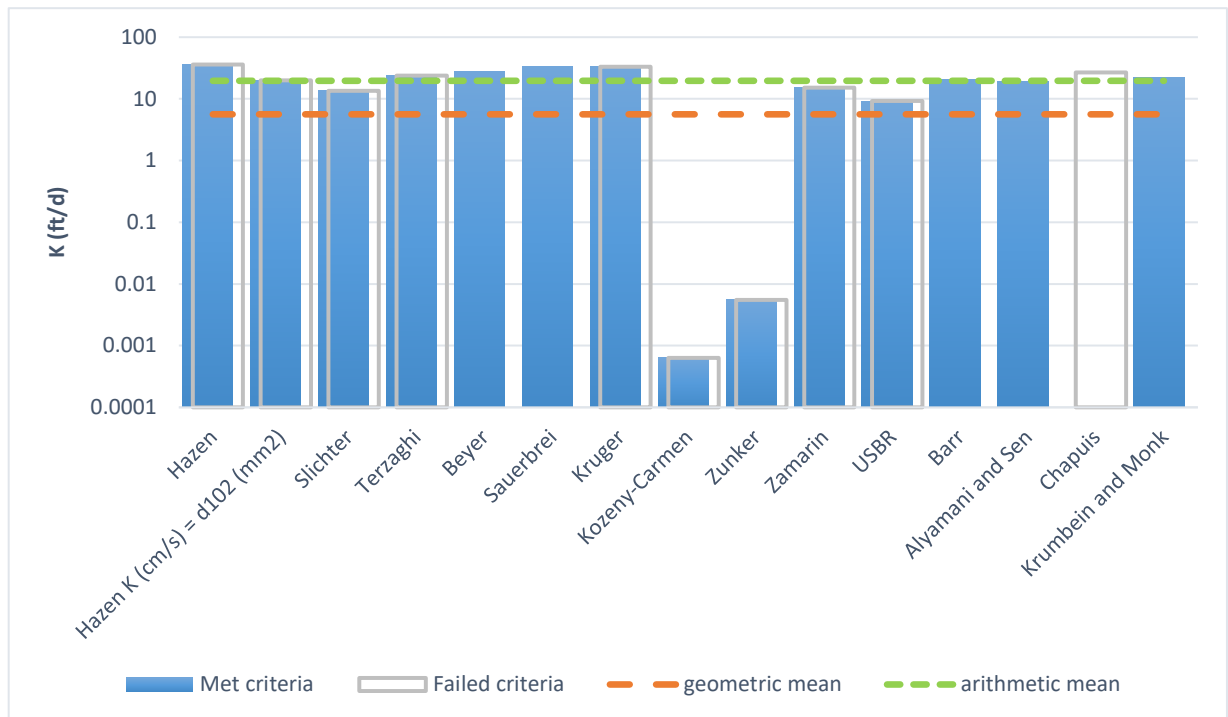
## K from Grain Size Analysis Report

Sample Name: OSS-3 15-17 ft bls

Mass Sample (g): 336.45

T (°C) 26

**Moderately well sorted sand with fines**



| Estimation of Hydraulic Conductivity | cm/s    | m/s     | ft/d |
|--------------------------------------|---------|---------|------|
| Hazen                                | .13E-01 | .13E-03 | 36   |
| Hazen K (cm/s) = $d_{10}$ (mm)       | .71E-02 | .71E-04 | 20   |
| Slichter                             | .48E-02 | .48E-04 | 14   |
| Terzaghi                             | .84E-02 | .84E-04 | 24   |
| Beyer                                | .99E-02 | .99E-04 | 28   |
| Sauerbrei                            | .12E-01 | .12E-03 | 34   |
| Kruger                               | .12E-01 | .12E-03 | 33   |
| Kozeny-Carmen                        | .22E-06 | .22E-08 | 0    |
| Zunker                               | .19E-05 | .19E-07 | 0    |
| Zamarin                              | .54E-02 | .54E-04 | 15   |
| USBR                                 | .33E-02 | .33E-04 | 9    |
| Barr                                 | .74E-02 | .74E-04 | 21   |
| Alyamani and Sen                     | .66E-02 | .66E-04 | 19   |
| Chapuis                              | .94E-02 | .94E-04 | 27   |
| Krumbein and Monk                    | .78E-02 | .78E-04 | 22   |
| geometric mean                       | .20E-02 | .20E-04 | 6    |
| arithmetic mean                      | .69E-02 | .69E-04 | 20   |



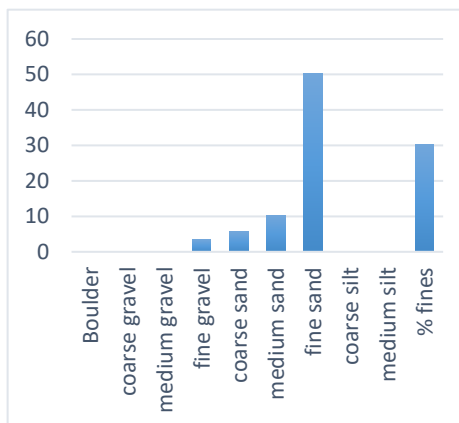
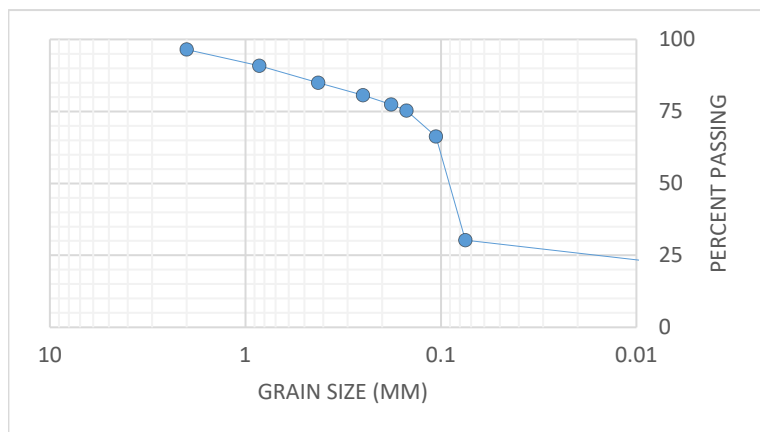
# Grain Size Analysis Report

Sample Name: OSS-3 17-19 ft bls

Mass Sample (g): 278.6

T (°C) 26

## Moderately well sorted sand with fines



| Sieve opening<br>(ps)<br>di (mm) | Mass of retained<br>(mr)<br>(g) | mass fraction<br>(mf) | Percent Passing<br>(pp) |
|----------------------------------|---------------------------------|-----------------------|-------------------------|
| 2                                | 9.82                            | 0.04                  | 96.48                   |
| 0.85                             | 15.57                           | 0.06                  | 90.89                   |
| 0.425                            | 16.44                           | 0.06                  | 84.99                   |
| 0.25                             | 12.02                           | 0.04                  | 80.67                   |
| 0.18                             | 8.98                            | 0.03                  | 77.45                   |
| 0.15                             | 6.04                            | 0.02                  | 75.28                   |
| 0.106                            | 24.97                           | 0.09                  | 66.32                   |
| 0.075                            | 100.33                          | 0.36                  | 30.31                   |
| 0.00001                          | 84.43                           | 0.30                  | 0.00                    |

| Effective Grain Diameters (mm) |       | Other Useful Parameters     |             |
|--------------------------------|-------|-----------------------------|-------------|
| d10                            | 0.025 | Uniformity Coef.            | 4.06        |
| d17                            | 0.042 | n computed                  | 0.37        |
| d20                            | 0.050 | g (cm/s <sup>2</sup> )      | 980.00      |
| d30                            | 0.074 | ρ (g/cm <sup>3</sup> )      | 0.9968      |
| d50                            | 0.092 | μ (g/cm s)                  | 0.0085      |
| d60                            | 0.101 | ρg/μ (1/cm s)               | 1.1461E+05  |
| de (Kruger)                    | 0.075 | tau (Sauerbrei)             | 1.209       |
| de (Kozeny)                    | 0.000 | d <sub>geometric mean</sub> | 0.112       |
| de (Zunker)                    | 0.000 | σ <sub>ψ</sub>              | 1.896       |
| de (Zamarin)                   | 0.024 |                             |             |
| lo (Alyameni)                  | 0.008 | 100                         | % in sample |
| mm                             |       | Boulder                     |             |
| >64                            |       | coarse gravel               |             |
| 16 - 64                        |       | medium gravel               |             |
| 8 - 16                         |       | fine gravel                 | 3.52        |
| 2 - 8                          |       | coarse sand                 | 5.59        |
| 0.5 - 2                        |       | medium sand                 | 10.22       |
| 0.25 - 0.5                     |       | fine sand                   | 50.37       |
| 0.063 - 0.25                   |       | coarse silt                 |             |
| 0.016 - 0.063                  |       | medium silt                 |             |
| 0.008 - 0.016                  |       |                             |             |
| 0.002 - 0.008                  |       | % fines                     | 30.31       |



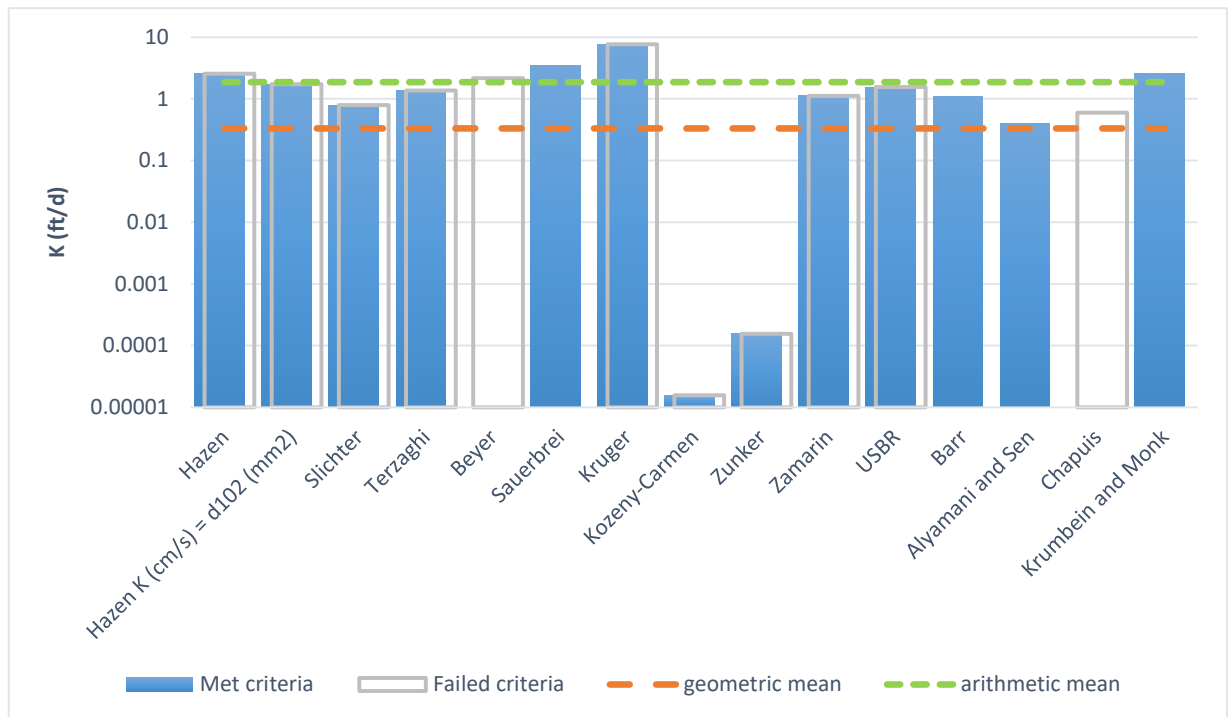
# K from Grain Size Analysis Report

Sample Name: OSS-3 17-19 ft bls

Mass Sample (g): 278.6

T (°C) 26

Moderately well sorted sand with fines



| Estimation of Hydraulic Conductivity  | cm/s    | m/s     | ft/d |
|---------------------------------------|---------|---------|------|
| Hazen                                 | .90E-03 | .90E-05 | 3    |
| Hazen K (cm/s) = d <sub>10</sub> (mm) | .61E-03 | .61E-05 | 2    |
| Slichter                              | .28E-03 | .28E-05 | 1    |
| Terzaghi                              | .48E-03 | .48E-05 | 1    |
| Beyer                                 | .76E-03 | .76E-05 | 2    |
| Sauerbrei                             | .12E-02 | .12E-04 | 4    |
| Kruger                                | .27E-02 | .27E-04 | 8    |
| Kozeny-Carmen                         | .56E-08 | .56E-10 | 0    |
| Zunker                                | .55E-07 | .55E-09 | 0    |
| Zamarin                               | .40E-03 | .40E-05 | 1    |
| USBR                                  | .55E-03 | .55E-05 | 2    |
| Barr                                  | .38E-03 | .38E-05 | 1    |
| Alyamani and Sen                      | .14E-03 | .14E-05 | 0    |
| Chapuis                               | .21E-03 | .21E-05 | 1    |
| Krumbein and Monk                     | .90E-03 | .90E-05 | 3    |
| geometric mean                        | .12E-03 | .12E-05 | 0    |
| arithmetic mean                       | .66E-03 | .66E-05 | 2    |





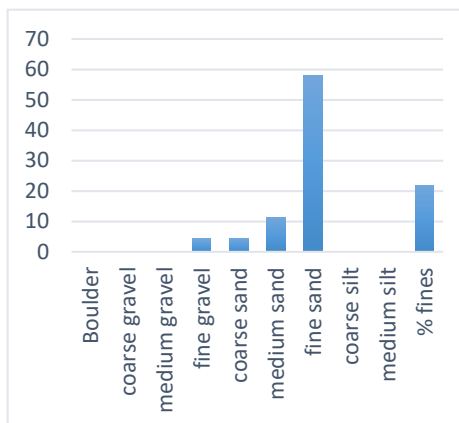
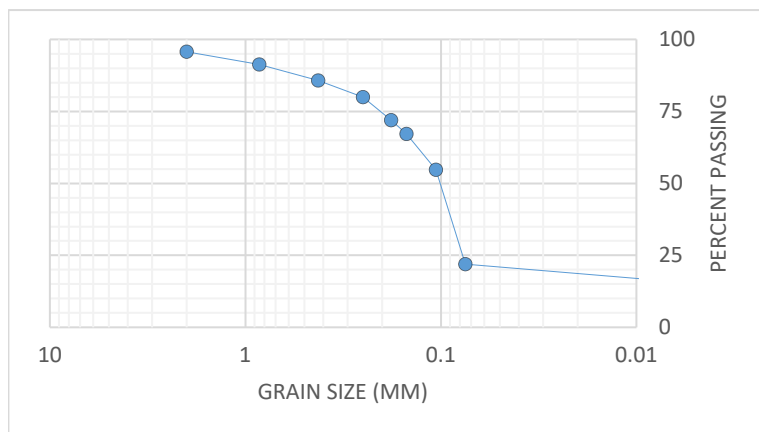
## Grain Size Analysis Report

Sample Name: OSS-3 19-21 ft bls

Mass Sample (g): 294.93

T (°C) 26

### Moderately well sorted sand with fines



| Sieve opening<br>(ps)<br>di (mm) | Mass of retained<br>(mr)<br>(g) | mass fraction<br>(mf) | Percent Passing<br>(pp) |
|----------------------------------|---------------------------------|-----------------------|-------------------------|
| 2                                | 12.66                           | 0.04                  | 95.71                   |
| 0.85                             | 13.11                           | 0.04                  | 91.26                   |
| 0.425                            | 16.36                           | 0.06                  | 85.72                   |
| 0.25                             | 16.87                           | 0.06                  | 80.00                   |
| 0.18                             | 23.77                           | 0.08                  | 71.94                   |
| 0.15                             | 13.96                           | 0.05                  | 67.20                   |
| 0.106                            | 36.67                           | 0.12                  | 54.77                   |
| 0.075                            | 96.96                           | 0.33                  | 21.89                   |
| 0.00001                          | 64.57                           | 0.22                  | 0.00                    |

| Effective Grain Diameters (mm) |       | Other Useful Parameters     |             |
|--------------------------------|-------|-----------------------------|-------------|
| d10                            | 0.034 | Uniformity Coef.            | 3.63        |
| d17                            | 0.058 | n computed                  | 0.38        |
| d20                            | 0.069 | g (cm/s <sup>2</sup> )      | 980.00      |
| d30                            | 0.083 | ρ (g/cm <sup>3</sup> )      | 0.9981      |
| d50                            | 0.102 | μ (g/cm s)                  | 0.0098      |
| d60                            | 0.125 | ρg/μ (1/cm s)               | 9.9327E+04  |
| de (Kruger)                    | 0.088 | tau (Sauerbrei)             | 1.053       |
| de (Kozeny)                    | 0.000 | d <sub>geometric mean</sub> | 0.128       |
| de (Zunker)                    | 0.000 | σ <sub>ψ</sub>              | 1.711       |
| de (Zamarin)                   | 0.032 |                             |             |
| lo (Alyameni)                  | 0.017 | 100                         | % in sample |
| mm                             |       | Boulder                     |             |
| >64                            |       | coarse gravel               |             |
| 16 - 64                        |       | medium gravel               |             |
| 8 - 16                         |       | fine gravel                 | 4.29        |
| 2 - 8                          |       | coarse sand                 | 4.45        |
| 0.5 - 2                        |       | medium sand                 | 11.27       |
| 0.25 - 0.5                     |       | fine sand                   | 58.1        |
| 0.063 - 0.25                   |       | coarse silt                 |             |
| 0.016 - 0.063                  |       | medium silt                 |             |
| 0.008 - 0.016                  |       |                             |             |
| 0.002 - 0.008                  |       | % fines                     | 21.89       |



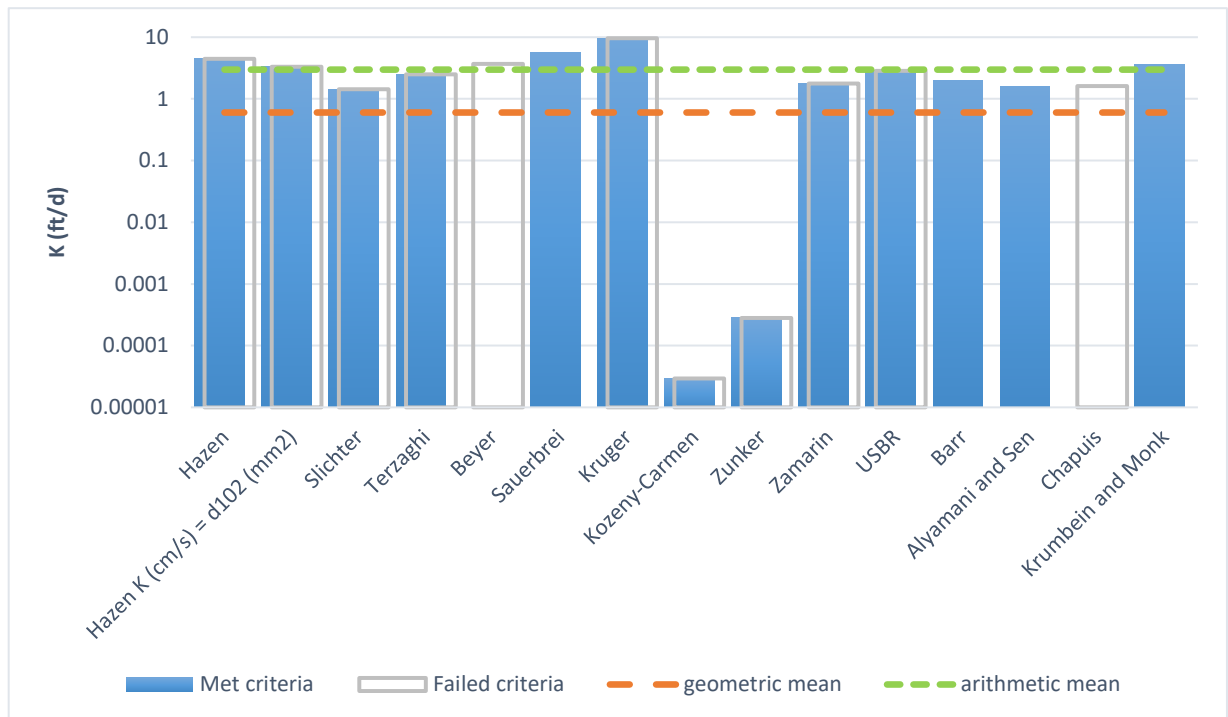
## K from Grain Size Analysis Report

Sample Name: OSS-3 19-21 ft bls

Mass Sample (g): 294.93

T (°C) 26

**Moderately well sorted sand with fines**



| Estimation of Hydraulic Conductivity | cm/s    | m/s     | ft/d |
|--------------------------------------|---------|---------|------|
| Hazen                                | .16E-02 | .16E-04 | 4    |
| Hazen K (cm/s) = $d_{10}$ (mm)       | .12E-02 | .12E-04 | 3    |
| Slichter                             | .50E-03 | .50E-05 | 1    |
| Terzaghi                             | .88E-03 | .88E-05 | 2    |
| Beyer                                | .13E-02 | .13E-04 | 4    |
| Sauerbrei                            | .20E-02 | .20E-04 | 6    |
| Kruger                               | .34E-02 | .34E-04 | 10   |
| Kozeny-Carmen                        | .10E-07 | .10E-09 | 0    |
| Zunker                               | .99E-07 | .99E-09 | 0    |
| Zamarin                              | .63E-03 | .63E-05 | 2    |
| USBR                                 | .10E-02 | .10E-04 | 3    |
| Barr                                 | .70E-03 | .70E-05 | 2    |
| Alyamani and Sen                     | .55E-03 | .55E-05 | 2    |
| Chapuis                              | .57E-03 | .57E-05 | 2    |
| Krumbein and Monk                    | .13E-02 | .13E-04 | 4    |
| geometric mean                       | .21E-03 | .21E-05 | 1    |
| arithmetic mean                      | .11E-02 | .11E-04 | 3    |



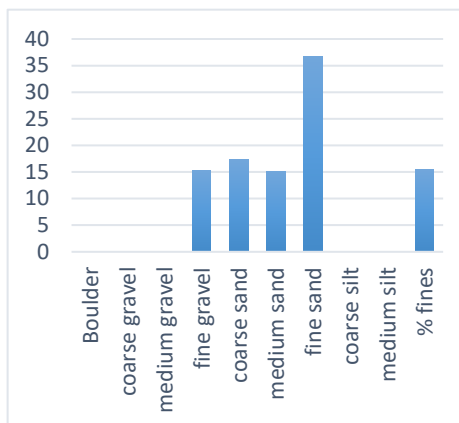
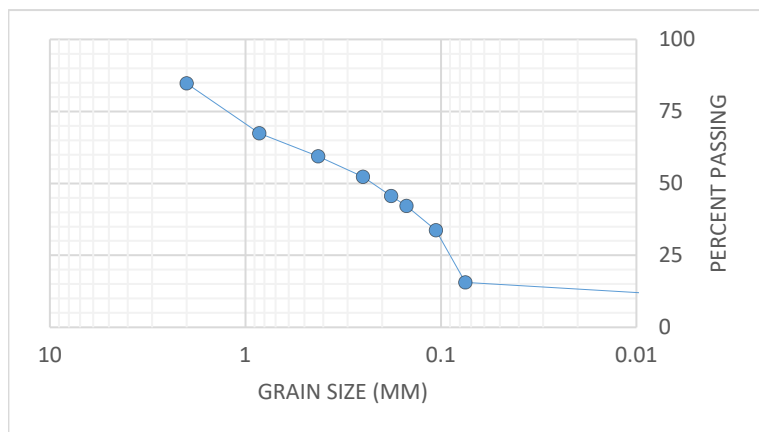
# Grain Size Analysis Report

Sample Name: OSS-3 21-23 ft bls

Mass Sample (g): 213.85

T (°C) 26

## Poorly sorted gravelly sand with fines



| Sieve opening<br>(ps)<br>di (mm) | Mass of retained<br>(mr)<br>(g) | mass fraction<br>(mf) | Percent Passing<br>(pp) |
|----------------------------------|---------------------------------|-----------------------|-------------------------|
| 2                                | 32.67                           | 0.15                  | 84.72                   |
| 0.85                             | 36.94                           | 0.17                  | 67.45                   |
| 0.425                            | 17.26                           | 0.08                  | 59.38                   |
| 0.25                             | 15.22                           | 0.07                  | 52.26                   |
| 0.18                             | 14.13                           | 0.07                  | 45.65                   |
| 0.15                             | 7.48                            | 0.03                  | 42.16                   |
| 0.106                            | 18.10                           | 0.08                  | 33.69                   |
| 0.075                            | 38.78                           | 0.18                  | 15.56                   |
| 0.00001                          | 33.27                           | 0.16                  | 0.00                    |

| Effective Grain Diameters (mm) |       | Other Useful Parameters     |             |
|--------------------------------|-------|-----------------------------|-------------|
| d10                            | 0.048 | Uniformity Coef.            | 9.49        |
| d17                            | 0.077 | n computed                  | 0.30        |
| d20                            | 0.083 | g (cm/s <sup>2</sup> )      | 980.00      |
| d30                            | 0.100 | ρ (g/cm <sup>3</sup> )      | 0.9968      |
| d50                            | 0.226 | μ (g/cm s)                  | 0.0085      |
| d60                            | 0.458 | ρg/μ (1/cm s)               | 1.1461E+05  |
| de (Kruger)                    | 0.128 | tau (Sauerbrei)             | 1.209       |
| de (Kozeny)                    | 0.000 | d <sub>geometric mean</sub> | 0.322       |
| de (Zunker)                    | 0.001 | σ <sub>ψ</sub>              | 2.163       |
| de (Zamarin)                   | 0.045 |                             |             |
| lo (Alyameni)                  | 0.004 | 100                         | % in sample |
| mm                             |       | Boulder                     |             |
| >64                            |       | coarse gravel               |             |
| 16 - 64                        |       | medium gravel               |             |
| 8 - 16                         |       | fine gravel                 | 15.28       |
| 2 - 8                          |       | coarse sand                 | 17.27       |
| 0.5 - 2                        |       | medium sand                 | 15.19       |
| 0.25 - 0.5                     |       | fine sand                   | 36.7        |
| 0.063 - 0.25                   |       | coarse silt                 |             |
| 0.016 - 0.063                  |       | medium silt                 |             |
| 0.008 - 0.016                  |       |                             |             |
| 0.002 - 0.008                  |       | % fines                     | 15.56       |



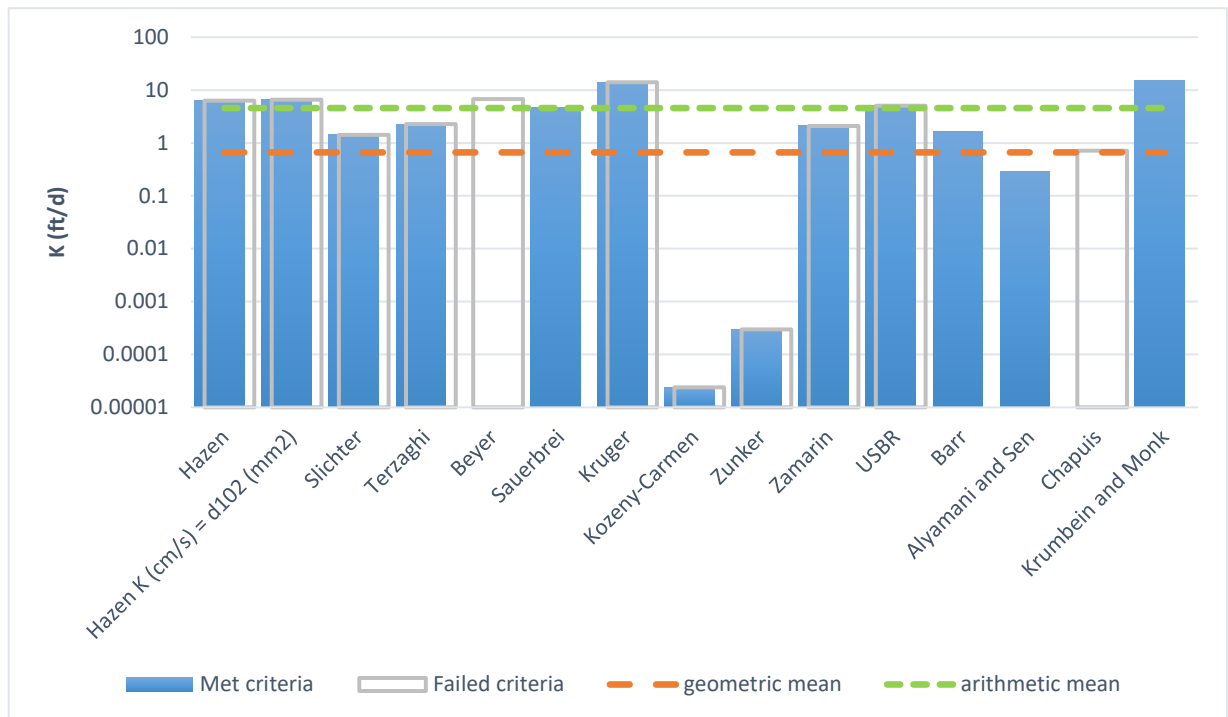
# K from Grain Size Analysis Report

Sample Name: OSS-3 21-23 ft bls

Mass Sample (g): 213.85

T (°C) 26

Poorly sorted gravelly sand with fines



| Estimation of Hydraulic Conductivity  | cm/s    | m/s     | ft/d |
|---------------------------------------|---------|---------|------|
| Hazen                                 | .22E-02 | .22E-04 | 6    |
| Hazen K (cm/s) = d <sub>10</sub> (mm) | .23E-02 | .23E-04 | 7    |
| Slichter                              | .50E-03 | .50E-05 | 1    |
| Terzaghi                              | .80E-03 | .80E-05 | 2    |
| Beyer                                 | .24E-02 | .24E-04 | 7    |
| Sauerbrei                             | .17E-02 | .17E-04 | 5    |
| Kruger                                | .50E-02 | .50E-04 | 14   |
| Kozeny-Carmen                         | .85E-08 | .85E-10 | 0    |
| Zunker                                | .11E-06 | .11E-08 | 0    |
| Zamarin                               | .74E-03 | .74E-05 | 2    |
| USBR                                  | .18E-02 | .18E-04 | 5    |
| Barr                                  | .58E-03 | .58E-05 | 2    |
| Alyamani and Sen                      | .10E-03 | .10E-05 | 0    |
| Chapuis                               | .25E-03 | .25E-05 | 1    |
| Krumbein and Monk                     | .53E-02 | .53E-04 | 15   |
| geometric mean                        | .23E-03 | .23E-05 | 1    |
| arithmetic mean                       | .16E-02 | .16E-04 | 5    |



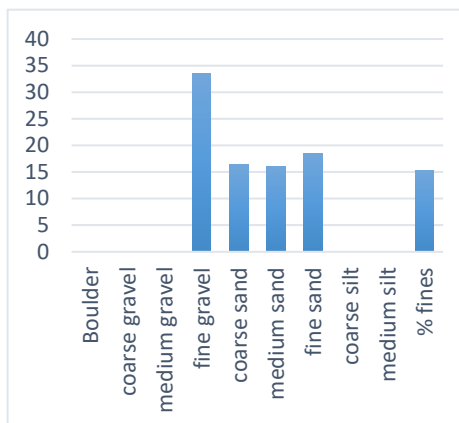
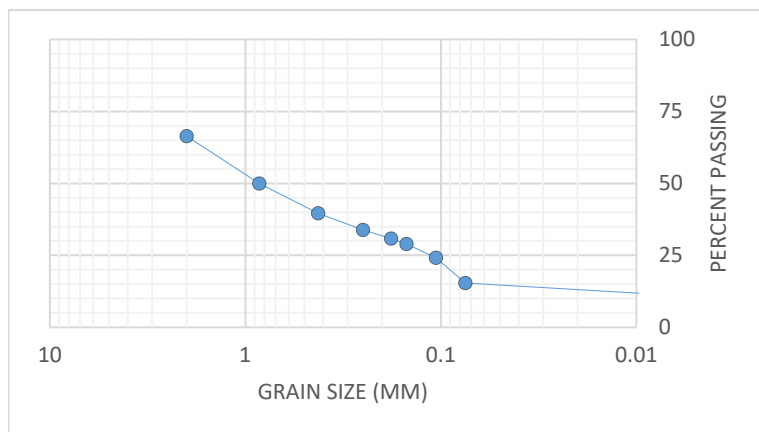
# Grain Size Analysis Report

Sample Name: OSS-3 21-23 ft bls

Mass Sample (g): 237

T (°C) 26

## Poorly sorted gravelly sand with fines



| Sieve opening<br>(ps)<br>di (mm) | Mass of retained<br>(mr)<br>(g) | mass fraction<br>(mf) | Percent Passing<br>(pp) |
|----------------------------------|---------------------------------|-----------------------|-------------------------|
| 2                                | 79.55                           | 0.34                  | 66.43                   |
| 0.85                             | 39.05                           | 0.16                  | 49.96                   |
| 0.425                            | 24.59                           | 0.10                  | 39.58                   |
| 0.25                             | 13.53                           | 0.06                  | 33.87                   |
| 0.18                             | 7.23                            | 0.03                  | 30.82                   |
| 0.15                             | 4.38                            | 0.02                  | 28.97                   |
| 0.106                            | 11.45                           | 0.05                  | 24.14                   |
| 0.075                            | 20.88                           | 0.09                  | 15.33                   |
| 0.00001                          | 36.34                           | 0.15                  | 0.00                    |

| Effective Grain Diameters (mm) |        | Other Useful Parameters     |             |
|--------------------------------|--------|-----------------------------|-------------|
| d10                            | 0.049  | Uniformity Coef.            | 31.70       |
| d17                            | 0.081  | n computed                  | 0.26        |
| d20                            | 0.091  | g (cm/s <sup>2</sup> )      | 980.00      |
| d30                            | 0.167  | ρ (g/cm <sup>3</sup> )      | 0.9968      |
| d50                            | 0.853  | μ (g/cm s)                  | 0.0085      |
| d60                            | 1.551  | ρg/μ (1/cm s)               | 1.1461E+05  |
| de (Kruger)                    | 0.163  | tau (Sauerbrei)             | 1.209       |
| de (Kozeny)                    | 0.000  | d <sub>geometric mean</sub> | 0.551       |
| de (Zunker)                    | 0.001  | σ <sub>ψ</sub>              | 2.299       |
| de (Zamarin)                   | 0.049  |                             |             |
| lo (Alyameni)                  | -0.152 | 100                         | % in sample |
| mm                             |        | Boulder                     |             |
| >64                            |        | coarse gravel               |             |
| 16 - 64                        |        | medium gravel               |             |
| 8 - 16                         |        | fine gravel                 | 33.57       |
| 2 - 8                          |        | coarse sand                 | 16.48       |
| 0.5 - 2                        |        | medium sand                 | 16.08       |
| 0.25 - 0.5                     |        | fine sand                   | 18.54       |
| 0.063 - 0.25                   |        | coarse silt                 |             |
| 0.016 - 0.063                  |        | medium silt                 |             |
| 0.008 - 0.016                  |        |                             |             |
| 0.002 - 0.008                  |        | % fines                     | 15.33       |



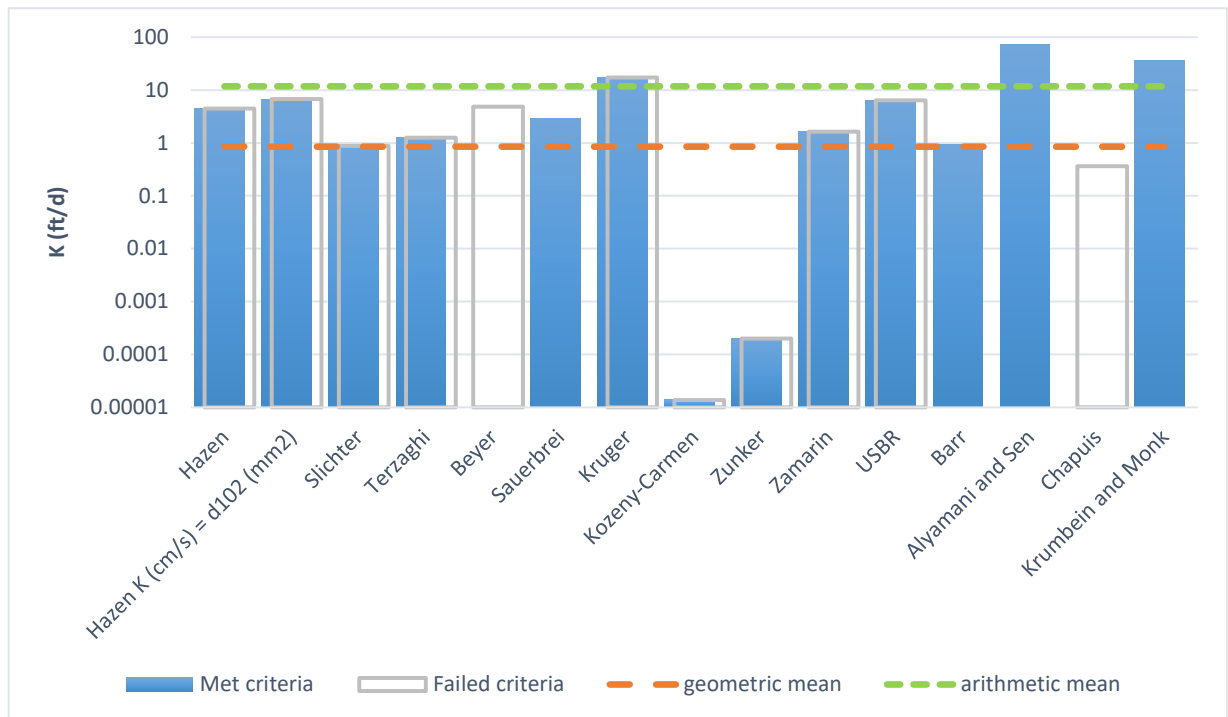
# K from Grain Size Analysis Report

Sample Name: OSS-3 21-23 ft bls

Mass Sample (g): 237

T (°C) 26

Poorly sorted gravelly sand with fines



| Estimation of Hydraulic Conductivity  | cm/s    | m/s     | ft/d |
|---------------------------------------|---------|---------|------|
| Hazen                                 | .16E-02 | .16E-04 | 4    |
| Hazen K (cm/s) = d <sub>10</sub> (mm) | .24E-02 | .24E-04 | 7    |
| Slichter                              | .31E-03 | .31E-05 | 1    |
| Terzaghi                              | .44E-03 | .44E-05 | 1    |
| Beyer                                 | .17E-02 | .17E-04 | 5    |
| Sauerbrei                             | .10E-02 | .10E-04 | 3    |
| Kruger                                | .61E-02 | .61E-04 | 17   |
| Kozeny-Carmen                         | .49E-08 | .49E-10 | 0    |
| Zunker                                | .71E-07 | .71E-09 | 0    |
| Zamarin                               | .58E-03 | .58E-05 | 2    |
| USBR                                  | .22E-02 | .22E-04 | 6    |
| Barr                                  | .33E-03 | .33E-05 | 1    |
| Alyamani and Sen                      | .26E-01 | .26E-03 | 74   |
| Chapuis                               | .13E-03 | .13E-05 | 0    |
| Krumbein and Monk                     | .13E-01 | .13E-03 | 36   |
| geometric mean                        | .30E-03 | .30E-05 | 1    |
| arithmetic mean                       | .42E-02 | .42E-04 | 12   |



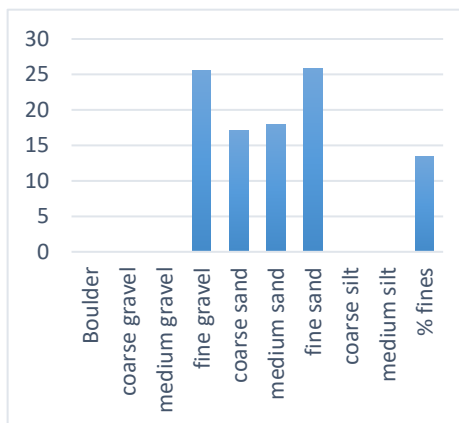
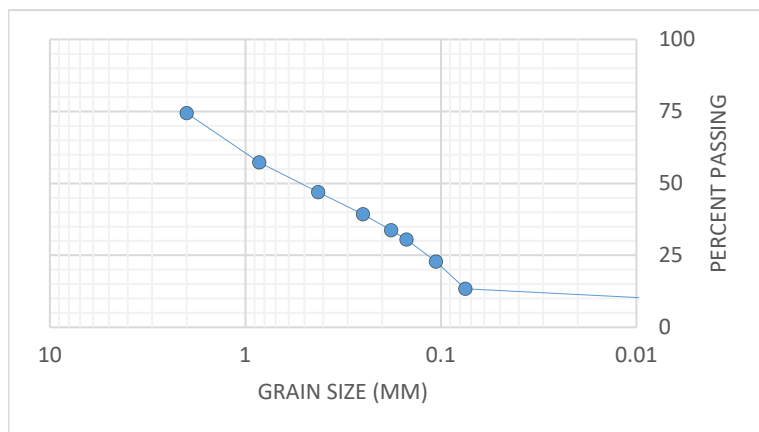
# Grain Size Analysis Report

Sample Name: OSS-3 23-25 ft bls

Mass Sample (g): 279.35

T (°C) 26

## Poorly sorted gravelly sand with fines



| Sieve opening (ps)<br>di (mm) | Mass of retained (mr)<br>(g) | mass fraction (mf) | Percent Passing (pp) |
|-------------------------------|------------------------------|--------------------|----------------------|
| 2                             | 71.39                        | 0.26               | 74.44                |
| 0.85                          | 47.94                        | 0.17               | 57.28                |
| 0.425                         | 28.76                        | 0.10               | 46.99                |
| 0.25                          | 21.56                        | 0.08               | 39.27                |
| 0.18                          | 15.51                        | 0.06               | 33.72                |
| 0.15                          | 9.09                         | 0.03               | 30.46                |
| 0.106                         | 21.39                        | 0.08               | 22.81                |
| 0.075                         | 26.28                        | 0.09               | 13.40                |
| 0.00001                       | 37.43                        | 0.13               | 0.00                 |

| Effective Grain Diameters (mm) |        | Other Useful Parameters     |             |
|--------------------------------|--------|-----------------------------|-------------|
| d10                            | 0.056  | Uniformity Coef.            | 18.44       |
| d17                            | 0.087  | n computed                  | 0.26        |
| d20                            | 0.097  | g (cm/s <sup>2</sup> )      | 980.00      |
| d30                            | 0.147  | ρ (g/cm <sup>3</sup> )      | 0.9968      |
| d50                            | 0.549  | μ (g/cm s)                  | 0.0085      |
| d60                            | 1.032  | ρg/μ (1/cm s)               | 1.1461E+05  |
| de (Kruger)                    | 0.162  | tau (Sauerbrei)             | 1.209       |
| de (Kozeny)                    | 0.000  | d <sub>geometric mean</sub> | 0.470       |
| de (Zunker)                    | 0.001  | σ <sub>ψ</sub>              | 2.175       |
| de (Zamarin)                   | 0.054  |                             |             |
| lo (Alyameni)                  | -0.067 | 100                         | % in sample |
| mm                             |        | Boulder                     |             |
| >64                            |        | coarse gravel               |             |
| 16 - 64                        |        | medium gravel               |             |
| 8 - 16                         |        | fine gravel                 | 25.56       |
| 2 - 8                          |        | coarse sand                 | 17.16       |
| 0.5 - 2                        |        | medium sand                 | 18.01       |
| 0.25 - 0.5                     |        | fine sand                   | 25.87       |
| 0.063 - 0.25                   |        | coarse silt                 |             |
| 0.016 - 0.063                  |        | medium silt                 |             |
| 0.008 - 0.016                  |        |                             |             |
| 0.002 - 0.008                  |        | % fines                     | 13.4        |





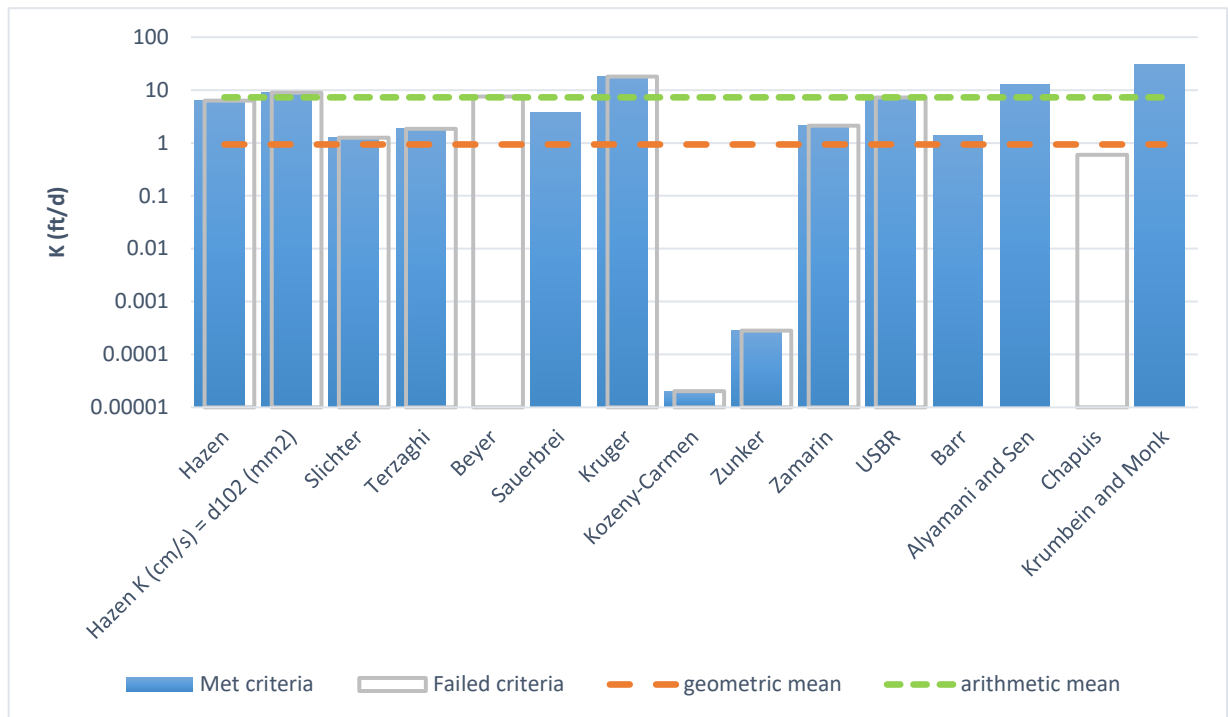
# K from Grain Size Analysis Report

Sample Name: OSS-3 23-25 ft bls

Mass Sample (g): 279.35

T (°C) 26

Poorly sorted gravelly sand with fines



| Estimation of Hydraulic Conductivity  | cm/s    | m/s     | ft/d |
|---------------------------------------|---------|---------|------|
| Hazen                                 | .22E-02 | .22E-04 | 6    |
| Hazen K (cm/s) = d <sub>10</sub> (mm) | .31E-02 | .31E-04 | 9    |
| Slichter                              | .45E-03 | .45E-05 | 1    |
| Terzaghi                              | .66E-03 | .66E-05 | 2    |
| Beyer                                 | .27E-02 | .27E-04 | 8    |
| Sauerbrei                             | .13E-02 | .13E-04 | 4    |
| Kruger                                | .63E-02 | .63E-04 | 18   |
| Kozeny-Carmen                         | .71E-08 | .71E-10 | 0    |
| Zunker                                | .10E-06 | .10E-08 | 0    |
| Zamarin                               | .75E-03 | .75E-05 | 2    |
| USBR                                  | .26E-02 | .26E-04 | 7    |
| Barr                                  | .48E-03 | .48E-05 | 1    |
| Alyamani and Sen                      | .46E-02 | .46E-04 | 13   |
| Chapuis                               | .21E-03 | .21E-05 | 1    |
| Krumbein and Monk                     | .11E-01 | .11E-03 | 31   |
| geometric mean                        | .33E-03 | .33E-05 | 1    |
| arithmetic mean                       | .26E-02 | .26E-04 | 7    |



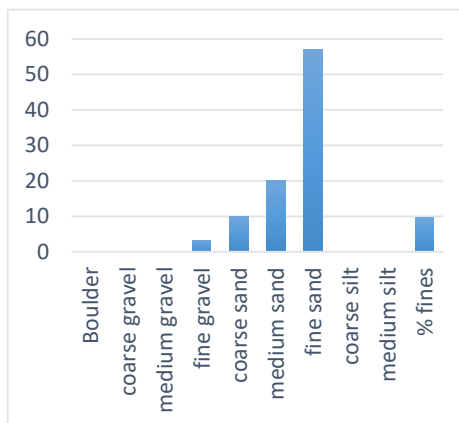
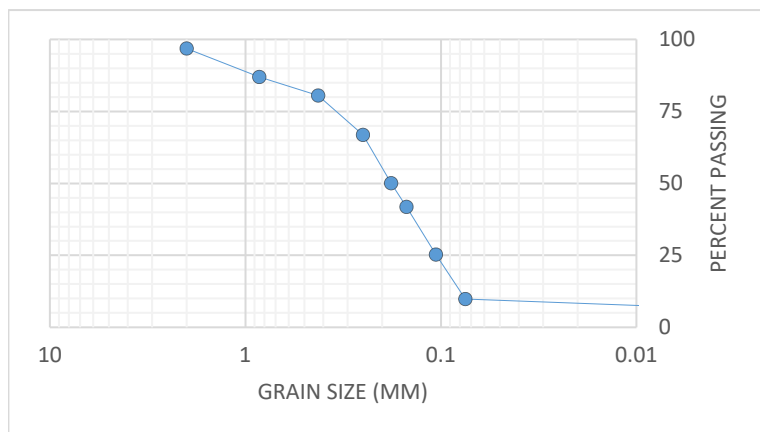
# Grain Size Analysis Report

Sample Name: OSS-3 25-27 ft bls

Mass Sample (g): 242.03

T (°C) 26

## Moderately well sorted sand with fines



| Sieve opening<br>(ps)<br>di (mm) | Mass of retained<br>(mr)<br>(g) | mass fraction<br>(mf) | Percent Passing<br>(pp) |
|----------------------------------|---------------------------------|-----------------------|-------------------------|
| 2                                | 7.64                            | 0.03                  | 96.84                   |
| 0.85                             | 24.02                           | 0.10                  | 86.92                   |
| 0.425                            | 15.44                           | 0.06                  | 80.54                   |
| 0.25                             | 33.02                           | 0.14                  | 66.90                   |
| 0.18                             | 40.81                           | 0.17                  | 50.04                   |
| 0.15                             | 19.71                           | 0.08                  | 41.89                   |
| 0.106                            | 40.28                           | 0.17                  | 25.25                   |
| 0.075                            | 37.40                           | 0.15                  | 9.80                    |
| 0.00001                          | 23.71                           | 0.10                  | 0.00                    |

| Effective Grain Diameters (mm) |       | Other Useful Parameters     |             |
|--------------------------------|-------|-----------------------------|-------------|
| d10                            | 0.075 | Uniformity Coef.            | 2.94        |
| d17                            | 0.089 | n computed                  | 0.40        |
| d20                            | 0.095 | g (cm/s <sup>2</sup> )      | 980.00      |
| d30                            | 0.119 | ρ (g/cm <sup>3</sup> )      | 0.9968      |
| d50                            | 0.180 | μ (g/cm s)                  | 0.0085      |
| d60                            | 0.221 | ρg/μ (1/cm s)               | 1.1461E+05  |
| de (Kruger)                    | 0.134 | tau (Sauerbrei)             | 1.209       |
| de (Kozeny)                    | 0.000 | d <sub>geometric mean</sub> | 0.218       |
| de (Zunker)                    | 0.001 | σ <sub>ψ</sub>              | 1.567       |
| de (Zamarin)                   | 0.060 |                             |             |
| lo (Alyameni)                  | 0.049 | 100                         | % in sample |
| mm                             |       | Boulder                     |             |
| >64                            |       | coarse gravel               |             |
| 16 - 64                        |       | medium gravel               |             |
| 8 - 16                         |       | fine gravel                 | 3.16        |
| 2 - 8                          |       | coarse sand                 | 9.92        |
| 0.5 - 2                        |       | medium sand                 | 20.02       |
| 0.25 - 0.5                     |       | fine sand                   | 57.1        |
| 0.063 - 0.25                   |       | coarse silt                 |             |
| 0.016 - 0.063                  |       | medium silt                 |             |
| 0.008 - 0.016                  |       |                             |             |
| 0.002 - 0.008                  |       | % fines                     | 9.8         |



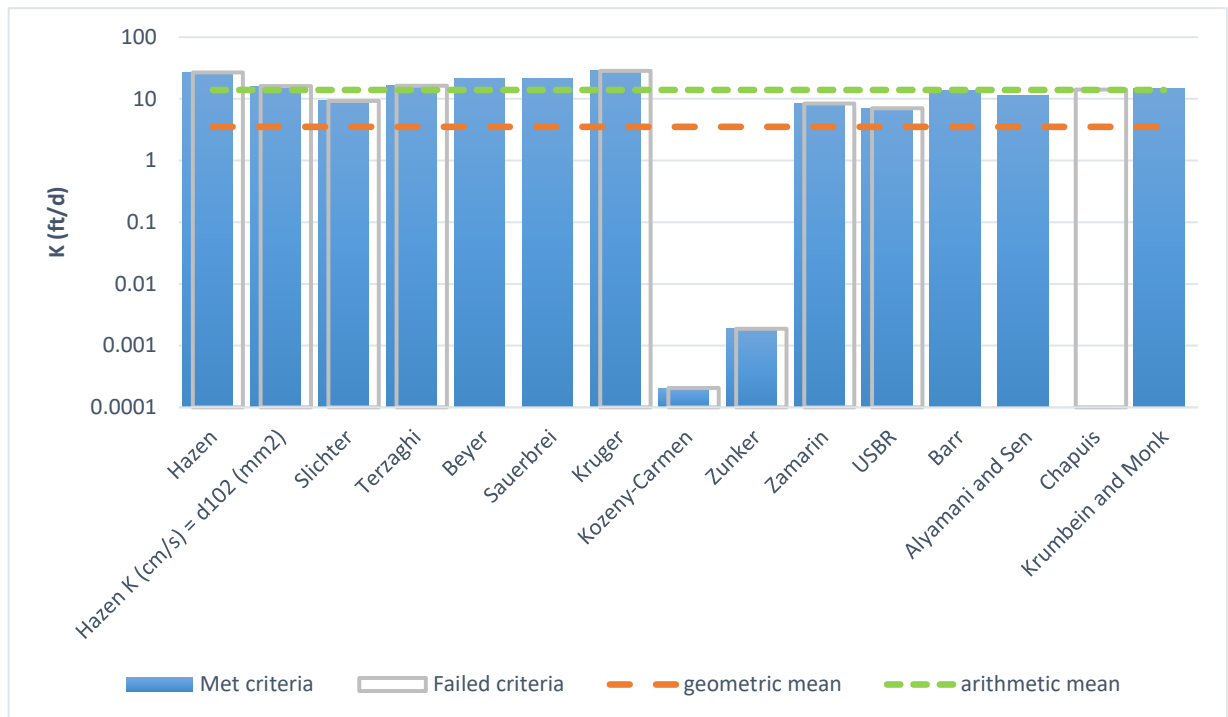
# K from Grain Size Analysis Report

Sample Name: OSS-3 25-27 ft bls

Mass Sample (g): 242.03

T (°C) 26

Moderately well sorted sand with fines



| Estimation of Hydraulic Conductivity  | cm/s    | m/s     | ft/d |
|---------------------------------------|---------|---------|------|
| Hazen                                 | .95E-02 | .95E-04 | 27   |
| Hazen K (cm/s) = d <sub>10</sub> (mm) | .57E-02 | .57E-04 | 16   |
| Slichter                              | .33E-02 | .33E-04 | 9    |
| Terzaghi                              | .57E-02 | .57E-04 | 16   |
| Beyer                                 | .76E-02 | .76E-04 | 21   |
| Sauerbrei                             | .76E-02 | .76E-04 | 22   |
| Kruger                                | .10E-01 | .10E-03 | 29   |
| Kozeny-Carmen                         | .72E-07 | .72E-09 | 0    |
| Zunker                                | .66E-06 | .66E-08 | 0    |
| Zamarin                               | .30E-02 | .30E-04 | 8    |
| USBR                                  | .25E-02 | .25E-04 | 7    |
| Barr                                  | .48E-02 | .48E-04 | 14   |
| Alyamani and Sen                      | .41E-02 | .41E-04 | 11   |
| Chapuis                               | .50E-02 | .50E-04 | 14   |
| Krumbein and Monk                     | .52E-02 | .52E-04 | 15   |
| geometric mean                        | .12E-02 | .12E-04 | 4    |
| arithmetic mean                       | .49E-02 | .49E-04 | 14   |



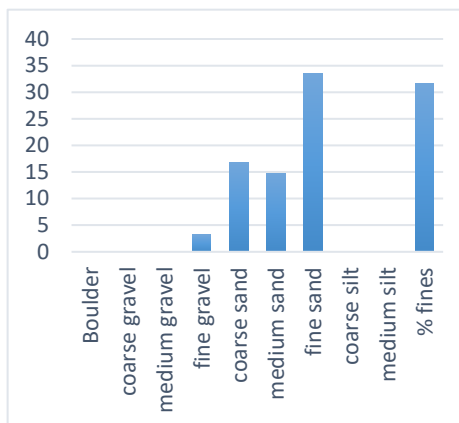
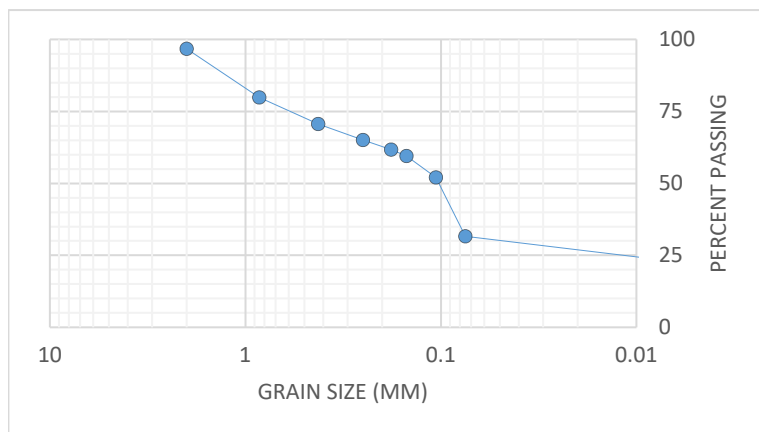
# Grain Size Analysis Report

Sample Name: OSS-3 27-29 ft bls

Mass Sample (g): 241.65

T (°C) 26

## Poorly sorted sand with fines



| Sieve opening (ps)<br>di (mm) | Mass of retained (mr)<br>(g) | mass fraction (mf) | Percent Passing (pp) |
|-------------------------------|------------------------------|--------------------|----------------------|
| 2                             | 7.81                         | 0.03               | 96.77                |
| 0.85                          | 40.78                        | 0.17               | 79.89                |
| 0.425                         | 22.42                        | 0.09               | 70.61                |
| 0.25                          | 13.32                        | 0.06               | 65.10                |
| 0.18                          | 8.19                         | 0.03               | 61.71                |
| 0.15                          | 5.37                         | 0.02               | 59.49                |
| 0.106                         | 17.89                        | 0.07               | 52.09                |
| 0.075                         | 49.46                        | 0.20               | 31.62                |
| 0.00001                       | 76.41                        | 0.32               | 0.00                 |

| Effective Grain Diameters (mm) |       | Other Useful Parameters     |             |
|--------------------------------|-------|-----------------------------|-------------|
| d10                            | 0.024 | Uniformity Coef.            | 6.61        |
| d17                            | 0.040 | n computed                  | 0.33        |
| d20                            | 0.047 | g (cm/s <sup>2</sup> )      | 980.00      |
| d30                            | 0.071 | ρ (g/cm <sup>3</sup> )      | 0.9968      |
| d50                            | 0.103 | μ (g/cm s)                  | 0.0085      |
| d60                            | 0.157 | ρg/μ (1/cm s)               | 1.1461E+05  |
| de (Kruger)                    | 0.083 | tau (Sauerbrei)             | 1.209       |
| de (Kozeny)                    | 0.000 | d <sub>geometric mean</sub> | 0.164       |
| de (Zunker)                    | 0.000 | σ <sub>ψ</sub>              | 2.331       |
| de (Zamarin)                   | 0.024 |                             |             |
| lo (Alyameni)                  | 0.004 | 100                         | % in sample |
| mm                             |       | Boulder                     |             |
| >64                            |       | coarse gravel               |             |
| 16 - 64                        |       | medium gravel               |             |
| 8 - 16                         |       | fine gravel                 | 3.23        |
| 2 - 8                          |       | coarse sand                 | 16.88       |
| 0.5 - 2                        |       | medium sand                 | 14.79       |
| 0.25 - 0.5                     |       | fine sand                   | 33.48       |
| 0.063 - 0.25                   |       | coarse silt                 |             |
| 0.016 - 0.063                  |       | medium silt                 |             |
| 0.008 - 0.016                  |       |                             |             |
| 0.002 - 0.008                  |       | % fines                     | 31.62       |



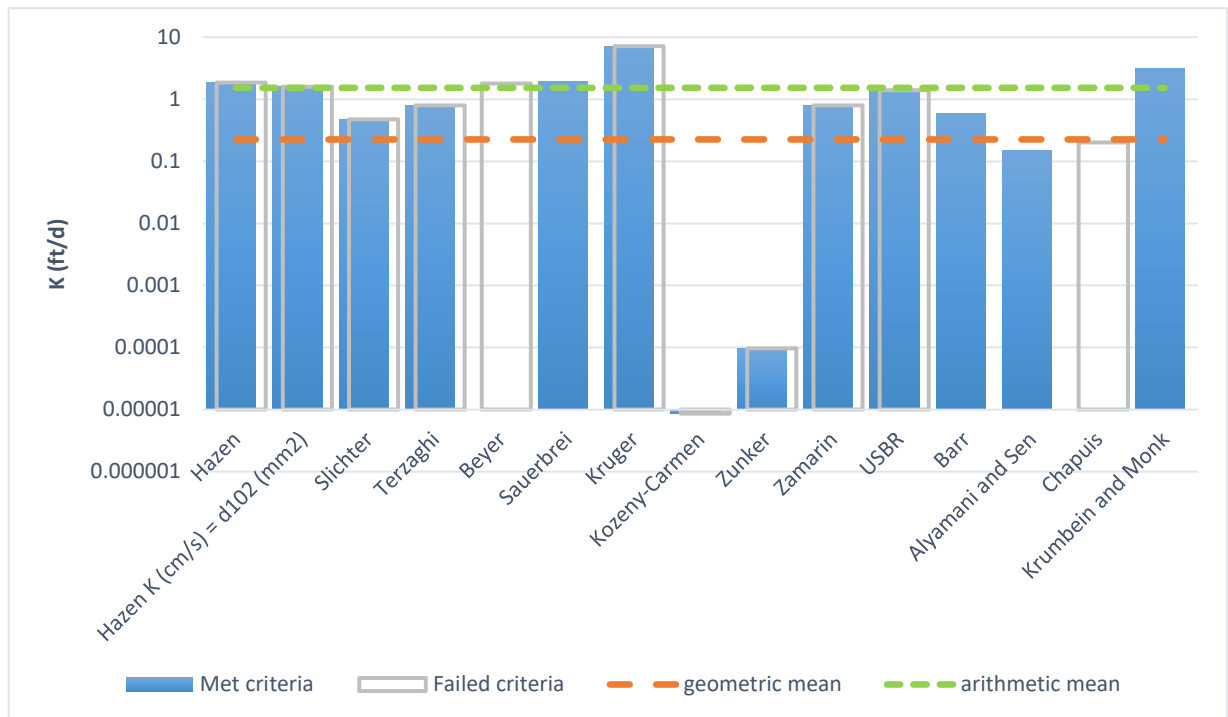
# K from Grain Size Analysis Report

Sample Name: OSS-3 27-29 ft bls

Mass Sample (g): 241.65

T (°C) 26

Poorly sorted sand with fines



| Estimation of Hydraulic Conductivity | cm/s    | m/s     | ft/d |
|--------------------------------------|---------|---------|------|
| Hazen                                | .66E-03 | .66E-05 | 2    |
| Hazen K (cm/s) = $d_{10}^2$ (mm)     | .56E-03 | .56E-05 | 2    |
| Slichter                             | .17E-03 | .17E-05 | 0    |
| Terzaghi                             | .28E-03 | .28E-05 | 1    |
| Beyer                                | .63E-03 | .63E-05 | 2    |
| Sauerbrei                            | .67E-03 | .67E-05 | 2    |
| Kruger                               | .25E-02 | .25E-04 | 7    |
| Kozeny-Carmen                        | .30E-08 | .30E-10 | 0    |
| Zunker                               | .34E-07 | .34E-09 | 0    |
| Zamarin                              | .28E-03 | .28E-05 | 1    |
| USBR                                 | .50E-03 | .50E-05 | 1    |
| Barr                                 | .21E-03 | .21E-05 | 1    |
| Alyamani and Sen                     | .53E-04 | .53E-06 | 0    |
| Chapuis                              | .71E-04 | .71E-06 | 0    |
| Krumbein and Monk                    | .11E-02 | .11E-04 | 3    |
| geometric mean                       | .80E-04 | .80E-06 | 0    |
| arithmetic mean                      | .54E-03 | .54E-05 | 2    |



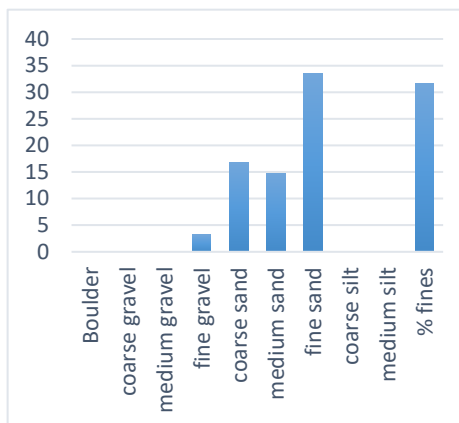
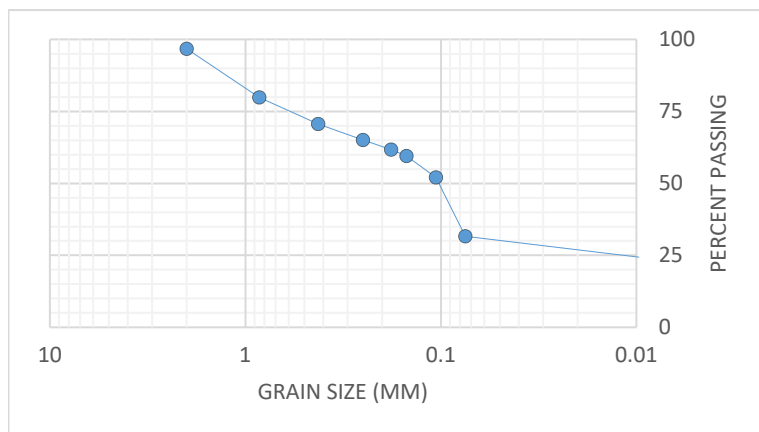
# Grain Size Analysis Report

Sample Name: OSS-3 29-31 ft bls

Mass Sample (g): 241.65

T (°C) 26

## Poorly sorted sand with fines



| Sieve opening<br>(ps)<br>di (mm) | Mass of retained<br>(mr)<br>(g) | mass fraction<br>(mf) | Percent Passing<br>(pp) |
|----------------------------------|---------------------------------|-----------------------|-------------------------|
| 2                                | 7.81                            | 0.03                  | 96.77                   |
| 0.85                             | 40.78                           | 0.17                  | 79.89                   |
| 0.425                            | 22.42                           | 0.09                  | 70.61                   |
| 0.25                             | 13.32                           | 0.06                  | 65.10                   |
| 0.18                             | 8.19                            | 0.03                  | 61.71                   |
| 0.15                             | 5.37                            | 0.02                  | 59.49                   |
| 0.106                            | 17.89                           | 0.07                  | 52.09                   |
| 0.075                            | 49.46                           | 0.20                  | 31.62                   |
| 0.00001                          | 76.41                           | 0.32                  | 0.00                    |

| Effective Grain Diameters (mm) |       | Other Useful Parameters     |             |
|--------------------------------|-------|-----------------------------|-------------|
| d10                            | 0.024 | Uniformity Coef.            | 6.61        |
| d17                            | 0.040 | n computed                  | 0.33        |
| d20                            | 0.047 | g (cm/s <sup>2</sup> )      | 980.00      |
| d30                            | 0.071 | ρ (g/cm <sup>3</sup> )      | 0.9968      |
| d50                            | 0.103 | μ (g/cm s)                  | 0.0085      |
| d60                            | 0.157 | ρg/μ (1/cm s)               | 1.1461E+05  |
| de (Kruger)                    | 0.083 | tau (Sauerbrei)             | 1.209       |
| de (Kozeny)                    | 0.000 | d <sub>geometric mean</sub> | 0.164       |
| de (Zunker)                    | 0.000 | σ <sub>ψ</sub>              | 2.331       |
| de (Zamarin)                   | 0.024 |                             |             |
| lo (Alyameni)                  | 0.004 | 100                         | % in sample |
| mm                             |       | Boulder                     |             |
| >64                            |       | coarse gravel               |             |
| 16 - 64                        |       | medium gravel               |             |
| 8 - 16                         |       | fine gravel                 | 3.23        |
| 2 - 8                          |       | coarse sand                 | 16.88       |
| 0.5 - 2                        |       | medium sand                 | 14.79       |
| 0.25 - 0.5                     |       | fine sand                   | 33.48       |
| 0.063 - 0.25                   |       | coarse silt                 |             |
| 0.016 - 0.063                  |       | medium silt                 |             |
| 0.008 - 0.016                  |       |                             |             |
| 0.002 - 0.008                  |       | % fines                     | 31.62       |



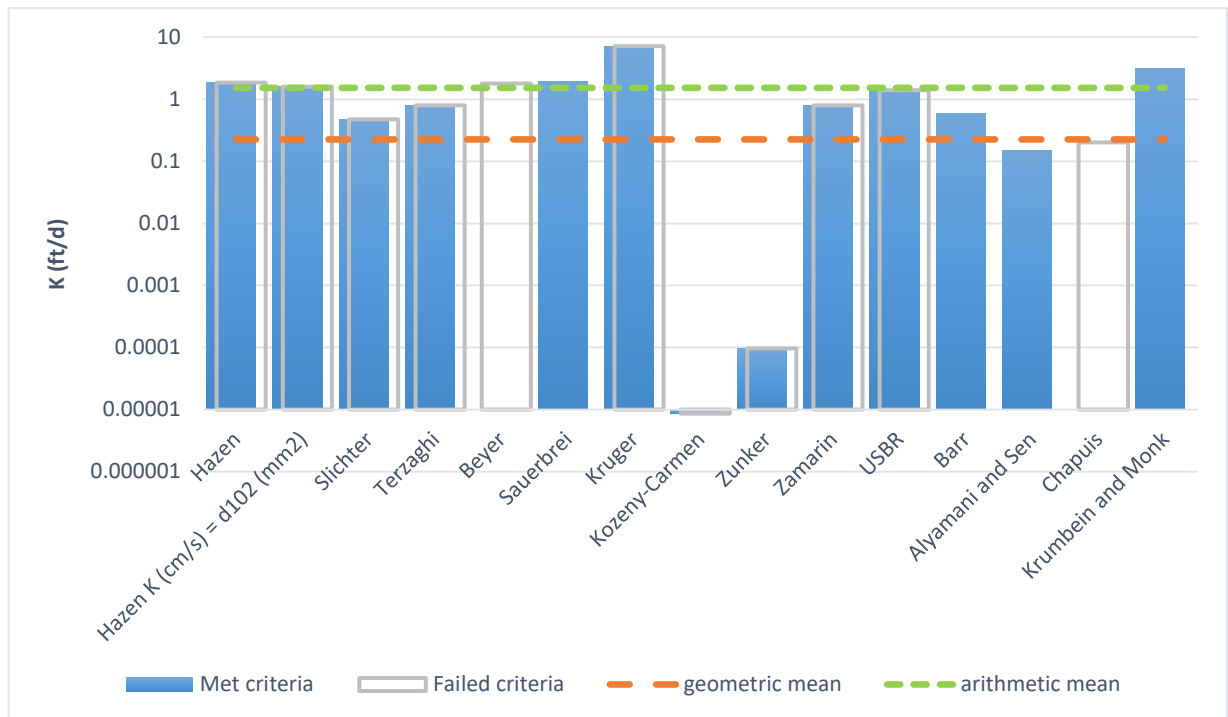
# K from Grain Size Analysis Report

Sample Name: OSS-3 29-31 ft bls

Mass Sample (g): 241.65

T (°C) 26

Poorly sorted sand with fines



| Estimation of Hydraulic Conductivity | cm/s    | m/s     | ft/d |
|--------------------------------------|---------|---------|------|
| Hazen                                | .66E-03 | .66E-05 | 2    |
| Hazen K (cm/s) = $d_{10}^2$ (mm)     | .56E-03 | .56E-05 | 2    |
| Slichter                             | .17E-03 | .17E-05 | 0    |
| Terzaghi                             | .28E-03 | .28E-05 | 1    |
| Beyer                                | .63E-03 | .63E-05 | 2    |
| Sauerbrei                            | .67E-03 | .67E-05 | 2    |
| Kruger                               | .25E-02 | .25E-04 | 7    |
| Kozeny-Carmen                        | .30E-08 | .30E-10 | 0    |
| Zunker                               | .34E-07 | .34E-09 | 0    |
| Zamarin                              | .28E-03 | .28E-05 | 1    |
| USBR                                 | .50E-03 | .50E-05 | 1    |
| Barr                                 | .21E-03 | .21E-05 | 1    |
| Alyamani and Sen                     | .53E-04 | .53E-06 | 0    |
| Chapuis                              | .71E-04 | .71E-06 | 0    |
| Krumbein and Monk                    | .11E-02 | .11E-04 | 3    |
| geometric mean                       | .80E-04 | .80E-06 | 0    |
| arithmetic mean                      | .54E-03 | .54E-05 | 2    |



## **APPENDIX D: SURVEYS**



## **SURVEYOR'S REPORT**

Specific Purpose Survey of the CFWI DMIT Wetland  
Snell Creek  
in  
Polk County, Florida

**Prepared for:**

**South Florida Water Management District**

3301 Gun -Club Road  
West Palm Beach, Florida 33406  
Ph. (561) 686-8800 (ext. 2978)  
Fax (561) 682-0066

**Prepared by:**

**Gregory A. Prather, PSM**

Florida Professional Surveyor and Mapper  
License Number 5135  
State of Florida

Pickett and Associates, Inc. LB No 364  
475 South First Avenue, Bartow, FL. 33830  
Tel (863) 533-9095

Field Date: July 26, 2018  
Report Date: August 02, 2018

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| SFWMD Site Form          | 17-20       |
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## **PURPOSE**

The purpose of this survey is to measure horizontal and vertical components of wetland, muck locations, transects, seasonal high water marks and a staff gauge at the Snell Creek location.

## **LOCATION OF PROJECT**

The CFWI DMIT Wetland Snell Creek site is located in Section 18, Township 27 South, Range 28 East, Polk County, Florida.



**General Location (Intended Display Scale is “Not to Scale”)**

**PROJECT VERTICAL DATUM**

The project vertical datum is the North American Vertical Datum of 1988 (NAVD 88).

To convert the NAVD 88 elevation to National Geodetic Vertical Datum of 1929 (NGVD 29) **add 0.938'** to the NAVD 88 elevation.

[NAVD 88 elevation + 0.938' = NGVD 29 elevation]

This value conversion factor is based on Corpscon 6.0.1 a US Army Corps of Engineers Engineering Research and Development Center Topographic Engineering Center Alexandria, Virginia Windows-based program to convert coordinates and elevations between datum's using vertcon05.txt and vertcon05.05 files supplied by the U.S. Army Corps of Engineers South Atlantic Division, Jacksonville, FL.

**PROJECT HORIZONTAL DATUM**

The project horizontal datum is North American Datum 83 (NAD 83 (2011) (EPOCH:2010.0000))

**LEVELING METHODS FOR VERTICAL CONTROL**

The leveling for this project was minimal. Levels were used to establish conventional control points. A level run was performed from POS-16 to GPS Point # 214 and from GPS # 217 to GPS # 218 to establish consistent elevations on RTK GPS control points set for the purpose of this survey. Levels were also used to establish elevations on features such as reference points of wells, top of concrete and ground elevations for the POS-16 and POS-17 well sites.

**GPS METHODS FOR HORIZONTAL CONTROL**

Latitude, Longitude and elevations for the Benchmark at Well POS-17 and the base check were established by observing a 4 -hour session of Static GPS data using a Trimble R-8 set over the point June 27, 2018. Rinex files containing the collected data were uploaded through the OPUS website and a report containing the final coordinates were obtained on July 19, 2018.

Latitude, Longitude and elevations for the Benchmark at Well POS-16 were established by setting the Base over the POS-17 Benchmark and measuring the POS-16 benchmark with RTK GPS. Checks with RTK-GPS were made to Benchmarks POS-18 and POS-19 at the Lake Marion Creek CFWI DMIT Wetland site. Coordinates & elevations for the benchmarks at the Lake Marion Creek sites were established with a 4-hour static GPS observation and the OPUS website.

**COORDINATES AND ELEVATIONS FOR WETLAND FEATURES**

RTK GPS was used to establish coordinates and elevations for the wetland transects and seasonal high elevations. Measurements were made on the ground adjacent to the rebar and pipes marking the point. In areas where tree canopy prevented a fixed RTK GPS solution, an optical total station was used. Control for the optical work was established with RTK GPS and leveling methods described above.

**EQUIPMENT USED**

- Trimble GPS unit R-8, Serial Number 6916 (static)
- Trimble GPS unit R-8, Serial Number 2534 (static)
- Trimble DiNi 22 Level Serial Number 772842 (level)
- Trimble GPS unit R-10, Serial Number 7093 (RTK)
- Trimble GPS unit R-10, Serial Number 5003 (RTK)
- Trimble Total Station, Serial Number 36820056 (optical)

**VERTICAL CONTROL POINT**

The Vertical Control point utilized and set as part of this survey is the:

|                                                                                    |                                   |                                                                                                                                                                                                                            |
|------------------------------------------------------------------------------------|-----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>BM: POS-17 (WELL) (Located as part of this survey)</b>                          |                                   |                                                                                                                                                                                                                            |
| LATITUDE: 28° 08' 03.64884" (N)                                                    | LONGITUDE: 081° 33' 06.52824" (W) |                                                                                                                                                                                                                            |
| OPUS - NAD_83 (2011)(EPOCH:2010.0000)                                              |                                   |                                                                                                                                                                                                                            |
| ELEVATION: 76.292 ft. (NAVD 88)                                                    | 23.254 m                          | OPUS – (Computed using GEOID12B)                                                                                                                                                                                           |
| ELEVATION: 77.230 ft. (NGVD 29)                                                    | 23.540 m                          | 0.938 ft. (conversion factor)                                                                                                                                                                                              |
|  |                                   | Corpscon 6.0.1                                                                                                                                                                                                             |
|                                                                                    |                                   | From the intersection of East Johnson Ave (580) and Power Line Rd East 1.9 Mi to Marion Creek Ave. West 750 feet to Baker Dairy Rd. North 1 Mi to dirt road North 0.3 Mi to Eileen Lake Blvd East 0.35 Mi to mark on Left. |

**Field Book 928, Page 29**

29/928

SWELMD  
18677

DMIT WETLAND AND WELL (North)  
SNELL CREEK

POS  
2534

SNELL CREEK WELL POS-16 EAST

START TIME 11:25 AM

STOP TIME 5:30 PM

HI: 6.55

POS  
2916

SNELL CREEK WELL POS-17 WEST

START TIME 11:43

STOP TIME 6:24 PM

HI: 6.55

SEE SHARED OPUS SOLUTION IN  
SUPPLEMENTAL DOCUMENTS  
INCLUDED IN THIS REPORT



|                                                                                   |          |                                                                                                                                                                                                                            |
|-----------------------------------------------------------------------------------|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>BM: BASE CHECK (Located as part of this survey)</b>                            |          |                                                                                                                                                                                                                            |
| LATITUDE: 28° 08' 02.39291" (N)                                                   |          | LONGITUDE: 081° 32' 38.79348" (W)                                                                                                                                                                                          |
| OPUS - NAD 83 (2011)(EPOCH:2010.0000)                                             |          |                                                                                                                                                                                                                            |
| ELEVATION: 77.926 ft. (NAVD 88)                                                   | 23.752 m | OPUS – (Computed using GEOID12B)<br>0.938 ft. (conversion factor)<br>Corpscon 6.0.1                                                                                                                                        |
| ELEVATION: 78.864 ft. (NGVD 29)                                                   | 24.038 m |                                                                                                                                                                                                                            |
|  |          | From the intersection of East Johnson Ave (580) and Power Line Rd East 1.9 Mi to Marion Creek Ave. West 750 feet to Baker Dairy Rd. North 1 Mi to dirt road North 0.3 Mi to Eileen Lake Blvd East 0.35 Mi to mark on Left. |

## Field Book 928, Page 49

49/1928

SWFWMD

18677

DIMIT WETLAND; WELL

SNELL CREEK

5/8" SIRC "REF LB 364"

128

2534

START TIME 8:34 AM

STOP TIME 4:57 PM

HI: 6.55

SEE SHARED OPUS SOLUTION  
IN SUPPLEMENTAL DOCUMENTS  
INCLUDED IN THIS REPORT

|                                                                                   |          |                                                                                                                                                                                                                            |
|-----------------------------------------------------------------------------------|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>BM: POS-16 (WELL) (Located as part of this survey)</b>                         |          |                                                                                                                                                                                                                            |
| LATITUDE: 28° 08' 00.84093" (N)                                                   |          | LONGITUDE: 081° 32' 38.39409" (W)                                                                                                                                                                                          |
| RTK-GPS - NAD 83 (2011)                                                           |          |                                                                                                                                                                                                                            |
| ELEVATION: 75.193 ft. (NAVD 88)                                                   | 22.919 m | RTK-GPS – (Computed using GEOID12B)<br>0.938 ft. (conversion factor)<br>Corpscon 6.0.1                                                                                                                                     |
| ELEVATION: 76.131 ft. (NGVD 29)                                                   | 23.205 m |                                                                                                                                                                                                                            |
|  |          | From the intersection of East Johnson Ave (580) and Power Line Rd East 1.9 Mi to Marion Creek Ave. West 750 feet to Baker Dairy Rd. North 1 Mi to dirt road North 0.3 Mi to Eileen Lake Blvd East 0.35 Mi to mark on Left. |

## Field Book 928, Page 47-48

|                     |                                                                                                                                                                                      |                                |                                   |                            |
|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|-----------------------------------|----------------------------|
| 47/928              | SWFWMD<br>18677<br>DMR Wellbore - Well<br>Snell Creek<br>RTK File: 18677-010318<br>(100)<br>Base @ Pos: 17 Brass Disk in S.E.<br>Corner of Cone Pad<br>Ht = 6.55<br>Fixed Rod = 6.90 | Base at<br>POS-17<br>Benchmark | 7-3-18<br>TUESDAY<br>CLEAR<br>85° | 48/928<br>Bickel<br>CHAVIS |
| FIELD ROVER<br>7093 | Pos: 18 Under (E) 200 CHECK Pos: 18 at Lake Marion Creek<br>201 CHECK 200                                                                                                            |                                | 214 Set 5/8" SRC Ref L8364"       |                            |
| Field Base<br>5006  | Pos: 19 Under (W) 202 CHECK Pos: 19 at Lake Marion Creek<br>203 CHECK 202                                                                                                            |                                | 215 CHECK 214                     |                            |
| TS03<br>2944        | Pos: 16 Snell (E) 204 Pos: 16 Snell (E)<br>205 CHECK 204<br>206 Set 1-1<br>207 Set 1-2<br>208 Set 1-3<br>209 Bolt 1<br>210 Bolt 2<br>211 Top of Board<br>212 SHW 1<br>213 SHW 2      |                                | 216 Baso                          |                            |
|                     |                                                                                                                                                                                      |                                | 217 Set 5/8" SRC Ref L8364"       |                            |
|                     |                                                                                                                                                                                      |                                | 218 Set 60d                       |                            |
|                     |                                                                                                                                                                                      |                                | 219 CK 218                        |                            |
|                     |                                                                                                                                                                                      |                                | 220 CK 217                        |                            |
|                     |                                                                                                                                                                                      |                                | 221 Set 3-2                       |                            |
|                     |                                                                                                                                                                                      |                                | 222 Set 3-1                       |                            |
|                     |                                                                                                                                                                                      |                                | 223 Set 3-3                       |                            |
|                     |                                                                                                                                                                                      |                                | 224 CK 223                        |                            |
|                     |                                                                                                                                                                                      |                                | 225 CK 222                        |                            |
|                     |                                                                                                                                                                                      |                                | 226 CK 221                        |                            |
|                     |                                                                                                                                                                                      |                                | 227 Baso                          |                            |
|                     |                                                                                                                                                                                      |                                | 228 Base @ 204 Pos: 16            |                            |

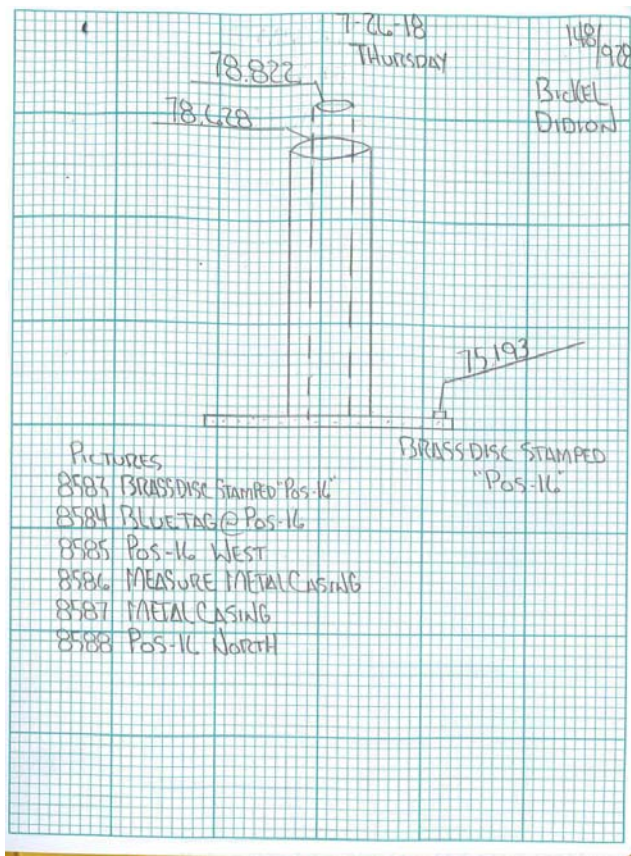
POS-16 measured  
with RTK-GPS to  
obtain Horizontal  
and Vertical values.



**PROJECT RESULTS**

| Reference and Ground Elevations:                       |                  |                     |                             |
|--------------------------------------------------------|------------------|---------------------|-----------------------------|
| Well                                                   | Ground Elevation | Reference Elevation | Comments                    |
| POS-16                                                 | 75.1 ft          | 78.82 ft            | Top of Metal                |
| Elevation on four (4) corners of the concrete well pad |                  |                     |                             |
| NE Corner                                              | SE Corner        | SW Corner           | NW Corner                   |
| 75.2 ft                                                | 75.2 ft          | 75.2 ft             | 75.2 ft                     |
| Well Diameter                                          |                  | Casing material     | DTW                         |
| 4 3/16"                                                |                  | METAL               | 7.70 ft (7/26/18, 02:53 pm) |





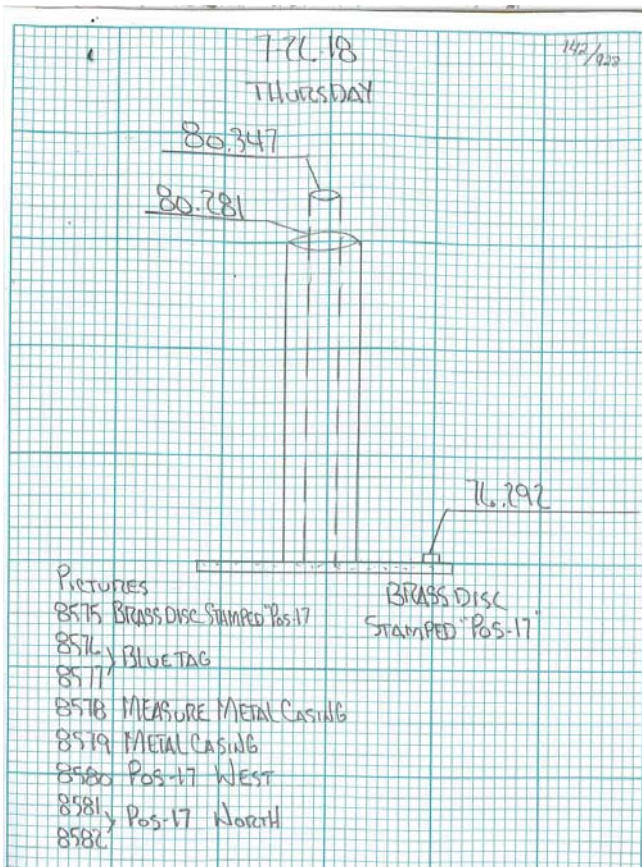
7-26-18 Thursday 148/1928  
Bridget Diron

78.822  
78.628  
75.193

BRASS DISC STAMPED "Pos-16"

PICTURES  
8583 BRASS DISC STAMPED "Pos-16"  
8584 BLUE TAG @ Pos-16  
8585 Pos-16 WEST  
8586 MEASURE METAL CASING  
8587 METAL CASING  
8588 Pos-16 NORTH

| Source & Site Benchmark | NAVD 88  | NGVD 29 (Published) | NGVD 29 (Corpscon) |
|-------------------------|----------|---------------------|--------------------|
| POS-16 Well             | 75.19 ft |                     | 76.13 ft           |

| Reference and Ground Elevations:                                                    |                  |                                                                                     |              |                             |  |                    |  |
|-------------------------------------------------------------------------------------|------------------|-------------------------------------------------------------------------------------|--------------|-----------------------------|--|--------------------|--|
| Well                                                                                | Ground Elevation | Reference Elevation                                                                 | Comments     |                             |  |                    |  |
| POS-17                                                                              | 76.2 ft          | 80.35 ft                                                                            | Top of Metal |                             |  |                    |  |
| Elevation on four (4) corners of the concrete well pad                              |                  |                                                                                     |              |                             |  |                    |  |
| NE Corner                                                                           | SE Corner        | SW Corner                                                                           | NW Corner    |                             |  |                    |  |
| 76.3 ft                                                                             | 76.2 ft          | 76.2 ft                                                                             | 76.3 ft      |                             |  |                    |  |
| Well Diameter                                                                       |                  |                                                                                     |              | Casing material             |  | DTW                |  |
| 4 3/16"                                                                             |                  | METAL                                                                               |              | 8.85 ft (7/26/18, 01:44 pm) |  |                    |  |
|   |                  |  |              |                             |  |                    |  |
|  |                  |                                                                                     |              |                             |  |                    |  |
| Source & Site Benchmark                                                             |                  | NAVD 88                                                                             |              | NGVD 29 (Published)         |  | NGVD 29 (Corpscon) |  |
| POS-17 Well                                                                         |                  | 76.29 ft                                                                            |              |                             |  | 77.23 ft           |  |

Surveyor's Notes:

1. All measurements are U.S. Survey feet unless stated otherwise.
2. Underground improvements, encroachments, foundations and/or utilities were not located as a part of this survey.
3. Additions or deletions to survey maps or reports by other than the signing party or parties is prohibited without written consent of the signing party or parties.
4. This Report is not valid without the original signature and the raised seal or the electronic signature and computer-generated seal of a Florida Licensed Surveyor and Mapper.
5. To convert from NAVD 88 to NGVD 29 add 0.938 feet. This value is based on Corpscon 6.0.1, U.S. Army Corps of Engineers Engineering Research and Development Center Topographic Engineering Center Alexandria, Virginia Windows-based program to convert coordinates and elevations between datum's using vertcon05.txt and vertcon05.05 files supplied by the U.S. Army Corps of Engineers South Atlantic Division, Jacksonville, FL.
6. Date of last field work: July 26, 2018
7. SFWMD Data records (on file at the District's headquarters)
  - A. Electronic Data files:
    - Miscellaneous picture files
    - Miscellaneous data files
  - B. Conventional reporting
    - Field Book: 928 Pages: 29-30, 47-68, 83-84, 137-148

Abbreviations:

**EL.** Elevation

**DTW** Distance to the water table inside the well

**PVC** Polyvinyl Chloride Pipe

**RTK GPS** Real-Time Kinematic Global Positioning System

**NAVD 88** North American Vertical Datum of 1988

**NGVD 29** National Geodetic Vertical Datum of 1929

**NGS** National Geodetic Survey

**PSM** Professional Surveyor & Mapper

**PID** Permanent Identifiers

**SFWMD** South Florida Water Management District

**USGS** United States Geological Survey

**CFWI** Central Florida Water Initiative.

**DMIT** Data, Monitoring and Investigations Team

**NGS** National Geodetic Survey

**SURVEYOR'S CERTIFICATION**

In my professional opinion this Specific Purpose Survey meets applicable portions of the Standards of Practice set forth by the Florida Board of Professional Surveyors and Mappers in Chapter 5J, Florida Administrative Code. This report is prepared for the sole and specific use of the South Florida Water Management District and is not assignable.

July 26, 2018

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GREGORY A. PRATHER, PSM  
FLORIDA REGISTRATION NO. 5135  
PICKETT AND ASSOCIATES, INC.  
FLORIDA REGISTRATION NO. 364

SURVEY DATE





# SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Rev. 1/16

|                                                                |                                                    |
|----------------------------------------------------------------|----------------------------------------------------|
| DESIGNATION: <b>POS-16</b>                                     | PROJECT: <b>CFWI DMIT Wetland Snell Creek East</b> |
| ESTABLISHED BY: <b>SOUTH FLORIDA WATER MANAGEMENT DISTRICT</b> | SURVEYOR: <b>Gregory A. Prather</b>                |
| RECOVERED BY: <b>PICKETT AND ASSOCIATES, INC.</b>              | DATE: <b>July 26, 2018</b>                         |

## GEOGRAPHIC POSITION

|                     |                                                                               |                      |
|---------------------|-------------------------------------------------------------------------------|----------------------|
| SECTION <b>18</b>   | TOWNSHIP <b>27</b> SOUTH                                                      | RANGE <b>28</b> EAST |
| COUNTY: <b>Polk</b> | NAME OF QUADRANGLE: <b>Davenport</b><br>GEOGRAPHIC INDEX OF QUAD: <b>3413</b> |                      |

|                                                                 |                   |                  |                                          |
|-----------------------------------------------------------------|-------------------|------------------|------------------------------------------|
| HORIZONTAL DATUM: 1927 1983 2022 Other (circle one) ZONE E or W |                   |                  |                                          |
| VERTICAL DATUM: MSL 1929 1988 2022 Other (circle one)           |                   |                  |                                          |
| VERTICAL ACCURACY: 1 2 3                                        |                   |                  |                                          |
| STATE PLANE<br>COORDINATE                                       | (N) Y= 1381656.35 | (E) X= 480839.34 | NAVD 88 EL. 75.193<br>NGVD 29 EL. 76.131 |

CORPSCON 6.0.1 CONVERSION FACTOR (NAVD88 TO NGVD29): **0.938'**

(A U.S. Army Corps of Engineers Engineering Research and Development Center Topographic Engineering Center Alexandria, Virginia Windows-based program to convert coordinates and elevations between datum's using vertcon05.txt and vertcon05.05 files supplied by the U.S. Army Corps of Engineers South Atlantic Division, Jacksonville FL.)

ACTUAL NGS or (ngvd29.txt file)

OPUS Ortho Height

|                                        |                                         |                                       |
|----------------------------------------|-----------------------------------------|---------------------------------------|
| LATITUDE: <b>28° 08' 00.84093" (N)</b> | LONGITUDE: <b>81° 32' 38.39409" (W)</b> | (Real-Time Kinematic – NAD 83 (2011)) |
|----------------------------------------|-----------------------------------------|---------------------------------------|

## RECOVERY DATA

Stamping: POS-16

To Reach: From the intersection of East Johnson Ave (580) and Power Line Rd East 1.9 Mi to Marion Creek Ave. West 750 feet to Baker Dairy Rd. North 1 Mi to dirt road North 0.3 Mi to Eileen Lake Blvd East 0.35 Mi to mark on Left.

NOTABLE LAND MARKS:

NGS-SOURCE BENCHMARK: POS-17

FIELD BOOK **928** PAGE **29-148**

## PICTURES

Aerial Overall Site







## SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Rev. 1/16



Looking North (Oblique not to scale) (July 26, 2018)



Top View (Not to Scale) (July 26, 2018)



Top View (Not to Scale) (July 26, 2018)





# SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Rev. 1/16

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                               |                                                    |                                                        |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|----------------------------------------------------|--------------------------------------------------------|
| DESIGNATION: <b>POS-17</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                               | PROJECT: <b>CFWI DMIT Wetland Snell Creek West</b> |                                                        |
| ESTABLISHED BY: <b>SOUTH FLORIDA WATER MANAGEMENT DISTRICT</b>                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                               | SURVEYOR: <b>Gregory A. Prather</b>                |                                                        |
| RECOVERED BY: <b>PICKETT AND ASSOCIATES, INC.</b>                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                               | DATE: <b>July 26, 2018</b>                         |                                                        |
| <b>GEOGRAPHIC POSITION</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                               |                                                    |                                                        |
| SECTION <b>18</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                            | TOWNSHIP <b>27 SOUTH</b>                                                      | RANGE <b>28 EAST</b>                               |                                                        |
| COUNTY: <b>Polk</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                          | NAME OF QUADRANGLE: <b>Davenport</b><br>GEOGRAPHIC INDEX OF QUAD: <b>3413</b> |                                                    |                                                        |
| HORIZONTAL DATUM: 1927 <u>(1983)</u> 2022 Other _____ (circle one) ZONE <u>(E)</u> or W                                                                                                                                                                                                                                                                                                                                                                                      |                                                                               |                                                    |                                                        |
| VERTICAL DATUM: MSL 1929 <u>(1988)</u> 2022 Other _____ (circle one)                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                               |                                                    |                                                        |
| VERTICAL ACCURACY: 1 2 <u>(3)</u>                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                               |                                                    |                                                        |
| STATE PLANE COORDINATE                                                                                                                                                                                                                                                                                                                                                                                                                                                       | (N) Y= <b>1381951.29</b>                                                      | (E) X= <b>478321.84</b>                            | NAVD 88 EL. <b>76.292</b><br>NGVD 29 EL. <b>77.230</b> |
| CORPSCON 6.0.1 CONVERSION FACTOR (NAVD88 TO NGVD29): <b>0.938'</b><br>(A U.S. Army Corps of Engineers Engineering Research and Development Center Topographic Engineering Center Alexandria, Virginia Windows-based program to convert coordinates and elevations between datum's using vertcon05.txt and vertcon05.05 files supplied by the U.S. Army Corps of Engineers South Atlantic Division, Jacksonville FL.)<br>ACTUAL NGS or (ngvd29.txt file)<br>OPUS Ortho Height |                                                                               |                                                    |                                                        |
| LATITUDE: <b>28° 08' 03.64884" (N)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                               | LONGITUDE: <b>81° 33' 06.52824" (W)</b>            | (OPUS – NAD_83 (2011) EPOCH:2010.0000)                 |
| <b>RECOVERY DATA</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                               |                                                    |                                                        |
| Stamping: POS-17                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                               |                                                    |                                                        |
| To Reach: From the intersection of East Johnson Ave (580) and Power Line Rd East 1.9 Mi to Marion Creek Ave. West 750 feet to Baker Dairy Rd. North 1 Mi to dirt road North 0.3 Mi to Eileen Lake Blvd East 0.35 Mi to mark on Left.                                                                                                                                                                                                                                         |                                                                               |                                                    |                                                        |
| NOTABLE LAND MARKS:                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                               |                                                    |                                                        |
| NGS-SOURCE BENCHMARK:                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                               |                                                    |                                                        |
| FIELD BOOK <b>928</b> PAGE <b>29-148</b>                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                               |                                                    |                                                        |
| <b>PICTURES</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                               |                                                    |                                                        |
| Aerial Overall Site                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                               |                                                    |                                                        |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                               |                                                    |                                                        |





## SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Rev. 1/16



Looking North (Oblique not to scale) (July 26, 2018)



Top View (Not to Scale) (July 26, 2018)



Top View (Not to Scale) (July 26, 2018)





# SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Rev. 1/16

|                                          |                                      |                                    |                                        |
|------------------------------------------|--------------------------------------|------------------------------------|----------------------------------------|
| SCADA RTU Station Name:<br><b>POS-16</b> | DB Hydro Site Name:<br><b>SNELLE</b> | Agency:<br><b>WMD</b>              | Date of Field Work:<br><b>07/26/18</b> |
| Party Chief: <b>Robby Bickel</b>         | Field Book: <b>928</b>               | Page(s): <b>29, 47-66, 137-148</b> | Prepared by: <b>Sherry Grymko</b>      |

## SITE SPECIFIC DATA

|                                                   |                                                                |                                                                      |
|---------------------------------------------------|----------------------------------------------------------------|----------------------------------------------------------------------|
| Site Benchmark:<br><b>POS-16</b>                  | Benchmark Elevation (NAVD88)<br><b>75.193'</b>                 | Corpscon 6.0.1 Conversion Factor (NAVD88 to NGVD29)<br><b>0.938'</b> |
| Reference Elevation(s) (NAVD88):<br><b>78.82'</b> | Existing Brass Tag Elevation (Datum):<br><b>Not Applicable</b> | Calibration Port Elevation(s) (NAVD88):<br><b>Not Applicable</b>     |
| Ground Elevation (NAVD88): <b>75.1'</b>           | Pad Elevation (NAVD88): <b>75.2'</b>                           |                                                                      |

## GEOGRAPHIC DATA

|                   |                                         |                                          |                                      |
|-------------------|-----------------------------------------|------------------------------------------|--------------------------------------|
| Section <b>18</b> | Township <b>27</b> South                |                                          | Range <b>28</b> East                 |
| Well              | Latitude:<br><b>28°08'00.83250" (N)</b> | Longitude:<br><b>81°32'38.40740" (W)</b> | Source: RTK-GPS - NAD_83             |
|                   | State Plane Coordinates                 | Northing (Y) =<br><b>1381655.51 ft</b>   | Easting (X) =<br><b>480838.14 ft</b> |

### Notes:

**NAVD88** – North American Vertical Datum of 1988

**NGVD29**- National Geodetic Vertical Datum of 1929

**Corpscon 6.0.1** - A U.S. Army Corps of Engineers Engineering Research and Development Center Topographic Engineering Center Alexandria, Virginia Windows-based program to convert coordinates and elevations between datum's using vertcon05.txt and vertcon05.05 files supplied by the U.S. Army Corps of Engineers South Atlantic Division, Jacksonville FL.

## PICTURES

### Aerial Overall Site



Not to scale (Google Earth product)



## SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Rev. 1/16

Overall

POS-16 Well Site  
Latitude:  $28^{\circ}08'00.83250''$   
Longitude:  $081^{\circ}32'38.40740''$   
El.  $78.82'$  (NAVD88)

Ground El.  $75.1'$  (NAVD88)

Concrete El.  $75.2'$  (NAVD88)



Benchmark "POS-16"  
Latitude:  $28^{\circ}08'00.84093''$   
Longitude:  $81^{\circ}32'38.39409''$   
El.  $75.193'$  (NAVD88)



Looking Northerly (oblique not to scale) (26-July-18)

Well Head

Reference Point  
El.  $78.82'$  (NAVD88)



Looking Northerly (oblique not to scale) (26-July-18)





# SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Rev. 1/16

|                                          |                                      |                                    |                                        |
|------------------------------------------|--------------------------------------|------------------------------------|----------------------------------------|
| SCADA RTU Station Name:<br><b>POS-17</b> | DB Hydro Site Name:<br><b>SNELLW</b> | Agency:<br><b>WMD</b>              | Date of Field Work:<br><b>07/26/18</b> |
| Party Chief: <b>Robby Bickel</b>         | Field Book: <b>928</b>               | Page(s): <b>29, 47-66, 137-148</b> | Prepared by: <b>Sherry Grymko</b>      |

## SITE SPECIFIC DATA

|                                                   |                                                                |                                                                      |
|---------------------------------------------------|----------------------------------------------------------------|----------------------------------------------------------------------|
| Site Benchmark:<br><b>POS-17</b>                  | Benchmark Elevation (NAVD88)<br><b>76.292'</b>                 | Corpscon 6.0.1 Conversion Factor (NAVD88 to NGVD29)<br><b>0.938'</b> |
| Reference Elevation(s) (NAVD88):<br><b>80.35'</b> | Existing Brass Tag Elevation (Datum):<br><b>Not Applicable</b> | Calibration Port Elevation(s) (NAVD88):<br><b>Not Applicable</b>     |
| Ground Elevation (NAVD88): <b>76.2'</b>           | Pad Elevation (NAVD88): <b>76.3'</b>                           |                                                                      |

## GEOGRAPHIC DATA

|                   |                                         |                                          |                                      |
|-------------------|-----------------------------------------|------------------------------------------|--------------------------------------|
| Section <b>18</b> | Township <b>27</b> South                |                                          | Range <b>28</b> East                 |
| <b>Well</b>       | Latitude:<br><b>28°08'03.64234" (N)</b> | Longitude:<br><b>81°33'06.54264" (W)</b> | Source: RTK-GPS - NAD_83             |
|                   | State Plane Coordinates                 | Northing (Y) =<br><b>1381950.64 ft</b>   | Easting (X) =<br><b>478320.55 ft</b> |

### Notes:

**NAVD88** – North American Vertical Datum of 1988

**NGVD29**- National Geodetic Vertical Datum of 1929

**Corpscon 6.0.1** - A U.S. Army Corps of Engineers Engineering Research and Development Center Topographic Engineering Center Alexandria, Virginia Windows-based program to convert coordinates and elevations between datum's using vertcon05.txt and vertcon05.05 files supplied by the U.S. Army Corps of Engineers South Atlantic Division, Jacksonville Fl.

## PICTURES

### Aerial Overall Site



Not to scale (Google Earth product)



# SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Rev. 1/16

Overall

POS-17 Well Site  
Latitude: **28°08'03.64234"**  
Longitude: **081°33'06.54264"**  
El. **80.35'** (NAVD88)

Ground El. **76.2'** (NAVD88)

Concrete El. **76.3'** (NAVD88)



Benchmark "POS-17"  
Latitude: **28° 08' 03.64884"**  
Longitude: **81° 33' 06.52824"**  
El. **76.292'** (NAVD88)



Looking Northerly (oblique not to scale) (26-July-18)

Well Head

Reference Point  
El. **80.35'** (NAVD88)



Looking Northerly (oblique not to scale) (26-July-18)



# SNELL CREEK WELL POS-17

FILE: 69161780.DAT OP1532018072466

## NGS OPUS SOLUTION REPORT

=====

All computed coordinate accuracies are listed as peak-to-peak values.

For additional information: <https://www.ngs.noaa.gov/OPUS/about.jsp#accuracy>

USER: [sgrymko@pickettusa.com](mailto:sgrymko@pickettusa.com)

DATE: July 19, 2018

RINEX FILE: 6916178p.18o

TIME: 16:35:24 UTC

SOFTWARE: page5 1603.24 master94.pl 160321 START: 2018/06/27 15:44:00  
EPHEMERIS: igs20073.eph [precise] STOP: 2018/06/27 22:21:00  
NAV FILE: brdc1780.18n OBS USED: 16181 / 17917 : 90%  
ANT NAME: TRM5800 NONE # FIXED AMB: 84 / 108 : 78%  
ARP HEIGHT: 1.9964 OVERALL RMS: 0.028(m)

REF FRAME: NAD\_83(2011)(EPOCH:2010.0000)

IGS08 (EPOCH:2018.4871)

X: 826941.935(m) 0.014(m)  
Y: -5567634.766(m) 0.026(m)  
Z: 2989640.813(m) 0.016(m)

826941.120(m) 0.014(m)  
-5567633.203(m) 0.026(m)  
2989640.650(m) 0.016(m)

LAT: 28 8 3.64884 0.019(m)  
E LON: 278 26 53.47176 0.012(m)  
W LON: 81 33 6.52824 0.012(m)  
EL HGT: -4.093(m) 0.024(m)

28 8 3.66968 0.019(m)  
278 26 53.45063 0.012(m)  
81 33 6.54937 0.012(m)  
-5.639(m) 0.024(m)

ORTHO HGT: 23.254(m) 0.034(m) [NAVD88 (Computed using GEOID12B)]

EL. 76.292 ft

### UTM COORDINATES STATE PLANE COORDINATES

|                       | UTM (Zone 17) | SPC (0901 FL E) |
|-----------------------|---------------|-----------------|
| Northing (Y) [meters] | 3112207.859   | 421219.596      |
| Easting (X) [meters]  | 445811.284    | 145792.789      |
| Convergence [degrees] | -0.26020833   | -0.26020833     |
| Point Scale           | 0.99963624    | 0.99997743      |
| Combined Factor       | 0.99963688    | 0.99997807      |

Y=1381951.29 ft  
X= 478321.84 ft

US NATIONAL GRID DESIGNATOR: 17RMM4581112207(NAD 83)

### BASE STATIONS USED

| PID    | DESIGNATION               | LATITUDE    | LONGITUDE    | DISTANCE(m) |
|--------|---------------------------|-------------|--------------|-------------|
| DF7046 | BRTW BARTOW CORS ARP      | N275658.642 | W0814658.200 | 30578.2     |
| DH3757 | WACH WAUCHULA CORS ARP    | N273051.042 | W0815256.615 | 76051.2     |
| DF7990 | ZEFR ZEPHYRHILLS CORS ARP | N281339.322 | W0820952.671 | 61057.3     |

NEAREST NGS PUBLISHED CONTROL POINT  
DO8901 777957 A N2809000023 W08133000054 2790.2

#### BASE STATION INFORMATION

STATION NAME: brtw a 3 (BARTOW; Bartow, Florida, U.S.A.)

MONUMENT: 49529S001

XYZ 805863.2966 -5580462.7024 2971581.0305 MON @ 2005.0000 (M)  
XYZ -0.0121 -0.0008 0.0002 VEL (M/YR)  
NEU 0.0000 0.0000 0.0000 MON TO ARP (M)  
NEU 0.0001 -0.0008 0.1242 ARP TO L1 PHASE CENTER (M)  
NEU -0.0000 -0.0008 0.1337 ARP TO L2 PHASE CENTER (M)  
XYZ -0.1631 -0.0103 0.0021 VEL TIMES 13.4864 YRS  
XYZ 0.0000 0.0000 0.0000 MON TO ARP  
XYZ 0.0149 -0.1087 0.0584 ARP TO L1 PHASE CENTER  
XYZ 805863.1484 -5580462.8214 2971581.0909 L1 PHS CEN @ 2018.4871  
XYZ 0.0000 0.0000 0.0000 + XYZ ADJUSTMENTS  
XYZ 805863.1484 -5580462.8214 2971581.0909 NEW L1 PHS CEN @ 2018.4871  
XYZ 805863.1335 -5580462.7127 2971581.0326 NEW ARP @ 2018.4871  
XYZ 805863.1335 -5580462.7127 2971581.0326 NEW MON @ 2018.4871  
LLH 27 56 58.66235 278 13 1.77786 12.1453 NEW L1 PHS CEN @ 2018.4871  
LLH 27 56 58.66235 278 13 1.77789 12.0211 NEW ARP @ 2018.4871  
LLH 27 56 58.66235 278 13 1.77789 12.0211 NEW MON @ 2018.4871

STATION NAME: wach a 1 (Wauchula; Wauchula, Florida, U.S.A.)

MONUMENT: NO DOMES NUMBER

XYZ 799335.5101 -5604081.2834 2928868.5861 MON @ 2005.0000 (M)  
XYZ -0.0117 0.0017 0.0004 VEL (M/YR)  
NEU 0.0000 0.0000 0.0000 MON TO ARP (M)  
NEU 0.0001 -0.0008 0.1242 ARP TO L1 PHASE CENTER (M)  
NEU -0.0000 -0.0008 0.1337 ARP TO L2 PHASE CENTER (M)  
XYZ -0.1583 0.0224 0.0053 VEL TIMES 13.4864 YRS  
XYZ 0.0000 0.0000 0.0000 MON TO ARP  
XYZ 0.0148 -0.1091 0.0575 ARP TO L1 PHASE CENTER  
XYZ 799335.3666 -5604081.3702 2928868.6489 L1 PHS CEN @ 2018.4871  
XYZ 0.0000 -0.0000 -0.0000 + XYZ ADJUSTMENTS  
XYZ 799335.3666 -5604081.3702 2928868.6489 NEW L1 PHS CEN @ 2018.4871  
XYZ 799335.3518 -5604081.2611 2928868.5914 NEW ARP @ 2018.4871  
XYZ 799335.3518 -5604081.2611 2928868.5914 NEW MON @ 2018.4871  
LLH 27 30 51.06279 278 7 3.36296 9.2623 NEW L1 PHS CEN @ 2018.4871  
LLH 27 30 51.06279 278 7 3.36299 9.1381 NEW ARP @ 2018.4871  
LLH 27 30 51.06279 278 7 3.36299 9.1381 NEW MON @ 2018.4871

STATION NAME: zefr a 2 (ZEPHYRHILLS; Zephyrhills, Florida, U.S.A.)

MONUMENT: 49526S001

XYZ 766680.6677 -5571328.4297 2998751.0226 MON @ 2005.0000 (M)  
XYZ -0.0123 0.0005 0.0010 VEL (M/YR)  
NEU 0.0000 0.0000 0.0000 MON TO ARP (M)  
NEU 0.0001 -0.0008 0.1242 ARP TO L1 PHASE CENTER (M)  
NEU -0.0000 -0.0008 0.1337 ARP TO L2 PHASE CENTER (M)

|     |                |                |              |                            |
|-----|----------------|----------------|--------------|----------------------------|
| XYZ | -0.1655        | 0.0072         | 0.0132       | VEL TIMES 13.4864 YRS      |
| XYZ | 0.0000         | 0.0000         | 0.0000       | MON TO ARP                 |
| XYZ | 0.0142         | -0.1085        | 0.0589       | ARP TO L1 PHASE CENTER     |
| XYZ | 766680.5164    | -5571328.5310  | 2998751.0947 | L1 PHS CEN @ 2018.4871     |
| XYZ | -0.0000        | 0.0000         | 0.0000       | + XYZ ADJUSTMENTS          |
| XYZ | 766680.5164    | -5571328.5310  | 2998751.0947 | NEW L1 PHS CEN @ 2018.4871 |
| XYZ | 766680.5022    | -5571328.4225  | 2998751.0358 | NEW ARP @ 2018.4871        |
| XYZ | 766680.5022    | -5571328.4225  | 2998751.0358 | NEW MON @ 2018.4871        |
| LLH | 28 13 39.34290 | 277 50 7.30647 | -1.3998      | NEW L1 PHS CEN @ 2018.4871 |
| LLH | 28 13 39.34290 | 277 50 7.30650 | -1.5240      | NEW ARP @ 2018.4871        |
| LLH | 28 13 39.34290 | 277 50 7.30650 | -1.5240      | NEW MON @ 2018.4871        |

#### REMOTE STATION INFORMATION

STATION NAME: 6916 1

MONUMENT: NO DOMES NUMBER

|     |             |               |              |                            |
|-----|-------------|---------------|--------------|----------------------------|
| XYZ | 826941.1588 | -5567633.3026 | 2989640.8321 | MON @ 2018.4867 (M)        |
| NEU | -0.0008     | -0.0011       | 1.9964       | MON TO ARP (M)             |
| NEU | 0.0008      | 0.0011        | 0.0748       | ARP TO L1 PHASE CENTER (M) |
| NEU | 0.0001      | -0.0022       | 0.0772       | ARP TO L2 PHASE CENTER (M) |
| XYZ | 0.2576      | -1.7420       | 0.9407       | MON TO ARP                 |
| XYZ | 0.0108      | -0.0648       | 0.0360       | ARP TO L1 PHASE CENTER     |
| XYZ | 826941.4271 | -5567635.1093 | 2989641.8088 | L1 PHS CEN @ 2018.4871     |

BASELINE NAME: brtw 6916

|     |              |                 |              |                            |
|-----|--------------|-----------------|--------------|----------------------------|
| XYZ | -0.0448      | 0.0993          | -0.1920      | + XYZ ADJUSTMENTS          |
| XYZ | 826941.3824  | -5567635.0100   | 2989641.6168 | NEW L1 PHS CEN @ 2018.4871 |
| XYZ | 826941.3716  | -5567634.9453   | 2989641.5808 | NEW ARP @ 2018.4871        |
| XYZ | 826941.1140  | -5567633.2033   | 2989640.6401 | NEW MON @ 2018.4871        |
| LLH | 28 8 3.66940 | 278 26 53.45040 | -3.5726      | NEW L1 PHS CEN @ 2018.4871 |
| LLH | 28 8 3.66937 | 278 26 53.45036 | -3.6475      | NEW ARP @ 2018.4871        |
| LLH | 28 8 3.66940 | 278 26 53.45040 | -5.6439      | NEW MON @ 2018.4871        |

BASELINE NAME: wach 6916

|     |              |                 |              |                            |
|-----|--------------|-----------------|--------------|----------------------------|
| XYZ | -0.0396      | 0.1130          | -0.1766      | + XYZ ADJUSTMENTS          |
| XYZ | 826941.3875  | -5567634.9964   | 2989641.6322 | NEW L1 PHS CEN @ 2018.4871 |
| XYZ | 826941.3768  | -5567634.9316   | 2989641.5962 | NEW ARP @ 2018.4871        |
| XYZ | 826941.1192  | -5567633.1896   | 2989640.6555 | NEW MON @ 2018.4871        |
| LLH | 28 8 3.67003 | 278 26 53.45066 | -3.5766      | NEW L1 PHS CEN @ 2018.4871 |
| LLH | 28 8 3.67001 | 278 26 53.45062 | -3.6514      | NEW ARP @ 2018.4871        |
| LLH | 28 8 3.67003 | 278 26 53.45066 | -5.6479      | NEW MON @ 2018.4871        |

BASELINE NAME: zefr 6916

|     |              |                 |              |                            |
|-----|--------------|-----------------|--------------|----------------------------|
| XYZ | -0.0308      | 0.0867          | -0.1762      | + XYZ ADJUSTMENTS          |
| XYZ | 826941.3964  | -5567635.0227   | 2989641.6326 | NEW L1 PHS CEN @ 2018.4871 |
| XYZ | 826941.3856  | -5567634.9579   | 2989641.5966 | NEW ARP @ 2018.4871        |
| XYZ | 826941.1280  | -5567633.2159   | 2989640.6559 | NEW MON @ 2018.4871        |
| LLH | 28 8 3.66963 | 278 26 53.45084 | -3.5523      | NEW L1 PHS CEN @ 2018.4871 |
| LLH | 28 8 3.66960 | 278 26 53.45080 | -3.6271      | NEW ARP @ 2018.4871        |
| LLH | 28 8 3.66963 | 278 26 53.45084 | -5.6236      | NEW MON @ 2018.4871        |

Axx2018 627 18 627

B2018 6271544 18 6272221 1 page5 v1603.24IGS 126 1 2 27NGS 2018 719IFDDPX  
IIGS08\_1930 IGS 20170101  
C00090004 -210779805 9 -128295094 32 -180596075 19 X1788A6916X1788ABRTW  
D 1 2 -6534429 1 3 6997047 2 3 -9017896

Axx2018 627 18 627

B2018 6271544 18 6272221 1 page5 v1603.24IGS 126 1 2 27NGS 2018 719IFDDPX  
IIGS08\_1930 IGS 20170101  
C00090003 -276057674 8 -364480714 36 -607720641 21 X1788A6916X1788AWACH  
D 1 2 -6567514 1 3 7091324 2 3 -8695835

Axx2018 627 18 627

B2018 6271544 18 6272221 1 page5 v1603.24IGS 126 1 2 27NGS 2018 719IFDDPX  
IIGS08\_1930 IGS 20170101  
C00090002 -602606258 11 -36952065 42 91103799 23 X1788A6916X1788AZEFR  
D 1 2 -6009117 1 3 5504295 2 3 -9486238

#### POST-FIT RMS BY SATELLITE VS. BASELINE

|           | OVERALL | 01    | 02    | 03    | 05    | 06    | 07    | 08    | 09    |
|-----------|---------|-------|-------|-------|-------|-------|-------|-------|-------|
| brtw-6916 | 0.026   | 0.015 | 0.027 | 0.034 | 0.018 | 0.028 | 0.014 | 0.015 | 0.016 |
|           | 11      | 12    | 13    | 17    | 18    | 19    | 22    | 24    | 25    |
| brtw-6916 | 0.014   | 0.028 | 0.028 | 0.028 | 0.017 | 0.032 | 0.026 | 0.049 | 0.013 |
|           | 28      | 30    |       |       |       |       |       |       |       |
| brtw-6916 | 0.027   | 0.021 |       |       |       |       |       |       |       |

|           | OVERALL | 01    | 02    | 03    | 05    | 06    | 07    | 08    | 09    |
|-----------|---------|-------|-------|-------|-------|-------|-------|-------|-------|
| wach-6916 | 0.025   | 0.024 | 0.026 | 0.033 | 0.024 | 0.024 | 0.022 | 0.017 | 0.032 |
|           | 11      | 12    | 13    | 17    | 18    | 19    | 22    | 24    | 25    |
| wach-6916 | 0.019   | 0.024 | 0.030 | 0.013 | 0.025 | 0.021 | 0.030 | 0.043 | 0.029 |
|           | 28      | 30    |       |       |       |       |       |       |       |
| wach-6916 | 0.025   | 0.025 |       |       |       |       |       |       |       |

|            | OVERALL | 01    | 02    | 03    | 05    | 06    | 07    | 08    | 09    |
|------------|---------|-------|-------|-------|-------|-------|-------|-------|-------|
| zeffr-6916 | 0.032   | 0.017 | 0.034 | 0.028 | 0.029 | 0.038 | 0.019 | 0.026 | 0.042 |
|            | 11      | 12    | 13    | 17    | 18    | 19    | 22    | 24    | 25    |
| zeffr-6916 | 0.020   | 0.034 | 0.022 | 0.029 | 0.018 | 0.029 | 0.024 | 0.048 | 0.022 |
|            | 28      | 30    |       |       |       |       |       |       |       |
| zeffr-6916 | 0.044   | 0.021 |       |       |       |       |       |       |       |

#### OBS BY SATELLITE VS. BASELINE

|           | OVERALL | 01  | 02  | 03  | 05  | 06  | 07  | 08  | 09  |
|-----------|---------|-----|-----|-----|-----|-----|-----|-----|-----|
| brtw-6916 | 5721    | 356 | 400 | 394 | 230 | 612 | 274 | 70  | 215 |
|           | 11      | 12  | 13  | 17  | 18  | 19  | 22  | 24  | 25  |
| brtw-6916 | 295     | 295 | 95  | 762 | 223 | 490 | 300 | 222 | 59  |
|           | 28      | 30  |     |     |     |     |     |     |     |
| brtw-6916 | 52      | 377 |     |     |     |     |     |     |     |

|           | OVERALL | 01  | 02  | 03  | 05  | 06  | 07  | 08  | 09  |
|-----------|---------|-----|-----|-----|-----|-----|-----|-----|-----|
| wach-6916 | 5020    | 305 | 413 | 304 | 233 | 611 | 253 | 66  | 42  |
|           | 11      | 12  | 13  | 17  | 18  | 19  | 22  | 24  | 25  |
| wach-6916 | 236     | 297 | 96  | 36  | 162 | 661 | 77  | 177 | 114 |

```

      28  30
wach-6916| 572 365
      OVERALL 01 02 03 05 06 07 08 09
zefr-6916| 5440 319 421 319 265 636 263 67 165
      11 12 13 17 18 19 22 24 25
zefr-6916| 244 313 46 54 180 648 193 210 99
      28  30
zefr-6916| 593 405

```

ITRF position of 6916 as determined by individual baselines

```

      X      Y      Z
brtw  826941.114 -5567633.203 2989640.640
wach  826941.119 -5567633.190 2989640.655
zefr  826941.128 -5567633.216 2989640.656

```

Residuals of position determined by individual baselines from the final position

```

      X      Y      Z      East      North      Up
brtw  -0.006  -0.000  -0.010  -0.006  -0.009  -0.005
wach  -0.001   0.013   0.005   0.001   0.011  -0.009
zefr   0.008  -0.013   0.005   0.006  -0.002   0.015

```

Covariance Matrix for the xyz OPUS Position (meters^2).

```

0.0000010533 -0.0000002520 0.0000001205
-0.0000002520 0.0000125800 -0.0000006200
0.0000001205 -0.0000006200 0.0000035444

```

Covariance Matrix for the enu OPUS Position (meters^2).

```

0.0000012289 0.0000006975 -0.0000012532
0.0000006975 0.0000049711 -0.0000033171
-0.0000012532 -0.0000033171 0.0000109777

```

Horizontal network accuracy = 0.00457 meters.

Vertical network accuracy = 0.00650 meters.

Derivation of NAD 83 vector components

Position of reference station ARP in NAD\_83(2011)(EPOCH:2010.0000).

```

      Xa(m)      Ya(m)      Za(m)
BRTW  805863.95044 -5580464.27627 2971581.21134 2010.00
WACH  799336.16446 -5604082.84993 2928868.77127 2010.00
ZEFR  766681.32093 -5571329.99195 2998751.20655 2010.00

```

Position of reference station monument in NAD\_83(2011)(EPOCH:2010.0000).

```

      Xr(m)      Yr(m)      Zr(m)
BRTW  805863.95044 -5580464.27627 2971581.21134 2010.00
WACH  799336.16446 -5604082.84993 2928868.77127 2010.00
ZEFR  766681.32093 -5571329.99195 2998751.20655 2010.00

```

Velocity of reference station monument in NAD\_83(2011)(EPOCH:2010.0000).

```

      Vx (m/yr)  Vy (m/yr)  Vz (m/yr)

```

|      |          |          |         |
|------|----------|----------|---------|
| BRTW | -0.01210 | -0.00080 | 0.00020 |
| WACH | -0.01170 | 0.00170  | 0.00040 |
| ZEFR | -0.01230 | 0.00050  | 0.00100 |

Vectors from unknown station monument to reference station monument  
in NAD\_83(2011)(EPOCH:2010.0000).

Xr-X= DX(m) Yr-Y= DY(m) Zr-Z= DZ(m)

|      |              |              |              |         |
|------|--------------|--------------|--------------|---------|
| BRTW | -21077.98456 | -12829.51027 | -18059.60166 | 2010.00 |
| WACH | -27605.77054 | -36448.08393 | -60772.04173 | 2010.00 |
| ZEFR | -60260.61407 | -3695.22595  | 9110.39355   | 2010.00 |

STATE PLANE COORDINATES - U.S. Survey Foot

SPC (0901 FL E)

|                       |             |
|-----------------------|-------------|
| Northing (Y) [feet]   | 1381951.291 |
| Easting (X) [feet]    | 478321.842  |
| Convergence [degrees] | -0.26020833 |
| Point Scale           | 0.99997743  |
| Combined Factor       | 0.99997807  |

\*\*\*\*\* New Reference Frame Preview \*\*\*\*\*

We are replacing the nation's NAD 83 and NAVD 88 datums, to improve access and accuracy of the National Spatial Reference System. More at <https://geodesy.noaa.gov/datums/newdatums/>

Below are approximate coordinates for this solution in the new frames:

APPROX ORTHO HGT: 23.224 (m) [PROTOTYPE (Computed using xGeoid17B,GRS80,IGS08)]

This position and the above vector components were computed without any knowledge by the National Geodetic Survey regarding the equipment or field operating procedures used.



# SNELL CREEK CHECK POINT

FILE: 25341840.DAT OP1532019043791

## NGS OPUS SOLUTION REPORT

=====

All computed coordinate accuracies are listed as peak-to-peak values.

For additional information: <https://www.ngs.noaa.gov/OPUS/about.jsp#accuracy>

USER: [sgrymko@pickettusa.com](mailto:sgrymko@pickettusa.com)

DATE: July 19, 2018

RINEX FILE: 2534184m.18o

TIME: 16:51:43 UTC

SOFTWARE: page5 1603.24 master71.pl 160321 START: 2018/07/03 12:36:00  
EPHEMERIS: igr20082.eph [rapid] STOP: 2018/07/03 18:54:00  
NAV FILE: brdc1840.18n OBS USED: 16588 / 18711 : 89%  
ANT NAME: TRM5800 NONE # FIXED AMB: 115 / 131 : 88%  
ARP HEIGHT: 1.9964 OVERALL RMS: 0.022(m)

REF FRAME: NAD\_83(2011)(EPOCH:2010.0000)

IGS08 (EPOCH:2018.5032)

X: 827693.306(m) 0.009(m)

827692.491(m) 0.009(m)

Y: -5567541.979(m) 0.011(m)

-5567540.416(m) 0.011(m)

Z: 2989606.948(m) 0.024(m)

2989606.785(m) 0.024(m)

LAT: 28 8 2.39291 0.025(m)

28 8 2.41375 0.025(m)

E LON: 278 27 21.20652 0.008(m)

278 27 21.18539 0.008(m)

W LON: 81 32 38.79348 0.008(m)

81 32 38.81461 0.008(m)

EL HGT: -3.608(m) 0.009(m)

-5.154(m) 0.009(m)

ORTHO HGT: 23.752(m) 0.025(m) [NAVD88 (Computed using GEOID12B)]

EL. 77.93 ft

### UTM COORDINATES STATE PLANE COORDINATES

|                       | UTM (Zone 17) | SPC (0901 FL E) |
|-----------------------|---------------|-----------------|
| Northing (Y) [meters] | 3112165.799   | 421177.522      |
| Easting (X) [meters]  | 446567.676    | 146549.438      |
| Convergence [degrees] | -0.25657222   | -0.25657222     |
| Point Scale           | 0.99963524    | 0.99997642      |
| Combined Factor       | 0.99963581    | 0.99997699      |

Y=1381813.25 ft

X= 480804.28 ft

US NATIONAL GRID DESIGNATOR: 17RMM4656712165(NAD 83)

### BASE STATIONS USED

| PID    | DESIGNATION                 | LATITUDE    | LONGITUDE    | DISTANCE(m) |
|--------|-----------------------------|-------------|--------------|-------------|
| DQ7965 | FLWE WEDGEFIELD FL CORS ARP | N282626.477 | W0810533.176 | 55834.6     |
| DH3757 | WACH WAUCHULA CORS ARP      | N273051.042 | W0815256.615 | 76344.5     |
| DF7046 | BRTW BARTOW CORS ARP        | N275658.642 | W0814658.200 | 31119.7     |

NEAREST NGS PUBLISHED CONTROL POINT  
DO8901 777957 A N2809000023 W08133000054 3246.4

#### BASE STATION INFORMATION

STATION NAME: flwe a 1 (Wedgefield FL; Wedgefield, Florida USA)

MONUMENT: NO DOMES NUMBER

XYZ 869051.5075 -5544931.6670 3019536.5449 MON @ 2005.0000 (M)  
XYZ -0.0120 -0.0007 0.0021 VEL (M/YR)  
NEU 0.0000 0.0000 0.0000 MON TO ARP (M)  
NEU 0.0013 -0.0007 0.0888 ARP TO L1 PHASE CENTER (M)  
NEU 0.0005 0.0002 0.0818 ARP TO L2 PHASE CENTER (M)  
XYZ -0.1620 -0.0095 0.0284 VEL TIMES 13.5024 YRS  
XYZ 0.0000 0.0000 0.0000 MON TO ARP  
XYZ 0.0113 -0.0767 0.0434 ARP TO L1 PHASE CENTER  
XYZ 869051.3568 -5544931.7531 3019536.6167 L1 PHS CEN @ 2018.5032  
XYZ -0.0000 0.0000 0.0001 + XYZ ADJUSTMENTS  
XYZ 869051.3568 -5544931.7531 3019536.6168 NEW L1 PHS CEN @ 2018.5032  
XYZ 869051.3455 -5544931.6764 3019536.5733 NEW ARP @ 2018.5032  
XYZ 869051.3455 -5544931.6764 3019536.5733 NEW MON @ 2018.5032  
LLH 28 26 26.49879 278 54 26.80294 -4.9944 NEW L1 PHS CEN @ 2018.5032  
LLH 28 26 26.49875 278 54 26.80297 -5.0832 NEW ARP @ 2018.5032  
LLH 28 26 26.49875 278 54 26.80297 -5.0832 NEW MON @ 2018.5032

STATION NAME: wach a 1 (Wauchula; Wauchula, Florida, U.S.A.)

MONUMENT: NO DOMES NUMBER

XYZ 799335.5101 -5604081.2834 2928868.5861 MON @ 2005.0000 (M)  
XYZ -0.0117 0.0017 0.0004 VEL (M/YR)  
NEU 0.0000 0.0000 0.0000 MON TO ARP (M)  
NEU 0.0001 -0.0008 0.1242 ARP TO L1 PHASE CENTER (M)  
NEU -0.0000 -0.0008 0.1337 ARP TO L2 PHASE CENTER (M)  
XYZ -0.1585 0.0224 0.0053 VEL TIMES 13.5024 YRS  
XYZ 0.0000 0.0000 0.0000 MON TO ARP  
XYZ 0.0148 -0.1091 0.0575 ARP TO L1 PHASE CENTER  
XYZ 799335.3664 -5604081.3702 2928868.6489 L1 PHS CEN @ 2018.5032  
XYZ -0.0000 -0.0000 -0.0000 + XYZ ADJUSTMENTS  
XYZ 799335.3664 -5604081.3702 2928868.6489 NEW L1 PHS CEN @ 2018.5032  
XYZ 799335.3516 -5604081.2610 2928868.5914 NEW ARP @ 2018.5032  
XYZ 799335.3516 -5604081.2610 2928868.5914 NEW MON @ 2018.5032  
LLH 27 30 51.06279 278 7 3.36295 9.2623 NEW L1 PHS CEN @ 2018.5032  
LLH 27 30 51.06279 278 7 3.36298 9.1380 NEW ARP @ 2018.5032  
LLH 27 30 51.06279 278 7 3.36298 9.1380 NEW MON @ 2018.5032

STATION NAME: brtw a 3 (BARTOW; Bartow, Florida, U.S.A.)

MONUMENT: 49529S001

XYZ 805863.2966 -5580462.7024 2971581.0305 MON @ 2005.0000 (M)  
XYZ -0.0121 -0.0008 0.0002 VEL (M/YR)  
NEU 0.0000 0.0000 0.0000 MON TO ARP (M)  
NEU 0.0001 -0.0008 0.1242 ARP TO L1 PHASE CENTER (M)  
NEU -0.0000 -0.0008 0.1337 ARP TO L2 PHASE CENTER (M)

|     |                |                |              |                            |
|-----|----------------|----------------|--------------|----------------------------|
| XYZ | -0.1633        | -0.0103        | 0.0021       | VEL TIMES 13.5024 YRS      |
| XYZ | 0.0000         | 0.0000         | 0.0000       | MON TO ARP                 |
| XYZ | 0.0149         | -0.1087        | 0.0584       | ARP TO L1 PHASE CENTER     |
| XYZ | 805863.1482    | -5580462.8214  | 2971581.0909 | L1 PHS CEN @ 2018.5032     |
| XYZ | -0.0000        | -0.0000        | -0.0000      | + XYZ ADJUSTMENTS          |
| XYZ | 805863.1482    | -5580462.8214  | 2971581.0909 | NEW L1 PHS CEN @ 2018.5032 |
| XYZ | 805863.1333    | -5580462.7127  | 2971581.0326 | NEW ARP @ 2018.5032        |
| XYZ | 805863.1333    | -5580462.7127  | 2971581.0326 | NEW MON @ 2018.5032        |
| LLH | 27 56 58.66235 | 278 13 1.77785 | 12.1453      | NEW L1 PHS CEN @ 2018.5032 |
| LLH | 27 56 58.66235 | 278 13 1.77788 | 12.0211      | NEW ARP @ 2018.5032        |
| LLH | 27 56 58.66235 | 278 13 1.77788 | 12.0211      | NEW MON @ 2018.5032        |

#### REMOTE STATION INFORMATION

STATION NAME: 2534 1

MONUMENT: NO DOMES NUMBER

|     |             |               |              |                            |
|-----|-------------|---------------|--------------|----------------------------|
| XYZ | 827692.5359 | -5567540.5608 | 2989606.9052 | MON @ 2018.5028 (M)        |
| NEU | -0.0008     | -0.0011       | 1.9964       | MON TO ARP (M)             |
| NEU | 0.0008      | 0.0011        | 0.0748       | ARP TO L1 PHASE CENTER (M) |
| NEU | 0.0001      | -0.0022       | 0.0772       | ARP TO L2 PHASE CENTER (M) |
| XYZ | 0.2578      | -1.7420       | 0.9407       | MON TO ARP                 |
| XYZ | 0.0108      | -0.0648       | 0.0360       | ARP TO L1 PHASE CENTER     |
| XYZ | 827692.8045 | -5567542.3675 | 2989607.8819 | L1 PHS CEN @ 2018.5032     |

BASELINE NAME: flwe 2534

|     |              |                 |              |                            |
|-----|--------------|-----------------|--------------|----------------------------|
| XYZ | -0.0500      | 0.1470          | -0.1069      | + XYZ ADJUSTMENTS          |
| XYZ | 827692.7545  | -5567542.2206   | 2989607.7750 | NEW L1 PHS CEN @ 2018.5032 |
| XYZ | 827692.7437  | -5567542.1558   | 2989607.7390 | NEW ARP @ 2018.5032        |
| XYZ | 827692.4859  | -5567540.4138   | 2989606.7983 | NEW MON @ 2018.5032        |
| LLH | 28 8 2.41418 | 278 27 21.18522 | -3.0786      | NEW L1 PHS CEN @ 2018.5032 |
| LLH | 28 8 2.41416 | 278 27 21.18518 | -3.1534      | NEW ARP @ 2018.5032        |
| LLH | 28 8 2.41418 | 278 27 21.18522 | -5.1499      | NEW MON @ 2018.5032        |

BASELINE NAME: wach 2534

|     |              |                 |              |                            |
|-----|--------------|-----------------|--------------|----------------------------|
| XYZ | -0.0435      | 0.1499          | -0.1229      | + XYZ ADJUSTMENTS          |
| XYZ | 827692.7610  | -5567542.2177   | 2989607.7590 | NEW L1 PHS CEN @ 2018.5032 |
| XYZ | 827692.7502  | -5567542.1529   | 2989607.7230 | NEW ARP @ 2018.5032        |
| XYZ | 827692.4924  | -5567540.4109   | 2989606.7823 | NEW MON @ 2018.5032        |
| LLH | 28 8 2.41375 | 278 27 21.18547 | -3.0878      | NEW L1 PHS CEN @ 2018.5032 |
| LLH | 28 8 2.41373 | 278 27 21.18542 | -3.1627      | NEW ARP @ 2018.5032        |
| LLH | 28 8 2.41375 | 278 27 21.18547 | -5.1591      | NEW MON @ 2018.5032        |

BASELINE NAME: brtw 2534

|     |              |                 |              |                            |
|-----|--------------|-----------------|--------------|----------------------------|
| XYZ | -0.0407      | 0.1390          | -0.1307      | + XYZ ADJUSTMENTS          |
| XYZ | 827692.7638  | -5567542.2285   | 2989607.7512 | NEW L1 PHS CEN @ 2018.5032 |
| XYZ | 827692.7530  | -5567542.1637   | 2989607.7152 | NEW ARP @ 2018.5032        |
| XYZ | 827692.4952  | -5567540.4218   | 2989606.7745 | NEW MON @ 2018.5032        |
| LLH | 28 8 2.41336 | 278 27 21.18551 | -3.0817      | NEW L1 PHS CEN @ 2018.5032 |
| LLH | 28 8 2.41334 | 278 27 21.18547 | -3.1565      | NEW ARP @ 2018.5032        |
| LLH | 28 8 2.41336 | 278 27 21.18551 | -5.1530      | NEW MON @ 2018.5032        |

## G-FILES

Axx2018 7 3 18 7 3

B2018 7 31236 18 7 31853 1 page5 v1603.24IGS 126 1 2 27NGS 2018 719IFDDPX  
IIGS08\_1930 IGS 20170101  
C00090005 413588596 9 226087374 34 299297750 20 X1848A2534X1848AFLWE  
D 1 2 -5116860 1 3 6356472 2 3 -9274531

Axx2018 7 3 18 7 3

B2018 7 31236 18 7 31853 1 page5 v1603.24IGS 126 1 2 27NGS 2018 719IFDDPX  
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C00090003 -283571408 6 -365408501 30 -607381909 16 X1848A2534X1848AWACH  
D 1 2 -4537074 1 3 5645625 2 3 -8783860

Axx2018 7 3 18 7 3

B2018 7 31236 18 7 31853 1 page5 v1603.24IGS 126 1 2 27NGS 2018 719IFDDPX  
IIGS08\_1930 IGS 20170101  
C00090004 -218293619 6 -129222910 26 -180257419 14 X1848A2534X1848ABRTW  
D 1 2 -3301233 1 3 4904496 2 3 -8993029

### POST-FIT RMS BY SATELLITE VS. BASELINE

|           | OVERALL | 01    | 02    | 03    | 06    | 07    | 08    | 09    | 11    |
|-----------|---------|-------|-------|-------|-------|-------|-------|-------|-------|
| flwe-2534 | 0.025   | 0.023 | 0.033 | 0.027 | 0.029 | 0.019 | 0.022 | 0.018 | 0.023 |
|           | 13      | 16    | 17    | 18    | 19    | 22    | 23    | 24    | 27    |
| flwe-2534 | 0.008   | 0.034 | 0.027 | 0.027 | 0.030 | 0.029 | 0.023 | 0.017 | 0.029 |
|           | 28      | 30    |       |       |       |       |       |       |       |
| flwe-2534 | 0.025   | 0.021 |       |       |       |       |       |       |       |

|           | OVERALL | 01    | 02    | 03    | 06    | 07    | 08    | 09    | 11    |
|-----------|---------|-------|-------|-------|-------|-------|-------|-------|-------|
| wach-2534 | 0.020   | 0.020 | 0.035 | 0.028 | 0.028 | 0.034 | 0.016 | 0.012 | 0.015 |
|           | 13      | 16    | 17    | 18    | 19    | 22    | 23    | 24    | 27    |
| wach-2534 | ...     | 0.017 | 0.022 | 0.017 | 0.026 | 0.029 | 0.016 | 0.045 | 0.015 |
|           | 28      | 30    |       |       |       |       |       |       |       |
| wach-2534 | 0.020   | 0.019 |       |       |       |       |       |       |       |

|           | OVERALL | 01    | 02    | 03    | 06    | 07    | 08    | 09    | 11    |
|-----------|---------|-------|-------|-------|-------|-------|-------|-------|-------|
| brtw-2534 | 0.020   | 0.020 | 0.036 | 0.031 | 0.024 | 0.030 | 0.015 | 0.014 | 0.017 |
|           | 13      | 16    | 17    | 18    | 19    | 22    | 23    | 24    | 27    |
| brtw-2534 | ...     | 0.017 | 0.017 | 0.018 | 0.028 | 0.031 | 0.018 | 0.028 | 0.014 |
|           | 28      | 30    |       |       |       |       |       |       |       |
| brtw-2534 | 0.018   | 0.020 |       |       |       |       |       |       |       |

### OBS BY SATELLITE VS. BASELINE

|           | OVERALL | 01  | 02  | 03  | 06  | 07  | 08  | 09  | 11  |
|-----------|---------|-----|-----|-----|-----|-----|-----|-----|-----|
| flwe-2534 | 5326    | 490 | 61  | 223 | 240 | 20  | 401 | 319 | 589 |
|           | 13      | 16  | 17  | 18  | 19  | 22  | 23  | 24  | 27  |
| flwe-2534 | 1       | 75  | 498 | 404 | 333 | 253 | 199 | 19  | 212 |
|           | 28      | 30  |     |     |     |     |     |     |     |
| flwe-2534 | 395     | 594 |     |     |     |     |     |     |     |
|           | OVERALL | 01  | 02  | 03  | 06  | 07  | 08  | 09  | 11  |
| wach-2534 | 5411    | 529 | 66  | 211 | 269 | 47  | 390 | 330 | 568 |

|           |         |     |     |     |     |     |     |     |     |
|-----------|---------|-----|-----|-----|-----|-----|-----|-----|-----|
|           | 13      | 16  | 17  | 18  | 19  | 22  | 23  | 24  | 27  |
| wach-2534 | ...     | 90  | 498 | 454 | 330 | 46  | 242 | 42  | 207 |
|           | 28      | 30  |     |     |     |     |     |     |     |
| wach-2534 | 438     | 654 |     |     |     |     |     |     |     |
|           | OVERALL | 01  | 02  | 03  | 06  | 07  | 08  | 09  | 11  |
| brtw-2534 | 5851    | 525 | 79  | 247 | 267 | 65  | 428 | 329 | 619 |
|           | 13      | 16  | 17  | 18  | 19  | 22  | 23  | 24  | 27  |
| brtw-2534 | ...     | 104 | 496 | 471 | 326 | 263 | 240 | 35  | 249 |
|           | 28      | 30  |     |     |     |     |     |     |     |
| brtw-2534 | 446     | 662 |     |     |     |     |     |     |     |

ITRF position of 2534 as determined by individual baselines

|      |            |              |             |
|------|------------|--------------|-------------|
|      | X          | Y            | Z           |
| flwe | 827692.486 | -5567540.414 | 2989606.798 |
| wach | 827692.492 | -5567540.411 | 2989606.782 |
| brtw | 827692.495 | -5567540.422 | 2989606.774 |

Residuals of position determined by individual baselines from the final position

|      |        |        |        |        |        |        |
|------|--------|--------|--------|--------|--------|--------|
|      | X      | Y      | Z      | East   | North  | Up     |
| flwe | -0.005 | 0.002  | 0.013  | -0.005 | 0.013  | 0.004  |
| wach | 0.001  | 0.005  | -0.003 | 0.002  | -0.000 | -0.005 |
| brtw | 0.004  | -0.006 | -0.011 | 0.003  | -0.013 | 0.001  |

Covariance Matrix for the xyz OPUS Position (meters^2).

|               |               |               |
|---------------|---------------|---------------|
| 0.0000005800  | -0.0000000836 | 0.0000000413  |
| -0.0000000836 | 0.0000064200  | -0.0000003357 |
| 0.0000000413  | -0.0000003357 | 0.0000020089  |

Covariance Matrix for the enu OPUS Position (meters^2).

|               |               |               |
|---------------|---------------|---------------|
| 0.0000006820  | 0.0000003534  | -0.0000006835 |
| 0.0000003534  | 0.0000026769  | -0.0000015958 |
| -0.0000006835 | -0.0000015958 | 0.0000056501  |

Horizontal network accuracy = 0.00336 meters.

Vertical network accuracy = 0.00466 meters.

Derivation of NAD 83 vector components

Position of reference station ARP in NAD\_83(2011)(EPOCH:2010.0000).

|      |              |                |               |
|------|--------------|----------------|---------------|
|      | Xa(m)        | Ya(m)          | Za(m)         |
| FLWE | 869052.16380 | -5544933.23814 | 3019536.73114 |
| WACH | 799336.16446 | -5604082.84993 | 2928868.77127 |
| BRTW | 805863.95044 | -5580464.27627 | 2971581.21134 |

Position of reference station monument in NAD\_83(2011)(EPOCH:2010.0000).

|      |              |                |               |
|------|--------------|----------------|---------------|
|      | Xr(m)        | Yr(m)          | Zr(m)         |
| FLWE | 869052.16380 | -5544933.23814 | 3019536.73114 |
| WACH | 799336.16446 | -5604082.84993 | 2928868.77127 |
| BRTW | 805863.95044 | -5580464.27627 | 2971581.21134 |

Velocity of reference station monument in NAD\_83(2011)(EPOCH:2010.0000).

|      | Vx (m/yr) | Vy (m/yr) | Vz (m/yr) |
|------|-----------|-----------|-----------|
| FLWE | -0.01200  | -0.00070  | 0.00210   |
| WACH | -0.01170  | 0.00170   | 0.00040   |
| BRTW | -0.01210  | -0.00080  | 0.00020   |

Vectors from unknown station monument to reference station monument  
in NAD\_83(2011)(EPOCH:2010.0000).

|      | Xr-X= DX(m)  | Yr-Y= DY(m)  | Zr-Z= DZ(m)  |         |
|------|--------------|--------------|--------------|---------|
| FLWE | 41358.85780  | 22608.74086  | 29929.78314  | 2010.00 |
| WACH | -28357.14154 | -36540.87093 | -60738.17673 | 2010.00 |
| BRTW | -21829.35556 | -12922.29727 | -18025.73666 | 2010.00 |

STATE PLANE COORDINATES - U.S. Survey Foot

SPC (0901 FL E)  
Northing (Y) [feet] 1381813.253  
Easting (X) [feet] 480804.281  
Convergence [degrees] -0.25657222  
Point Scale 0.99997642  
Combined Factor 0.99997699

\*\*\*\*\* New Reference Frame Preview \*\*\*\*\*

We are replacing the nation's NAD 83 and NAVD 88 datums, to improve access and accuracy of the National Spatial Reference System. More at <https://geodesy.noaa.gov/datums/newdatums/>

Below are approximate coordinates for this solution in the new frames:

APPROX ORTHO HGT: 23.724 (m) [PROTOTYPE (Computed using xGeoid17B,GRS80,IGS08)]

This position and the above vector components were computed without any knowledge by the National Geodetic Survey regarding the equipment or field operating procedures used.



29/1928

SWFWMD

18677

DMIT WETLAND AND WELL (North)

SNELL CREEK

128  
2534

SNELL CREEK WELL POS-16 EAST

START TIME 11:25 AM

STOP TIME 5:30 PM

HI: 6.55

128  
6916

SNELL CREEK WELL POS-17 WEST

START TIME 11:43

STOP TIME 6:24 PM

HI: 6.55

6-27-18 91°  
WEDNESDAY PARTLY CLOUDY

30/1928  
BICKEL  
PRICE



47/928

SWFWMD

18677

DMIT Wetland Well

SWELL CREEK

TC10 ROVER

7093

TC10 BASE

RTK FILE = 18677-070318

5006

TSC3

2944

(100)  
BASE @ POS-17 BRASS DISC IN S.E  
CORNER of CONC PAD

H1 = 6.55

FIXED ROD = 6.90

Pos-18 Lmark(E) Z00 CHECK POS-18 AT LAKE MARION CREEK

Z01 CHECK Z00

Pos-19 Lmark(W) Z02 CHECK POS-19 AT LAKE MARION CREEK

Z03 CHECK Z02

Pos-16 SWELL(E) Z04 POS-16 SWELL(E)

Z05 CHECK Z04

Z06 SC1 1.1

Z07 SC1 1.2

Z08 SC1 1.3

Z09 Bolt 1

Z10 Bolt 2

Z11 TOP OF BOARD

Z12 SHW1

Z13 SHW2

STAFF GAUGE

7-3-18

TUESDAY

CLEAR

85°

48/928

BICKEL

CHINIS

Z14 SET 5/8" SRC "REFLB364"

Z15 CHECK Z14

Z16 BAD

Z17 SET 5/8" SRC "REFLB364"

Z18 SET Good

Z19 CK Z18

Z20 CK Z17

Z21 SC3 1.2

Z22 SC3 1.1

Z23 SC3 1.3

Z24 CK Z23

Z25 CK Z22

Z26 CK Z21

Z27 BAD

Z28 BASE CK @ Z04 POS-16



49/928

SWEWMD

18677

DIMIT WETLAND, WELL

SWELL CREEK

5/8" SRC "REF LB 364"

START TIME 8:34 AM

STOP TIME 4:57 PM

HI=6.55

R8  
7534

7-3-18

TUESDAY

LEVEL FROM POS-16 → GPS# 214

50/928

BRICKEL  
CHAVIS

| +     | HI     | EL    | BMEL   | DESC                                               |
|-------|--------|-------|--------|----------------------------------------------------|
| 5.152 | 80.345 |       | 75.193 | Pos-16<br>BRASS DISC<br>@ S.E. CORNER<br>CONC PAD  |
| 6.950 | 80.293 | 7.002 | 73.343 | 73.374<br>SET 5/8" SRC<br>"REF LB 364"<br>GPS# 214 |
|       |        | 5.16  | 75.193 | 75.193                                             |



5/1/928

S5

TSC3

2944

SWIFWAD

18677

SWELL CREEK

Access File = 18677-070318c

1@ 214 BS 204

H1=5.06

BsH1=7.00

Rad=5.00

Bsck=300

301 Sc1 1.1

302 Sc1 1.2

303 Sc1 1.3

304 GRND @ STAFF GAUGE

305 Bolt 1

306 Bolt 2

307 Top of BOLTED

308 SHW 2

309 SHW 1

310 SHW 3

311 Bsck

312 CK 310

313 CK 309

314 CK 308

STAFF GAUGE

7-3-18

TUESDAY

5/1/928

BICKEL  
CHAINS

315 CK 307

316 CK 306

317 CK 305

318 CK 303

319 CK 302

320 CK 301

321 Bsck

322 CK 301

323 CK 302

324 CK 303

325 CK 305

326 CK 306

327 CK 307

328 CK 308

329 CK 309

330 CK 310

331 Bsck



53/1928

SWEWMD

18677

SWELL CREEK

LEVEL BETWEEN 217 AND 218

| +     | HI    | - | EL |
|-------|-------|---|----|
| 5.040 | 79.98 |   |    |

|       |       |       |       |
|-------|-------|-------|-------|
| 4.790 | 79.96 | 4.810 | 75.17 |
|-------|-------|-------|-------|

|  |       |       |
|--|-------|-------|
|  | 5.020 | 74.94 |
|--|-------|-------|

7-3-18

TUESDAY

54/1928

BICKEL  
CHAVIS

BMEL DESC

74.940 5/8" SIZE "REFUB 3/4" GPS 217

SET BRIDGE SPIKE GPS 218

74.94 C-ABOVE



55/928

SWEWMO  
18677  
SNELL CREEK

ACCESS FILE: 18677-070318C

100 217 BS 218

HI=5.22

BSHI=7.00

ROD=5.00 → 8.50

Bsck=332

333 SC1 3-1

334 SC1 3-2

335 SC1 3-3

336 Bsck

337 CK 335

338 CK 334

339 CK 333

340 Bsck

341 CK 333

342 CK 334

343 CK 335

344 Bsck

7-3-18

TUESDAY

80°  
CLOUDY/RAINY

56/928

BICKEL  
CHAVIS



57/928

SWFWMD

18677

SWELL CREEK

Rto BASE

5006

Rto ROVER

To 93

TSC3

2944

Rtk File-18677-070518

BASE@100(Pos-17)

HI=6.55

Fixed Rod=6.90

229 CHECK 204 (Pos-16)

230 CHECK 214

231 5/8" SFC "REF 18364" (Static Point)

232 CHECK 231

233 CK 221

234 CK 222

235 CK 223

236 SC1 2.1

237 SC1 2.2

238 SC1 2.3

239 CK 238

240 CK 237

241 CK 236

242 CK 236

243 CK 237

244 CK 238

7-5-18

THURSDAY

58/928

BRICKEL  
CHAVIS  
REESE

245 SC2 3.1

246 SC2 3.2

247 Bolt 1

248 Bolt 2

249 TOP of BOARD

250 CK 245

251 CK 246

252 CK 247

253 CK 248

254 CK 249

255 GRIND SHOT

256 CK 245

257 CK 246

258 CK 247

259 CK 248

260 CK 249

261 SC2 1.1

262 SC2 1.2

263 CK 261

264 CK 262

265 CK 261

266 CK 262

SC2 SG



59/1928

SWFWMD

18677

SNELL CREEK

ITK FILE: 18677-070518

267 SCZ 2.1

268 CK 267

269 CK 267

270 CK 249

271 SCZ SH3

272 CK 271

273 CK 271

274 SCZ SH2

275 CK 274

276 CK 274

277 CK 274

278 CK 274

279 SCZ SH1

280 CK 279

281 CK 279

282 CK 204

7-5-18  
THURSDAY

60/1928

BRICKEL  
CHANNIS  
REESE

283

↓ } Topo @ Pos-16

290

291

↓ } Topo @ Pos-17

296

297 CK 204



Cal 1978

SWFWMD

18677

SNELL CREEK

Pos-16

| +    | HI     | - | EL |
|------|--------|---|----|
| 4.99 | 80.183 |   |    |

|  |  |      |        |
|--|--|------|--------|
|  |  | 1.36 | 78.823 |
|--|--|------|--------|

|      |        |      |        |
|------|--------|------|--------|
| 4.83 | 80.033 | 4.98 | 75.203 |
|------|--------|------|--------|

|  |  |      |        |
|--|--|------|--------|
|  |  | 4.84 | 75.193 |
|--|--|------|--------|

NOTE MEASURE DOWN FROM TOP OF METAL CASING  
TO WATER TABLE = 8.15.

4:25 PM

WATER ELEV = 70.673

7-5-18  
THURSDAY

621  
1978

BICKEL  
CHAVIS  
REESE

BMEL DESC

75.193 BRASS DISC IN N.E. CORNER OF  
CONC PAD @ POS-16

NORTH RIM OF 4'1/8" METAL CASING  
(POS-16)

NORTH SIDE OF POS-16 ON CONC  
PAD

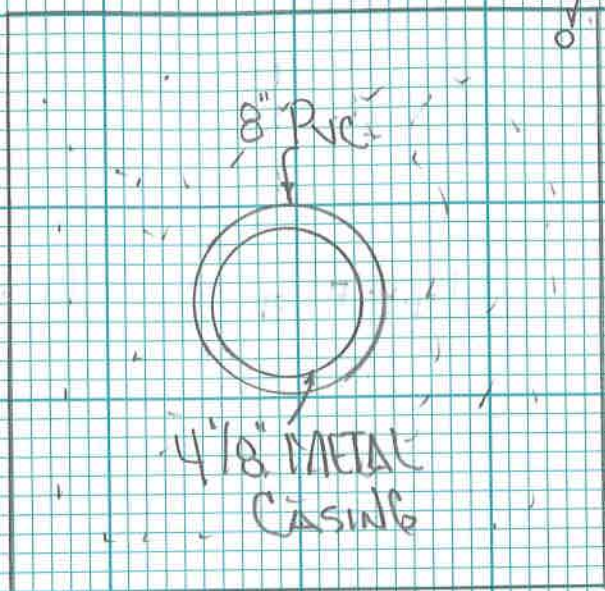
BRASS DISC (POS-16)



63/928

SWFWMD  
18677  
SNELL CREEK  
POS-16

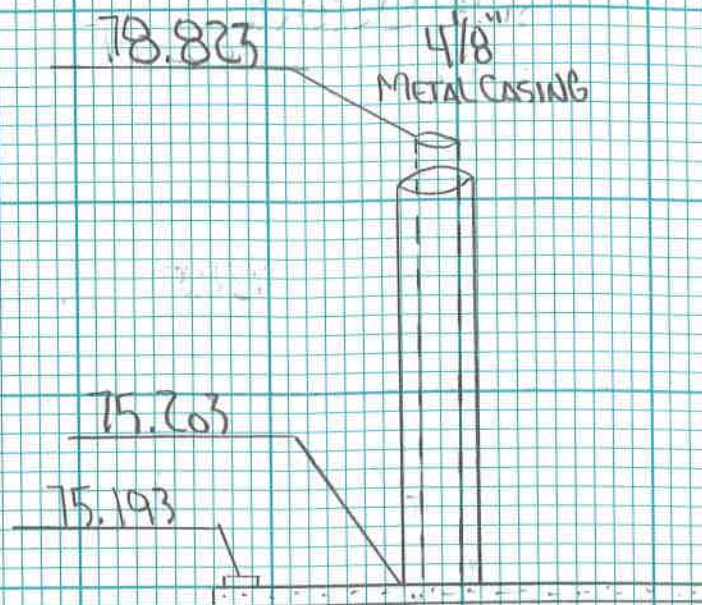
BRASS  
DISC



7-5-18  
THURSDAY

64/1928

BICKEL  
CHAVIS  
REESE



FACING EAST  
POS-16



65/928 7.45

SWFWMD  
186.77  
S. JELL CREEK

| +    | HI     | -    | EL     |
|------|--------|------|--------|
| 4.83 | 81.122 |      |        |
|      |        | 0.78 | 80.342 |
| 4.78 | 81.052 | 4.85 | 76.272 |
|      |        | 4.76 | 76.292 |

NOTE MEASURE DOWN FROM TOP OF CASING  
TO WATER TABLE = 7.45

5:10 PM

WATER ELEV = 72.892

7-5-18  
THURSDAY

66/928

BICKEL  
CHAMBERS  
REESE

BMEL DESC

76.292 BRASS DISC W N.E. CORNER  
OF CONC PAD @ POS-17

NORTH RIM OF 4" 1/8" METAL CASING  
POS-17

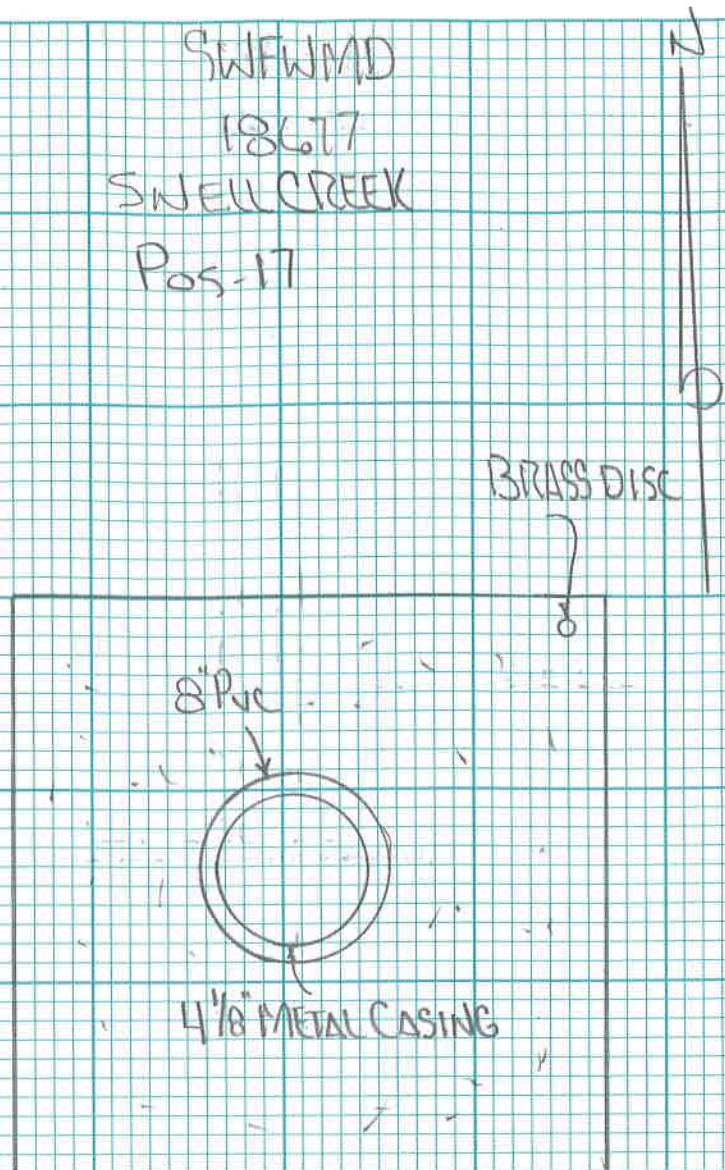
NORTH SIDE OF POS-17 CONC PAD

76.292 BRASS DISC (POS-17)



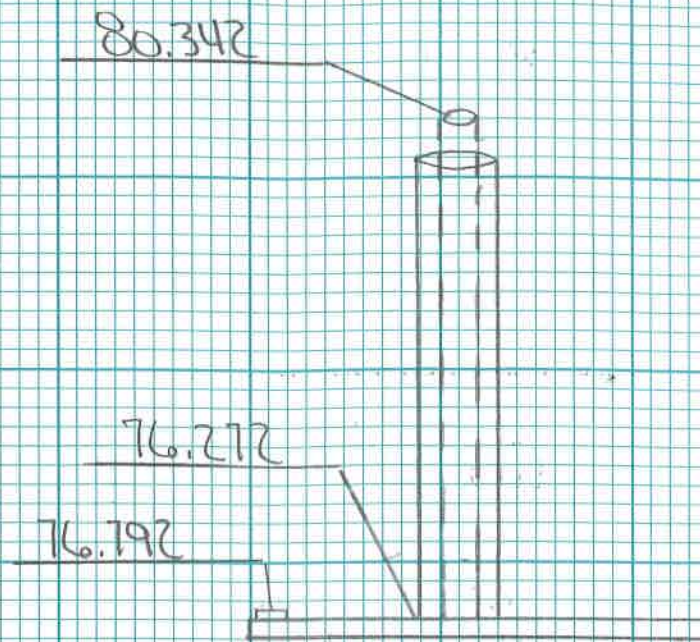
67/1928

SWFWMD  
18617  
SWEEL CREEK  
Pos-17



7-5-18  
THURSDAY

68/1928  
BICKEL  
CHAVIS  
REESE



Pos-17  
Facing East



83/928

18678

SWFUND

~~EXPERIMENTAL CREEK~~

SNELL CREEK

R 8

2534

SNELL E POS = 16

START TIME 9:30 AM

STOP TIME 4:21 PM

HI = 6.55

7-9-18

MONDAY

84/928

DICKER

FRED



137/928

SWF M/D  
18677  
SNELL CREEK  
POS-17

| +     | HI     | - | ELEV. |
|-------|--------|---|-------|
| 4.425 | 80.717 |   |       |

NOTES 1:44 PM 7/26/18  
MEASURE DOWN FROM  
TOP OF CASING TO  
WATER TABLE: 8.85  
WATER ELEV: 71.368

|       |        |
|-------|--------|
| 4.436 | 76.221 |
|-------|--------|

|       |        |
|-------|--------|
| 4.495 | 76.222 |
|-------|--------|

|       |        |
|-------|--------|
| 4.480 | 76.237 |
|-------|--------|

|       |        |
|-------|--------|
| 4.465 | 76.252 |
|-------|--------|

7-26-18  
THURSDAY

138/928

DIDION  
BICKEL

| BHEL   | DESC.                                          | NE |
|--------|------------------------------------------------|----|
| 76.292 | BRASS DISC @ NW CORNER OF<br>CONC PAD (POS-17) |    |

W: RIM OF 4 3/16" METAL CASING  
POS-17

NE CORNER OF CONC PAD

SE CORNER OF CONC PAD

SW CORNER OF CONC PAD

NW CORNER OF CONC PAD



139/928

SWFVMD  
18677  
SNELL CREEK  
POS-17

+

HI

-

ELEV.

4.480

76.237

4.530

76.187

4.530

76.187

4.538

76.179

.368

80.586

.499

80.218

4.296

76.290

7-26-18  
THURSDAY

140/928

DIDION  
BICKEL

DIFF

BMEL

DESC.

76.292

NE. GND

SE GND

SW GND

NW GND

N. RIM OF 3" PVC PIPE

-0.002

76.292

BRASS DISC @ <sup>NE</sup> NW CORNER OF  
CONC PAD POS-17



141/928

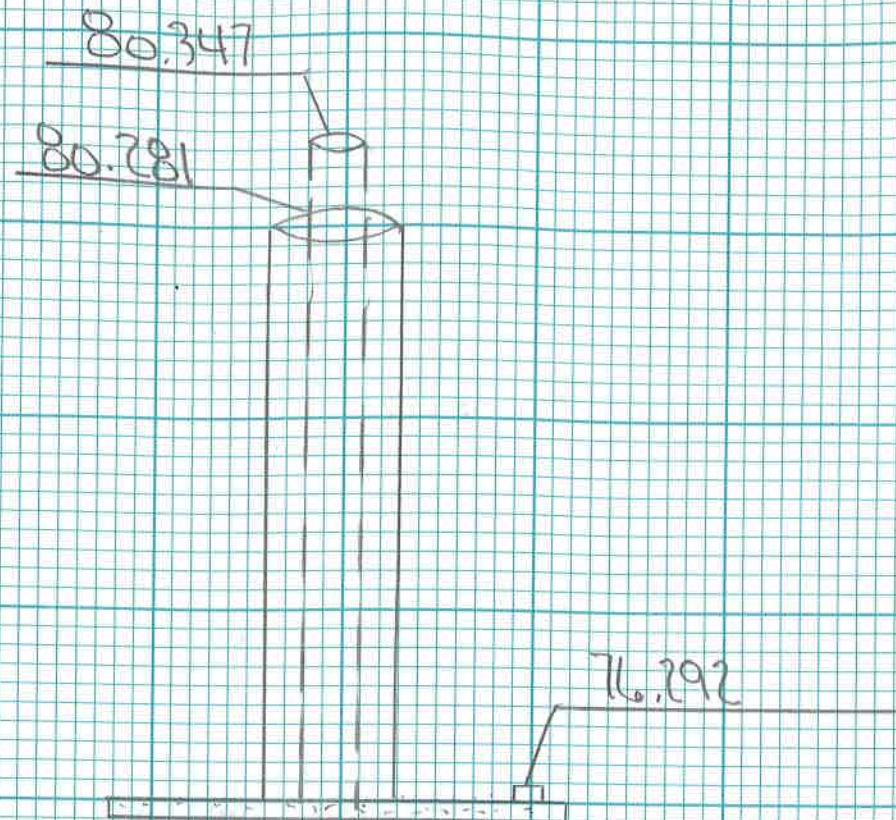
SWTWMID  
18677  
S JELL CREEK



7-26-18

142/928

THURSDAY



PICTURES

8575 BRASS DISC STAMPED "POS-17"

8576 } BLUE TAG

8577

8578 MEASURE METAL CASING

8579 METAL CASING

8580 POS-17 WEST

8581 } POS-17 NORTH

8582

BRASS DISC  
STAMPED "POS-17"



HB/928

SW FWD  
18677  
SUELL CREEK  
POS. 16

| +     | HI     | - | ELEV. |
|-------|--------|---|-------|
| 4.900 | 80.093 |   |       |

NOTES

2:55 pm 7-26-18  
MEASURE DOWN FROM  
TOP OF CASING TO  
WATER TABLE: 7.7  
WATER ELEV: 70.878

1.271 78.822

4.905 75.188

4.924 75.169

4.883 75.210

4.881 75.212

7-26-18  
THURSDAY

144/928

DION  
BICKELBMEL  
75.193DESC.  
BRASS DISC. @ NE CORNER OF  
CONC PAD (POS. 16)N. RIM OF 4 3/16" METAL CASING  
POS-

NE CORNER OF CONC PAD

SE CORNER OF CONC PAD

SW CORNER OF CONC PAD

NW CORNER OF CONC PAD



145/928

SWFWMD  
18677  
SWEET CREEK  
POS- 16

+

H1

-

ELEV.

5.030

75.063

5.109

74.984

4.998

75.095

4.962

75.131

1.328

79.956

1.465

76.528

4.760

~~4.896~~

75.196

7-26-18  
THURSDAY

146/928

DIDION  
BICKEL

DIFF

BMFC

75.193

DESC

NE GND

SE GND

SW GND

NW GND

N. RIM OF 8" PVC PIPE

2.003

75.193

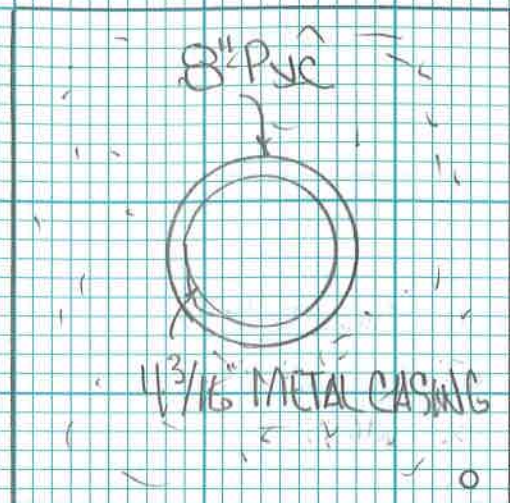
BRASS DISK @ NE CORNER OF  
CONC PAD



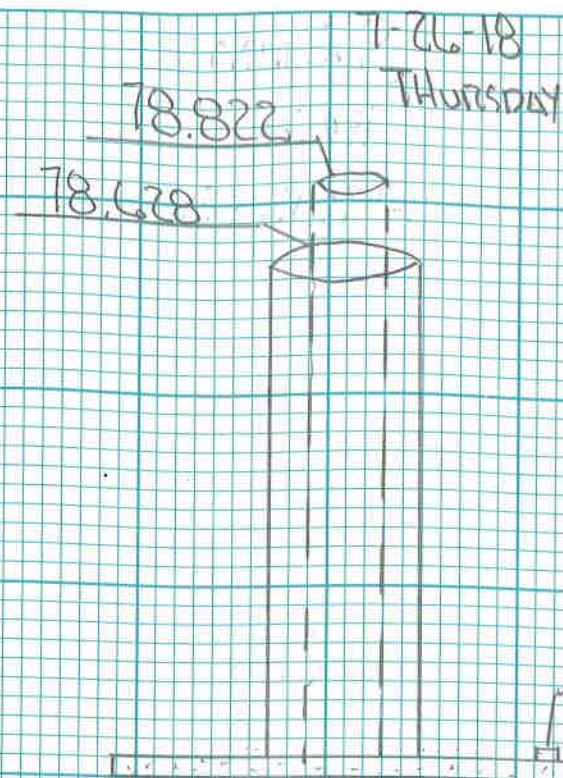
147/928

SWFWMD  
18677  
SWELL CREEK

Pos-16



BRASS DISC



7-26-18  
THURSDAY

148/928  
BICKEL  
DIDION

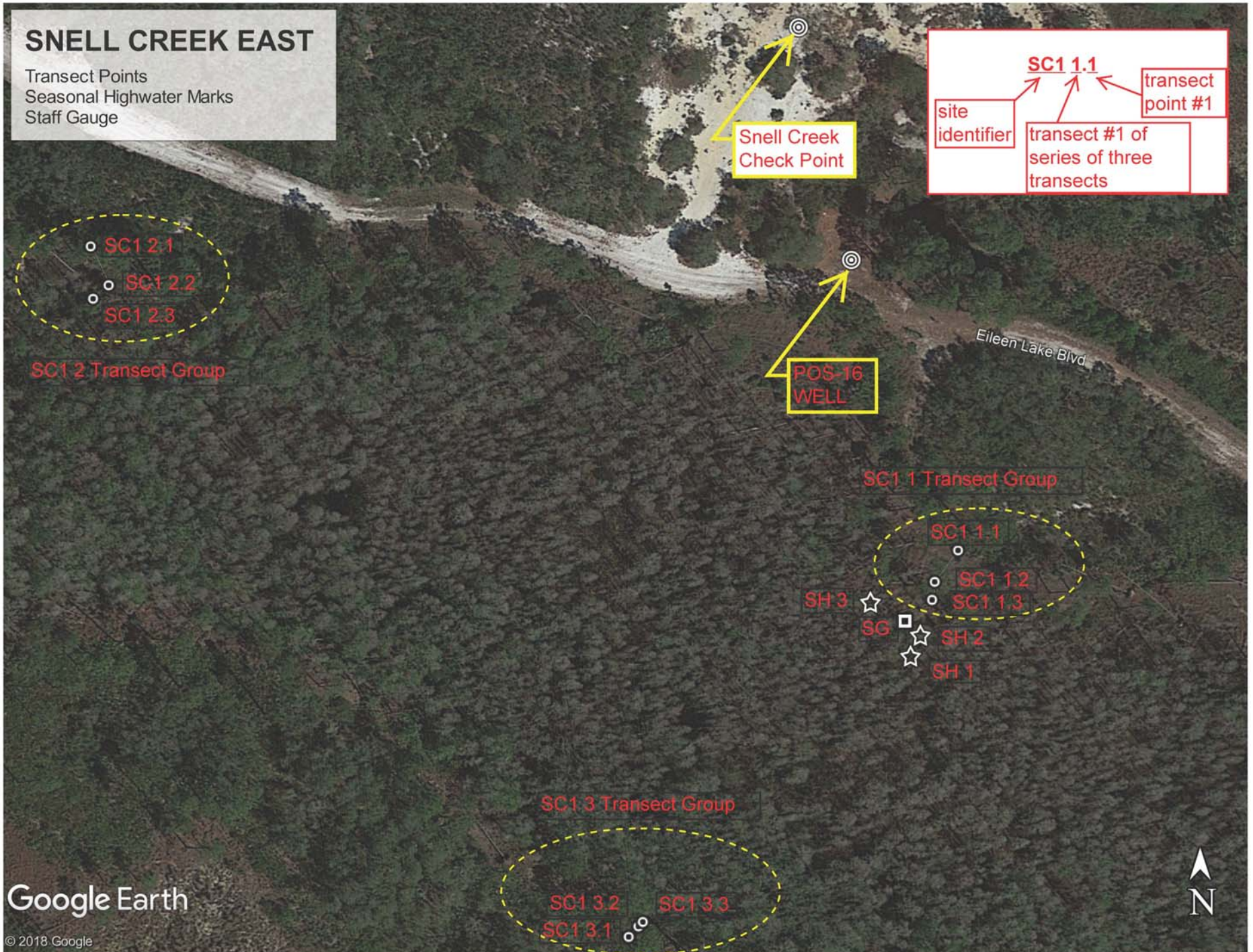
### PICTURES

- 8583 BRASS DISC STAMPED "Pos-16"
- 8584 BLUE TAG @ Pos-16
- 8585 Pos-16 WEST
- 8586 MEASURE METAL CASING
- 8587 METAL CASING
- 8588 Pos-16 NORTH

BRASS DISC STAMPED  
"Pos-16"



# SNELL CREEK EAST



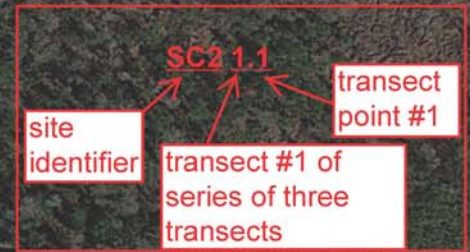


# SNELL CREEK WEST & HERB

## SNELL CREEK WEST & HERB

Transect Points  
Seasonal Highwater Marks  
Staff Gauge

SH 3 ☆ SH 1  
SH 2



SG □

SC2 3.2

SC2 3.1

SC2 3 Transect Group

SC2 2.1

SC2 2 Transect Group

SC2 1.2

SC2 1.1

SC2 1 Transect Group

POS-17  
WELL

Eileen Lake Blvd

SC3 1.2

SC3 1.1

SC3 1 Transect Group

SC3 1.3

Google Earth

© 2018 Google





# SNELL CREEK EAST

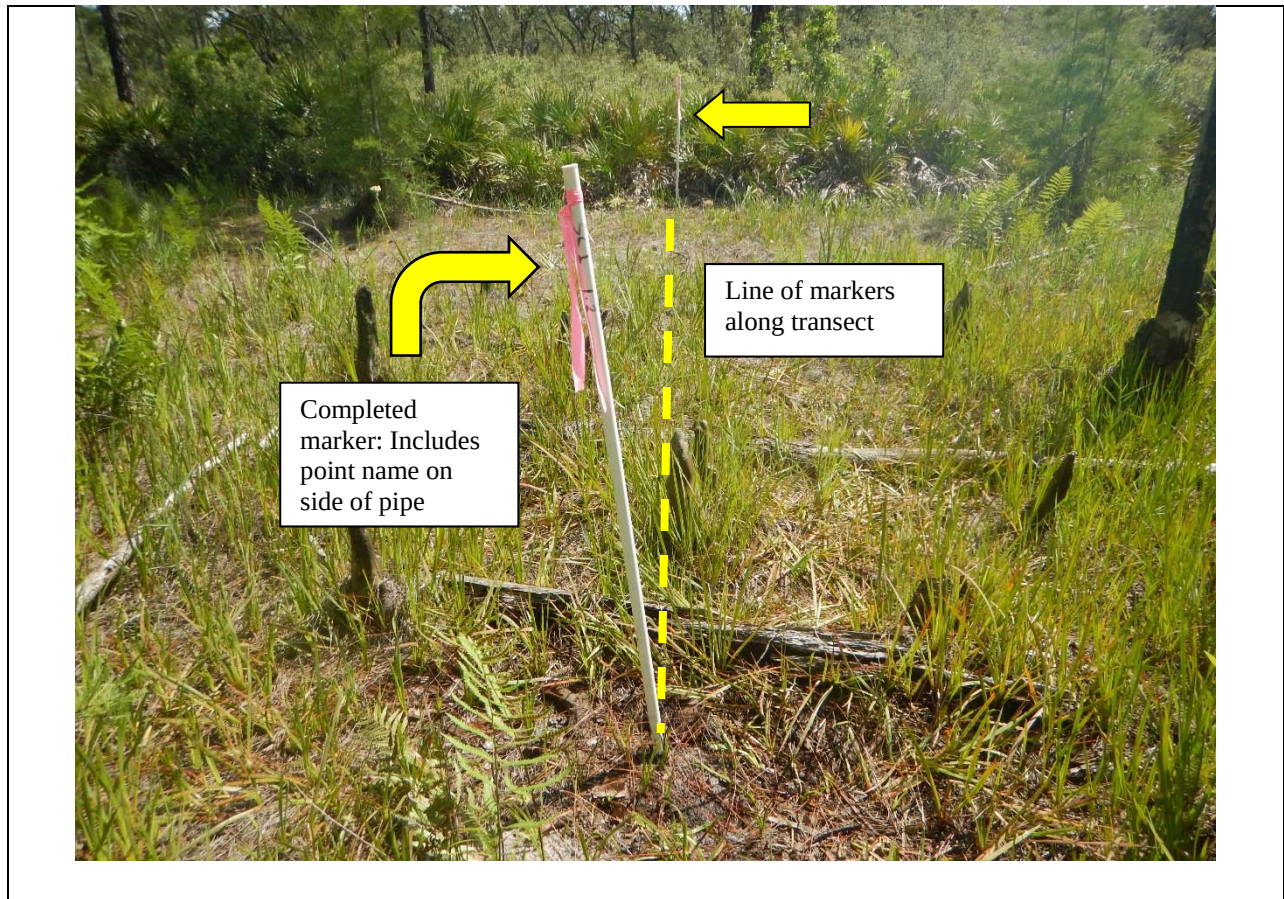
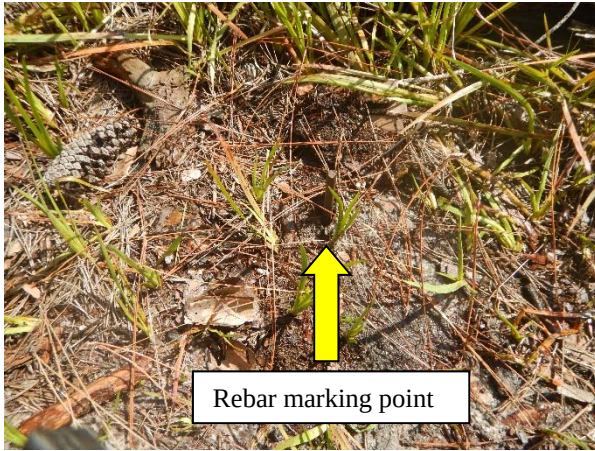
| Soil Transects – SC1 1 Transect Group                                                                                                                   |                                   |                                              |
|---------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|----------------------------------------------|
| <b>SC1 1.1</b>                                                                                                                                          | <b>Wetland Boundary</b>           |                                              |
| LATITUDE: 28° 07' 58.91362" (N)                                                                                                                         | LONGITUDE: 081° 32' 37.57891" (W) |                                              |
| NORTHING: 1381461.38                                                                                                                                    | EASTING: 480911.45                |                                              |
| ELEVATION: 73.71 ft. (NAVD 88)                                                                                                                          | 22.467 m                          | RTK GPS                                      |
| ELEVATION: 74.65 ft. (NGVD 29)                                                                                                                          | 22.753 m                          | 0.938 ft. (conversion factor) Corpscon 6.0.1 |
| <div> <div>No picture available for Rebar marking point</div>  </div> |                                   |                                              |





# SNELL CREEK EAST

| Soil Transects – SC1 1 Transect Group |                                   |                                              |
|---------------------------------------|-----------------------------------|----------------------------------------------|
| <b>SC1 1.2</b>                        | <b>Hydric at Surface</b>          |                                              |
| LATITUDE: 28° 07' 58.69643" (N)       | LONGITUDE: 081° 32' 37.75668" (W) |                                              |
| NORTHING: 1381439.52                  | EASTING: 480895.43                |                                              |
| ELEVATION: 72.66 ft. (NAVD 88)        | 22.147 m                          | RTK GPS                                      |
| ELEVATION: 73.60 ft. (NGVD 29)        | 23.433 m                          | 0.938 ft. (conversion factor) Corpscon 6.0.1 |



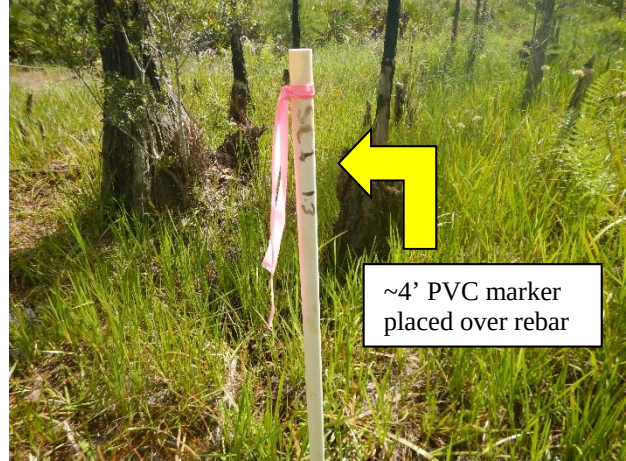


# SNELL CREEK EAST

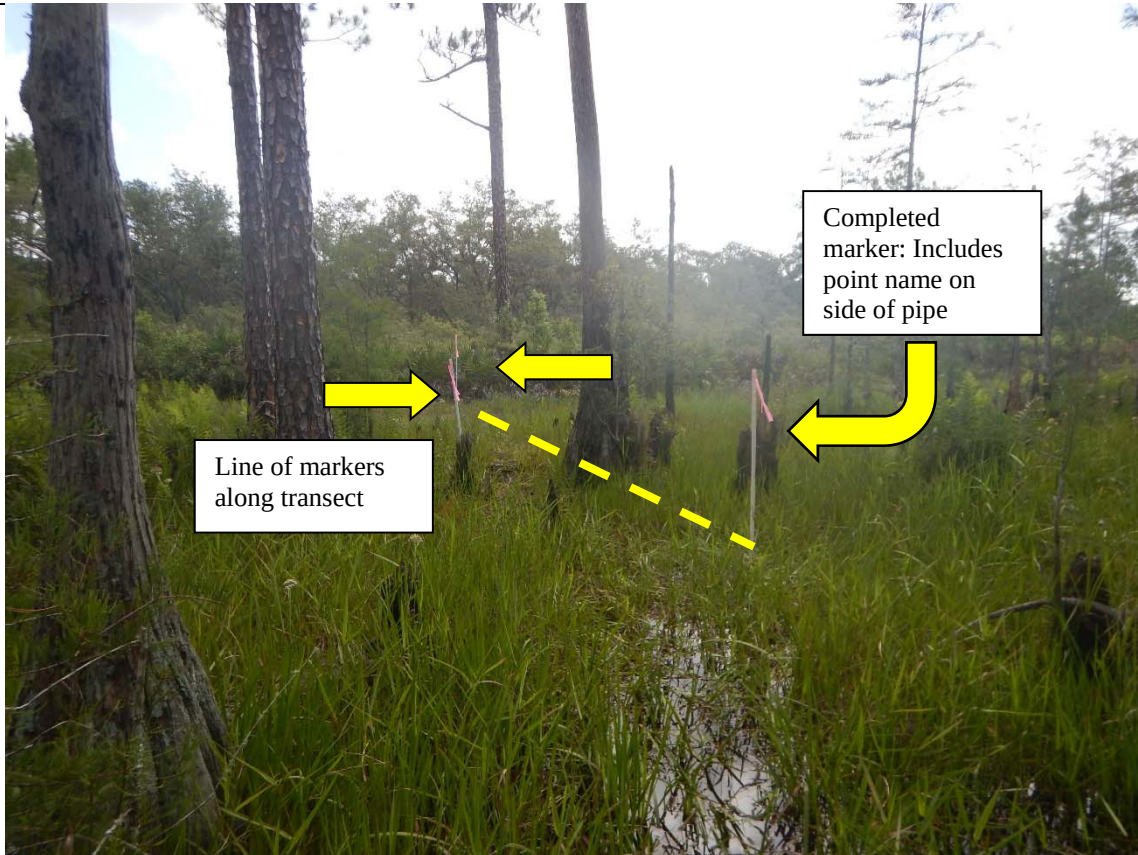
| Soil Transects – SC1 1 Transect Group |                                   |                                              |
|---------------------------------------|-----------------------------------|----------------------------------------------|
| <b>SC1 1.3</b>                        | <b>Muck at Surface</b>            |                                              |
| LATITUDE: 28° 07' 58.57872" (N)       | LONGITUDE: 081° 32' 37.77659" (W) |                                              |
| NORTHING: 1381427.64                  | EASTING: 480893.60                |                                              |
| ELEVATION: 72.56 ft. (NAVD 88)        | 22.116 m                          | RTK GPS                                      |
| ELEVATION: 73.50 ft. (NGVD 29)        | 22.402 m                          | 0.938 ft. (conversion factor) Corpscon 6.0.1 |



Rebar marking point



~4' PVC marker placed over rebar



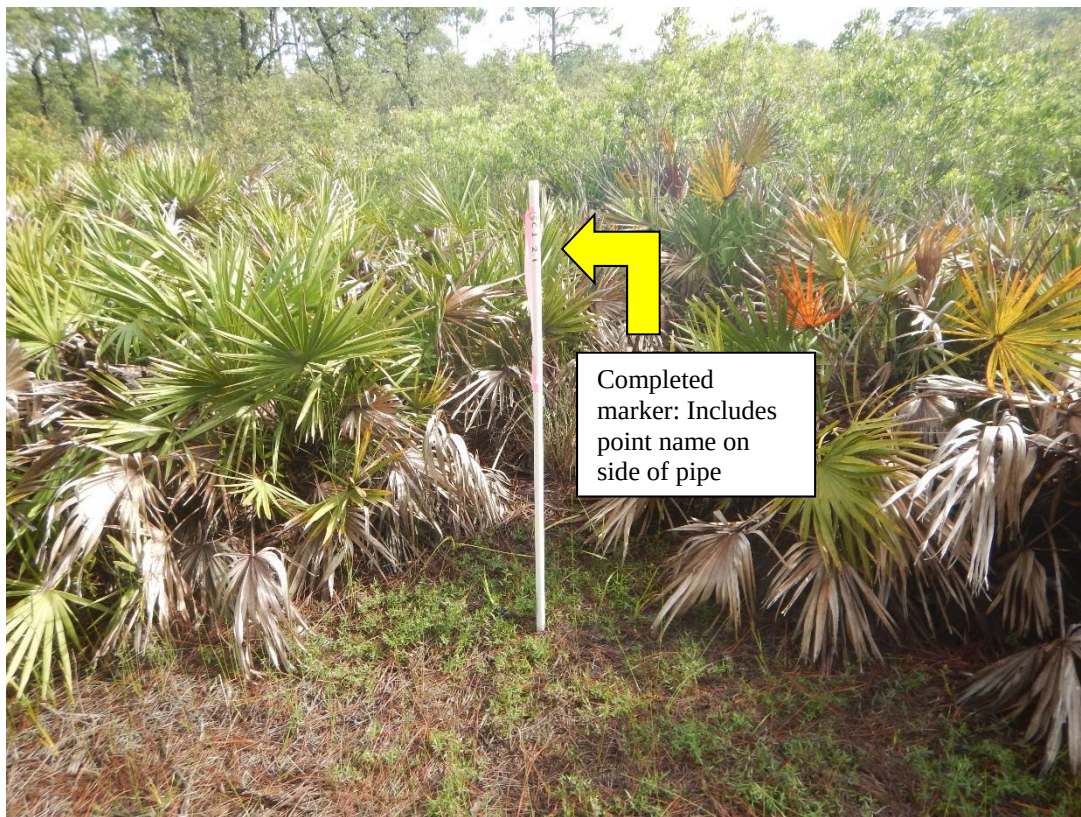
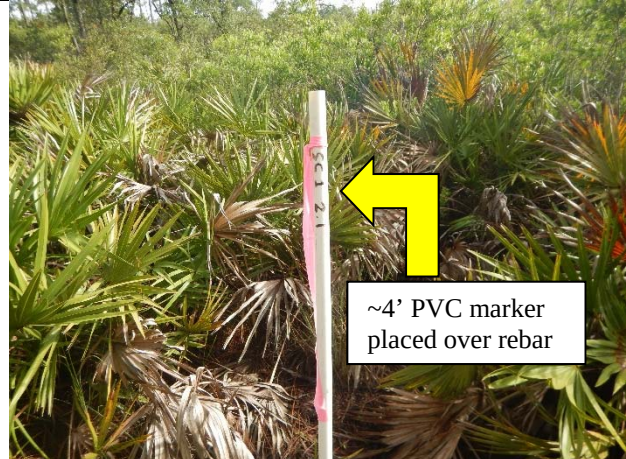
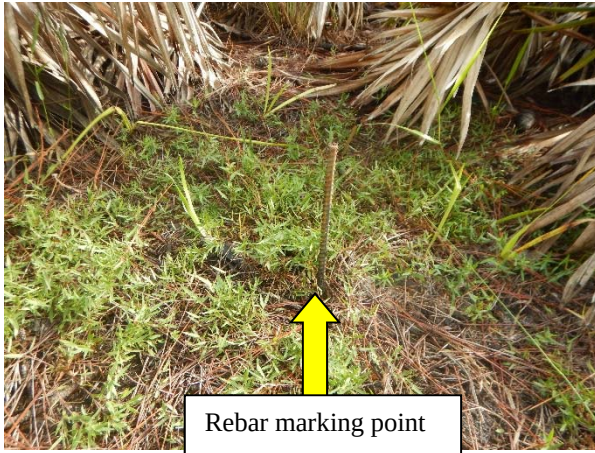
Line of markers along transect

Completed marker: Includes point name on side of pipe



# SNELL CREEK EAST

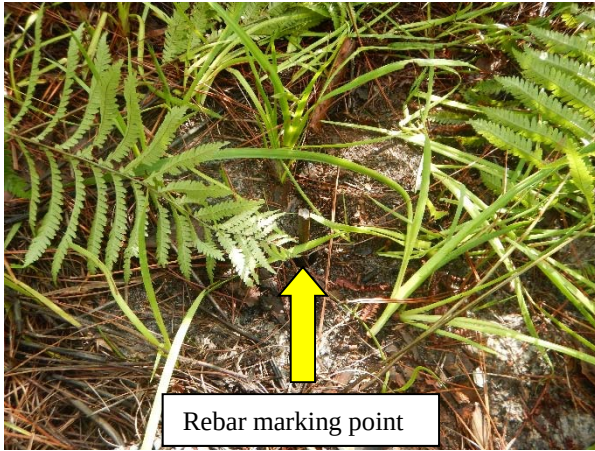
| Soil Transects – SC1 2 Transect Group |                                   |                                              |
|---------------------------------------|-----------------------------------|----------------------------------------------|
| <b>SC1 2.1</b>                        | <b>Wetland Boundary</b>           |                                              |
| LATITUDE: 28° 08' 00.93805" (N)       | LONGITUDE: 081° 32' 44.14509" (W) |                                              |
| NORTHING: 1381668.47                  | EASTING: 480324.51                |                                              |
| ELEVATION: 73.43 ft. (NAVD 88)        | 22.382 m                          | RTK GPS                                      |
| ELEVATION: 74.37 ft. (NGVD 29)        | 22.667 m                          | 0.938 ft. (conversion factor) Corpscon 6.0.1 |





# SNELL CREEK EAST

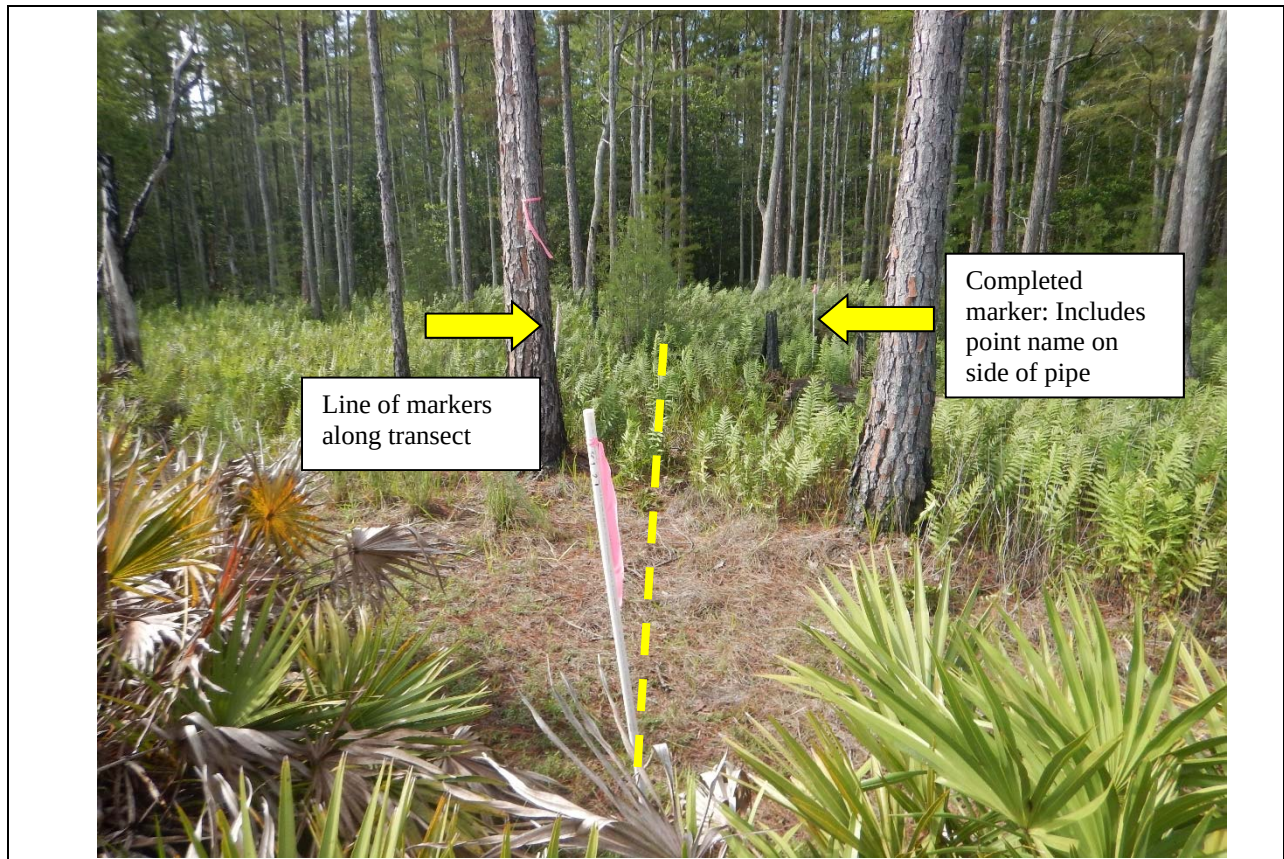
| Soil Transects – SC1 2 Transect Group |                                   |                                              |
|---------------------------------------|-----------------------------------|----------------------------------------------|
| <b>SC1 2.2</b>                        | <b>Hydric at Surface</b>          |                                              |
| LATITUDE: 28° 08' 00.68466" (N)       | LONGITUDE: 081° 32' 44.00967" (W) |                                              |
| NORTHING: 1381642.83                  | EASTING: 480336.52                |                                              |
| ELEVATION: 72.81 ft. (NAVD 88)        | 22.193 m                          | RTK GPS                                      |
| ELEVATION: 73.75 ft. (NGVD 29)        | 22.478 m                          | 0.938 ft. (conversion factor) Corpscon 6.0.1 |





# SNELL CREEK EAST

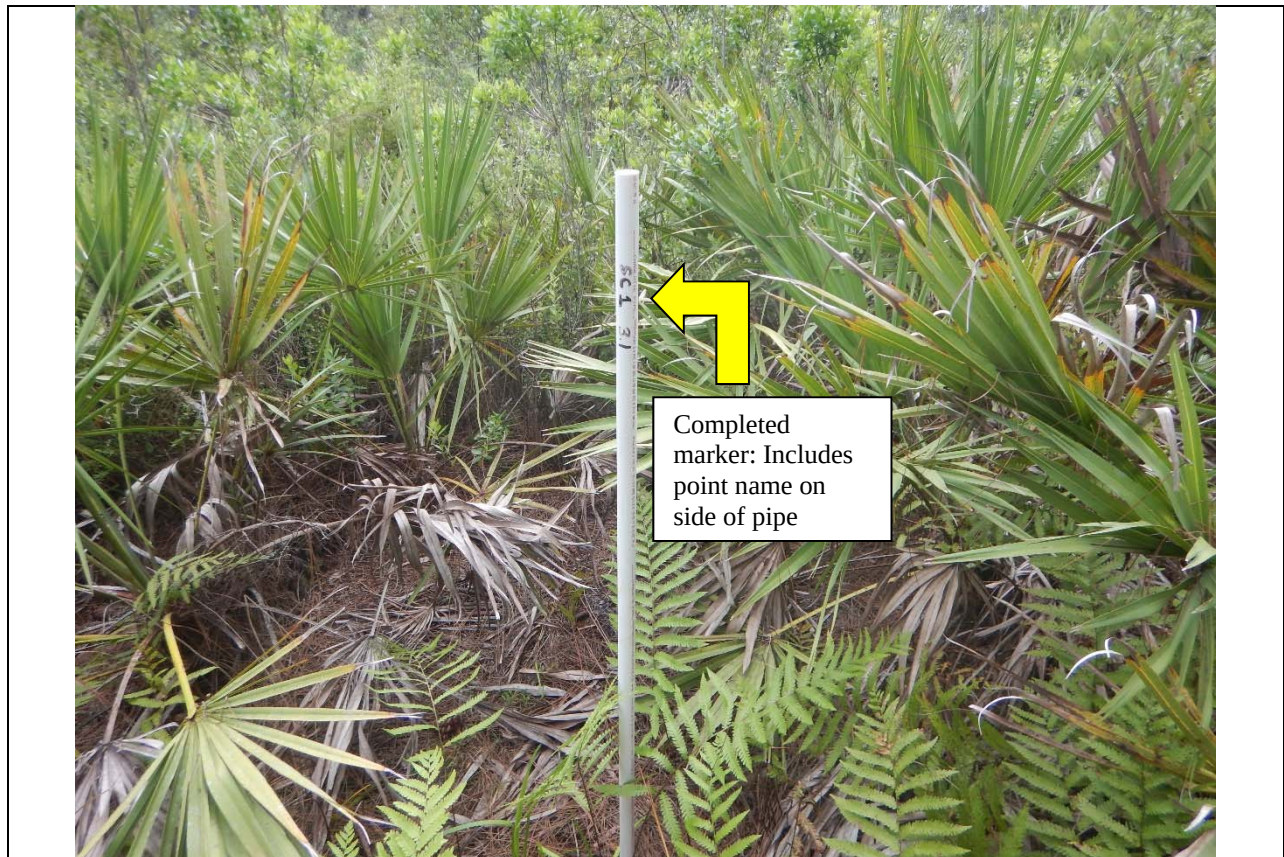
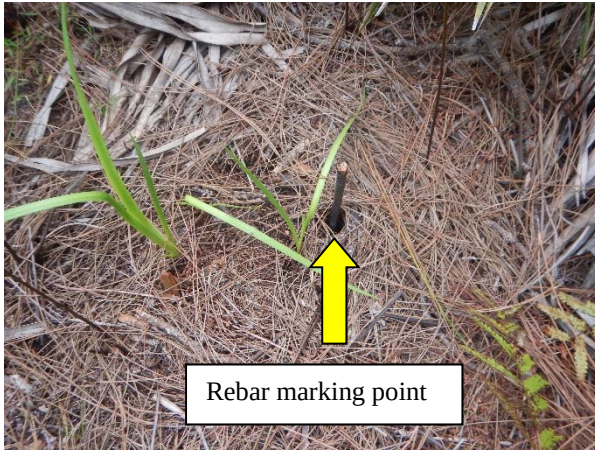
| Soil Transects – SC1 2 Transect Group |                                   |                                              |
|---------------------------------------|-----------------------------------|----------------------------------------------|
| <b>SC1 2.3</b>                        | <b>Muck at Surface</b>            |                                              |
| LATITUDE: 28° 08' 00.59475" (N)       | LONGITUDE: 081° 32' 44.12698" (W) |                                              |
| NORTHING: 1381633.79                  | EASTING: 480325.97                |                                              |
| ELEVATION: 72.78 ft. (NAVD 88)        | 22.183 m                          | RTK GPS                                      |
| ELEVATION: 73.72 ft. (NGVD 29)        | 22.469 m                          | 0.938 ft. (conversion factor) Corpscon 6.0.1 |





# SNELL CREEK EAST

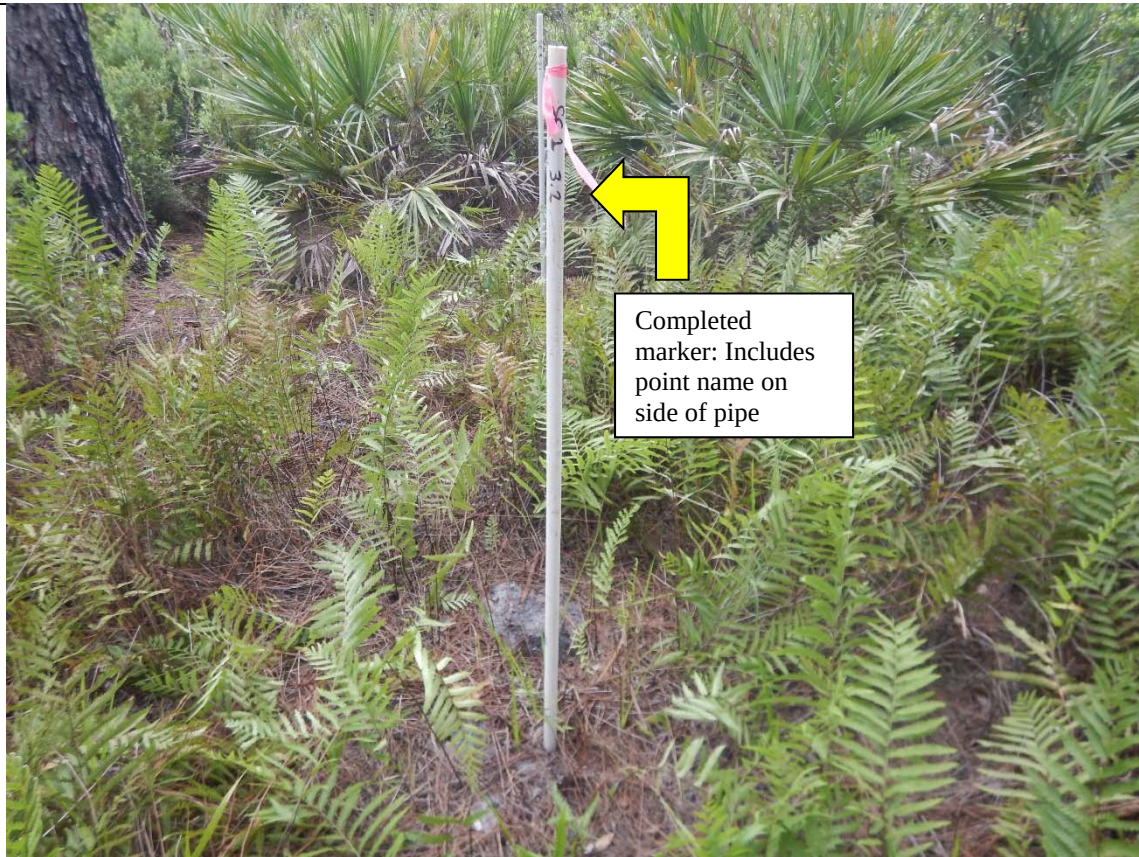
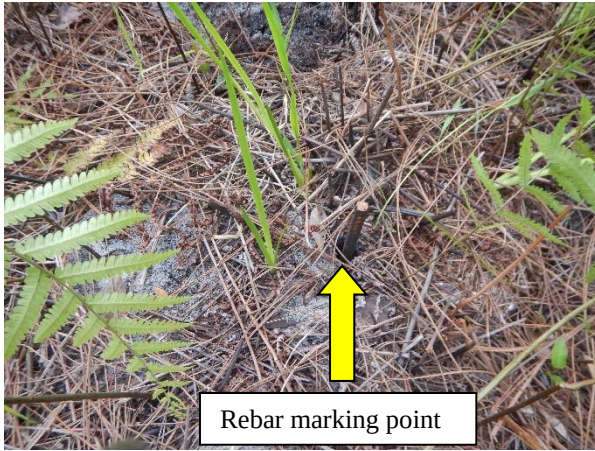
| Soil Transects – SC1 3 Transect Group |                                   |                                              |
|---------------------------------------|-----------------------------------|----------------------------------------------|
| <b>SC1 3.1</b>                        | <b>Wetland Boundary</b>           |                                              |
| LATITUDE: 28° 07' 56.33468" (N)       | LONGITUDE: 081° 32' 40.07357" (W) |                                              |
| NORTHING: 1381201.93                  | EASTING: 480646.94                |                                              |
| ELEVATION: 73.91 ft. (NAVD 88)        | 22.528 m                          | RTK GPS                                      |
| ELEVATION: 74.85 ft. (NGVD 29)        | 22.814 m                          | 0.938 ft. (conversion factor) Corpscon 6.0.1 |





# SNELL CREEK EAST

| Soil Transects – SC1 3 Transect Group |                                   |                                              |
|---------------------------------------|-----------------------------------|----------------------------------------------|
| <b>SC1 3.2</b>                        | <b>Hydric at Surface</b>          |                                              |
| LATITUDE: 28° 07' 56.40266" (N)       | LONGITUDE: 081° 32' 39.99966" (W) |                                              |
| NORTHING: 1381208.76                  | EASTING: 480693.59                |                                              |
| ELEVATION: 73.58 ft. (NAVD 88)        | 22.427 m                          | RTK GPS                                      |
| ELEVATION: 74.52 ft. (NGVD 29)        | 22.713 m                          | 0.938 ft. (conversion factor) Corpscon 6.0.1 |





# SNELL CREEK EAST

| Soil Transects – SC1 3 Transect Group |                                   |                                              |
|---------------------------------------|-----------------------------------|----------------------------------------------|
| <b>SC1 3.3</b>                        | <b>Muck at Surface</b>            |                                              |
| LATITUDE: 28° 07' 56.42753" (N)       | LONGITUDE: 081° 32' 39.96666" (W) |                                              |
| NORTHING: 1381211.26                  | EASTING: 480696.55                |                                              |
| ELEVATION: 73.39 ft. (NAVD 88)        | 22.369 m                          | RTK GPS                                      |
| ELEVATION: 74.33 ft. (NGVD 29)        | 22.655 m                          | 0.938 ft. (conversion factor) Corpscon 6.0.1 |





# SNELL CREEK EAST

| Seasonal High-Water Marks       |                                   |                                              |
|---------------------------------|-----------------------------------|----------------------------------------------|
| SC1 SH 1                        | Seasonal HW Elevation             |                                              |
| LATITUDE: 28° 07' 58.20203" (N) | LONGITUDE: 081° 32' 37.94453" (W) |                                              |
| NORTHING: 1381389.66            | EASTING: 480878.39                |                                              |
| ELEVATION: 74.57 ft. (NAVD 88)  | 22.729 m                          | RTK GPS                                      |
| ELEVATION: 75.51 ft. (NGVD 29)  | 23.015 m                          | 0.938 ft. (conversion factor) Corpscon 6.0.1 |





## SNELL CREEK EAST

| Seasonal High-Water Marks       |                                   |                                              |
|---------------------------------|-----------------------------------|----------------------------------------------|
| SC1 SH 2                        | Seasonal HW Elevation             |                                              |
| LATITUDE: 28° 07' 58.33518" (N) | LONGITUDE: 081° 32' 37.87026" (W) |                                              |
| NORTHING: 1381403.08            | EASTING: 480885.10                |                                              |
| ELEVATION: 74.60 ft. (NAVD 88)  | 22.738 m                          | RTK GPS                                      |
| ELEVATION: 75.54 ft. (NGVD 29)  | 23.024 m                          | 0.938 ft. (conversion factor) Corpscon 6.0.1 |





## SNELL CREEK EAST

| Seasonal High-Water Marks       |                                   |                                              |
|---------------------------------|-----------------------------------|----------------------------------------------|
| SC1 SH 3                        | Seasonal HW Elevation             |                                              |
| LATITUDE: 28° 07' 58.56481" (N) | LONGITUDE: 081° 32' 38.24850" (W) |                                              |
| NORTHING: 1381426.42            | EASTING: 480851.34                |                                              |
| ELEVATION: 74.62 ft. (NAVD 88)  | 22.744 m                          | RTK GPS                                      |
| ELEVATION: 75.56 ft. (NGVD 29)  | 23.030 m                          | 0.938 ft. (conversion factor) Corpscon 6.0.1 |



Trees Marked  
with flagging

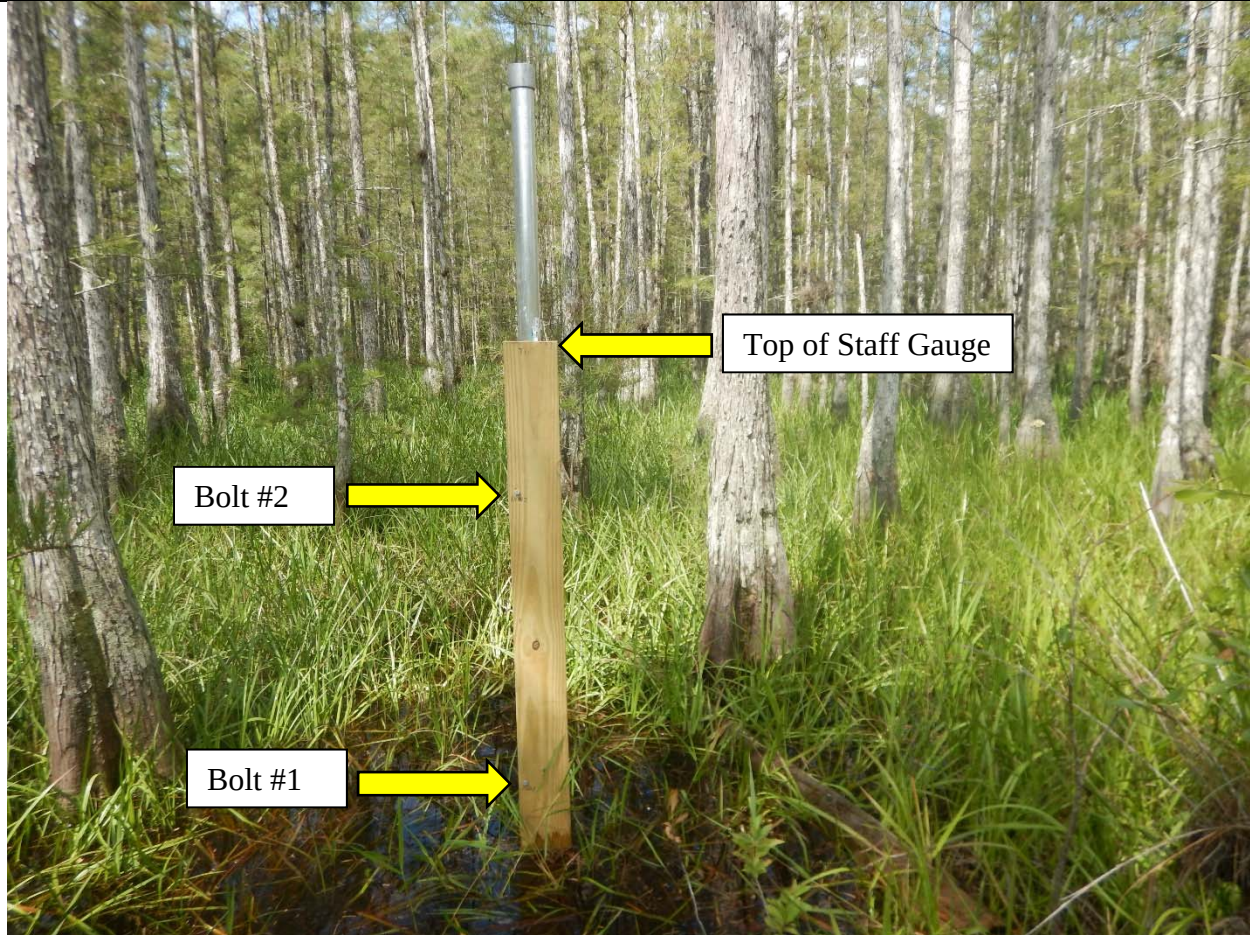


Seasonal High Water  
elevation marked with nail  
and flagging



# SNELL CREEK EAST

| Staff Gauge                     |                                |                                   |                                              |
|---------------------------------|--------------------------------|-----------------------------------|----------------------------------------------|
| SC1 SG                          |                                |                                   |                                              |
| TOP OF BOARD                    |                                |                                   |                                              |
| LATITUDE: 28° 07' 58.43889" (N) |                                | LONGITUDE: 081° 32' 37.98098" (W) |                                              |
| NORTHING: 1381413.60            |                                | EASTING: 480875.24                |                                              |
| ELEVATION: 77.35 ft. (NAVD 88)  |                                | 23.576 m                          | RTK GPS                                      |
| ELEVATION: 78.29 ft. (NGVD 29)  |                                | 23.862 m                          | 0.938 ft. (conversion factor) Corpscon 6.0.1 |
|                                 |                                |                                   |                                              |
| BOLT #1                         | ELEVATION: 73.35 ft. (NAVD 88) | 22.357 m                          | RTK GPS                                      |
|                                 | ELEVATION: 74.29 ft. (NGVD 29) | 22.643 m                          |                                              |
| BOLT #2                         | ELEVATION: 76.06 ft. (NAVD 88) | 23.183 m                          | RTK GPS                                      |
|                                 | ELEVATION: 77.00 ft. (NGVD 29) | 23.469 m                          |                                              |
|                                 |                                |                                   |                                              |



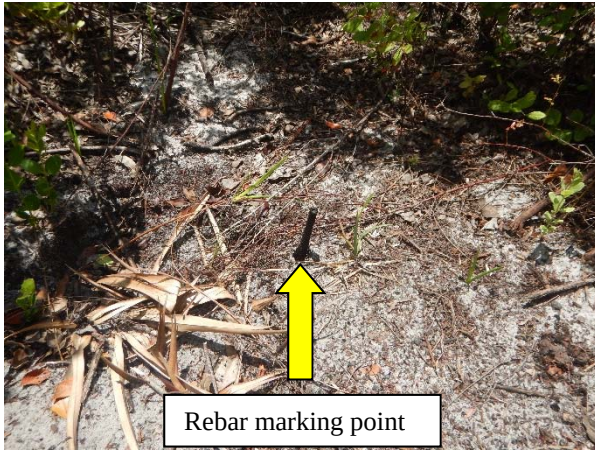
# SNELL CREEK EAST





# SNELL CREEK WEST

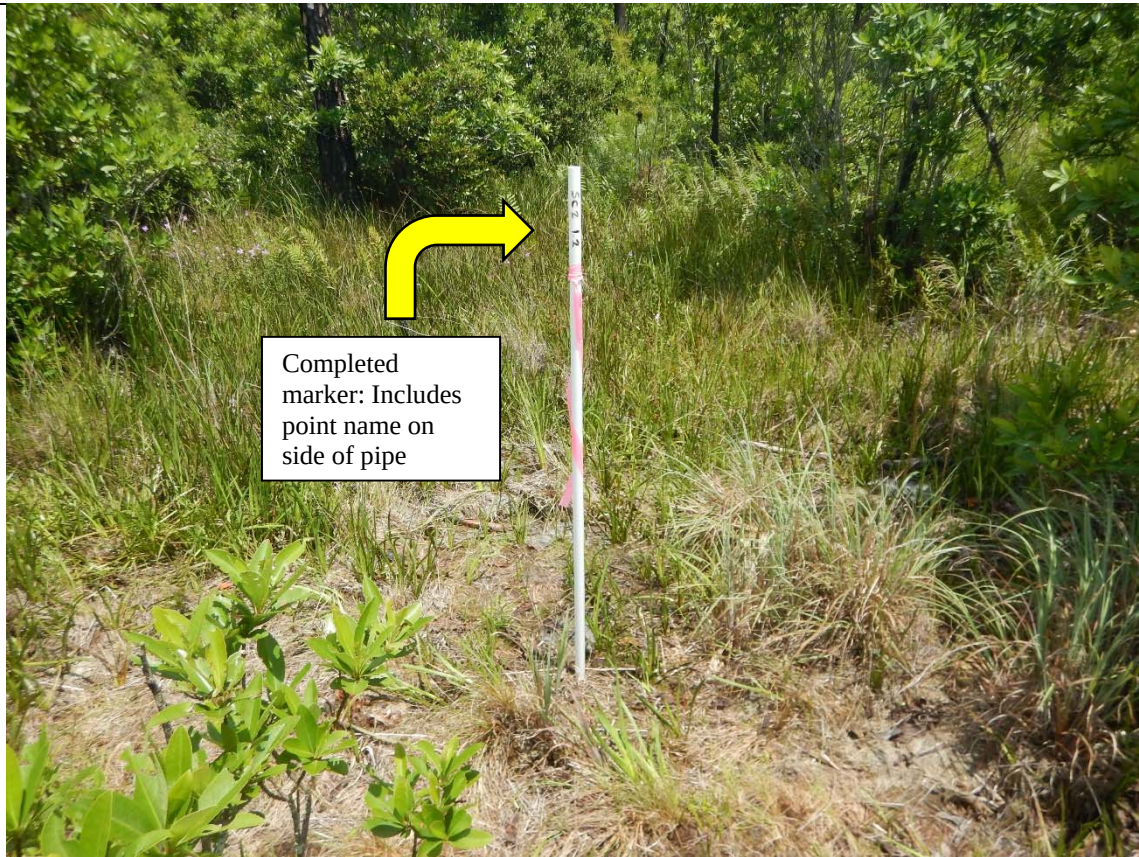
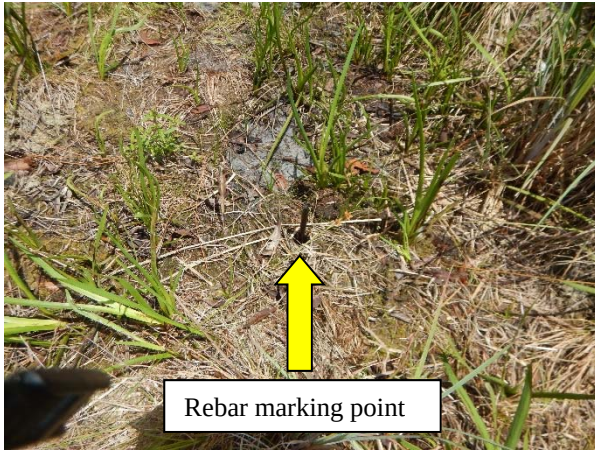
| Soil Transects – SC2 1 Transect Group |                                   |                                              |
|---------------------------------------|-----------------------------------|----------------------------------------------|
| <b>SC2 1.1</b>                        | <b>Wetland Boundary</b>           |                                              |
| LATITUDE: 28° 08' 04.97580" (N)       | LONGITUDE: 081° 33' 07.13620" (W) |                                              |
| NORTHING: 1382085.55                  | EASTING: 478268.02                |                                              |
| ELEVATION: 73.55 ft. (NAVD 88)        | 22.418 m                          | RTK GPS                                      |
| ELEVATION: 74.49 ft. (NGVD 29)        | 22.704 m                          | 0.938 ft. (conversion factor) Corpscon 6.0.1 |





# SNELL CREEK WEST

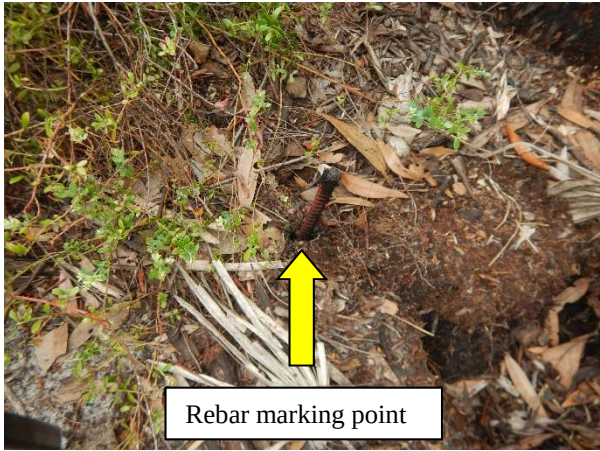
| Soil Transects – SC2 1 Transect Group |                                   |                                              |
|---------------------------------------|-----------------------------------|----------------------------------------------|
| <b>SC2 1.2</b>                        | <b>Hydric at Surface</b>          |                                              |
| LATITUDE: 28° 08' 05.15046" (N)       | LONGITUDE: 081° 33' 07.22734" (W) |                                              |
| NORTHING: 1382103.23                  | EASTING: 478259.94                |                                              |
| ELEVATION: 72.70 ft. (NAVD 88)        | 22.159 m                          | RTK GPS                                      |
| ELEVATION: 73.64 ft. (NGVD 29)        | 22.445 m                          | 0.938 ft. (conversion factor) Corpscon 6.0.1 |





# SNELL CREEK WEST

| Soil Transects – SC2 2 Transect Group |                                               |                                              |
|---------------------------------------|-----------------------------------------------|----------------------------------------------|
| <b>SC2 2.1</b>                        | <b>Wetland Boundary &amp; Muck at Surface</b> |                                              |
| LATITUDE: 28° 08' 04.99265" (N)       | LONGITUDE: 081° 33' 09.24994" (W)             |                                              |
| NORTHING: 1382088.11                  | EASTING: 478078.79                            |                                              |
| ELEVATION: 73.38 ft. (NAVD 88)        | 22.366 m                                      | RTK GPS                                      |
| ELEVATION: 74.32 ft. (NGVD 29)        | 22.652 m                                      | 0.938 ft. (conversion factor) Corpscon 6.0.1 |



Rebar marking point



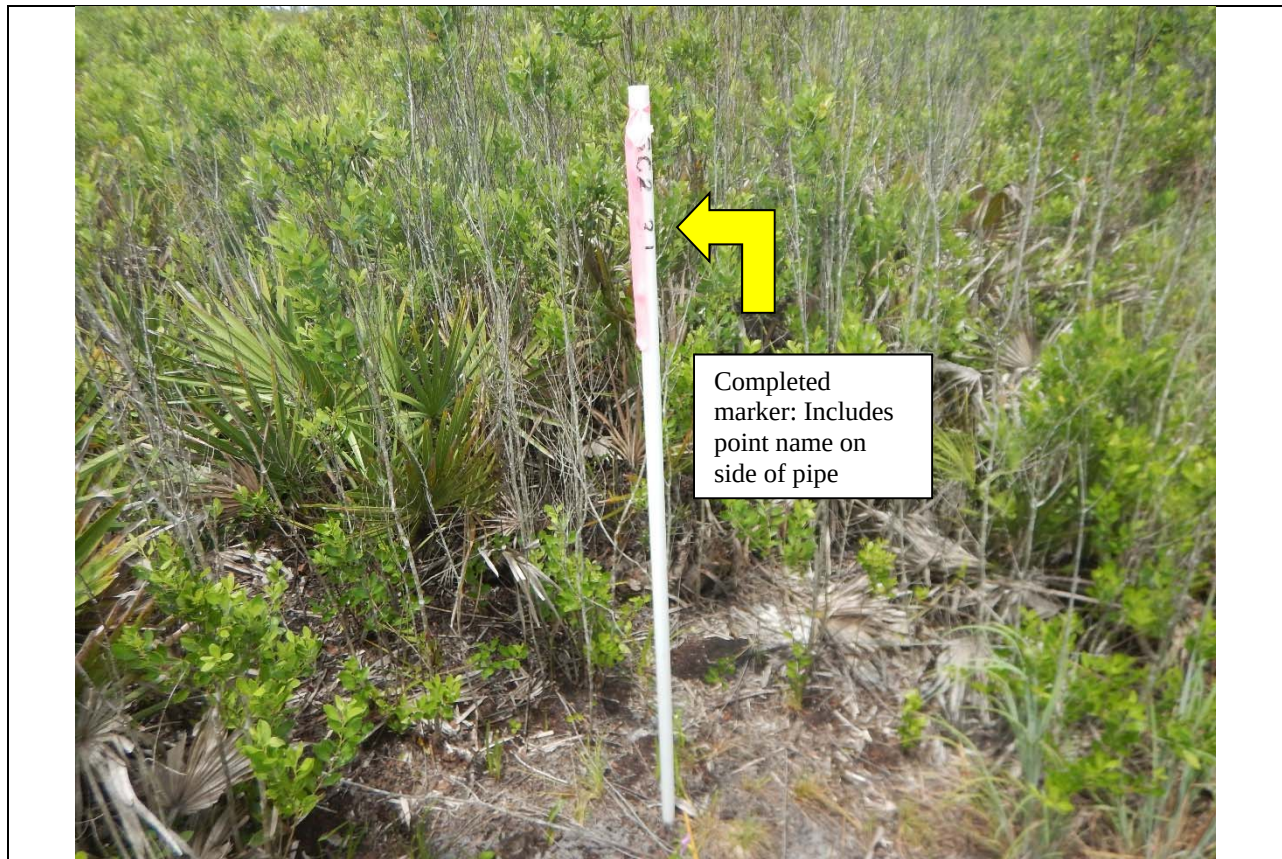
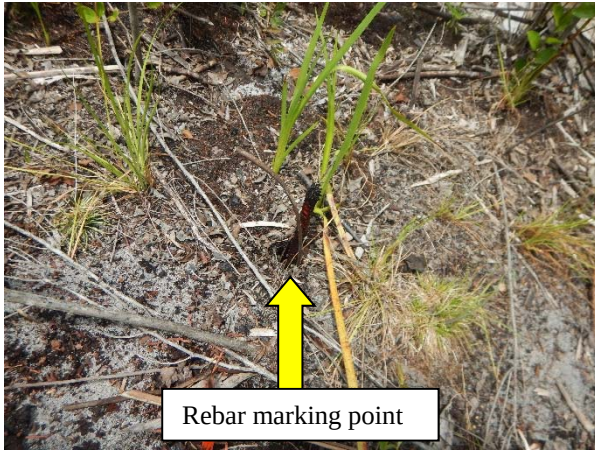
~4' PVC marker placed over rebar





# SNELL CREEK WEST

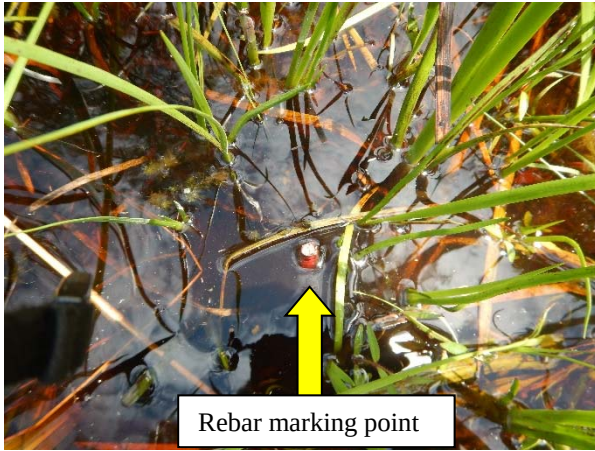
| Soil Transects – SC2 3 Transect Group |                                                 |                                              |
|---------------------------------------|-------------------------------------------------|----------------------------------------------|
| <b>SC2 3.1</b>                        | <b>Wetland Boundary &amp; Hydric at Surface</b> |                                              |
| LATITUDE: 28° 08' 06.13238" (N)       | LONGITUDE: 081° 33' 05.31640" (W)               |                                              |
| NORTHING: 1382201.62                  | EASTING: 478431.47                              |                                              |
| ELEVATION: 73.15 ft. (NAVD 88)        | 22.296 m                                        | RTK GPS                                      |
| ELEVATION: 74.09 ft. (NGVD 29)        | 22.582 m                                        | 0.938 ft. (conversion factor) Corpscon 6.0.1 |





# SNELL CREEK WEST

| Soil Transects – SC2 3 Transect Group |                                   |                                              |
|---------------------------------------|-----------------------------------|----------------------------------------------|
| <b>SC2 3.2</b>                        | <b>Muck at Surface</b>            |                                              |
| LATITUDE: 28° 08' 06.49077" (N)       | LONGITUDE: 081° 33' 05.39003" (W) |                                              |
| NORTHING: 1382237.84                  | EASTING: 478425.05                |                                              |
| ELEVATION: 71.95 ft. (NAVD 88)        | 21.930 m                          | RTK GPS                                      |
| ELEVATION: 72.89 ft. (NGVD 29)        | 22.216 m                          | 0.938 ft. (conversion factor) Corpscon 6.0.1 |





SNELL CREEK WEST

| Seasonal High-Water Marks       |                                   |                                              |
|---------------------------------|-----------------------------------|----------------------------------------------|
| SC2 SH 1                        | Seasonal HW Elevation             |                                              |
| LATITUDE: 28° 08' 09.05118" (N) | LONGITUDE: 081° 33' 05.88885" (W) |                                              |
| NORTHING: 1382496.63            | EASTING: 478381.56                |                                              |
| ELEVATION: 73.15 ft. (NAVD 88)  | 22.296 m                          | RTK GPS                                      |
| ELEVATION: 74.09 ft. (NGVD 29)  | 22.582 m                          | 0.938 ft. (conversion factor) Corpscon 6.0.1 |





# SNELL CREEK WEST

| Seasonal High-Water Marks       |                                   |                                              |
|---------------------------------|-----------------------------------|----------------------------------------------|
| SC2 SH 2                        | Seasonal HW Elevation             |                                              |
| LATITUDE: 28° 08' 09.06053" (N) | LONGITUDE: 081° 33' 05.92643" (W) |                                              |
| NORTHING: 1382497.59            | EASTING: 478378.20                |                                              |
| ELEVATION: 73.10 ft. (NAVD 88)  | 22.281 m                          | RTK GPS                                      |
| ELEVATION: 74.04 ft. (NGVD 29)  | 22.567 m                          | 0.938 ft. (conversion factor) Corpscon 6.0.1 |





# SNELL CREEK WEST

| Seasonal High-Water Marks       |                                   |                                              |
|---------------------------------|-----------------------------------|----------------------------------------------|
| SC3 SH 3                        | Seasonal HW Elevation             |                                              |
| LATITUDE: 28° 08' 09.05347" (N) | LONGITUDE: 081° 33' 05.94313" (W) |                                              |
| NORTHING: 1382496.88            | EASTING: 478376.70                |                                              |
| ELEVATION: 73.41 ft. (NAVD 88)  | 22.375 m                          | RTK GPS                                      |
| ELEVATION: 74.35 ft. (NGVD 29)  | 22.661 m                          | 0.938 ft. (conversion factor) Corpscon 6.0.1 |



Trees Marked with flagging SH 3 on the left

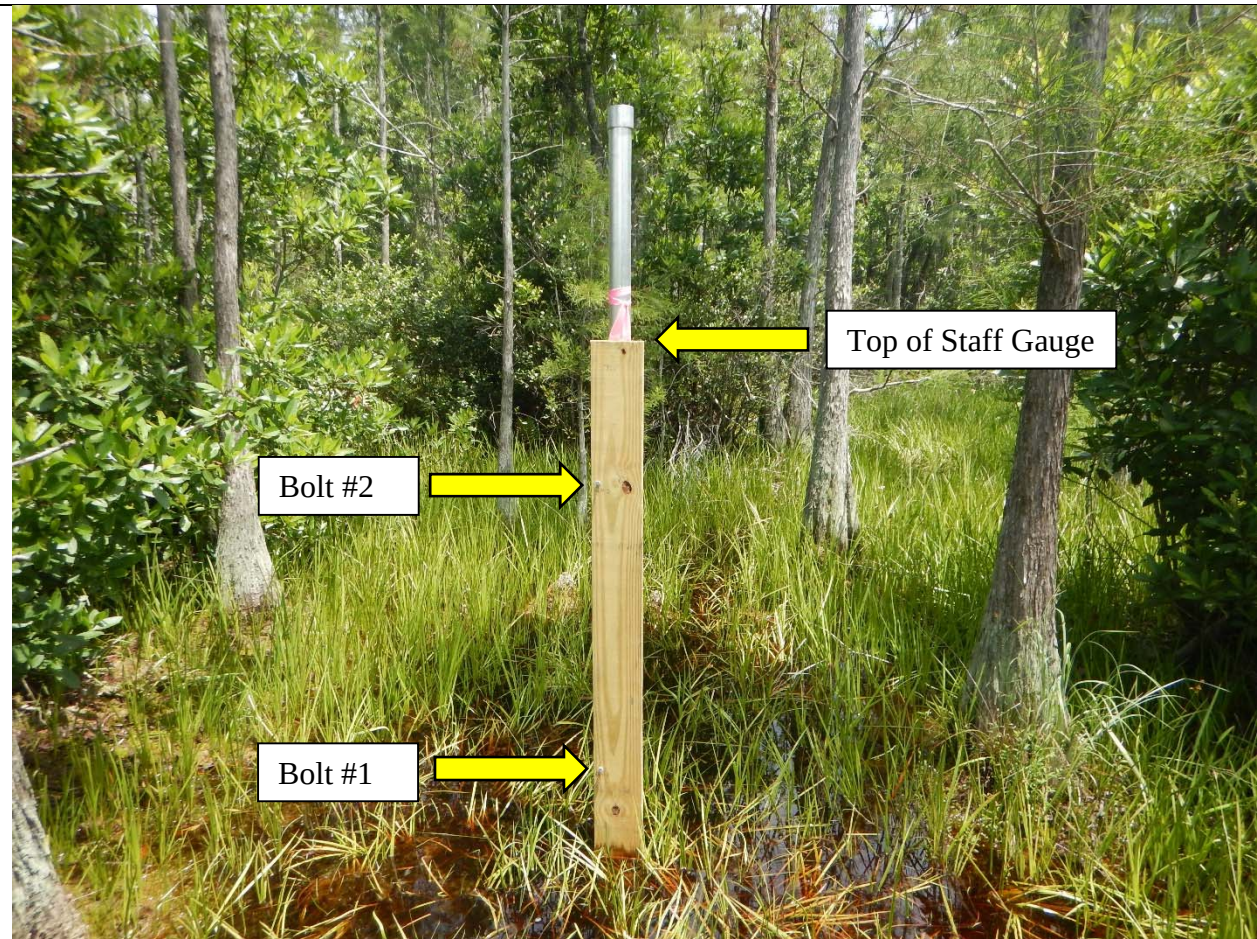


Seasonal High Water elevation marked with nail and flagging



# SNELL CREEK WEST

| Staff Gauge                     |                                |                                   |                                              |
|---------------------------------|--------------------------------|-----------------------------------|----------------------------------------------|
| SC2 SG                          |                                |                                   |                                              |
| TOP OF BOARD                    |                                |                                   |                                              |
| LATITUDE: 28° 08' 06.51163" (N) |                                | LONGITUDE: 081° 33' 05.83872" (W) |                                              |
| NORTHING: 1382240.13            |                                | EASTING: 478384.89                |                                              |
| ELEVATION: 77.18 ft. (NAVD 88)  |                                | 23.525 m                          | RTK GPS                                      |
| ELEVATION: 78.12 ft. (NGVD 29)  |                                | 23.810 m                          | 0.938 ft. (conversion factor) Corpscon 6.0.1 |
|                                 |                                |                                   |                                              |
| BOLT #1                         | ELEVATION: 73.20 ft. (NAVD 88) | 22.311 m                          | RTK GPS                                      |
|                                 | ELEVATION: 74.14 ft. (NGVD 29) | 22.597 m                          |                                              |
| BOLT #2                         | ELEVATION: 75.98 ft. (NAVD 88) | 23.159 m                          | RTK GPS                                      |
|                                 | ELEVATION: 76.92 ft. (NGVD 29) | 23.445 m                          |                                              |





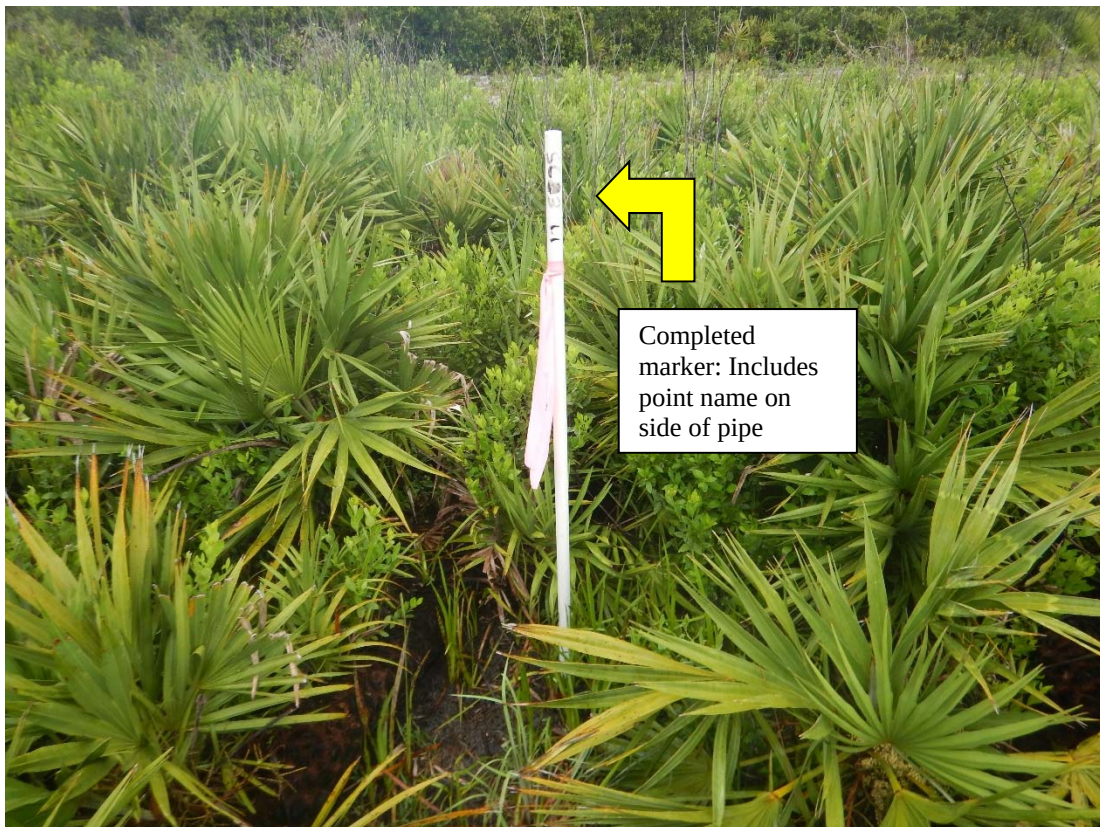
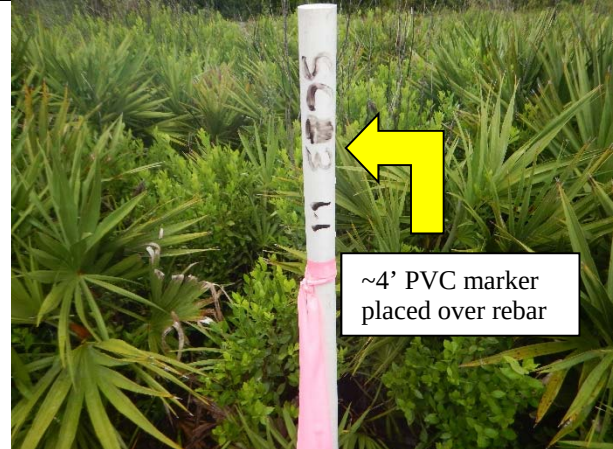
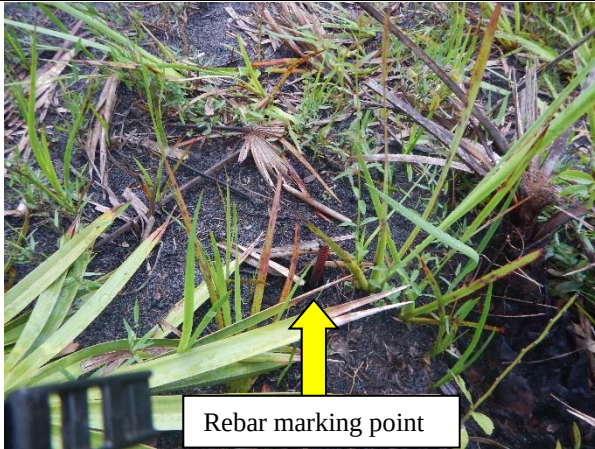
# SNELL CREEK WEST





# SNELL CREEK HERB

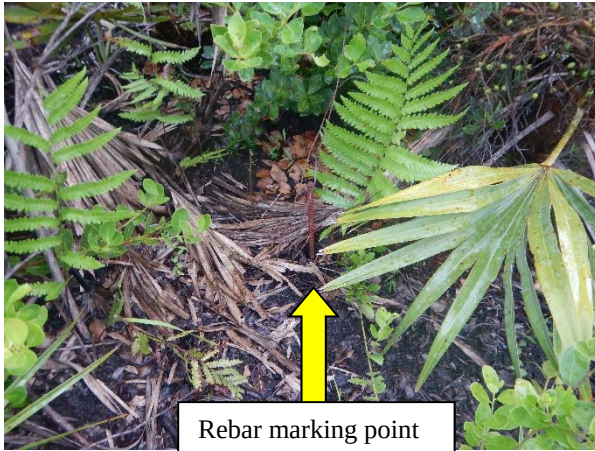
| Soil Transects – SC3 1 Transect Group |                                   |                                              |
|---------------------------------------|-----------------------------------|----------------------------------------------|
| <b>SC3 1.1</b>                        | <b>Wetland Boundary</b>           |                                              |
| LATITUDE: 28° 08' 03.17529" (N)       | LONGITUDE: 081° 33' 07.67834" (W) |                                              |
| NORTHING: 1381903.93                  | EASTING: 478218.66                |                                              |
| ELEVATION: 74.71 ft. (NAVD 88)        | 22.772 m                          | RTK GPS                                      |
| ELEVATION: 75.65 ft. (NGVD 29)        | 23.058 m                          | 0.938 ft. (conversion factor) Corpscon 6.0.1 |





# SNELL CREEK HERB

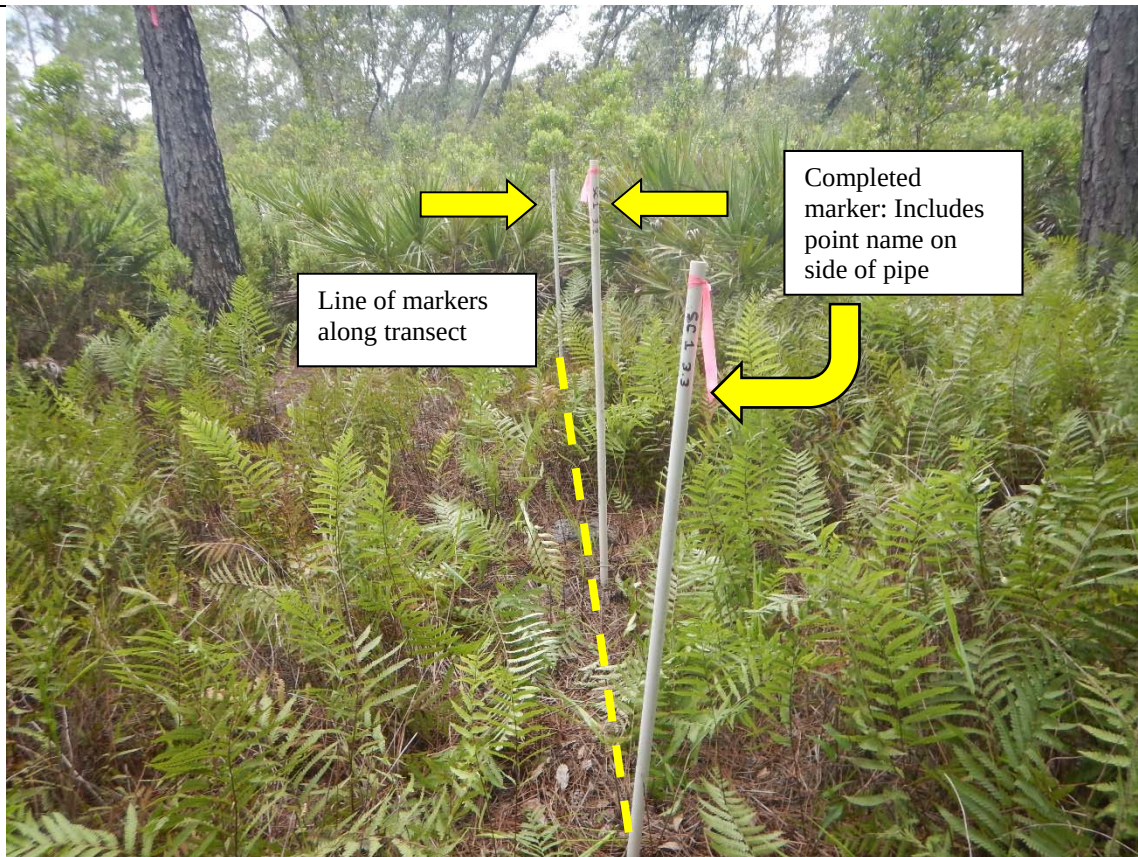
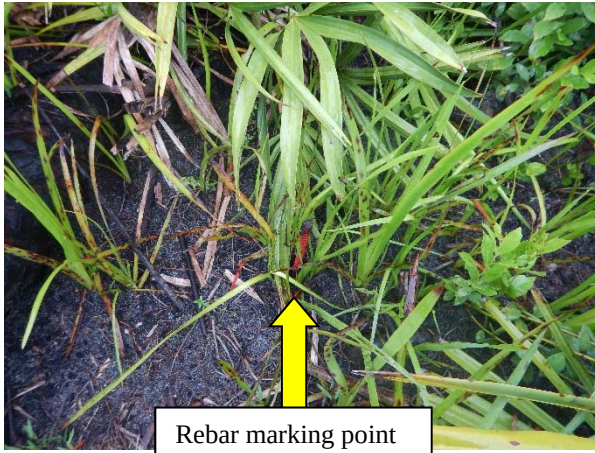
| Soil Transects – SC3 1 Transect Group |                                   |                                              |
|---------------------------------------|-----------------------------------|----------------------------------------------|
| <b>SC3 1.2</b>                        | <b>Wetland Boundary</b>           |                                              |
| LATITUDE: 28° 08'03.18659" (N)        | LONGITUDE: 081° 33' 08.44897" (W) |                                              |
| NORTHING: 1381905.39                  | EASTING: 478149.67                |                                              |
| ELEVATION: 74.65 ft. (NAVD 88)        | 22.753 m                          | RTK GPS                                      |
| ELEVATION: 75.59 ft. (NGVD 29)        | 23.039 m                          | 0.938 ft. (conversion factor) Corpscon 6.0.1 |





# SNELL CREEK HERB

| Soil Transects – SC3 1 Transect Group |                                   |                                              |
|---------------------------------------|-----------------------------------|----------------------------------------------|
| <b>SC3 1.3</b>                        | <b>Wetland Boundary</b>           |                                              |
| LATITUDE: 28° 08' 02.38907" (N)       | LONGITUDE: 081° 33' 07.66371" (W) |                                              |
| NORTHING: 1381824.53                  | EASTING: 478219.61                |                                              |
| ELEVATION: 74.92 ft. (NAVD 88)        | 22.836 m                          | RTK GPS                                      |
| ELEVATION: 75.86 ft. (NGVD 29)        | 23.122 m                          | 0.938 ft. (conversion factor) Corpscon 6.0.1 |





## **SURVEYOR'S REPORT**

Specific Purpose Survey of the CFWI DMIT Wetland  
Snell Creek  
in  
Polk County, Florida

**Prepared for:**

**South Florida Water Management District**

3301 Gun -Club Road  
West Palm Beach, Florida 33406  
Ph. (561) 686-8800 (ext. 2978)  
Fax (561) 682-0066

**Prepared by:**

**Gregory A. Prather, PSM**

Florida Professional Surveyor and Mapper  
License Number 5135  
State of Florida

Pickett and Associates, Inc. LB No 364  
475 South First Avenue, Bartow, FL. 33830  
Tel (863) 533-9095

Field Date: July 26, 2018  
Report Date: August 02, 2018

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## **PURPOSE**

The purpose of this survey is to measure horizontal and vertical components of wetland, muck locations, transects, seasonal high water marks and a staff gauge at the Snell Creek location.

## **LOCATION OF PROJECT**

The CFWI DMIT Wetland Snell Creek site is located in Section 18, Township 27 South, Range 28 East, Polk County, Florida.



**General Location (Intended Display Scale is “Not to Scale”)**

**PROJECT VERTICAL DATUM**

The project vertical datum is the North American Vertical Datum of 1988 (NAVD 88).

To convert the NAVD 88 elevation to National Geodetic Vertical Datum of 1929 (NGVD 29) **add 0.938'** to the NAVD 88 elevation.

[NAVD 88 elevation + 0.938' = NGVD 29 elevation]

This value conversion factor is based on Corpscon 6.0.1 a US Army Corps of Engineers Engineering Research and Development Center Topographic Engineering Center Alexandria, Virginia Windows-based program to convert coordinates and elevations between datum's using vertcon05.txt and vertcon05.05 files supplied by the U.S. Army Corps of Engineers South Atlantic Division, Jacksonville, FL.

**PROJECT HORIZONTAL DATUM**

The project horizontal datum is North American Datum 83 (NAD 83 (2011) (EPOCH:2010.0000))

**LEVELING METHODS FOR VERTICAL CONTROL**

The leveling for this project was minimal. Levels were used to establish conventional control points. A level run was performed from POS-16 to GPS Point # 214 and from GPS # 217 to GPS # 218 to establish consistent elevations on RTK GPS control points set for the purpose of this survey. Levels were also used to establish elevations on features such as reference points of wells, top of concrete and ground elevations for the POS-16 and POS-17 well sites.

**GPS METHODS FOR HORIZONTAL CONTROL**

Latitude, Longitude and elevations for the Benchmark at Well POS-17 and the base check were established by observing a 4 -hour session of Static GPS data using a Trimble R-8 set over the point June 27, 2018. Rinex files containing the collected data were uploaded through the OPUS website and a report containing the final coordinates were obtained on July 19, 2018.

Latitude, Longitude and elevations for the Benchmark at Well POS-16 were established by setting the Base over the POS-17 Benchmark and measuring the POS-16 benchmark with RTK GPS. Checks with RTK-GPS were made to Benchmarks POS-18 and POS-19 at the Lake Marion Creek CFWI DMIT Wetland site. Coordinates & elevations for the benchmarks at the Lake Marion Creek sites were established with a 4-hour static GPS observation and the OPUS website.

**COORDINATES AND ELEVATIONS FOR WETLAND FEATURES**

RTK GPS was used to establish coordinates and elevations for the wetland transects and seasonal high elevations. Measurements were made on the ground adjacent to the rebar and pipes marking the point. In areas where tree canopy prevented a fixed RTK GPS solution, an optical total station was used. Control for the optical work was established with RTK GPS and leveling methods described above.

**EQUIPMENT USED**

- Trimble GPS unit R-8, Serial Number 6916 (static)
- Trimble GPS unit R-8, Serial Number 2534 (static)
- Trimble DiNi 22 Level Serial Number 772842 (level)
- Trimble GPS unit R-10, Serial Number 7093 (RTK)
- Trimble GPS unit R-10, Serial Number 5003 (RTK)
- Trimble Total Station, Serial Number 36820056 (optical)



**VERTICAL CONTROL POINT**

The Vertical Control point utilized and set as part of this survey is the:

|                                                                                    |                                   |                                                                                                                                                                                                                            |
|------------------------------------------------------------------------------------|-----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>BM: POS-17 (WELL) (Located as part of this survey)</b>                          |                                   |                                                                                                                                                                                                                            |
| LATITUDE: 28° 08' 03.64884" (N)                                                    | LONGITUDE: 081° 33' 06.52824" (W) |                                                                                                                                                                                                                            |
| OPUS - NAD_83 (2011)(EPOCH:2010.0000)                                              |                                   |                                                                                                                                                                                                                            |
| ELEVATION: 76.292 ft. (NAVD 88)                                                    | 23.254 m                          | OPUS – (Computed using GEOID12B)                                                                                                                                                                                           |
| ELEVATION: 77.230 ft. (NGVD 29)                                                    | 23.540 m                          | 0.938 ft. (conversion factor)                                                                                                                                                                                              |
|  |                                   | Corpscon 6.0.1                                                                                                                                                                                                             |
|                                                                                    |                                   | From the intersection of East Johnson Ave (580) and Power Line Rd East 1.9 Mi to Marion Creek Ave. West 750 feet to Baker Dairy Rd. North 1 Mi to dirt road North 0.3 Mi to Eileen Lake Blvd East 0.35 Mi to mark on Left. |

**Field Book 928, Page 29**

29/928

SWELMD  
18677

DMIT WETLAND AND WELL (North)  
SNELL CREEK

POS  
2534

SNELL CREEK WELL POS-16 EAST

START TIME 11:25 AM

STOP TIME 5:30 PM

HI: 6.55

POS  
2516

SNELL CREEK WELL POS-17 WEST

START TIME 11:43

STOP TIME 6:24 PM

HI: 6.55

SEE SHARED OPUS SOLUTION IN  
SUPPLEMENTAL DOCUMENTS  
INCLUDED IN THIS REPORT

|                                                                                   |          |                                                                                                                                                                                                                            |
|-----------------------------------------------------------------------------------|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>BM: BASE CHECK (Located as part of this survey)</b>                            |          |                                                                                                                                                                                                                            |
| LATITUDE: 28° 08' 02.39291" (N)                                                   |          | LONGITUDE: 081° 32' 38.79348" (W)                                                                                                                                                                                          |
| OPUS - NAD 83 (2011)(EPOCH:2010.0000)                                             |          |                                                                                                                                                                                                                            |
| ELEVATION: 77.926 ft. (NAVD 88)                                                   | 23.752 m | OPUS – (Computed using GEOID12B)<br>0.938 ft. (conversion factor)<br>Corpscon 6.0.1                                                                                                                                        |
| ELEVATION: 78.864 ft. (NGVD 29)                                                   | 24.038 m |                                                                                                                                                                                                                            |
|  |          | From the intersection of East Johnson Ave (580) and Power Line Rd East 1.9 Mi to Marion Creek Ave. West 750 feet to Baker Dairy Rd. North 1 Mi to dirt road North 0.3 Mi to Eileen Lake Blvd East 0.35 Mi to mark on Left. |

## Field Book 928, Page 49

49/1928

SWFWMD

18677

DIMIT WETLAND; WELL

SNELL CREEK

5/8" SIRC "REF LB 364"

128

2534

START TIME 8:34 AM

STOP TIME 4:57 PM

HI: 6.55

SEE SHARED OPUS SOLUTION  
IN SUPPLEMENTAL DOCUMENTS  
INCLUDED IN THIS REPORT



A close-up photograph of a circular, brownish-gold metal token or coin. The token has the embossed text "POS - 16" in the center. It is resting on a light gray, textured surface.

From the intersection of East Johnson Ave (580) and Power Line Rd East 1.9 Mi to Marion Creek Ave. West 750 feet to Baker Dairy Rd. North 1 Mi to dirt road North 0.3 Mi to Eileen Lake Blvd East 0.35 Mi to mark on Left.

Field Book 928, Page 47-48

4/19/98 SHFWMD 186.77 DMitt Wierland's Well SWELL Creek

TEL01 COVER To 93

TEL01 Base RTK File 186.77-07a31B

5006 (100) Base @ Pos-17 Brass Disc in S.E. corner of Cone Pad

TS03 Ht: 6.55

2944 Fixed Rod: 6.90

Pos-18 UNDER (E) Zoo CHECK Pos-18 at LAKE MARION CREEK

Z01 CHECK Zoo

Pos-19 UNDER (W) Z02 CHECK Pos-19 at LAKE MARION CREEK

Z03 CHECK Zoo

Pos-16 SWELL (E) Z04 Pos-16 SWELL (E)

Z05 CHECK Zoo

Z06 Set 1-1

Z07 Set 1-2

Z08 Set 1-3

Z09 Bolt 1

Z10 Bolt 2

Z11 Top of Board

Z12 SHW 1

Z13 SHW 2

STAFF GAUGE

Base at POS-17 Benchmark

POS-16 measured with RTK-GPS to obtain Horizontal and Vertical values.

7-3-18 TUESDAY CLEAR 85° 48/98 Biddle CHAVIS

Z14 Set 98" SRC Ref L8364"

Z15 CHECK Z14

Z16 Bad

Z17 Set 98" SRC Ref L8364"

Z18 Set Good

Z19 CK Z18

Z20 CK Z17

Z21 Set 1.2

Z22 Set 1.1

Z23 Set 1.3

Z24 CK Z23

Z25 CK Z22

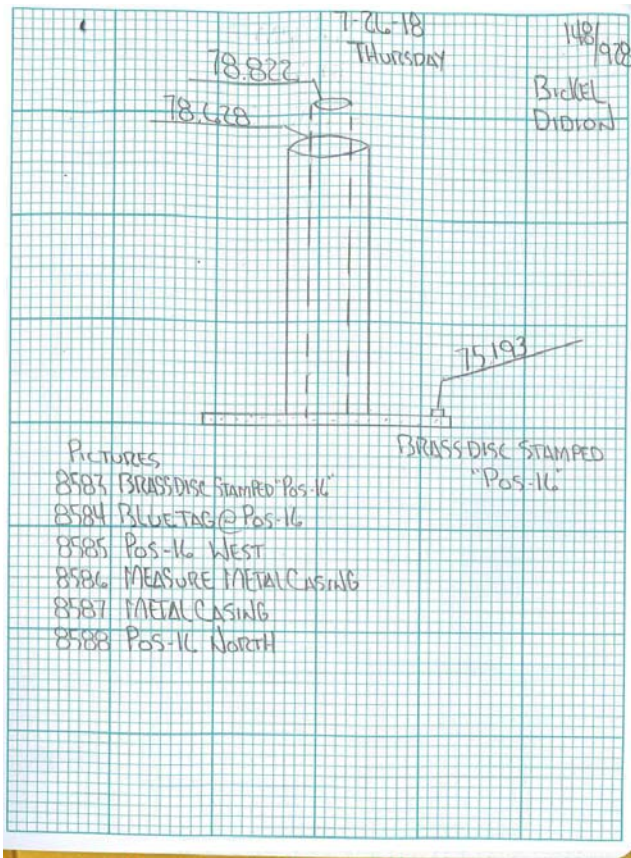
Z26 CK Z21

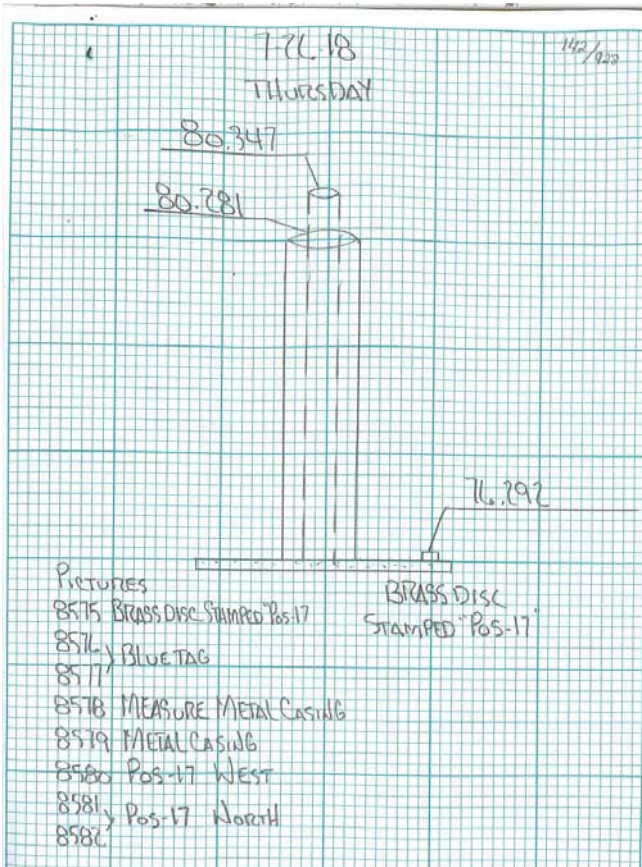
Z27 Bad

Z28 Base @ Z04 Pos-16



**PROJECT RESULTS**

| Reference and Ground Elevations:                                                    |                  |                                                                                     |                             |
|-------------------------------------------------------------------------------------|------------------|-------------------------------------------------------------------------------------|-----------------------------|
| Well                                                                                | Ground Elevation | Reference Elevation                                                                 | Comments                    |
| POS-16                                                                              | 75.1 ft          | 78.82 ft                                                                            | Top of Metal                |
| Elevation on four (4) corners of the concrete well pad                              |                  |                                                                                     |                             |
| NE Corner                                                                           | SE Corner        | SW Corner                                                                           | NW Corner                   |
| 75.2 ft                                                                             | 75.2 ft          | 75.2 ft                                                                             | 75.2 ft                     |
| Well Diameter                                                                       |                  |                                                                                     |                             |
| 4 3/16"                                                                             | Casing material  |                                                                                     | DTW                         |
|                                                                                     | METAL            |                                                                                     | 7.70 ft (7/26/18, 02:53 pm) |
|   |                  |  |                             |
|  |                  |                                                                                     |                             |
| Source & Site Benchmark                                                             | NAVD 88          | NGVD 29 (Published)                                                                 | NGVD 29 (Corpscon)          |
| POS-16 Well                                                                         | 75.19 ft         |                                                                                     | 76.13 ft                    |

| Reference and Ground Elevations:                                                    |                  |                                                                                     |                             |
|-------------------------------------------------------------------------------------|------------------|-------------------------------------------------------------------------------------|-----------------------------|
| Well                                                                                | Ground Elevation | Reference Elevation                                                                 | Comments                    |
| POS-17                                                                              | 76.2 ft          | 80.35 ft                                                                            | Top of Metal                |
| Elevation on four (4) corners of the concrete well pad                              |                  |                                                                                     |                             |
| NE Corner                                                                           | SE Corner        | SW Corner                                                                           | NW Corner                   |
| 76.3 ft                                                                             | 76.2 ft          | 76.2 ft                                                                             | 76.3 ft                     |
|                                                                                     |                  |                                                                                     |                             |
| Well Diameter                                                                       | Casing material  |                                                                                     | DTW                         |
| 4 3/16"                                                                             | METAL            |                                                                                     | 8.85 ft (7/26/18, 01:44 pm) |
|   |                  |  |                             |
|  |                  |                                                                                     |                             |
| Source & Site Benchmark                                                             | NAVD 88          | NGVD 29 (Published)                                                                 | NGVD 29 (Corpscon)          |
| POS-17 Well                                                                         | 76.29 ft         |                                                                                     | 77.23 ft                    |

Surveyor's Notes:

1. All measurements are U.S. Survey feet unless stated otherwise.
2. Underground improvements, encroachments, foundations and/or utilities were not located as a part of this survey.
3. Additions or deletions to survey maps or reports by other than the signing party or parties is prohibited without written consent of the signing party or parties.
4. This Report is not valid without the original signature and the raised seal or the electronic signature and computer-generated seal of a Florida Licensed Surveyor and Mapper.
5. To convert from NAVD 88 to NGVD 29 add 0.938 feet. This value is based on Corpscon 6.0.1, U.S. Army Corps of Engineers Engineering Research and Development Center Topographic Engineering Center Alexandria, Virginia Windows-based program to convert coordinates and elevations between datum's using vertcon05.txt and vertcon05.05 files supplied by the U.S. Army Corps of Engineers South Atlantic Division, Jacksonville, FL.
6. Date of last field work: July 26, 2018
7. SFWMD Data records (on file at the District's headquarters)
  - A. Electronic Data files:
    - Miscellaneous picture files
    - Miscellaneous data files
  - B. Conventional reporting
    - Field Book: 928 Pages: 29-30, 47-68, 83-84, 137-148

Abbreviations:

**EL.** Elevation

**DTW** Distance to the water table inside the well

**PVC** Polyvinyl Chloride Pipe

**RTK GPS** Real-Time Kinematic Global Positioning System

**NAVD 88** North American Vertical Datum of 1988

**NGVD 29** National Geodetic Vertical Datum of 1929

**NGS** National Geodetic Survey

**PSM** Professional Surveyor & Mapper

**PID** Permanent Identifiers

**SFWMD** South Florida Water Management District

**USGS** United States Geological Survey

**CFWI** Central Florida Water Initiative.

**DMIT** Data, Monitoring and Investigations Team

**NGS** National Geodetic Survey



**SURVEYOR'S CERTIFICATION**

In my professional opinion this Specific Purpose Survey meets applicable portions of the Standards of Practice set forth by the Florida Board of Professional Surveyors and Mappers in Chapter 5J, Florida Administrative Code. This report is prepared for the sole and specific use of the South Florida Water Management District and is not assignable.

---

July 26, 2018

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GREGORY A. PRATHER, PSM  
FLORIDA REGISTRATION NO. 5135  
PICKETT AND ASSOCIATES, INC.  
FLORIDA REGISTRATION NO. 364

SURVEY DATE



# SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Rev. 1/16

|                                                                |                                                    |
|----------------------------------------------------------------|----------------------------------------------------|
| DESIGNATION: <b>POS-16</b>                                     | PROJECT: <b>CFWI DMIT Wetland Snell Creek East</b> |
| ESTABLISHED BY: <b>SOUTH FLORIDA WATER MANAGEMENT DISTRICT</b> | SURVEYOR: <b>Gregory A. Prather</b>                |
| RECOVERED BY: <b>PICKETT AND ASSOCIATES, INC.</b>              | DATE: <b>July 26, 2018</b>                         |

## GEOGRAPHIC POSITION

|                     |                                                                               |                      |
|---------------------|-------------------------------------------------------------------------------|----------------------|
| SECTION <b>18</b>   | TOWNSHIP <b>27</b> SOUTH                                                      | RANGE <b>28</b> EAST |
| COUNTY: <b>Polk</b> | NAME OF QUADRANGLE: <b>Davenport</b><br>GEOGRAPHIC INDEX OF QUAD: <b>3413</b> |                      |

HORIZONTAL DATUM: 1927 (1983) 2022 Other (circle one) ZONE (E) or W

VERTICAL DATUM: MSL 1929 (1988) 2022 Other (circle one)

VERTICAL ACCURACY: 1 2 (3)

|                        |                          |                         |                                                        |
|------------------------|--------------------------|-------------------------|--------------------------------------------------------|
| STATE PLANE COORDINATE | (N) Y= <b>1381656.35</b> | (E) X= <b>480839.34</b> | NAVD 88 EL. <b>75.193</b><br>NGVD 29 EL. <b>76.131</b> |
|------------------------|--------------------------|-------------------------|--------------------------------------------------------|

CORPSCON 6.0.1 CONVERSION FACTOR (NAVD88 TO NGVD29): **0.938'**  
(A U.S. Army Corps of Engineers Engineering Research and Development Center Topographic Engineering Center Alexandria, Virginia Windows-based program to convert coordinates and elevations between datum's using vertcon05.txt and vertcon05.05 files supplied by the U.S. Army Corps of Engineers South Atlantic Division, Jacksonville FL.)  
ACTUAL NGS or (ngvd29.txt file)  
OPUS Ortho Height

LATITUDE: **28° 08' 00.84093" (N)** LONGITUDE: **81° 32' 38.39409" (W)** (Real-Time Kinematic – NAD 83 (2011))

## RECOVERY DATA

Stamping: POS-16  
To Reach: From the intersection of East Johnson Ave (580) and Power Line Rd East 1.9 Mi to Marion Creek Ave. West 750 feet to Baker Dairy Rd. North 1 Mi to dirt road North 0.3 Mi to Eileen Lake Blvd East 0.35 Mi to mark on Left.  
NOTABLE LAND MARKS:  
NGS-SOURCE BENCHMARK: POS-17  
FIELD BOOK **928** PAGE **29-148**

## PICTURES

Aerial Overall Site







## SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Rev. 1/16



Looking North (Oblique not to scale) (July 26, 2018)



Top View (Not to Scale) (July 26, 2018)



Top View (Not to Scale) (July 26, 2018)





# SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Rev. 1/16

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                               |                                                                                |                                                        |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|--------------------------------------------------------------------------------|--------------------------------------------------------|
| DESIGNATION: <b>POS-17</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                               | PROJECT: <b>CFWI DMIT Wetland Snell Creek West</b>                             |                                                        |
| ESTABLISHED BY: <b>SOUTH FLORIDA WATER MANAGEMENT DISTRICT</b>                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                               | SURVEYOR: <b>Gregory A. Prather</b>                                            |                                                        |
| RECOVERED BY: <b>PICKETT AND ASSOCIATES, INC.</b>                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                               | DATE: <b>July 26, 2018</b>                                                     |                                                        |
| <b>GEOGRAPHIC POSITION</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                               |                                                                                |                                                        |
| SECTION <b>18</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                            | TOWNSHIP <b>27</b> SOUTH                                                      | RANGE <b>28</b> EAST                                                           |                                                        |
| COUNTY: <b>Polk</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                          | NAME OF QUADRANGLE: <b>Davenport</b><br>GEOGRAPHIC INDEX OF QUAD: <b>3413</b> |                                                                                |                                                        |
| HORIZONTAL DATUM: 1927 <u>(1983)</u> 2022 Other _____ (circle one) ZONE <u>(E)</u> or W                                                                                                                                                                                                                                                                                                                                                                                      |                                                                               |                                                                                |                                                        |
| VERTICAL DATUM: MSL 1929 <u>(1988)</u> 2022 Other _____ (circle one)                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                               |                                                                                |                                                        |
| VERTICAL ACCURACY: 1 2 <u>(3)</u>                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                               |                                                                                |                                                        |
| STATE PLANE COORDINATE                                                                                                                                                                                                                                                                                                                                                                                                                                                       | (N) Y= <b>1381951.29</b>                                                      | (E) X= <b>478321.84</b>                                                        | NAVD 88 EL. <b>76.292</b><br>NGVD 29 EL. <b>77.230</b> |
| CORPSCON 6.0.1 CONVERSION FACTOR (NAVD88 TO NGVD29): <b>0.938'</b><br>(A U.S. Army Corps of Engineers Engineering Research and Development Center Topographic Engineering Center Alexandria, Virginia Windows-based program to convert coordinates and elevations between datum's using vertcon05.txt and vertcon05.05 files supplied by the U.S. Army Corps of Engineers South Atlantic Division, Jacksonville FL.)<br>ACTUAL NGS or (ngvd29.txt file)<br>OPUS Ortho Height |                                                                               |                                                                                |                                                        |
| LATITUDE: <b>28° 08' 03.64884" (N)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                               | LONGITUDE: <b>81° 33' 06.52824" (W)</b> (OPUS – NAD_83 (2011) EPOCH:2010.0000) |                                                        |
| <b>RECOVERY DATA</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                               |                                                                                |                                                        |
| Stamping: POS-17                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                               |                                                                                |                                                        |
| To Reach: From the intersection of East Johnson Ave (580) and Power Line Rd East 1.9 Mi to Marion Creek Ave. West 750 feet to Baker Dairy Rd. North 1 Mi to dirt road North 0.3 Mi to Eileen Lake Blvd East 0.35 Mi to mark on Left.                                                                                                                                                                                                                                         |                                                                               |                                                                                |                                                        |
| NOTABLE LAND MARKS:                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                               |                                                                                |                                                        |
| NGS-SOURCE BENCHMARK:                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                               |                                                                                |                                                        |
| FIELD BOOK <b>928</b> PAGE <b>29-148</b>                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                               |                                                                                |                                                        |
| <b>PICTURES</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                               |                                                                                |                                                        |
| <b>Aerial Overall Site</b><br>                                                                                                                                                                                                                                                                                                                                                           |                                                                               |                                                                                |                                                        |





## SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Rev. 1/16



Looking North (Oblique not to scale) (July 26, 2018)



Top View (Not to Scale) (July 26, 2018)



Top View (Not to Scale) (July 26, 2018)





# SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Rev. 1/16

|                                          |                                      |                                    |                                        |
|------------------------------------------|--------------------------------------|------------------------------------|----------------------------------------|
| SCADA RTU Station Name:<br><b>POS-16</b> | DB Hydro Site Name:<br><b>SNELLE</b> | Agency:<br><b>WMD</b>              | Date of Field Work:<br><b>07/26/18</b> |
| Party Chief: <b>Robby Bickel</b>         | Field Book: <b>928</b>               | Page(s): <b>29, 47-66, 137-148</b> | Prepared by: <b>Sherry Grymko</b>      |

## SITE SPECIFIC DATA

|                                                   |                                                                |                                                                      |
|---------------------------------------------------|----------------------------------------------------------------|----------------------------------------------------------------------|
| Site Benchmark:<br><b>POS-16</b>                  | Benchmark Elevation (NAVD88)<br><b>75.193'</b>                 | Corpscon 6.0.1 Conversion Factor (NAVD88 to NGVD29)<br><b>0.938'</b> |
| Reference Elevation(s) (NAVD88):<br><b>78.82'</b> | Existing Brass Tag Elevation (Datum):<br><b>Not Applicable</b> | Calibration Port Elevation(s) (NAVD88):<br><b>Not Applicable</b>     |
| Ground Elevation (NAVD88): <b>75.1'</b>           | Pad Elevation (NAVD88): <b>75.2'</b>                           |                                                                      |

## GEOGRAPHIC DATA

|                   |                                         |                                          |                                      |
|-------------------|-----------------------------------------|------------------------------------------|--------------------------------------|
| Section <b>18</b> | Township <b>27</b> South                |                                          | Range <b>28</b> East                 |
| <b>Well</b>       | Latitude:<br><b>28°08'00.83250" (N)</b> | Longitude:<br><b>81°32'38.40740" (W)</b> | Source: RTK-GPS - NAD_83             |
|                   | State Plane Coordinates                 | Northing (Y) =<br><b>1381655.51 ft</b>   | Easting (X) =<br><b>480838.14 ft</b> |

### Notes:

**NAVD88** – North American Vertical Datum of 1988

**NGVD29**- National Geodetic Vertical Datum of 1929

**Corpscon 6.0.1** - A U.S. Army Corps of Engineers Engineering Research and Development Center Topographic Engineering Center Alexandria, Virginia Windows-based program to convert coordinates and elevations between datum's using vertcon05.txt and vertcon05.05 files supplied by the U.S. Army Corps of Engineers South Atlantic Division, Jacksonville FL.

## PICTURES

### Aerial Overall Site



Not to scale (Google Earth product)





## SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Rev. 1/16

Overall

POS-16 Well Site  
Latitude:  $28^{\circ}08'00.83250''$   
Longitude:  $081^{\circ}32'38.40740''$   
El.  $78.82'$  (NAVD88)

Ground El.  $75.1'$  (NAVD88)

Concrete El.  $75.2'$  (NAVD88)



Benchmark "POS-16"  
Latitude:  $28^{\circ}08'00.84093''$   
Longitude:  $81^{\circ}32'38.39409''$   
El.  $75.193'$  (NAVD88)



Looking Northerly (oblique not to scale) (26-July-18)

Well Head

Reference Point  
El.  $78.82'$  (NAVD88)



Looking Northerly (oblique not to scale) (26-July-18)



# SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Rev. 1/16

|                                          |                                      |                                    |                                        |
|------------------------------------------|--------------------------------------|------------------------------------|----------------------------------------|
| SCADA RTU Station Name:<br><b>POS-17</b> | DB Hydro Site Name:<br><b>SNELLW</b> | Agency:<br><b>WMD</b>              | Date of Field Work:<br><b>07/26/18</b> |
| Party Chief: <b>Robby Bickel</b>         | Field Book: <b>928</b>               | Page(s): <b>29, 47-66, 137-148</b> | Prepared by: <b>Sherry Grymko</b>      |

## SITE SPECIFIC DATA

|                                                   |                                                                |                                                                      |
|---------------------------------------------------|----------------------------------------------------------------|----------------------------------------------------------------------|
| Site Benchmark:<br><b>POS-17</b>                  | Benchmark Elevation (NAVD88)<br><b>76.292'</b>                 | Corpscon 6.0.1 Conversion Factor (NAVD88 to NGVD29)<br><b>0.938'</b> |
| Reference Elevation(s) (NAVD88):<br><b>80.35'</b> | Existing Brass Tag Elevation (Datum):<br><b>Not Applicable</b> | Calibration Port Elevation(s) (NAVD88):<br><b>Not Applicable</b>     |
| Ground Elevation (NAVD88): <b>76.2'</b>           | Pad Elevation (NAVD88): <b>76.3'</b>                           |                                                                      |

## GEOGRAPHIC DATA

|                   |                                         |                                          |                                      |
|-------------------|-----------------------------------------|------------------------------------------|--------------------------------------|
| Section <b>18</b> | Township <b>27</b> South                |                                          | Range <b>28</b> East                 |
| <b>Well</b>       | Latitude:<br><b>28°08'03.64234" (N)</b> | Longitude:<br><b>81°33'06.54264" (W)</b> | Source: RTK-GPS - NAD_83             |
|                   | State Plane Coordinates                 | Northing (Y) =<br><b>1381950.64 ft</b>   | Easting (X) =<br><b>478320.55 ft</b> |

### Notes:

**NAVD88** – North American Vertical Datum of 1988

**NGVD29**- National Geodetic Vertical Datum of 1929

**Corpscon 6.0.1** - A U.S. Army Corps of Engineers Engineering Research and Development Center Topographic Engineering Center Alexandria, Virginia Windows-based program to convert coordinates and elevations between datum's using vertcon05.txt and vertcon05.05 files supplied by the U.S. Army Corps of Engineers South Atlantic Division, Jacksonville FL.

## PICTURES

Aerial Overall Site



Not to scale (Google Earth product)





## SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Rev. 1/16

Overall

POS-17 Well Site  
Latitude: **28°08'03.64234"**  
Longitude: **081°33'06.54264"**  
El. **80.35'** (NAVD88)

Ground El. **76.2'** (NAVD88)

Concrete El. **76.3'** (NAVD88)



Benchmark "POS-17"  
Latitude: **28° 08' 03.64884"**  
Longitude: **81° 33' 06.52824"**  
El. **76.292'** (NAVD88)



Looking Northerly (oblique not to scale) (26-July-18)

Well Head

Reference Point  
El. **80.35'** (NAVD88)



Looking Northerly (oblique not to scale) (26-July-18)



# SNELL CREEK WELL POS-17

FILE: 69161780.DAT OP1532018072466

## NGS OPUS SOLUTION REPORT

=====

All computed coordinate accuracies are listed as peak-to-peak values.

For additional information: <https://www.ngs.noaa.gov/OPUS/about.jsp#accuracy>

USER: [sgrymko@pickettusa.com](mailto:sgrymko@pickettusa.com)  
RINEX FILE: 6916178p.18o

DATE: July 19, 2018  
TIME: 16:35:24 UTC

SOFTWARE: page5 1603.24 master94.pl 160321 START: 2018/06/27 15:44:00  
EPHEMERIS: igs20073.eph [precise] STOP: 2018/06/27 22:21:00  
NAV FILE: brdc1780.18n OBS USED: 16181 / 17917 : 90%  
ANT NAME: TRM5800 NONE # FIXED AMB: 84 / 108 : 78%  
ARP HEIGHT: 1.9964 OVERALL RMS: 0.028(m)

REF FRAME: NAD\_83(2011)(EPOCH:2010.0000)

IGS08 (EPOCH:2018.4871)

X: 826941.935(m) 0.014(m)  
Y: -5567634.766(m) 0.026(m)  
Z: 2989640.813(m) 0.016(m)

826941.120(m) 0.014(m)  
-5567633.203(m) 0.026(m)  
2989640.650(m) 0.016(m)

LAT: 28 8 3.64884 0.019(m)  
E LON: 278 26 53.47176 0.012(m)  
W LON: 81 33 6.52824 0.012(m)  
EL HGT: -4.093(m) 0.024(m)

28 8 3.66968 0.019(m)  
278 26 53.45063 0.012(m)  
81 33 6.54937 0.012(m)  
-5.639(m) 0.024(m)

ORTHO HGT: 23.254(m) 0.034(m) [NAVD88 (Computed using GEOID12B)]

EL. 76.292 ft

### UTM COORDINATES STATE PLANE COORDINATES

|                       | UTM (Zone 17) | SPC (0901 FL E) |
|-----------------------|---------------|-----------------|
| Northing (Y) [meters] | 3112207.859   | 421219.596      |
| Easting (X) [meters]  | 445811.284    | 145792.789      |
| Convergence [degrees] | -0.26020833   | -0.26020833     |
| Point Scale           | 0.99963624    | 0.99997743      |
| Combined Factor       | 0.99963688    | 0.99997807      |

Y=1381951.29 ft  
X= 478321.84 ft

US NATIONAL GRID DESIGNATOR: 17RMM4581112207(NAD 83)

### BASE STATIONS USED

| PID    | DESIGNATION               | LATITUDE    | LONGITUDE    | DISTANCE(m) |
|--------|---------------------------|-------------|--------------|-------------|
| DF7046 | BRTW BARTOW CORS ARP      | N275658.642 | W0814658.200 | 30578.2     |
| DH3757 | WACH WAUCHULA CORS ARP    | N273051.042 | W0815256.615 | 76051.2     |
| DF7990 | ZEFR ZEPHYRHILLS CORS ARP | N281339.322 | W0820952.671 | 61057.3     |

NEAREST NGS PUBLISHED CONTROL POINT  
DO8901 777957 A N2809000023 W08133000054 2790.2

#### BASE STATION INFORMATION

STATION NAME: brtw a 3 (BARTOW; Bartow, Florida, U.S.A.)

MONUMENT: 49529S001

XYZ 805863.2966 -5580462.7024 2971581.0305 MON @ 2005.0000 (M)  
XYZ -0.0121 -0.0008 0.0002 VEL (M/YR)  
NEU 0.0000 0.0000 0.0000 MON TO ARP (M)  
NEU 0.0001 -0.0008 0.1242 ARP TO L1 PHASE CENTER (M)  
NEU -0.0000 -0.0008 0.1337 ARP TO L2 PHASE CENTER (M)  
XYZ -0.1631 -0.0103 0.0021 VEL TIMES 13.4864 YRS  
XYZ 0.0000 0.0000 0.0000 MON TO ARP  
XYZ 0.0149 -0.1087 0.0584 ARP TO L1 PHASE CENTER  
XYZ 805863.1484 -5580462.8214 2971581.0909 L1 PHS CEN @ 2018.4871  
XYZ 0.0000 0.0000 0.0000 + XYZ ADJUSTMENTS  
XYZ 805863.1484 -5580462.8214 2971581.0909 NEW L1 PHS CEN @ 2018.4871  
XYZ 805863.1335 -5580462.7127 2971581.0326 NEW ARP @ 2018.4871  
XYZ 805863.1335 -5580462.7127 2971581.0326 NEW MON @ 2018.4871  
LLH 27 56 58.66235 278 13 1.77786 12.1453 NEW L1 PHS CEN @ 2018.4871  
LLH 27 56 58.66235 278 13 1.77789 12.0211 NEW ARP @ 2018.4871  
LLH 27 56 58.66235 278 13 1.77789 12.0211 NEW MON @ 2018.4871

STATION NAME: wach a 1 (Wauchula; Wauchula, Florida, U.S.A.)

MONUMENT: NO DOMES NUMBER

XYZ 799335.5101 -5604081.2834 2928868.5861 MON @ 2005.0000 (M)  
XYZ -0.0117 0.0017 0.0004 VEL (M/YR)  
NEU 0.0000 0.0000 0.0000 MON TO ARP (M)  
NEU 0.0001 -0.0008 0.1242 ARP TO L1 PHASE CENTER (M)  
NEU -0.0000 -0.0008 0.1337 ARP TO L2 PHASE CENTER (M)  
XYZ -0.1583 0.0224 0.0053 VEL TIMES 13.4864 YRS  
XYZ 0.0000 0.0000 0.0000 MON TO ARP  
XYZ 0.0148 -0.1091 0.0575 ARP TO L1 PHASE CENTER  
XYZ 799335.3666 -5604081.3702 2928868.6489 L1 PHS CEN @ 2018.4871  
XYZ 0.0000 -0.0000 -0.0000 + XYZ ADJUSTMENTS  
XYZ 799335.3666 -5604081.3702 2928868.6489 NEW L1 PHS CEN @ 2018.4871  
XYZ 799335.3518 -5604081.2611 2928868.5914 NEW ARP @ 2018.4871  
XYZ 799335.3518 -5604081.2611 2928868.5914 NEW MON @ 2018.4871  
LLH 27 30 51.06279 278 7 3.36296 9.2623 NEW L1 PHS CEN @ 2018.4871  
LLH 27 30 51.06279 278 7 3.36299 9.1381 NEW ARP @ 2018.4871  
LLH 27 30 51.06279 278 7 3.36299 9.1381 NEW MON @ 2018.4871

STATION NAME: zefr a 2 (ZEPHYRHILLS; Zephyrhills, Florida, U.S.A.)

MONUMENT: 49526S001

XYZ 766680.6677 -5571328.4297 2998751.0226 MON @ 2005.0000 (M)  
XYZ -0.0123 0.0005 0.0010 VEL (M/YR)  
NEU 0.0000 0.0000 0.0000 MON TO ARP (M)  
NEU 0.0001 -0.0008 0.1242 ARP TO L1 PHASE CENTER (M)  
NEU -0.0000 -0.0008 0.1337 ARP TO L2 PHASE CENTER (M)

|     |                |                |              |                            |
|-----|----------------|----------------|--------------|----------------------------|
| XYZ | -0.1655        | 0.0072         | 0.0132       | VEL TIMES 13.4864 YRS      |
| XYZ | 0.0000         | 0.0000         | 0.0000       | MON TO ARP                 |
| XYZ | 0.0142         | -0.1085        | 0.0589       | ARP TO L1 PHASE CENTER     |
| XYZ | 766680.5164    | -5571328.5310  | 2998751.0947 | L1 PHS CEN @ 2018.4871     |
| XYZ | -0.0000        | 0.0000         | 0.0000       | + XYZ ADJUSTMENTS          |
| XYZ | 766680.5164    | -5571328.5310  | 2998751.0947 | NEW L1 PHS CEN @ 2018.4871 |
| XYZ | 766680.5022    | -5571328.4225  | 2998751.0358 | NEW ARP @ 2018.4871        |
| XYZ | 766680.5022    | -5571328.4225  | 2998751.0358 | NEW MON @ 2018.4871        |
| LLH | 28 13 39.34290 | 277 50 7.30647 | -1.3998      | NEW L1 PHS CEN @ 2018.4871 |
| LLH | 28 13 39.34290 | 277 50 7.30650 | -1.5240      | NEW ARP @ 2018.4871        |
| LLH | 28 13 39.34290 | 277 50 7.30650 | -1.5240      | NEW MON @ 2018.4871        |

#### REMOTE STATION INFORMATION

STATION NAME: 6916 1

MONUMENT: NO DOMES NUMBER

|     |             |               |              |                            |
|-----|-------------|---------------|--------------|----------------------------|
| XYZ | 826941.1588 | -5567633.3026 | 2989640.8321 | MON @ 2018.4867 (M)        |
| NEU | -0.0008     | -0.0011       | 1.9964       | MON TO ARP (M)             |
| NEU | 0.0008      | 0.0011        | 0.0748       | ARP TO L1 PHASE CENTER (M) |
| NEU | 0.0001      | -0.0022       | 0.0772       | ARP TO L2 PHASE CENTER (M) |
| XYZ | 0.2576      | -1.7420       | 0.9407       | MON TO ARP                 |
| XYZ | 0.0108      | -0.0648       | 0.0360       | ARP TO L1 PHASE CENTER     |
| XYZ | 826941.4271 | -5567635.1093 | 2989641.8088 | L1 PHS CEN @ 2018.4871     |

BASELINE NAME: brtw 6916

|     |              |                 |              |                            |
|-----|--------------|-----------------|--------------|----------------------------|
| XYZ | -0.0448      | 0.0993          | -0.1920      | + XYZ ADJUSTMENTS          |
| XYZ | 826941.3824  | -5567635.0100   | 2989641.6168 | NEW L1 PHS CEN @ 2018.4871 |
| XYZ | 826941.3716  | -5567634.9453   | 2989641.5808 | NEW ARP @ 2018.4871        |
| XYZ | 826941.1140  | -5567633.2033   | 2989640.6401 | NEW MON @ 2018.4871        |
| LLH | 28 8 3.66940 | 278 26 53.45040 | -3.5726      | NEW L1 PHS CEN @ 2018.4871 |
| LLH | 28 8 3.66937 | 278 26 53.45036 | -3.6475      | NEW ARP @ 2018.4871        |
| LLH | 28 8 3.66940 | 278 26 53.45040 | -5.6439      | NEW MON @ 2018.4871        |

BASELINE NAME: wach 6916

|     |              |                 |              |                            |
|-----|--------------|-----------------|--------------|----------------------------|
| XYZ | -0.0396      | 0.1130          | -0.1766      | + XYZ ADJUSTMENTS          |
| XYZ | 826941.3875  | -5567634.9964   | 2989641.6322 | NEW L1 PHS CEN @ 2018.4871 |
| XYZ | 826941.3768  | -5567634.9316   | 2989641.5962 | NEW ARP @ 2018.4871        |
| XYZ | 826941.1192  | -5567633.1896   | 2989640.6555 | NEW MON @ 2018.4871        |
| LLH | 28 8 3.67003 | 278 26 53.45066 | -3.5766      | NEW L1 PHS CEN @ 2018.4871 |
| LLH | 28 8 3.67001 | 278 26 53.45062 | -3.6514      | NEW ARP @ 2018.4871        |
| LLH | 28 8 3.67003 | 278 26 53.45066 | -5.6479      | NEW MON @ 2018.4871        |

BASELINE NAME: zefr 6916

|     |              |                 |              |                            |
|-----|--------------|-----------------|--------------|----------------------------|
| XYZ | -0.0308      | 0.0867          | -0.1762      | + XYZ ADJUSTMENTS          |
| XYZ | 826941.3964  | -5567635.0227   | 2989641.6326 | NEW L1 PHS CEN @ 2018.4871 |
| XYZ | 826941.3856  | -5567634.9579   | 2989641.5966 | NEW ARP @ 2018.4871        |
| XYZ | 826941.1280  | -5567633.2159   | 2989640.6559 | NEW MON @ 2018.4871        |
| LLH | 28 8 3.66963 | 278 26 53.45084 | -3.5523      | NEW L1 PHS CEN @ 2018.4871 |
| LLH | 28 8 3.66960 | 278 26 53.45080 | -3.6271      | NEW ARP @ 2018.4871        |
| LLH | 28 8 3.66963 | 278 26 53.45084 | -5.6236      | NEW MON @ 2018.4871        |



Axx2018 627 18 627

B2018 6271544 18 6272221 1 page5 v1603.24IGS 126 1 2 27NGS 2018 719IFDDPX  
IIGS08\_1930 IGS 20170101  
C00090004 -210779805 9 -128295094 32 -180596075 19 X1788A6916X1788ABRTW  
D 1 2 -6534429 1 3 6997047 2 3 -9017896

Axx2018 627 18 627

B2018 6271544 18 6272221 1 page5 v1603.24IGS 126 1 2 27NGS 2018 719IFDDPX  
IIGS08\_1930 IGS 20170101  
C00090003 -276057674 8 -364480714 36 -607720641 21 X1788A6916X1788AWACH  
D 1 2 -6567514 1 3 7091324 2 3 -8695835

Axx2018 627 18 627

B2018 6271544 18 6272221 1 page5 v1603.24IGS 126 1 2 27NGS 2018 719IFDDPX  
IIGS08\_1930 IGS 20170101  
C00090002 -602606258 11 -36952065 42 91103799 23 X1788A6916X1788AZEFR  
D 1 2 -6009117 1 3 5504295 2 3 -9486238

#### POST-FIT RMS BY SATELLITE VS. BASELINE

|           | OVERALL | 01    | 02    | 03    | 05    | 06    | 07    | 08    | 09    |
|-----------|---------|-------|-------|-------|-------|-------|-------|-------|-------|
| brtw-6916 | 0.026   | 0.015 | 0.027 | 0.034 | 0.018 | 0.028 | 0.014 | 0.015 | 0.016 |
|           | 11      | 12    | 13    | 17    | 18    | 19    | 22    | 24    | 25    |
| brtw-6916 | 0.014   | 0.028 | 0.028 | 0.028 | 0.017 | 0.032 | 0.026 | 0.049 | 0.013 |
|           | 28      | 30    |       |       |       |       |       |       |       |
| brtw-6916 | 0.027   | 0.021 |       |       |       |       |       |       |       |

|           | OVERALL | 01    | 02    | 03    | 05    | 06    | 07    | 08    | 09    |
|-----------|---------|-------|-------|-------|-------|-------|-------|-------|-------|
| wach-6916 | 0.025   | 0.024 | 0.026 | 0.033 | 0.024 | 0.024 | 0.022 | 0.017 | 0.032 |
|           | 11      | 12    | 13    | 17    | 18    | 19    | 22    | 24    | 25    |
| wach-6916 | 0.019   | 0.024 | 0.030 | 0.013 | 0.025 | 0.021 | 0.030 | 0.043 | 0.029 |
|           | 28      | 30    |       |       |       |       |       |       |       |
| wach-6916 | 0.025   | 0.025 |       |       |       |       |       |       |       |

|            | OVERALL | 01    | 02    | 03    | 05    | 06    | 07    | 08    | 09    |
|------------|---------|-------|-------|-------|-------|-------|-------|-------|-------|
| zeffr-6916 | 0.032   | 0.017 | 0.034 | 0.028 | 0.029 | 0.038 | 0.019 | 0.026 | 0.042 |
|            | 11      | 12    | 13    | 17    | 18    | 19    | 22    | 24    | 25    |
| zeffr-6916 | 0.020   | 0.034 | 0.022 | 0.029 | 0.018 | 0.029 | 0.024 | 0.048 | 0.022 |
|            | 28      | 30    |       |       |       |       |       |       |       |
| zeffr-6916 | 0.044   | 0.021 |       |       |       |       |       |       |       |

#### OBS BY SATELLITE VS. BASELINE

|           | OVERALL | 01  | 02  | 03  | 05  | 06  | 07  | 08  | 09  |
|-----------|---------|-----|-----|-----|-----|-----|-----|-----|-----|
| brtw-6916 | 5721    | 356 | 400 | 394 | 230 | 612 | 274 | 70  | 215 |
|           | 11      | 12  | 13  | 17  | 18  | 19  | 22  | 24  | 25  |
| brtw-6916 | 295     | 295 | 95  | 762 | 223 | 490 | 300 | 222 | 59  |
|           | 28      | 30  |     |     |     |     |     |     |     |
| brtw-6916 | 52      | 377 |     |     |     |     |     |     |     |
|           | OVERALL | 01  | 02  | 03  | 05  | 06  | 07  | 08  | 09  |
| wach-6916 | 5020    | 305 | 413 | 304 | 233 | 611 | 253 | 66  | 42  |
|           | 11      | 12  | 13  | 17  | 18  | 19  | 22  | 24  | 25  |
| wach-6916 | 236     | 297 | 96  | 36  | 162 | 661 | 77  | 177 | 114 |

```

      28 30
wach-6916| 572 365
      OVERALL 01 02 03 05 06 07 08 09
zefr-6916| 5440 319 421 319 265 636 263 67 165
      11 12 13 17 18 19 22 24 25
zefr-6916| 244 313 46 54 180 648 193 210 99
      28 30
zefr-6916| 593 405

```

ITRF position of 6916 as determined by individual baselines

```

      X      Y      Z
brtw  826941.114 -5567633.203 2989640.640
wach  826941.119 -5567633.190 2989640.655
zefr  826941.128 -5567633.216 2989640.656

```

Residuals of position determined by individual baselines from the final position

```

      X      Y      Z      East      North      Up
brtw  -0.006  -0.000  -0.010  -0.006  -0.009  -0.005
wach  -0.001   0.013   0.005   0.001   0.011  -0.009
zefr   0.008  -0.013   0.005   0.006  -0.002   0.015

```

Covariance Matrix for the xyz OPUS Position (meters^2).

```

0.0000010533 -0.0000002520 0.0000001205
-0.0000002520 0.0000125800 -0.0000006200
0.0000001205 -0.0000006200 0.0000035444

```

Covariance Matrix for the enu OPUS Position (meters^2).

```

0.0000012289 0.0000006975 -0.0000012532
0.0000006975 0.0000049711 -0.0000033171
-0.0000012532 -0.0000033171 0.0000109777

```

Horizontal network accuracy = 0.00457 meters.

Vertical network accuracy = 0.00650 meters.

Derivation of NAD 83 vector components

Position of reference station ARP in NAD\_83(2011)(EPOCH:2010.0000).

```

      Xa(m)      Ya(m)      Za(m)
BRTW  805863.95044 -5580464.27627 2971581.21134 2010.00
WACH  799336.16446 -5604082.84993 2928868.77127 2010.00
ZEFR  766681.32093 -5571329.99195 2998751.20655 2010.00

```

Position of reference station monument in NAD\_83(2011)(EPOCH:2010.0000).

```

      Xr(m)      Yr(m)      Zr(m)
BRTW  805863.95044 -5580464.27627 2971581.21134 2010.00
WACH  799336.16446 -5604082.84993 2928868.77127 2010.00
ZEFR  766681.32093 -5571329.99195 2998751.20655 2010.00

```

Velocity of reference station monument in NAD\_83(2011)(EPOCH:2010.0000).

```

      Vx (m/yr)  Vy (m/yr)  Vz (m/yr)

```

|      |          |          |         |
|------|----------|----------|---------|
| BRTW | -0.01210 | -0.00080 | 0.00020 |
| WACH | -0.01170 | 0.00170  | 0.00040 |
| ZEFR | -0.01230 | 0.00050  | 0.00100 |

Vectors from unknown station monument to reference station monument  
in NAD\_83(2011)(EPOCH:2010.0000).

Xr-X= DX(m) Yr-Y= DY(m) Zr-Z= DZ(m)

|      |              |              |              |         |
|------|--------------|--------------|--------------|---------|
| BRTW | -21077.98456 | -12829.51027 | -18059.60166 | 2010.00 |
| WACH | -27605.77054 | -36448.08393 | -60772.04173 | 2010.00 |
| ZEFR | -60260.61407 | -3695.22595  | 9110.39355   | 2010.00 |

STATE PLANE COORDINATES - U.S. Survey Foot

SPC (0901 FL E)

|                       |             |
|-----------------------|-------------|
| Northing (Y) [feet]   | 1381951.291 |
| Easting (X) [feet]    | 478321.842  |
| Convergence [degrees] | -0.26020833 |
| Point Scale           | 0.99997743  |
| Combined Factor       | 0.99997807  |

\*\*\*\*\* New Reference Frame Preview \*\*\*\*\*

We are replacing the nation's NAD 83 and NAVD 88 datums, to improve access and accuracy of the National Spatial Reference System. More at <https://geodesy.noaa.gov/datums/newdatums/>

Below are approximate coordinates for this solution in the new frames:

APPROX ORTHO HGT: 23.224 (m) [PROTOTYPE (Computed using xGeoid17B,GRS80,IGS08)]

This position and the above vector components were computed without any knowledge by the National Geodetic Survey regarding the equipment or field operating procedures used.



## SNELL CREEK CHECK POINT

FILE: 25341840.DAT OP1532019043791

### NGS OPUS SOLUTION REPORT

=====

All computed coordinate accuracies are listed as peak-to-peak values.

For additional information: <https://www.ngs.noaa.gov/OPUS/about.jsp#accuracy>

USER: [sgrymko@pickettusa.com](mailto:sgrymko@pickettusa.com)

DATE: July 19, 2018

RINEX FILE: 2534184m.18o

TIME: 16:51:43 UTC

SOFTWARE: page5 1603.24 master71.pl 160321 START: 2018/07/03 12:36:00  
EPHEMERIS: igr20082.eph [rapid] STOP: 2018/07/03 18:54:00  
NAV FILE: brdc1840.18n OBS USED: 16588 / 18711 : 89%  
ANT NAME: TRM5800 NONE # FIXED AMB: 115 / 131 : 88%  
ARP HEIGHT: 1.9964 OVERALL RMS: 0.022(m)

REF FRAME: NAD\_83(2011)(EPOCH:2010.0000)

IGS08 (EPOCH:2018.5032)

|    |                 |          |                 |          |
|----|-----------------|----------|-----------------|----------|
| X: | 827693.306(m)   | 0.009(m) | 827692.491(m)   | 0.009(m) |
| Y: | -5567541.979(m) | 0.011(m) | -5567540.416(m) | 0.011(m) |
| Z: | 2989606.948(m)  | 0.024(m) | 2989606.785(m)  | 0.024(m) |

|            |                 |          |                                    |          |
|------------|-----------------|----------|------------------------------------|----------|
| LAT:       | 28 8 2.39291    | 0.025(m) | 28 8 2.41375                       | 0.025(m) |
| E LON:     | 278 27 21.20652 | 0.008(m) | 278 27 21.18539                    | 0.008(m) |
| W LON:     | 81 32 38.79348  | 0.008(m) | 81 32 38.81461                     | 0.008(m) |
| EL HGT:    | -3.608(m)       | 0.009(m) | -5.154(m)                          | 0.009(m) |
| ORTHO HGT: | 23.752(m)       | 0.025(m) | [NAVD88 (Computed using GEOID12B)] |          |
|            | EL. 77.93 ft    |          |                                    |          |

#### UTM COORDINATES STATE PLANE COORDINATES

|                       | UTM (Zone 17) | SPC (0901 FL E) |                 |
|-----------------------|---------------|-----------------|-----------------|
| Northing (Y) [meters] | 3112165.799   | 421177.522      | Y=1381813.25 ft |
| Easting (X) [meters]  | 446567.676    | 146549.438      | X= 480804.28 ft |
| Convergence [degrees] | -0.25657222   | -0.25657222     |                 |
| Point Scale           | 0.99963524    | 0.99997642      |                 |
| Combined Factor       | 0.99963581    | 0.99997699      |                 |

US NATIONAL GRID DESIGNATOR: 17RMM4656712165(NAD 83)

#### BASE STATIONS USED

| PID    | DESIGNATION                 | LATITUDE    | LONGITUDE    | DISTANCE(m) |
|--------|-----------------------------|-------------|--------------|-------------|
| DQ7965 | FLWE WEDGEFIELD FL CORS ARP | N282626.477 | W0810533.176 | 55834.6     |
| DH3757 | WACH WAUCHULA CORS ARP      | N273051.042 | W0815256.615 | 76344.5     |
| DF7046 | BRTW BARTOW CORS ARP        | N275658.642 | W0814658.200 | 31119.7     |

NEAREST NGS PUBLISHED CONTROL POINT  
DO8901 777957 A N2809000023 W08133000054 3246.4

#### BASE STATION INFORMATION

STATION NAME: flwe a 1 (Wedgefield FL; Wedgefield, Florida USA)

MONUMENT: NO DOMES NUMBER

XYZ 869051.5075 -5544931.6670 3019536.5449 MON @ 2005.0000 (M)  
XYZ -0.0120 -0.0007 0.0021 VEL (M/YR)  
NEU 0.0000 0.0000 0.0000 MON TO ARP (M)  
NEU 0.0013 -0.0007 0.0888 ARP TO L1 PHASE CENTER (M)  
NEU 0.0005 0.0002 0.0818 ARP TO L2 PHASE CENTER (M)  
XYZ -0.1620 -0.0095 0.0284 VEL TIMES 13.5024 YRS  
XYZ 0.0000 0.0000 0.0000 MON TO ARP  
XYZ 0.0113 -0.0767 0.0434 ARP TO L1 PHASE CENTER  
XYZ 869051.3568 -5544931.7531 3019536.6167 L1 PHS CEN @ 2018.5032  
XYZ -0.0000 0.0000 0.0001 + XYZ ADJUSTMENTS  
XYZ 869051.3568 -5544931.7531 3019536.6168 NEW L1 PHS CEN @ 2018.5032  
XYZ 869051.3455 -5544931.6764 3019536.5733 NEW ARP @ 2018.5032  
XYZ 869051.3455 -5544931.6764 3019536.5733 NEW MON @ 2018.5032  
LLH 28 26 26.49879 278 54 26.80294 -4.9944 NEW L1 PHS CEN @ 2018.5032  
LLH 28 26 26.49875 278 54 26.80297 -5.0832 NEW ARP @ 2018.5032  
LLH 28 26 26.49875 278 54 26.80297 -5.0832 NEW MON @ 2018.5032

STATION NAME: wach a 1 (Wauchula; Wauchula, Florida, U.S.A.)

MONUMENT: NO DOMES NUMBER

XYZ 799335.5101 -5604081.2834 2928868.5861 MON @ 2005.0000 (M)  
XYZ -0.0117 0.0017 0.0004 VEL (M/YR)  
NEU 0.0000 0.0000 0.0000 MON TO ARP (M)  
NEU 0.0001 -0.0008 0.1242 ARP TO L1 PHASE CENTER (M)  
NEU -0.0000 -0.0008 0.1337 ARP TO L2 PHASE CENTER (M)  
XYZ -0.1585 0.0224 0.0053 VEL TIMES 13.5024 YRS  
XYZ 0.0000 0.0000 0.0000 MON TO ARP  
XYZ 0.0148 -0.1091 0.0575 ARP TO L1 PHASE CENTER  
XYZ 799335.3664 -5604081.3702 2928868.6489 L1 PHS CEN @ 2018.5032  
XYZ -0.0000 -0.0000 -0.0000 + XYZ ADJUSTMENTS  
XYZ 799335.3664 -5604081.3702 2928868.6489 NEW L1 PHS CEN @ 2018.5032  
XYZ 799335.3516 -5604081.2610 2928868.5914 NEW ARP @ 2018.5032  
XYZ 799335.3516 -5604081.2610 2928868.5914 NEW MON @ 2018.5032  
LLH 27 30 51.06279 278 7 3.36295 9.2623 NEW L1 PHS CEN @ 2018.5032  
LLH 27 30 51.06279 278 7 3.36298 9.1380 NEW ARP @ 2018.5032  
LLH 27 30 51.06279 278 7 3.36298 9.1380 NEW MON @ 2018.5032

STATION NAME: brtw a 3 (BARTOW; Bartow, Florida, U.S.A.)

MONUMENT: 49529S001

XYZ 805863.2966 -5580462.7024 2971581.0305 MON @ 2005.0000 (M)  
XYZ -0.0121 -0.0008 0.0002 VEL (M/YR)  
NEU 0.0000 0.0000 0.0000 MON TO ARP (M)  
NEU 0.0001 -0.0008 0.1242 ARP TO L1 PHASE CENTER (M)  
NEU -0.0000 -0.0008 0.1337 ARP TO L2 PHASE CENTER (M)

|     |                |                |              |                            |
|-----|----------------|----------------|--------------|----------------------------|
| XYZ | -0.1633        | -0.0103        | 0.0021       | VEL TIMES 13.5024 YRS      |
| XYZ | 0.0000         | 0.0000         | 0.0000       | MON TO ARP                 |
| XYZ | 0.0149         | -0.1087        | 0.0584       | ARP TO L1 PHASE CENTER     |
| XYZ | 805863.1482    | -5580462.8214  | 2971581.0909 | L1 PHS CEN @ 2018.5032     |
| XYZ | -0.0000        | -0.0000        | -0.0000      | + XYZ ADJUSTMENTS          |
| XYZ | 805863.1482    | -5580462.8214  | 2971581.0909 | NEW L1 PHS CEN @ 2018.5032 |
| XYZ | 805863.1333    | -5580462.7127  | 2971581.0326 | NEW ARP @ 2018.5032        |
| XYZ | 805863.1333    | -5580462.7127  | 2971581.0326 | NEW MON @ 2018.5032        |
| LLH | 27 56 58.66235 | 278 13 1.77785 | 12.1453      | NEW L1 PHS CEN @ 2018.5032 |
| LLH | 27 56 58.66235 | 278 13 1.77788 | 12.0211      | NEW ARP @ 2018.5032        |
| LLH | 27 56 58.66235 | 278 13 1.77788 | 12.0211      | NEW MON @ 2018.5032        |

#### REMOTE STATION INFORMATION

STATION NAME: 2534 1

MONUMENT: NO DOMES NUMBER

|     |             |               |              |                            |
|-----|-------------|---------------|--------------|----------------------------|
| XYZ | 827692.5359 | -5567540.5608 | 2989606.9052 | MON @ 2018.5028 (M)        |
| NEU | -0.0008     | -0.0011       | 1.9964       | MON TO ARP (M)             |
| NEU | 0.0008      | 0.0011        | 0.0748       | ARP TO L1 PHASE CENTER (M) |
| NEU | 0.0001      | -0.0022       | 0.0772       | ARP TO L2 PHASE CENTER (M) |
| XYZ | 0.2578      | -1.7420       | 0.9407       | MON TO ARP                 |
| XYZ | 0.0108      | -0.0648       | 0.0360       | ARP TO L1 PHASE CENTER     |
| XYZ | 827692.8045 | -5567542.3675 | 2989607.8819 | L1 PHS CEN @ 2018.5032     |

BASELINE NAME: flwe 2534

|     |              |                 |              |                            |
|-----|--------------|-----------------|--------------|----------------------------|
| XYZ | -0.0500      | 0.1470          | -0.1069      | + XYZ ADJUSTMENTS          |
| XYZ | 827692.7545  | -5567542.2206   | 2989607.7750 | NEW L1 PHS CEN @ 2018.5032 |
| XYZ | 827692.7437  | -5567542.1558   | 2989607.7390 | NEW ARP @ 2018.5032        |
| XYZ | 827692.4859  | -5567540.4138   | 2989606.7983 | NEW MON @ 2018.5032        |
| LLH | 28 8 2.41418 | 278 27 21.18522 | -3.0786      | NEW L1 PHS CEN @ 2018.5032 |
| LLH | 28 8 2.41416 | 278 27 21.18518 | -3.1534      | NEW ARP @ 2018.5032        |
| LLH | 28 8 2.41418 | 278 27 21.18522 | -5.1499      | NEW MON @ 2018.5032        |

BASELINE NAME: wach 2534

|     |              |                 |              |                            |
|-----|--------------|-----------------|--------------|----------------------------|
| XYZ | -0.0435      | 0.1499          | -0.1229      | + XYZ ADJUSTMENTS          |
| XYZ | 827692.7610  | -5567542.2177   | 2989607.7590 | NEW L1 PHS CEN @ 2018.5032 |
| XYZ | 827692.7502  | -5567542.1529   | 2989607.7230 | NEW ARP @ 2018.5032        |
| XYZ | 827692.4924  | -5567540.4109   | 2989606.7823 | NEW MON @ 2018.5032        |
| LLH | 28 8 2.41375 | 278 27 21.18547 | -3.0878      | NEW L1 PHS CEN @ 2018.5032 |
| LLH | 28 8 2.41373 | 278 27 21.18542 | -3.1627      | NEW ARP @ 2018.5032        |
| LLH | 28 8 2.41375 | 278 27 21.18547 | -5.1591      | NEW MON @ 2018.5032        |

BASELINE NAME: brtw 2534

|     |              |                 |              |                            |
|-----|--------------|-----------------|--------------|----------------------------|
| XYZ | -0.0407      | 0.1390          | -0.1307      | + XYZ ADJUSTMENTS          |
| XYZ | 827692.7638  | -5567542.2285   | 2989607.7512 | NEW L1 PHS CEN @ 2018.5032 |
| XYZ | 827692.7530  | -5567542.1637   | 2989607.7152 | NEW ARP @ 2018.5032        |
| XYZ | 827692.4952  | -5567540.4218   | 2989606.7745 | NEW MON @ 2018.5032        |
| LLH | 28 8 2.41336 | 278 27 21.18551 | -3.0817      | NEW L1 PHS CEN @ 2018.5032 |
| LLH | 28 8 2.41334 | 278 27 21.18547 | -3.1565      | NEW ARP @ 2018.5032        |
| LLH | 28 8 2.41336 | 278 27 21.18551 | -5.1530      | NEW MON @ 2018.5032        |



## G-FILES

Axx2018 7 3 18 7 3

B2018 7 31236 18 7 31853 1 page5 v1603.24IGS 126 1 2 27NGS 2018 719IFDDPX  
IIGS08\_1930 IGS 20170101  
C00090005 413588596 9 226087374 34 299297750 20 X1848A2534X1848AFLWE  
D 1 2 -5116860 1 3 6356472 2 3 -9274531

Axx2018 7 3 18 7 3

B2018 7 31236 18 7 31853 1 page5 v1603.24IGS 126 1 2 27NGS 2018 719IFDDPX  
IIGS08\_1930 IGS 20170101  
C00090003 -283571408 6 -365408501 30 -607381909 16 X1848A2534X1848AWACH  
D 1 2 -4537074 1 3 5645625 2 3 -8783860

Axx2018 7 3 18 7 3

B2018 7 31236 18 7 31853 1 page5 v1603.24IGS 126 1 2 27NGS 2018 719IFDDPX  
IIGS08\_1930 IGS 20170101  
C00090004 -218293619 6 -129222910 26 -180257419 14 X1848A2534X1848ABRTW  
D 1 2 -3301233 1 3 4904496 2 3 -8993029

### POST-FIT RMS BY SATELLITE VS. BASELINE

|           | OVERALL | 01    | 02    | 03    | 06    | 07    | 08    | 09    | 11    |
|-----------|---------|-------|-------|-------|-------|-------|-------|-------|-------|
| flwe-2534 | 0.025   | 0.023 | 0.033 | 0.027 | 0.029 | 0.019 | 0.022 | 0.018 | 0.023 |
|           | 13      | 16    | 17    | 18    | 19    | 22    | 23    | 24    | 27    |
| flwe-2534 | 0.008   | 0.034 | 0.027 | 0.027 | 0.030 | 0.029 | 0.023 | 0.017 | 0.029 |
|           | 28      | 30    |       |       |       |       |       |       |       |
| flwe-2534 | 0.025   | 0.021 |       |       |       |       |       |       |       |

|           | OVERALL | 01    | 02    | 03    | 06    | 07    | 08    | 09    | 11    |
|-----------|---------|-------|-------|-------|-------|-------|-------|-------|-------|
| wach-2534 | 0.020   | 0.020 | 0.035 | 0.028 | 0.028 | 0.034 | 0.016 | 0.012 | 0.015 |
|           | 13      | 16    | 17    | 18    | 19    | 22    | 23    | 24    | 27    |
| wach-2534 | ...     | 0.017 | 0.022 | 0.017 | 0.026 | 0.029 | 0.016 | 0.045 | 0.015 |
|           | 28      | 30    |       |       |       |       |       |       |       |
| wach-2534 | 0.020   | 0.019 |       |       |       |       |       |       |       |

|           | OVERALL | 01    | 02    | 03    | 06    | 07    | 08    | 09    | 11    |
|-----------|---------|-------|-------|-------|-------|-------|-------|-------|-------|
| brtw-2534 | 0.020   | 0.020 | 0.036 | 0.031 | 0.024 | 0.030 | 0.015 | 0.014 | 0.017 |
|           | 13      | 16    | 17    | 18    | 19    | 22    | 23    | 24    | 27    |
| brtw-2534 | ...     | 0.017 | 0.017 | 0.018 | 0.028 | 0.031 | 0.018 | 0.028 | 0.014 |
|           | 28      | 30    |       |       |       |       |       |       |       |
| brtw-2534 | 0.018   | 0.020 |       |       |       |       |       |       |       |

### OBS BY SATELLITE VS. BASELINE

|           | OVERALL | 01  | 02  | 03  | 06  | 07  | 08  | 09  | 11  |
|-----------|---------|-----|-----|-----|-----|-----|-----|-----|-----|
| flwe-2534 | 5326    | 490 | 61  | 223 | 240 | 20  | 401 | 319 | 589 |
|           | 13      | 16  | 17  | 18  | 19  | 22  | 23  | 24  | 27  |
| flwe-2534 | 1       | 75  | 498 | 404 | 333 | 253 | 199 | 19  | 212 |
|           | 28      | 30  |     |     |     |     |     |     |     |
| flwe-2534 | 395     | 594 |     |     |     |     |     |     |     |

|           | OVERALL | 01  | 02 | 03  | 06  | 07 | 08  | 09  | 11  |
|-----------|---------|-----|----|-----|-----|----|-----|-----|-----|
| wach-2534 | 5411    | 529 | 66 | 211 | 269 | 47 | 390 | 330 | 568 |

|           |         |     |     |     |     |     |     |     |     |
|-----------|---------|-----|-----|-----|-----|-----|-----|-----|-----|
|           | 13      | 16  | 17  | 18  | 19  | 22  | 23  | 24  | 27  |
| wach-2534 | ...     | 90  | 498 | 454 | 330 | 46  | 242 | 42  | 207 |
|           | 28      | 30  |     |     |     |     |     |     |     |
| wach-2534 | 438     | 654 |     |     |     |     |     |     |     |
|           | OVERALL | 01  | 02  | 03  | 06  | 07  | 08  | 09  | 11  |
| brtw-2534 | 5851    | 525 | 79  | 247 | 267 | 65  | 428 | 329 | 619 |
|           | 13      | 16  | 17  | 18  | 19  | 22  | 23  | 24  | 27  |
| brtw-2534 | ...     | 104 | 496 | 471 | 326 | 263 | 240 | 35  | 249 |
|           | 28      | 30  |     |     |     |     |     |     |     |
| brtw-2534 | 446     | 662 |     |     |     |     |     |     |     |

ITRF position of 2534 as determined by individual baselines

|      |            |              |             |
|------|------------|--------------|-------------|
|      | X          | Y            | Z           |
| flwe | 827692.486 | -5567540.414 | 2989606.798 |
| wach | 827692.492 | -5567540.411 | 2989606.782 |
| brtw | 827692.495 | -5567540.422 | 2989606.774 |

Residuals of position determined by individual baselines from the final position

|      |        |        |        |        |        |        |
|------|--------|--------|--------|--------|--------|--------|
|      | X      | Y      | Z      | East   | North  | Up     |
| flwe | -0.005 | 0.002  | 0.013  | -0.005 | 0.013  | 0.004  |
| wach | 0.001  | 0.005  | -0.003 | 0.002  | -0.000 | -0.005 |
| brtw | 0.004  | -0.006 | -0.011 | 0.003  | -0.013 | 0.001  |

Covariance Matrix for the xyz OPUS Position (meters^2).

|               |               |               |
|---------------|---------------|---------------|
| 0.0000005800  | -0.0000000836 | 0.0000000413  |
| -0.0000000836 | 0.0000064200  | -0.0000003357 |
| 0.0000000413  | -0.0000003357 | 0.0000020089  |

Covariance Matrix for the enu OPUS Position (meters^2).

|               |               |               |
|---------------|---------------|---------------|
| 0.0000006820  | 0.0000003534  | -0.0000006835 |
| 0.0000003534  | 0.0000026769  | -0.0000015958 |
| -0.0000006835 | -0.0000015958 | 0.0000056501  |

Horizontal network accuracy = 0.00336 meters.

Vertical network accuracy = 0.00466 meters.

Derivation of NAD 83 vector components

Position of reference station ARP in NAD\_83(2011)(EPOCH:2010.0000).

|      |              |                |               |
|------|--------------|----------------|---------------|
|      | Xa(m)        | Ya(m)          | Za(m)         |
| FLWE | 869052.16380 | -5544933.23814 | 3019536.73114 |
| WACH | 799336.16446 | -5604082.84993 | 2928868.77127 |
| BRTW | 805863.95044 | -5580464.27627 | 2971581.21134 |

Position of reference station monument in NAD\_83(2011)(EPOCH:2010.0000).

|      |              |                |               |
|------|--------------|----------------|---------------|
|      | Xr(m)        | Yr(m)          | Zr(m)         |
| FLWE | 869052.16380 | -5544933.23814 | 3019536.73114 |
| WACH | 799336.16446 | -5604082.84993 | 2928868.77127 |
| BRTW | 805863.95044 | -5580464.27627 | 2971581.21134 |

Velocity of reference station monument in NAD\_83(2011)(EPOCH:2010.0000).

|      | Vx (m/yr) | Vy (m/yr) | Vz (m/yr) |
|------|-----------|-----------|-----------|
| FLWE | -0.01200  | -0.00070  | 0.00210   |
| WACH | -0.01170  | 0.00170   | 0.00040   |
| BRTW | -0.01210  | -0.00080  | 0.00020   |

Vectors from unknown station monument to reference station monument  
in NAD\_83(2011)(EPOCH:2010.0000).

|      | Xr-X= DX(m)  | Yr-Y= DY(m)  | Zr-Z= DZ(m)  |         |
|------|--------------|--------------|--------------|---------|
| FLWE | 41358.85780  | 22608.74086  | 29929.78314  | 2010.00 |
| WACH | -28357.14154 | -36540.87093 | -60738.17673 | 2010.00 |
| BRTW | -21829.35556 | -12922.29727 | -18025.73666 | 2010.00 |

STATE PLANE COORDINATES - U.S. Survey Foot

SPC (0901 FL E)  
Northing (Y) [feet] 1381813.253  
Easting (X) [feet] 480804.281  
Convergence [degrees] -0.25657222  
Point Scale 0.99997642  
Combined Factor 0.99997699

\*\*\*\*\* New Reference Frame Preview \*\*\*\*\*

We are replacing the nation's NAD 83 and NAVD 88 datums, to improve access and accuracy of the National Spatial Reference System. More at <https://geodesy.noaa.gov/datums/newdatums/>

Below are approximate coordinates for this solution in the new frames:

APPROX ORTHO HGT: 23.724 (m) [PROTOTYPE (Computed using xGeoid17B,GRS80,IGS08)]

This position and the above vector components were computed without any knowledge by the National Geodetic Survey regarding the equipment or field operating procedures used.



29/1928

SWFWMD

18677

DMIT WETLAND AND WELL (North)

SNELL CREEK

128  
2534

SNELL CREEK WELL POS-16 EAST

START TIME 11:25 AM

STOP TIME 5:30 PM

HI: 6.55

128  
6916

SNELL CREEK WELL POS-17 WEST

START TIME 11:43

STOP TIME 6:24 PM

HI: 6.55

6-27-18 91°  
WEDNESDAY PARTLY CLOUDY

30/1928  
BICKEL  
PRICE



47/928

SWFWMD

18677

DMIT Wetland Well

SWELL CREEK

TEL0 ROVER

7093

TEL0 BASE

RTK FILE = 18677-070318

5006

TSC3

2944

(100)  
BASE @ POS-17 BRASS DISC IN S.E.  
CORNER of CONC PAD

H1 = 6.55

FIXED ROD = 6.90

Pos-18 Lmark(E) Z00 CHECK POS-18 AT LAKE MARION CREEK

Z01 CHECK Z00

Pos-19 Lmark(W) Z02 CHECK POS-19 AT LAKE MARION CREEK

Z03 CHECK Z02

Pos-16 SWELL(E) Z04 POS-16 SWELL(E)

Z05 CHECK Z04

Z06 SC1 1.1

Z07 SC1 1.2

Z08 SC1 1.3

Z09 Bolt 1

Z10 Bolt 2

Z11 TOP OF BOARD

Z12 SHW1

Z13 SHW2

STAFF GAUGE

7-3-18

TUESDAY

CLEAR

85°

48/928

BICKEL

CHINIS

Z14 SET 5/8" SRC "REFLB364"

Z15 CHECK Z14

Z16 BAD

Z17 SET 5/8" SRC "REFLB364"

Z18 SET Good

Z19 CK Z18

Z20 CK Z17

Z21 SC3 1.2

Z22 SC3 1.1

Z23 SC3 1.3

Z24 CK Z23

Z25 CK Z22

Z26 CK Z21

Z27 BAD

Z28 BASE CK @ Z04 POS-16



49/928

SWEWMD

18677

DIMIT WETLAND, WELL

SWELL CREEK

5/8" SRC "REF LB 364"

START TIME 8:34 AM

STOP TIME 4:57 PM

HI=6.55

R8  
7534

7-3-18

TUESDAY

LEVEL FROM POS-16 → GPS# 214

50/928

BRICKEL  
CHAVIS

| +     | HI     | EL    | BMEL   | DESC                                               |
|-------|--------|-------|--------|----------------------------------------------------|
| 5.152 | 80.345 |       | 75.193 | Pos-16<br>BRASS DISC<br>@ S.E. CORNER<br>CONC PAD  |
| 6.950 | 80.293 | 7.002 | 73.343 | 73.374<br>SET 5/8" SRC<br>"REF LB 364"<br>GPS# 214 |
|       |        | 5.16  | 75.193 | 75.193                                             |



5/1/928

S5

TSC3

2944

SWFWMD

18677

SWELL CREEK

Access File = 18677-070318c

1@ 214 BS 204

H1=5.06

BsH1=7.00

Rad=5.00

Bsck=300

301 Sc1 1.1

302 Sc1 1.2

303 Sc1 1.3

304 GROUND@ STAFF GAUGE

305 Bolt 1

306 Bolt 2

307 Top of Boxed

308 SHW 2

309 SHW 1

310 SHW 3

311 BscK

312 CK 310

313 CK 309

314 CK 308

STAFF GAUGE

7-3-18

TUESDAY

5/1/928

Buckel  
CHAMPS

315 CK 307

316 CK 306

317 CK 305

318 CK 303

319 CK 302

320 CK 301

321 BscK

322 CK 301

323 CK 302

324 CK 303

325 CK 305

326 CK 306

327 CK 307

328 CK 308

329 CK 309

330 CK 310

331 BscK



53/1928

SWEWMD

18677

SWELL CREEK

LEVEL BETWEEN 217 AND 218

| +     | HI    | - | EL |
|-------|-------|---|----|
| 5.040 | 79.98 |   |    |

|       |       |       |       |
|-------|-------|-------|-------|
| 4.790 | 79.96 | 4.810 | 75.17 |
|-------|-------|-------|-------|

|  |       |       |
|--|-------|-------|
|  | 5.020 | 74.94 |
|--|-------|-------|

7-3-18

TUESDAY

54/1928

BICKEL  
CHAVIS

BMEL DESC

74.940 5/8" SIZE "REFUB 3/4" GPS 217

SET BRIDGE SPIKE GPS 218

74.94 C-ABOVE



55/928

SWEWIND  
18677  
SNELL CREEK

ACCESS FILE: 18677-070318C

100 217 BS 218

HI=5.22

BSHI=7.00

ROD=5.00 → 8.50

Bsck=332

333 SC1 3-1

334 SC1 3-2

335 SC1 3-3

336 Bsck

337 CK 335

338 CK 334

339 CK 333

340 Bsck

341 CK 333

342 CK 334

343 CK 335

344 Bsck

7-3-18

TUESDAY

80°  
CLOUDY/RAINY

56/928

BICKEL  
CHAVIS



57/928

SWFWMD

18677

SWELL CREEK

Rto BASE

5006

Rto ROVER

To 93

Rtk File-18677-070518

BASE@100(Pos-17)

HI=6.55

Fixed Rod=6.90

TSC3

2944

229 CHECK 204 (Pos-16)

230 CHECK 214

231 5/8" SFC "REF 18364" (Static Point)

232 CHECK 231

233 CK 221

234 CK 222

235 CK 223

236 SC1 2.1

237 SC1 2.2

238 SC1 2.3

239 CK 238

240 CK 237

241 CK 236

242 CK 236

243 CK 237

244 CK 238

7-5-18

THURSDAY

58/928

BICKEL  
CHAVIS  
REESE

245 SC2 3.1

246 SC2 3.2

247 Bolt 1

248 Bolt 2

249 TOP of BOARD

250 CK 245

251 CK 246

252 CK 247

253 CK 248

254 CK 249

255 GRIND SHOT

256 CK 245

257 CK 246

258 CK 247

259 CK 248

260 CK 249

261 SC2 1.1

262 SC2 1.2

263 CK 261

264 CK 262

265 CK 261

266 CK 262

SC2 SG



59/1928

SWFWMD

18677

SNELL CREEK

ITK FILE: 18677-070518

267 SCZ 2.1

268 CK 267

269 CK 267

270 CK 249

271 SCZ SH3

272 CK 271

273 CK 271

274 SCZ SH2

275 CK 274

276 CK 274

277 CK 274

278 CK 274

279 SCZ SH1

280 CK 279

281 CK 279

282 CK 204

7-5-18  
THURSDAY

60/1928

BRICKEL  
CHANNIS  
REESE

283

↓ } Topo @ Pos-16

290

291

↓ } Topo @ Pos-17

296

297 CK 204



Cal 1978

SWFWMD

18677

SNELL CREEK

Pos-16

| +    | HI     | - | EL |
|------|--------|---|----|
| 4.99 | 80.183 |   |    |

|  |  |      |        |
|--|--|------|--------|
|  |  | 1.36 | 78.823 |
|--|--|------|--------|

|      |        |      |        |
|------|--------|------|--------|
| 4.83 | 80.033 | 4.98 | 75.203 |
|------|--------|------|--------|

|  |  |      |        |
|--|--|------|--------|
|  |  | 4.84 | 75.193 |
|--|--|------|--------|

NOTE MEASURE DOWN FROM TOP OF METAL CASING  
TO WATER TABLE = 8.15.

4:25 PM

WATER ELEV = 70.673

7-5-18  
THURSDAY

621  
1978

BICKEL  
CHAVIS  
REESE

BMEL DESC

75.193 BRASS DISC IN N.E. CORNER OF  
CONC PAD @ POS-16

NORTH RIM OF 4'1/8" METAL CASING  
(POS-16)

NORTH SIDE OF POS-16 ON CONC  
PAD

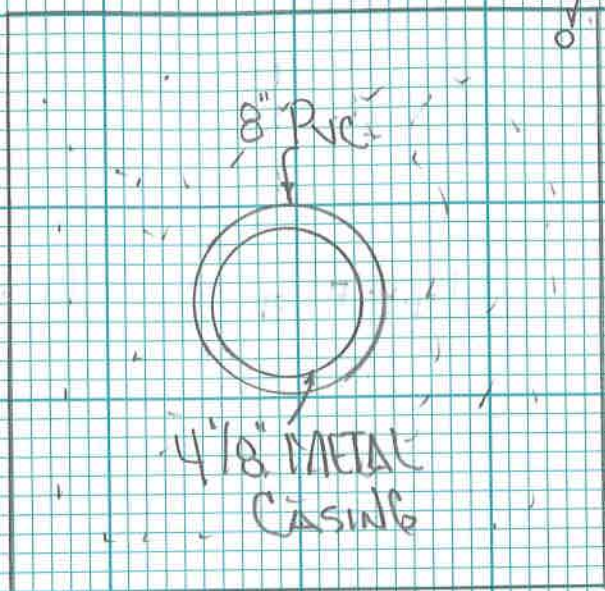
BRASS DISC (POS-16)



63/928

SWFWMD  
18677  
SNELL CREEK  
POS-16

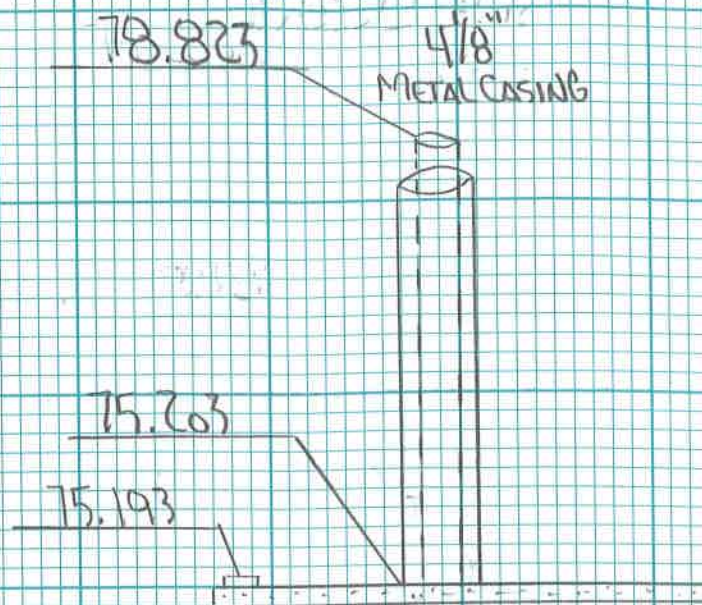
BRASS  
DISC



7-5-18  
THURSDAY

64/1928

BICKEL  
CHAVIS  
REESE



FACING EAST  
POS-16



65/928 7.45

SWFWMD  
186.77  
S. JELL CREEK

| +    | HI     | -    | EL     |
|------|--------|------|--------|
| 4.83 | 81.122 |      |        |
|      |        | 0.78 | 80.342 |
| 4.78 | 81.052 | 4.85 | 76.272 |
|      |        | 4.76 | 76.292 |

NOTE MEASURE DOWN FROM TOP OF CASING  
TO WATER TABLE = 7.45

5:10 PM

WATER ELEV = 72.892

7-5-18  
THURSDAY

66/928

BICKEL  
CHAVIS  
REESE

BMEL DESC

76.292 BRASS DISC W N.E. CORNER  
OF CONC PAD @ POS-17

NORTH RIM OF 4" 1/8" METAL CASING  
POS-17

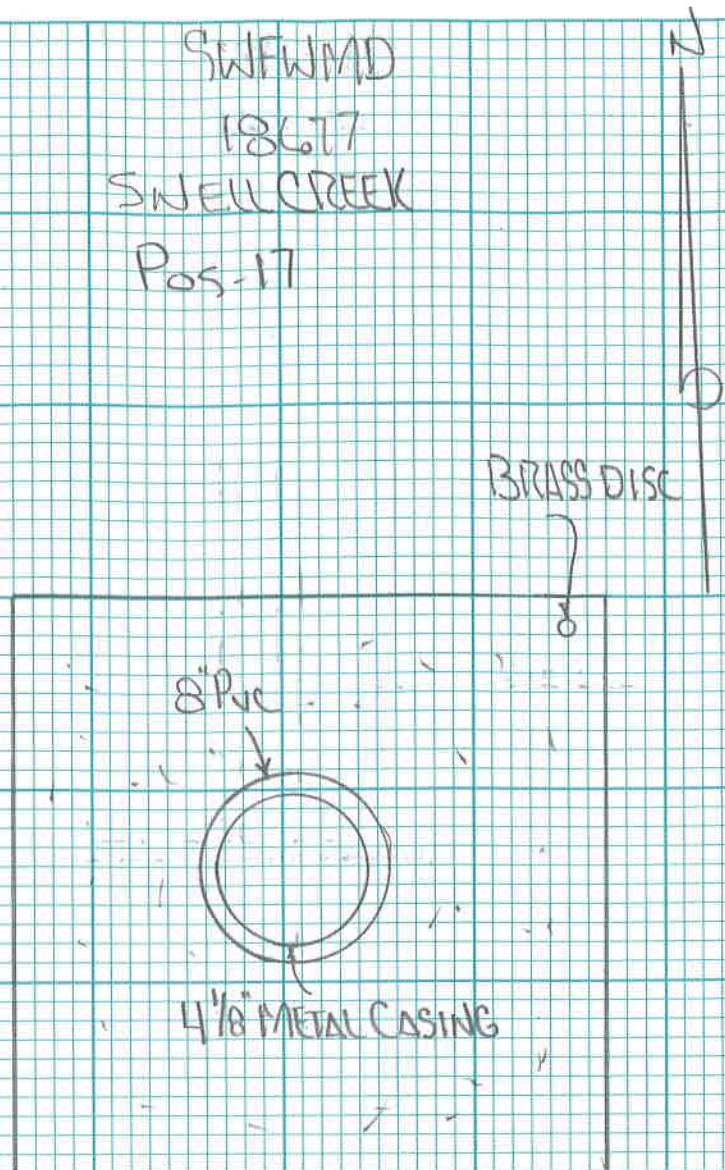
NORTH SIDE OF POS-17 CONC PAD

76.292 BRASS DISC (POS-17)



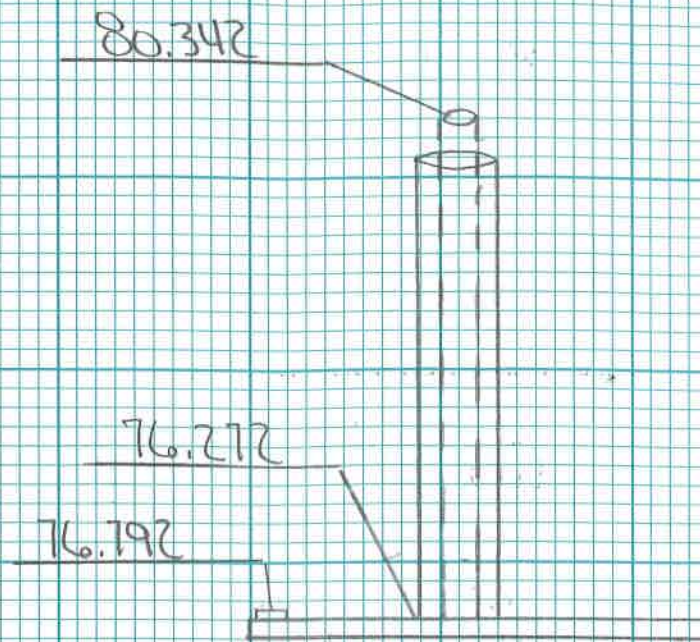
67/1928

SWFWMD  
18617  
SWEEL CREEK  
Pos-17



7-5-18  
THURSDAY

68/1928  
BICKEL  
CHAVIS  
REESE



Pos-17  
Facing East



83/928

18678

SWFUMID

~~WATERWAY CREEK~~

SNELL CREEK

R 8

2534

SNELL E POS = 16

START TIME 9:30 AM

STOP TIME 4:21 PM

HI = 6.55

7-9-18

MONDAY

84/928

DICKER

FRED



137/928

SWF WMD  
18677  
SNELL CREEK  
POS-17

| +     | HI     | - | ELEV. |
|-------|--------|---|-------|
| 4.425 | 80.717 |   |       |

NOTES  
1:44 PM 7/26/18  
MEASURE DOWN FROM  
TOP OF CASING TO  
WATER TABLE: 8.85  
WATER ELEV: 71.368

|       |        |
|-------|--------|
| 4.436 | 76.221 |
|-------|--------|

|       |        |
|-------|--------|
| 4.495 | 76.222 |
|-------|--------|

|       |        |
|-------|--------|
| 4.480 | 76.237 |
|-------|--------|

|       |        |
|-------|--------|
| 4.465 | 76.252 |
|-------|--------|

7-26-18  
THURSDAY

138/928

DIDION  
BICKEL

| BHEL   | DESC.                                          | NE |
|--------|------------------------------------------------|----|
| 76.292 | BRASS DISC @ NW CORNER OF<br>CONC PAD (POS-17) |    |

W: RIM OF 4 3/16" METAL CASING  
POS-17

NE CORNER OF CONC PAD

SE CORNER OF CONC PAD

SW CORNER OF CONC PAD

NW CORNER OF CONC PAD



139/928

SWFVMD  
18677  
SNELL CREEK  
POS-17

+

HI

-

ELEV.

4.480

76.237

4.530

76.187

4.530

76.187

4.538

76.179

.368

80.586

.499

80.218

4.296

76.290

7-26-18  
THURSDAY

140/928

DIDION  
BICKEL

DIFF

BMEL

DESC.

76.292

NE. GND

SE GND

SW GND

NW GND

N. RIM OF 8" PVC PIPE

-0.002

76.292

BRASS DISC @ <sup>NE</sup> NW CORNER OF  
CONC PAD POS-17



141/928

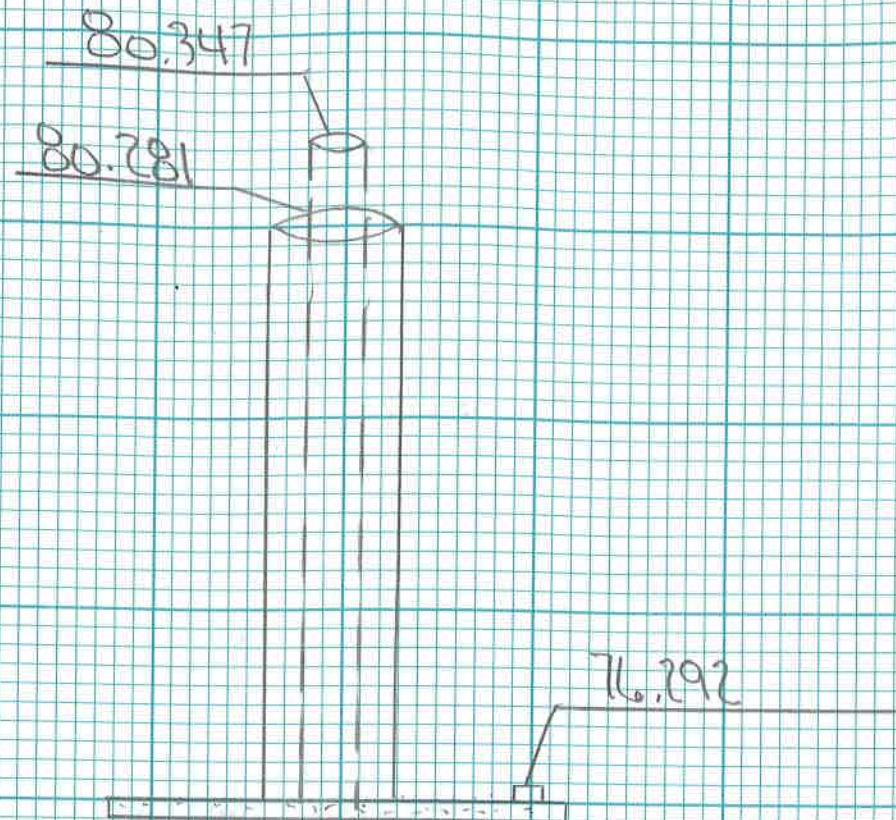
SWTWMID  
18677  
S JELL CREEK



7-26-18

142/928

THURSDAY



PICTURES

8575 BRASS DISC STAMPED "POS-17"

8576 } BLUE TAG

8577

8578 MEASURE METAL CASING

8579 METAL CASING

8580 POS-17 WEST

8581 } POS-17 NORTH

8582

BRASS DISC  
STAMPED "POS-17"



HB/928

SW FWD  
18677  
SUELL CREEK  
POS. 16

| +     | HI     | - | ELEV. |
|-------|--------|---|-------|
| 4.900 | 80.093 |   |       |

2:55 pm 7-26-18  
NOTES MEASURE DOWN FROM  
TOP OF CASING TO  
WATER TABLE: 7.7  
WATER ELEV: 70.878

1.271 78.822

4.905 75.188

4.924 75.169

4.883 75.210

4.881 75.212

7-26-18  
THURSDAY

144/928

DION  
BICKELBMEL  
75.193DESC.  
BRASS DISC. @ NE CORNER OF  
CONC PAD (POS. 16)N. RIM OF 4 3/16" METAL CASING  
POS-

NE CORNER OF CONC PAD

SE CORNER OF CONC PAD

SW CORNER OF CONC PAD

NW CORNER OF CONC PAD



145/928

SWFWMD  
18677  
SWEET CREEK  
POS- 16

+

H1

-

ELEV.

5.030

75.063

5.109

74.984

4.998

75.095

4.962

75.131

1.328

79.956

1.465

76.528

4.760

~~4.896~~

75.196

7-26-18  
THURSDAY

146/928

DIDION  
BICKEL

DIFF

BMFC

75.193

DESC

NE GND

SE GND

SW GND

NW GND

N. RIM OF 8" PVC PIPE

2.003

75.193

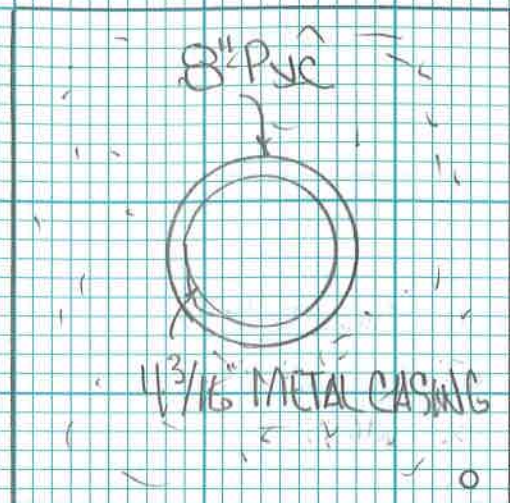
BRASS DISK @ NE CORNER OF  
CONC PAD



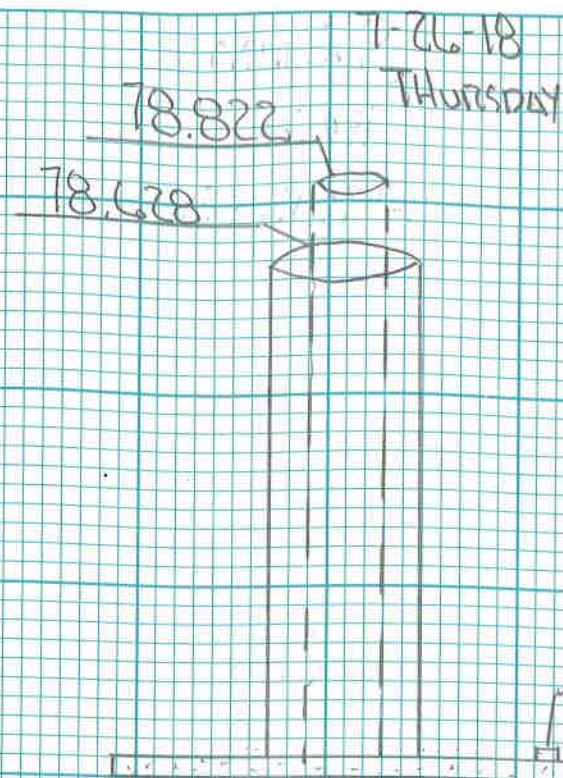
147/928

SWFWMD  
18677  
SWELL CREEK

Pos-16



BRASS DISC



7-26-18  
THURSDAY

148/928  
BICKEL  
DIDION

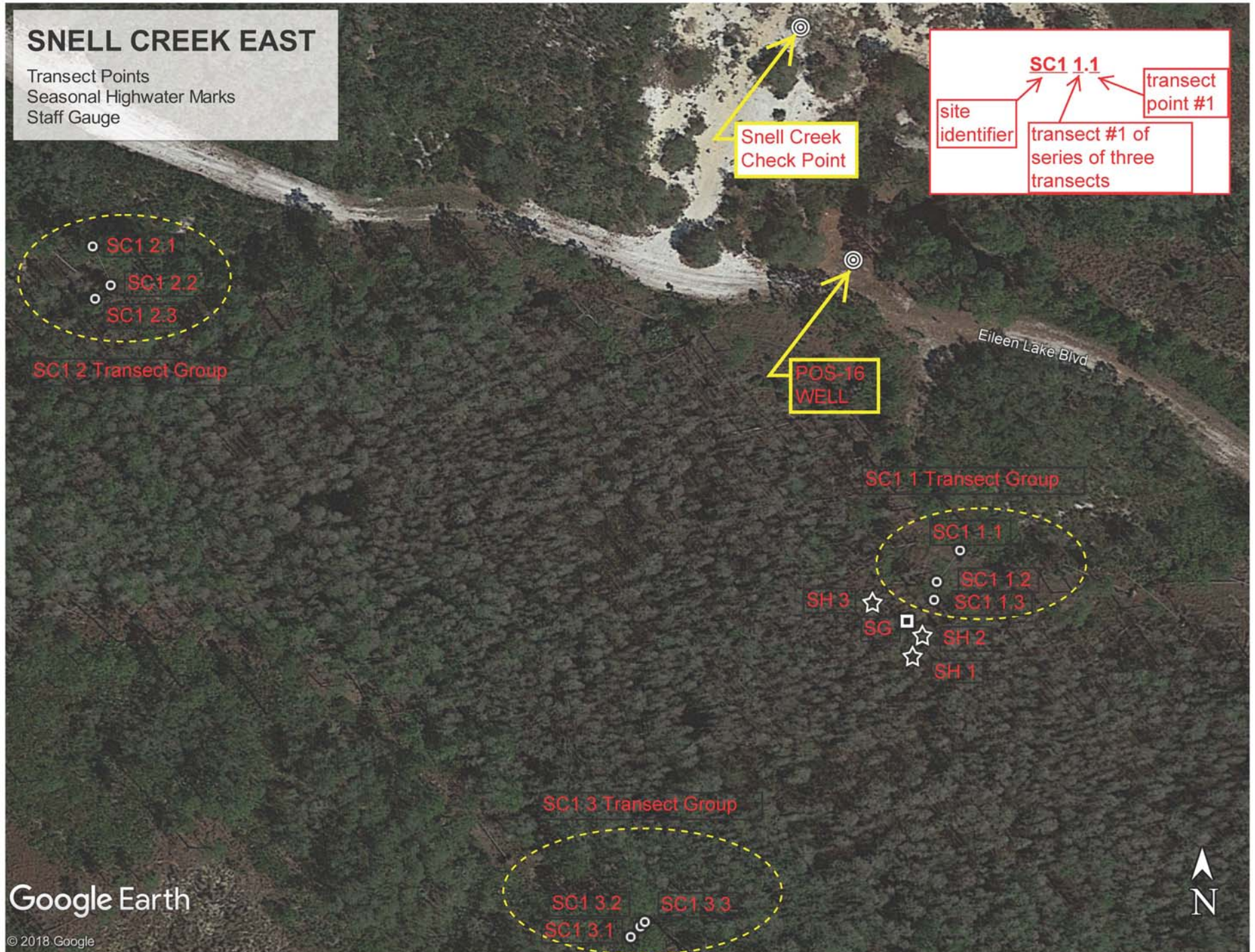
### PICTURES

- 8583 BRASS DISC STAMPED "Pos-16"
- 8584 BLUE TAG @ Pos-16
- 8585 Pos-16 WEST
- 8586 MEASURE METAL CASING
- 8587 METAL CASING
- 8588 Pos-16 NORTH

BRASS DISC STAMPED  
"Pos-16"



# SNELL CREEK EAST



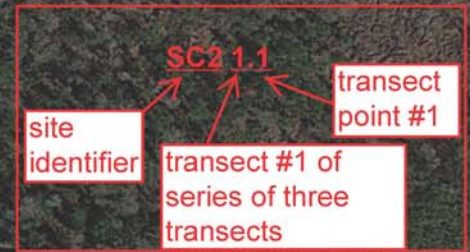


# SNELL CREEK WEST & HERB

## SNELL CREEK WEST & HERB

Transect Points  
Seasonal Highwater Marks  
Staff Gauge

SH 3 ☆ SH 1  
SH 2



SG □

SC2 3.2

SC2 3.1

SC2 3 Transect Group

SC2 2.1

SC2 2 Transect Group

SC2 1.2

SC2 1.1

SC2 1 Transect Group

POS-17  
WELL

Eileen Lake Blvd

SC3 1.2

SC3 1.1

SC3 1 Transect Group

SC3 1.3

Google Earth

© 2018 Google





# SNELL CREEK EAST

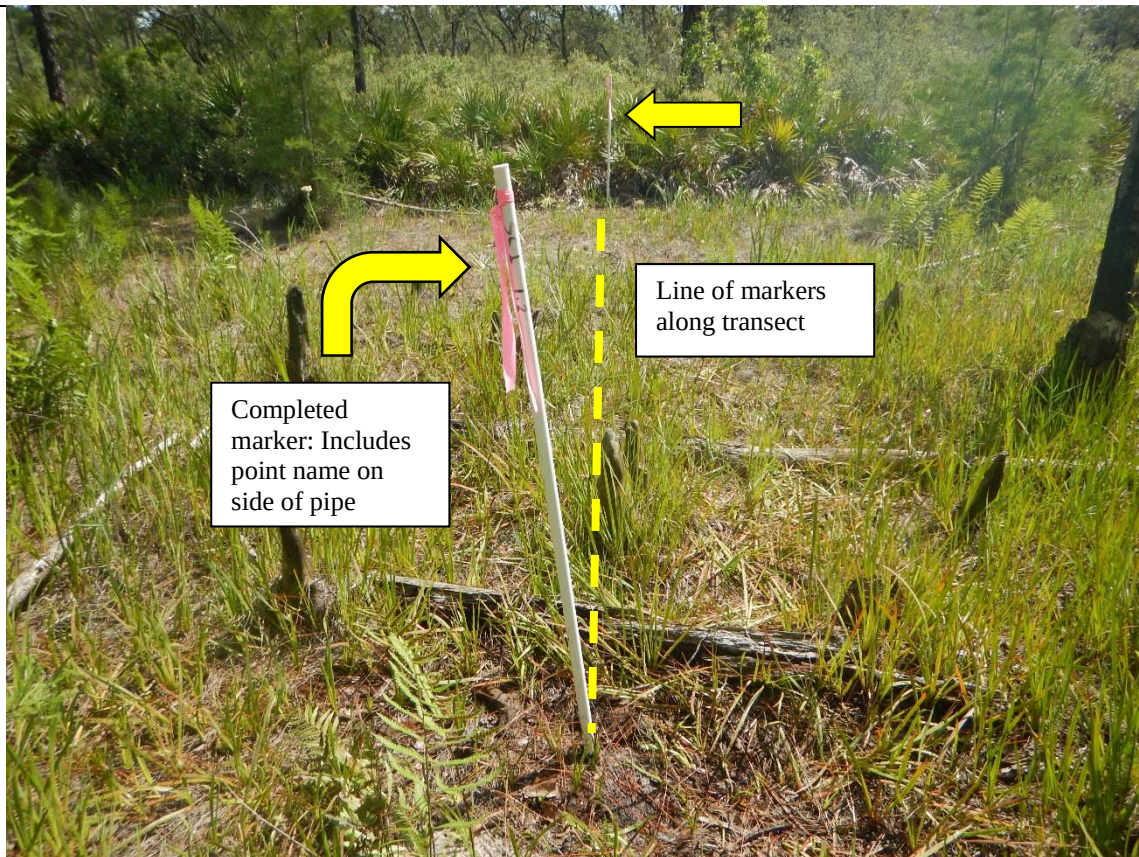
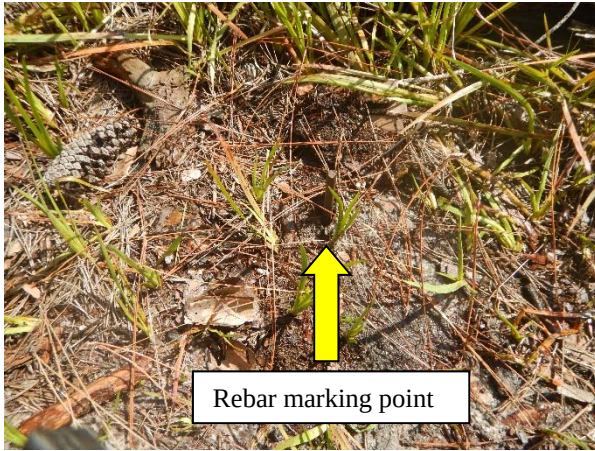
| Soil Transects – SC1 1 Transect Group                                                                                                                   |                                   |                                              |
|---------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|----------------------------------------------|
| <b>SC1 1.1</b>                                                                                                                                          | <b>Wetland Boundary</b>           |                                              |
| LATITUDE: 28° 07' 58.91362" (N)                                                                                                                         | LONGITUDE: 081° 32' 37.57891" (W) |                                              |
| NORTHING: 1381461.38                                                                                                                                    | EASTING: 480911.45                |                                              |
| ELEVATION: 73.71 ft. (NAVD 88)                                                                                                                          | 22.467 m                          | RTK GPS                                      |
| ELEVATION: 74.65 ft. (NGVD 29)                                                                                                                          | 22.753 m                          | 0.938 ft. (conversion factor) Corpscon 6.0.1 |
| <div> <div>No picture available for Rebar marking point</div>  </div> |                                   |                                              |





# SNELL CREEK EAST

| Soil Transects – SC1 1 Transect Group |                                   |                                              |
|---------------------------------------|-----------------------------------|----------------------------------------------|
| <b>SC1 1.2</b>                        | <b>Hydric at Surface</b>          |                                              |
| LATITUDE: 28° 07' 58.69643" (N)       | LONGITUDE: 081° 32' 37.75668" (W) |                                              |
| NORTHING: 1381439.52                  | EASTING: 480895.43                |                                              |
| ELEVATION: 72.66 ft. (NAVD 88)        | 22.147 m                          | RTK GPS                                      |
| ELEVATION: 73.60 ft. (NGVD 29)        | 23.433 m                          | 0.938 ft. (conversion factor) Corpscon 6.0.1 |





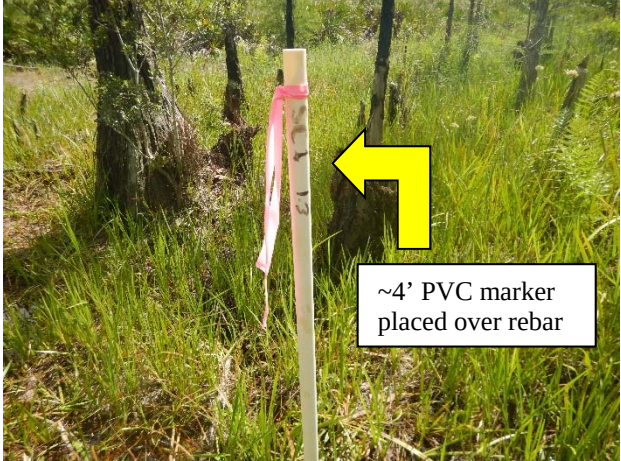
# SNELL CREEK EAST

| Soil Transects – SC1 1 Transect Group |                                   |                                              |
|---------------------------------------|-----------------------------------|----------------------------------------------|
| <b>SC1 1.3</b>                        | <b>Muck at Surface</b>            |                                              |
| LATITUDE: 28° 07' 58.57872" (N)       | LONGITUDE: 081° 32' 37.77659" (W) |                                              |
| NORTHING: 1381427.64                  | EASTING: 480893.60                |                                              |
| ELEVATION: 72.56 ft. (NAVD 88)        | 22.116 m                          | RTK GPS                                      |
| ELEVATION: 73.50 ft. (NGVD 29)        | 22.402 m                          | 0.938 ft. (conversion factor) Corpscon 6.0.1 |

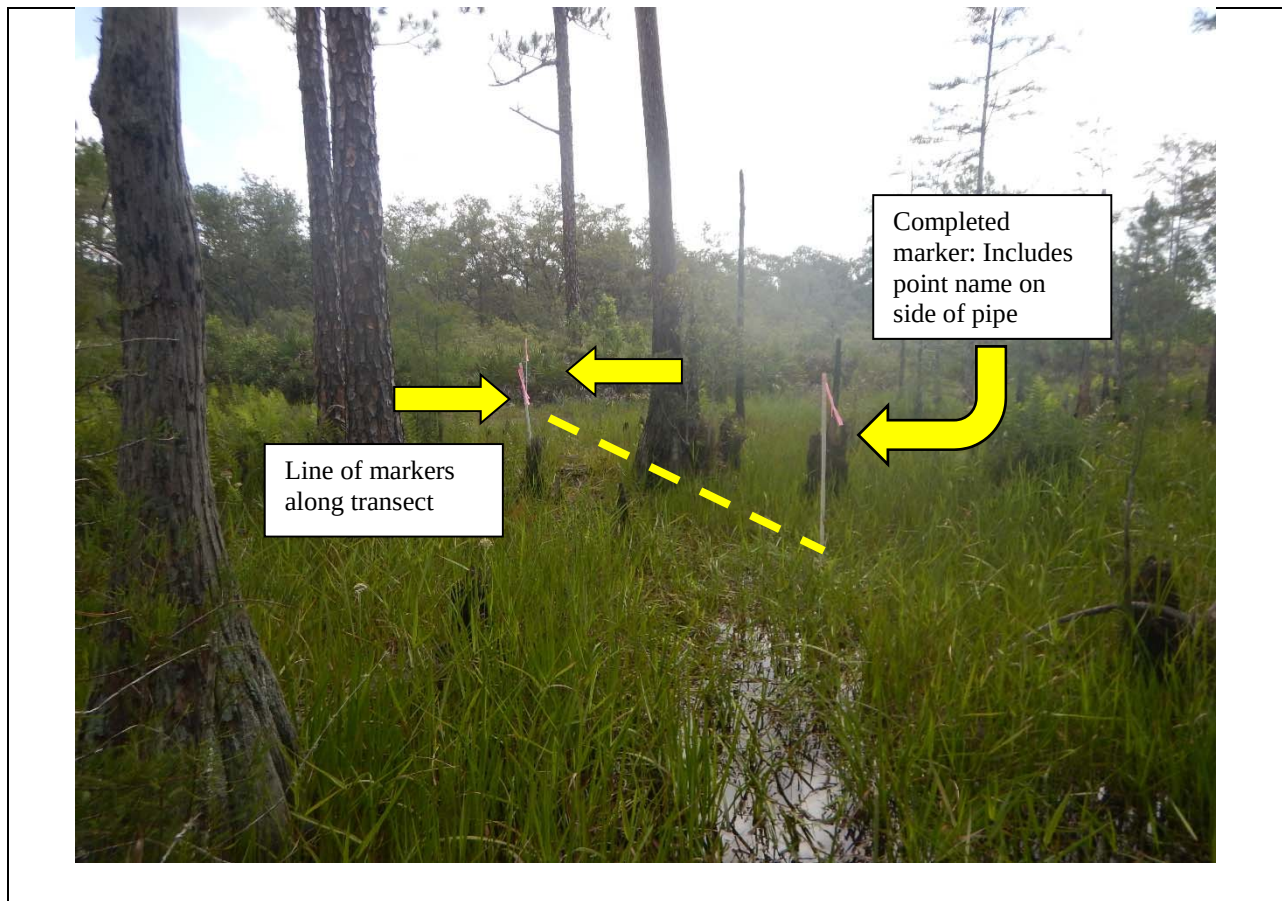
  



Rebar marking point



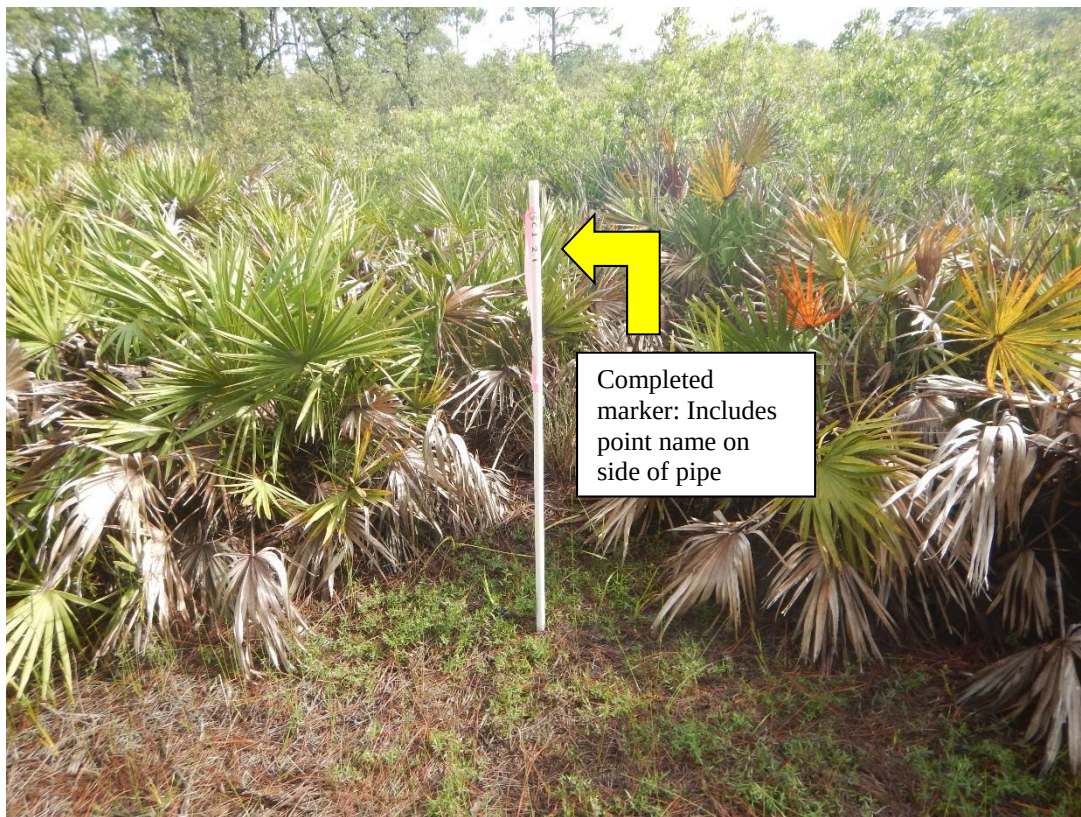
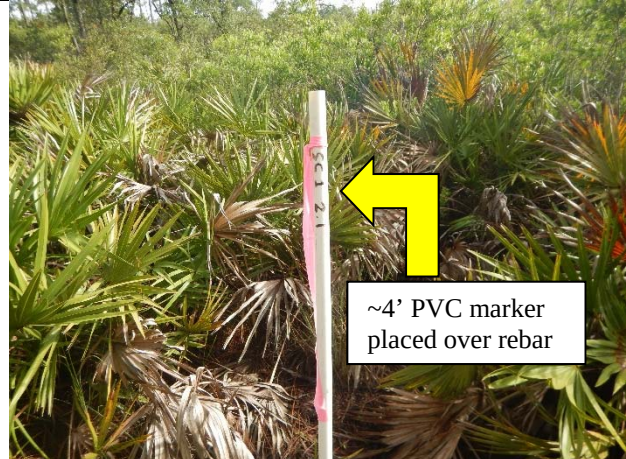
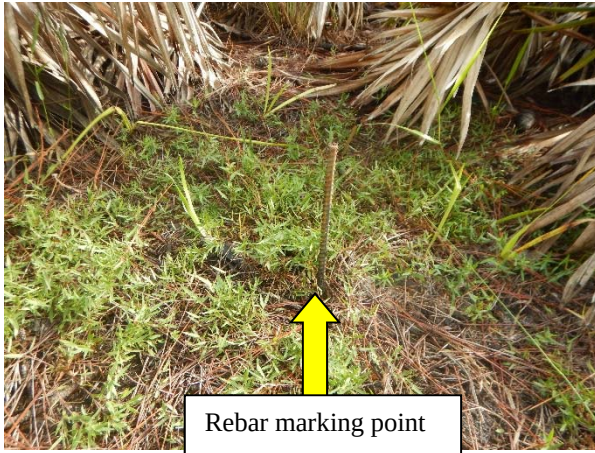
~4' PVC marker placed over rebar





# SNELL CREEK EAST

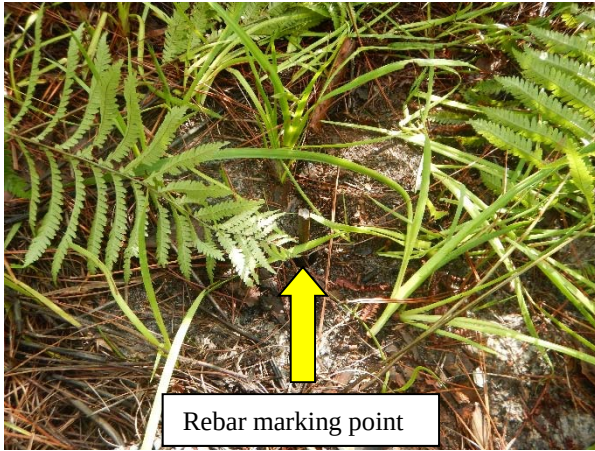
| Soil Transects – SC1 2 Transect Group |                                   |                                              |
|---------------------------------------|-----------------------------------|----------------------------------------------|
| <b>SC1 2.1</b>                        | <b>Wetland Boundary</b>           |                                              |
| LATITUDE: 28° 08' 00.93805" (N)       | LONGITUDE: 081° 32' 44.14509" (W) |                                              |
| NORTHING: 1381668.47                  | EASTING: 480324.51                |                                              |
| ELEVATION: 73.43 ft. (NAVD 88)        | 22.382 m                          | RTK GPS                                      |
| ELEVATION: 74.37 ft. (NGVD 29)        | 22.667 m                          | 0.938 ft. (conversion factor) Corpscon 6.0.1 |





# SNELL CREEK EAST

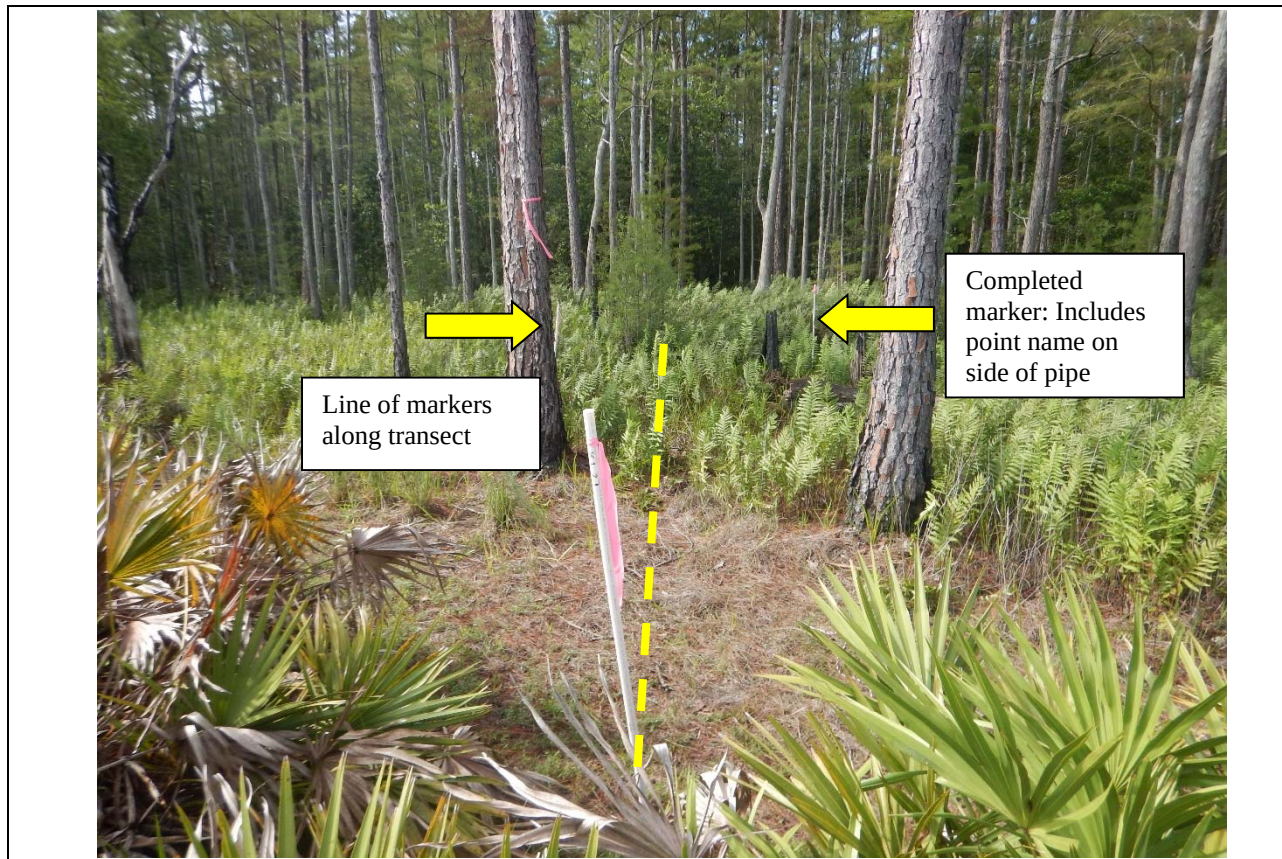
| Soil Transects – SC1 2 Transect Group |                                   |                                              |
|---------------------------------------|-----------------------------------|----------------------------------------------|
| <b>SC1 2.2</b>                        | <b>Hydric at Surface</b>          |                                              |
| LATITUDE: 28° 08' 00.68466" (N)       | LONGITUDE: 081° 32' 44.00967" (W) |                                              |
| NORTHING: 1381642.83                  | EASTING: 480336.52                |                                              |
| ELEVATION: 72.81 ft. (NAVD 88)        | 22.193 m                          | RTK GPS                                      |
| ELEVATION: 73.75 ft. (NGVD 29)        | 22.478 m                          | 0.938 ft. (conversion factor) Corpscon 6.0.1 |





# SNELL CREEK EAST

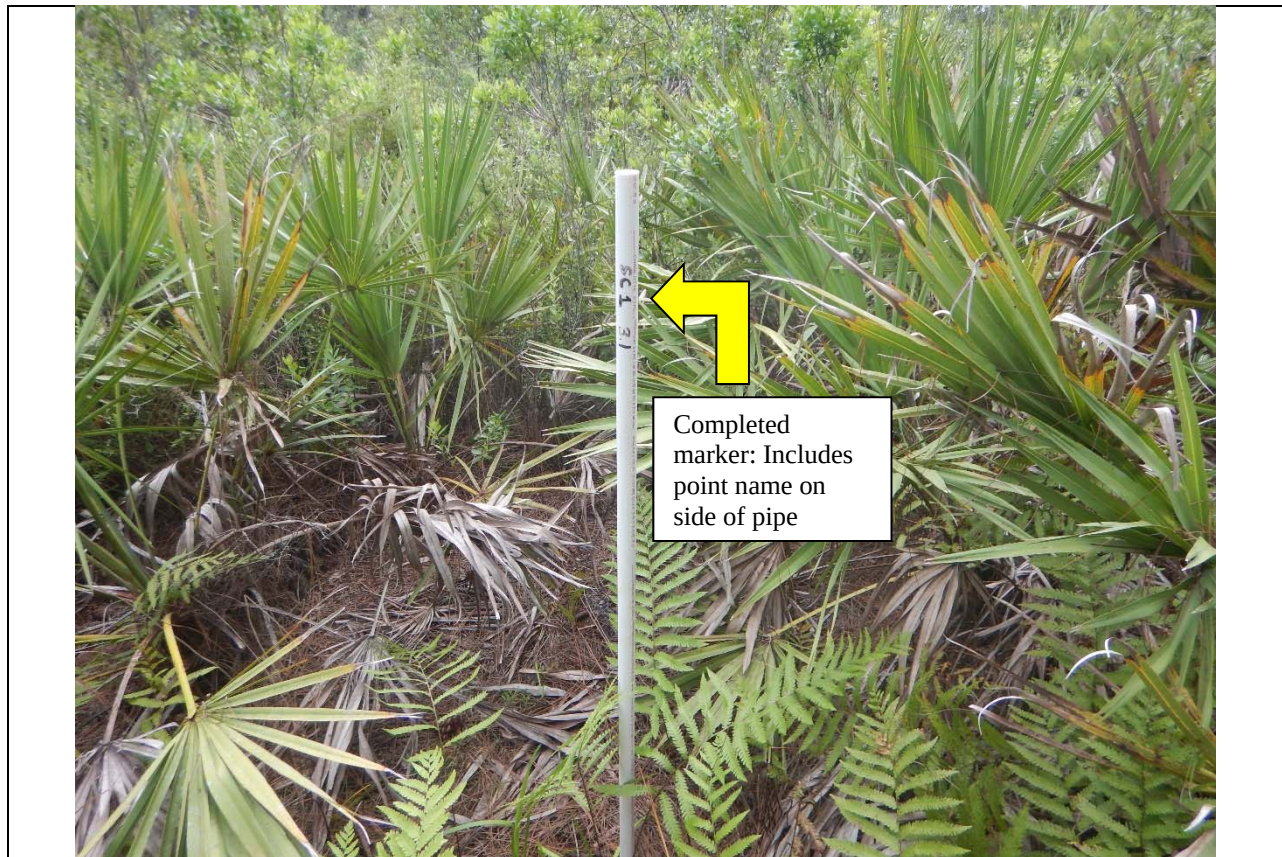
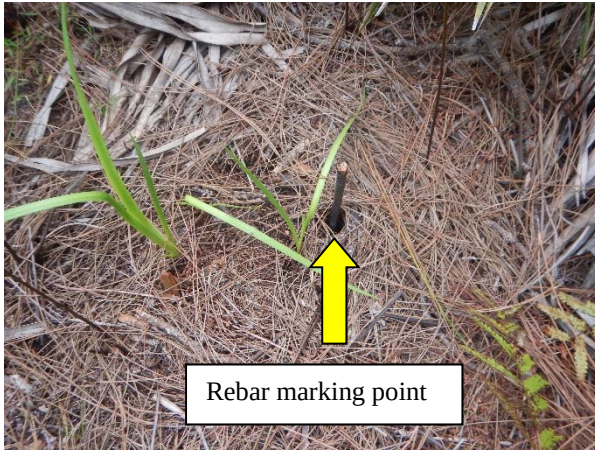
| Soil Transects – SC1 2 Transect Group |                                   |                                              |
|---------------------------------------|-----------------------------------|----------------------------------------------|
| <b>SC1 2.3</b>                        | <b>Muck at Surface</b>            |                                              |
| LATITUDE: 28° 08' 00.59475" (N)       | LONGITUDE: 081° 32' 44.12698" (W) |                                              |
| NORTHING: 1381633.79                  | EASTING: 480325.97                |                                              |
| ELEVATION: 72.78 ft. (NAVD 88)        | 22.183 m                          | RTK GPS                                      |
| ELEVATION: 73.72 ft. (NGVD 29)        | 22.469 m                          | 0.938 ft. (conversion factor) Corpscon 6.0.1 |





# SNELL CREEK EAST

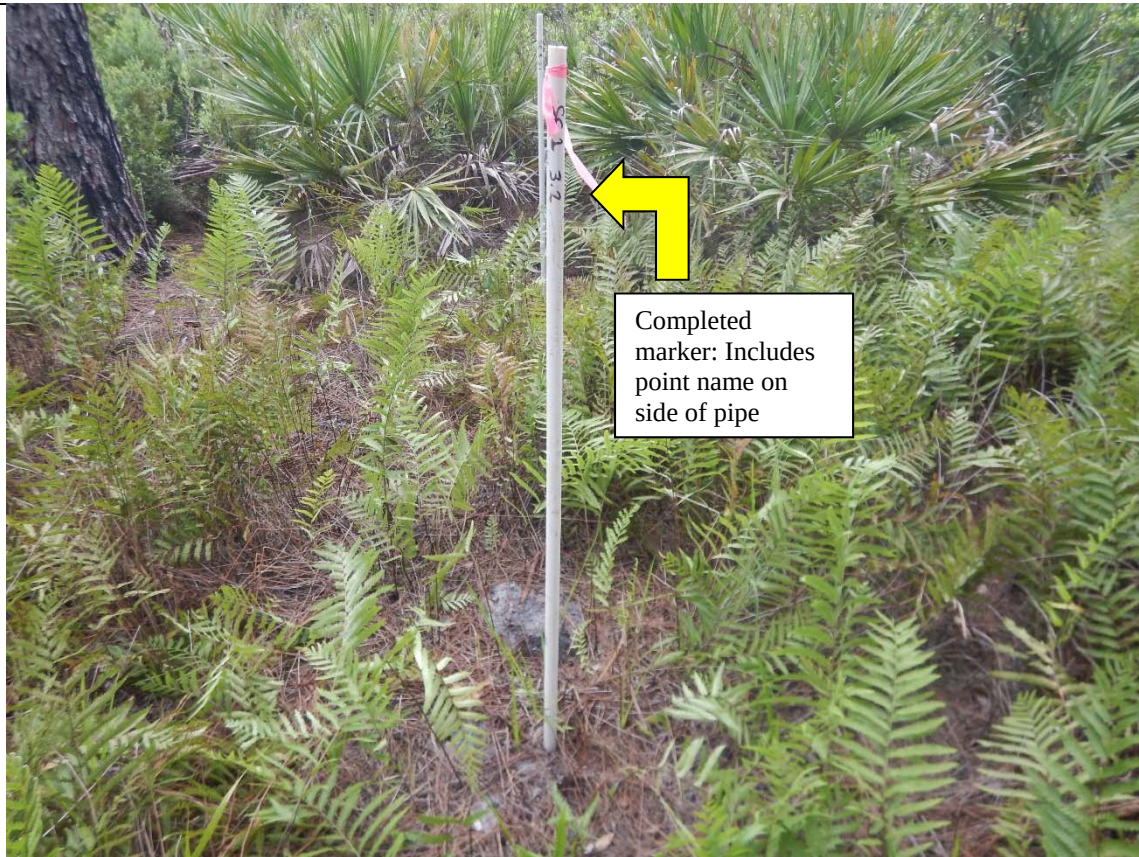
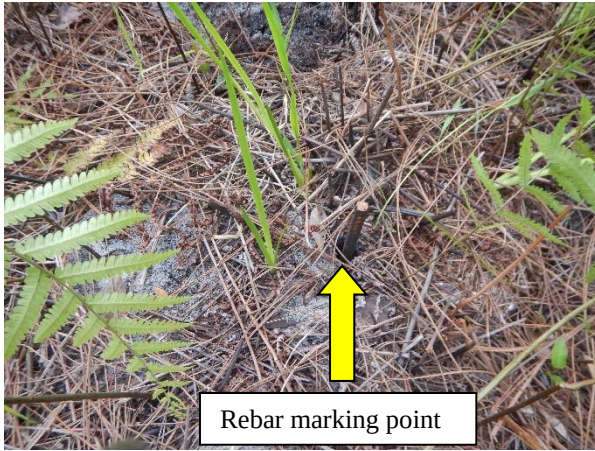
| Soil Transects – SC1 3 Transect Group |                                   |                                              |
|---------------------------------------|-----------------------------------|----------------------------------------------|
| <b>SC1 3.1</b>                        | <b>Wetland Boundary</b>           |                                              |
| LATITUDE: 28° 07' 56.33468" (N)       | LONGITUDE: 081° 32' 40.07357" (W) |                                              |
| NORTHING: 1381201.93                  | EASTING: 480646.94                |                                              |
| ELEVATION: 73.91 ft. (NAVD 88)        | 22.528 m                          | RTK GPS                                      |
| ELEVATION: 74.85 ft. (NGVD 29)        | 22.814 m                          | 0.938 ft. (conversion factor) Corpscon 6.0.1 |





# SNELL CREEK EAST

| Soil Transects – SC1 3 Transect Group |                                   |                                              |
|---------------------------------------|-----------------------------------|----------------------------------------------|
| <b>SC1 3.2</b>                        | <b>Hydric at Surface</b>          |                                              |
| LATITUDE: 28° 07' 56.40266" (N)       | LONGITUDE: 081° 32' 39.99966" (W) |                                              |
| NORTHING: 1381208.76                  | EASTING: 480693.59                |                                              |
| ELEVATION: 73.58 ft. (NAVD 88)        | 22.427 m                          | RTK GPS                                      |
| ELEVATION: 74.52 ft. (NGVD 29)        | 22.713 m                          | 0.938 ft. (conversion factor) Corpscon 6.0.1 |





# SNELL CREEK EAST

| Soil Transects – SC1 3 Transect Group |                                   |                                              |
|---------------------------------------|-----------------------------------|----------------------------------------------|
| <b>SC1 3.3</b>                        | <b>Muck at Surface</b>            |                                              |
| LATITUDE: 28° 07' 56.42753" (N)       | LONGITUDE: 081° 32' 39.96666" (W) |                                              |
| NORTHING: 1381211.26                  | EASTING: 480696.55                |                                              |
| ELEVATION: 73.39 ft. (NAVD 88)        | 22.369 m                          | RTK GPS                                      |
| ELEVATION: 74.33 ft. (NGVD 29)        | 22.655 m                          | 0.938 ft. (conversion factor) Corpscon 6.0.1 |





# SNELL CREEK EAST

| Seasonal High-Water Marks       |                                   |                                              |
|---------------------------------|-----------------------------------|----------------------------------------------|
| SC1 SH 1                        | Seasonal HW Elevation             |                                              |
| LATITUDE: 28° 07' 58.20203" (N) | LONGITUDE: 081° 32' 37.94453" (W) |                                              |
| NORTHING: 1381389.66            | EASTING: 480878.39                |                                              |
| ELEVATION: 74.57 ft. (NAVD 88)  | 22.729 m                          | RTK GPS                                      |
| ELEVATION: 75.51 ft. (NGVD 29)  | 23.015 m                          | 0.938 ft. (conversion factor) Corpscon 6.0.1 |





## SNELL CREEK EAST

| Seasonal High-Water Marks       |                                   |                                              |
|---------------------------------|-----------------------------------|----------------------------------------------|
| SC1 SH 2                        | Seasonal HW Elevation             |                                              |
| LATITUDE: 28° 07' 58.33518" (N) | LONGITUDE: 081° 32' 37.87026" (W) |                                              |
| NORTHING: 1381403.08            | EASTING: 480885.10                |                                              |
| ELEVATION: 74.60 ft. (NAVD 88)  | 22.738 m                          | RTK GPS                                      |
| ELEVATION: 75.54 ft. (NGVD 29)  | 23.024 m                          | 0.938 ft. (conversion factor) Corpscon 6.0.1 |





## SNELL CREEK EAST

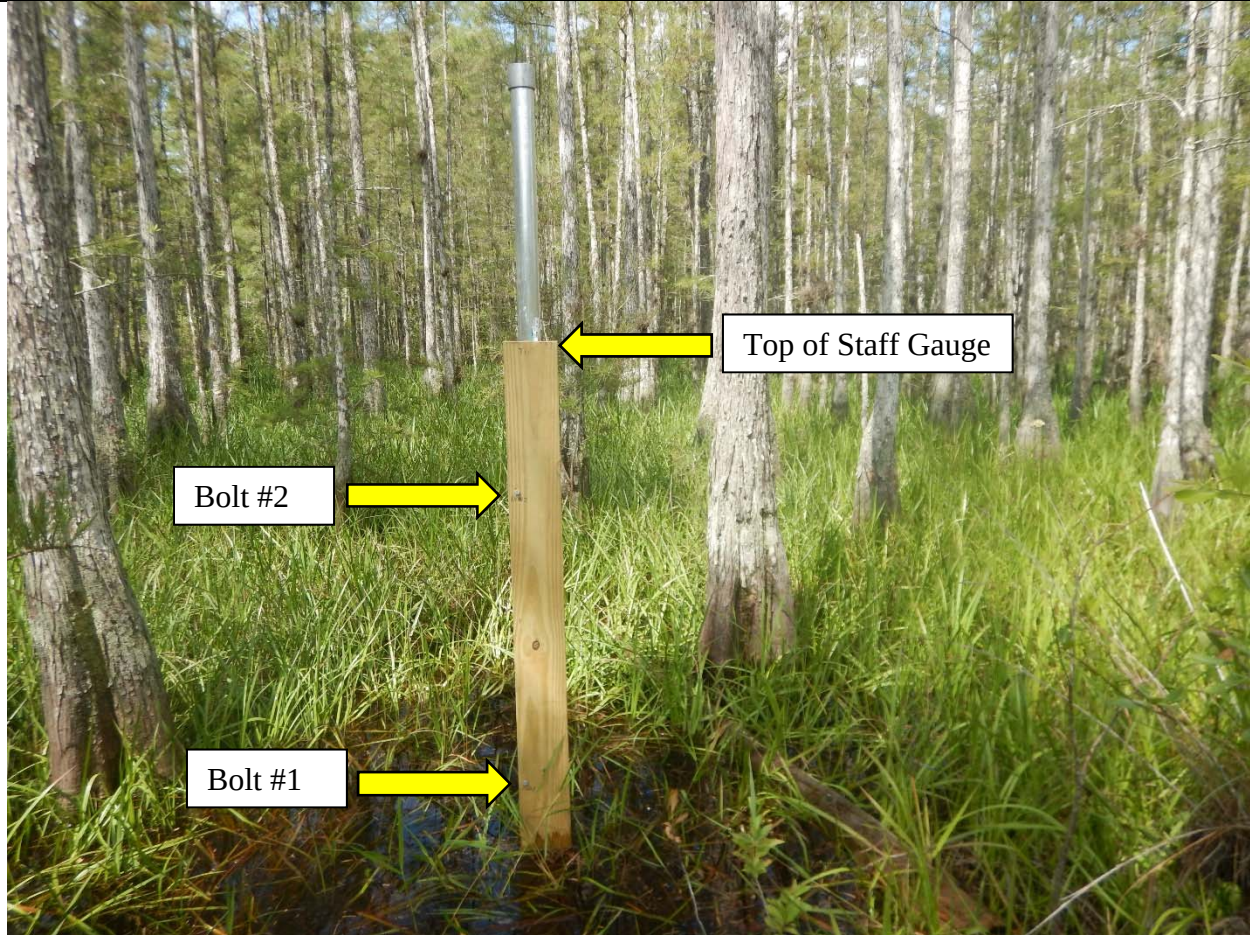
| Seasonal High-Water Marks       |                                   |                                              |
|---------------------------------|-----------------------------------|----------------------------------------------|
| SC1 SH 3                        | Seasonal HW Elevation             |                                              |
| LATITUDE: 28° 07' 58.56481" (N) | LONGITUDE: 081° 32' 38.24850" (W) |                                              |
| NORTHING: 1381426.42            | EASTING: 480851.34                |                                              |
| ELEVATION: 74.62 ft. (NAVD 88)  | 22.744 m                          | RTK GPS                                      |
| ELEVATION: 75.56 ft. (NGVD 29)  | 23.030 m                          | 0.938 ft. (conversion factor) Corpscon 6.0.1 |





# SNELL CREEK EAST

| Staff Gauge                     |                                |                                   |                                              |
|---------------------------------|--------------------------------|-----------------------------------|----------------------------------------------|
| SC1 SG                          |                                |                                   |                                              |
| TOP OF BOARD                    |                                |                                   |                                              |
| LATITUDE: 28° 07' 58.43889" (N) |                                | LONGITUDE: 081° 32' 37.98098" (W) |                                              |
| NORTHING: 1381413.60            |                                | EASTING: 480875.24                |                                              |
| ELEVATION: 77.35 ft. (NAVD 88)  |                                | 23.576 m                          | RTK GPS                                      |
| ELEVATION: 78.29 ft. (NGVD 29)  |                                | 23.862 m                          | 0.938 ft. (conversion factor) Corpscon 6.0.1 |
|                                 |                                |                                   |                                              |
| BOLT #1                         | ELEVATION: 73.35 ft. (NAVD 88) | 22.357 m                          | RTK GPS                                      |
|                                 | ELEVATION: 74.29 ft. (NGVD 29) | 22.643 m                          |                                              |
| BOLT #2                         | ELEVATION: 76.06 ft. (NAVD 88) | 23.183 m                          | RTK GPS                                      |
|                                 | ELEVATION: 77.00 ft. (NGVD 29) | 23.469 m                          |                                              |
|                                 |                                |                                   |                                              |



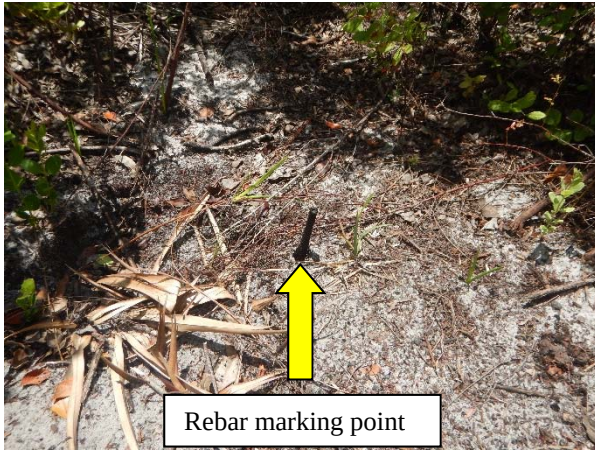
# SNELL CREEK EAST





# SNELL CREEK WEST

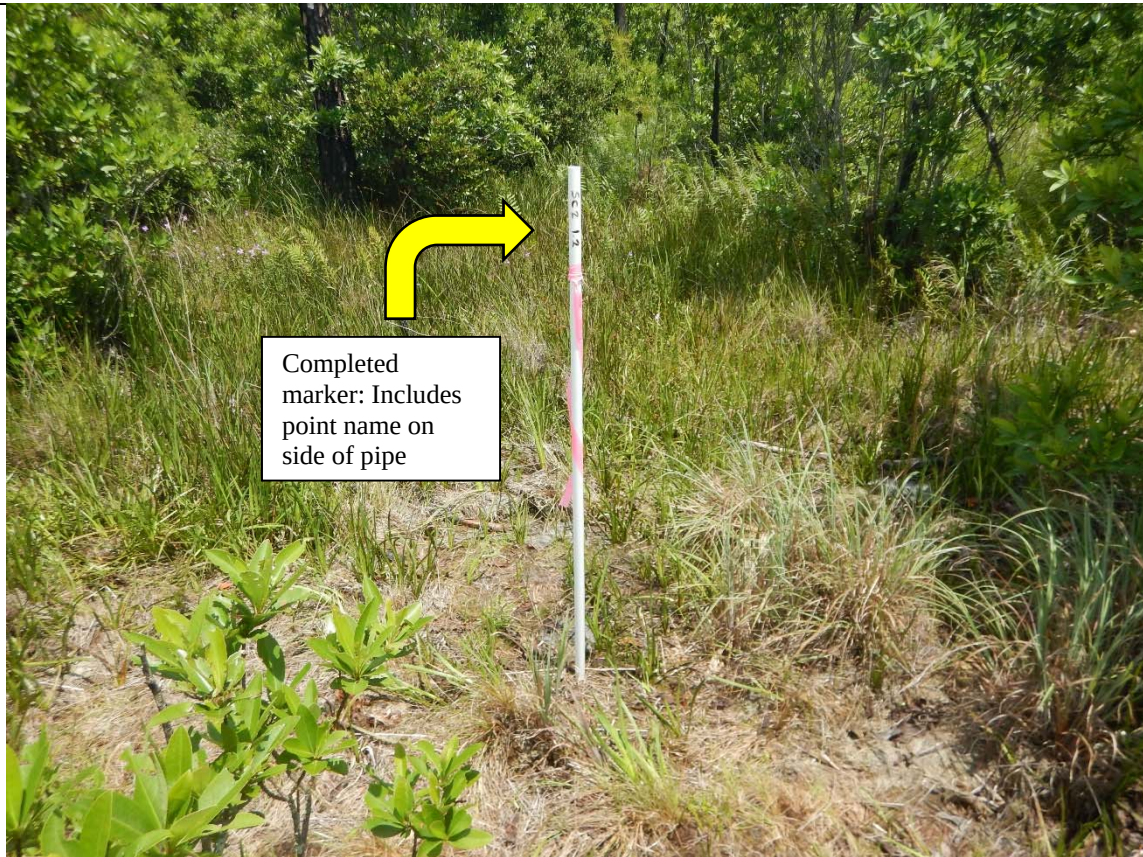
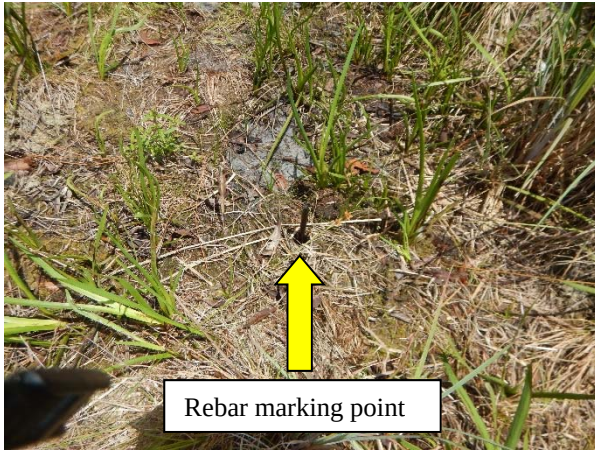
| Soil Transects – SC2 1 Transect Group |                                   |                                              |
|---------------------------------------|-----------------------------------|----------------------------------------------|
| <b>SC2 1.1</b>                        | <b>Wetland Boundary</b>           |                                              |
| LATITUDE: 28° 08' 04.97580" (N)       | LONGITUDE: 081° 33' 07.13620" (W) |                                              |
| NORTHING: 1382085.55                  | EASTING: 478268.02                |                                              |
| ELEVATION: 73.55 ft. (NAVD 88)        | 22.418 m                          | RTK GPS                                      |
| ELEVATION: 74.49 ft. (NGVD 29)        | 22.704 m                          | 0.938 ft. (conversion factor) Corpscon 6.0.1 |





# SNELL CREEK WEST

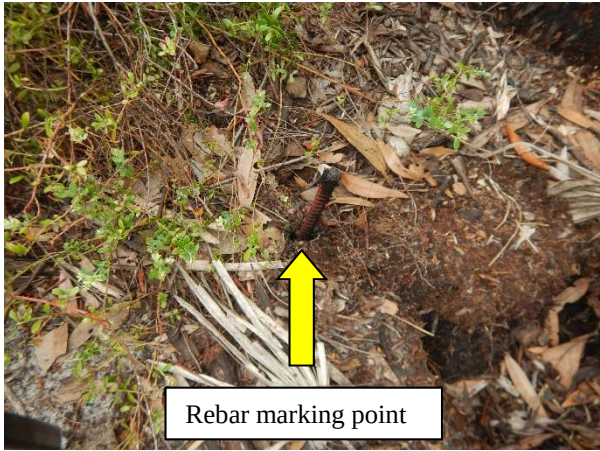
| Soil Transects – SC2 1 Transect Group |                                   |                                              |
|---------------------------------------|-----------------------------------|----------------------------------------------|
| <b>SC2 1.2</b>                        | <b>Hydric at Surface</b>          |                                              |
| LATITUDE: 28° 08' 05.15046" (N)       | LONGITUDE: 081° 33' 07.22734" (W) |                                              |
| NORTHING: 1382103.23                  | EASTING: 478259.94                |                                              |
| ELEVATION: 72.70 ft. (NAVD 88)        | 22.159 m                          | RTK GPS                                      |
| ELEVATION: 73.64 ft. (NGVD 29)        | 22.445 m                          | 0.938 ft. (conversion factor) Corpscon 6.0.1 |





# SNELL CREEK WEST

| Soil Transects – SC2 2 Transect Group |                                               |                                              |
|---------------------------------------|-----------------------------------------------|----------------------------------------------|
| <b>SC2 2.1</b>                        | <b>Wetland Boundary &amp; Muck at Surface</b> |                                              |
| LATITUDE: 28° 08' 04.99265" (N)       | LONGITUDE: 081° 33' 09.24994" (W)             |                                              |
| NORTHING: 1382088.11                  | EASTING: 478078.79                            |                                              |
| ELEVATION: 73.38 ft. (NAVD 88)        | 22.366 m                                      | RTK GPS                                      |
| ELEVATION: 74.32 ft. (NGVD 29)        | 22.652 m                                      | 0.938 ft. (conversion factor) Corpscon 6.0.1 |



Rebar marking point



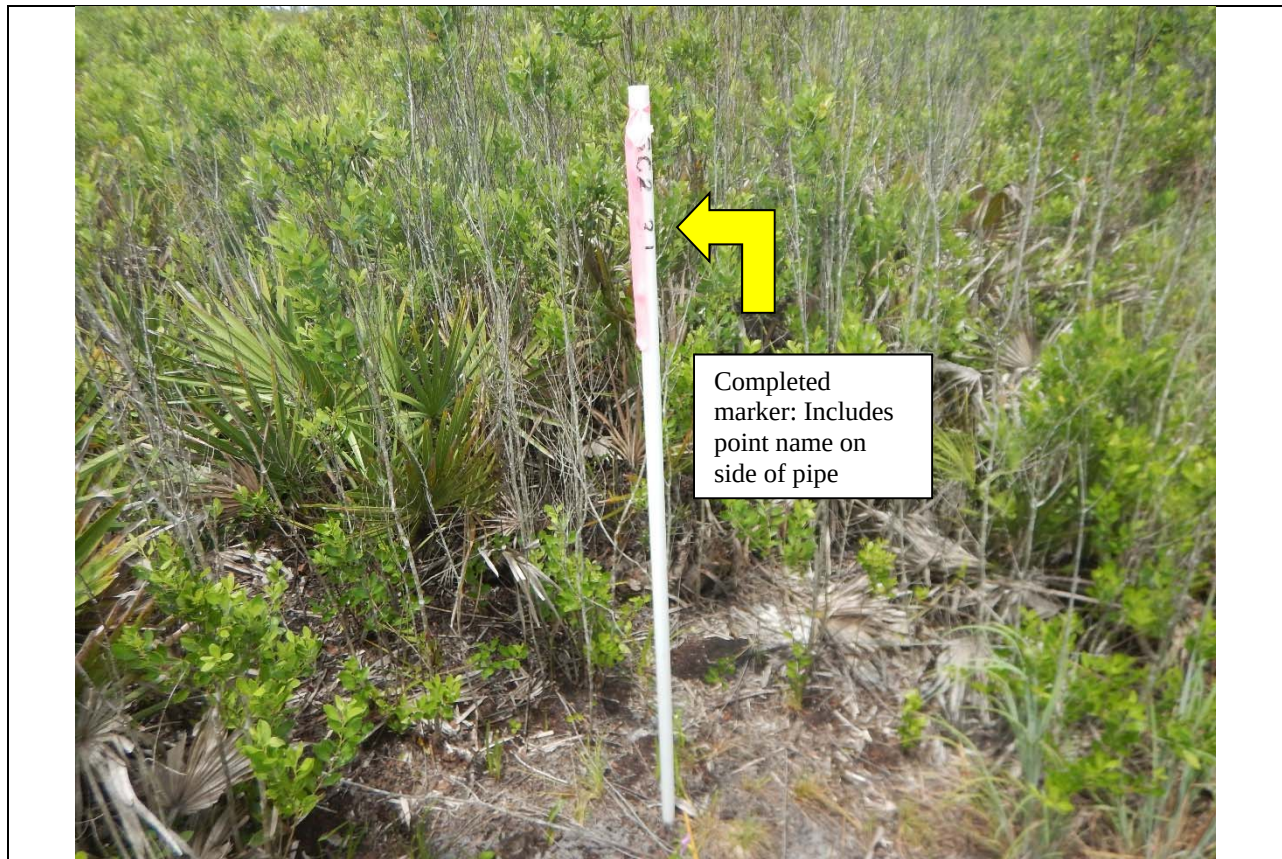
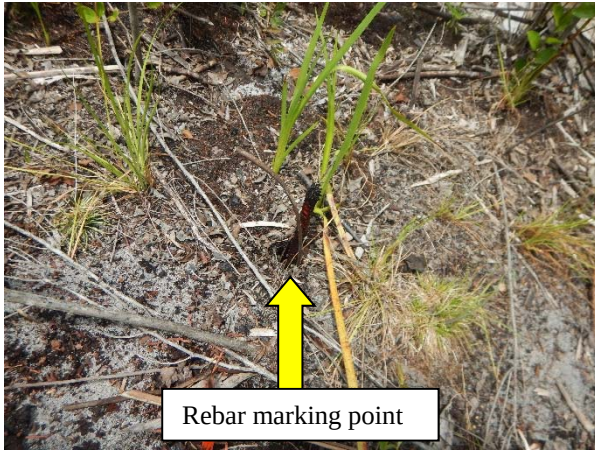
~4' PVC marker placed over rebar





# SNELL CREEK WEST

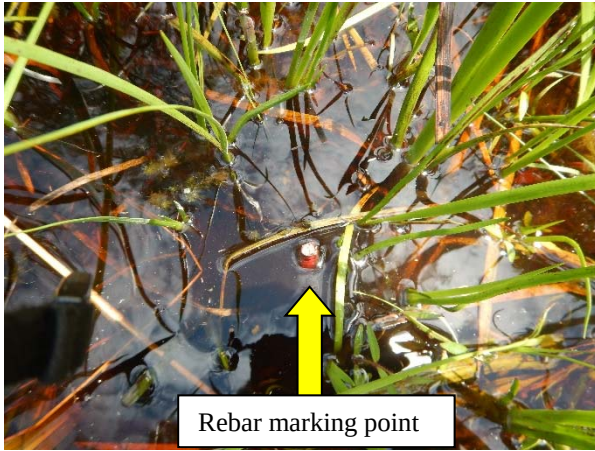
| Soil Transects – SC2 3 Transect Group |                                                 |                                              |
|---------------------------------------|-------------------------------------------------|----------------------------------------------|
| <b>SC2 3.1</b>                        | <b>Wetland Boundary &amp; Hydric at Surface</b> |                                              |
| LATITUDE: 28° 08' 06.13238" (N)       | LONGITUDE: 081° 33' 05.31640" (W)               |                                              |
| NORTHING: 1382201.62                  | EASTING: 478431.47                              |                                              |
| ELEVATION: 73.15 ft. (NAVD 88)        | 22.296 m                                        | RTK GPS                                      |
| ELEVATION: 74.09 ft. (NGVD 29)        | 22.582 m                                        | 0.938 ft. (conversion factor) Corpscon 6.0.1 |





# SNELL CREEK WEST

| Soil Transects – SC2 3 Transect Group |                                   |                                              |
|---------------------------------------|-----------------------------------|----------------------------------------------|
| <b>SC2 3.2</b>                        | <b>Muck at Surface</b>            |                                              |
| LATITUDE: 28° 08' 06.49077" (N)       | LONGITUDE: 081° 33' 05.39003" (W) |                                              |
| NORTHING: 1382237.84                  | EASTING: 478425.05                |                                              |
| ELEVATION: 71.95 ft. (NAVD 88)        | 21.930 m                          | RTK GPS                                      |
| ELEVATION: 72.89 ft. (NGVD 29)        | 22.216 m                          | 0.938 ft. (conversion factor) Corpscon 6.0.1 |





SNELL CREEK WEST

| Seasonal High-Water Marks                                                                                                                                         |                                   |                                              |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|----------------------------------------------|
| SC2 SH 1                                                                                                                                                          | Seasonal HW Elevation             |                                              |
| LATITUDE: 28° 08' 09.05118" (N)                                                                                                                                   | LONGITUDE: 081° 33' 05.88885" (W) |                                              |
| NORTHING: 1382496.63                                                                                                                                              | EASTING: 478381.56                |                                              |
| ELEVATION: 73.15 ft. (NAVD 88)                                                                                                                                    | 22.296 m                          | RTK GPS                                      |
| ELEVATION: 74.09 ft. (NGVD 29)                                                                                                                                    | 22.582 m                          | 0.938 ft. (conversion factor) Corpscon 6.0.1 |
| <div><p>Trees Marked with flagging</p></div>                                   |                                   |                                              |
| <div><p>Seasonal High Water elevation marked with nail and flagging</p></div> |                                   |                                              |



# SNELL CREEK WEST

| Seasonal High-Water Marks       |                                   |                                              |
|---------------------------------|-----------------------------------|----------------------------------------------|
| SC2 SH 2                        | Seasonal HW Elevation             |                                              |
| LATITUDE: 28° 08' 09.06053" (N) | LONGITUDE: 081° 33' 05.92643" (W) |                                              |
| NORTHING: 1382497.59            | EASTING: 478378.20                |                                              |
| ELEVATION: 73.10 ft. (NAVD 88)  | 22.281 m                          | RTK GPS                                      |
| ELEVATION: 74.04 ft. (NGVD 29)  | 22.567 m                          | 0.938 ft. (conversion factor) Corpscon 6.0.1 |





# SNELL CREEK WEST

| Seasonal High-Water Marks       |                                   |                                              |
|---------------------------------|-----------------------------------|----------------------------------------------|
| SC3 SH 3                        | Seasonal HW Elevation             |                                              |
| LATITUDE: 28° 08' 09.05347" (N) | LONGITUDE: 081° 33' 05.94313" (W) |                                              |
| NORTHING: 1382496.88            | EASTING: 478376.70                |                                              |
| ELEVATION: 73.41 ft. (NAVD 88)  | 22.375 m                          | RTK GPS                                      |
| ELEVATION: 74.35 ft. (NGVD 29)  | 22.661 m                          | 0.938 ft. (conversion factor) Corpscon 6.0.1 |



Trees Marked with flagging SH 3 on the left

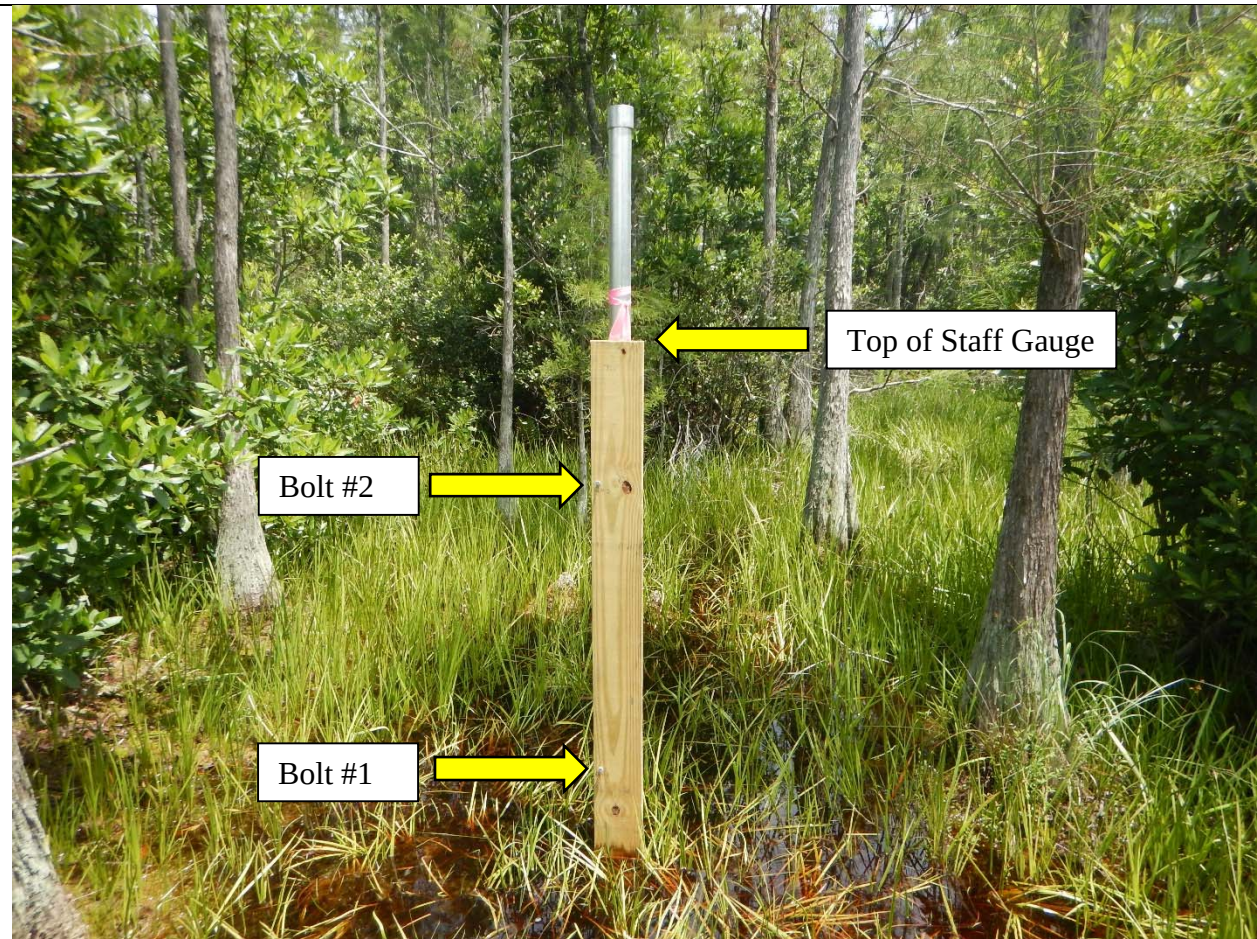


Seasonal High Water elevation marked with nail and flagging



# SNELL CREEK WEST

| Staff Gauge                     |                                |                                   |                                              |
|---------------------------------|--------------------------------|-----------------------------------|----------------------------------------------|
| SC2 SG                          |                                |                                   |                                              |
| TOP OF BOARD                    |                                |                                   |                                              |
| LATITUDE: 28° 08' 06.51163" (N) |                                | LONGITUDE: 081° 33' 05.83872" (W) |                                              |
| NORTHING: 1382240.13            |                                | EASTING: 478384.89                |                                              |
| ELEVATION: 77.18 ft. (NAVD 88)  |                                | 23.525 m                          | RTK GPS                                      |
| ELEVATION: 78.12 ft. (NGVD 29)  |                                | 23.810 m                          | 0.938 ft. (conversion factor) Corpscon 6.0.1 |
|                                 |                                |                                   |                                              |
| BOLT #1                         | ELEVATION: 73.20 ft. (NAVD 88) | 22.311 m                          | RTK GPS                                      |
|                                 | ELEVATION: 74.14 ft. (NGVD 29) | 22.597 m                          |                                              |
| BOLT #2                         | ELEVATION: 75.98 ft. (NAVD 88) | 23.159 m                          | RTK GPS                                      |
|                                 | ELEVATION: 76.92 ft. (NGVD 29) | 23.445 m                          |                                              |





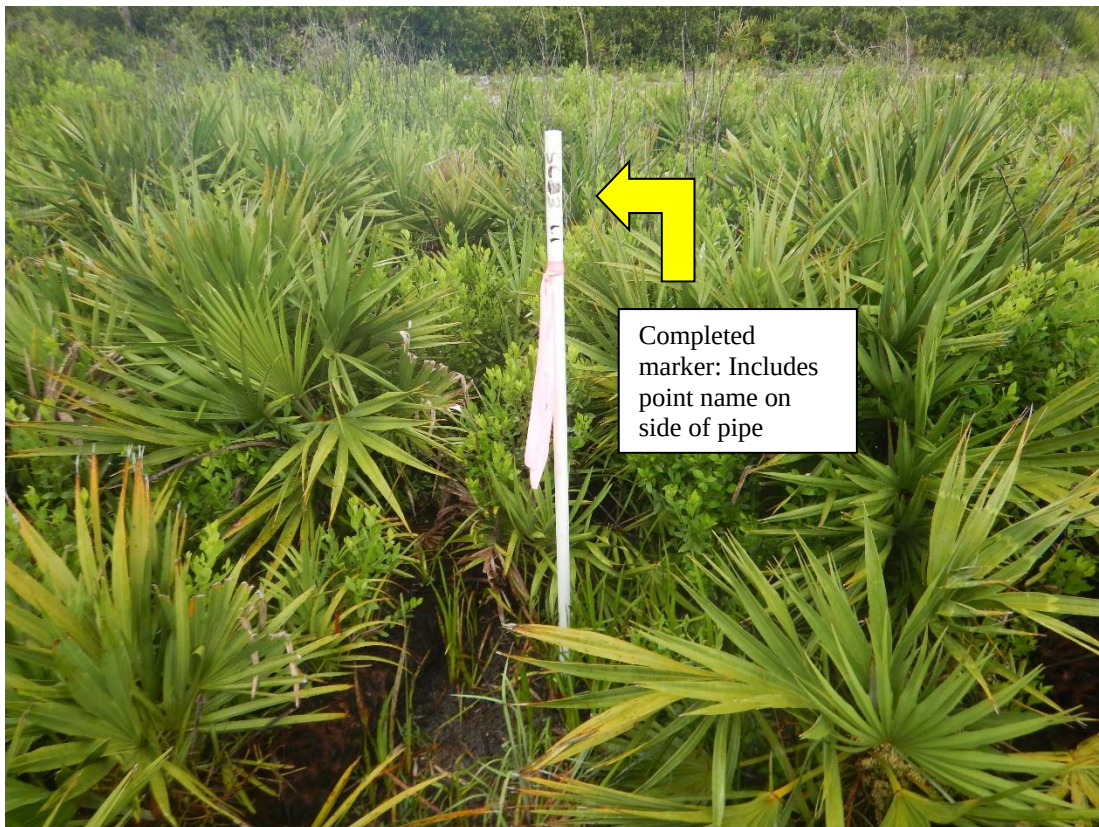
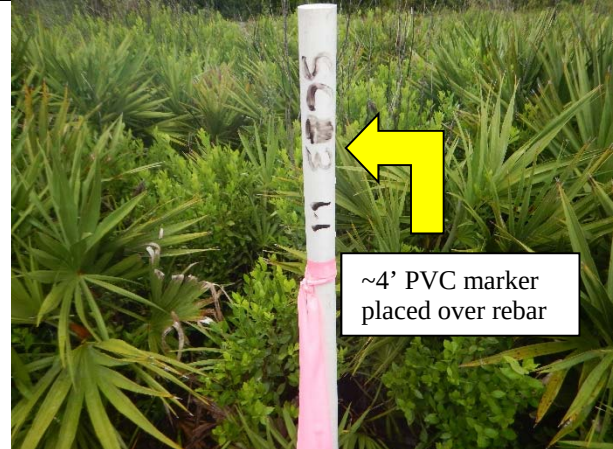
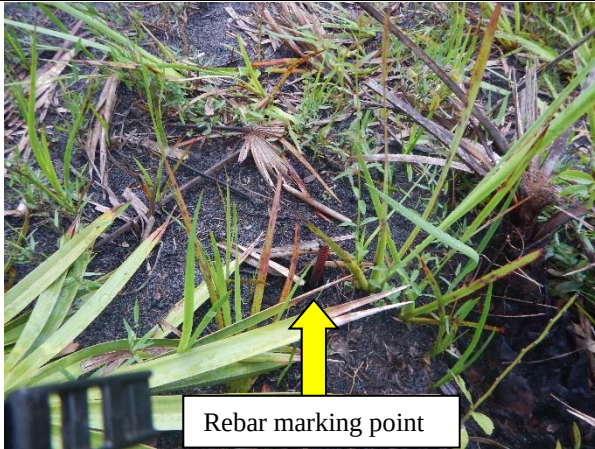
# SNELL CREEK WEST





# SNELL CREEK HERB

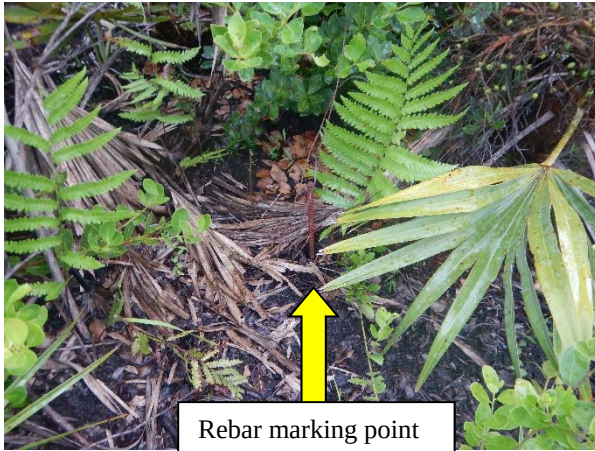
| Soil Transects – SC3 1 Transect Group |                                   |                                              |
|---------------------------------------|-----------------------------------|----------------------------------------------|
| <b>SC3 1.1</b>                        | <b>Wetland Boundary</b>           |                                              |
| LATITUDE: 28° 08' 03.17529" (N)       | LONGITUDE: 081° 33' 07.67834" (W) |                                              |
| NORTHING: 1381903.93                  | EASTING: 478218.66                |                                              |
| ELEVATION: 74.71 ft. (NAVD 88)        | 22.772 m                          | RTK GPS                                      |
| ELEVATION: 75.65 ft. (NGVD 29)        | 23.058 m                          | 0.938 ft. (conversion factor) Corpscon 6.0.1 |





# SNELL CREEK HERB

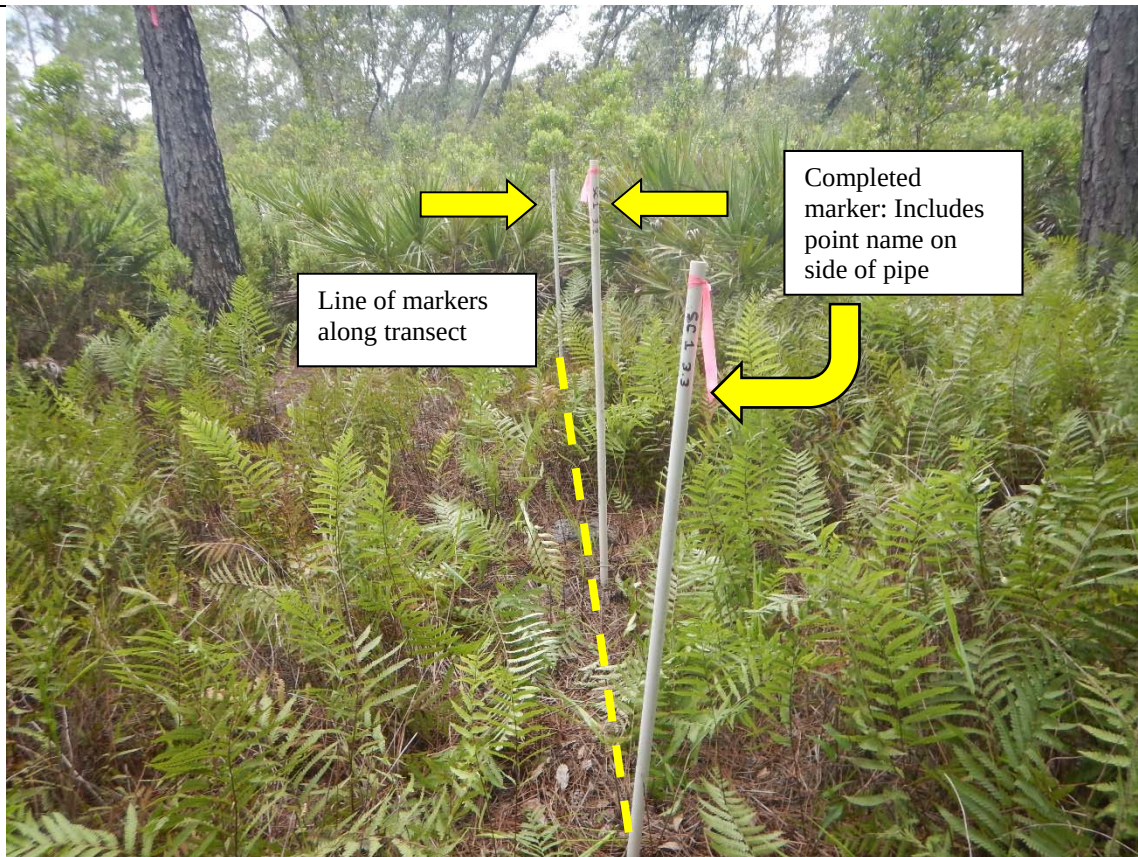
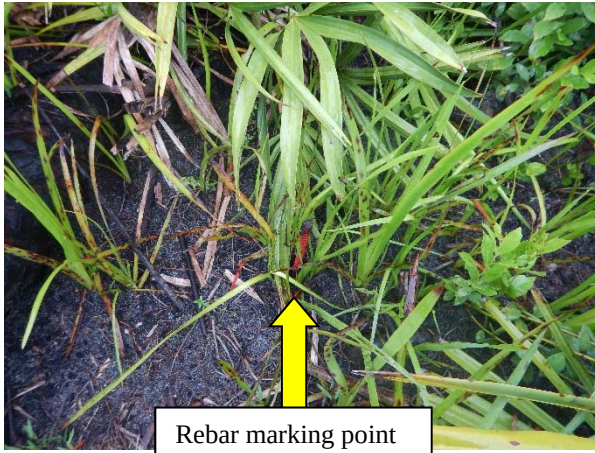
| Soil Transects – SC3 1 Transect Group |                                   |                                              |
|---------------------------------------|-----------------------------------|----------------------------------------------|
| <b>SC3 1.2</b>                        | <b>Wetland Boundary</b>           |                                              |
| LATITUDE: 28° 08'03.18659" (N)        | LONGITUDE: 081° 33' 08.44897" (W) |                                              |
| NORTHING: 1381905.39                  | EASTING: 478149.67                |                                              |
| ELEVATION: 74.65 ft. (NAVD 88)        | 22.753 m                          | RTK GPS                                      |
| ELEVATION: 75.59 ft. (NGVD 29)        | 23.039 m                          | 0.938 ft. (conversion factor) Corpscon 6.0.1 |





# SNELL CREEK HERB

| Soil Transects – SC3 1 Transect Group |                                   |                                              |
|---------------------------------------|-----------------------------------|----------------------------------------------|
| <b>SC3 1.3</b>                        | <b>Wetland Boundary</b>           |                                              |
| LATITUDE: 28° 08' 02.38907" (N)       | LONGITUDE: 081° 33' 07.66371" (W) |                                              |
| NORTHING: 1381824.53                  | EASTING: 478219.61                |                                              |
| ELEVATION: 74.92 ft. (NAVD 88)        | 22.836 m                          | RTK GPS                                      |
| ELEVATION: 75.86 ft. (NGVD 29)        | 23.122 m                          | 0.938 ft. (conversion factor) Corpscon 6.0.1 |





## **SURVEYOR'S REPORT**

Specific Purpose Survey of the CFWI DMIT Wetland  
Lake Marion Creek  
in  
Polk County, Florida

**Prepared for:**

**South Florida Water Management District**

3301 Gun -Club Road  
West Palm Beach, Florida 33406  
Ph. (561) 686-8800 (ext. 2978)  
Fax (561) 682-0066

**Prepared by:**

**Gregory A. Prather, PSM**

Florida Professional Surveyor and Mapper  
License Number 5135  
State of Florida

Pickett and Associates, Inc. LB No 364  
475 South First Avenue, Bartow, FL. 33830  
Tel (863) 533-9095

Field Date: July 26, 2018  
Report Date: August 02, 2018



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The purpose of this survey is to measure horizontal and vertical components of wetland, muck locations, transects, seasonal high water marks, staff gauges and a seep at the Lake Marion Creek location.

The CFWI DMIT Wetland Lake Marion Creek site is located in Section 28, Township 27 South, Range 28 East, Polk County, Florida.





**PROJECT VERTICAL DATUM**

The project vertical datum is the North American Vertical Datum of 1988 (NAVD 88).

To convert the NAVD 88 elevation to National Geodetic Vertical Datum of 1929 (NGVD 29) **add 0.971'** to the NAVD 88 elevation.

[NAVD 88 elevation + 0.971' = NGVD 29 elevation]

This value conversion factor is based on Corpscon 6.0.1 a US Army Corps of Engineers Engineering Research and Development Center Topographic Engineering Center Alexandria, Virginia Windows-based program to convert coordinates and elevations between datum's using vertcon05.txt and vertcon05.05 files supplied by the U.S. Army Corps of Engineers South Atlantic Division, Jacksonville, FL.

**PROJECT HORIZONTAL DATUM**

The project horizontal datum is North American Datum 83 (NAD 83 (2011) (EPOCH:2010.0000))

**LEVELING METHODS FOR VERTICAL CONTROL**

The leveling for this project was minimal. Levels were used to establish conventional control points. A level run was performed from POS-18 to GPS Point # 244 and GPS Point # 247, closing back on POS-18 to establish consistent elevations on RTK GPS control points set for the purpose of this survey. Levels were also used to establish elevations on features such as reference points of wells, top of concrete and ground elevations for the POS-18 and POS-19 well sites.

**GPS METHODS FOR HORIZONTAL CONTROL**

Latitude, Longitude and elevations for the Benchmark at Well POS-18 and the Benchmark at Well POS-19 were established by observing a 4 -hour session of Static GPS data using a Trimble R-8 set over the point June 28, 2018. Rinex files containing the collected data were uploaded through the OPUS website and a report containing the final coordinates were obtained on July 19, 2018.

Checks with RTK-GPS were made to Benchmarks POS-16 and POS-17 at the Snell Creek CFWI DMIT Wetland site. Coordinates & elevations for the benchmarks at the Snell Creek sites were established with RTK-GPs and a 4-hour static GPS observation and the OPUS website, respectively.

**COORDINATES AND ELEVATIONS FOR WETLAND FEATURES**

RTK GPS was used to establish coordinates and elevations for the wetland transects, seasonal high elevations, staff gauges and seep. Measurements were made on the ground adjacent to the rebar and pipes marking the point. In areas where tree canopy prevented a fixed RTK GPS solution, an optical total station was used. Control for the optical work was established with RTK GPS and leveling methods described above.

**EQUIPMENT USED**

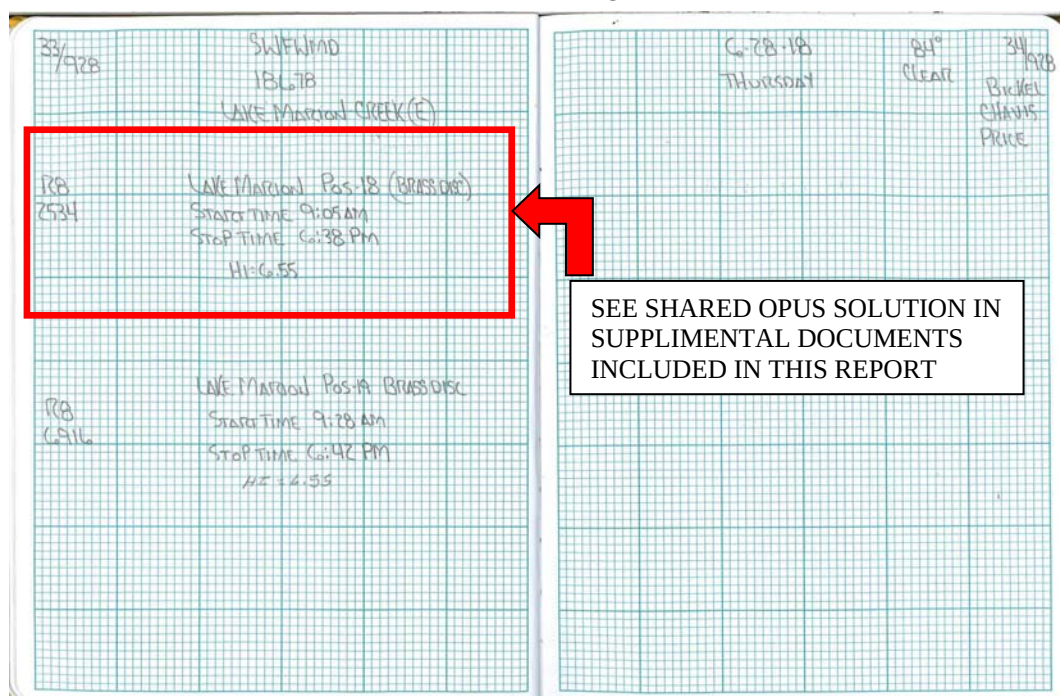
- Trimble GPS unit R-8, Serial Number 6916 (static)
- Trimble GPS unit R-8, Serial Number 2534 (static)
- Trimble DiNi 22 Level Serial Number 772842 (level)
- Trimble GPS unit R-10, Serial Number 7093 (RTK)
- Trimble GPS unit R-10, Serial Number 5003 (RTK)
- Trimble Total Station, Serial Number 36820056 (optical)



**VERTICAL CONTROL POINT**

The Vertical Control point utilized and set as part of this survey is the:

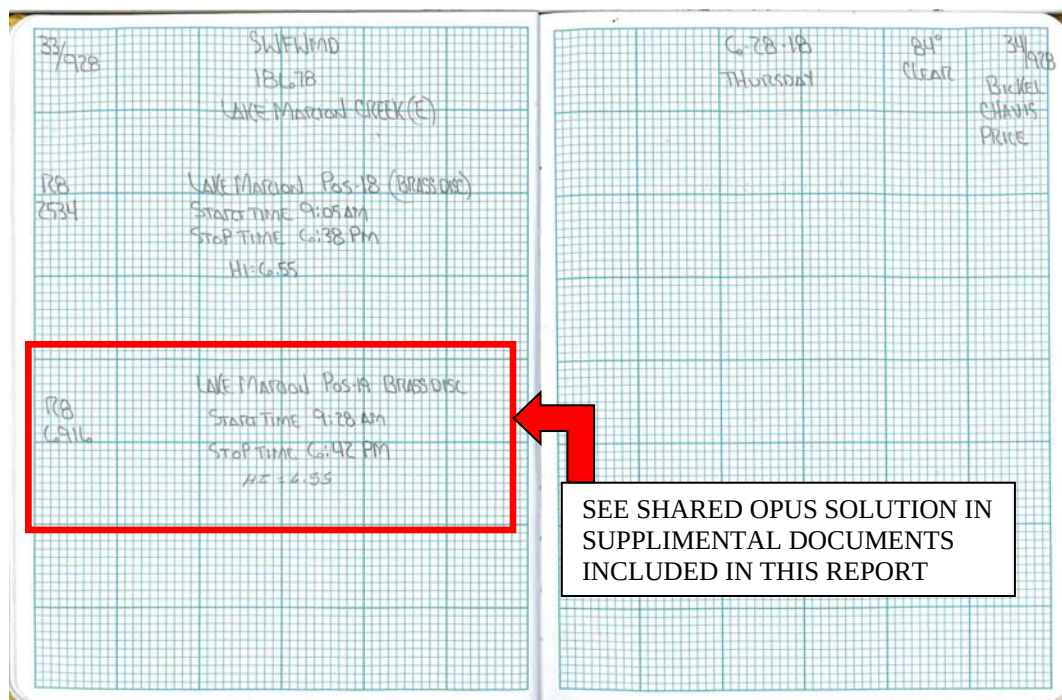
|                                                                                    |                                   |                                                                                                                                                                                                                                                                                                                                       |
|------------------------------------------------------------------------------------|-----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>BM: POS-18 (WELL) (Located as part of this survey)</b>                          |                                   |                                                                                                                                                                                                                                                                                                                                       |
| LATITUDE: 28° 06' 06.76703" (N)                                                    | LONGITUDE: 081° 30' 42.98184" (W) |                                                                                                                                                                                                                                                                                                                                       |
| OPUS - NAD_83 (2011)(EPOCH:2010.0000)                                              |                                   |                                                                                                                                                                                                                                                                                                                                       |
| ELEVATION: 82.480 ft. (NAVD 88)                                                    | 25.140 m                          | OPUS – (Computed using GEOID12B)                                                                                                                                                                                                                                                                                                      |
| ELEVATION: 83.451 ft. (NGVD 29)                                                    | 25.436 m                          | 0.971 ft. (conversion factor)<br>Corpscon 6.0.1                                                                                                                                                                                                                                                                                       |
|  |                                   | From the intersection of Poinciana Pkwy and Lk Marion Creek Dr North on Lk Marion Creek Dr for 3 Mi to Caspian Rd East on Caspian Rd for 0.5 Mi to Baltic Dr. North on Baltic Dr. for 0.15 Mi to the intersection of Baltic Dr. North on dirt drive 150 ft. to gate thru gate on dirt trail North then East 1,000 ft to mark on Left. |

**Field Book 928, Page 33-34**

|                                                           |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-----------------------------------------------------------|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>BM: POS-19 (WELL) (Located as part of this survey)</b> |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| LATITUDE: 28° 06' 16.57919" (N)                           |          | LONGITUDE: 081° 30' 57.86298" (W)                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| OPUS - NAD 83 (2011)(EPOCH:2010.0000)                     |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| ELEVATION: 81.096 ft. (NAVD 88)                           | 24.718 m | OPUS – (Computed using GEOID12B)<br>0.971 ft. (conversion factor)<br>Corpscon 6.0.1<br>From the intersection of Poinciana Pkwy and Lk Marion Creek Dr North on Lk Marion Creek Dr for 3 Mi to Caspian Rd East on Caspian Rd for 0.5 Mi to Baltic Dr. North on Baltic Dr. for 0.15 Mi to the intersection of Baltic Dr. North on dirt drive 150 ft. to gate thru gate on dirt trail North then East 1,000 ft then northwesterly and north 1,900 feet to mark on right. |
| ELEVATION: 82.067 ft. (NGVD 29)                           | 25.014 m |                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

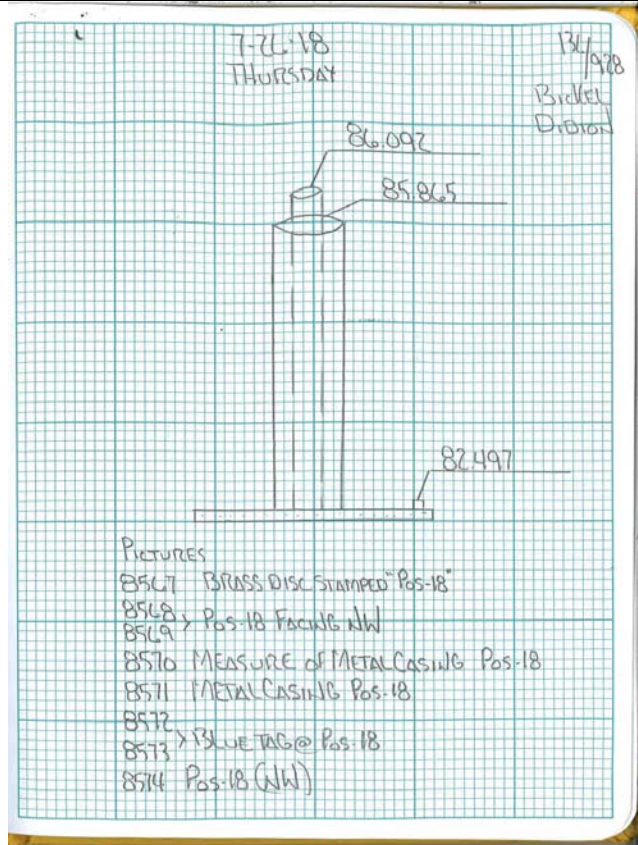


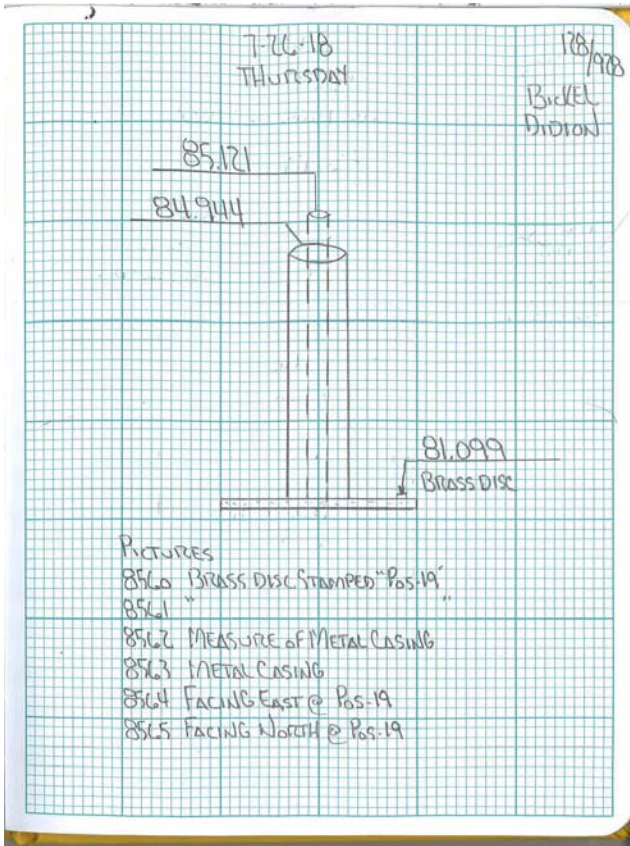
Field Book 928, Page 33-34





**PROJECT RESULTS**

| Reference and Ground Elevations:                                                    |                  |                                                                                     |                             |
|-------------------------------------------------------------------------------------|------------------|-------------------------------------------------------------------------------------|-----------------------------|
| Well                                                                                | Ground Elevation | Reference Elevation                                                                 | Comments                    |
| POS-18                                                                              | 82.4 ft          | 86.10 ft                                                                            | Top of Metal                |
| Elevation on four (4) corners of the concrete well pad                              |                  |                                                                                     |                             |
| NE Corner                                                                           | SE Corner        | SW Corner                                                                           | NW Corner                   |
| 82.5 ft                                                                             | 82.5 ft          | 82.5 ft                                                                             | 82.5 ft                     |
| Well Diameter                                                                       |                  |                                                                                     |                             |
| 4 3/16"                                                                             | Casing material  |                                                                                     | DTW                         |
|                                                                                     | METAL            |                                                                                     | 7.91 ft (7/26/18, 11:57 am) |
|   |                  |  |                             |
|  |                  |                                                                                     |                             |
| Source & Site Benchmark                                                             | NAVD 88          | NGVD 29 (Published)                                                                 | NGVD 29 (Corpscon)          |
| POS-18 Well                                                                         | 82.48 ft         |                                                                                     | 83.45 ft                    |

| Reference and Ground Elevations:                                                    |                  |                                                                                                                                                                                                                                                                                                                                                                                                                       |                             |                    |
|-------------------------------------------------------------------------------------|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|--------------------|
| Well                                                                                | Ground Elevation | Reference Elevation                                                                                                                                                                                                                                                                                                                                                                                                   | Comments                    |                    |
| POS-19                                                                              | 81.0 ft          | 85.12 ft                                                                                                                                                                                                                                                                                                                                                                                                              | Top of Metal                |                    |
| Elevation on four (4) corners of the concrete well pad                              |                  |                                                                                                                                                                                                                                                                                                                                                                                                                       |                             |                    |
| NE Corner                                                                           | SE Corner        | SW Corner                                                                                                                                                                                                                                                                                                                                                                                                             | NW Corner                   |                    |
| 81.1 ft                                                                             | 81.1 ft          | 81.2 ft                                                                                                                                                                                                                                                                                                                                                                                                               | 81.2 ft                     |                    |
| Well Diameter                                                                       |                  | Casing material                                                                                                                                                                                                                                                                                                                                                                                                       | DTW                         |                    |
| 4 3/16"                                                                             |                  | METAL                                                                                                                                                                                                                                                                                                                                                                                                                 | 8.30 ft (7/26/18, 10:22 am) |                    |
|   |                  |  <p>7-26-18<br/>THURSDAY</p> <p>1281/978<br/>Bridget<br/>Dutton</p> <p>85.121</p> <p>84.944</p> <p>81.099<br/>Brass Disc</p> <p>PICTURES</p> <p>8560 BRASS DISC STAMPED "POS-19"</p> <p>8561 "</p> <p>8562 MEASURE OF METAL CASING</p> <p>8563 METAL CASING</p> <p>8564 FACING EAST @ POS-19</p> <p>8565 FACING NORTH @ POS-19</p> |                             |                    |
|  |                  |                                                                                                                                                                                                                                                                                                                                                                                                                       |                             |                    |
| Source & Site Benchmark                                                             |                  | NAVD 88                                                                                                                                                                                                                                                                                                                                                                                                               | NGVD 29 (Published)         | NGVD 29 (Corpscon) |
| POS-19 Well                                                                         |                  | 81.10ft                                                                                                                                                                                                                                                                                                                                                                                                               |                             | 82.07 ft           |



Surveyor's Notes:

1. All measurements are U.S. Survey feet unless stated otherwise.
2. Underground improvements, encroachments, foundations and/or utilities were not located as a part of this survey.
3. Additions or deletions to survey maps or reports by other than the signing party or parties is prohibited without written consent of the signing party or parties.
4. This Report is not valid without the original signature and the raised seal or the electronic signature and computer-generated seal of a Florida Licensed Surveyor and Mapper.
5. To convert from NAVD 88 to NGVD 29 add 0.971 feet. This value is based on Corpscon 6.0.1, U.S. Army Corps of Engineers Engineering Research and Development Center Topographic Engineering Center Alexandria, Virginia Windows-based program to convert coordinates and elevations between datum's using vertcon05.txt and vertcon05.05 files supplied by the U.S. Army Corps of Engineers South Atlantic Division, Jacksonville, FL.
6. Date of last field work: July 26, 2018
7. SFWMD Data records (on file at the District's headquarters)
  - A. Electronic Data files:
    - Miscellaneous picture files
    - Miscellaneous data files
  - B. Conventional reporting
    - Field Book: 928 Pages: 33-34, 69-90, 123-136

Abbreviations:

**EL.** Elevation

**DTW** Distance to the water table inside the well

**PVC** Polyvinyl Chloride Pipe

**RTK GPS** Real-Time Kinematic Global Positioning System

**NAVD 88** North American Vertical Datum of 1988

**NGVD 29** National Geodetic Vertical Datum of 1929

**NGS** National Geodetic Survey

**PSM** Professional Surveyor & Mapper

**PID** Permanent Identifiers

**SFWMD** South Florida Water Management District

**USGS** United States Geological Survey

**CFWI** Central Florida Water Initiative.

**DMIT** Data, Monitoring and Investigations Team

**NGS** National Geodetic Survey

## SURVEYOR'S CERTIFICATION

In my professional opinion this Specific Purpose Survey meets applicable portions of the Standards of Practice set forth by the Florida Board of Professional Surveyors and Mappers in Chapter 5J, Florida Administrative Code. This report is prepared for the sole and specific use of the South Florida Water Management District and is not assignable.

July 26, 2018

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GREGORY A. PRATHER, PSM  
FLORIDA REGISTRATION NO. 5135  
PICKETT AND ASSOCIATES, INC.  
FLORIDA REGISTRATION NO. 364

SURVEY DATE





# SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Rev. 1/16

|                                                                |                                                    |
|----------------------------------------------------------------|----------------------------------------------------|
| DESIGNATION: <b>POS-18</b>                                     | PROJECT: <b>CFWI DMIT Wetland Lake Marion East</b> |
| ESTABLISHED BY: <b>SOUTH FLORIDA WATER MANAGEMENT DISTRICT</b> | SURVEYOR: <b>Gregory A. Prather</b>                |
| RECOVERED BY: <b>PICKETT AND ASSOCIATES, INC.</b>              | DATE: <b>July 26, 2018</b>                         |

## GEOGRAPHIC POSITION

|                                                                 |                                                              |                  |                                          |
|-----------------------------------------------------------------|--------------------------------------------------------------|------------------|------------------------------------------|
| SECTION 28                                                      | TOWNSHIP 27 SOUTH                                            | RANGE 28 EAST    |                                          |
| COUNTY: Polk                                                    | NAME OF QUADRANGLE: Dundee<br>GEOGRAPHIC INDEX OF QUAD: 3313 |                  |                                          |
| HORIZONTAL DATUM: 1927 1983 2022 Other (circle one) ZONE E or W |                                                              |                  |                                          |
| VERTICAL DATUM: MSL 1929 1988 2022 Other (circle one)           |                                                              |                  |                                          |
| VERTICAL ACCURACY: 1 2 3                                        |                                                              |                  |                                          |
| STATE PLANE<br>COORDINATE                                       | (N) Y= 1370090.85                                            | (E) X= 491123.39 | NAVD 88 EL. 82.480<br>NGVD 29 EL. 83.451 |

CORPSCON 6.0.1 CONVERSION FACTOR (NAVD88 TO NGVD29): **0.971'**

(A U.S. Army Corps of Engineers Engineering Research and Development Center Topographic Engineering Center Alexandria, Virginia Windows-based program to convert coordinates and elevations between datum's using vertcon05.txt and vertcon05.05 files supplied by the U.S. Army Corps of Engineers South Atlantic Division, Jacksonville FL.)

ACTUAL NGS or (ngvd29.txt file)

OPUS Ortho Height

|                                        |                                         |                                        |
|----------------------------------------|-----------------------------------------|----------------------------------------|
| LATITUDE: <b>28° 06' 06.76703" (N)</b> | LONGITUDE: <b>81° 30' 42.98184" (W)</b> | (OPUS – NAD_83 (2011) EPOCH:2010.0000) |
|----------------------------------------|-----------------------------------------|----------------------------------------|

## RECOVERY DATA

Stamping: POS-18

To Reach: From the intersection of Poinciana Pkwy and Lk Marion Creek Dr North on Lk Marion Creek Dr for 3 Mi to Caspian Rd East on Caspian Rd for 0.5 Mi to Baltic Dr. North on Baltic Dr. for 0.15 Mi to the intersection of Baltic Dr. North on dirt drive 150 ft. to gate thru gate on dirt trail North then East 1,000 ft to mark on Left.

NOTABLE LAND MARKS:

NGS-SOURCE BENCHMARK:

FIELD BOOK **928** PAGE **33**

## PICTURES

Aerial Overall Site







## SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Rev. 1/16



Looking Northwest (Oblique not to scale) (July 26, 2018)



Top View (Not to Scale) (July 26, 2018)



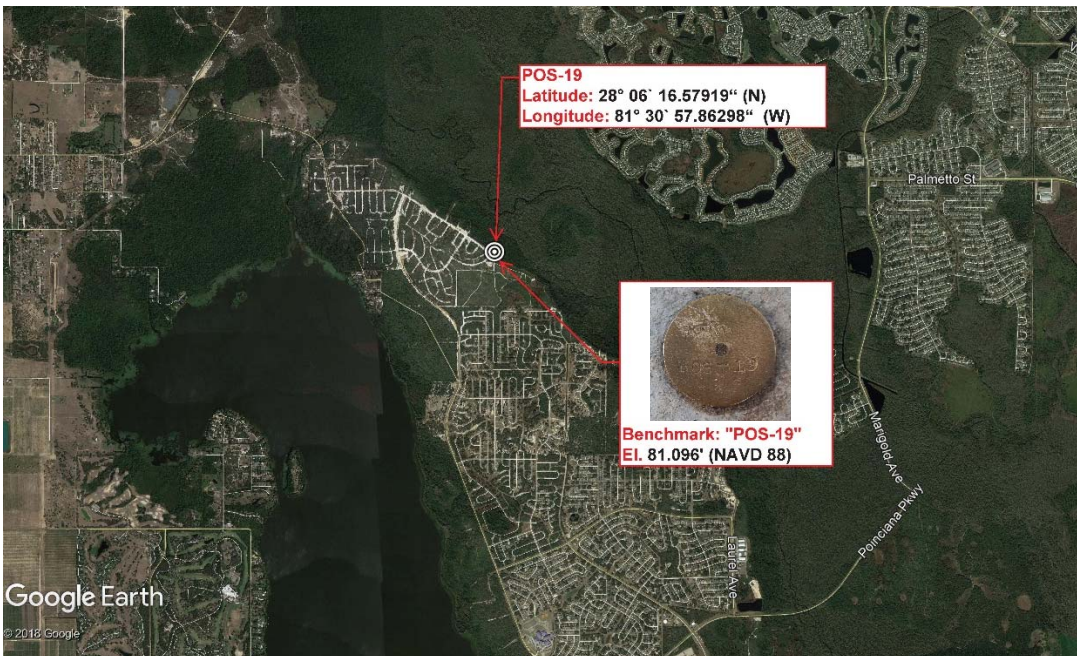
Top View (Not to Scale) (July 26, 2018)





# SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Rev. 1/16

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                            |                                                                                |                                                        |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|--------------------------------------------------------------------------------|--------------------------------------------------------|
| DESIGNATION: <b>POS-19</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                            | PROJECT: <b>CFWI DMIT Wetland Lake Marion West</b>                             |                                                        |
| ESTABLISHED BY: <b>SOUTH FLORIDA WATER MANAGEMENT DISTRICT</b>                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                            | SURVEYOR: <b>Gregory A. Prather</b>                                            |                                                        |
| RECOVERED BY: <b>PICKETT AND ASSOCIATES, INC.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                            | DATE: <b>July 26, 2018</b>                                                     |                                                        |
| <b>GEOGRAPHIC POSITION</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                            |                                                                                |                                                        |
| SECTION <b>28</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | TOWNSHIP <b>27 SOUTH</b>                                                   | RANGE <b>28 EAST</b>                                                           |                                                        |
| COUNTY: <b>Polk</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | NAME OF QUADRANGLE: <b>Dundee</b><br>GEOGRAPHIC INDEX OF QUAD: <b>3313</b> |                                                                                |                                                        |
| HORIZONTAL DATUM: 1927 <u>(1983)</u> 2022 Other _____ (circle one) ZONE <u>(E)</u> or W                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                            |                                                                                |                                                        |
| VERTICAL DATUM: MSL 1929 <u>(1988)</u> 2022 Other _____ (circle one)                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                            |                                                                                |                                                        |
| VERTICAL ACCURACY: 1 2 <u>(3)</u>                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                            |                                                                                |                                                        |
| STATE PLANE COORDINATE                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | (N) Y= <b>1371087.43</b>                                                   | (E) X= <b>489794.93</b>                                                        | NAVD 88 EL. <b>81.096</b><br>NGVD 29 EL. <b>82.067</b> |
| CORPSCON 6.0.1 CONVERSION FACTOR (NAVD88 TO NGVD29): <b>0.971'</b><br><small>(A U.S. Army Corps of Engineers Engineering Research and Development Center Topographic Engineering Center Alexandria, Virginia Windows-based program to convert coordinates and elevations between datum's using vertcon05.txt and vertcon05.05 files supplied by the U.S. Army Corps of Engineers South Atlantic Division, Jacksonville FL.)</small><br>ACTUAL NGS or (ngvd29.txt file)<br>OPUS Ortho Height |                                                                            |                                                                                |                                                        |
| LATITUDE: <b>28° 06' 16.57919" (N)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                            | LONGITUDE: <b>81° 30' 57.86298" (W)</b> (OPUS – NAD_83 (2011) EPOCH:2010.0000) |                                                        |
| <b>RECOVERY DATA</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                            |                                                                                |                                                        |
| Stamping: POS-19                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                            |                                                                                |                                                        |
| To Reach: From the intersection of Poinciana Pkwy and Lk Marion Creek Dr North on Lk Marion Creek Dr for 3 Mi to Caspian Rd East on Caspian Rd for 0.5 Mi to Baltic Dr. North on Baltic Dr. for 0.15 Mi to the intersection of Baltic Dr. North on dirt drive 150 ft. to gate thru gate on dirt trail North then East 1,000 ft then northwesterly and north 1,900 feet to mark on right.                                                                                                    |                                                                            |                                                                                |                                                        |
| NOTABLE LAND MARKS:                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                            |                                                                                |                                                        |
| NGS-SOURCE BENCHMARK:                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                            |                                                                                |                                                        |
| FIELD BOOK <b>928 PAGE 33</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                            |                                                                                |                                                        |
| <b>PICTURES</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                            |                                                                                |                                                        |
| <b>Aerial Overall Site</b><br>                                                                                                        |                                                                            |                                                                                |                                                        |





## SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Rev. 1/16



Looking West (Oblique not to scale) (July 26, 2018)

No Blue Tag at this Location



Top View (Not to Scale) (July 26, 2018)





# SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Rev. 1/16

|                                          |                                      |                                    |                                        |
|------------------------------------------|--------------------------------------|------------------------------------|----------------------------------------|
| SCADA RTU Station Name:<br><b>POS-18</b> | DB Hydro Site Name:<br><b>LMCRKE</b> | Agency:<br><b>WMD</b>              | Date of Field Work:<br><b>07/26/18</b> |
| Party Chief: <b>Robby Bickel</b>         | Field Book: <b>928</b>               | Page(s): <b>33, 69-90, 125-136</b> | Prepared by: <b>Sherry Grymko</b>      |

## SITE SPECIFIC DATA

|                                                   |                                                                |                                                                      |
|---------------------------------------------------|----------------------------------------------------------------|----------------------------------------------------------------------|
| Site Benchmark:<br><b>POS-18</b>                  | Benchmark Elevation (NAVD88)<br><b>82.480'</b>                 | Corpscon 6.0.1 Conversion Factor (NAVD88 to NGVD29)<br><b>0.971'</b> |
| Reference Elevation(s) (NAVD88):<br><b>86.10'</b> | Existing Brass Tag Elevation (Datum):<br><b>Not Applicable</b> | Calibration Port Elevation(s) (NAVD88):<br><b>Not Applicable</b>     |
| Ground Elevation (NAVD88): <b>82.4'</b>           | Pad Elevation (NAVD88): <b>82.5'</b>                           |                                                                      |

## GEOGRAPHIC DATA

|                   |                                         |                                          |                                      |
|-------------------|-----------------------------------------|------------------------------------------|--------------------------------------|
| Section <b>28</b> | Township <b>27</b> South                |                                          | Range <b>28</b> East                 |
| Well              | Latitude:<br><b>28°06'06.76436" (N)</b> | Longitude:<br><b>81°30'42.99790" (W)</b> | Source: RTK-GPS - NAD_83             |
|                   | State Plane Coordinates                 | Northing (Y) =<br><b>1370090.58 ft</b>   | Easting (X) =<br><b>491121.95 ft</b> |

### Notes:

**NAVD88** – North American Vertical Datum of 1988

**NGVD29**- National Geodetic Vertical Datum of 1929

**Corpscon 6.0.1** - A U.S. Army Corps of Engineers Engineering Research and Development Center Topographic Engineering Center Alexandria, Virginia Windows-based program to convert coordinates and elevations between datum's using vertcon05.txt and vertcon05.05 files supplied by the U.S. Army Corps of Engineers South Atlantic Division, Jacksonville FL.

## PICTURES

Aerial Overall Site



Benchmark "POS-18"  
Latitude: **28° 06' 06.76703"**  
Longitude: **81° 30' 42.98184"**  
El. **82.480' (NAVD88)**



Google Earth

© 2018 Google

Not to scale (Google Earth product)

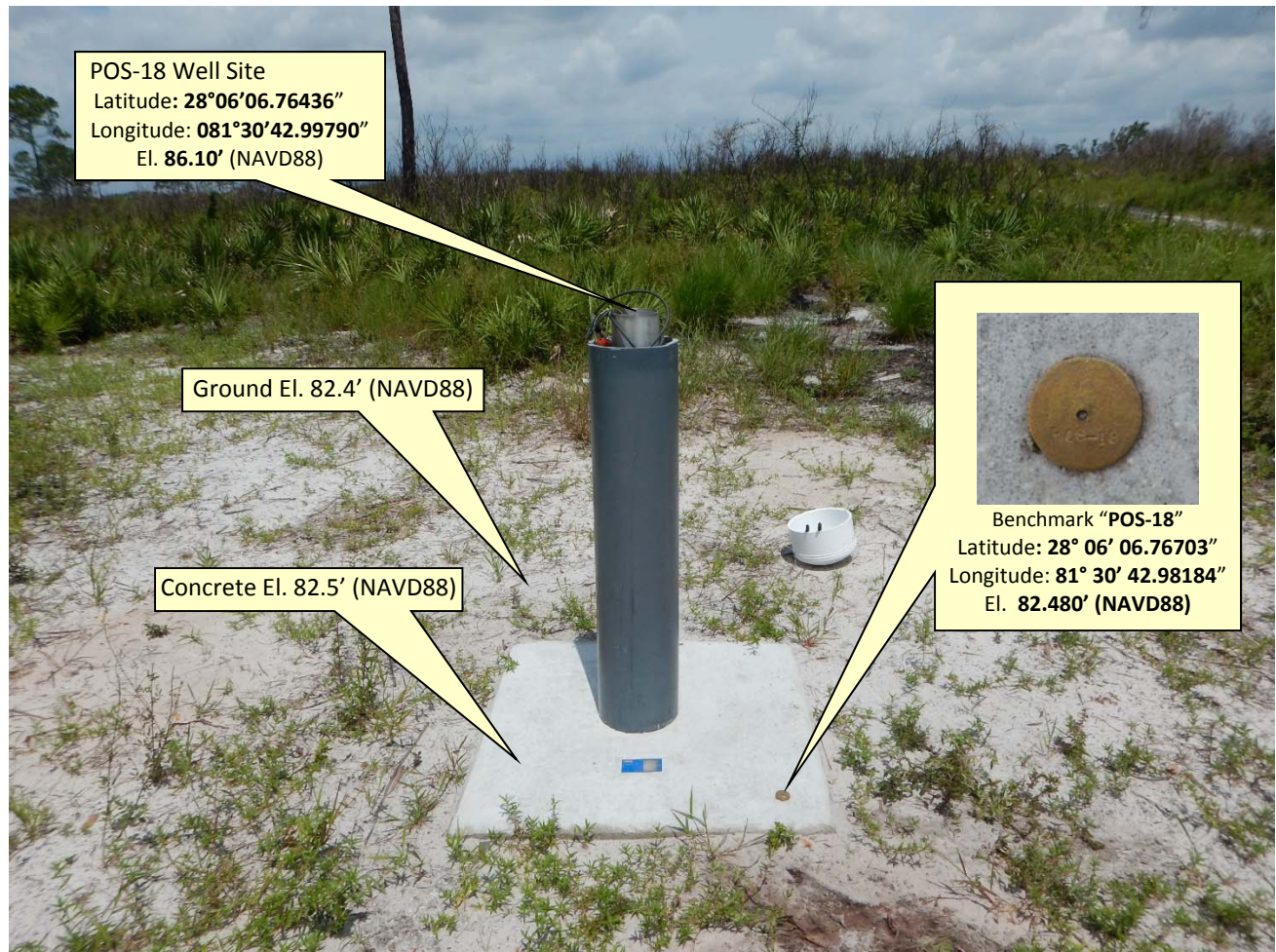




## SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Rev. 1/16

### Overall



Looking Northwesterly (oblique not to scale) (26-July-18)

### Well Head



Looking Northwesterly (oblique not to scale) (26-July-18)





# SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Rev. 1/16

|                                          |                                      |                                    |                                        |
|------------------------------------------|--------------------------------------|------------------------------------|----------------------------------------|
| SCADA RTU Station Name:<br><b>POS-19</b> | DB Hydro Site Name:<br><b>LMCRKW</b> | Agency:<br><b>WMD</b>              | Date of Field Work:<br><b>07/26/18</b> |
| Party Chief: <b>Robby Bickel</b>         | Field Book: <b>928</b>               | Page(s): <b>33, 69-90, 123-136</b> | Prepared by: <b>Sherry Grymko</b>      |

## SITE SPECIFIC DATA

|                                                   |                                                                |                                                                      |
|---------------------------------------------------|----------------------------------------------------------------|----------------------------------------------------------------------|
| Site Benchmark:<br><b>POS-19</b>                  | Benchmark Elevation (NAVD88)<br><b>81.096'</b>                 | Corpscon 6.0.1 Conversion Factor (NAVD88 to NGVD29)<br><b>0.971'</b> |
| Reference Elevation(s) (NAVD88):<br><b>85.12'</b> | Existing Brass Tag Elevation (Datum):<br><b>Not Applicable</b> | Calibration Port Elevation(s) (NAVD88):<br><b>Not Applicable</b>     |
| Ground Elevation (NAVD88): <b>81.0'</b>           | Pad Elevation (NAVD88): <b>81.2'</b>                           |                                                                      |

## GEOGRAPHIC DATA

|                   |                                         |                                          |                                      |
|-------------------|-----------------------------------------|------------------------------------------|--------------------------------------|
| Section <b>28</b> | Township <b>27</b> South                |                                          | Range <b>28</b> East                 |
| <b>Well</b>       | Latitude:<br><b>28°06'16.56909" (N)</b> | Longitude:<br><b>81°30'57.86788" (W)</b> | Source: RTK-GPS - NAD_83             |
|                   | State Plane Coordinates                 | Northing (Y) =<br><b>1371086.41 ft</b>   | Easting (X) =<br><b>489794.49 ft</b> |

### Notes:

**NAVD88** – North American Vertical Datum of 1988

**NGVD29**- National Geodetic Vertical Datum of 1929

**Corpscon 6.0.1** - A U.S. Army Corps of Engineers Engineering Research and Development Center Topographic Engineering Center Alexandria, Virginia Windows-based program to convert coordinates and elevations between datum's using vertcon05.txt and vertcon05.05 files supplied by the U.S. Army Corps of Engineers South Atlantic Division, Jacksonville FL.

## PICTURES

Aerial Overall Site



Benchmark "POS-19"  
Latitude: **28° 06' 16.57919"**  
Longitude: **81° 30' 57.86298"**  
El. **81.096' (NAVD88)**



Not to scale (Google Earth product)





## SOUTH FLORIDA WATER MANAGEMENT DISTRICT

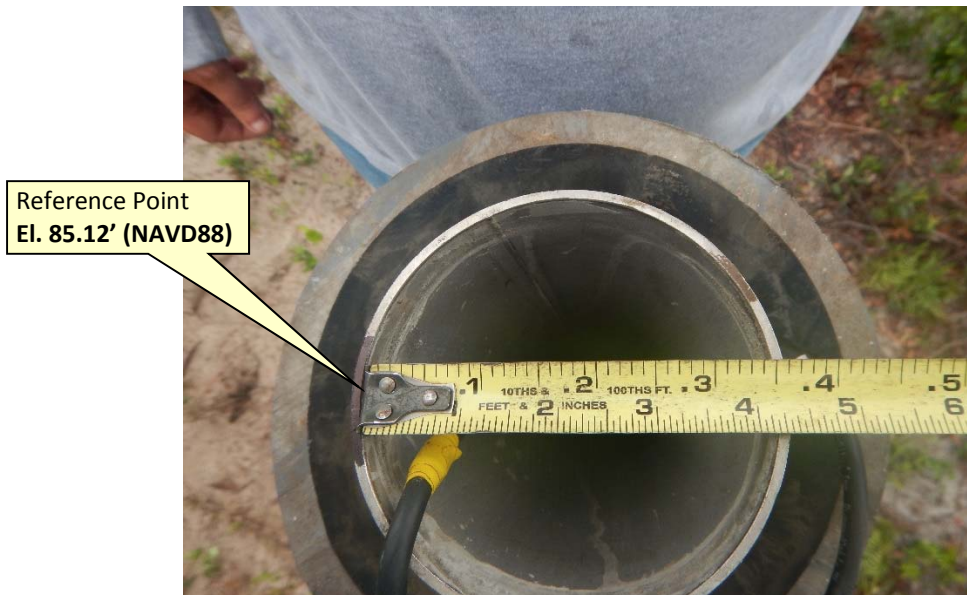
Rev. 1/16

Overall



Looking Easterly (oblique not to scale) (26-July-18)

Well Head



Looking Easterly (oblique not to scale) (26-July-18)



# Office

## Project

31 July 2018

### INPUT

Geographic, flhp gn - Florida HPGN  
Vertical - NAVD88, U.S. Feet

### OUTPUT

State Plane, flhp gn - Florida HPGN  
0901 - Florida East, U.S. Feet  
Vertical - NGVD29 (Vertcon94), U.S. Feet

---

## POS-18

1/1

**Latitude:** 28 06 06.76703  
**Longitude:** 81 30 42.98184  
**Elevation/Z:** 0

**Northing/Y:** 1370090.845  
**Easting/X:** 491123.387  
**Elevation/Z:** 0.971  
**Convergence:** -0 14 28.13794  
**Scale Factor:** 0.999972399  
**Combined Factor:** 0.999976636

---

**Remark:**

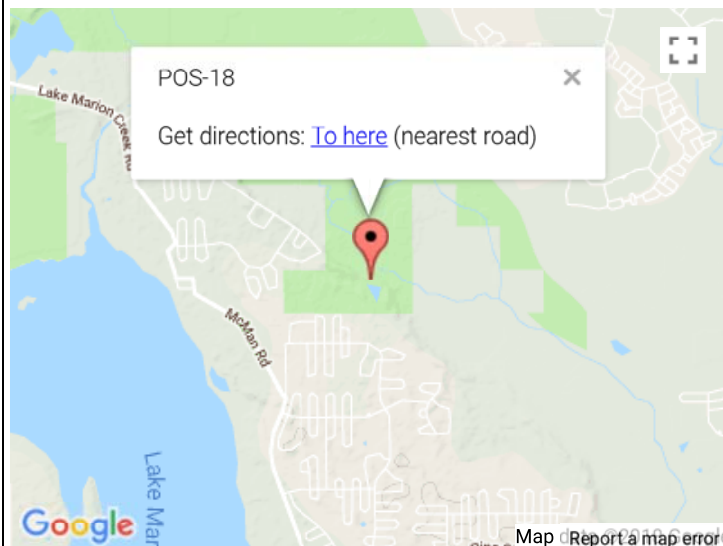
## Shared Solution

**PID:** BBGB32**Designation:** POS-18**Stamping:** POS-18**Stability:** May hold, commonly subject to ground movement**Setting:** Set in top of concrete monument

**Description:** From the intersection of Poinciana Pkwy and Lk Marion Creek Dr North on Lk Marion Creek Dr for 3 Mi to Caspian Rd East on Caspian Rd for 0.5 Mi to Baltic Dr. North on Baltic Dr. for 0.15 Mi to the intersection of Baltic Dr. North on dirt drive 150 ft. to gate thru gate on dirt trail North then East 1,000 ft to mark on Left

**Observed:** 2018-06-28T13:07:00Z**Source:** OPUS - page5 1603.24**Close-up View**

| REF_FRAME:                               | EPOCH:    | SOURCE:                          | UNITS:                                        | SET     | DETAILS |
|------------------------------------------|-----------|----------------------------------|-----------------------------------------------|---------|---------|
| NAD_83(2011)                             | 2010.0000 | NAVD88 (Computed using GEOID12B) | m                                             | PROFILE |         |
| <b>LAT:</b> 28° 6' 6.76703" ± 0.013 m    |           |                                  | <b>UTM 17 SPC 901(FL E)</b>                   |         |         |
| <b>LON:</b> -81° 30' 42.98184" ± 0.009 m |           |                                  | <b>NORTHING:</b> 3108594.021m 417604.525m     |         |         |
| <b>ELL HT:</b> -2.192 ± 0.031 m          |           |                                  | <b>EASTING:</b> 449711.872m 149694.708m       |         |         |
| <b>X:</b> 831066.976 ± 0.009 m           |           |                                  | <b>CONVERGENCE:</b> -0.24115000° -0.24115000° |         |         |
| <b>Y:</b> -5568736.736 ± 0.034 m         |           |                                  | <b>POINT SCALE:</b> 0.99963121 0.99997240     |         |         |
| <b>Z:</b> 2986468.305 ± 0.003 m          |           |                                  | <b>COMBINED FACTOR:</b> 0.99963155 0.99997274 |         |         |
| <b>ORTHO HT:</b> 25.140 ± 0.039 m        |           |                                  |                                               |         |         |

**CONTRIBUTED BY**[sgrymko](#)[Pickett & Associates, Inc.](#)**Horizon View**

The numerical values for this position solution have satisfied the quality control criteria of the National Geodetic Survey. The contributor has verified that the information submitted is accurate and complete.



# LAKE MARION CREEK WELL POS-18

FILE: 25341790.DAT OP1532023160771

## NGS OPUS SOLUTION REPORT

=====

All computed coordinate accuracies are listed as peak-to-peak values.

For additional information: <https://www.ngs.noaa.gov/OPUS/about.jsp#accuracy>

USER: [sgrymko@pickettusa.com](mailto:sgrymko@pickettusa.com) DATE: July 19, 2018  
RINEX FILE: 2534179n.18o TIME: 18:00:37 UTC

SOFTWARE: page5 1603.24 master55.pl 160321 START: 2018/06/28 13:07:00  
EPHEMERIS: igs20074.eph [precise] STOP: 2018/06/28 22:39:00  
NAV FILE: brdc1790.18n OBS USED: 23874 / 26376 : 91%  
ANT NAME: TRM5800 NONE # FIXED AMB: 119 / 149 : 80%  
ARP HEIGHT: 1.9964 OVERALL RMS: 0.025(m)

REF FRAME: NAD\_83(2011)(EPOCH:2010.0000) IGS08 (EPOCH:2018.4897)

|    |                 |          |                 |          |
|----|-----------------|----------|-----------------|----------|
| X: | 831066.976(m)   | 0.009(m) | 831066.161(m)   | 0.009(m) |
| Y: | -5568736.736(m) | 0.034(m) | -5568735.173(m) | 0.034(m) |
| Z: | 2986468.305(m)  | 0.003(m) | 2986468.142(m)  | 0.003(m) |

|            |                 |          |                                    |          |
|------------|-----------------|----------|------------------------------------|----------|
| LAT:       | 28 6 6.76703    | 0.013(m) | 28 6 6.78784                       | 0.013(m) |
| E LON:     | 278 29 17.01816 | 0.009(m) | 278 29 16.99706                    | 0.009(m) |
| W LON:     | 81 30 42.98184  | 0.009(m) | 81 30 43.00294                     | 0.009(m) |
| EL HGT:    | -2.192(m)       | 0.031(m) | -3.738(m)                          | 0.031(m) |
| ORTHO HGT: | 25.140(m)       | 0.039(m) | [NAVD88 (Computed using GEOID12B)] |          |

EL. 82.48 ft

### UTM COORDINATES STATE PLANE COORDINATES

|                       | UTM (Zone 17) | SPC (0901 FL E) |                 |
|-----------------------|---------------|-----------------|-----------------|
| Northing (Y) [meters] | 3108594.021   | 417604.525      | Y=1370090.85 ft |
| Easting (X) [meters]  | 449711.872    | 149694.708      | X= 491123.39 ft |
| Convergence [degrees] | -0.24115000   | -0.24115000     |                 |
| Point Scale           | 0.99963121    | 0.99997240      |                 |
| Combined Factor       | 0.99963155    | 0.99997274      |                 |

US NATIONAL GRID DESIGNATOR: 17RMM4971108594(NAD 83)

### BASE STATIONS USED

| PID    | DESIGNATION                 | LATITUDE    | LONGITUDE    | DISTANCE(m) |
|--------|-----------------------------|-------------|--------------|-------------|
| DF7990 | ZEFR ZEPHYRHILLS CORS ARP   | N281339.322 | W0820952.671 | 65598.1     |
| DQ7965 | FLWE WEDGEFIELD FL CORS ARP | N282626.477 | W0810533.176 | 55704.6     |
| DH3757 | WACH WAUCHULA CORS ARP      | N273051.042 | W0815256.615 | 74658.6     |

NEAREST NGS PUBLISHED CONTROL POINT  
DN9717 T 739 N2804000038 W08132000042 4236.0

BASE STATION INFORMATION

STATION NAME: zefr a 2 (ZEPHYRHILLS; Zephyrhills, Florida, U.S.A.)

MONUMENT: 49526S001

XYZ 766680.6677 -5571328.4297 2998751.0226 MON @ 2005.0000 (M)  
XYZ -0.0123 0.0005 0.0010 VEL (M/YR)  
NEU 0.0000 0.0000 0.0000 MON TO ARP (M)  
NEU 0.0001 -0.0008 0.1242 ARP TO L1 PHASE CENTER (M)  
NEU -0.0000 -0.0008 0.1337 ARP TO L2 PHASE CENTER (M)  
XYZ -0.1655 0.0072 0.0132 VEL TIMES 13.4890 YRS  
XYZ 0.0000 0.0000 0.0000 MON TO ARP  
XYZ 0.0142 -0.1085 0.0589 ARP TO L1 PHASE CENTER  
XYZ 766680.5163 -5571328.5310 2998751.0947 L1 PHS CEN @ 2018.4897  
XYZ -0.0000 -0.0000 -0.0000 + XYZ ADJUSTMENTS  
XYZ 766680.5163 -5571328.5310 2998751.0947 NEW L1 PHS CEN @ 2018.4897  
XYZ 766680.5022 -5571328.4225 2998751.0358 NEW ARP @ 2018.4897  
XYZ 766680.5022 -5571328.4225 2998751.0358 NEW MON @ 2018.4897  
LLH 28 13 39.34290 277 50 7.30647 -1.3998 NEW L1 PHS CEN @ 2018.4897  
LLH 28 13 39.34290 277 50 7.30650 -1.5240 NEW ARP @ 2018.4897  
LLH 28 13 39.34290 277 50 7.30650 -1.5240 NEW MON @ 2018.4897

STATION NAME: flwe a 1 (Wedgfield FL; Wedgfield, Florida USA)

MONUMENT: NO DOMES NUMBER

XYZ 869051.5075 -5544931.6670 3019536.5449 MON @ 2005.0000 (M)  
XYZ -0.0120 -0.0007 0.0021 VEL (M/YR)  
NEU 0.0000 0.0000 0.0000 MON TO ARP (M)  
NEU 0.0013 -0.0007 0.0888 ARP TO L1 PHASE CENTER (M)  
NEU 0.0005 0.0002 0.0818 ARP TO L2 PHASE CENTER (M)  
XYZ -0.1619 -0.0094 0.0283 VEL TIMES 13.4890 YRS  
XYZ 0.0000 0.0000 0.0000 MON TO ARP  
XYZ 0.0113 -0.0767 0.0434 ARP TO L1 PHASE CENTER  
XYZ 869051.3569 -5544931.7531 3019536.6167 L1 PHS CEN @ 2018.4897  
XYZ 0.0000 -0.0000 -0.0000 + XYZ ADJUSTMENTS  
XYZ 869051.3570 -5544931.7532 3019536.6166 NEW L1 PHS CEN @ 2018.4897  
XYZ 869051.3457 -5544931.6765 3019536.5732 NEW ARP @ 2018.4897  
XYZ 869051.3457 -5544931.6765 3019536.5732 NEW MON @ 2018.4897  
LLH 28 26 26.49879 278 54 26.80295 -4.9944 NEW L1 PHS CEN @ 2018.4897  
LLH 28 26 26.49874 278 54 26.80297 -5.0832 NEW ARP @ 2018.4897  
LLH 28 26 26.49874 278 54 26.80297 -5.0832 NEW MON @ 2018.4897

STATION NAME: wach a 1 (Wauchula; Wauchula, Florida, U.S.A.)

MONUMENT: NO DOMES NUMBER

XYZ 799335.5101 -5604081.2834 2928868.5861 MON @ 2005.0000 (M)  
XYZ -0.0117 0.0017 0.0004 VEL (M/YR)  
NEU 0.0000 0.0000 0.0000 MON TO ARP (M)  
NEU 0.0001 -0.0008 0.1242 ARP TO L1 PHASE CENTER (M)  
NEU -0.0000 -0.0008 0.1337 ARP TO L2 PHASE CENTER (M)



|     |                |               |              |                            |
|-----|----------------|---------------|--------------|----------------------------|
| XYZ | -0.1584        | 0.0224        | 0.0053       | VEL TIMES 13.4889 YRS      |
| XYZ | 0.0000         | 0.0000        | 0.0000       | MON TO ARP                 |
| XYZ | 0.0148         | -0.1091       | 0.0575       | ARP TO L1 PHASE CENTER     |
| XYZ | 799335.3665    | -5604081.3702 | 2928868.6489 | L1 PHS CEN @ 2018.4897     |
| XYZ | 0.0000         | 0.0000        | 0.0000       | + XYZ ADJUSTMENTS          |
| XYZ | 799335.3665    | -5604081.3702 | 2928868.6489 | NEW L1 PHS CEN @ 2018.4897 |
| XYZ | 799335.3518    | -5604081.2611 | 2928868.5914 | NEW ARP @ 2018.4897        |
| XYZ | 799335.3518    | -5604081.2611 | 2928868.5914 | NEW MON @ 2018.4897        |
| LLH | 27 30 51.06279 | 278 7 3.36296 | 9.2623       | NEW L1 PHS CEN @ 2018.4897 |
| LLH | 27 30 51.06279 | 278 7 3.36299 | 9.1381       | NEW ARP @ 2018.4897        |
| LLH | 27 30 51.06279 | 278 7 3.36299 | 9.1381       | NEW MON @ 2018.4897        |

#### REMOTE STATION INFORMATION

STATION NAME: 2534 1

MONUMENT: NO DOMES NUMBER

|     |             |               |              |                            |
|-----|-------------|---------------|--------------|----------------------------|
| XYZ | 831066.2144 | -5568735.2773 | 2986468.2394 | MON @ 2018.4892 (M)        |
| NEU | -0.0008     | -0.0011       | 1.9964       | MON TO ARP (M)             |
| NEU | 0.0008      | 0.0011        | 0.0748       | ARP TO L1 PHASE CENTER (M) |
| NEU | 0.0001      | -0.0022       | 0.0772       | ARP TO L2 PHASE CENTER (M) |
| XYZ | 0.2589      | -1.7423       | 0.9397       | MON TO ARP                 |
| XYZ | 0.0108      | -0.0648       | 0.0359       | ARP TO L1 PHASE CENTER     |
| XYZ | 831066.4841 | -5568737.0844 | 2986469.2151 | L1 PHS CEN @ 2018.4897     |

BASELINE NAME: zefr 2534

|     |              |                 |              |                            |
|-----|--------------|-----------------|--------------|----------------------------|
| XYZ | -0.0498      | 0.0839          | -0.0963      | + XYZ ADJUSTMENTS          |
| XYZ | 831066.4343  | -5568737.0005   | 2986469.1188 | NEW L1 PHS CEN @ 2018.4897 |
| XYZ | 831066.4235  | -5568736.9358   | 2986469.0828 | NEW ARP @ 2018.4897        |
| XYZ | 831066.1646  | -5568735.1934   | 2986468.1431 | NEW MON @ 2018.4897        |
| LLH | 28 6 6.78756 | 278 29 16.99710 | -1.6479      | NEW L1 PHS CEN @ 2018.4897 |
| LLH | 28 6 6.78753 | 278 29 16.99706 | -1.7228      | NEW ARP @ 2018.4897        |
| LLH | 28 6 6.78756 | 278 29 16.99710 | -3.7192      | NEW MON @ 2018.4897        |

BASELINE NAME: flwe 2534

|     |              |                 |              |                            |
|-----|--------------|-----------------|--------------|----------------------------|
| XYZ | -0.0589      | 0.1103          | -0.0978      | + XYZ ADJUSTMENTS          |
| XYZ | 831066.4252  | -5568736.9741   | 2986469.1172 | NEW L1 PHS CEN @ 2018.4897 |
| XYZ | 831066.4144  | -5568736.9093   | 2986469.0813 | NEW ARP @ 2018.4897        |
| XYZ | 831066.1555  | -5568735.1670   | 2986468.1416 | NEW MON @ 2018.4897        |
| LLH | 28 6 6.78793 | 278 29 16.99692 | -1.6729      | NEW L1 PHS CEN @ 2018.4897 |
| LLH | 28 6 6.78791 | 278 29 16.99687 | -1.7477      | NEW ARP @ 2018.4897        |
| LLH | 28 6 6.78793 | 278 29 16.99692 | -3.7442      | NEW MON @ 2018.4897        |

BASELINE NAME: wach 2534

|     |              |                 |              |                            |
|-----|--------------|-----------------|--------------|----------------------------|
| XYZ | -0.0506      | 0.1175          | -0.0995      | + XYZ ADJUSTMENTS          |
| XYZ | 831066.4335  | -5568736.9669   | 2986469.1156 | NEW L1 PHS CEN @ 2018.4897 |
| XYZ | 831066.4227  | -5568736.9021   | 2986469.0796 | NEW ARP @ 2018.4897        |
| XYZ | 831066.1638  | -5568735.1598   | 2986468.1399 | NEW MON @ 2018.4897        |
| LLH | 28 6 6.78798 | 278 29 16.99725 | -1.6789      | NEW L1 PHS CEN @ 2018.4897 |
| LLH | 28 6 6.78795 | 278 29 16.99721 | -1.7537      | NEW ARP @ 2018.4897        |
| LLH | 28 6 6.78798 | 278 29 16.99725 | -3.7502      | NEW MON @ 2018.4897        |

Axx2018 628 18 628

B2018 62813 6 18 6282238 1 page5 v1603.24IGS 126 1 2 27NGS 2018 719IFDDPX  
IIGS08\_1930 IGS 20170101  
C00090002 -643856624 9 -25932291 29 122828927 16 X1798A2534X1798AZEFR  
D 1 2 -4969291 1 3 4272297 2 3 -9451524

Axx2018 628 18 628

B2018 62813 6 18 6282238 1 page5 v1603.24IGS 126 1 2 27NGS 2018 719IFDDPX  
IIGS08\_1930 IGS 20170101  
C00090005 379851902 9 238034905 29 330684316 17 X1798A2534X1798AFLWE  
D 1 2 -6085200 1 3 7240385 2 3 -9023733

Axx2018 628 18 628

B2018 62813 6 18 6282238 1 page5 v1603.24IGS 126 1 2 27NGS 2018 719IFDDPX  
IIGS08\_1930 IGS 20170101  
C00090003 -317308120 7 -353461013 29 -575995485 15 X1798A2534X1798AWACH  
D 1 2 -5923173 1 3 7023006 2 3 -8442963

#### POST-FIT RMS BY SATELLITE VS. BASELINE

|           | OVERALL | 01    | 02    | 03    | 05    | 06    | 07    | 08    | 09    |
|-----------|---------|-------|-------|-------|-------|-------|-------|-------|-------|
| zefr-2534 | 0.026   | 0.037 | 0.017 | 0.029 | 0.018 | 0.021 | 0.024 | 0.040 | 0.019 |
|           | 11      | 12    | 13    | 16    | 17    | 18    | 19    | 22    | 23    |
| zefr-2534 | 0.029   | 0.018 | 0.034 | 0.016 | 0.037 | 0.028 | 0.020 | 0.044 | 0.014 |
|           | 24      | 25    | 27    | 28    | 29    | 30    |       |       |       |
| zefr-2534 | 0.025   | 0.011 | 0.013 | 0.025 | ...   | 0.033 |       |       |       |

|           | OVERALL | 01    | 02    | 03    | 05    | 06    | 07    | 08    | 09    |
|-----------|---------|-------|-------|-------|-------|-------|-------|-------|-------|
| flwe-2534 | 0.025   | 0.029 | 0.018 | 0.041 | 0.018 | 0.023 | 0.019 | 0.044 | 0.020 |
|           | 11      | 12    | 13    | 16    | 17    | 18    | 19    | 22    | 23    |
| flwe-2534 | 0.026   | 0.020 | 0.027 | 0.016 | 0.023 | 0.028 | 0.033 | 0.038 | 0.014 |
|           | 24      | 25    | 27    | 28    | 29    | 30    |       |       |       |
| flwe-2534 | 0.039   | 0.018 | 0.014 | 0.023 | ...   | 0.024 |       |       |       |

|           | OVERALL | 01    | 02    | 03    | 05    | 06    | 07    | 08    | 09    |
|-----------|---------|-------|-------|-------|-------|-------|-------|-------|-------|
| wach-2534 | 0.022   | 0.023 | 0.020 | 0.030 | 0.017 | 0.019 | 0.017 | 0.021 | 0.014 |
|           | 11      | 12    | 13    | 16    | 17    | 18    | 19    | 22    | 23    |
| wach-2534 | 0.021   | 0.026 | 0.042 | 0.014 | 0.022 | 0.019 | 0.023 | 0.052 | 0.015 |
|           | 24      | 25    | 27    | 28    | 29    | 30    |       |       |       |
| wach-2534 | 0.033   | 0.020 | 0.015 | 0.027 | ...   | 0.025 |       |       |       |

#### OBS BY SATELLITE VS. BASELINE

|           | OVERALL | 01  | 02  | 03  | 05  | 06  | 07  | 08  | 09  |
|-----------|---------|-----|-----|-----|-----|-----|-----|-----|-----|
| zefr-2534 | 7930    | 540 | 480 | 338 | 290 | 637 | 584 | 31  | 427 |
|           | 11      | 12  | 13  | 16  | 17  | 18  | 19  | 22  | 23  |
| zefr-2534 | 559     | 363 | 69  | 43  | 133 | 455 | 595 | 194 | 212 |
|           | 24      | 25  | 27  | 28  | 29  | 30  |     |     |     |
| zefr-2534 | 185     | 124 | 183 | 829 | ... | 659 |     |     |     |

|           | OVERALL | 01  | 02  | 03  | 05  | 06  | 07  | 08  | 09  |
|-----------|---------|-----|-----|-----|-----|-----|-----|-----|-----|
| flwe-2534 | 8220    | 554 | 484 | 366 | 284 | 639 | 561 | 75  | 461 |
|           | 11      | 12  | 13  | 16  | 17  | 18  | 19  | 22  | 23  |
| flwe-2534 | 603     | 351 | 140 | 84  | 144 | 486 | 618 | 273 | 198 |



```

      24  25  27  28  29  30
flwe-2534| 188 120 206 795 ... 590
      OVERALL 01 02 03 05 06 07 08 09
wach-2534| 7724 494 501 312 286 638 553 55 310
      11 12 13 16 17 18 19 22 23
wach-2534| 556 364 80 59 148 472 628 51 210
      24 25 27 28 29 30
wach-2534| 230 144 177 802 ... 654

```

ITRF position of 2534 as determined by individual baselines

|      | X          | Y            | Z           |
|------|------------|--------------|-------------|
| zefr | 831066.165 | -5568735.193 | 2986468.143 |
| flwe | 831066.155 | -5568735.167 | 2986468.142 |
| wach | 831066.164 | -5568735.160 | 2986468.140 |

Residuals of position determined by individual baselines from the final position

|      | X      | Y      | Z      | East   | North  | Up     |
|------|--------|--------|--------|--------|--------|--------|
| zefr | 0.003  | -0.020 | 0.002  | 0.000  | -0.008 | 0.019  |
| flwe | -0.006 | 0.006  | 0.000  | -0.005 | 0.003  | -0.006 |
| wach | 0.002  | 0.014  | -0.002 | 0.004  | 0.005  | -0.012 |

Covariance Matrix for the xyz OPUS Position (meters^2).

|               |               |               |
|---------------|---------------|---------------|
| 0.0000007244  | -0.0000001384 | 0.0000000660  |
| -0.0000001384 | 0.0000074733  | -0.0000003700 |
| 0.0000000660  | -0.0000003700 | 0.0000021444  |

Covariance Matrix for the enu OPUS Position (meters^2).

|               |               |               |
|---------------|---------------|---------------|
| 0.0000008311  | 0.0000004091  | -0.0000007484 |
| 0.0000004091  | 0.0000029801  | -0.0000019511 |
| -0.0000007484 | -0.0000019511 | 0.0000065311  |

Horizontal network accuracy = 0.00356 meters.

Vertical network accuracy = 0.00501 meters.

Derivation of NAD 83 vector components

Position of reference station ARP in NAD\_83(2011)(EPOCH:2010.0000).

|      | Xa(m)        | Ya(m)          | Za(m)         |
|------|--------------|----------------|---------------|
| ZEFR | 766681.32093 | -5571329.99195 | 2998751.20655 |
| FLWE | 869052.16380 | -5544933.23814 | 3019536.73114 |
| WACH | 799336.16446 | -5604082.84993 | 2928868.77127 |

Position of reference station monument in NAD\_83(2011)(EPOCH:2010.0000).

|      | Xr(m)        | Yr(m)          | Zr(m)         |
|------|--------------|----------------|---------------|
| ZEFR | 766681.32093 | -5571329.99195 | 2998751.20655 |
| FLWE | 869052.16380 | -5544933.23814 | 3019536.73114 |
| WACH | 799336.16446 | -5604082.84993 | 2928868.77127 |

Velocity of reference station monument in NAD\_83(2011)(EPOCH:2010.0000).

| Vx (m/yr) | Vy (m/yr) | Vz (m/yr) |
|-----------|-----------|-----------|
|-----------|-----------|-----------|

|      |          |          |         |
|------|----------|----------|---------|
| ZEFR | -0.01230 | 0.00050  | 0.00100 |
| FLWE | -0.01200 | -0.00070 | 0.00210 |
| WACH | -0.01170 | 0.00170  | 0.00040 |

Vectors from unknown station monument to reference station monument  
in NAD\_83(2011)(EPOCH:2010.0000).

Xr-X= DX(m) Yr-Y= DY(m) Zr-Z= DZ(m)

|      |              |              |              |         |
|------|--------------|--------------|--------------|---------|
| ZEFR | -64385.65507 | -2593.25595  | 12282.90155  | 2010.00 |
| FLWE | 37985.18780  | 23803.49786  | 33068.42614  | 2010.00 |
| WACH | -31730.81154 | -35346.11393 | -57599.53373 | 2010.00 |

STATE PLANE COORDINATES - U.S. Survey Foot

SPC (0901 FL E)

|                       |             |
|-----------------------|-------------|
| Northing (Y) [feet]   | 1370090.846 |
| Easting (X) [feet]    | 491123.388  |
| Convergence [degrees] | -0.24115000 |
| Point Scale           | 0.99997240  |
| Combined Factor       | 0.99997274  |

\*\*\*\*\* New Reference Frame Preview \*\*\*\*\*

We are replacing the nation's NAD 83 and NAVD 88 datums, to improve access and accuracy of the National Spatial Reference System. More at <https://geodesy.noaa.gov/datums/newdatums/>

Below are approximate coordinates for this solution in the new frames:

APPROX ORTHO HGT: 25.123 (m) [PROTOTYPE (Computed using xGeoid17B,GRS80,IGS08)]

This position and the above vector components were computed without any knowledge by the National Geodetic Survey regarding the equipment or field operating procedures used.



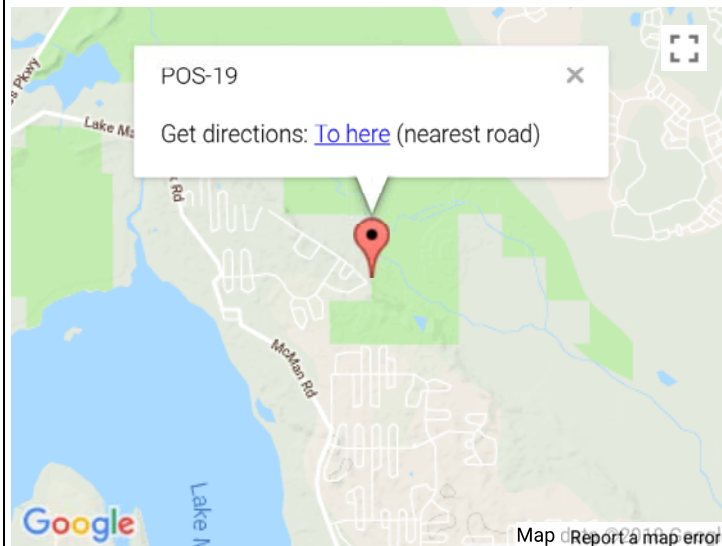
## Shared Solution

**PID:** BBGB33**Designation:** POS-19**Stamping:** POS-19**Stability:** May hold, commonly subject to ground movement**Setting:** Set in top of concrete monument

**Description:** From the intersection of Poinciana Pkwy and Lk Marion Creek Dr North on Lk Marion Creek Dr for 3 Mi to Caspian Rd East on Caspian Rd for 0.5 Mi to Baltic Dr. North on Baltic Dr. for 0.15 Mi to the intersection of Baltic Dr. North on dirt drive 150 ft. to gate thru gate on dirt trail North then East 1,000 ft then northwesterly and north 1,900 feet to mark on right

**Observed:** 2018-06-28T13:28:00Z**Source:** OPUS - page5 1603.24**Close-up View**

| REF_FRAME:                               | EPOCH:    | SOURCE:                                       | UNITS: | SET     | DETAILS |
|------------------------------------------|-----------|-----------------------------------------------|--------|---------|---------|
| NAD_83(2011)                             | 2010.0000 | NAVD88 (Computed using GEOID12B)              | m      | PROFILE |         |
| <b>LAT:</b> 28° 6' 16.57919" ± 0.016 m   |           | <b>UTM 17 SPC 901(FL E)</b>                   |        |         |         |
| <b>LON:</b> -81° 30' 57.86298" ± 0.011 m |           | <b>NORTHING:</b> 3108897.677m 417908.284m     |        |         |         |
| <b>ELL HT:</b> -2.614 ± 0.060 m          |           | <b>EASTING:</b> 449307.096m 149289.794m       |        |         |         |
| <b>X:</b> 830644.166 ± 0.002 m           |           | <b>CONVERGENCE:</b> -0.24311944° -0.24311944° |        |         |         |
| <b>Y:</b> -5568655.582 ± 0.062 m         |           | <b>POINT SCALE:</b> 0.99963172 0.99997290     |        |         |         |
| <b>Z:</b> 2986734.548 ± 0.015 m          |           | <b>COMBINED FACTOR:</b> 0.99963213 0.99997331 |        |         |         |
| <b>ORTHO HT:</b> 24.718 ± 0.065 m        |           |                                               |        |         |         |

**CONTRIBUTED BY**[sgrymko](#)[Pickett & Associates, Inc.](#)**Horizon View**

The numerical values for this position solution have satisfied the quality control criteria of the National Geodetic Survey. The contributor has verified that the information submitted is accurate and complete.

# LAKE MARION CREEK WELL POS-19

FILE: 69161790.DAT OP1532023873896

## NGS OPUS SOLUTION REPORT

=====

All computed coordinate accuracies are listed as peak-to-peak values.

For additional information: <https://www.ngs.noaa.gov/OPUS/about.jsp#accuracy>

USER: [sgrymko@pickettusa.com](mailto:sgrymko@pickettusa.com) DATE: July 19, 2018  
RINEX FILE: 6916179n.18o TIME: 18:12:36 UTC

SOFTWARE: page5 1603.24 master95.pl 160321 START: 2018/06/28 13:28:00  
EPHEMERIS: igs20074.eph [precise] STOP: 2018/06/28 22:43:00  
NAV FILE: brdc1790.18n OBS USED: 20548 / 24746 : 83%  
ANT NAME: TRM5800 NONE # FIXED AMB: 173 / 196 : 88%  
ARP HEIGHT: 1.9964 OVERALL RMS: 0.026(m)

REF FRAME: NAD\_83(2011)(EPOCH:2010.0000) IGS08 (EPOCH:2018.4897)

|    |                 |          |                 |          |
|----|-----------------|----------|-----------------|----------|
| X: | 830644.166(m)   | 0.002(m) | 830643.351(m)   | 0.002(m) |
| Y: | -5568655.582(m) | 0.062(m) | -5568654.019(m) | 0.062(m) |
| Z: | 2986734.548(m)  | 0.015(m) | 2986734.385(m)  | 0.015(m) |

|            |                |                                             |                |          |
|------------|----------------|---------------------------------------------|----------------|----------|
| LAT:       | 28 6 16.57919  | 0.016(m)                                    | 28 6 16.60000  | 0.016(m) |
| E LON:     | 278 29 2.13702 | 0.011(m)                                    | 278 29 2.11592 | 0.011(m) |
| W LON:     | 81 30 57.86298 | 0.011(m)                                    | 81 30 57.88408 | 0.011(m) |
| EL HGT:    | -2.614(m)      | 0.060(m)                                    | -4.160(m)      | 0.060(m) |
| ORTHO HGT: | 24.718(m)      | 0.065(m) [NAVD88 (Computed using GEOID12B)] |                |          |

EL. 81.10 ft

### UTM COORDINATES STATE PLANE COORDINATES

|                       | UTM (Zone 17) | SPC (0901 FL E) |                 |
|-----------------------|---------------|-----------------|-----------------|
| Northing (Y) [meters] | 3108897.677   | 417908.284      | Y=1371087.43 ft |
| Easting (X) [meters]  | 449307.096    | 149289.794      | X= 489794.93 ft |
| Convergence [degrees] | -0.24311944   | -0.24311944     |                 |
| Point Scale           | 0.99963172    | 0.99997290      |                 |
| Combined Factor       | 0.99963213    | 0.99997331      |                 |

US NATIONAL GRID DESIGNATOR: 17RMM4930708897(NAD 83)

### BASE STATIONS USED

| PID    | DESIGNATION                 | LATITUDE    | LONGITUDE    | DISTANCE(m) |
|--------|-----------------------------|-------------|--------------|-------------|
| DF7990 | ZEFR ZEPHYRHILLS CORS ARP   | N281339.322 | W0820952.671 | 65136.8     |
| DQ7965 | FLWE WEDGEFIELD FL CORS ARP | N282626.477 | W0810533.176 | 55802.4     |
| DH3757 | WACH WAUCHULA CORS ARP      | N273051.042 | W0815256.615 | 74724.4     |



NEAREST NGS PUBLISHED CONTROL POINT  
DN9717 T 739 N2804000038 W08132000042 4145.9

#### BASE STATION INFORMATION

STATION NAME: zefr a 2 (ZEPHYRHILLS; Zephyrhills, Florida, U.S.A.)

MONUMENT: 49526S001

XYZ 766680.6677 -5571328.4297 2998751.0226 MON @ 2005.0000 (M)  
XYZ -0.0123 0.0005 0.0010 VEL (M/YR)  
NEU 0.0000 0.0000 0.0000 MON TO ARP (M)  
NEU 0.0001 -0.0008 0.1242 ARP TO L1 PHASE CENTER (M)  
NEU -0.0000 -0.0008 0.1337 ARP TO L2 PHASE CENTER (M)  
XYZ -0.1655 0.0072 0.0132 VEL TIMES 13.4890 YRS  
XYZ 0.0000 0.0000 0.0000 MON TO ARP  
XYZ 0.0142 -0.1085 0.0589 ARP TO L1 PHASE CENTER  
XYZ 766680.5163 -5571328.5310 2998751.0947 L1 PHS CEN @ 2018.4897  
XYZ -0.0000 -0.0000 -0.0000 + XYZ ADJUSTMENTS  
XYZ 766680.5163 -5571328.5310 2998751.0947 NEW L1 PHS CEN @ 2018.4897  
XYZ 766680.5022 -5571328.4225 2998751.0358 NEW ARP @ 2018.4897  
XYZ 766680.5022 -5571328.4225 2998751.0358 NEW MON @ 2018.4897  
LLH 28 13 39.34290 277 50 7.30647 -1.3998 NEW L1 PHS CEN @ 2018.4897  
LLH 28 13 39.34290 277 50 7.30650 -1.5240 NEW ARP @ 2018.4897  
LLH 28 13 39.34290 277 50 7.30650 -1.5240 NEW MON @ 2018.4897

STATION NAME: flwe a 1 (Wedgfield FL; Wedgfield, Florida USA)

MONUMENT: NO DOMES NUMBER

XYZ 869051.5075 -5544931.6670 3019536.5449 MON @ 2005.0000 (M)  
XYZ -0.0120 -0.0007 0.0021 VEL (M/YR)  
NEU 0.0000 0.0000 0.0000 MON TO ARP (M)  
NEU 0.0013 -0.0007 0.0888 ARP TO L1 PHASE CENTER (M)  
NEU 0.0005 0.0002 0.0818 ARP TO L2 PHASE CENTER (M)  
XYZ -0.1619 -0.0094 0.0283 VEL TIMES 13.4890 YRS  
XYZ 0.0000 0.0000 0.0000 MON TO ARP  
XYZ 0.0113 -0.0767 0.0434 ARP TO L1 PHASE CENTER  
XYZ 869051.3569 -5544931.7531 3019536.6167 L1 PHS CEN @ 2018.4897  
XYZ 0.0001 0.0000 0.0001 + XYZ ADJUSTMENTS  
XYZ 869051.3571 -5544931.7531 3019536.6167 NEW L1 PHS CEN @ 2018.4897  
XYZ 869051.3457 -5544931.6764 3019536.5733 NEW ARP @ 2018.4897  
XYZ 869051.3457 -5544931.6764 3019536.5733 NEW MON @ 2018.4897  
LLH 28 26 26.49879 278 54 26.80295 -4.9944 NEW L1 PHS CEN @ 2018.4897  
LLH 28 26 26.49875 278 54 26.80298 -5.0832 NEW ARP @ 2018.4897  
LLH 28 26 26.49875 278 54 26.80298 -5.0832 NEW MON @ 2018.4897

STATION NAME: wach a 1 (Wauchula; Wauchula, Florida, U.S.A.)

MONUMENT: NO DOMES NUMBER

XYZ 799335.5101 -5604081.2834 2928868.5861 MON @ 2005.0000 (M)  
XYZ -0.0117 0.0017 0.0004 VEL (M/YR)  
NEU 0.0000 0.0000 0.0000 MON TO ARP (M)  
NEU 0.0001 -0.0008 0.1242 ARP TO L1 PHASE CENTER (M)  
NEU -0.0000 -0.0008 0.1337 ARP TO L2 PHASE CENTER (M)

|     |                |               |              |                            |
|-----|----------------|---------------|--------------|----------------------------|
| XYZ | -0.1584        | 0.0224        | 0.0053       | VEL TIMES 13.4890 YRS      |
| XYZ | 0.0000         | 0.0000        | 0.0000       | MON TO ARP                 |
| XYZ | 0.0148         | -0.1091       | 0.0575       | ARP TO L1 PHASE CENTER     |
| XYZ | 799335.3665    | -5604081.3702 | 2928868.6489 | L1 PHS CEN @ 2018.4897     |
| XYZ | 0.0000         | 0.0000        | -0.0000      | + XYZ ADJUSTMENTS          |
| XYZ | 799335.3665    | -5604081.3702 | 2928868.6489 | NEW L1 PHS CEN @ 2018.4897 |
| XYZ | 799335.3518    | -5604081.2611 | 2928868.5914 | NEW ARP @ 2018.4897        |
| XYZ | 799335.3518    | -5604081.2611 | 2928868.5914 | NEW MON @ 2018.4897        |
| LLH | 27 30 51.06279 | 278 7 3.36296 | 9.2623       | NEW L1 PHS CEN @ 2018.4897 |
| LLH | 27 30 51.06279 | 278 7 3.36299 | 9.1381       | NEW ARP @ 2018.4897        |
| LLH | 27 30 51.06279 | 278 7 3.36299 | 9.1381       | NEW MON @ 2018.4897        |

#### REMOTE STATION INFORMATION

STATION NAME: 6916 1

MONUMENT: NO DOMES NUMBER

|     |             |               |              |                            |
|-----|-------------|---------------|--------------|----------------------------|
| XYZ | 830643.3721 | -5568654.1819 | 2986734.5099 | MON @ 2018.4892 (M)        |
| NEU | -0.0008     | -0.0011       | 1.9964       | MON TO ARP (M)             |
| NEU | 0.0008      | 0.0011        | 0.0748       | ARP TO L1 PHASE CENTER (M) |
| NEU | 0.0001      | -0.0022       | 0.0773       | ARP TO L2 PHASE CENTER (M) |
| XYZ | 0.2587      | -1.7423       | 0.9398       | MON TO ARP                 |
| XYZ | 0.0108      | -0.0648       | 0.0359       | ARP TO L1 PHASE CENTER     |
| XYZ | 830643.6417 | -5568655.9890 | 2986735.4857 | L1 PHS CEN @ 2018.4897     |

BASELINE NAME: zefr 6916

|     |               |                |              |                            |
|-----|---------------|----------------|--------------|----------------------------|
| XYZ | -0.0220       | 0.1354         | -0.1186      | + XYZ ADJUSTMENTS          |
| XYZ | 830643.6196   | -5568655.8536  | 2986735.3670 | NEW L1 PHS CEN @ 2018.4897 |
| XYZ | 830643.6088   | -5568655.7888  | 2986735.3311 | NEW ARP @ 2018.4897        |
| XYZ | 830643.3501   | -5568654.0465  | 2986734.3913 | NEW MON @ 2018.4897        |
| LLH | 28 6 16.59977 | 278 29 2.11575 | -2.0621      | NEW L1 PHS CEN @ 2018.4897 |
| LLH | 28 6 16.59975 | 278 29 2.11571 | -2.1370      | NEW ARP @ 2018.4897        |
| LLH | 28 6 16.59977 | 278 29 2.11575 | -4.1334      | NEW MON @ 2018.4897        |

BASELINE NAME: flwe 6916

|     |               |                |              |                            |
|-----|---------------|----------------|--------------|----------------------------|
| XYZ | -0.0199       | 0.1559         | -0.1221      | + XYZ ADJUSTMENTS          |
| XYZ | 830643.6218   | -5568655.8331  | 2986735.3636 | NEW L1 PHS CEN @ 2018.4897 |
| XYZ | 830643.6110   | -5568655.7683  | 2986735.3276 | NEW ARP @ 2018.4897        |
| XYZ | 830643.3522   | -5568654.0260  | 2986734.3878 | NEW MON @ 2018.4897        |
| LLH | 28 6 16.59998 | 278 29 2.11594 | -2.0814      | NEW L1 PHS CEN @ 2018.4897 |
| LLH | 28 6 16.59996 | 278 29 2.11590 | -2.1562      | NEW ARP @ 2018.4897        |
| LLH | 28 6 16.59998 | 278 29 2.11594 | -4.1527      | NEW MON @ 2018.4897        |

BASELINE NAME: wach 6916

|     |               |                |              |                            |
|-----|---------------|----------------|--------------|----------------------------|
| XYZ | -0.0203       | 0.1971         | -0.1332      | + XYZ ADJUSTMENTS          |
| XYZ | 830643.6214   | -5568655.7919  | 2986735.3525 | NEW L1 PHS CEN @ 2018.4897 |
| XYZ | 830643.6106   | -5568655.7271  | 2986735.3165 | NEW ARP @ 2018.4897        |
| XYZ | 830643.3518   | -5568653.9848  | 2986734.3767 | NEW MON @ 2018.4897        |
| LLH | 28 6 16.60029 | 278 29 2.11614 | -2.1226      | NEW L1 PHS CEN @ 2018.4897 |
| LLH | 28 6 16.60026 | 278 29 2.11610 | -2.1974      | NEW ARP @ 2018.4897        |
| LLH | 28 6 16.60029 | 278 29 2.11614 | -4.1939      | NEW MON @ 2018.4897        |



Axx2018 628 18 628

B2018 6281328 18 6282242 1 page5 v1603.24IGS 126 1 2 27NGS 2018 719IFDDPX  
IIGS08\_1930 IGS 20170101  
C00090002 -639628479 9 -26743760 32 120166445 19 X1798A6916X1798AZEFR  
D 1 2 -3912433 1 3 3345150 2 3 -9497349

Axx2018 628 18 628

B2018 6281328 18 6282242 1 page5 v1603.24IGS 126 1 2 27NGS 2018 719IFDDPX  
IIGS08\_1930 IGS 20170101  
C00090005 384079935 8 237223496 33 328021855 18 X1798A6916X1798AFLWE  
D 1 2 -4974065 1 3 6246057 2 3 -8988974

Axx2018 628 18 628

B2018 6281328 18 6282242 1 page5 v1603.24IGS 126 1 2 27NGS 2018 719IFDDPX  
IIGS08\_1930 IGS 20170101  
C00090003 -313080000 8 -354272763 37 -578657853 20 X1798A6916X1798AWACH  
D 1 2 -6048974 1 3 7035690 2 3 -8711732

#### POST-FIT RMS BY SATELLITE VS. BASELINE

|           | OVERALL | 01    | 02    | 03    | 05    | 06    | 07    | 08    | 09    |
|-----------|---------|-------|-------|-------|-------|-------|-------|-------|-------|
| zefr-6916 | 0.025   | 0.036 | 0.018 | 0.029 | 0.020 | 0.024 | 0.021 | ...   | 0.016 |
|           | 11      | 12    | 13    | 16    | 17    | 18    | 19    | 22    | 23    |
| zefr-6916 | 0.024   | 0.020 | ...   | ...   | 0.031 | 0.027 | 0.024 | 0.034 | 0.017 |
|           | 24      | 25    | 27    | 28    | 29    | 30    |       |       |       |
| zefr-6916 | 0.026   | 0.020 | 0.013 | 0.028 | 0.024 | 0.030 |       |       |       |

|           | OVERALL | 01    | 02    | 03    | 05    | 06    | 07    | 08    | 09    |
|-----------|---------|-------|-------|-------|-------|-------|-------|-------|-------|
| flwe-6916 | 0.027   | 0.030 | 0.031 | 0.038 | 0.019 | 0.024 | 0.020 | 0.034 | 0.021 |
|           | 11      | 12    | 13    | 16    | 17    | 18    | 19    | 22    | 23    |
| flwe-6916 | 0.022   | 0.022 | ...   | ...   | 0.026 | 0.020 | 0.034 | 0.039 | 0.014 |
|           | 24      | 25    | 27    | 28    | 29    | 30    |       |       |       |
| flwe-6916 | 0.033   | 0.021 | 0.015 | 0.029 | ...   | 0.026 |       |       |       |

|           | OVERALL | 01    | 02    | 03    | 05    | 06    | 07    | 08    | 09    |
|-----------|---------|-------|-------|-------|-------|-------|-------|-------|-------|
| wach-6916 | 0.025   | 0.032 | 0.023 | 0.028 | 0.019 | 0.022 | 0.018 | 0.011 | 0.020 |
|           | 11      | 12    | 13    | 16    | 17    | 18    | 19    | 22    | 23    |
| wach-6916 | 0.021   | 0.028 | 0.038 | ...   | 0.018 | 0.019 | 0.026 | 0.038 | 0.019 |
|           | 24      | 25    | 27    | 28    | 29    | 30    |       |       |       |
| wach-6916 | 0.034   | 0.021 | 0.017 | 0.030 | 0.030 | 0.028 |       |       |       |

#### OBS BY SATELLITE VS. BASELINE

|           | OVERALL | 01  | 02  | 03  | 05  | 06  | 07  | 08  | 09  |
|-----------|---------|-----|-----|-----|-----|-----|-----|-----|-----|
| zefr-6916 | 6931    | 419 | 452 | 303 | 273 | 637 | 508 | ... | 253 |
|           | 11      | 12  | 13  | 16  | 17  | 18  | 19  | 22  | 23  |
| zefr-6916 | 462     | 371 | ... | ... | 137 | 363 | 675 | 114 | 125 |
|           | 24      | 25  | 27  | 28  | 29  | 30  |     |     |     |
| zefr-6916 | 152     | 152 | 144 | 731 | 26  | 634 |     |     |     |

|           | OVERALL | 01  | 02  | 03  | 05  | 06  | 07  | 08  | 09  |
|-----------|---------|-----|-----|-----|-----|-----|-----|-----|-----|
| flwe-6916 | 7011    | 431 | 500 | 262 | 273 | 658 | 511 | 29  | 331 |
|           | 11      | 12  | 13  | 16  | 17  | 18  | 19  | 22  | 23  |
| flwe-6916 | 474     | 343 | ... | ... | 150 | 388 | 612 | 210 | 124 |

|           |         |     |     |     |     |     |            |
|-----------|---------|-----|-----|-----|-----|-----|------------|
|           | 24      | 25  | 27  | 28  | 29  | 30  |            |
| flwe-6916 | 170     | 135 | 150 | 690 | ... | 570 |            |
|           | OVERALL | 01  | 02  | 03  | 05  | 06  | 07 08 09   |
| wach-6916 | 6606    | 393 | 462 | 237 | 284 | 651 | 472 1 257  |
|           | 11      | 12  | 13  | 16  | 17  | 18  | 19 22 23   |
| wach-6916 | 464     | 369 | 5   | ... | 121 | 353 | 655 55 126 |
|           | 24      | 25  | 27  | 28  | 29  | 30  |            |
| wach-6916 | 137     | 111 | 140 | 671 | 21  | 621 |            |

ITRF position of 6916 as determined by individual baselines

|      |            |              |             |
|------|------------|--------------|-------------|
|      | X          | Y            | Z           |
| zefr | 830643.350 | -5568654.047 | 2986734.391 |
| flwe | 830643.352 | -5568654.026 | 2986734.388 |
| wach | 830643.352 | -5568653.985 | 2986734.377 |

Residuals of position determined by individual baselines from the final position

|      |        |        |        |        |        |        |
|------|--------|--------|--------|--------|--------|--------|
|      | X      | Y      | Z      | East   | North  | Up     |
| zefr | -0.001 | -0.027 | 0.006  | -0.005 | -0.007 | 0.027  |
| flwe | 0.001  | -0.007 | 0.003  | -0.000 | -0.001 | 0.007  |
| wach | 0.000  | 0.034  | -0.009 | 0.005  | 0.008  | -0.034 |

Covariance Matrix for the xyz OPUS Position (meters^2).

|               |               |               |
|---------------|---------------|---------------|
| 0.0000008911  | -0.0000001618 | 0.0000000784  |
| -0.0000001618 | 0.0000106533  | -0.0000005538 |
| 0.0000000784  | -0.0000005538 | 0.0000033111  |

Covariance Matrix for the enu OPUS Position (meters^2).

|               |               |               |
|---------------|---------------|---------------|
| 0.0000010564  | 0.0000005913  | -0.0000011236 |
| 0.0000005913  | 0.0000044241  | -0.0000026575 |
| -0.0000011236 | -0.0000026575 | 0.0000093751  |

Horizontal network accuracy = 0.00430 meters.

Vertical network accuracy = 0.00600 meters.

#### Derivation of NAD 83 vector components

Position of reference station ARP in NAD\_83(2011)(EPOCH:2010.0000).

|      |              |                |                       |
|------|--------------|----------------|-----------------------|
|      | Xa(m)        | Ya(m)          | Za(m)                 |
| ZEFR | 766681.32093 | -5571329.99195 | 2998751.20655 2010.00 |
| FLWE | 869052.16380 | -5544933.23814 | 3019536.73114 2010.00 |
| WACH | 799336.16446 | -5604082.84993 | 2928868.77127 2010.00 |

Position of reference station monument in NAD\_83(2011)(EPOCH:2010.0000).

|      |              |                |                       |
|------|--------------|----------------|-----------------------|
|      | Xr(m)        | Yr(m)          | Zr(m)                 |
| ZEFR | 766681.32093 | -5571329.99195 | 2998751.20655 2010.00 |
| FLWE | 869052.16380 | -5544933.23814 | 3019536.73114 2010.00 |
| WACH | 799336.16446 | -5604082.84993 | 2928868.77127 2010.00 |

Velocity of reference station monument in NAD\_83(2011)(EPOCH:2010.0000).

|           |           |           |
|-----------|-----------|-----------|
| Vx (m/yr) | Vy (m/yr) | Vz (m/yr) |
|-----------|-----------|-----------|



|      |          |          |         |
|------|----------|----------|---------|
| ZEFR | -0.01230 | 0.00050  | 0.00100 |
| FLWE | -0.01200 | -0.00070 | 0.00210 |
| WACH | -0.01170 | 0.00170  | 0.00040 |

Vectors from unknown station monument to reference station monument  
in NAD\_83(2011)(EPOCH:2010.0000).

Xr-X= DX(m) Yr-Y= DY(m) Zr-Z= DZ(m)

|      |              |              |              |         |
|------|--------------|--------------|--------------|---------|
| ZEFR | -63962.84507 | -2674.40995  | 12016.65855  | 2010.00 |
| FLWE | 38407.99780  | 23722.34386  | 32802.18314  | 2010.00 |
| WACH | -31308.00154 | -35427.26793 | -57865.77673 | 2010.00 |

STATE PLANE COORDINATES - U.S. Survey Foot

SPC (0901 FL E)

|                       |             |
|-----------------------|-------------|
| Northing (Y) [feet]   | 1371087.428 |
| Easting (X) [feet]    | 489794.932  |
| Convergence [degrees] | -0.24311944 |
| Point Scale           | 0.99997290  |
| Combined Factor       | 0.99997331  |

\*\*\*\*\* New Reference Frame Preview \*\*\*\*\*

We are replacing the nation's NAD 83 and NAVD 88 datums, to improve access and accuracy of the National Spatial Reference System. More at <https://geodesy.noaa.gov/datums/newdatums/>

Below are approximate coordinates for this solution in the new frames:

APPROX ORTHO HGT: 24.700 (m) [PROTOTYPE (Computed using xGeoid17B,GRS80,IGS08)]

This position and the above vector components were computed without any knowledge by the National Geodetic Survey regarding the equipment or field operating procedures used.



33/928

SWIFWIND

18678

LAKE MARION CREEK (E)

RB

2534

LAKE MARION Pos-18 (BRASS DISC)

START TIME 9:05 AM

STOP TIME 6:38 PM

H1 = 6.55

RB

6916

LAKE MARION Pos-19 BRASS DISC

START TIME 9:28 AM

STOP TIME 6:42 PM

H2 = 6.55

6-28-18

THURSDAY

84°

CLEAR

34/1928

BICKEL  
CHAVIS  
PRICE



69/928

SWFWMD

18678

LAKE MARION CREEK

RIO BASE

5006

RIO ROVER

7093

RK FILE-18678-070618

BASE @ 100 (Pos-18)

H1=6.55

FIXED ROD: 6.90

200 CHECK 101 (Pos-19) BRASS DISC

201 CK 204 (Pos-16)

202 CK (Pos-17)

203 LMZ 3.1

204 LMZ 3.2

205 LMZ 3.3

206 CK 205

207 CK 204

208 CK 203

209 CK 203

210 CK 204

211 CK 205

212 LMZ 1.1

213 LMZ 1.2

214 LMZ 1.3

215 CK 214

7-6-18

FRIDAY

70/928

BUCKEL

CHAVIS

REESE

216 CK 213

217 CK 212

218 CK 217

219 CK 216

220 CK 215

221

↓ > TOPO @ Pos-19

228

229 LMZ 2.1

230 LMZ 2.2

231 LMZ 2.3

232 CK 231

233 CK 230

234 CK 229

235 CK 229

236 CK 230

237 CK 231

238 SHEEP

239 CK 238

240 CK 239

241 CK 240

242 GRND SHOT



7/1/928

SWFWMD

18678

LAKE MARION CREEK

Pos-19

+

HI

-

EL

7.58

88.679

3.57

85.109

7.45

88.589

7.54

81.139

7.49

81.099

NOTE MEASURE DOWN FROM TOP OF  
CASING TO WATER TABLE = 10.23  
WATER ELEV = 74.879

7-1-18

FRIDAY

77°

Cloudy

7/1/928

BICKEL  
CHAIRIS  
REESE

BMEEL

DESC

BRASS DISC @ NW CORNER OF  
CONC PAD (Pos-19)

N. Rim of 4 3/4" METAL CASING  
Pos-19

N. Side of (Pos-19) CONC. PAD

BRASS DISC (Pos-19)



7/3/928

SWFWMD  
18678  
LAKE MARION CREEK

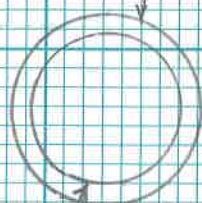
Pos-19



BRASS DISC



8" PVC



4 3/16" METAL CASING

4 3/16" METAL CASING

7-6-18  
FRIDAY

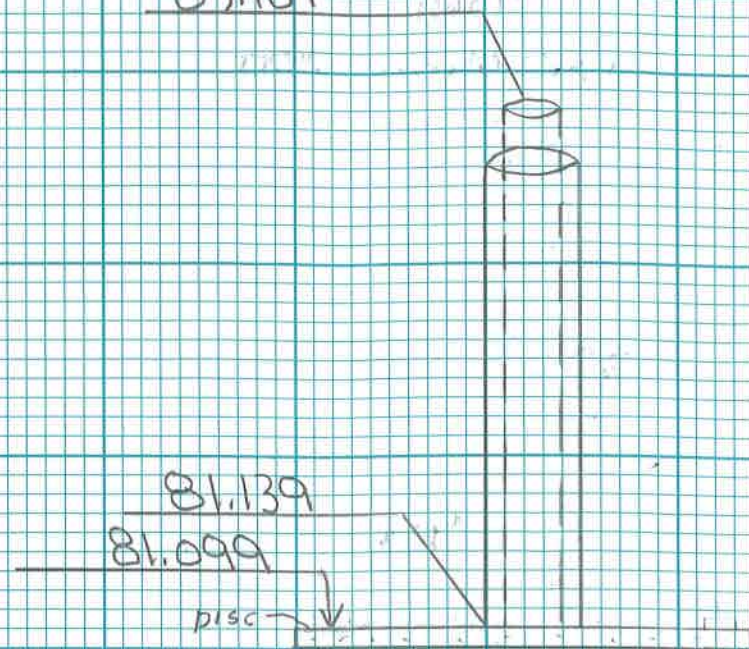
85.109

7/4/928  
BICKEL  
CHAVIS  
REESE

81.139

81.099

disc





75/928

SWFWMD  
18678  
LAKE MARLOW CREEK

+

HI

-

EL

2.49

84.987

TBM1  
GPS 250

4.29

84.307

4.97

80.017

0.20

81.957

2.55

81.757

TBM2  
GPS 244

0.37

73.747

8.58

73.377

TBM3  
GPS 247

10.43

74.197

9.98

63.767

10.49

83.857

0.83

73.367

7-6-18  
FRIDAY

76/928

BUCKEL  
CHAVIS  
REESE

BMEL

DESC

82.497

BRASS DISC @ S.E. CORNER of  
CONC PAD (Pos-18)

5/8" SRC "REF LB 364"

TURTLE

5/8" SRC "REF LB 364" TBM2

5/8" SRC "REF LB 364" TBM3

TURTLE



77/928

SWFWMD

18678

LAKE MARION CREEK

TSC3 2944

SS

Access File: 18678-070618C

to 247A BS 244A

HI=5.44

BS HI=5.10

ROD=5.00

Bsck=300

301 Ho

302 Bolt 1

303 Bolt 2

304 TOP OF BOARD

305 Bsck

306 CK 302

307 CK 303

306 CK 302

307 CK 303

308 CK 304

309 CK 304

310 Bsck

311 CK 302

312 CK 303

313 CK 304

314 Bsck

7-6-18

FRIDAY

78/928

BICKEL  
CHAVIS  
REESE



79/928

SWFWMD

186.78

LAKE MARION CREEK

ITC FILE: 186.78-070618

243 Bolt 1

244 SET 5/8" SRC "REF LB 364"

245 CK 244

246 CK 244

247 SET 5/8" SRC "REF LB 364"

248 CK 247

249 CK 247

250 SET 5/8" SRC "REF LB 364"

251 CK 250

252 CK 250

253 LMZ SH2

254 CK 253

255 CK 253

256 CMZ SH2

257 CK 256

258 CK 256

259 CK Pos-19

80/928

BICKEL  
CHAVIS  
REESE



81/928

SWEWIND

18678

LAKE MARION CREEK

CONT FROM Pg 75/928

| +    | Hi     | -    | EL     |
|------|--------|------|--------|
| 3.70 | 85.487 | 2.07 | 81.787 |

|      |        |
|------|--------|
| 3.00 | 82.487 |
|------|--------|

7-6-18  
FRIDAY

82/928

BICKEL  
CHAVIS  
REESE

BMEL DESC

TURTLE

82.497 BRASS DISC @ (Pos-18)



85/928

SWEWIND  
18678  
LAKE MARION CREEK

55

TSC3

2944

Access File: 18678-070918 Con

1@ 250 Bsl 100 (Pos-18)

H1: 5.00

Bsl H1: 7.00

R00: 0.45: 6.50

BscK: 315

316 LM1.1

317 LM1.2

318 LM1.3

319 GRND

320 Bolr 1

321 Bolr 2

322 Top of Board

323 BscK

324 CK 322

325 CK 321

326 CK 320

327 CK 318

328 CK 317

329 CK 316

STAFF GAUGE LM1 SG

7.9.18

Monday

86/928

Bridel  
Freed

330 BscK

331 CK 316

332 CK 317

333 CK 318

334 CK 320

335 CK 321

336 CK 322

337 BscK

338 BscK

339 LM 2.1

340 LM 2.2

341 LM 2.3

342 BscK

343 CK 341

344 CK 340

345 CK 339

346 BscK

347 CK 339

348 CK 340

349 CK 341

350 BscK

351 BscK

352 LM 3.1

353 LM 3.2

354 LM 3.3

355 BscK

356 CK 354

357 CK 353

358 CK 352

359 BscK

360 BscK

361 CK 353

362 CK 354

363 BscK

364 LM 1 SH1

365 BscK

366 CK 364

367 BscK

368 CK 364

369 BscK



87/928

SLFWMD

18678

LAKE MARION CREEK

ACCESS FILE: 18678-070918lon

to 250 Bslon (Pos-18)

HI=5.17

BsHI=7.00

Rod=0.45; 6.50

Bsck=370; 383

371

↓ Location at Pos-18

380

381 NORTH RIM OF 4 3/16" METAL

CASING (NORTH EDGE)

382 CK 381

NOTE: MEASURE DOWN FROM TOP OF METAL  
CASING TO WATER TABLE = 8.30  
WATER ELEV = 77.795

7-9-18

MONDAY

88/

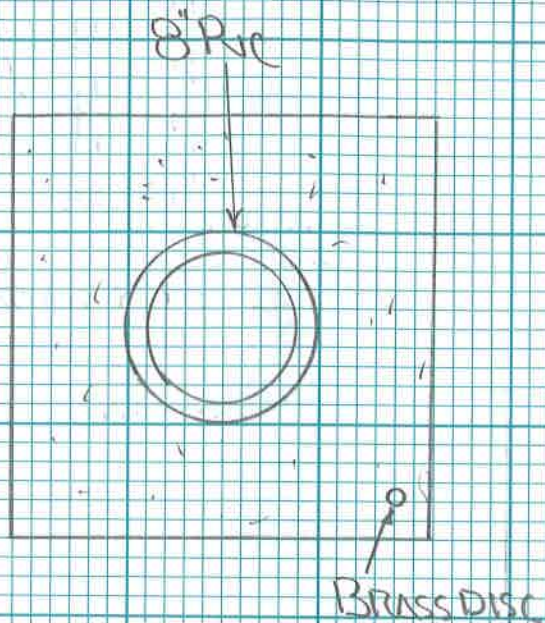
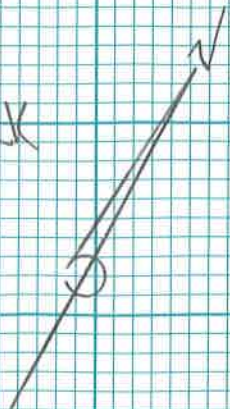
928

BUCKET  
FREED



89/928

SWFWMD  
18678  
LAKE MARION CREEK  
Pos-18

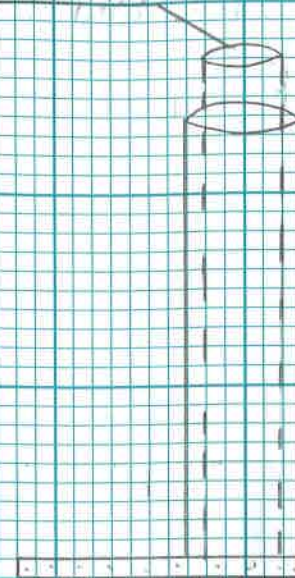


7-9-18  
MONDAY

90/928

BUCKEL  
FREED

86.095



82.580

82.497

FACING North North West

Pos-18



123/422

SWFWMD  
18678  
LAKE MARION  
POS-19

| +     | HI     | - | ELEV. |
|-------|--------|---|-------|
| 5.    |        |   |       |
| 5.582 | 86.681 |   |       |

NOTES

10:22AM 7/26/18  
MEASURE DOWN FROM  
TOP OF CASING TO  
WATER TABLE: 8.50  
WATER ELEV: 76.821

1.560 85.121

5.600 81.081

5.632 81.149

5.468 81.273

5.461 81.22

7-26-18  
THURSDAY80°F  
SUNNY

124/922

O'DION  
BICKEEBMEL  
81.079

DESC.

BRASS DISC @ NW CORNER OF  
CONC PAD (POS-19)N. RTM OF 4<sup>3</sup>/<sub>8</sub>" META CASING  
POS-19

NE. CORNER OF CONC. PAD

SE. CORNER OF CONC. PAD

SW. CORNER OF CONC. PAD

NW CORNER OF CONC. PAD



125/938

SWFWMD  
18678  
LAKEHARTON  
POS-19

+

HI

86.681

-

5.760

ELEV.

80.921

5.810

80.871

5.515

81.166

5.545

81.136

-

1.630

86.574

1.737

84.944

5.470

81.104

7-26-18  
THURSDAY80°F  
SUNNY

126/920

DZDTON  
BICKEL

DIFF.

BMEL

81.099

DESL.

NE. GROUND

SE GND

SW. GND

NW. GND

N. <sup>RTM</sup> OF PVC PIPE

+ .005

81.099

BRASS DISC @ NW CORNER OF  
CONC PAD (POS-19)



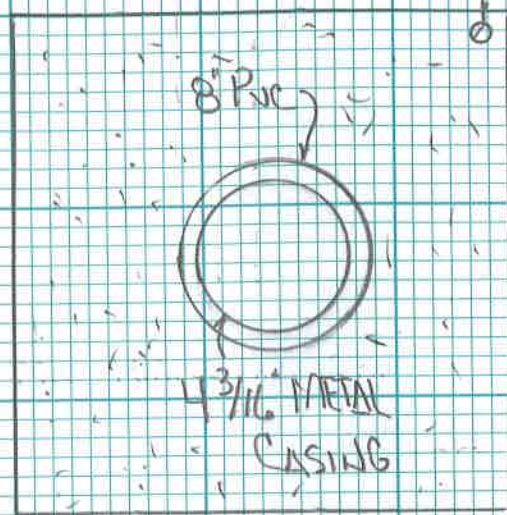
127/928

SWT WIND  
18678  
LAKE MARION CREEK  
Pos-19



NOTE  
NO BLUE  
TAG ON THIS  
SITE

BRASS DISC  
STAMPED "Pos-19"

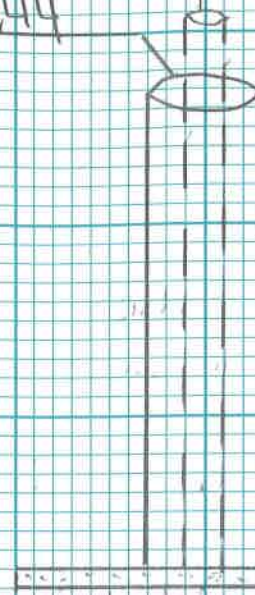


7-26-18  
THURSDAY

128/928  
BUCKEL  
DIDION

85.121

84.944



81.099  
BRASS DISC

PICTURES

8560 BRASS DISC STAMPED "Pos-19"

8561 "

8562 MEASURE OF METAL CASING

8563 METAL CASING

8564 FACING EAST @ Pos-19

8565 FACING NORTH @ Pos-19



129/928

SWEWIND  
18678  
LAKE MARION CREEK

NRS FILE 18678-072618NRS

Note

JOB WAS MADE  
IN FLA EAST

FLW 7693

TSC3 2944

260 BRASS DISC STAMPED "Pos-19"

261 WELL Pos-19 Location ONLY

262 CK 260

263 CK 261

264 CK 260

265 CK 261

266

↓ Location of Cone Pad @ Pos-19

269

270 BRASS DISC STAMPED "Pos-18"

271 WELL Pos-19 Location ONLY

272

↓ Location of Cone Pad @ Pos-18

275

276 CK 270

277 CK 271

278 CK 270

279 CK 271

7-26-18  
THURSDAY

130/928

BRICKEL  
DIDION

280 BRASS

281 WELL Pos-17

282

↓ Location of Cone Pad @ Pos-17

285

286 BRASS DISC "Pos-17"

287 CK 281

288 CK 286

289 CK 286

290 BRASS DISC "Pos-16"

291 WELL Pos-16

292 CK 290 (Foot)

293 CK 290 (Foot)

294

↓ Location of Cone Pad @ Pos-16

297



131/923

SWEFWD  
18678  
LAKE MARION  
POS-18

| +     | HI     | ELEV. |
|-------|--------|-------|
| 3.910 | 86.407 |       |

11:57am 7/26/18

NOTES

MEASURE DOWN FROM  
TOP OF CASING TO  
WATER TABLE: 7.91  
WATER ELEV: 78.198

|       |        |
|-------|--------|
| 3.909 | 86.098 |
|-------|--------|

|       |        |
|-------|--------|
| 3.918 | 82.489 |
|-------|--------|

|       |        |
|-------|--------|
| 3.920 | 82.487 |
|-------|--------|

|       |        |
|-------|--------|
| 3.908 | 82.499 |
|-------|--------|

|       |        |
|-------|--------|
| 3.925 | 82.482 |
|-------|--------|

7-26-18  
THURSDAY

132/922

DIDION  
BICKEL

BMEL.  
82.497

DESC.  
BRASS DISC @ NW CORNER OF  
CONC PAD (POS-18)

N. RIM OF 4 3/16" METAL CASING  
POS-18

NE CORNER OF CONC PAD

SE CORNER OF CONC PAD

SW CORNER OF CONC PAD

NW CORNER OF CONC PAD



133/928

SWEWMD  
18278  
LAKE MARION  
POS-18

+

HI

-

ELEV.  
82.416

3.991

NOTE

4.034

82.373

4.013

82.394

4.012

82.395

0.436

86.301

.542  
~~1.052~~

85.865

3.805

82.496

7-26-18  
THURSDAY

134/928

DIDION  
BICKEL

DIFF

BMEL

DESC.

82.497

NE GND.

SE. GND

SW. GND

NW GND

8"  
N. RIM OF PVC PIPE

-0.001

82.497

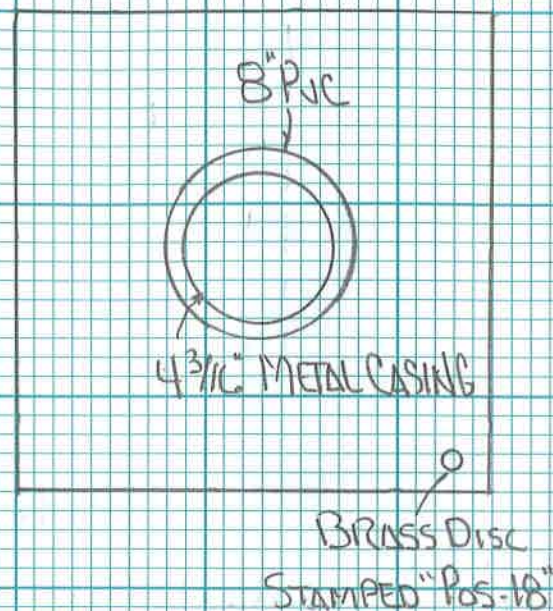
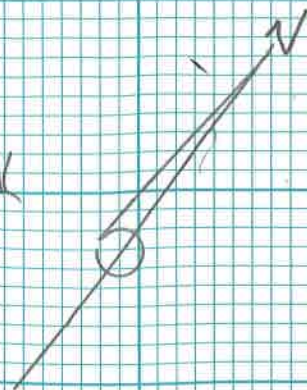
BRASS DISC @ NW CORNER OF  
CONC PAD POS-18



135/928

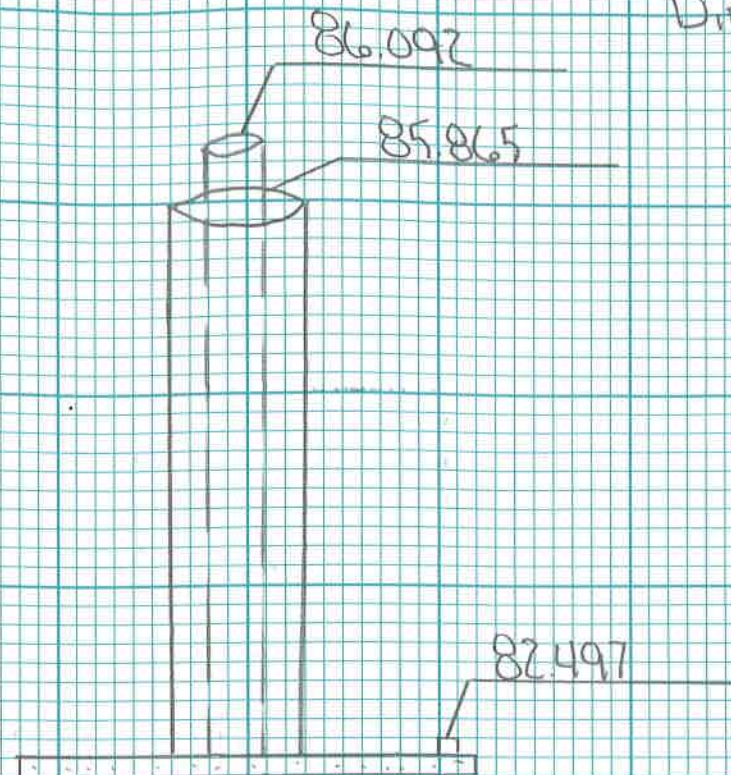
SW WIND  
18678  
LAKE MARION CREEK

Pos-18



7-26-18  
THURSDAY

136/928  
BICKEL  
DIDION



### PICTURES

8567 BRASS DISC STAMPED "Pos-18"

8568 > Pos-18 Facing NW

8569

8570 MEASURE OF METAL CASING Pos-18

8571 METAL CASING Pos-18

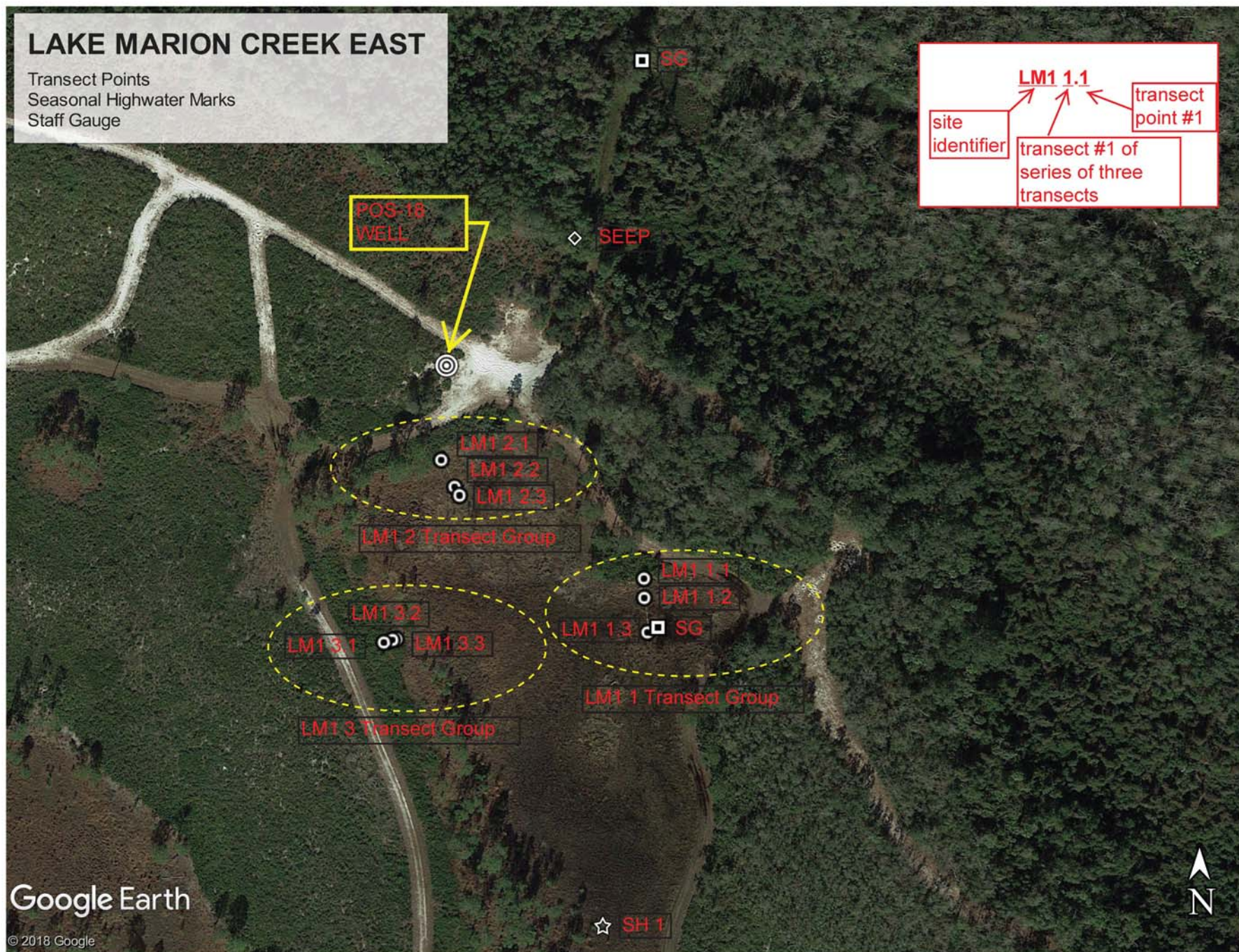
8572

8573 > 13 BLUE TAG @ Pos-18

8574 Pos-18 (NW)



# LAKE MARION CREEK EAST





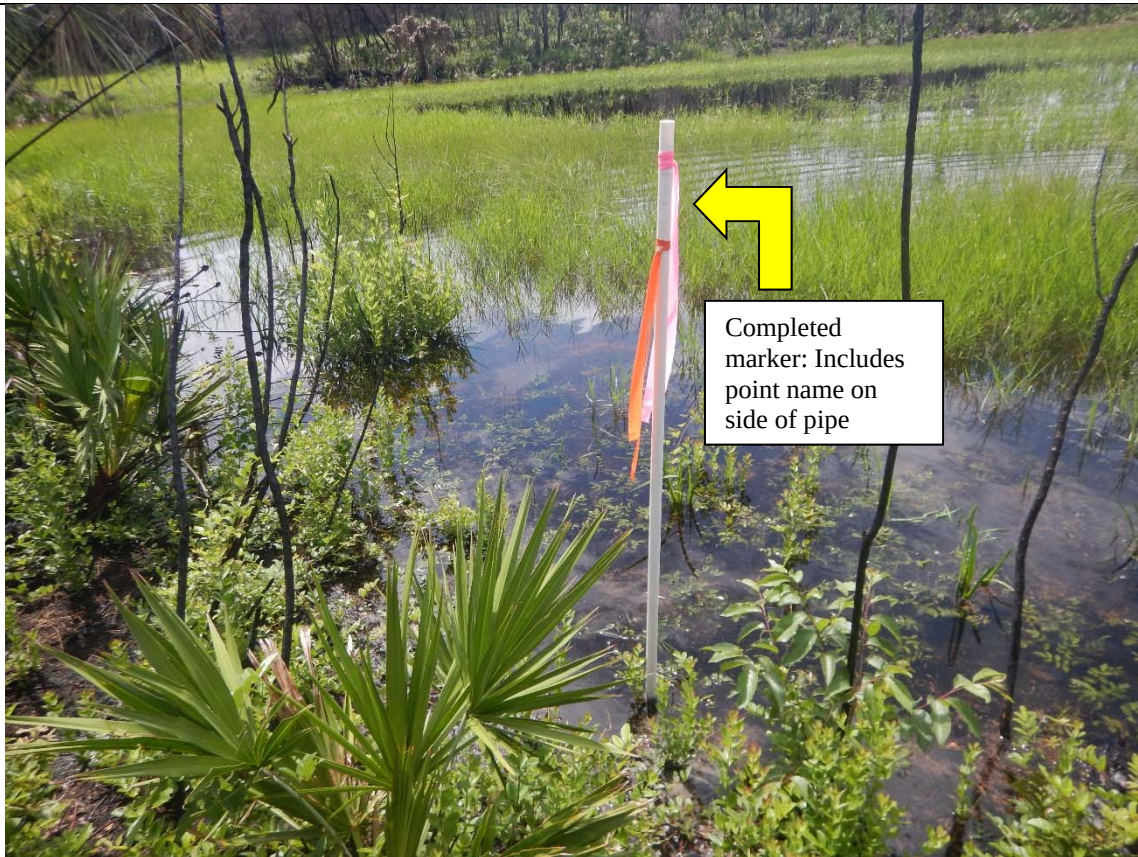
# LAKE MARION CREEK WEST





# LAKE MARION CREEK EAST

| Soil Transects – LM1 1 Transect Group |                                   |                                              |
|---------------------------------------|-----------------------------------|----------------------------------------------|
| <b>LM1 1.1</b>                        | <b>Wetland Boundary</b>           |                                              |
| LATITUDE: 28° 06' 04.24824" (N)       | LONGITUDE: 081° 30' 40.30561" (W) |                                              |
| NORTHING: 1369835.46                  | EASTING: 491361.98                |                                              |
| ELEVATION: 78.06 ft. (NAVD 88)        | 23.793 m                          | RTK GPS                                      |
| ELEVATION: 79.03 ft. (NGVD 29)        | 24.089 m                          | 0.971 ft. (conversion factor) Corpscon 6.0.1 |





# LAKE MARION CREEK EAST

| Soil Transects – LM1 1 Transect Group                                                                                                                                                                                                      |                                   |                                              |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|----------------------------------------------|
| <b>LM1 1.2</b>                                                                                                                                                                                                                             | <b>Hydric at Surface</b>          |                                              |
| LATITUDE: 28° 06' 04.02249" (N)                                                                                                                                                                                                            | LONGITUDE: 081° 30' 40.30201" (W) |                                              |
| NORTHING: 1369812.66                                                                                                                                                                                                                       | EASTING: 491362.21                |                                              |
| ELEVATION: 76.63 ft. (NAVD 88)                                                                                                                                                                                                             | 23.357 m                          | RTK GPS                                      |
| ELEVATION: 77.60 ft. (NGVD 29)                                                                                                                                                                                                             | 23.653 m                          | 0.971 ft. (conversion factor) Corpscon 6.0.1 |
| <div> <div>Rebar marking point is under water.<br/>There is no picture available.</div> <div>  <div>~4' PVC marker placed over rebar</div> </div> </div> |                                   |                                              |





# LAKE MARION CREEK EAST

| Soil Transects – LM1 1 Transect Group                                                                                                                                                                                                                                                                      |                                   |                                              |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|----------------------------------------------|
| <b>LM1 1.3</b>                                                                                                                                                                                                                                                                                             | <b>Muck at Surface</b>            |                                              |
| LATITUDE: 28° 06' 03.61175" (N)                                                                                                                                                                                                                                                                            | LONGITUDE: 081° 30' 40.25924" (W) |                                              |
| NORTHING: 1369771.16                                                                                                                                                                                                                                                                                       | EASTING: 491365.87                |                                              |
| ELEVATION: 75.78 ft. (NAVD 88)                                                                                                                                                                                                                                                                             | 23.098 m                          | RTK GPS                                      |
| ELEVATION: 76.75 ft. (NGVD 29)                                                                                                                                                                                                                                                                             | 23.394 m                          | 0.971 ft. (conversion factor) Corpscon 6.0.1 |
| <div data-bbox="292 672 725 756" data-label="Text"> <p>Rebar marking point is under water.<br/>There is no picture available.</p> </div> <div data-bbox="823 462 1455 919" data-label="Image"> <div data-bbox="1218 724 1455 808" data-label="Text"> <p>~4' PVC marker placed over rebar</p> </div> </div> |                                   |                                              |





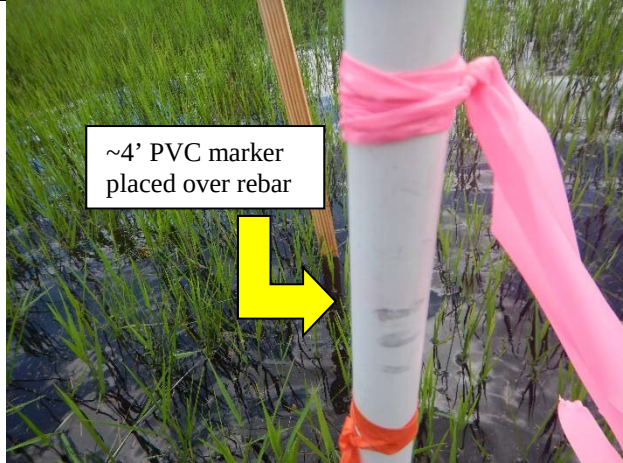
# LAKE MARION CREEK EAST

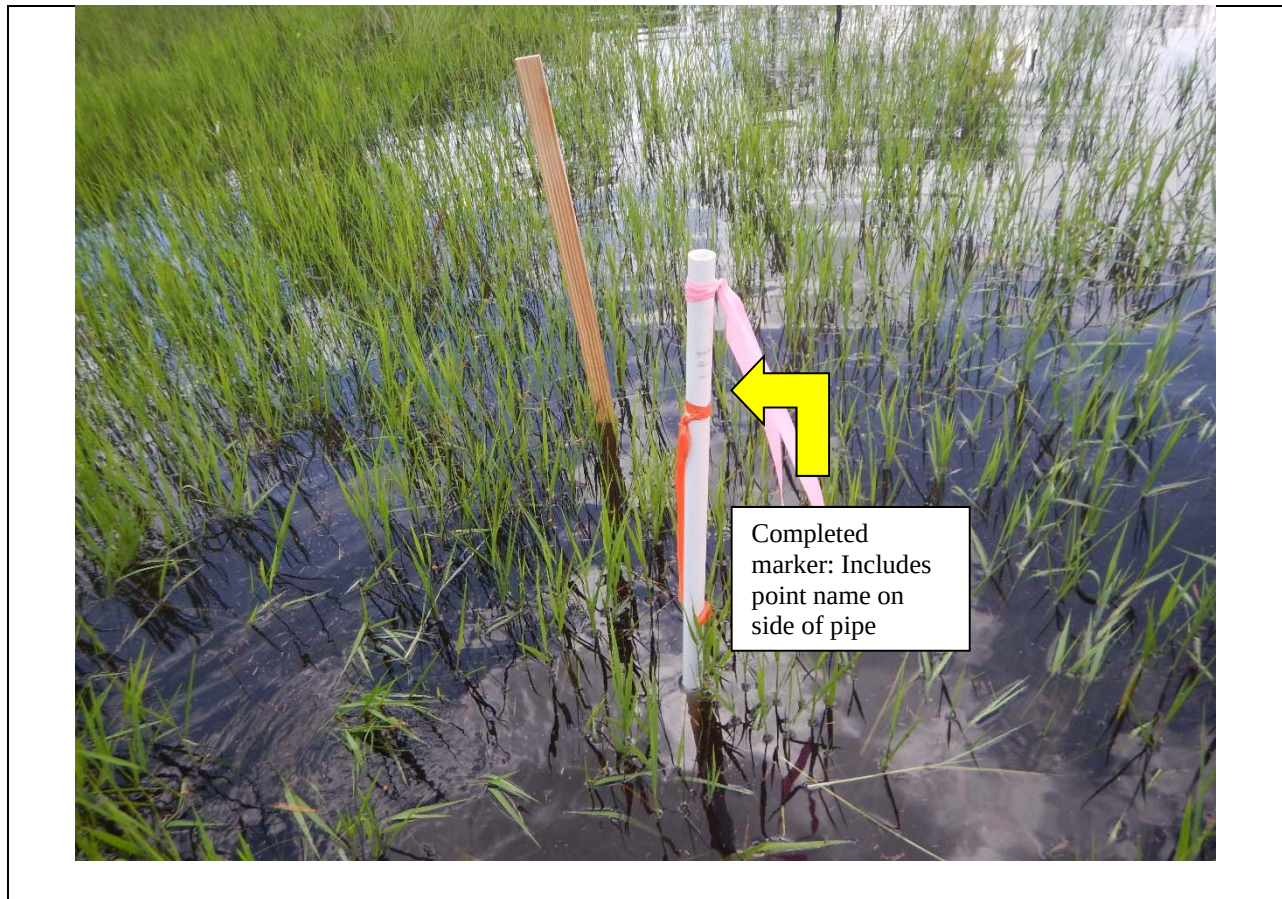
| Soil Transects – LM1 2 Transect Group |                                   |                                              |
|---------------------------------------|-----------------------------------|----------------------------------------------|
| <b>LM1 2.1</b>                        | <b>Wetland Boundary</b>           |                                              |
| LATITUDE: 28° 06' 05.65525" (N)       | LONGITUDE: 081° 30' 43.04208" (W) |                                              |
| NORTHING: 1369978.59                  | EASTING: 491117.52                |                                              |
| ELEVATION: 78.40 ft. (NAVD 88)        | 23.896 m                          | RTK GPS                                      |
| ELEVATION: 79.37 ft. (NGVD 29)        | 24.192 m                          | 0.971 ft. (conversion factor) Corpscon 6.0.1 |





# LAKE MARION CREEK EAST

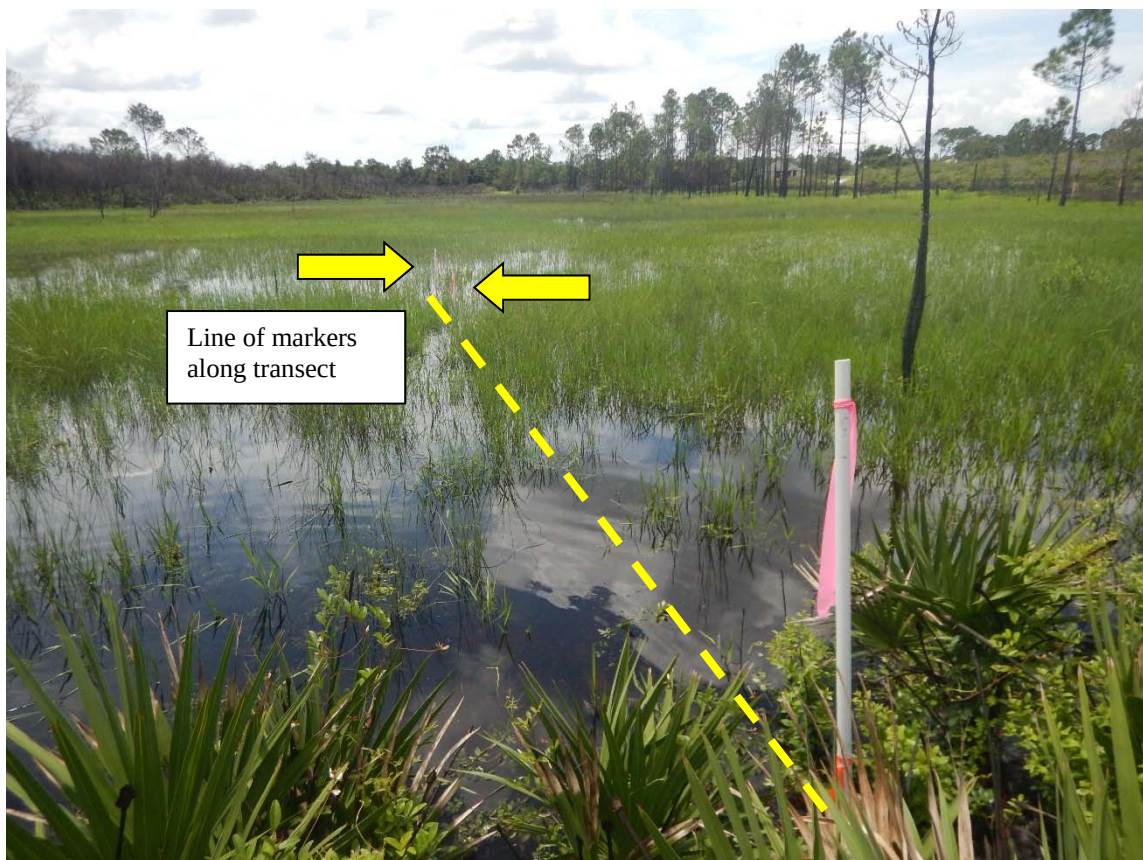
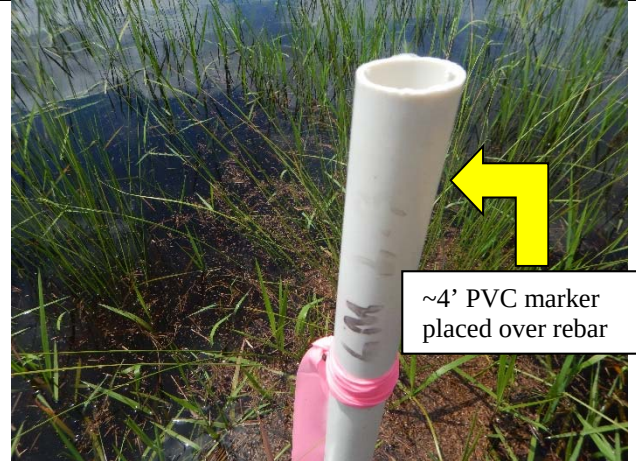
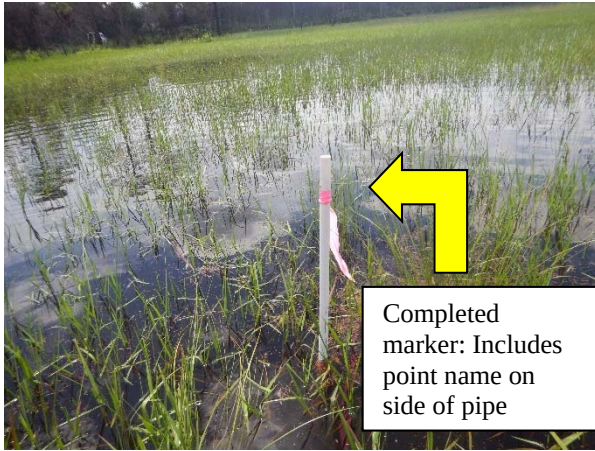
| Soil Transects – LM1 2 Transect Group                                                                                                                                         |                                   |                                              |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|----------------------------------------------|
| <b>LM1 2.2</b>                                                                                                                                                                | <b>Hydric at Surface</b>          |                                              |
| LATITUDE: 28° 06' 05.34196" (N)                                                                                                                                               | LONGITUDE: 081° 30' 42.86130" (W) |                                              |
| NORTHING: 1369946.88                                                                                                                                                          | EASTING: 491133.58                |                                              |
| ELEVATION: 76.73 ft. (NAVD 88)                                                                                                                                                | 23.387 m                          | RTK GPS                                      |
| ELEVATION: 77.70 ft. (NGVD 29)                                                                                                                                                | 23.683 m                          | 0.971 ft. (conversion factor) Corpscon 6.0.1 |
| <div> <div>Rebar marking point is under water. There is no picture available.</div>  </div> |                                   |                                              |





# LAKE MARION CREEK EAST

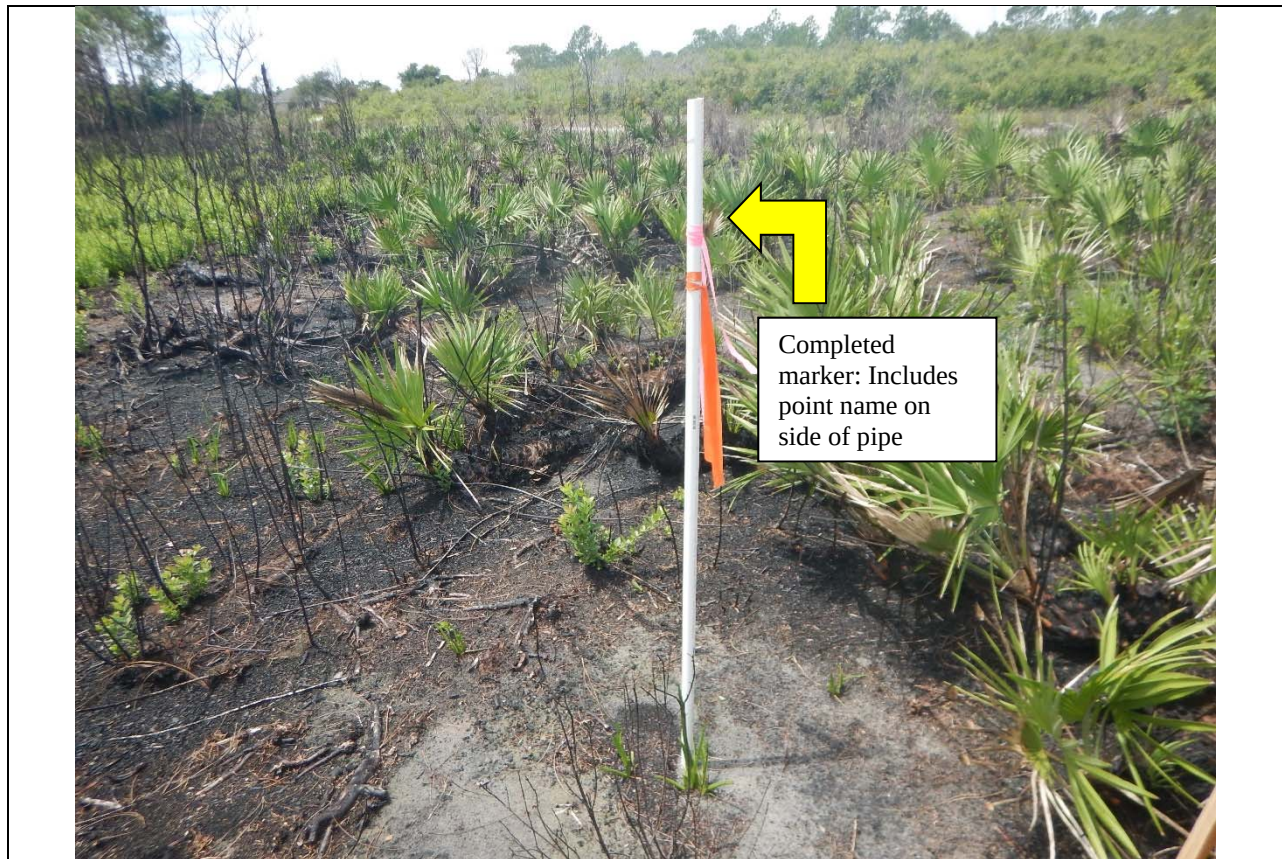
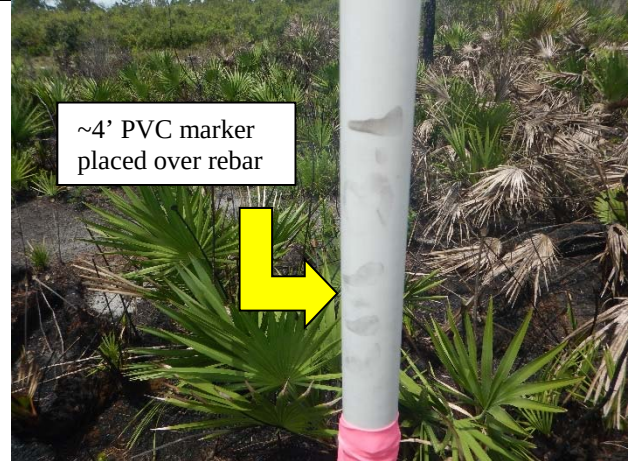
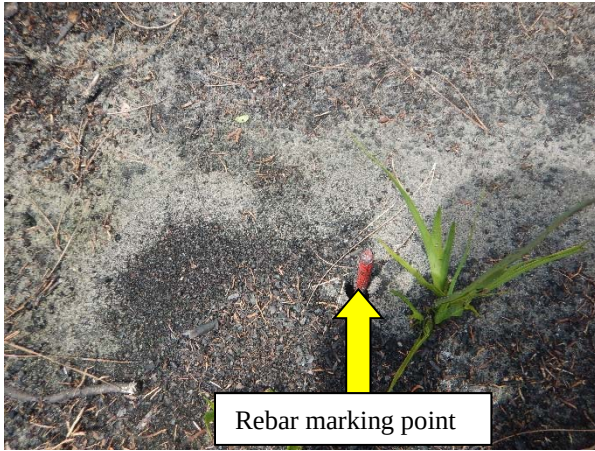
| Soil Transects – LM1 2 Transect Group |                                   |                                              |
|---------------------------------------|-----------------------------------|----------------------------------------------|
| <b>LM1 2.3</b>                        | <b>Muck at Surface</b>            |                                              |
| LATITUDE: 28° 06' 05.23601" (N)       | LONGITUDE: 081° 30' 42.79463" (W) |                                              |
| NORTHING: 1369936.15                  | EASTING: 491139.50                |                                              |
| ELEVATION: 76.52 ft. (NAVD 88)        | 23.323 m                          | RTK GPS                                      |
| ELEVATION: 77.49 ft. (NGVD 29)        | 23.619 m                          | 0.971 ft. (conversion factor) Corpscon 6.0.1 |





# LAKE MARION CREEK EAST

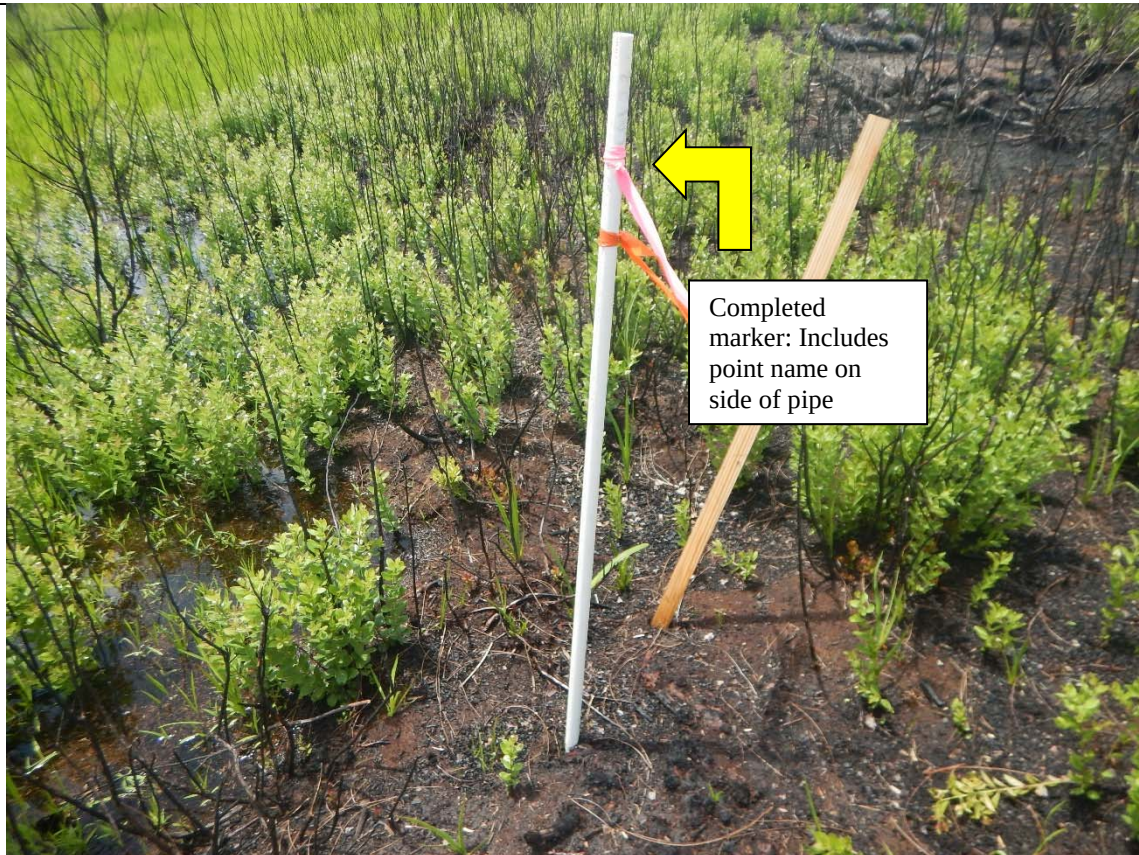
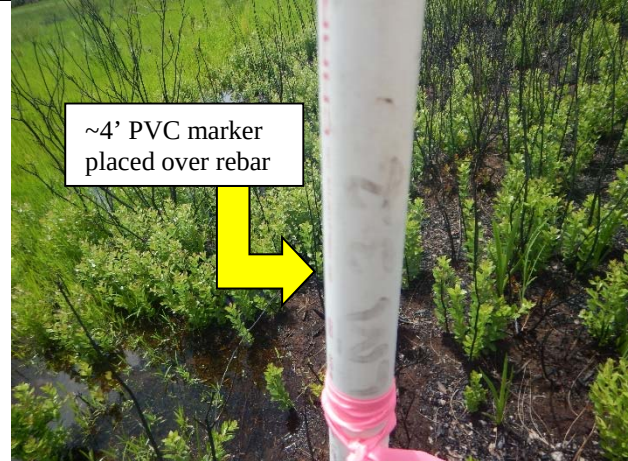
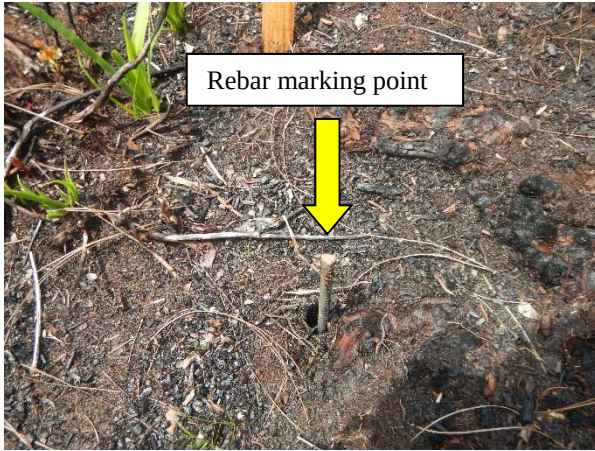
| Soil Transects – LM1 3 Transect Group |                                   |                                              |
|---------------------------------------|-----------------------------------|----------------------------------------------|
| <b>LM1 3.1</b>                        | <b>Wetland Boundary</b>           |                                              |
| LATITUDE: 28° 06' 03.49063" (N)       | LONGITUDE: 081° 30' 43.81653" (W) |                                              |
| NORTHING: 1369760.27                  | EASTING: 491047.24                |                                              |
| ELEVATION: 78.78ft. (NAVD 88)         | 24.012 m                          | RTK GPS                                      |
| ELEVATION: 79.75 ft. (NGVD 29)        | 24.308 m                          | 0.971 ft. (conversion factor) Corpscon 6.0.1 |





# LAKE MARION CREEK EAST

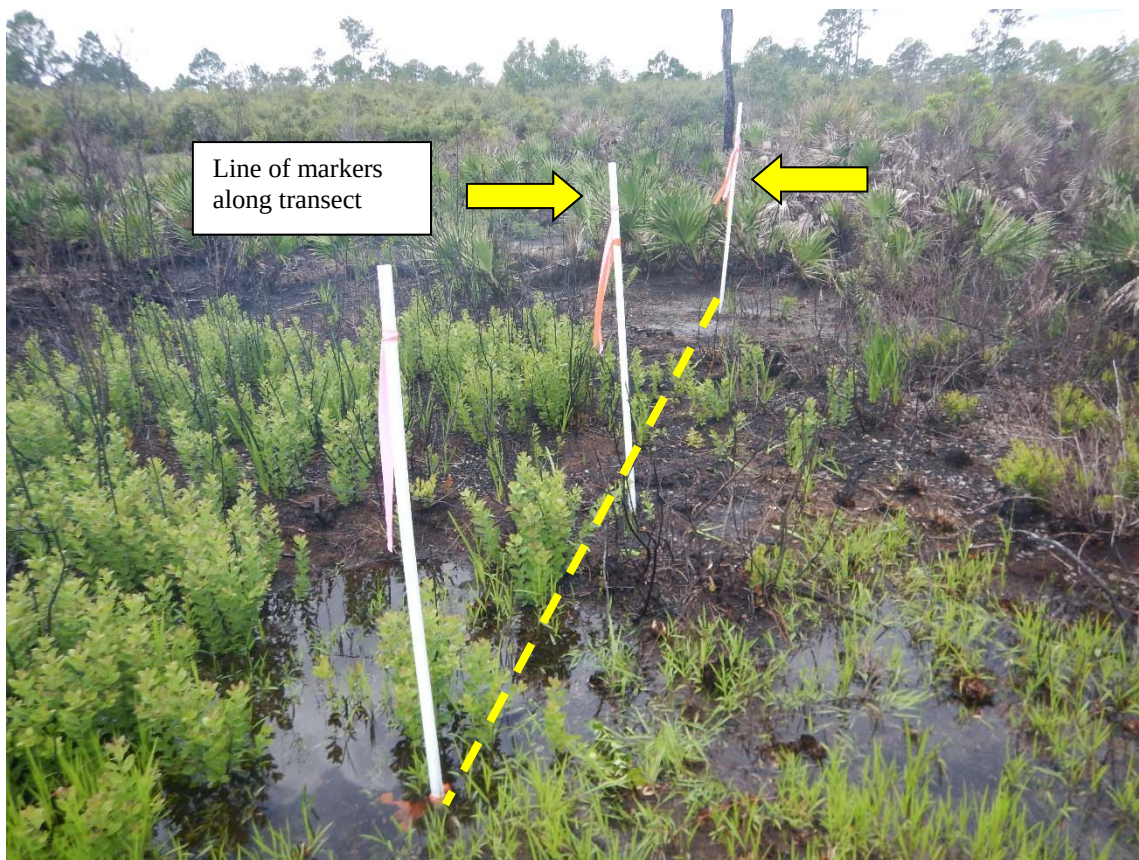
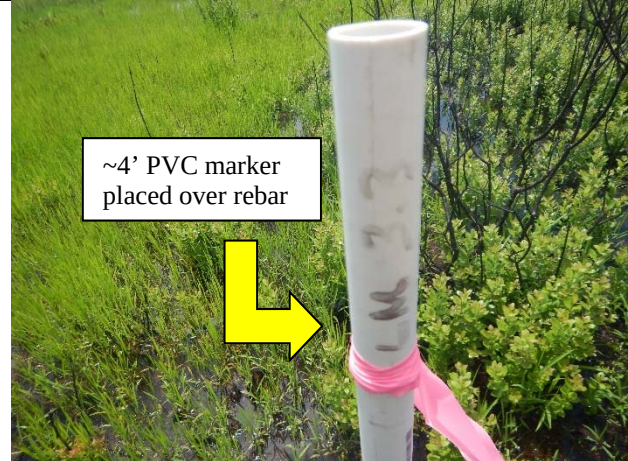
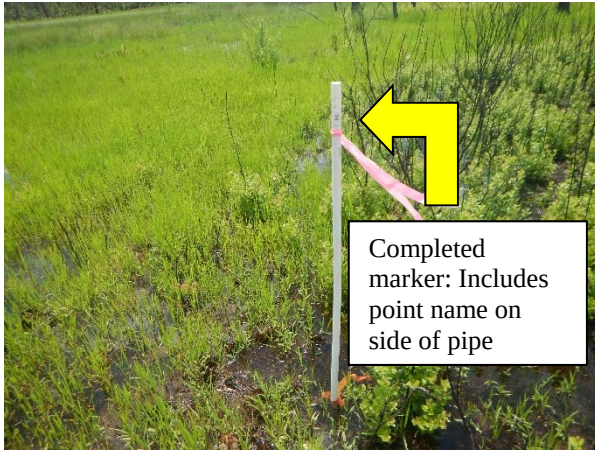
| Soil Transects – LM1 3 Transect Group |                                   |                                              |
|---------------------------------------|-----------------------------------|----------------------------------------------|
| <b>LM1 3.2</b>                        | <b>Hydric at Surface</b>          |                                              |
| LATITUDE: 28° 06' 03.51785" (N)       | LONGITUDE: 081° 30' 43.70355" (W) |                                              |
| NORTHING: 1369762.98                  | EASTING: 491057.37                |                                              |
| ELEVATION: 78.35 ft. (NAVD 88)        | 23.881 m                          | RTK GPS                                      |
| ELEVATION: 79.32 ft. (NGVD 29)        | 24.177 m                          | 0.971 ft. (conversion factor) Corpscon 6.0.1 |





# LAKE MARION CREEK EAST

| Soil Transects – LM1 3 Transect Group |                                   |                                              |
|---------------------------------------|-----------------------------------|----------------------------------------------|
| <b>LM1 3.3</b>                        | <b>Muck at Surface</b>            |                                              |
| LATITUDE: 28° 06' 03.52509" (N)       | LONGITUDE: 081° 30' 43.64926" (W) |                                              |
| NORTHING: 1369763.69                  | EASTING: 491062.24                |                                              |
| ELEVATION: 78.01 ft. (NAVD 88)        | 23.777 m                          | RTK GPS                                      |
| ELEVATION: 78.98 ft. (NGVD 29)        | 24.073 m                          | 0.971 ft. (conversion factor) Corpscon 6.0.1 |





# LAKE MARION CREEK EAST

| SEEP                                                                                 |                                           |                                              |
|--------------------------------------------------------------------------------------|-------------------------------------------|----------------------------------------------|
| LM1 SP                                                                               | Seep/Sand boils located in shallow ravine |                                              |
| CENTER OF SEEP                                                                       |                                           |                                              |
| LATITUDE: 28° 06' 08.28830" (N)                                                      | LONGITUDE: 081° 30' 41.25227" (W)         |                                              |
| NORTHING: 1370243.83                                                                 | EASTING: 491278.92                        |                                              |
| ELEVATION: 72.00 ft. (NAVD 88)                                                       | 21.946 m                                  | RTK GPS                                      |
| ELEVATION: 72.97 ft. (NGVD 29)                                                       | 22.242 m                                  | 0.971 ft. (conversion factor) Corpscon 6.0.1 |
|   |                                           |                                              |
|  |                                           |                                              |



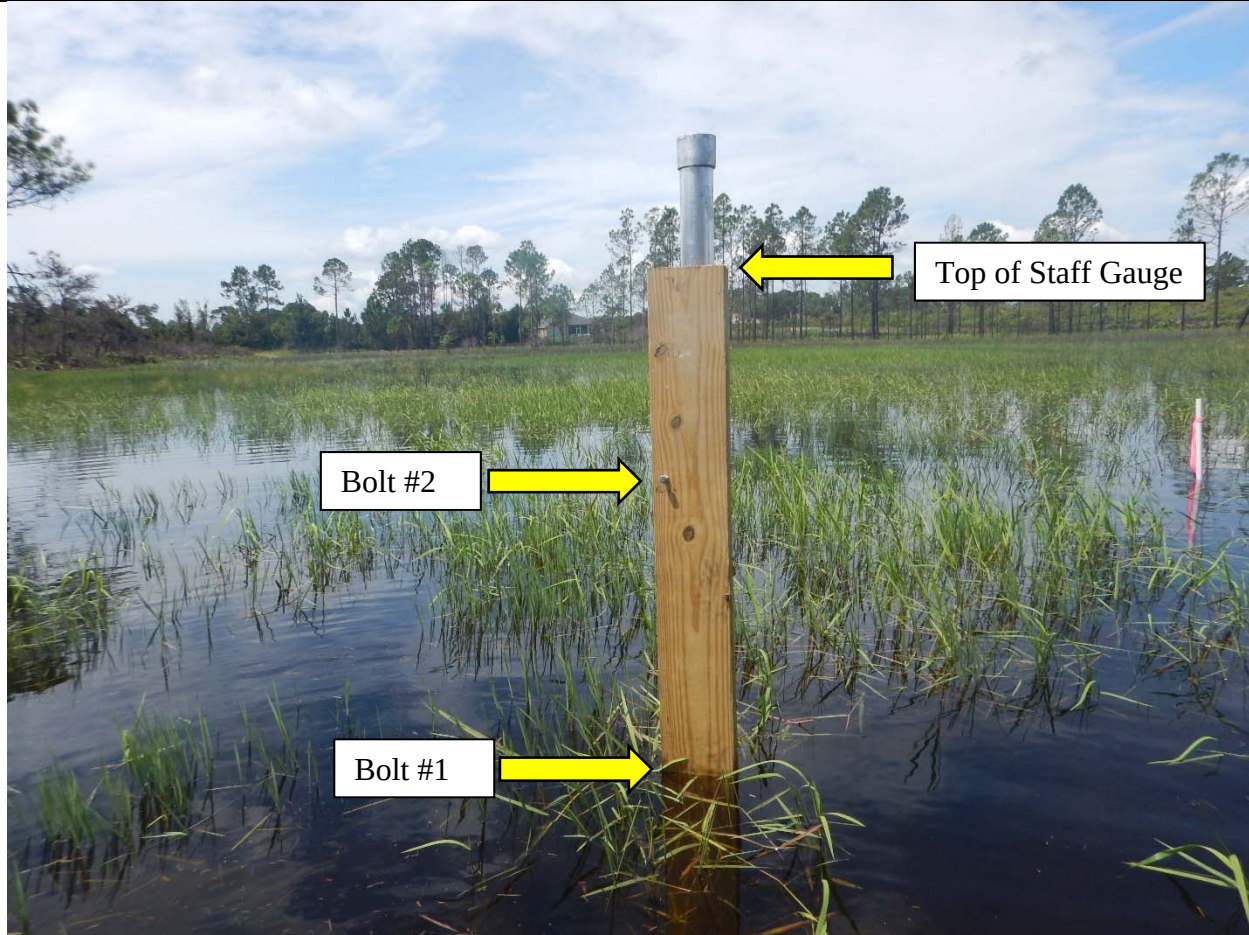
# LAKE MARION CREEK EAST

| Seasonal High-Water Marks                                                                                                                               |                                   |                                              |
|---------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|----------------------------------------------|
| LM1 SH 1                                                                                                                                                | Seasonal HW Elevation             |                                              |
| LATITUDE: 28° 06' 00.10365" (N)                                                                                                                         | LONGITUDE: 081° 30' 40.87355" (W) |                                              |
| NORTHING: 1369417.10                                                                                                                                    | EASTING: 491309.36                |                                              |
| ELEVATION: 78.13 ft. (NAVD 88)                                                                                                                          | 23.814 m                          | RTK GPS                                      |
| ELEVATION: 79.10 ft. (NGVD 29)                                                                                                                          | 24.110 m                          | 0.971 ft. (conversion factor) Corpscon 6.0.1 |
|  <p>Trees Marked with flagging</p>                                   |                                   |                                              |
|  <p>Seasonal High Water elevation marked with nail and flagging</p> |                                   |                                              |



# SNELL CREEK EAST

| Staff Gauge                     |                                |                                               |                                              |
|---------------------------------|--------------------------------|-----------------------------------------------|----------------------------------------------|
| LM1 SG                          |                                | Located towards wetland interior from LM1 1.3 |                                              |
| TOP OF BOARD                    |                                |                                               |                                              |
| LATITUDE: 28° 06' 03.66706" (N) |                                | LONGITUDE: 081° 30' 40.11629" (W)             |                                              |
| NORTHING: 1369776.69            |                                | EASTING: 491378.69                            |                                              |
| ELEVATION: 81.27 ft. (NAVD 88)  |                                | 24.771m                                       | RTK GPS                                      |
| ELEVATION: 82.24 ft. (NGVD 29)  |                                | 25.067 m                                      | 0.971 ft. (conversion factor) Corpscon 6.0.1 |
|                                 |                                |                                               |                                              |
| BOLT #1                         | ELEVATION: 77.45 ft. (NAVD 88) | 23.607 m                                      | RTK GPS                                      |
|                                 | ELEVATION: 78.42 ft. (NGVD 29) | 23.903 m                                      |                                              |
| BOLT #2                         | ELEVATION: 80.12 ft. (NAVD 88) | 24.421 m                                      | RTK GPS                                      |
|                                 | ELEVATION: 81.09 ft. (NGVD 29) | 24.717 m                                      |                                              |
|                                 |                                |                                               |                                              |



Top of Staff Gauge

Bolt #2

Bolt #1

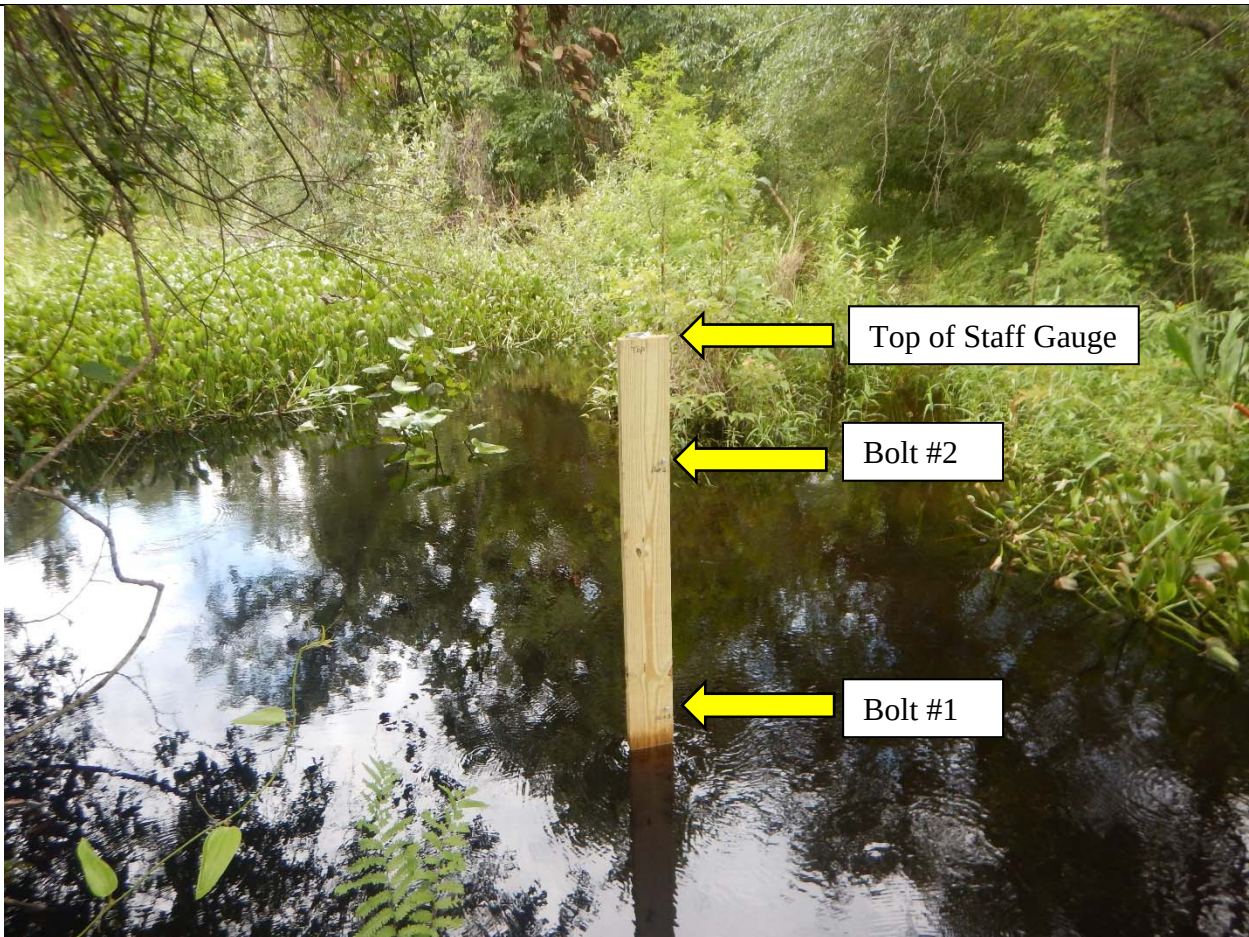
## SNELL CREEK EAST





# SNELL CREEK EAST

| Staff Gauge                     |                                |                                             |                                              |
|---------------------------------|--------------------------------|---------------------------------------------|----------------------------------------------|
| LM1 SG                          |                                | Located in Lake Marion Creek (actual creek) |                                              |
| TOP OF BOARD                    |                                |                                             |                                              |
| LATITUDE: 28° 06' 10.42121" (N) |                                | LONGITUDE: 081° 30' 40.33079" (W)           |                                              |
| NORTHING: 1370458.89            |                                | EASTING: 491362.35                          |                                              |
| ELEVATION: 67.21 ft. (NAVD 88)  |                                | 20.486m                                     | RTK GPS                                      |
| ELEVATION: 68.18 ft. (NGVD 29)  |                                | 20.782 m                                    | 0.971 ft. (conversion factor) Corpscon 6.0.1 |
|                                 |                                |                                             |                                              |
| BOLT #1                         | ELEVATION: 63.46 ft. (NAVD 88) | 19.343 m                                    | RTK GPS                                      |
|                                 | ELEVATION: 64.43 ft. (NGVD 29) | 19.639 m                                    |                                              |
| BOLT #2                         | ELEVATION: 66.12 ft. (NAVD 88) | 20.153 m                                    | RTK GPS                                      |
|                                 | ELEVATION: 67.09 ft. (NGVD 29) | 20.449 m                                    |                                              |



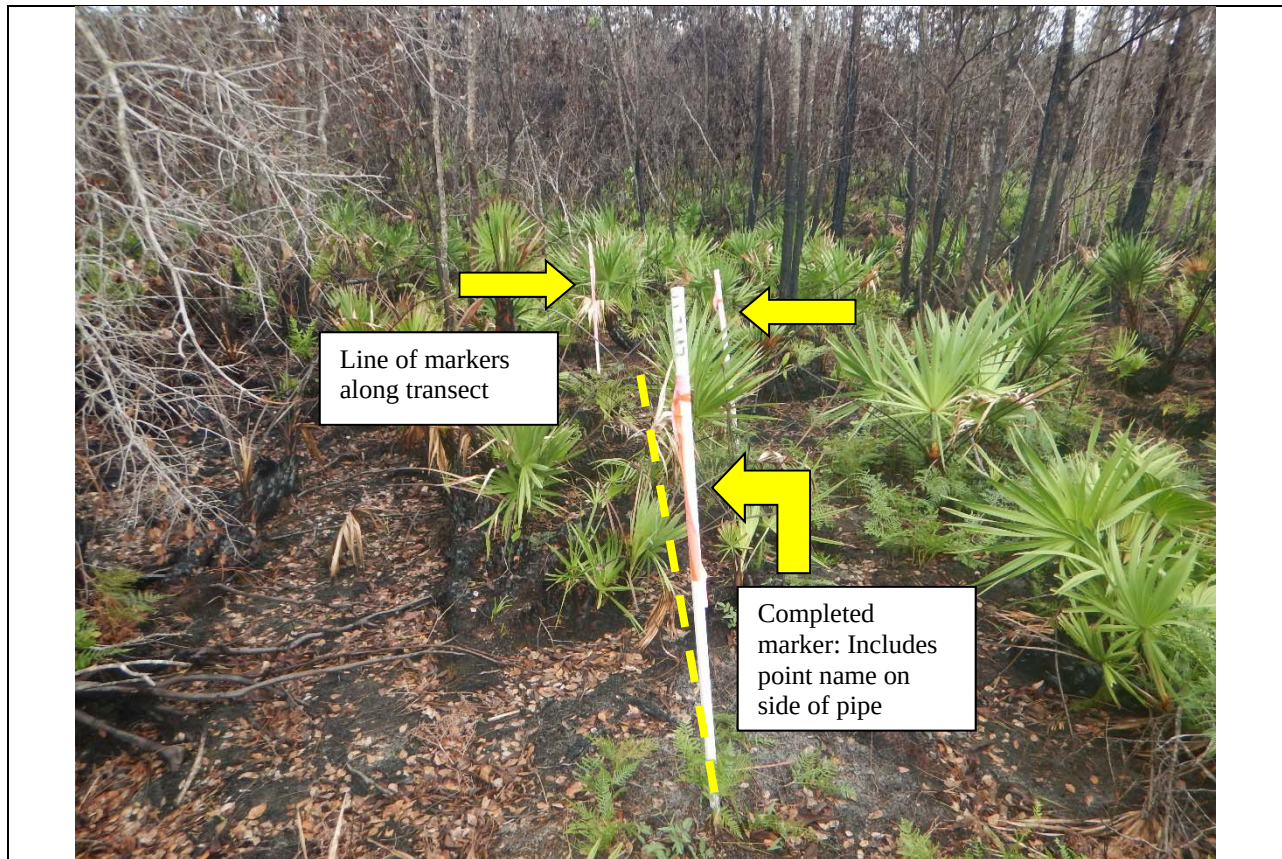
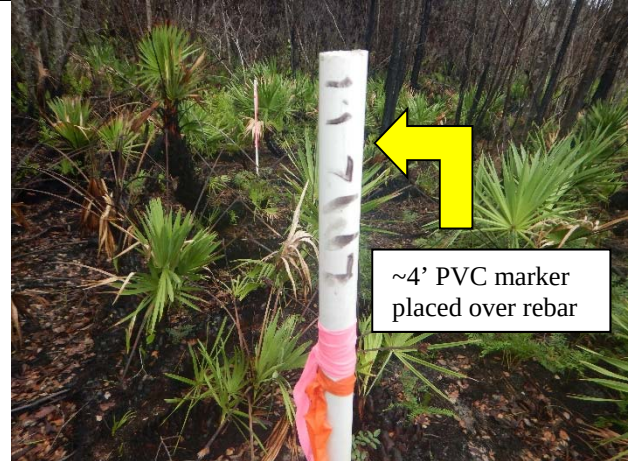
## SNELL CREEK EAST





# LAKE MARION CREEK WEST

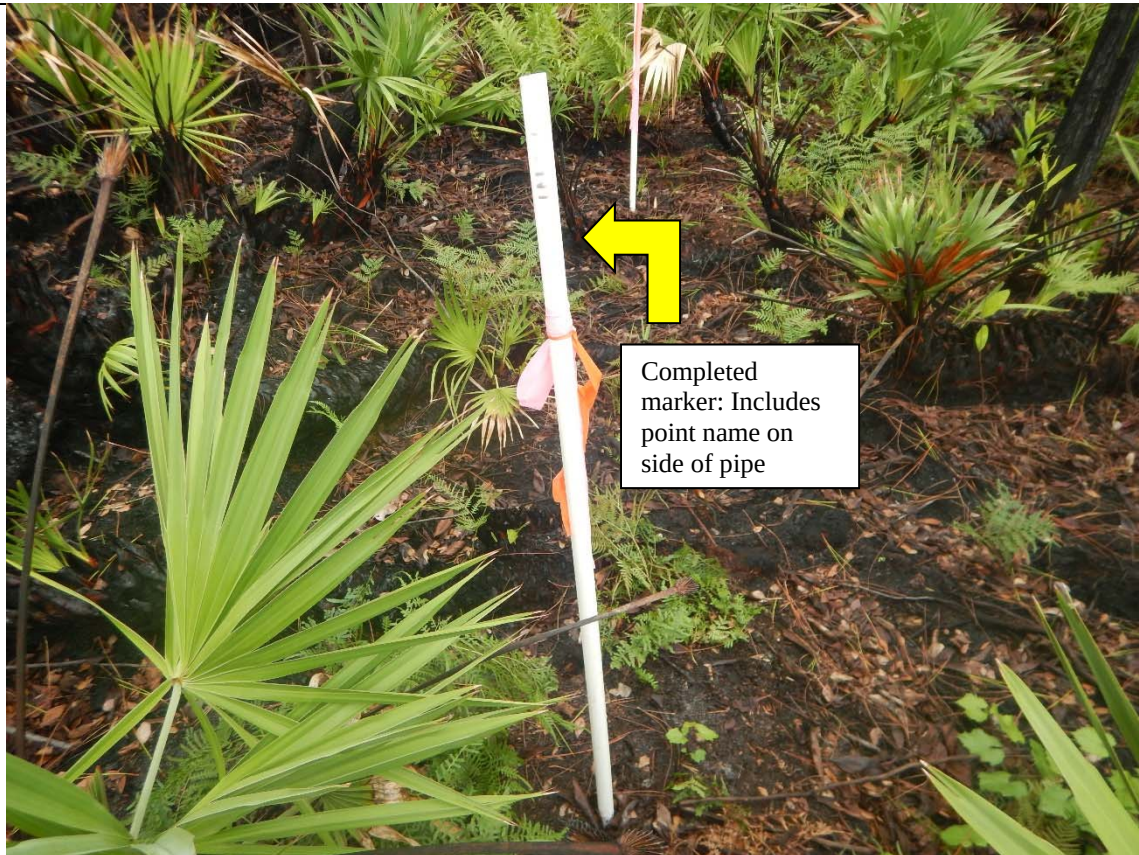
| Soil Transects – LM2 1 Transect Group |                                   |                                              |
|---------------------------------------|-----------------------------------|----------------------------------------------|
| <b>LM2 1.1</b>                        | <b>Wetland Boundary</b>           |                                              |
| LATITUDE: 28° 06' 16.92280" (N)       | LONGITUDE: 081° 30' 57.83197" (W) |                                              |
| NORTHING: 1371122.12                  | EASTING: 489797.86                |                                              |
| ELEVATION: 77.24 ft. (NAVD 88)        | 23.543 m                          | RTK GPS                                      |
| ELEVATION: 78.21 ft. (NGVD 29)        | 23.839 m                          | 0.971 ft. (conversion factor) Corpscon 6.0.1 |





# LAKE MARION CREEK WEST

| Soil Transects – LM2 1 Transect Group |                                   |                                              |
|---------------------------------------|-----------------------------------|----------------------------------------------|
| LM2 1.2                               | Hydric at Surface                 |                                              |
| LATITUDE: 28° 06' 16.94802" (N)       | LONGITUDE: 081° 30' 57.74154" (W) |                                              |
| NORTHING: 1371124.63                  | EASTING: 489805.96                |                                              |
| ELEVATION: 76.19 ft. (NAVD 88)        | 23.223 m                          | RTK GPS                                      |
| ELEVATION: 77.16 ft. (NGVD 29)        | 23.519 m                          | 0.971 ft. (conversion factor) Corpscon 6.0.1 |





# LAKE MARION CREEK WEST

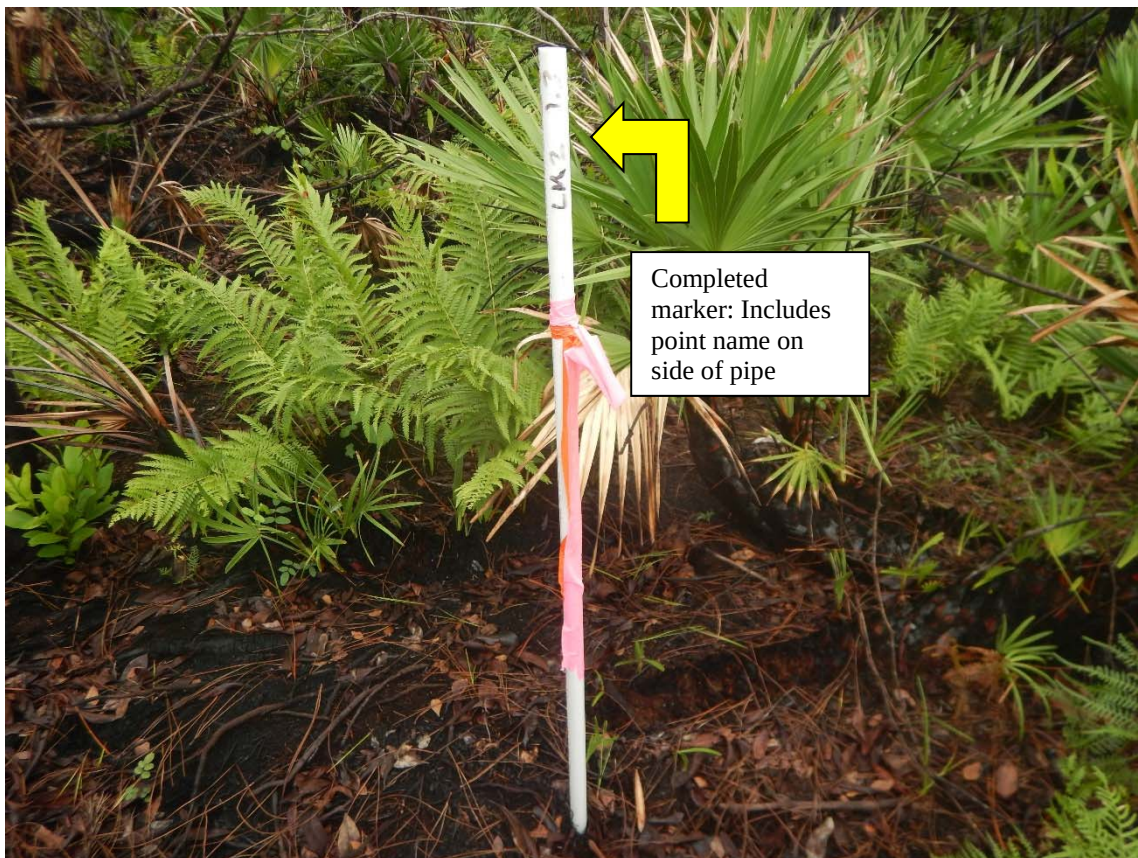
| Soil Transects – LM2 1 Transect Group |                                   |                                              |
|---------------------------------------|-----------------------------------|----------------------------------------------|
| <b>LM2 1.3</b>                        | <b>Muck at Surface</b>            |                                              |
| LATITUDE: 28° 06' 17.01465" (N)       | LONGITUDE: 081° 30' 57.66663" (W) |                                              |
| NORTHING: 1371131.33                  | EASTING: 489812.70                |                                              |
| ELEVATION: 75.33 ft. (NAVD 88)        | 22.961 m                          | RTK GPS                                      |
| ELEVATION: 76.30 ft. (NGVD 29)        | 23.257 m                          | 0.971 ft. (conversion factor) Corpscon 6.0.1 |



Rebar marking point



~4' PVC marker placed over rebar

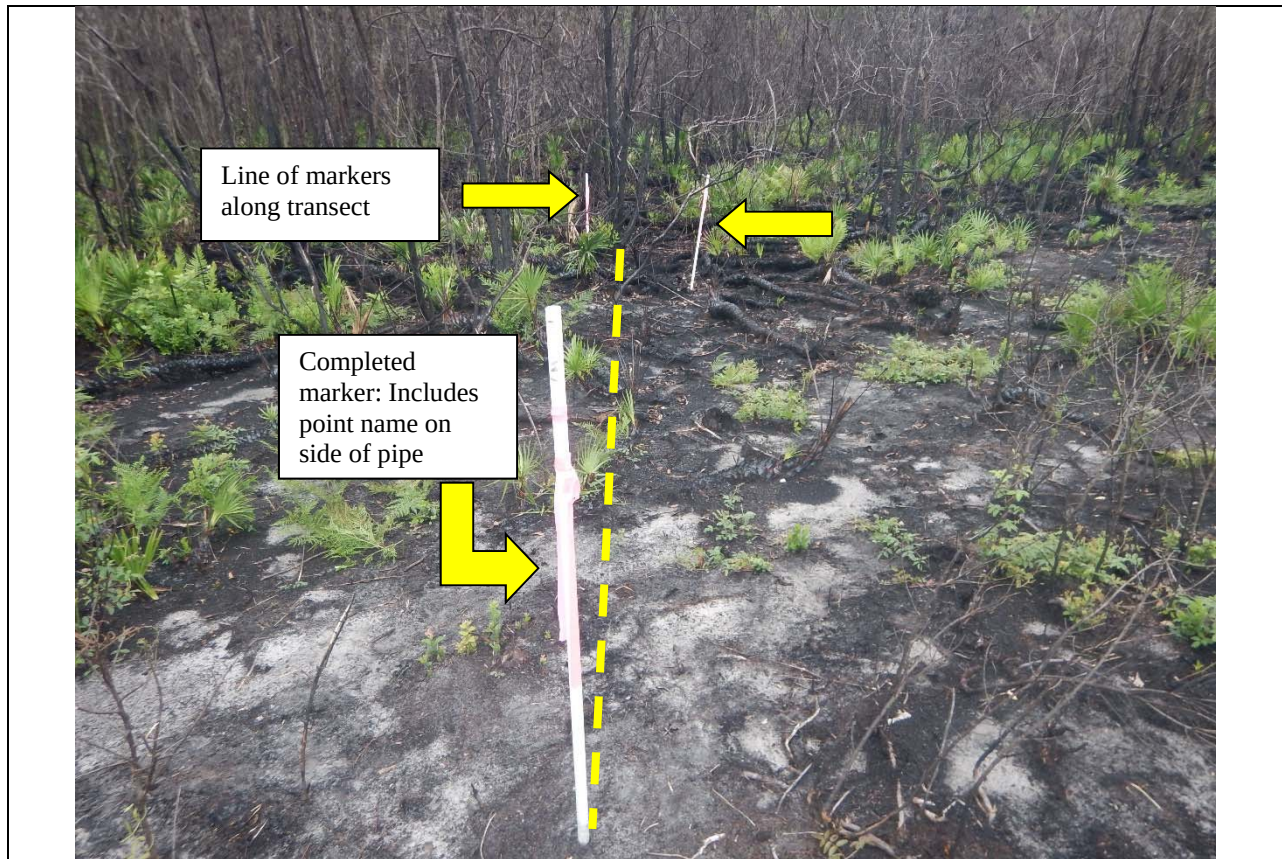
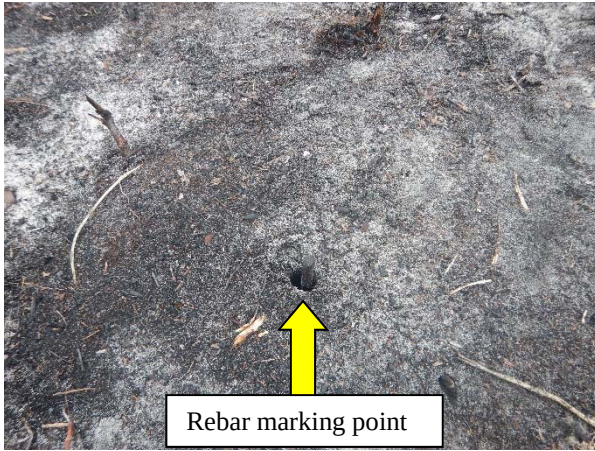


Completed marker: Includes point name on side of pipe



# LAKE MARION CREEK WEST

| Soil Transects – LM2 2 Transect Group |                                   |                                              |
|---------------------------------------|-----------------------------------|----------------------------------------------|
| <b>LM2 2.1</b>                        | <b>Wetland Boundary</b>           |                                              |
| LATITUDE: 28° 06' 13.54637" (N)       | LONGITUDE: 081° 30' 55.97606" (W) |                                              |
| NORTHING: 1370780.42                  | EASTING: 489962.61                |                                              |
| ELEVATION: 79.74 ft. (NAVD 88)        | 24.305 m                          | RTK GPS                                      |
| ELEVATION: 80.71 ft. (NGVD 29)        | 24.601 m                          | 0.971 ft. (conversion factor) Corpscon 6.0.1 |





## LAKE MARION CREEK WEST

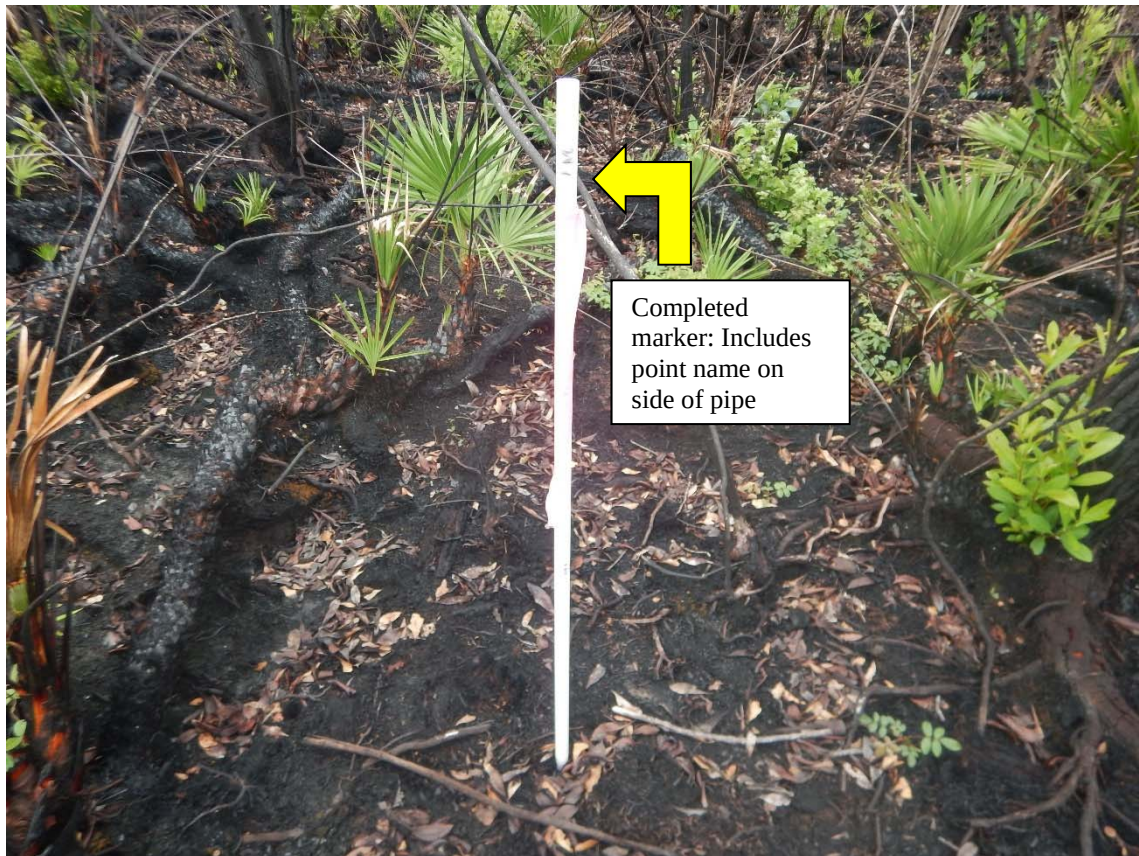
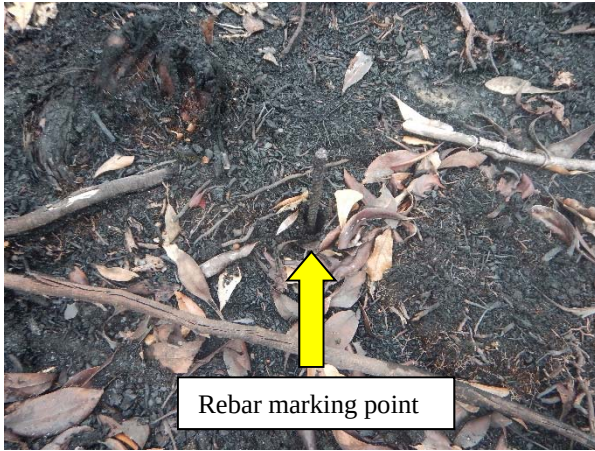
| Soil Transects – LM2 2 Transect Group |                                   |                                              |
|---------------------------------------|-----------------------------------|----------------------------------------------|
| LM2 2.2                               | Hydric at Surface                 |                                              |
| LATITUDE: 28° 06' 13.62362" (N)       | LONGITUDE: 081° 30' 55.69486" (W) |                                              |
| NORTHING: 1370788.12                  | EASTING: 489987.83                |                                              |
| ELEVATION: 77.00 ft. (NAVD 88)        | 23.470 m                          | RTK GPS                                      |
| ELEVATION: 77.97 ft. (NGVD 29)        | 23.766 m                          | 0.971 ft. (conversion factor) Corpscon 6.0.1 |





# LAKE MARION CREEK WEST

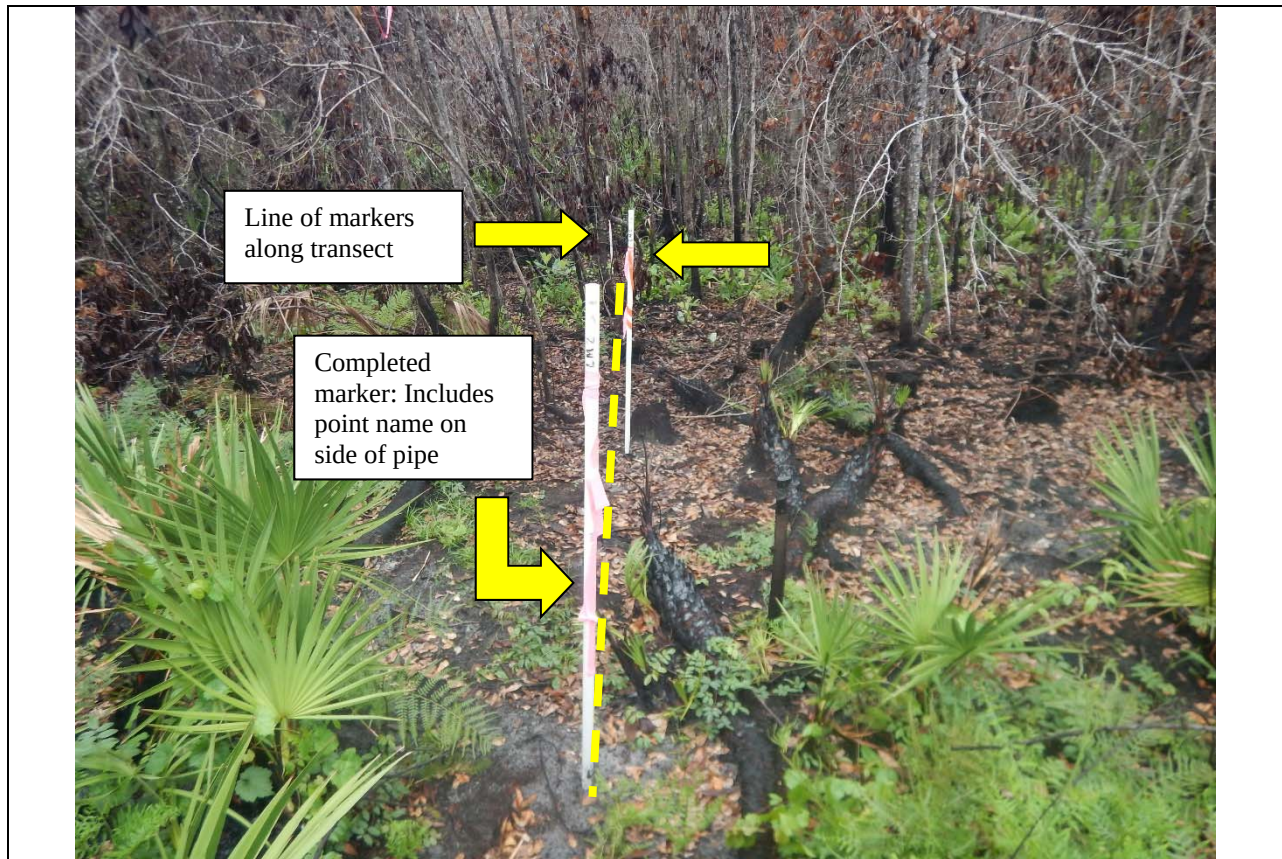
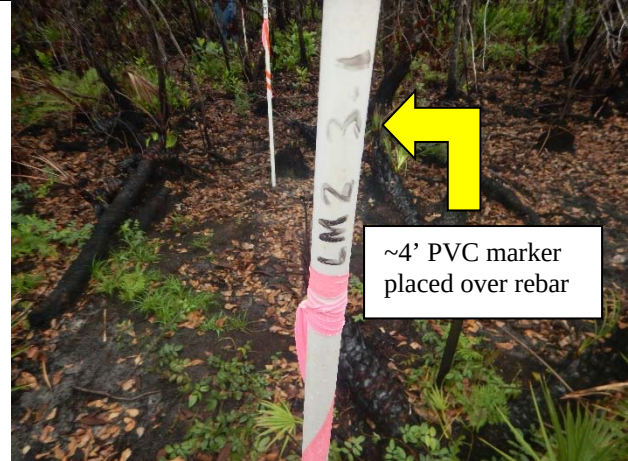
| Soil Transects – LM2 2 Transect Group |                                   |                                              |
|---------------------------------------|-----------------------------------|----------------------------------------------|
| <b>LM2 2.3</b>                        | <b>Muck at Surface</b>            |                                              |
| LATITUDE: 28° 06' 13.67956" (N)       | LONGITUDE: 081° 30' 55.66457" (W) |                                              |
| NORTHING: 1370793.75                  | EASTING: 489990.56                |                                              |
| ELEVATION: 76.21 ft. (NAVD 88)        | 23.229 m                          | RTK GPS                                      |
| ELEVATION: 77.18 ft. (NGVD 29)        | 23.525 m                          | 0.971 ft. (conversion factor) Corpscon 6.0.1 |





# LAKE MARION CREEK WEST

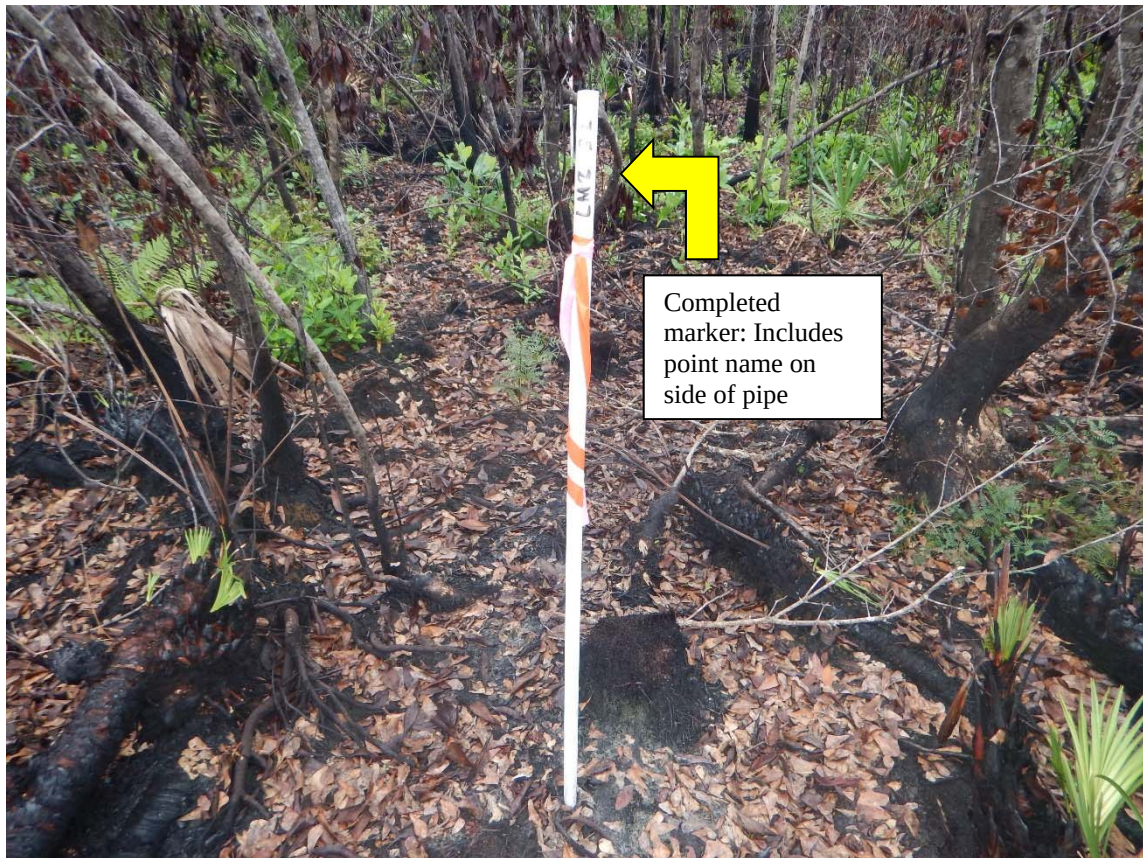
| Soil Transects – LM2 3 Transect Group |                                   |                                              |
|---------------------------------------|-----------------------------------|----------------------------------------------|
| <b>LM2 3.1</b>                        | <b>Wetland Boundary</b>           |                                              |
| LATITUDE: 28° 06' 18.86711" (N)       | LONGITUDE: 081° 31' 00.50594" (W) |                                              |
| NORTHING: 1371319.50                  | EASTING: 489559.23                |                                              |
| ELEVATION: 79.03 ft. (NAVD 88)        | 24.088 m                          | RTK GPS                                      |
| ELEVATION: 80.00 ft. (NGVD 29)        | 24.384 m                          | 0.971 ft. (conversion factor) Corpscon 6.0.1 |





# LAKE MARION CREEK WEST

| Soil Transects – LM2 3 Transect Group |                                   |                                              |
|---------------------------------------|-----------------------------------|----------------------------------------------|
| <b>LM2 3.2</b>                        | <b>Hydric at Surface</b>          |                                              |
| LATITUDE: 28° 06' 18.95064" (N)       | LONGITUDE: 081° 31' 00.47769" (W) |                                              |
| NORTHING: 1371327.92                  | EASTING: 489561.80                |                                              |
| ELEVATION: 77.18 ft. (NAVD 88)        | 23.525 m                          | RTK GPS                                      |
| ELEVATION: 78.15 ft. (NGVD 29)        | 23.820 m                          | 0.971 ft. (conversion factor) Corpscon 6.0.1 |





# LAKE MARION CREEK WEST

| Soil Transects – LM2 3 Transect Group |                                   |                                              |
|---------------------------------------|-----------------------------------|----------------------------------------------|
| <b>LM2 3.3</b>                        | <b>Muck at Surface</b>            |                                              |
| LATITUDE: 28° 06' 19.17070" (N)       | LONGITUDE: 081° 31' 00.42361" (W) |                                              |
| NORTHING: 1371350.13                  | EASTING: 489566.74                |                                              |
| ELEVATION: 73.67 ft. (NAVD 88)        | 22.455 m                          | RTK GPS                                      |
| ELEVATION: 74.64 ft. (NGVD 29)        | 22.751 m                          | 0.971 ft. (conversion factor) Corpscon 6.0.1 |





# LAKE MARION CREEK WEST

| Seasonal High-Water Marks       |                                   |                                              |
|---------------------------------|-----------------------------------|----------------------------------------------|
| LM2 SH 1                        | Seasonal HW Elevation             |                                              |
| LATITUDE: 28° 06' 21.06283" (N) | LONGITUDE: 081° 30' 50.66222" (W) |                                              |
| NORTHING: 1371537.51            | EASTING: 490441.68                |                                              |
| ELEVATION: 64.70 ft. (NAVD 88)  | 19.721 m                          | RTK GPS                                      |
| ELEVATION: 65.67 ft. (NGVD 29)  | 20.017 m                          | 0.971 ft. (conversion factor) Corpscon 6.0.1 |





## LAKE MARION CREEK WEST

| Seasonal High-Water Marks       |                                   |                                              |
|---------------------------------|-----------------------------------|----------------------------------------------|
| LM2 SH 2                        | Seasonal HW Elevation             |                                              |
| LATITUDE: 28° 06' 21.08006" (N) | LONGITUDE: 081° 30' 50.62864" (W) |                                              |
| NORTHING: 1371539.24            | EASTING: 490444.70                |                                              |
| ELEVATION: 64.82 ft. (NAVD 88)  | 19.757 m                          | RTK GPS                                      |
| ELEVATION: 65.79 ft. (NGVD 29)  | 20.053 m                          | 0.971 ft. (conversion factor) Corpscon 6.0.1 |



Trees Marked  
with flagging



Seasonal High Water  
elevation marked with nail  
and flagging



## **SURVEYOR'S REPORT**

Specific Purpose Survey of the CFWI DMIT Wetland  
Lake Marion Creek  
in  
Polk County, Florida

**Prepared for:**

**South Florida Water Management District**

3301 Gun -Club Road  
West Palm Beach, Florida 33406  
Ph. (561) 686-8800 (ext. 2978)  
Fax (561) 682-0066

**Prepared by:**

**Gregory A. Prather, PSM**

Florida Professional Surveyor and Mapper  
License Number 5135  
State of Florida

Pickett and Associates, Inc. LB No 364  
475 South First Avenue, Bartow, FL. 33830  
Tel (863) 533-9095

Field Date: July 26, 2018  
Report Date: August 02, 2018



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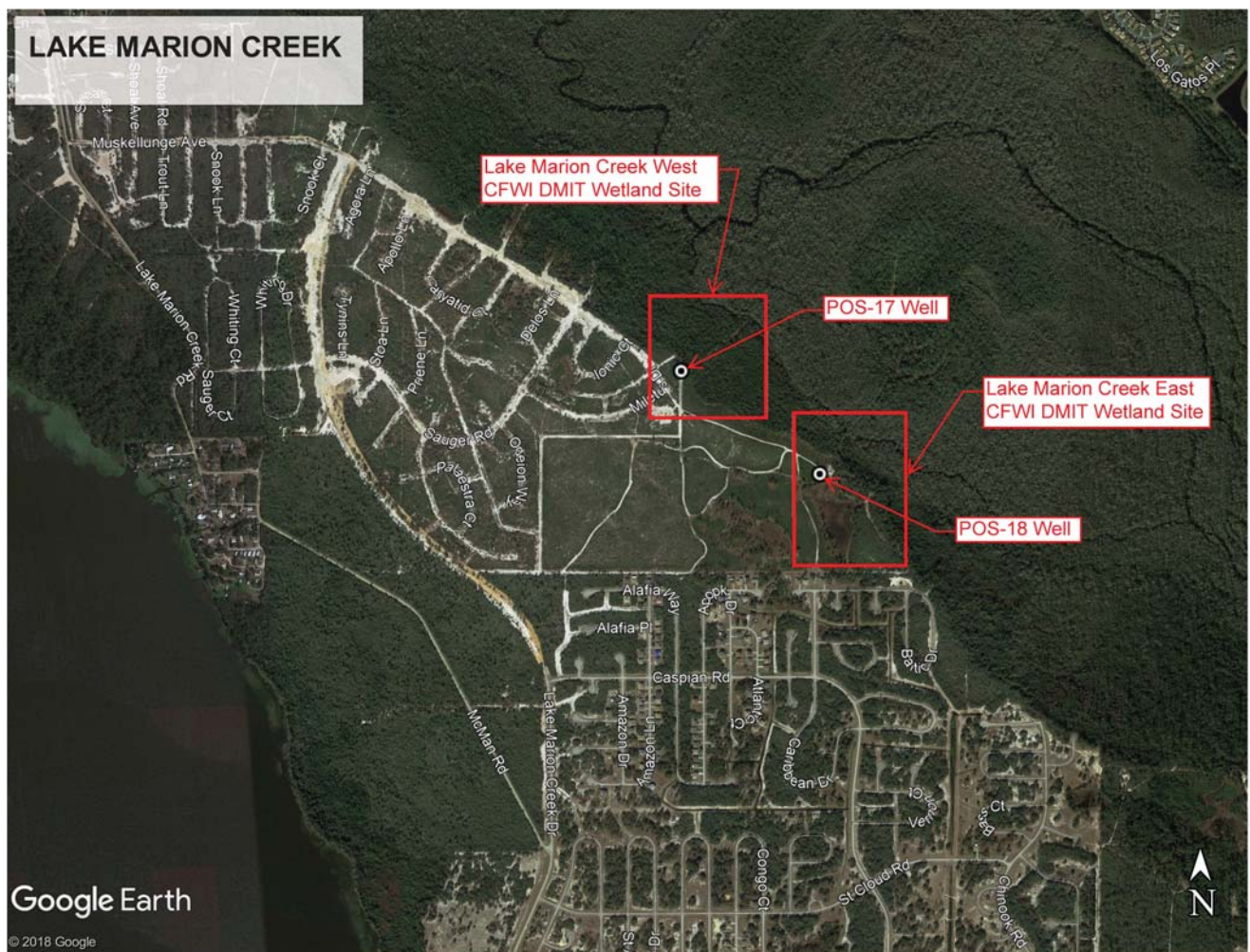
| <b>Title</b>             | <b>Page</b> |
|--------------------------|-------------|
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## **PURPOSE**

The purpose of this survey is to measure horizontal and vertical components of wetland, muck locations, transects, seasonal high water marks, staff gauges and a seep at the Lake Marion Creek location.

## **LOCATION OF PROJECT**

The CFWI DMIT Wetland Lake Marion Creek site is located in Section 28, Township 27 South, Range 28 East, Polk County, Florida.



**General Location (Intended Display Scale is “Not to Scale”)**



**PROJECT VERTICAL DATUM**

The project vertical datum is the North American Vertical Datum of 1988 (NAVD 88).

To convert the NAVD 88 elevation to National Geodetic Vertical Datum of 1929 (NGVD 29) **add 0.971'** to the NAVD 88 elevation.

[NAVD 88 elevation + 0.971' = NGVD 29 elevation]

This value conversion factor is based on Corpscon 6.0.1 a US Army Corps of Engineers Engineering Research and Development Center Topographic Engineering Center Alexandria, Virginia Windows-based program to convert coordinates and elevations between datum's using vertcon05.txt and vertcon05.05 files supplied by the U.S. Army Corps of Engineers South Atlantic Division, Jacksonville, FL.

**PROJECT HORIZONTAL DATUM**

The project horizontal datum is North American Datum 83 (NAD 83 (2011) (EPOCH:2010.0000))

**LEVELING METHODS FOR VERTICAL CONTROL**

The leveling for this project was minimal. Levels were used to establish conventional control points. A level run was performed from POS-18 to GPS Point # 244 and GPS Point # 247, closing back on POS-18 to establish consistent elevations on RTK GPS control points set for the purpose of this survey. Levels were also used to establish elevations on features such as reference points of wells, top of concrete and ground elevations for the POS-18 and POS-19 well sites.

**GPS METHODS FOR HORIZONTAL CONTROL**

Latitude, Longitude and elevations for the Benchmark at Well POS-18 and the Benchmark at Well POS-19 were established by observing a 4 -hour session of Static GPS data using a Trimble R-8 set over the point June 28, 2018. Rinex files containing the collected data were uploaded through the OPUS website and a report containing the final coordinates were obtained on July 19, 2018.

Checks with RTK-GPS were made to Benchmarks POS-16 and POS-17 at the Snell Creek CFWI DMIT Wetland site. Coordinates & elevations for the benchmarks at the Snell Creek sites were established with RTK-GPs and a 4-hour static GPS observation and the OPUS website, respectively.

**COORDINATES AND ELEVATIONS FOR WETLAND FEATURES**

RTK GPS was used to establish coordinates and elevations for the wetland transects, seasonal high elevations, staff gauges and seep. Measurements were made on the ground adjacent to the rebar and pipes marking the point. In areas where tree canopy prevented a fixed RTK GPS solution, an optical total station was used. Control for the optical work was established with RTK GPS and leveling methods described above.

**EQUIPMENT USED**

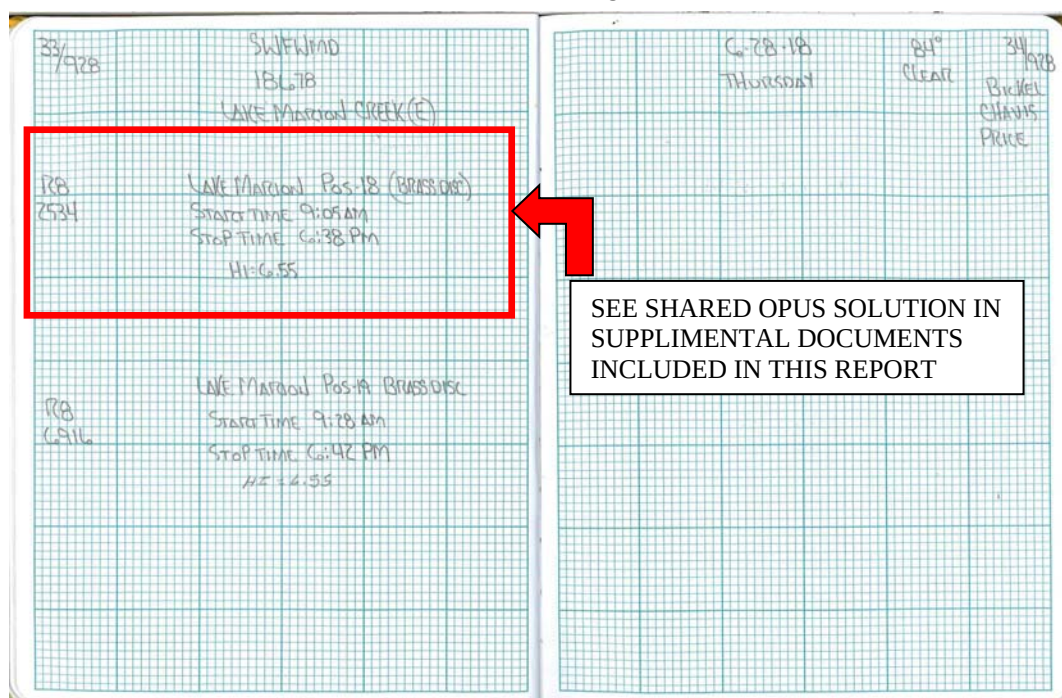
- Trimble GPS unit R-8, Serial Number 6916 (static)
- Trimble GPS unit R-8, Serial Number 2534 (static)
- Trimble DiNi 22 Level Serial Number 772842 (level)
- Trimble GPS unit R-10, Serial Number 7093 (RTK)
- Trimble GPS unit R-10, Serial Number 5003 (RTK)
- Trimble Total Station, Serial Number 36820056 (optical)



**VERTICAL CONTROL POINT**

The Vertical Control point utilized and set as part of this survey is the:

|                                                                                    |                                   |                                                                                                                                                                                                                                                                                                                                       |
|------------------------------------------------------------------------------------|-----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>BM: POS-18 (WELL) (Located as part of this survey)</b>                          |                                   |                                                                                                                                                                                                                                                                                                                                       |
| LATITUDE: 28° 06' 06.76703" (N)                                                    | LONGITUDE: 081° 30' 42.98184" (W) |                                                                                                                                                                                                                                                                                                                                       |
| OPUS - NAD_83 (2011)(EPOCH:2010.0000)                                              |                                   |                                                                                                                                                                                                                                                                                                                                       |
| ELEVATION: 82.480 ft. (NAVD 88)                                                    | 25.140 m                          | OPUS – (Computed using GEOID12B)                                                                                                                                                                                                                                                                                                      |
| ELEVATION: 83.451 ft. (NGVD 29)                                                    | 25.436 m                          | 0.971 ft. (conversion factor)<br>Corpscon 6.0.1                                                                                                                                                                                                                                                                                       |
|  |                                   | From the intersection of Poinciana Pkwy and Lk Marion Creek Dr North on Lk Marion Creek Dr for 3 Mi to Caspian Rd East on Caspian Rd for 0.5 Mi to Baltic Dr. North on Baltic Dr. for 0.15 Mi to the intersection of Baltic Dr. North on dirt drive 150 ft. to gate thru gate on dirt trail North then East 1,000 ft to mark on Left. |

**Field Book 928, Page 33-34**

|                                                           |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-----------------------------------------------------------|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>BM: POS-19 (WELL) (Located as part of this survey)</b> |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| LATITUDE: 28° 06' 16.57919" (N)                           |          | LONGITUDE: 081° 30' 57.86298" (W)                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| OPUS - NAD 83 (2011)(EPOCH:2010.0000)                     |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| ELEVATION: 81.096 ft. (NAVD 88)                           | 24.718 m | OPUS – (Computed using GEOID12B)<br>0.971 ft. (conversion factor)<br>Corpscon 6.0.1<br>From the intersection of Poinciana Pkwy and Lk Marion Creek Dr North on Lk Marion Creek Dr for 3 Mi to Caspian Rd East on Caspian Rd for 0.5 Mi to Baltic Dr. North on Baltic Dr. for 0.15 Mi to the intersection of Baltic Dr. North on dirt drive 150 ft. to gate thru gate on dirt trail North then East 1,000 ft then northwesterly and north 1,900 feet to mark on right. |
| ELEVATION: 82.067 ft. (NGVD 29)                           | 25.014 m |                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |



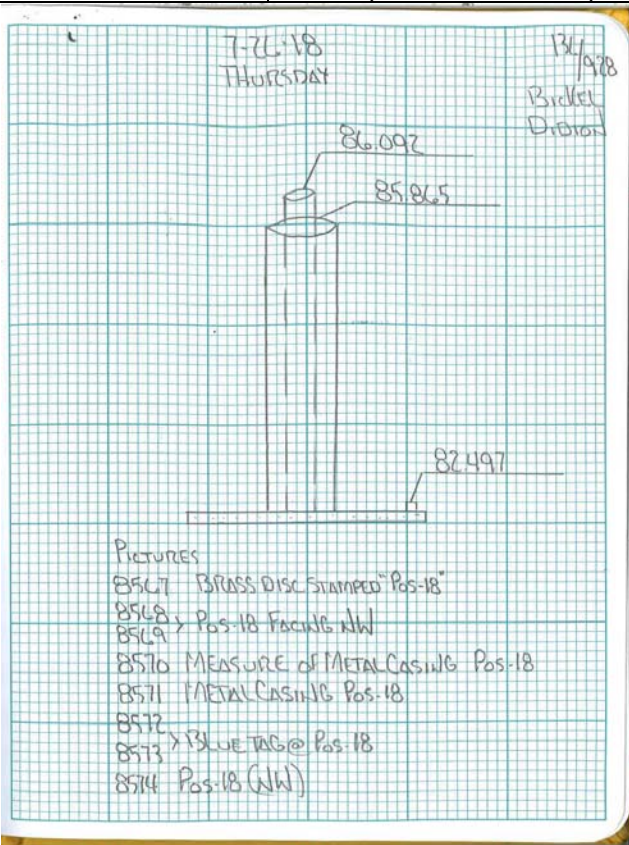
## Field Book 928, Page 33-34

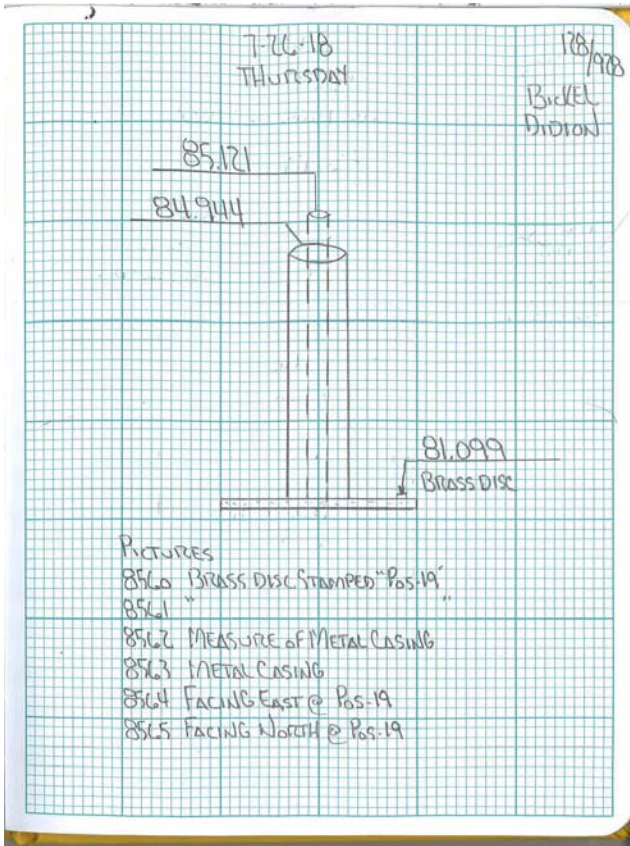
|            |                                                                                       |                     |              |                                      |
|------------|---------------------------------------------------------------------------------------|---------------------|--------------|--------------------------------------|
| 33/928     | SKIFWMD<br>18678<br>LAKE MARION CREEK (E)                                             | 6-28-18<br>THURSDAY | 84°<br>CLEAR | 34/928<br>Bridget<br>Chavis<br>Price |
| RB<br>2534 | LAKE MARION Pos-18 (BRASS DISC)<br>START TIME 9:05 AM<br>STOP TIME 6:38 PM<br>HT-6.55 |                     |              |                                      |
| RB<br>2516 | LAKE MARION Pos-19 BRASS DISC<br>START TIME 9:28 AM<br>STOP TIME 6:42 PM<br>HT-6.55   |                     |              |                                      |

SEE SHARED OPUS SOLUTION IN  
SUPPLEMENTAL DOCUMENTS  
INCLUDED IN THIS REPORT



**PROJECT RESULTS**

| Reference and Ground Elevations:                                                    |                  |                                                                                     |                             |
|-------------------------------------------------------------------------------------|------------------|-------------------------------------------------------------------------------------|-----------------------------|
| Well                                                                                | Ground Elevation | Reference Elevation                                                                 | Comments                    |
| POS-18                                                                              | 82.4 ft          | 86.10 ft                                                                            | Top of Metal                |
| Elevation on four (4) corners of the concrete well pad                              |                  |                                                                                     |                             |
| NE Corner                                                                           | SE Corner        | SW Corner                                                                           | NW Corner                   |
| 82.5 ft                                                                             | 82.5 ft          | 82.5 ft                                                                             | 82.5 ft                     |
| Well Diameter                                                                       |                  | Casing material                                                                     | DTW                         |
| 4 3/16"                                                                             |                  | METAL                                                                               | 7.91 ft (7/26/18, 11:57 am) |
|   |                  |  |                             |
|  |                  |                                                                                     |                             |
| Source & Site Benchmark                                                             |                  | NAVD 88                                                                             | NGVD 29 (Published)         |
| POS-18 Well                                                                         |                  | 82.48 ft                                                                            | 83.45 ft                    |

| Reference and Ground Elevations:                                                    |                  |                                                                                     |                             |                    |
|-------------------------------------------------------------------------------------|------------------|-------------------------------------------------------------------------------------|-----------------------------|--------------------|
| Well                                                                                | Ground Elevation | Reference Elevation                                                                 | Comments                    |                    |
| POS-19                                                                              | 81.0 ft          | 85.12 ft                                                                            | Top of Metal                |                    |
| Elevation on four (4) corners of the concrete well pad                              |                  |                                                                                     |                             |                    |
| NE Corner                                                                           | SE Corner        | SW Corner                                                                           | NW Corner                   |                    |
| 81.1 ft                                                                             | 81.1 ft          | 81.2 ft                                                                             | 81.2 ft                     |                    |
| Well Diameter                                                                       |                  | Casing material                                                                     | DTW                         |                    |
| 4 3/16"                                                                             |                  | METAL                                                                               | 8.30 ft (7/26/18, 10:22 am) |                    |
|   |                  |  |                             |                    |
|  |                  |                                                                                     |                             |                    |
| Source & Site Benchmark                                                             |                  | NAVD 88                                                                             | NGVD 29 (Published)         | NGVD 29 (Corpscon) |
| POS-19 Well                                                                         |                  | 81.10ft                                                                             |                             | 82.07 ft           |



Surveyor's Notes:

1. All measurements are U.S. Survey feet unless stated otherwise.
2. Underground improvements, encroachments, foundations and/or utilities were not located as a part of this survey.
3. Additions or deletions to survey maps or reports by other than the signing party or parties is prohibited without written consent of the signing party or parties.
4. This Report is not valid without the original signature and the raised seal or the electronic signature and computer-generated seal of a Florida Licensed Surveyor and Mapper.
5. To convert from NAVD 88 to NGVD 29 add 0.971 feet. This value is based on Corpscon 6.0.1, U.S. Army Corps of Engineers Engineering Research and Development Center Topographic Engineering Center Alexandria, Virginia Windows-based program to convert coordinates and elevations between datum's using vertcon05.txt and vertcon05.05 files supplied by the U.S. Army Corps of Engineers South Atlantic Division, Jacksonville, FL.
6. Date of last field work: July 26, 2018
7. SFWMD Data records (on file at the District's headquarters)
  - A. Electronic Data files:
    - Miscellaneous picture files
    - Miscellaneous data files
  - B. Conventional reporting
    - Field Book: 928 Pages: 33-34, 69-90, 123-136

Abbreviations:

**EL.** Elevation

**DTW** Distance to the water table inside the well

**PVC** Polyvinyl Chloride Pipe

**RTK GPS** Real-Time Kinematic Global Positioning System

**NAVD 88** North American Vertical Datum of 1988

**NGVD 29** National Geodetic Vertical Datum of 1929

**NGS** National Geodetic Survey

**PSM** Professional Surveyor & Mapper

**PID** Permanent Identifiers

**SFWMD** South Florida Water Management District

**USGS** United States Geological Survey

**CFWI** Central Florida Water Initiative.

**DMIT** Data, Monitoring and Investigations Team

**NGS** National Geodetic Survey

## SURVEYOR'S CERTIFICATION

In my professional opinion this Specific Purpose Survey meets applicable portions of the Standards of Practice set forth by the Florida Board of Professional Surveyors and Mappers in Chapter 5J, Florida Administrative Code. This report is prepared for the sole and specific use of the South Florida Water Management District and is not assignable.

July 26, 2018

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GREGORY A. PRATHER, PSM  
FLORIDA REGISTRATION NO. 5135  
PICKETT AND ASSOCIATES, INC.  
FLORIDA REGISTRATION NO. 364

SURVEY DATE





# SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Rev. 1/16

|                                                                |                                                    |
|----------------------------------------------------------------|----------------------------------------------------|
| DESIGNATION: <b>POS-18</b>                                     | PROJECT: <b>CFWI DMIT Wetland Lake Marion East</b> |
| ESTABLISHED BY: <b>SOUTH FLORIDA WATER MANAGEMENT DISTRICT</b> | SURVEYOR: <b>Gregory A. Prather</b>                |
| RECOVERED BY: <b>PICKETT AND ASSOCIATES, INC.</b>              | DATE: <b>July 26, 2018</b>                         |

## GEOGRAPHIC POSITION

|                                                                 |                                                              |                  |                                          |
|-----------------------------------------------------------------|--------------------------------------------------------------|------------------|------------------------------------------|
| SECTION 28                                                      | TOWNSHIP 27 SOUTH                                            | RANGE 28 EAST    |                                          |
| COUNTY: Polk                                                    | NAME OF QUADRANGLE: Dundee<br>GEOGRAPHIC INDEX OF QUAD: 3313 |                  |                                          |
| HORIZONTAL DATUM: 1927 1983 2022 Other (circle one) ZONE E or W |                                                              |                  |                                          |
| VERTICAL DATUM: MSL 1929 1988 2022 Other (circle one)           |                                                              |                  |                                          |
| VERTICAL ACCURACY: 1 2 3                                        |                                                              |                  |                                          |
| STATE PLANE<br>COORDINATE                                       | (N) Y= 1370090.85                                            | (E) X= 491123.39 | NAVD 88 EL. 82.480<br>NGVD 29 EL. 83.451 |

CORPSCON 6.0.1 CONVERSION FACTOR (NAVD88 TO NGVD29): **0.971'**

(A U.S. Army Corps of Engineers Engineering Research and Development Center Topographic Engineering Center Alexandria, Virginia Windows-based program to convert coordinates and elevations between datum's using vertcon05.txt and vertcon05.05 files supplied by the U.S. Army Corps of Engineers South Atlantic Division, Jacksonville FL.)

ACTUAL NGS or (ngvd29.txt file)

OPUS Ortho Height

|                                        |                                         |                                        |
|----------------------------------------|-----------------------------------------|----------------------------------------|
| LATITUDE: <b>28° 06' 06.76703" (N)</b> | LONGITUDE: <b>81° 30' 42.98184" (W)</b> | (OPUS – NAD_83 (2011) EPOCH:2010.0000) |
|----------------------------------------|-----------------------------------------|----------------------------------------|

## RECOVERY DATA

Stamping: POS-18

To Reach: From the intersection of Poinciana Pkwy and Lk Marion Creek Dr North on Lk Marion Creek Dr for 3 Mi to Caspian Rd East on Caspian Rd for 0.5 Mi to Baltic Dr. North on Baltic Dr. for 0.15 Mi to the intersection of Baltic Dr. North on dirt drive 150 ft. to gate thru gate on dirt trail North then East 1,000 ft to mark on Left.

NOTABLE LAND MARKS:

NGS-SOURCE BENCHMARK:

FIELD BOOK **928** PAGE **33**

## PICTURES

Aerial Overall Site







## SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Rev. 1/16



Looking Northwest (Oblique not to scale) (July 26, 2018)



Top View (Not to Scale) (July 26, 2018)



Top View (Not to Scale) (July 26, 2018)





# SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Rev. 1/16

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                            |                                                    |                                                        |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|----------------------------------------------------|--------------------------------------------------------|
| DESIGNATION: <b>POS-19</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                            | PROJECT: <b>CFWI DMIT Wetland Lake Marion West</b> |                                                        |
| ESTABLISHED BY: <b>SOUTH FLORIDA WATER MANAGEMENT DISTRICT</b>                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                            | SURVEYOR: <b>Gregory A. Prather</b>                |                                                        |
| RECOVERED BY: <b>PICKETT AND ASSOCIATES, INC.</b>                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                            | DATE: <b>July 26, 2018</b>                         |                                                        |
| <b>GEOGRAPHIC POSITION</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                            |                                                    |                                                        |
| SECTION <b>28</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                            | TOWNSHIP <b>27 SOUTH</b>                                                   | RANGE <b>28 EAST</b>                               |                                                        |
| COUNTY: <b>Polk</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                          | NAME OF QUADRANGLE: <b>Dundee</b><br>GEOGRAPHIC INDEX OF QUAD: <b>3313</b> |                                                    |                                                        |
| HORIZONTAL DATUM: 1927 <u>(1983)</u> 2022 Other _____ (circle one) ZONE <u>(E)</u> or W                                                                                                                                                                                                                                                                                                                                                                                      |                                                                            |                                                    |                                                        |
| VERTICAL DATUM: MSL 1929 <u>(1988)</u> 2022 Other _____ (circle one)                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                            |                                                    |                                                        |
| VERTICAL ACCURACY: 1 2 <u>(3)</u>                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                            |                                                    |                                                        |
| STATE PLANE COORDINATE                                                                                                                                                                                                                                                                                                                                                                                                                                                       | (N) Y= <b>1371087.43</b>                                                   | (E) X= <b>489794.93</b>                            | NAVD 88 EL. <b>81.096</b><br>NGVD 29 EL. <b>82.067</b> |
| CORPSCON 6.0.1 CONVERSION FACTOR (NAVD88 TO NGVD29): <b>0.971'</b><br>(A U.S. Army Corps of Engineers Engineering Research and Development Center Topographic Engineering Center Alexandria, Virginia Windows-based program to convert coordinates and elevations between datum's using vertcon05.txt and vertcon05.05 files supplied by the U.S. Army Corps of Engineers South Atlantic Division, Jacksonville FL.)<br>ACTUAL NGS or (ngvd29.txt file)<br>OPUS Ortho Height |                                                                            |                                                    |                                                        |
| LATITUDE: <b>28° 06' 16.57919" (N)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                            | LONGITUDE: <b>81° 30' 57.86298" (W)</b>            | (OPUS – NAD_83 (2011) EPOCH:2010.0000)                 |
| <b>RECOVERY DATA</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                            |                                                    |                                                        |
| Stamping: POS-19                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                            |                                                    |                                                        |
| To Reach: From the intersection of Poinciana Pkwy and Lk Marion Creek Dr North on Lk Marion Creek Dr for 3 Mi to Caspian Rd East on Caspian Rd for 0.5 Mi to Baltic Dr. North on Baltic Dr. for 0.15 Mi to the intersection of Baltic Dr. North on dirt drive 150 ft. to gate thru gate on dirt trail North then East 1,000 ft then northwesterly and north 1,900 feet to mark on right.                                                                                     |                                                                            |                                                    |                                                        |
| NOTABLE LAND MARKS:                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                            |                                                    |                                                        |
| NGS-SOURCE BENCHMARK:                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                            |                                                    |                                                        |
| FIELD BOOK <b>928 PAGE 33</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                            |                                                    |                                                        |
| <b>PICTURES</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                            |                                                    |                                                        |
| Aerial Overall Site                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                            |                                                    |                                                        |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                            |                                                    |                                                        |





## SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Rev. 1/16



Looking West (Oblique not to scale) (July 26, 2018)

No Blue Tag at this Location



Top View (Not to Scale) (July 26, 2018)





# SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Rev. 1/16

|                                          |                                      |                                    |                                        |
|------------------------------------------|--------------------------------------|------------------------------------|----------------------------------------|
| SCADA RTU Station Name:<br><b>POS-18</b> | DB Hydro Site Name:<br><b>LMCRKE</b> | Agency:<br><b>WMD</b>              | Date of Field Work:<br><b>07/26/18</b> |
| Party Chief: <b>Robby Bickel</b>         | Field Book: <b>928</b>               | Page(s): <b>33, 69-90, 125-136</b> | Prepared by: <b>Sherry Grymko</b>      |

## SITE SPECIFIC DATA

|                                                   |                                                                |                                                                      |
|---------------------------------------------------|----------------------------------------------------------------|----------------------------------------------------------------------|
| Site Benchmark:<br><b>POS-18</b>                  | Benchmark Elevation (NAVD88)<br><b>82.480'</b>                 | Corpscon 6.0.1 Conversion Factor (NAVD88 to NGVD29)<br><b>0.971'</b> |
| Reference Elevation(s) (NAVD88):<br><b>86.10'</b> | Existing Brass Tag Elevation (Datum):<br><b>Not Applicable</b> | Calibration Port Elevation(s) (NAVD88):<br><b>Not Applicable</b>     |
| Ground Elevation (NAVD88): <b>82.4'</b>           | Pad Elevation (NAVD88): <b>82.5'</b>                           |                                                                      |

## GEOGRAPHIC DATA

|                   |                                         |                                          |                                      |
|-------------------|-----------------------------------------|------------------------------------------|--------------------------------------|
| Section <b>28</b> | Township <b>27</b> South                |                                          | Range <b>28</b> East                 |
| <b>Well</b>       | Latitude:<br><b>28°06'06.76436" (N)</b> | Longitude:<br><b>81°30'42.99790" (W)</b> | Source: RTK-GPS - NAD_83             |
|                   | State Plane Coordinates                 | Northing (Y) =<br><b>1370090.58 ft</b>   | Easting (X) =<br><b>491121.95 ft</b> |

### Notes:

**NAVD88** – North American Vertical Datum of 1988

**NGVD29**- National Geodetic Vertical Datum of 1929

**Corpscon 6.0.1** - A U.S. Army Corps of Engineers Engineering Research and Development Center Topographic Engineering Center Alexandria, Virginia Windows-based program to convert coordinates and elevations between datum's using vertcon05.txt and vertcon05.05 files supplied by the U.S. Army Corps of Engineers South Atlantic Division, Jacksonville FL.

## PICTURES

Aerial Overall Site



Not to scale (Google Earth product)

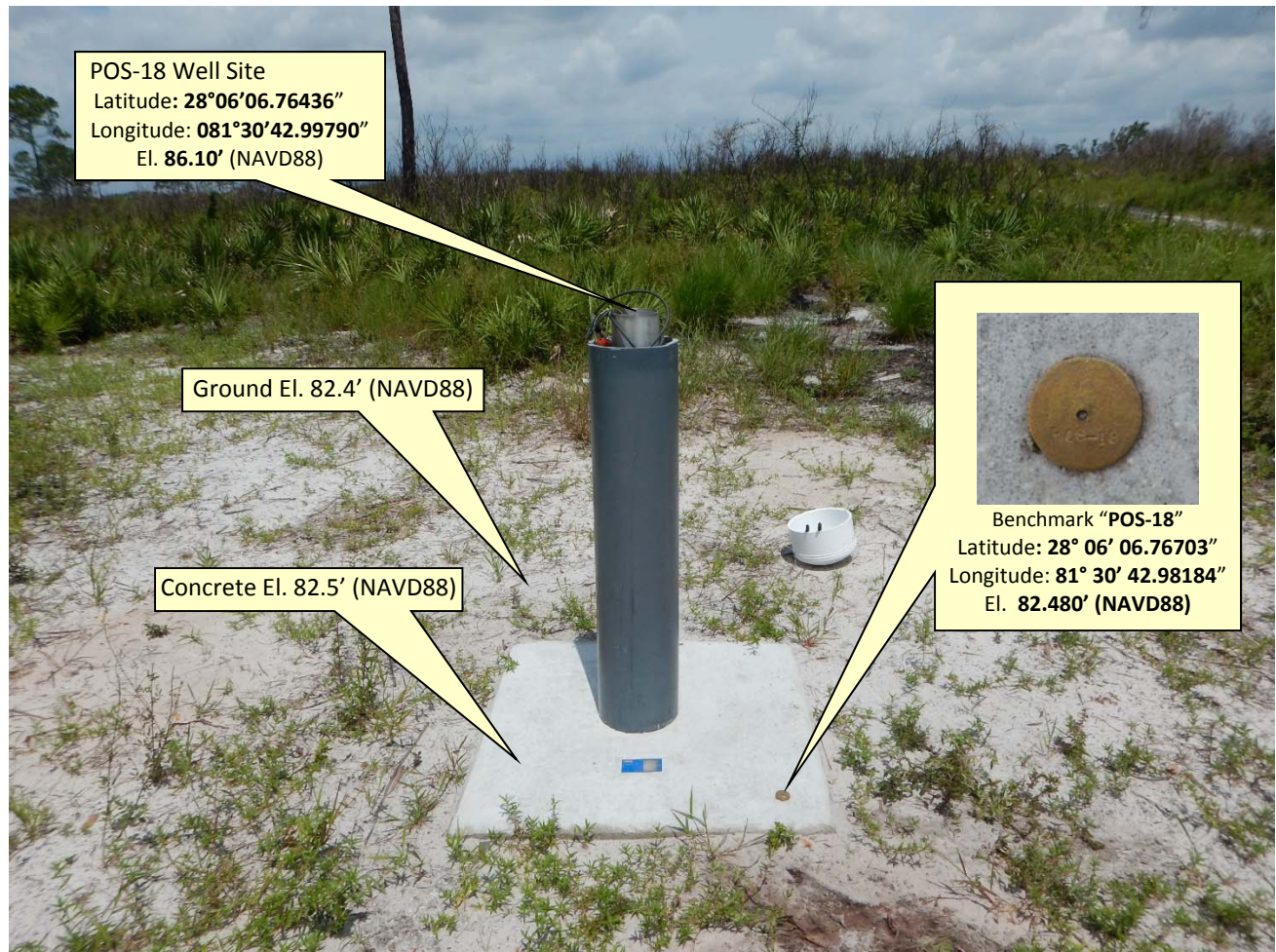




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### Overall



Looking Northwesterly (oblique not to scale) (26-July-18)

### Well Head



Looking Northwesterly (oblique not to scale) (26-July-18)





# SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Rev. 1/16

|                                          |                                      |                                    |                                        |
|------------------------------------------|--------------------------------------|------------------------------------|----------------------------------------|
| SCADA RTU Station Name:<br><b>POS-19</b> | DB Hydro Site Name:<br><b>LMCRKW</b> | Agency:<br><b>WMD</b>              | Date of Field Work:<br><b>07/26/18</b> |
| Party Chief: <b>Robby Bickel</b>         | Field Book: <b>928</b>               | Page(s): <b>33, 69-90, 123-136</b> | Prepared by: <b>Sherry Grymko</b>      |

## SITE SPECIFIC DATA

|                                                   |                                                                |                                                                      |
|---------------------------------------------------|----------------------------------------------------------------|----------------------------------------------------------------------|
| Site Benchmark:<br><b>POS-19</b>                  | Benchmark Elevation (NAVD88)<br><b>81.096'</b>                 | Corpscon 6.0.1 Conversion Factor (NAVD88 to NGVD29)<br><b>0.971'</b> |
| Reference Elevation(s) (NAVD88):<br><b>85.12'</b> | Existing Brass Tag Elevation (Datum):<br><b>Not Applicable</b> | Calibration Port Elevation(s) (NAVD88):<br><b>Not Applicable</b>     |
| Ground Elevation (NAVD88): <b>81.0'</b>           | Pad Elevation (NAVD88): <b>81.2'</b>                           |                                                                      |

## GEOGRAPHIC DATA

|                   |                                         |                                          |                                      |
|-------------------|-----------------------------------------|------------------------------------------|--------------------------------------|
| Section <b>28</b> | Township <b>27</b> South                |                                          | Range <b>28</b> East                 |
| <b>Well</b>       | Latitude:<br><b>28°06'16.56909" (N)</b> | Longitude:<br><b>81°30'57.86788" (W)</b> | Source: RTK-GPS - NAD_83             |
|                   | State Plane Coordinates                 | Northing (Y) =<br><b>1371086.41 ft</b>   | Easting (X) =<br><b>489794.49 ft</b> |

### Notes:

**NAVD88** – North American Vertical Datum of 1988

**NGVD29**- National Geodetic Vertical Datum of 1929

**Corpscon 6.0.1** - A U.S. Army Corps of Engineers Engineering Research and Development Center Topographic Engineering Center Alexandria, Virginia Windows-based program to convert coordinates and elevations between datum's using vertcon05.txt and vertcon05.05 files supplied by the U.S. Army Corps of Engineers South Atlantic Division, Jacksonville FL.

## PICTURES

Aerial Overall Site



Benchmark "POS-19"  
Latitude: **28° 06' 16.57919"**  
Longitude: **81° 30' 57.86298"**  
El. **81.096' (NAVD88)**



Not to scale (Google Earth product)





## SOUTH FLORIDA WATER MANAGEMENT DISTRICT

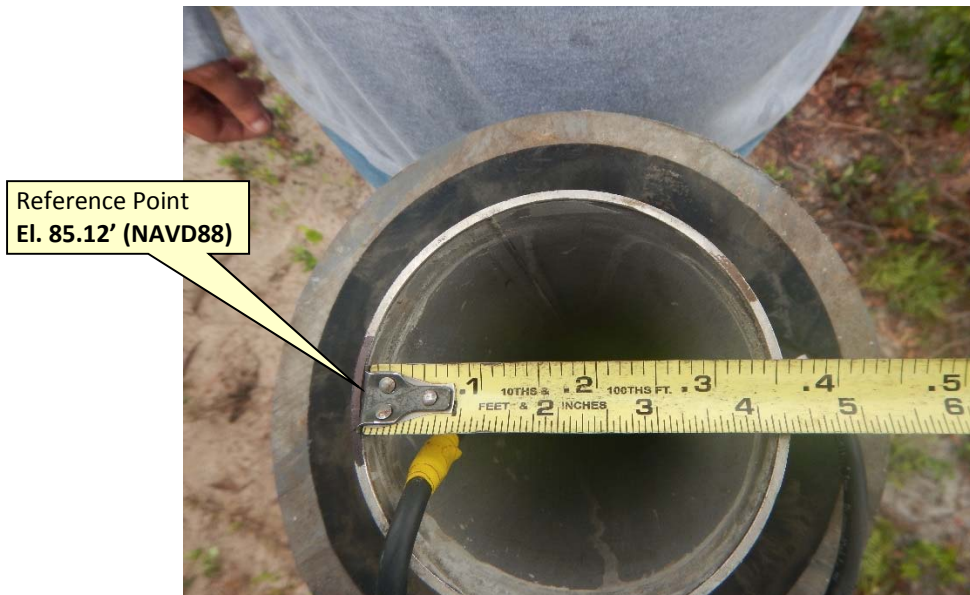
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Overall



Looking Easterly (oblique not to scale) (26-July-18)

Well Head



Looking Easterly (oblique not to scale) (26-July-18)



# Office

## Project

31 July 2018

### INPUT

Geographic, flhp gn - Florida HPGN  
Vertical - NAVD88, U.S. Feet

### OUTPUT

State Plane, flhp gn - Florida HPGN  
0901 - Florida East, U.S. Feet  
Vertical - NGVD29 (Vertcon94), U.S. Feet

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## POS-18

1/1

**Latitude:** 28 06 06.76703  
**Longitude:** 81 30 42.98184  
**Elevation/Z:** 0

**Northing/Y:** 1370090.845  
**Easting/X:** 491123.387  
**Elevation/Z:** 0.971  
**Convergence:** -0 14 28.13794  
**Scale Factor:** 0.999972399  
**Combined Factor:** 0.999976636

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**Remark:**

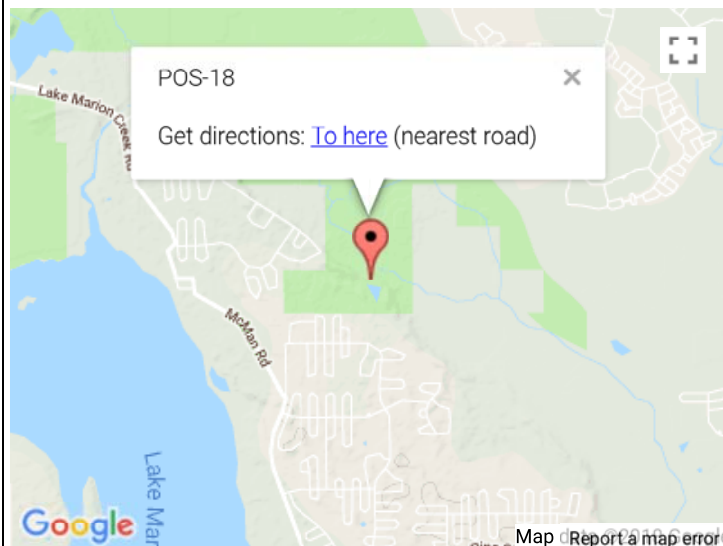
## Shared Solution

**PID:** BBGB32**Designation:** POS-18**Stamping:** POS-18**Stability:** May hold, commonly subject to ground movement**Setting:** Set in top of concrete monument

**Description:** From the intersection of Poinciana Pkwy and Lk Marion Creek Dr North on Lk Marion Creek Dr for 3 Mi to Caspian Rd East on Caspian Rd for 0.5 Mi to Baltic Dr. North on Baltic Dr. for 0.15 Mi to the intersection of Baltic Dr. North on dirt drive 150 ft. to gate thru gate on dirt trail North then East 1,000 ft to mark on Left

**Observed:** 2018-06-28T13:07:00Z**Source:** OPUS - page5 1603.24**Close-up View**

| REF_FRAME:                               | EPOCH:    | SOURCE:                          | UNITS:                                        | SET     | DETAILS |
|------------------------------------------|-----------|----------------------------------|-----------------------------------------------|---------|---------|
| NAD_83(2011)                             | 2010.0000 | NAVD88 (Computed using GEOID12B) | m                                             | PROFILE |         |
| <b>LAT:</b> 28° 6' 6.76703" ± 0.013 m    |           |                                  | <b>UTM 17 SPC 901(FL E)</b>                   |         |         |
| <b>LON:</b> -81° 30' 42.98184" ± 0.009 m |           |                                  | <b>NORTHING:</b> 3108594.021m 417604.525m     |         |         |
| <b>ELL HT:</b> -2.192 ± 0.031 m          |           |                                  | <b>EASTING:</b> 449711.872m 149694.708m       |         |         |
| <b>X:</b> 831066.976 ± 0.009 m           |           |                                  | <b>CONVERGENCE:</b> -0.24115000° -0.24115000° |         |         |
| <b>Y:</b> -5568736.736 ± 0.034 m         |           |                                  | <b>POINT SCALE:</b> 0.99963121 0.99997240     |         |         |
| <b>Z:</b> 2986468.305 ± 0.003 m          |           |                                  | <b>COMBINED FACTOR:</b> 0.99963155 0.99997274 |         |         |
| <b>ORTHO HT:</b> 25.140 ± 0.039 m        |           |                                  |                                               |         |         |

**CONTRIBUTED BY**[sgrymko](#)[Pickett & Associates, Inc.](#)**Horizon View**

The numerical values for this position solution have satisfied the quality control criteria of the National Geodetic Survey. The contributor has verified that the information submitted is accurate and complete.



# LAKE MARION CREEK WELL POS-18

FILE: 25341790.DAT OP1532023160771

## NGS OPUS SOLUTION REPORT

=====

All computed coordinate accuracies are listed as peak-to-peak values.

For additional information: <https://www.ngs.noaa.gov/OPUS/about.jsp#accuracy>

USER: [sgrymko@pickettusa.com](mailto:sgrymko@pickettusa.com) DATE: July 19, 2018  
RINEX FILE: 2534179n.18o TIME: 18:00:37 UTC

SOFTWARE: page5 1603.24 master55.pl 160321 START: 2018/06/28 13:07:00  
EPHEMERIS: igs20074.eph [precise] STOP: 2018/06/28 22:39:00  
NAV FILE: brdc1790.18n OBS USED: 23874 / 26376 : 91%  
ANT NAME: TRM5800 NONE # FIXED AMB: 119 / 149 : 80%  
ARP HEIGHT: 1.9964 OVERALL RMS: 0.025(m)

REF FRAME: NAD\_83(2011)(EPOCH:2010.0000) IGS08 (EPOCH:2018.4897)

|                             |                          |
|-----------------------------|--------------------------|
| X: 831066.976(m) 0.009(m)   | 831066.161(m) 0.009(m)   |
| Y: -5568736.736(m) 0.034(m) | -5568735.173(m) 0.034(m) |
| Z: 2986468.305(m) 0.003(m)  | 2986468.142(m) 0.003(m)  |

|                                                                  |                          |
|------------------------------------------------------------------|--------------------------|
| LAT: 28 6 6.76703 0.013(m)                                       | 28 6 6.78784 0.013(m)    |
| E LON: 278 29 17.01816 0.009(m)                                  | 278 29 16.99706 0.009(m) |
| W LON: 81 30 42.98184 0.009(m)                                   | 81 30 43.00294 0.009(m)  |
| EL HGT: -2.192(m) 0.031(m)                                       | -3.738(m) 0.031(m)       |
| ORTHO HGT: 25.140(m) 0.039(m) [NAVD88 (Computed using GEOID12B)] |                          |

EL. 82.48 ft

### UTM COORDINATES STATE PLANE COORDINATES

|                       | UTM (Zone 17) | SPC (0901 FL E) |
|-----------------------|---------------|-----------------|
| Northing (Y) [meters] | 3108594.021   | 417604.525      |
| Easting (X) [meters]  | 449711.872    | 149694.708      |
| Convergence [degrees] | -0.24115000   | -0.24115000     |
| Point Scale           | 0.99963121    | 0.99997240      |
| Combined Factor       | 0.99963155    | 0.99997274      |

|                 |
|-----------------|
| Y=1370090.85 ft |
| X= 491123.39 ft |

US NATIONAL GRID DESIGNATOR: 17RMM4971108594(NAD 83)

### BASE STATIONS USED

| PID    | DESIGNATION                 | LATITUDE    | LONGITUDE    | DISTANCE(m) |
|--------|-----------------------------|-------------|--------------|-------------|
| DF7990 | ZEFR ZEPHYRHILLS CORS ARP   | N281339.322 | W0820952.671 | 65598.1     |
| DQ7965 | FLWE WEDGEFIELD FL CORS ARP | N282626.477 | W0810533.176 | 55704.6     |
| DH3757 | WACH WAUCHULA CORS ARP      | N273051.042 | W0815256.615 | 74658.6     |

NEAREST NGS PUBLISHED CONTROL POINT  
DN9717 T 739 N2804000038 W08132000042 4236.0

BASE STATION INFORMATION

STATION NAME: zefr a 2 (ZEPHYRHILLS; Zephyrhills, Florida, U.S.A.)

MONUMENT: 49526S001

XYZ 766680.6677 -5571328.4297 2998751.0226 MON @ 2005.0000 (M)  
XYZ -0.0123 0.0005 0.0010 VEL (M/YR)  
NEU 0.0000 0.0000 0.0000 MON TO ARP (M)  
NEU 0.0001 -0.0008 0.1242 ARP TO L1 PHASE CENTER (M)  
NEU -0.0000 -0.0008 0.1337 ARP TO L2 PHASE CENTER (M)  
XYZ -0.1655 0.0072 0.0132 VEL TIMES 13.4890 YRS  
XYZ 0.0000 0.0000 0.0000 MON TO ARP  
XYZ 0.0142 -0.1085 0.0589 ARP TO L1 PHASE CENTER  
XYZ 766680.5163 -5571328.5310 2998751.0947 L1 PHS CEN @ 2018.4897  
XYZ -0.0000 -0.0000 -0.0000 + XYZ ADJUSTMENTS  
XYZ 766680.5163 -5571328.5310 2998751.0947 NEW L1 PHS CEN @ 2018.4897  
XYZ 766680.5022 -5571328.4225 2998751.0358 NEW ARP @ 2018.4897  
XYZ 766680.5022 -5571328.4225 2998751.0358 NEW MON @ 2018.4897  
LLH 28 13 39.34290 277 50 7.30647 -1.3998 NEW L1 PHS CEN @ 2018.4897  
LLH 28 13 39.34290 277 50 7.30650 -1.5240 NEW ARP @ 2018.4897  
LLH 28 13 39.34290 277 50 7.30650 -1.5240 NEW MON @ 2018.4897

STATION NAME: flwe a 1 (Wedgfield FL; Wedgfield, Florida USA)

MONUMENT: NO DOMES NUMBER

XYZ 869051.5075 -5544931.6670 3019536.5449 MON @ 2005.0000 (M)  
XYZ -0.0120 -0.0007 0.0021 VEL (M/YR)  
NEU 0.0000 0.0000 0.0000 MON TO ARP (M)  
NEU 0.0013 -0.0007 0.0888 ARP TO L1 PHASE CENTER (M)  
NEU 0.0005 0.0002 0.0818 ARP TO L2 PHASE CENTER (M)  
XYZ -0.1619 -0.0094 0.0283 VEL TIMES 13.4890 YRS  
XYZ 0.0000 0.0000 0.0000 MON TO ARP  
XYZ 0.0113 -0.0767 0.0434 ARP TO L1 PHASE CENTER  
XYZ 869051.3569 -5544931.7531 3019536.6167 L1 PHS CEN @ 2018.4897  
XYZ 0.0000 -0.0000 -0.0000 + XYZ ADJUSTMENTS  
XYZ 869051.3570 -5544931.7532 3019536.6166 NEW L1 PHS CEN @ 2018.4897  
XYZ 869051.3457 -5544931.6765 3019536.5732 NEW ARP @ 2018.4897  
XYZ 869051.3457 -5544931.6765 3019536.5732 NEW MON @ 2018.4897  
LLH 28 26 26.49879 278 54 26.80295 -4.9944 NEW L1 PHS CEN @ 2018.4897  
LLH 28 26 26.49874 278 54 26.80297 -5.0832 NEW ARP @ 2018.4897  
LLH 28 26 26.49874 278 54 26.80297 -5.0832 NEW MON @ 2018.4897

STATION NAME: wach a 1 (Wauchula; Wauchula, Florida, U.S.A.)

MONUMENT: NO DOMES NUMBER

XYZ 799335.5101 -5604081.2834 2928868.5861 MON @ 2005.0000 (M)  
XYZ -0.0117 0.0017 0.0004 VEL (M/YR)  
NEU 0.0000 0.0000 0.0000 MON TO ARP (M)  
NEU 0.0001 -0.0008 0.1242 ARP TO L1 PHASE CENTER (M)  
NEU -0.0000 -0.0008 0.1337 ARP TO L2 PHASE CENTER (M)



|     |                |               |              |                            |
|-----|----------------|---------------|--------------|----------------------------|
| XYZ | -0.1584        | 0.0224        | 0.0053       | VEL TIMES 13.4889 YRS      |
| XYZ | 0.0000         | 0.0000        | 0.0000       | MON TO ARP                 |
| XYZ | 0.0148         | -0.1091       | 0.0575       | ARP TO L1 PHASE CENTER     |
| XYZ | 799335.3665    | -5604081.3702 | 2928868.6489 | L1 PHS CEN @ 2018.4897     |
| XYZ | 0.0000         | 0.0000        | 0.0000       | + XYZ ADJUSTMENTS          |
| XYZ | 799335.3665    | -5604081.3702 | 2928868.6489 | NEW L1 PHS CEN @ 2018.4897 |
| XYZ | 799335.3518    | -5604081.2611 | 2928868.5914 | NEW ARP @ 2018.4897        |
| XYZ | 799335.3518    | -5604081.2611 | 2928868.5914 | NEW MON @ 2018.4897        |
| LLH | 27 30 51.06279 | 278 7 3.36296 | 9.2623       | NEW L1 PHS CEN @ 2018.4897 |
| LLH | 27 30 51.06279 | 278 7 3.36299 | 9.1381       | NEW ARP @ 2018.4897        |
| LLH | 27 30 51.06279 | 278 7 3.36299 | 9.1381       | NEW MON @ 2018.4897        |

#### REMOTE STATION INFORMATION

STATION NAME: 2534 1

MONUMENT: NO DOMES NUMBER

|     |             |               |              |                            |
|-----|-------------|---------------|--------------|----------------------------|
| XYZ | 831066.2144 | -5568735.2773 | 2986468.2394 | MON @ 2018.4892 (M)        |
| NEU | -0.0008     | -0.0011       | 1.9964       | MON TO ARP (M)             |
| NEU | 0.0008      | 0.0011        | 0.0748       | ARP TO L1 PHASE CENTER (M) |
| NEU | 0.0001      | -0.0022       | 0.0772       | ARP TO L2 PHASE CENTER (M) |
| XYZ | 0.2589      | -1.7423       | 0.9397       | MON TO ARP                 |
| XYZ | 0.0108      | -0.0648       | 0.0359       | ARP TO L1 PHASE CENTER     |
| XYZ | 831066.4841 | -5568737.0844 | 2986469.2151 | L1 PHS CEN @ 2018.4897     |

BASELINE NAME: zefr 2534

|     |              |                 |              |                            |
|-----|--------------|-----------------|--------------|----------------------------|
| XYZ | -0.0498      | 0.0839          | -0.0963      | + XYZ ADJUSTMENTS          |
| XYZ | 831066.4343  | -5568737.0005   | 2986469.1188 | NEW L1 PHS CEN @ 2018.4897 |
| XYZ | 831066.4235  | -5568736.9358   | 2986469.0828 | NEW ARP @ 2018.4897        |
| XYZ | 831066.1646  | -5568735.1934   | 2986468.1431 | NEW MON @ 2018.4897        |
| LLH | 28 6 6.78756 | 278 29 16.99710 | -1.6479      | NEW L1 PHS CEN @ 2018.4897 |
| LLH | 28 6 6.78753 | 278 29 16.99706 | -1.7228      | NEW ARP @ 2018.4897        |
| LLH | 28 6 6.78756 | 278 29 16.99710 | -3.7192      | NEW MON @ 2018.4897        |

BASELINE NAME: flwe 2534

|     |              |                 |              |                            |
|-----|--------------|-----------------|--------------|----------------------------|
| XYZ | -0.0589      | 0.1103          | -0.0978      | + XYZ ADJUSTMENTS          |
| XYZ | 831066.4252  | -5568736.9741   | 2986469.1172 | NEW L1 PHS CEN @ 2018.4897 |
| XYZ | 831066.4144  | -5568736.9093   | 2986469.0813 | NEW ARP @ 2018.4897        |
| XYZ | 831066.1555  | -5568735.1670   | 2986468.1416 | NEW MON @ 2018.4897        |
| LLH | 28 6 6.78793 | 278 29 16.99692 | -1.6729      | NEW L1 PHS CEN @ 2018.4897 |
| LLH | 28 6 6.78791 | 278 29 16.99687 | -1.7477      | NEW ARP @ 2018.4897        |
| LLH | 28 6 6.78793 | 278 29 16.99692 | -3.7442      | NEW MON @ 2018.4897        |

BASELINE NAME: wach 2534

|     |              |                 |              |                            |
|-----|--------------|-----------------|--------------|----------------------------|
| XYZ | -0.0506      | 0.1175          | -0.0995      | + XYZ ADJUSTMENTS          |
| XYZ | 831066.4335  | -5568736.9669   | 2986469.1156 | NEW L1 PHS CEN @ 2018.4897 |
| XYZ | 831066.4227  | -5568736.9021   | 2986469.0796 | NEW ARP @ 2018.4897        |
| XYZ | 831066.1638  | -5568735.1598   | 2986468.1399 | NEW MON @ 2018.4897        |
| LLH | 28 6 6.78798 | 278 29 16.99725 | -1.6789      | NEW L1 PHS CEN @ 2018.4897 |
| LLH | 28 6 6.78795 | 278 29 16.99721 | -1.7537      | NEW ARP @ 2018.4897        |
| LLH | 28 6 6.78798 | 278 29 16.99725 | -3.7502      | NEW MON @ 2018.4897        |

Axx2018 628 18 628

B2018 62813 6 18 6282238 1 page5 v1603.24IGS 126 1 2 27NGS 2018 719IFDDPX  
IIGS08\_1930 IGS 20170101  
C00090002 -643856624 9 -25932291 29 122828927 16 X1798A2534X1798AZEFR  
D 1 2 -4969291 1 3 4272297 2 3 -9451524

Axx2018 628 18 628

B2018 62813 6 18 6282238 1 page5 v1603.24IGS 126 1 2 27NGS 2018 719IFDDPX  
IIGS08\_1930 IGS 20170101  
C00090005 379851902 9 238034905 29 330684316 17 X1798A2534X1798AFLWE  
D 1 2 -6085200 1 3 7240385 2 3 -9023733

Axx2018 628 18 628

B2018 62813 6 18 6282238 1 page5 v1603.24IGS 126 1 2 27NGS 2018 719IFDDPX  
IIGS08\_1930 IGS 20170101  
C00090003 -317308120 7 -353461013 29 -575995485 15 X1798A2534X1798AWACH  
D 1 2 -5923173 1 3 7023006 2 3 -8442963

#### POST-FIT RMS BY SATELLITE VS. BASELINE

|           | OVERALL | 01    | 02    | 03    | 05    | 06    | 07    | 08    | 09    |
|-----------|---------|-------|-------|-------|-------|-------|-------|-------|-------|
| zefr-2534 | 0.026   | 0.037 | 0.017 | 0.029 | 0.018 | 0.021 | 0.024 | 0.040 | 0.019 |
|           | 11      | 12    | 13    | 16    | 17    | 18    | 19    | 22    | 23    |
| zefr-2534 | 0.029   | 0.018 | 0.034 | 0.016 | 0.037 | 0.028 | 0.020 | 0.044 | 0.014 |
|           | 24      | 25    | 27    | 28    | 29    | 30    |       |       |       |
| zefr-2534 | 0.025   | 0.011 | 0.013 | 0.025 | ...   | 0.033 |       |       |       |

|           | OVERALL | 01    | 02    | 03    | 05    | 06    | 07    | 08    | 09    |
|-----------|---------|-------|-------|-------|-------|-------|-------|-------|-------|
| flwe-2534 | 0.025   | 0.029 | 0.018 | 0.041 | 0.018 | 0.023 | 0.019 | 0.044 | 0.020 |
|           | 11      | 12    | 13    | 16    | 17    | 18    | 19    | 22    | 23    |
| flwe-2534 | 0.026   | 0.020 | 0.027 | 0.016 | 0.023 | 0.028 | 0.033 | 0.038 | 0.014 |
|           | 24      | 25    | 27    | 28    | 29    | 30    |       |       |       |
| flwe-2534 | 0.039   | 0.018 | 0.014 | 0.023 | ...   | 0.024 |       |       |       |

|           | OVERALL | 01    | 02    | 03    | 05    | 06    | 07    | 08    | 09    |
|-----------|---------|-------|-------|-------|-------|-------|-------|-------|-------|
| wach-2534 | 0.022   | 0.023 | 0.020 | 0.030 | 0.017 | 0.019 | 0.017 | 0.021 | 0.014 |
|           | 11      | 12    | 13    | 16    | 17    | 18    | 19    | 22    | 23    |
| wach-2534 | 0.021   | 0.026 | 0.042 | 0.014 | 0.022 | 0.019 | 0.023 | 0.052 | 0.015 |
|           | 24      | 25    | 27    | 28    | 29    | 30    |       |       |       |
| wach-2534 | 0.033   | 0.020 | 0.015 | 0.027 | ...   | 0.025 |       |       |       |

#### OBS BY SATELLITE VS. BASELINE

|           | OVERALL | 01  | 02  | 03  | 05  | 06  | 07  | 08  | 09  |
|-----------|---------|-----|-----|-----|-----|-----|-----|-----|-----|
| zefr-2534 | 7930    | 540 | 480 | 338 | 290 | 637 | 584 | 31  | 427 |
|           | 11      | 12  | 13  | 16  | 17  | 18  | 19  | 22  | 23  |
| zefr-2534 | 559     | 363 | 69  | 43  | 133 | 455 | 595 | 194 | 212 |
|           | 24      | 25  | 27  | 28  | 29  | 30  |     |     |     |
| zefr-2534 | 185     | 124 | 183 | 829 | ... | 659 |     |     |     |

|           | OVERALL | 01  | 02  | 03  | 05  | 06  | 07  | 08  | 09  |
|-----------|---------|-----|-----|-----|-----|-----|-----|-----|-----|
| flwe-2534 | 8220    | 554 | 484 | 366 | 284 | 639 | 561 | 75  | 461 |
|           | 11      | 12  | 13  | 16  | 17  | 18  | 19  | 22  | 23  |
| flwe-2534 | 603     | 351 | 140 | 84  | 144 | 486 | 618 | 273 | 198 |



```

      24  25  27  28  29  30
flwe-2534| 188 120 206 795 ... 590
      OVERALL 01 02 03 05 06 07 08 09
wach-2534| 7724 494 501 312 286 638 553 55 310
      11 12 13 16 17 18 19 22 23
wach-2534| 556 364 80 59 148 472 628 51 210
      24 25 27 28 29 30
wach-2534| 230 144 177 802 ... 654

```

ITRF position of 2534 as determined by individual baselines

|      | X          | Y            | Z           |
|------|------------|--------------|-------------|
| zefr | 831066.165 | -5568735.193 | 2986468.143 |
| flwe | 831066.155 | -5568735.167 | 2986468.142 |
| wach | 831066.164 | -5568735.160 | 2986468.140 |

Residuals of position determined by individual baselines from the final position

|      | X      | Y      | Z      | East   | North  | Up     |
|------|--------|--------|--------|--------|--------|--------|
| zefr | 0.003  | -0.020 | 0.002  | 0.000  | -0.008 | 0.019  |
| flwe | -0.006 | 0.006  | 0.000  | -0.005 | 0.003  | -0.006 |
| wach | 0.002  | 0.014  | -0.002 | 0.004  | 0.005  | -0.012 |

Covariance Matrix for the xyz OPUS Position (meters^2).

|               |               |               |
|---------------|---------------|---------------|
| 0.0000007244  | -0.0000001384 | 0.0000000660  |
| -0.0000001384 | 0.0000074733  | -0.0000003700 |
| 0.0000000660  | -0.0000003700 | 0.0000021444  |

Covariance Matrix for the enu OPUS Position (meters^2).

|               |               |               |
|---------------|---------------|---------------|
| 0.0000008311  | 0.0000004091  | -0.0000007484 |
| 0.0000004091  | 0.0000029801  | -0.0000019511 |
| -0.0000007484 | -0.0000019511 | 0.0000065311  |

Horizontal network accuracy = 0.00356 meters.

Vertical network accuracy = 0.00501 meters.

Derivation of NAD 83 vector components

Position of reference station ARP in NAD\_83(2011)(EPOCH:2010.0000).

|      | Xa(m)        | Ya(m)          | Za(m)         |
|------|--------------|----------------|---------------|
| ZEFR | 766681.32093 | -5571329.99195 | 2998751.20655 |
| FLWE | 869052.16380 | -5544933.23814 | 3019536.73114 |
| WACH | 799336.16446 | -5604082.84993 | 2928868.77127 |

Position of reference station monument in NAD\_83(2011)(EPOCH:2010.0000).

|      | Xr(m)        | Yr(m)          | Zr(m)         |
|------|--------------|----------------|---------------|
| ZEFR | 766681.32093 | -5571329.99195 | 2998751.20655 |
| FLWE | 869052.16380 | -5544933.23814 | 3019536.73114 |
| WACH | 799336.16446 | -5604082.84993 | 2928868.77127 |

Velocity of reference station monument in NAD\_83(2011)(EPOCH:2010.0000).

| Vx (m/yr) | Vy (m/yr) | Vz (m/yr) |
|-----------|-----------|-----------|
|-----------|-----------|-----------|

|      |          |          |         |
|------|----------|----------|---------|
| ZEFR | -0.01230 | 0.00050  | 0.00100 |
| FLWE | -0.01200 | -0.00070 | 0.00210 |
| WACH | -0.01170 | 0.00170  | 0.00040 |

Vectors from unknown station monument to reference station monument  
in NAD\_83(2011)(EPOCH:2010.0000).

Xr-X= DX(m) Yr-Y= DY(m) Zr-Z= DZ(m)

|      |              |              |              |         |
|------|--------------|--------------|--------------|---------|
| ZEFR | -64385.65507 | -2593.25595  | 12282.90155  | 2010.00 |
| FLWE | 37985.18780  | 23803.49786  | 33068.42614  | 2010.00 |
| WACH | -31730.81154 | -35346.11393 | -57599.53373 | 2010.00 |

STATE PLANE COORDINATES - U.S. Survey Foot

SPC (0901 FL E)

|                       |             |
|-----------------------|-------------|
| Northing (Y) [feet]   | 1370090.846 |
| Easting (X) [feet]    | 491123.388  |
| Convergence [degrees] | -0.24115000 |
| Point Scale           | 0.99997240  |
| Combined Factor       | 0.99997274  |

\*\*\*\*\* New Reference Frame Preview \*\*\*\*\*

We are replacing the nation's NAD 83 and NAVD 88 datums, to improve access and accuracy of the National Spatial Reference System. More at <https://geodesy.noaa.gov/datums/newdatums/>

Below are approximate coordinates for this solution in the new frames:

APPROX ORTHO HGT: 25.123 (m) [PROTOTYPE (Computed using xGeoid17B,GRS80,IGS08)]

This position and the above vector components were computed without any knowledge by the National Geodetic Survey regarding the equipment or field operating procedures used.



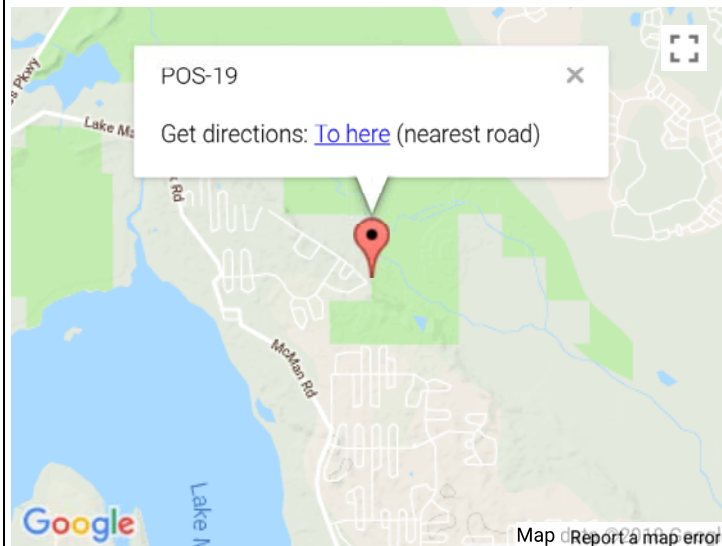
## Shared Solution

**PID:** BBGB33**Designation:** POS-19**Stamping:** POS-19**Stability:** May hold, commonly subject to ground movement**Setting:** Set in top of concrete monument

**Description:** From the intersection of Poinciana Pkwy and Lk Marion Creek Dr North on Lk Marion Creek Dr for 3 Mi to Caspian Rd East on Caspian Rd for 0.5 Mi to Baltic Dr. North on Baltic Dr. for 0.15 Mi to the intersection of Baltic Dr. North on dirt drive 150 ft. to gate thru gate on dirt trail North then East 1,000 ft then northwesterly and north 1,900 feet to mark on right

**Observed:** 2018-06-28T13:28:00Z**Source:** OPUS - page5 1603.24**Close-up View**

| REF_FRAME:                               | EPOCH:    | SOURCE:                                       | UNITS: | SET     | DETAILS |
|------------------------------------------|-----------|-----------------------------------------------|--------|---------|---------|
| NAD_83(2011)                             | 2010.0000 | NAVD88 (Computed using GEOID12B)              | m      | PROFILE |         |
| <b>LAT:</b> 28° 6' 16.57919" ± 0.016 m   |           | <b>UTM 17 SPC 901(FL E)</b>                   |        |         |         |
| <b>LON:</b> -81° 30' 57.86298" ± 0.011 m |           | <b>NORTHING:</b> 3108897.677m 417908.284m     |        |         |         |
| <b>ELL HT:</b> -2.614 ± 0.060 m          |           | <b>EASTING:</b> 449307.096m 149289.794m       |        |         |         |
| <b>X:</b> 830644.166 ± 0.002 m           |           | <b>CONVERGENCE:</b> -0.24311944° -0.24311944° |        |         |         |
| <b>Y:</b> -5568655.582 ± 0.062 m         |           | <b>POINT SCALE:</b> 0.99963172 0.99997290     |        |         |         |
| <b>Z:</b> 2986734.548 ± 0.015 m          |           | <b>COMBINED FACTOR:</b> 0.99963213 0.99997331 |        |         |         |
| <b>ORTHO HT:</b> 24.718 ± 0.065 m        |           |                                               |        |         |         |

**CONTRIBUTED BY**[sgrymko](#)[Pickett & Associates, Inc.](#)**Horizon View**

The numerical values for this position solution have satisfied the quality control criteria of the National Geodetic Survey. The contributor has verified that the information submitted is accurate and complete.

# LAKE MARION CREEK WELL POS-19

FILE: 69161790.DAT OP1532023873896

## NGS OPUS SOLUTION REPORT

=====

All computed coordinate accuracies are listed as peak-to-peak values.

For additional information: <https://www.ngs.noaa.gov/OPUS/about.jsp#accuracy>

USER: [sgrymko@pickettusa.com](mailto:sgrymko@pickettusa.com) DATE: July 19, 2018  
RINEX FILE: 6916179n.18o TIME: 18:12:36 UTC

SOFTWARE: page5 1603.24 master95.pl 160321 START: 2018/06/28 13:28:00  
EPHEMERIS: igs20074.eph [precise] STOP: 2018/06/28 22:43:00  
NAV FILE: brdc1790.18n OBS USED: 20548 / 24746 : 83%  
ANT NAME: TRM5800 NONE # FIXED AMB: 173 / 196 : 88%  
ARP HEIGHT: 1.9964 OVERALL RMS: 0.026(m)

REF FRAME: NAD\_83(2011)(EPOCH:2010.0000) IGS08 (EPOCH:2018.4897)

|    |                 |          |                 |          |
|----|-----------------|----------|-----------------|----------|
| X: | 830644.166(m)   | 0.002(m) | 830643.351(m)   | 0.002(m) |
| Y: | -5568655.582(m) | 0.062(m) | -5568654.019(m) | 0.062(m) |
| Z: | 2986734.548(m)  | 0.015(m) | 2986734.385(m)  | 0.015(m) |

|            |                |                                             |                |          |
|------------|----------------|---------------------------------------------|----------------|----------|
| LAT:       | 28 6 16.57919  | 0.016(m)                                    | 28 6 16.60000  | 0.016(m) |
| E LON:     | 278 29 2.13702 | 0.011(m)                                    | 278 29 2.11592 | 0.011(m) |
| W LON:     | 81 30 57.86298 | 0.011(m)                                    | 81 30 57.88408 | 0.011(m) |
| EL HGT:    | -2.614(m)      | 0.060(m)                                    | -4.160(m)      | 0.060(m) |
| ORTHO HGT: | 24.718(m)      | 0.065(m) [NAVD88 (Computed using GEOID12B)] |                |          |

EL. 81.10 ft

### UTM COORDINATES STATE PLANE COORDINATES

|                       | UTM (Zone 17) | SPC (0901 FL E) |
|-----------------------|---------------|-----------------|
| Northing (Y) [meters] | 3108897.677   | 417908.284      |
| Easting (X) [meters]  | 449307.096    | 149289.794      |
| Convergence [degrees] | -0.24311944   | -0.24311944     |
| Point Scale           | 0.99963172    | 0.99997290      |
| Combined Factor       | 0.99963213    | 0.99997331      |

|                 |
|-----------------|
| Y=1371087.43 ft |
| X= 489794.93 ft |

US NATIONAL GRID DESIGNATOR: 17RMM4930708897(NAD 83)

### BASE STATIONS USED

| PID    | DESIGNATION                 | LATITUDE    | LONGITUDE    | DISTANCE(m) |
|--------|-----------------------------|-------------|--------------|-------------|
| DF7990 | ZEFR ZEPHYRHILLS CORS ARP   | N281339.322 | W0820952.671 | 65136.8     |
| DQ7965 | FLWE WEDGEFIELD FL CORS ARP | N282626.477 | W0810533.176 | 55802.4     |
| DH3757 | WACH WAUCHULA CORS ARP      | N273051.042 | W0815256.615 | 74724.4     |



NEAREST NGS PUBLISHED CONTROL POINT  
DN9717 T 739 N2804000038 W08132000042 4145.9

BASE STATION INFORMATION

STATION NAME: zefr a 2 (ZEPHYRHILLS; Zephyrhills, Florida, U.S.A.)

MONUMENT: 49526S001

XYZ 766680.6677 -5571328.4297 2998751.0226 MON @ 2005.0000 (M)  
XYZ -0.0123 0.0005 0.0010 VEL (M/YR)  
NEU 0.0000 0.0000 0.0000 MON TO ARP (M)  
NEU 0.0001 -0.0008 0.1242 ARP TO L1 PHASE CENTER (M)  
NEU -0.0000 -0.0008 0.1337 ARP TO L2 PHASE CENTER (M)  
XYZ -0.1655 0.0072 0.0132 VEL TIMES 13.4890 YRS  
XYZ 0.0000 0.0000 0.0000 MON TO ARP  
XYZ 0.0142 -0.1085 0.0589 ARP TO L1 PHASE CENTER  
XYZ 766680.5163 -5571328.5310 2998751.0947 L1 PHS CEN @ 2018.4897  
XYZ -0.0000 -0.0000 -0.0000 + XYZ ADJUSTMENTS  
XYZ 766680.5163 -5571328.5310 2998751.0947 NEW L1 PHS CEN @ 2018.4897  
XYZ 766680.5022 -5571328.4225 2998751.0358 NEW ARP @ 2018.4897  
XYZ 766680.5022 -5571328.4225 2998751.0358 NEW MON @ 2018.4897  
LLH 28 13 39.34290 277 50 7.30647 -1.3998 NEW L1 PHS CEN @ 2018.4897  
LLH 28 13 39.34290 277 50 7.30650 -1.5240 NEW ARP @ 2018.4897  
LLH 28 13 39.34290 277 50 7.30650 -1.5240 NEW MON @ 2018.4897

STATION NAME: flwe a 1 (Wedgfield FL; Wedgfield, Florida USA)

MONUMENT: NO DOMES NUMBER

XYZ 869051.5075 -5544931.6670 3019536.5449 MON @ 2005.0000 (M)  
XYZ -0.0120 -0.0007 0.0021 VEL (M/YR)  
NEU 0.0000 0.0000 0.0000 MON TO ARP (M)  
NEU 0.0013 -0.0007 0.0888 ARP TO L1 PHASE CENTER (M)  
NEU 0.0005 0.0002 0.0818 ARP TO L2 PHASE CENTER (M)  
XYZ -0.1619 -0.0094 0.0283 VEL TIMES 13.4890 YRS  
XYZ 0.0000 0.0000 0.0000 MON TO ARP  
XYZ 0.0113 -0.0767 0.0434 ARP TO L1 PHASE CENTER  
XYZ 869051.3569 -5544931.7531 3019536.6167 L1 PHS CEN @ 2018.4897  
XYZ 0.0001 0.0000 0.0001 + XYZ ADJUSTMENTS  
XYZ 869051.3571 -5544931.7531 3019536.6167 NEW L1 PHS CEN @ 2018.4897  
XYZ 869051.3457 -5544931.6764 3019536.5733 NEW ARP @ 2018.4897  
XYZ 869051.3457 -5544931.6764 3019536.5733 NEW MON @ 2018.4897  
LLH 28 26 26.49879 278 54 26.80295 -4.9944 NEW L1 PHS CEN @ 2018.4897  
LLH 28 26 26.49875 278 54 26.80298 -5.0832 NEW ARP @ 2018.4897  
LLH 28 26 26.49875 278 54 26.80298 -5.0832 NEW MON @ 2018.4897

STATION NAME: wach a 1 (Wauchula; Wauchula, Florida, U.S.A.)

MONUMENT: NO DOMES NUMBER

XYZ 799335.5101 -5604081.2834 2928868.5861 MON @ 2005.0000 (M)  
XYZ -0.0117 0.0017 0.0004 VEL (M/YR)  
NEU 0.0000 0.0000 0.0000 MON TO ARP (M)  
NEU 0.0001 -0.0008 0.1242 ARP TO L1 PHASE CENTER (M)  
NEU -0.0000 -0.0008 0.1337 ARP TO L2 PHASE CENTER (M)

|     |                |               |              |                            |
|-----|----------------|---------------|--------------|----------------------------|
| XYZ | -0.1584        | 0.0224        | 0.0053       | VEL TIMES 13.4890 YRS      |
| XYZ | 0.0000         | 0.0000        | 0.0000       | MON TO ARP                 |
| XYZ | 0.0148         | -0.1091       | 0.0575       | ARP TO L1 PHASE CENTER     |
| XYZ | 799335.3665    | -5604081.3702 | 2928868.6489 | L1 PHS CEN @ 2018.4897     |
| XYZ | 0.0000         | 0.0000        | -0.0000      | + XYZ ADJUSTMENTS          |
| XYZ | 799335.3665    | -5604081.3702 | 2928868.6489 | NEW L1 PHS CEN @ 2018.4897 |
| XYZ | 799335.3518    | -5604081.2611 | 2928868.5914 | NEW ARP @ 2018.4897        |
| XYZ | 799335.3518    | -5604081.2611 | 2928868.5914 | NEW MON @ 2018.4897        |
| LLH | 27 30 51.06279 | 278 7 3.36296 | 9.2623       | NEW L1 PHS CEN @ 2018.4897 |
| LLH | 27 30 51.06279 | 278 7 3.36299 | 9.1381       | NEW ARP @ 2018.4897        |
| LLH | 27 30 51.06279 | 278 7 3.36299 | 9.1381       | NEW MON @ 2018.4897        |

#### REMOTE STATION INFORMATION

STATION NAME: 6916 1

MONUMENT: NO DOMES NUMBER

|     |             |               |              |                            |
|-----|-------------|---------------|--------------|----------------------------|
| XYZ | 830643.3721 | -5568654.1819 | 2986734.5099 | MON @ 2018.4892 (M)        |
| NEU | -0.0008     | -0.0011       | 1.9964       | MON TO ARP (M)             |
| NEU | 0.0008      | 0.0011        | 0.0748       | ARP TO L1 PHASE CENTER (M) |
| NEU | 0.0001      | -0.0022       | 0.0773       | ARP TO L2 PHASE CENTER (M) |
| XYZ | 0.2587      | -1.7423       | 0.9398       | MON TO ARP                 |
| XYZ | 0.0108      | -0.0648       | 0.0359       | ARP TO L1 PHASE CENTER     |
| XYZ | 830643.6417 | -5568655.9890 | 2986735.4857 | L1 PHS CEN @ 2018.4897     |

BASELINE NAME: zefr 6916

|     |               |                |              |                            |
|-----|---------------|----------------|--------------|----------------------------|
| XYZ | -0.0220       | 0.1354         | -0.1186      | + XYZ ADJUSTMENTS          |
| XYZ | 830643.6196   | -5568655.8536  | 2986735.3670 | NEW L1 PHS CEN @ 2018.4897 |
| XYZ | 830643.6088   | -5568655.7888  | 2986735.3311 | NEW ARP @ 2018.4897        |
| XYZ | 830643.3501   | -5568654.0465  | 2986734.3913 | NEW MON @ 2018.4897        |
| LLH | 28 6 16.59977 | 278 29 2.11575 | -2.0621      | NEW L1 PHS CEN @ 2018.4897 |
| LLH | 28 6 16.59975 | 278 29 2.11571 | -2.1370      | NEW ARP @ 2018.4897        |
| LLH | 28 6 16.59977 | 278 29 2.11575 | -4.1334      | NEW MON @ 2018.4897        |

BASELINE NAME: flwe 6916

|     |               |                |              |                            |
|-----|---------------|----------------|--------------|----------------------------|
| XYZ | -0.0199       | 0.1559         | -0.1221      | + XYZ ADJUSTMENTS          |
| XYZ | 830643.6218   | -5568655.8331  | 2986735.3636 | NEW L1 PHS CEN @ 2018.4897 |
| XYZ | 830643.6110   | -5568655.7683  | 2986735.3276 | NEW ARP @ 2018.4897        |
| XYZ | 830643.3522   | -5568654.0260  | 2986734.3878 | NEW MON @ 2018.4897        |
| LLH | 28 6 16.59998 | 278 29 2.11594 | -2.0814      | NEW L1 PHS CEN @ 2018.4897 |
| LLH | 28 6 16.59996 | 278 29 2.11590 | -2.1562      | NEW ARP @ 2018.4897        |
| LLH | 28 6 16.59998 | 278 29 2.11594 | -4.1527      | NEW MON @ 2018.4897        |

BASELINE NAME: wach 6916

|     |               |                |              |                            |
|-----|---------------|----------------|--------------|----------------------------|
| XYZ | -0.0203       | 0.1971         | -0.1332      | + XYZ ADJUSTMENTS          |
| XYZ | 830643.6214   | -5568655.7919  | 2986735.3525 | NEW L1 PHS CEN @ 2018.4897 |
| XYZ | 830643.6106   | -5568655.7271  | 2986735.3165 | NEW ARP @ 2018.4897        |
| XYZ | 830643.3518   | -5568653.9848  | 2986734.3767 | NEW MON @ 2018.4897        |
| LLH | 28 6 16.60029 | 278 29 2.11614 | -2.1226      | NEW L1 PHS CEN @ 2018.4897 |
| LLH | 28 6 16.60026 | 278 29 2.11610 | -2.1974      | NEW ARP @ 2018.4897        |
| LLH | 28 6 16.60029 | 278 29 2.11614 | -4.1939      | NEW MON @ 2018.4897        |



Axx2018 628 18 628

B2018 6281328 18 6282242 1 page5 v1603.24IGS 126 1 2 27NGS 2018 719IFDDPX  
IIGS08\_1930 IGS 20170101  
C00090002 -639628479 9 -26743760 32 120166445 19 X1798A6916X1798AZEFR  
D 1 2 -3912433 1 3 3345150 2 3 -9497349

Axx2018 628 18 628

B2018 6281328 18 6282242 1 page5 v1603.24IGS 126 1 2 27NGS 2018 719IFDDPX  
IIGS08\_1930 IGS 20170101  
C00090005 384079935 8 237223496 33 328021855 18 X1798A6916X1798AFLWE  
D 1 2 -4974065 1 3 6246057 2 3 -8988974

Axx2018 628 18 628

B2018 6281328 18 6282242 1 page5 v1603.24IGS 126 1 2 27NGS 2018 719IFDDPX  
IIGS08\_1930 IGS 20170101  
C00090003 -313080000 8 -354272763 37 -578657853 20 X1798A6916X1798AWACH  
D 1 2 -6048974 1 3 7035690 2 3 -8711732

#### POST-FIT RMS BY SATELLITE VS. BASELINE

| OVERALL   | 01    | 02    | 03    | 05    | 06    | 07    | 08    | 09    |       |
|-----------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| zefr-6916 | 0.025 | 0.036 | 0.018 | 0.029 | 0.020 | 0.024 | 0.021 | ...   | 0.016 |
|           | 11    | 12    | 13    | 16    | 17    | 18    | 19    | 22    | 23    |
| zefr-6916 | 0.024 | 0.020 | ...   | ...   | 0.031 | 0.027 | 0.024 | 0.034 | 0.017 |
|           | 24    | 25    | 27    | 28    | 29    | 30    |       |       |       |
| zefr-6916 | 0.026 | 0.020 | 0.013 | 0.028 | 0.024 | 0.030 |       |       |       |

| OVERALL   | 01    | 02    | 03    | 05    | 06    | 07    | 08    | 09    |       |
|-----------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| flwe-6916 | 0.027 | 0.030 | 0.031 | 0.038 | 0.019 | 0.024 | 0.020 | 0.034 | 0.021 |
|           | 11    | 12    | 13    | 16    | 17    | 18    | 19    | 22    | 23    |
| flwe-6916 | 0.022 | 0.022 | ...   | ...   | 0.026 | 0.020 | 0.034 | 0.039 | 0.014 |
|           | 24    | 25    | 27    | 28    | 29    | 30    |       |       |       |
| flwe-6916 | 0.033 | 0.021 | 0.015 | 0.029 | ...   | 0.026 |       |       |       |

| OVERALL   | 01    | 02    | 03    | 05    | 06    | 07    | 08    | 09    |       |
|-----------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| wach-6916 | 0.025 | 0.032 | 0.023 | 0.028 | 0.019 | 0.022 | 0.018 | 0.011 | 0.020 |
|           | 11    | 12    | 13    | 16    | 17    | 18    | 19    | 22    | 23    |
| wach-6916 | 0.021 | 0.028 | 0.038 | ...   | 0.018 | 0.019 | 0.026 | 0.038 | 0.019 |
|           | 24    | 25    | 27    | 28    | 29    | 30    |       |       |       |
| wach-6916 | 0.034 | 0.021 | 0.017 | 0.030 | 0.030 | 0.028 |       |       |       |

#### OBS BY SATELLITE VS. BASELINE

| OVERALL   | 01   | 02  | 03  | 05  | 06  | 07  | 08  | 09  |     |
|-----------|------|-----|-----|-----|-----|-----|-----|-----|-----|
| zefr-6916 | 6931 | 419 | 452 | 303 | 273 | 637 | 508 | ... | 253 |
|           | 11   | 12  | 13  | 16  | 17  | 18  | 19  | 22  | 23  |
| zefr-6916 | 462  | 371 | ... | ... | 137 | 363 | 675 | 114 | 125 |
|           | 24   | 25  | 27  | 28  | 29  | 30  |     |     |     |
| zefr-6916 | 152  | 152 | 144 | 731 | 26  | 634 |     |     |     |

| OVERALL   | 01   | 02  | 03  | 05  | 06  | 07  | 08  | 09  |     |
|-----------|------|-----|-----|-----|-----|-----|-----|-----|-----|
| flwe-6916 | 7011 | 431 | 500 | 262 | 273 | 658 | 511 | 29  | 331 |
|           | 11   | 12  | 13  | 16  | 17  | 18  | 19  | 22  | 23  |
| flwe-6916 | 474  | 343 | ... | ... | 150 | 388 | 612 | 210 | 124 |

|           |         |     |     |     |     |     |            |
|-----------|---------|-----|-----|-----|-----|-----|------------|
|           | 24      | 25  | 27  | 28  | 29  | 30  |            |
| flwe-6916 | 170     | 135 | 150 | 690 | ... | 570 |            |
|           | OVERALL | 01  | 02  | 03  | 05  | 06  | 07 08 09   |
| wach-6916 | 6606    | 393 | 462 | 237 | 284 | 651 | 472 1 257  |
|           | 11      | 12  | 13  | 16  | 17  | 18  | 19 22 23   |
| wach-6916 | 464     | 369 | 5   | ... | 121 | 353 | 655 55 126 |
|           | 24      | 25  | 27  | 28  | 29  | 30  |            |
| wach-6916 | 137     | 111 | 140 | 671 | 21  | 621 |            |

ITRF position of 6916 as determined by individual baselines

|      |            |              |             |
|------|------------|--------------|-------------|
|      | X          | Y            | Z           |
| zefr | 830643.350 | -5568654.047 | 2986734.391 |
| flwe | 830643.352 | -5568654.026 | 2986734.388 |
| wach | 830643.352 | -5568653.985 | 2986734.377 |

Residuals of position determined by individual baselines from the final position

|      |        |        |        |        |        |        |
|------|--------|--------|--------|--------|--------|--------|
|      | X      | Y      | Z      | East   | North  | Up     |
| zefr | -0.001 | -0.027 | 0.006  | -0.005 | -0.007 | 0.027  |
| flwe | 0.001  | -0.007 | 0.003  | -0.000 | -0.001 | 0.007  |
| wach | 0.000  | 0.034  | -0.009 | 0.005  | 0.008  | -0.034 |

Covariance Matrix for the xyz OPUS Position (meters^2).

|               |               |               |
|---------------|---------------|---------------|
| 0.0000008911  | -0.0000001618 | 0.0000000784  |
| -0.0000001618 | 0.0000106533  | -0.0000005538 |
| 0.0000000784  | -0.0000005538 | 0.0000033111  |

Covariance Matrix for the enu OPUS Position (meters^2).

|               |               |               |
|---------------|---------------|---------------|
| 0.0000010564  | 0.0000005913  | -0.0000011236 |
| 0.0000005913  | 0.0000044241  | -0.0000026575 |
| -0.0000011236 | -0.0000026575 | 0.0000093751  |

Horizontal network accuracy = 0.00430 meters.

Vertical network accuracy = 0.00600 meters.

#### Derivation of NAD 83 vector components

Position of reference station ARP in NAD\_83(2011)(EPOCH:2010.0000).

|      |              |                |                       |
|------|--------------|----------------|-----------------------|
|      | Xa(m)        | Ya(m)          | Za(m)                 |
| ZEFR | 766681.32093 | -5571329.99195 | 2998751.20655 2010.00 |
| FLWE | 869052.16380 | -5544933.23814 | 3019536.73114 2010.00 |
| WACH | 799336.16446 | -5604082.84993 | 2928868.77127 2010.00 |

Position of reference station monument in NAD\_83(2011)(EPOCH:2010.0000).

|      |              |                |                       |
|------|--------------|----------------|-----------------------|
|      | Xr(m)        | Yr(m)          | Zr(m)                 |
| ZEFR | 766681.32093 | -5571329.99195 | 2998751.20655 2010.00 |
| FLWE | 869052.16380 | -5544933.23814 | 3019536.73114 2010.00 |
| WACH | 799336.16446 | -5604082.84993 | 2928868.77127 2010.00 |

Velocity of reference station monument in NAD\_83(2011)(EPOCH:2010.0000).

|           |           |           |
|-----------|-----------|-----------|
| Vx (m/yr) | Vy (m/yr) | Vz (m/yr) |
|-----------|-----------|-----------|



|      |          |          |         |
|------|----------|----------|---------|
| ZEFR | -0.01230 | 0.00050  | 0.00100 |
| FLWE | -0.01200 | -0.00070 | 0.00210 |
| WACH | -0.01170 | 0.00170  | 0.00040 |

Vectors from unknown station monument to reference station monument  
in NAD\_83(2011)(EPOCH:2010.0000).

Xr-X= DX(m) Yr-Y= DY(m) Zr-Z= DZ(m)

|      |              |              |              |         |
|------|--------------|--------------|--------------|---------|
| ZEFR | -63962.84507 | -2674.40995  | 12016.65855  | 2010.00 |
| FLWE | 38407.99780  | 23722.34386  | 32802.18314  | 2010.00 |
| WACH | -31308.00154 | -35427.26793 | -57865.77673 | 2010.00 |

STATE PLANE COORDINATES - U.S. Survey Foot

SPC (0901 FL E)

|                       |             |
|-----------------------|-------------|
| Northing (Y) [feet]   | 1371087.428 |
| Easting (X) [feet]    | 489794.932  |
| Convergence [degrees] | -0.24311944 |
| Point Scale           | 0.99997290  |
| Combined Factor       | 0.99997331  |

\*\*\*\*\* New Reference Frame Preview \*\*\*\*\*

We are replacing the nation's NAD 83 and NAVD 88 datums, to improve access and accuracy of the National Spatial Reference System. More at <https://geodesy.noaa.gov/datums/newdatums/>

Below are approximate coordinates for this solution in the new frames:

APPROX ORTHO HGT: 24.700 (m) [PROTOTYPE (Computed using xGeoid17B,GRS80,IGS08)]

This position and the above vector components were computed without any knowledge by the National Geodetic Survey regarding the equipment or field operating procedures used.



33/928

SWIFWIND

18678

LAKE MARION CREEK (E)

RB

2534

LAKE MARION Pos-18 (BRASS DISC)

START TIME 9:05 AM

STOP TIME 6:38 PM

H1 = 6.55

RB

6916

LAKE MARION Pos-19 BRASS DISC

START TIME 9:28 AM

STOP TIME 6:42 PM

H2 = 6.55

6-28-18

THURSDAY

84°

CLEAR

34/1928

BICKEL  
CHAVIS  
PRICE



69/928

SWFWMD

18678

LAKE MARION CREEK

RIO BASE

5006

RIO ROVER

7093

RK FILE-18678-070618

BASE @ 100 (Pos-18)

H1=6.55

FIXED ROD: 6.90

200 CHECK 101 (Pos-19) BRASS DISC

201 CK 204 (Pos-16)

202 CK (Pos-17)

203 LMZ 3.1

204 LMZ 3.2

205 LMZ 3.3

206 CK 205

207 CK 204

208 CK 203

209 CK 203

210 CK 204

211 CK 205

212 LMZ 1.1

213 LMZ 1.2

214 LMZ 1.3

215 CK 214

7-6-18

FRIDAY

70/928

BUCKEL

CHAVIS

REESE

216 CK 213

217 CK 212

218 CK 217

219 CK 216

220 CK 215

221

↓ > TOPO @ Pos-19

228

229 LMZ 2.1

230 LMZ 2.2

231 LMZ 2.3

232 CK 231

233 CK 230

234 CK 229

235 CK 229

236 CK 230

237 CK 231

238 SHEEP

239 CK 238

240 CK 239

241 CK 240

242 GRND SHOT



7/1/928

SWFWMD

18678

LAKE MARION CREEK

Pos-19

| +    | HI     | -    | EL     |
|------|--------|------|--------|
| 7.58 | 88.679 |      |        |
|      |        | 3.57 | 85.109 |
| 7.45 | 88.589 | 7.54 | 81.139 |
|      |        | 7.49 | 81.099 |

NOTE MEASURE DOWN FROM TOP OF  
CASING TO WATER TABLE = 10.23  
WATER ELEV = 74.879

7-1-18

FRIDAY

77°

Cloudy

7/1/928

BICKEL  
CHAIRIS  
REESE

BMEEL

DESC

BRASS DISC @ NW CORNER OF  
CONC PAD (Pos-19)

N. Rim of 4 3/4" METAL CASING  
Pos-19

N. Side of (Pos-19) CONC. PAD

BRASS DISC (Pos-19)



73/928

SWFWMD  
18678  
LAKE MARION CREEK

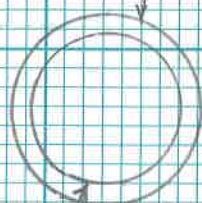
Pos-19



BRASS DISC



8" PVC



4 3/16" METAL CASING

4 3/16" METAL CASING

7-6-18  
FRIDAY

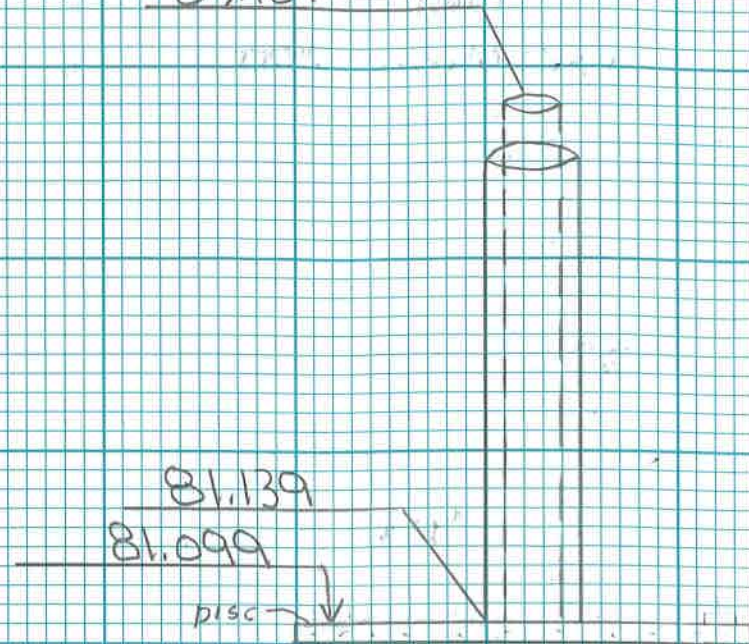
85.109

74/928  
BICKEL  
CHAVIS  
REESE

81.139

81.099

disc





75/928

SWFWMD  
18678  
LAKE MARLOW CREEK

+

HI

-

EL

2.49

84.987

TBM1  
GPS 250

4.29

84.307

4.97

80.017

0.20

81.957

2.55

81.757

TBM2  
GPS 244

0.37

73.747

8.58

73.377

TBM3  
GPS 247

10.43

74.197

9.98

63.767

10.49

83.857

0.83

73.367

7-6-18  
FRIDAY

76/928

BUCKEL  
CHAVIS  
REESE

BMEL

DESC

82.497

BRASS DISC @ S.E. CORNER of  
CONC PAD (Pos-18)

5/8" SRC "REF LB 364"

TURTLE

5/8" SRC "REF LB 364" TBM2

5/8" SRC "REF LB 364" TBM3

TURTLE



77/928

SWFWMD

18678

LAKE MARION CREEK

TSC3 2944

SS

Access File: 18678-070618C

to 247A BS 244A

HI=5.44

BS HI=5.10

ROD=5.00

Bsck=300

301 Ho

302 Bolt 1

303 Bolt 2

304 TOP OF BOARD

305 Bsck

306 CK 302

307 CK 303

306 CK 302

307 CK 303

308 CK 304

309 CK 304

310 Bsck

311 CK 302

312 CK 303

313 CK 304

314 Bsck

7-6-18

FRIDAY

78/928

BICKEL  
CHAVIS  
REESE



79/928

SWEWIND

186.78

LAKE MARION CREEK

ITC FILE: 186.78-070618

243 Bolt 1

244 SET 5/8" SRC "REF LB 364"

245 CK 244

246 CK 244

247 SET 5/8" SRC "REF LB 364"

248 CK 247

249 CK 247

250 SET 5/8" SRC "REF LB 364"

251 CK 250

252 CK 250

253 LMZ SH2

254 CK 253

255 CK 253

256 CMZ SH2

257 CK 256

258 CK 256

259 CK Pos-19

80/928

BICKEL  
CHAVIS  
REESE



81/928

SWFWMD

18678

LAKE MARION CREEK

CONT FROM Pg 75/928

| +    | Hi     | -    | EL     |
|------|--------|------|--------|
| 3.70 | 85.487 | 2.07 | 81.787 |

|  |      |        |
|--|------|--------|
|  | 3.00 | 82.487 |
|--|------|--------|

7-6-18  
FRIDAY

82/928

BICKEL  
CHAVIS  
REESE

BMEL DESC

TURTLE

82.497 BRASS DISC @ (Pos-18)



85/928

SWEWIND  
18678  
LAKE MARION CREEK

55

TSC3  
2944

Access File: 18678-070918 Con

1@ 250 Bsl 100 (Pos-18)

H1: 5.00

Bsl H1: 7.00

R00: 0.45: 6.50

BscK: 315

316 LM1.1

317 LM1.2

318 LM1.3

319 GRND

320 Bolr 1

321 Bolr 2

322 Top of Board

323 BscK

324 CK 322

325 CK 321

326 CK 320

327 CK 318

328 CK 317

329 CK 316

STAFF GAUGE LM1 SG

7.9.18

Monday

86/928

BICKEL  
FREED

330 BscK

331 CK 316

332 CK 317

333 CK 318

334 CK 320

335 CK 321

336 CK 322

337 BscK

338 BscK

339 LM 2.1

340 LM 2.2

341 LM 2.3

342 BscK

343 CK 341

344 CK 340

345 CK 339

346 BscK

347 CK 339

348 CK 340

349 CK 341

350 BscK

351 BscK

352 LM 3.1

353 LM 3.2

354 LM 3.3

355 BscK

356 CK 354

357 CK 353

358 CK 352

359 BscK

360 BscK

361 CK 353

362 CK 354

363 BscK

364 LM 1 SH1

365 BscK

366 CK 364

367 BscK

368 CK 364

369 BscK



87/928

SLFWMD

18678

LAKE MARION CREEK

ACCESS FILE: 18678-070918lon

to 250 BSL (Pos-18)

HI=5.17

BSH=7.00

ROD=0.45' 6.50

Bsck=370' 383

371

↓ Location at Pos-18

380

381 NORTH RIM OF 4 3/16" METAL

CASING (NORTH EDGE)

382 CK 381

NOTE: MEASURE DOWN FROM TOP OF METAL  
CASING TO WATER TABLE = 8.30  
WATER ELEV = 77.795

7-9-18

MONDAY

88/

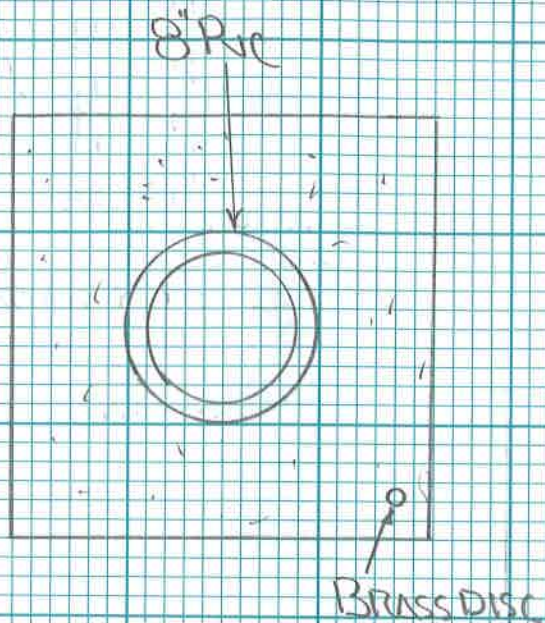
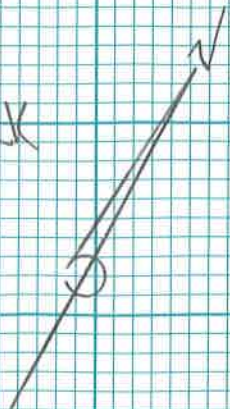
928

BUCKET  
FREED



89/928

SWEFWM  
18678  
LAKE MARION CREEK  
Pos-18

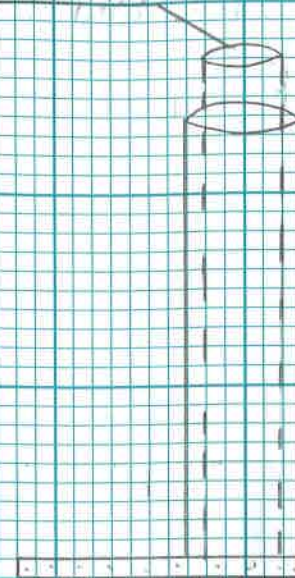


7-9-18  
MONDAY

90/928

BUCKEL  
FREED

86.095



82.580

82.497

FACING North North West

Pos-18



123/420

SWFWMD  
18678  
LAKE MARION  
POS-19

| +     | HI     | - | ELEV. |
|-------|--------|---|-------|
| 5.    |        |   |       |
| 5.582 | 86.681 |   |       |

NOTES

10:22AM 7/26/18  
MEASURE DOWN FROM  
TOP OF CASING TO  
WATER TABLE: 8.50  
WATER ELEV: 76.821

1.560 85.121

5.600 81.081

5.632 81.149

5.468 81.273

5.461 81.22

7-26-18  
THURSDAY80°F  
SUNNY

124/420

O'DION  
BICKEEBMEL  
81.079

DESC.

BRASS DISC @ NW CORNER OF  
CONC PAD (POS-19)N. RTM OF 4 $\frac{3}{8}$ " META CASING  
POS-19

NE. CORNER OF CONC. PAD

SE. CORNER OF CONC. PAD

SW. CORNER OF CONC. PAD

NW CORNER OF CONC. PAD



125/938

SWFWMD  
18678  
LAKEHARTON  
POS-19

+

HI

86.681

-

5.760

ELEV.

80.921

5.810

80.871

5.515

81.166

5.545

81.136

-

1.630

86.574

1.737

84.944

5.470

81.104

7-26-18  
THURSDAY80°F  
SUNNY

126/938

DZDTON  
BICKEL

DIFF.

BMEL

81.099

DESL.

NE. GROUND

SE GND

SW. GND

NW. GND

N. <sup>RTM</sup> OF PVC PIPE

+ .005

81.099

BRASS DISC @ NW CORNER OF  
CONC PAD (POS-19)



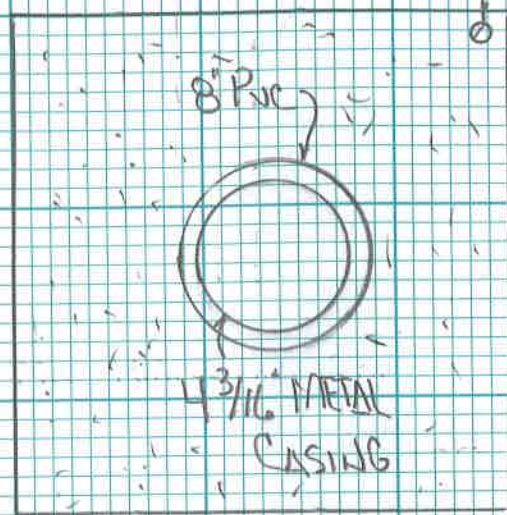
127/928

SWT WIND  
18678  
LAKE MARION CREEK  
Pos-19



NOTE  
NO BLUE  
TAG ON THIS  
SITE

BRASS DISC  
STAMPED "Pos-19"

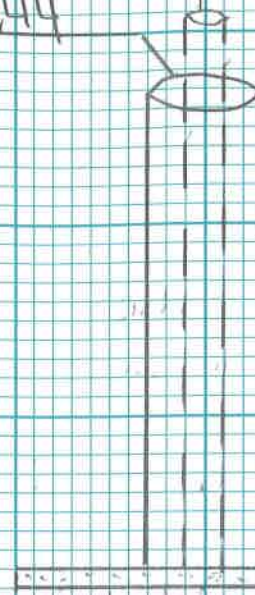


7-26-18  
THURSDAY

128/928  
BUCKEL  
DIDION

85.121

84.944



81.099  
BRASS DISC

PICTURES

8560 BRASS DISC STAMPED "Pos-19"

8561 "

8562 MEASURE OF METAL CASING

8563 METAL CASING

8564 FACING EAST @ Pos-19

8565 FACING NORTH @ Pos-19



129/928

SWEWIND  
18678  
LAKE MARION CREEK

NRS FILE 18678-072618NRS

Note

JOB WAS MADE  
IN FLA EAST

FLW 7693

TSC3 2944

260 BRASS DISC STAMPED "Pos-19"

261 WELL Pos-19 Location ONLY

262 CK 260

263 CK 261

264 CK 260

265 CK 261

266

↓ Location of Cone Pad @ Pos-19

269

270 BRASS DISC STAMPED "Pos-18"

271 WELL Pos-19 Location ONLY

272

↓ Location of Cone Pad @ Pos-18

275

276 CK 270

277 CK 271

278 CK 270

279 CK 271

7-26-18  
THURSDAY

130/928

BRICKEL  
DIDION

280 BASS

281 WELL Pos-17

282

↓ Location of Cone Pad @ Pos-17

285

286 BRASS DISC "Pos-17"

287 CK 281

288 CK 286

289 CK 286

290 BRASS DISC "Pos-16"

291 WELL Pos-16

292 CK 290 (Foot)

293 CK 290 (Foot)

294

↓ Location of Cone Pad @ Pos-16

297



131/923

SWEFWD  
18678  
LAKE MARION  
POS-18

| +     | HI     | ELEV. |
|-------|--------|-------|
| 3.910 | 86.407 |       |

11:57am 7/26/18

NOTES

MEASURE DOWN FROM  
TOP OF CASING TO  
WATER TABLE: 7.91  
WATER ELEV: 78.198

3.909 86.098

3.918 82.489

3.920 82.487

3.908 82.499

3.925 82.482

7-26-18  
THURSDAY

132/922

DIDION  
BICKELBMEL.  
82.497

DESC.

BRASS DISC @ NW CORNER OF  
CONC PAD (POS-18)N. RIM OF 4 3/16" METAL CASING  
POS-18

NE CORNER OF CONC PAD

SE CORNER OF CONC PAD

SW CORNER OF CONC PAD

NW CORNER OF CONC PAD



133/928

SWEWMD  
18278  
LAKE MARION  
POS-18

+

HI

-

ELEV.  
82.416

3.991

NOTE

4.034

82.373

4.013

82.394

4.012

82.385

0.436

86.301

.542  
~~1.052~~

85.865

3.805

82.496

7-26-18  
THURSDAY

134/928

DIDION  
BICKEL

DIFF

BMEL

DESC.

82.497

NE GND.

SE. GND

SW. GND

NW GND

8"  
N. RIM OF PVC PIPE

-0.001

82.497

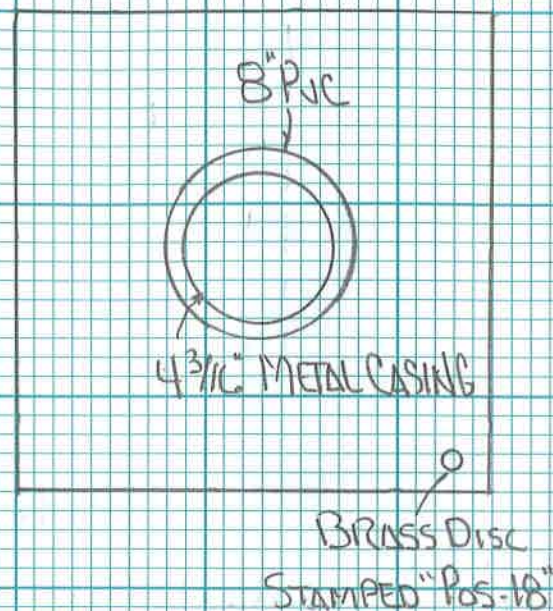
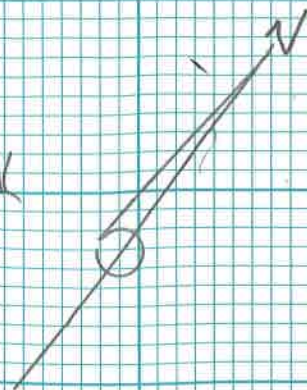
BRASS DISC @ NW CORNER OF  
CONC PAD POS-18



135/928

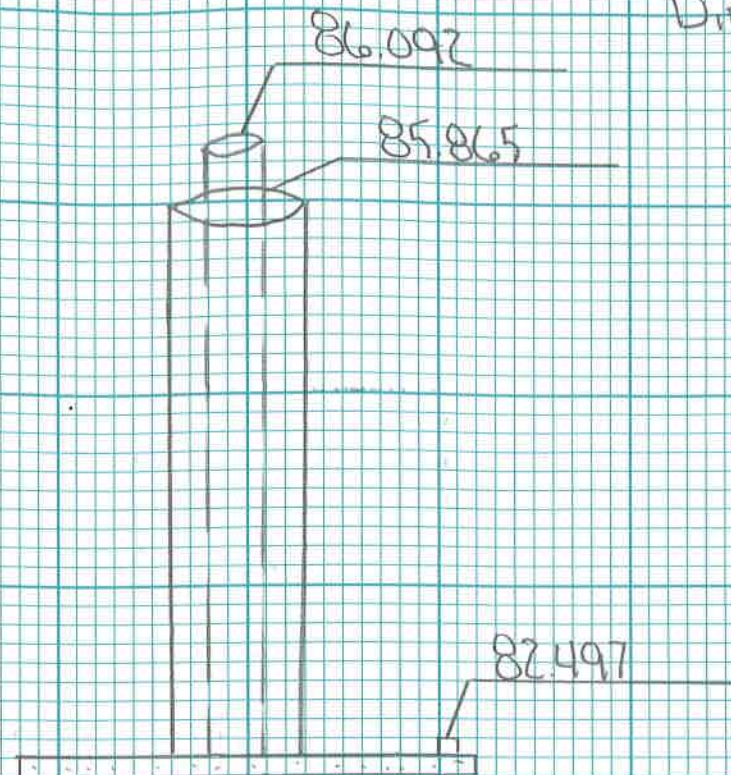
SW WIND  
18678  
LAKE MARION CREEK

Pos-18



7-26-18  
THURSDAY

136/928  
BICKEL  
DIDION



### PICTURES

8567 BRASS DISC STAMPED "Pos-18"

8568 > Pos-18 Facing NW

8569

8570 MEASURE OF METAL CASING Pos-18

8571 METAL CASING Pos-18

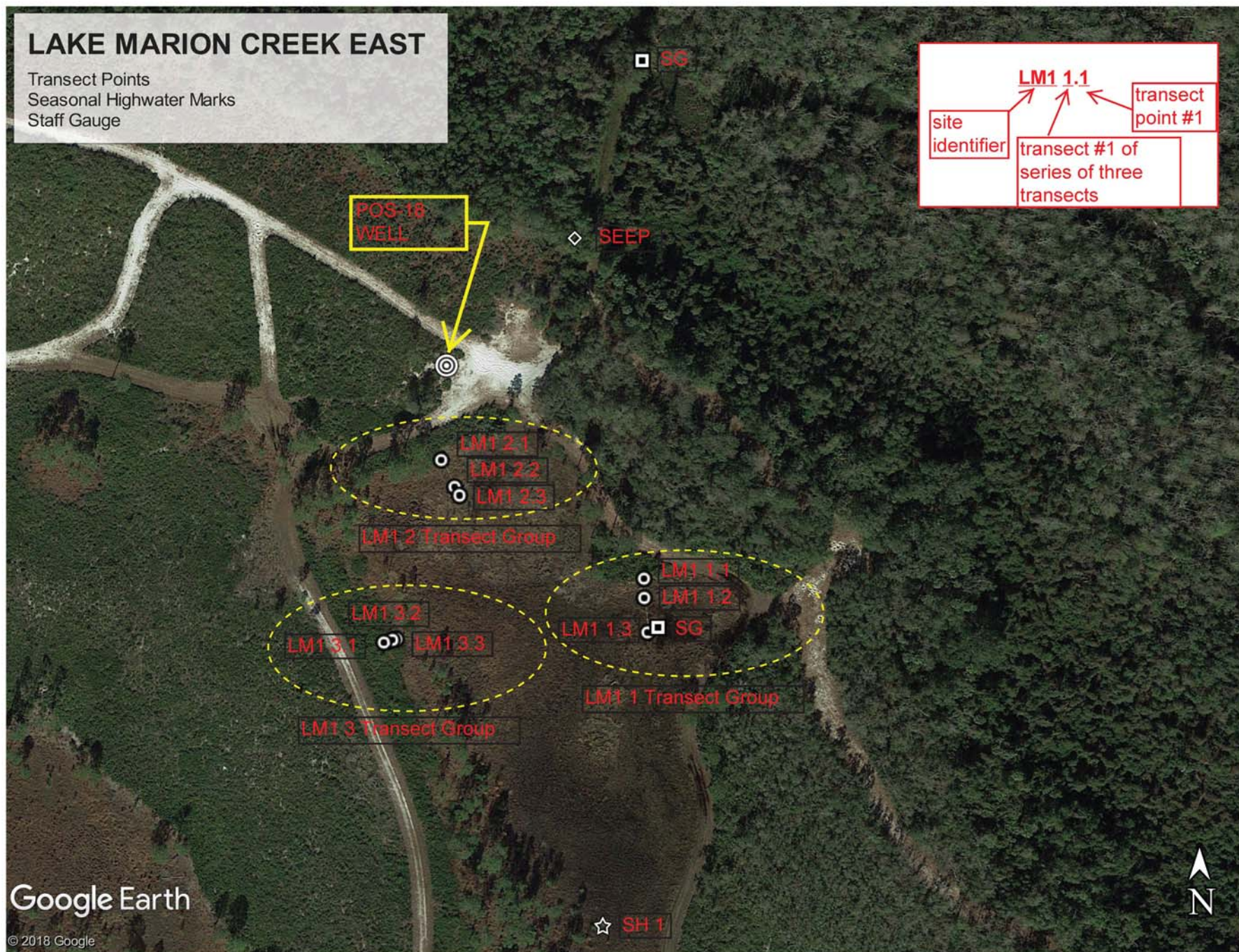
8572

8573 > 13 BLUE TAG @ Pos-18

8574 Pos-18 (NW)



# LAKE MARION CREEK EAST





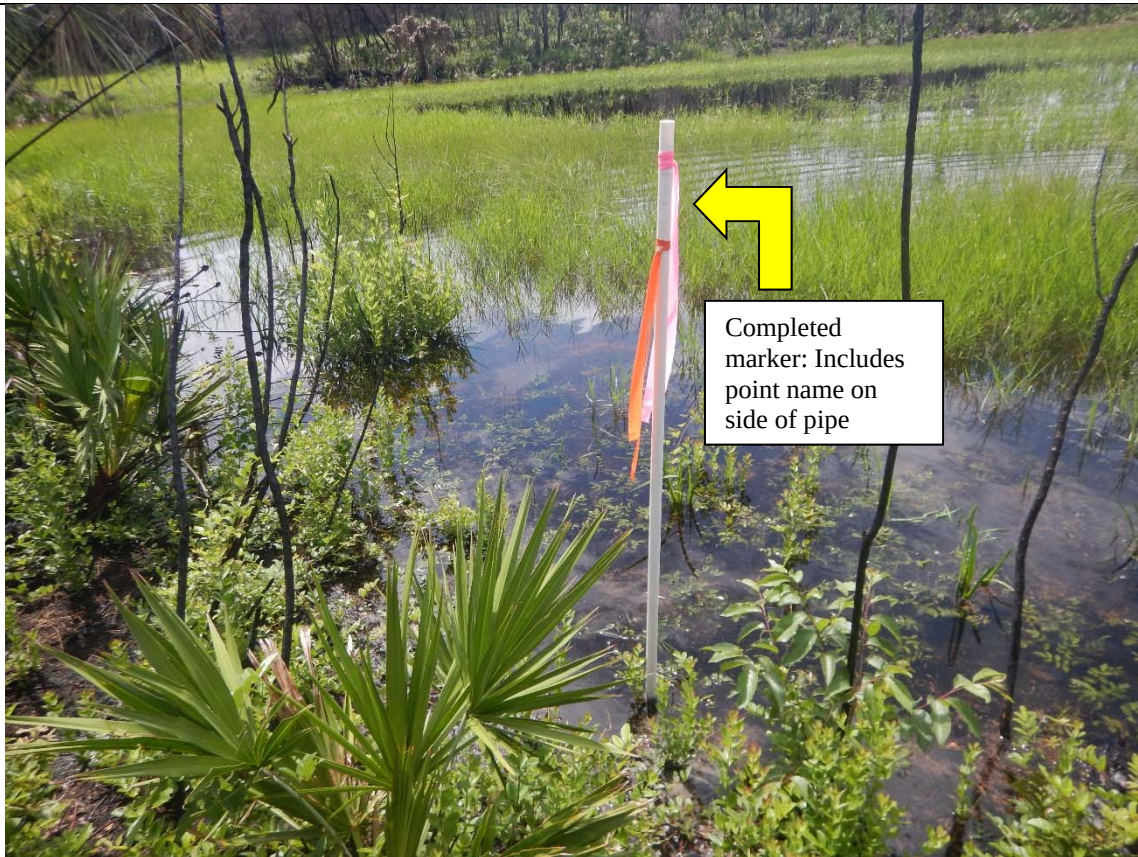
# LAKE MARION CREEK WEST





# LAKE MARION CREEK EAST

| Soil Transects – LM1 1 Transect Group |                                   |                                              |
|---------------------------------------|-----------------------------------|----------------------------------------------|
| <b>LM1 1.1</b>                        | <b>Wetland Boundary</b>           |                                              |
| LATITUDE: 28° 06' 04.24824" (N)       | LONGITUDE: 081° 30' 40.30561" (W) |                                              |
| NORTHING: 1369835.46                  | EASTING: 491361.98                |                                              |
| ELEVATION: 78.06 ft. (NAVD 88)        | 23.793 m                          | RTK GPS                                      |
| ELEVATION: 79.03 ft. (NGVD 29)        | 24.089 m                          | 0.971 ft. (conversion factor) Corpscon 6.0.1 |





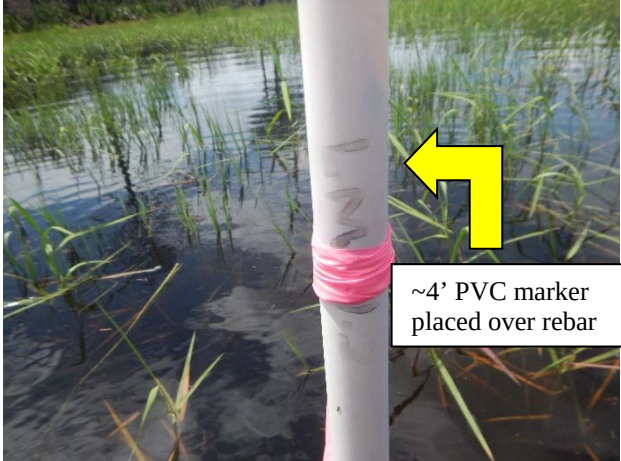
# LAKE MARION CREEK EAST

| Soil Transects – LM1 1 Transect Group                                                                                                                                                                                                  |                                   |                                              |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|----------------------------------------------|
| <b>LM1 1.2</b>                                                                                                                                                                                                                         | <b>Hydric at Surface</b>          |                                              |
| LATITUDE: 28° 06' 04.02249" (N)                                                                                                                                                                                                        | LONGITUDE: 081° 30' 40.30201" (W) |                                              |
| NORTHING: 1369812.66                                                                                                                                                                                                                   | EASTING: 491362.21                |                                              |
| ELEVATION: 76.63 ft. (NAVD 88)                                                                                                                                                                                                         | 23.357 m                          | RTK GPS                                      |
| ELEVATION: 77.60 ft. (NGVD 29)                                                                                                                                                                                                         | 23.653 m                          | 0.971 ft. (conversion factor) Corpscon 6.0.1 |
| <div> <div>Rebar marking point is under water.<br/>There is no picture available.</div> <div>  <p>~4' PVC marker placed over rebar</p> </div> </div> |                                   |                                              |





# LAKE MARION CREEK EAST

| Soil Transects – LM1 1 Transect Group                                                                                                                                                                                                        |                                   |                                              |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|----------------------------------------------|
| <b>LM1 1.3</b>                                                                                                                                                                                                                               | <b>Muck at Surface</b>            |                                              |
| LATITUDE: 28° 06' 03.61175" (N)                                                                                                                                                                                                              | LONGITUDE: 081° 30' 40.25924" (W) |                                              |
| NORTHING: 1369771.16                                                                                                                                                                                                                         | EASTING: 491365.87                |                                              |
| ELEVATION: 75.78 ft. (NAVD 88)                                                                                                                                                                                                               | 23.098 m                          | RTK GPS                                      |
| ELEVATION: 76.75 ft. (NGVD 29)                                                                                                                                                                                                               | 23.394 m                          | 0.971 ft. (conversion factor) Corpscon 6.0.1 |
| <div> <div> Rebar marking point is under water.<br/>There is no picture available. </div> <div>  <div>~4' PVC marker placed over rebar</div> </div> </div> |                                   |                                              |





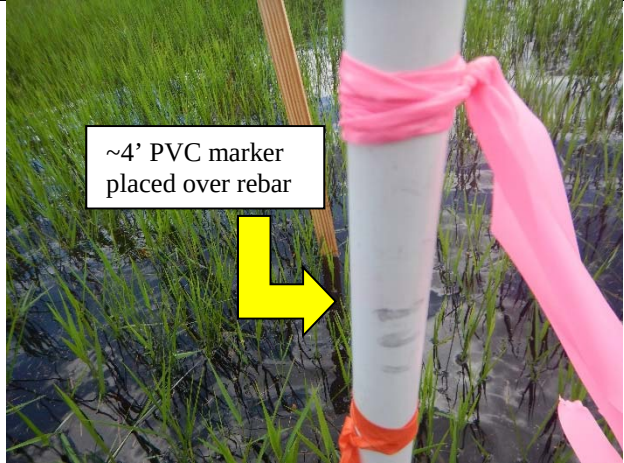
# LAKE MARION CREEK EAST

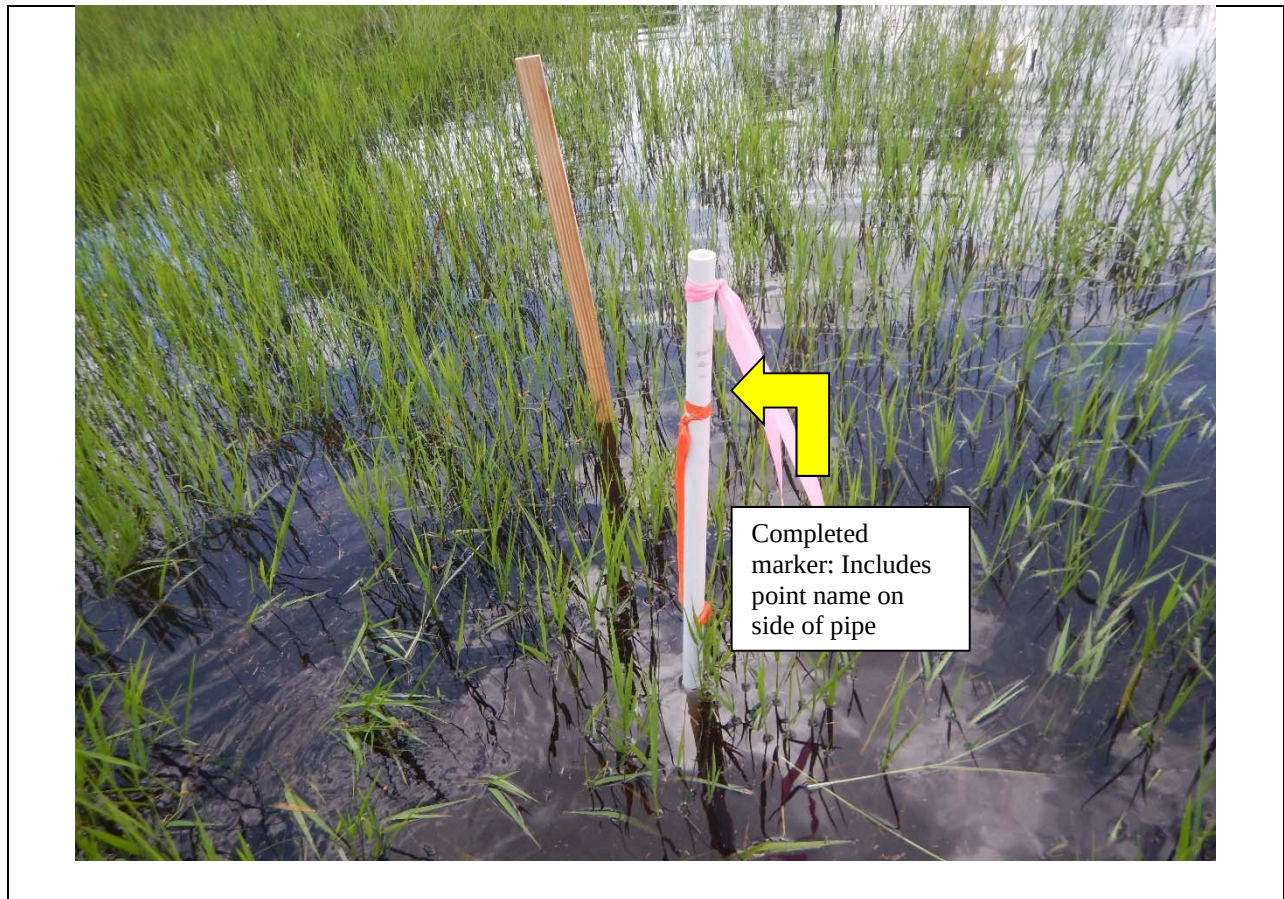
| Soil Transects – LM1 2 Transect Group |                                   |                                              |
|---------------------------------------|-----------------------------------|----------------------------------------------|
| <b>LM1 2.1</b>                        | <b>Wetland Boundary</b>           |                                              |
| LATITUDE: 28° 06' 05.65525" (N)       | LONGITUDE: 081° 30' 43.04208" (W) |                                              |
| NORTHING: 1369978.59                  | EASTING: 491117.52                |                                              |
| ELEVATION: 78.40 ft. (NAVD 88)        | 23.896 m                          | RTK GPS                                      |
| ELEVATION: 79.37 ft. (NGVD 29)        | 24.192 m                          | 0.971 ft. (conversion factor) Corpscon 6.0.1 |





# LAKE MARION CREEK EAST

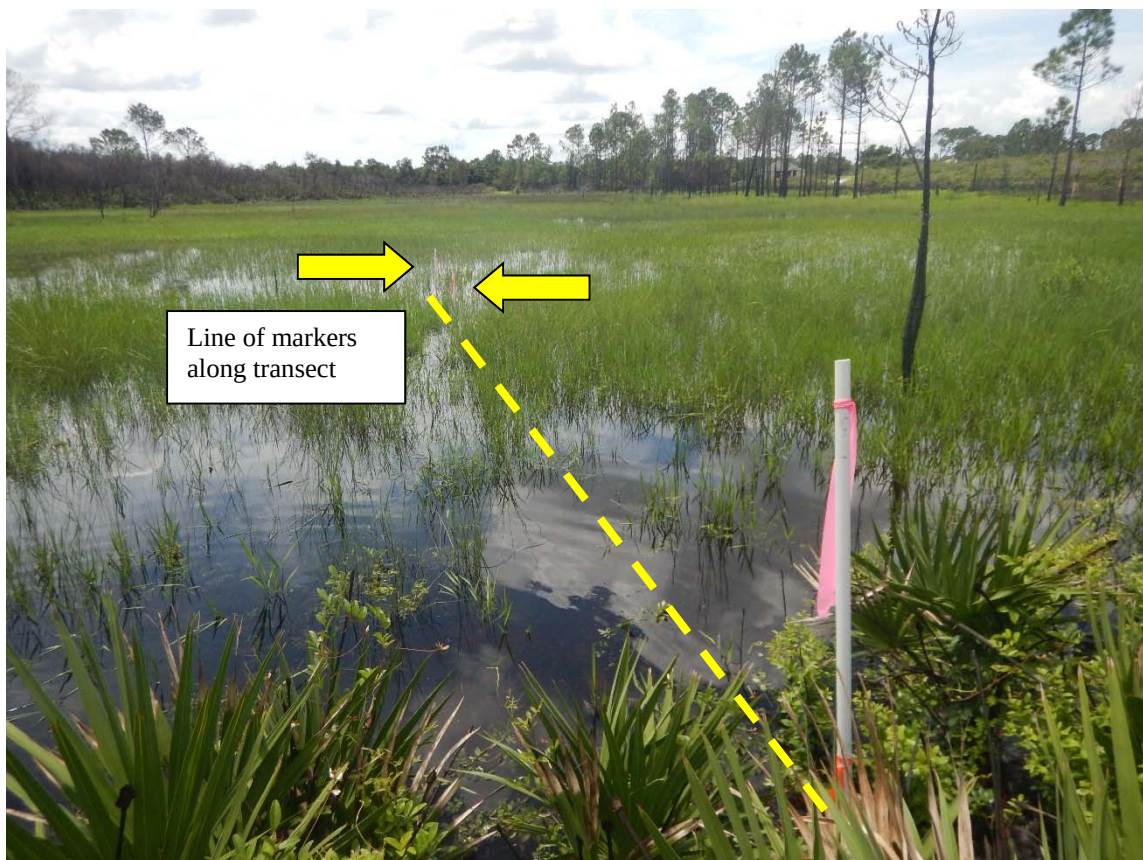
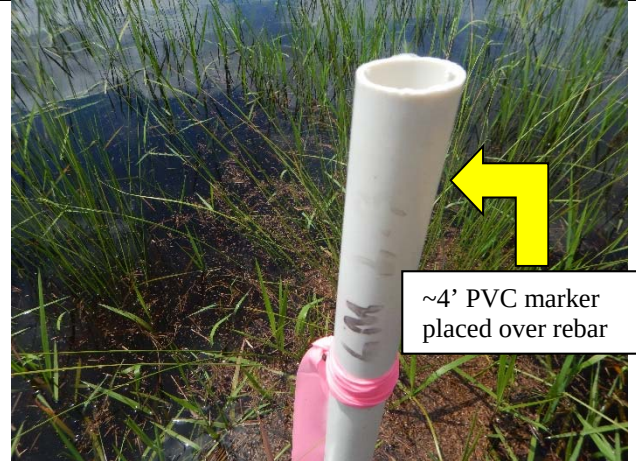
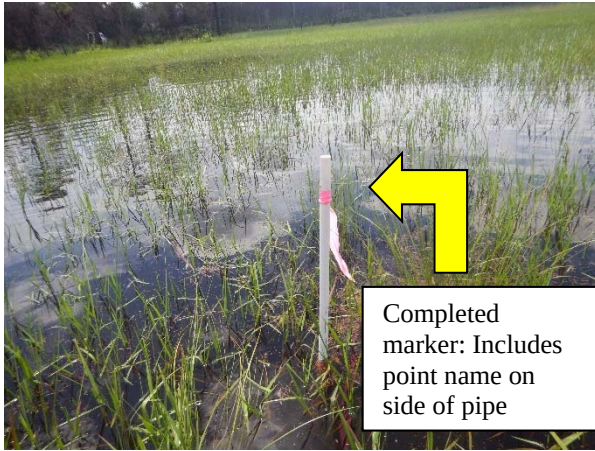
| Soil Transects – LM1 2 Transect Group                                                                                                                                                                                                  |                                   |                                              |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|----------------------------------------------|
| <b>LM1 2.2</b>                                                                                                                                                                                                                         | <b>Hydric at Surface</b>          |                                              |
| LATITUDE: 28° 06' 05.34196" (N)                                                                                                                                                                                                        | LONGITUDE: 081° 30' 42.86130" (W) |                                              |
| NORTHING: 1369946.88                                                                                                                                                                                                                   | EASTING: 491133.58                |                                              |
| ELEVATION: 76.73 ft. (NAVD 88)                                                                                                                                                                                                         | 23.387 m                          | RTK GPS                                      |
| ELEVATION: 77.70 ft. (NGVD 29)                                                                                                                                                                                                         | 23.683 m                          | 0.971 ft. (conversion factor) Corpscon 6.0.1 |
| <div> <div>Rebar marking point is under water. There is no picture available.</div> <div>  <div>~4' PVC marker placed over rebar</div> </div> </div> |                                   |                                              |





# LAKE MARION CREEK EAST

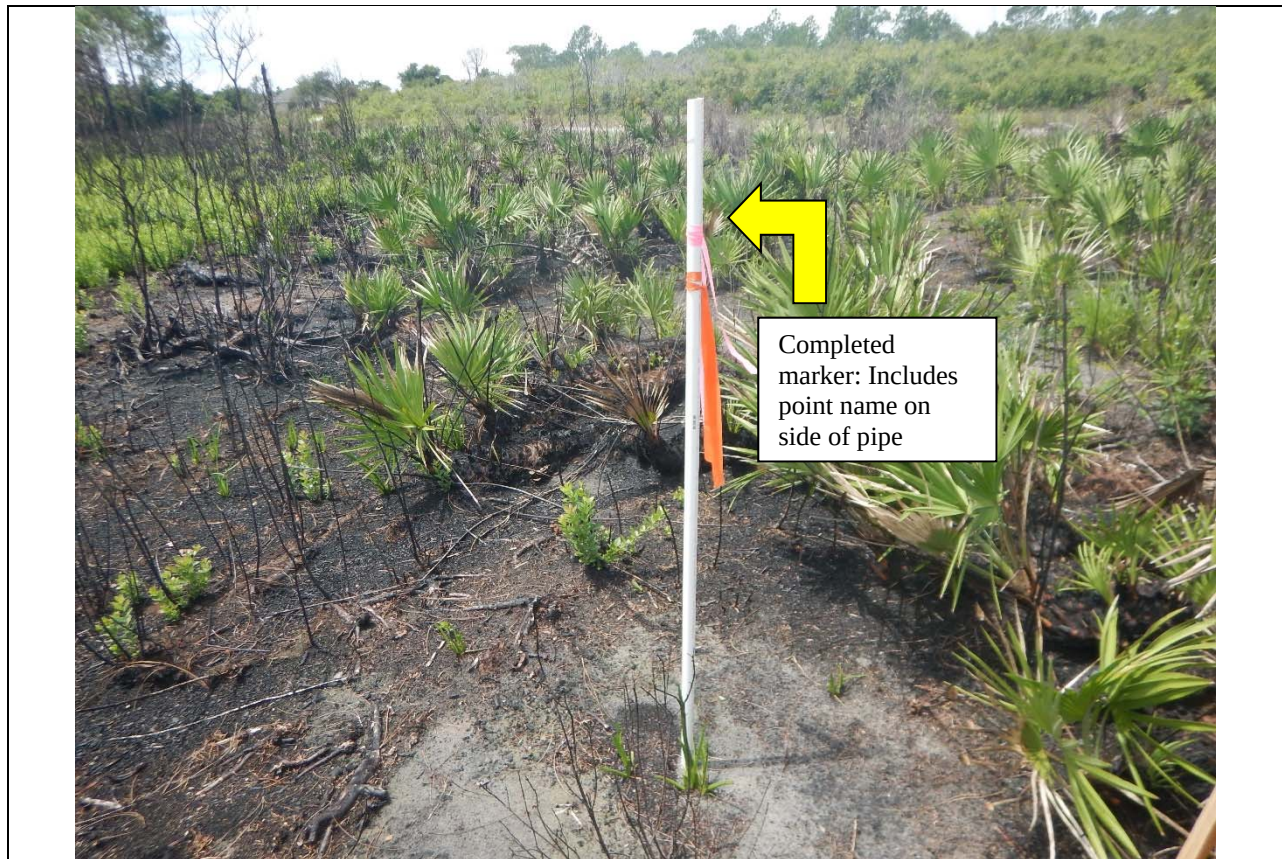
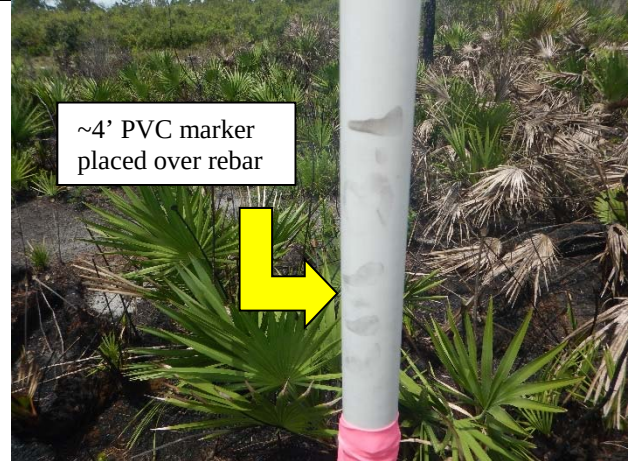
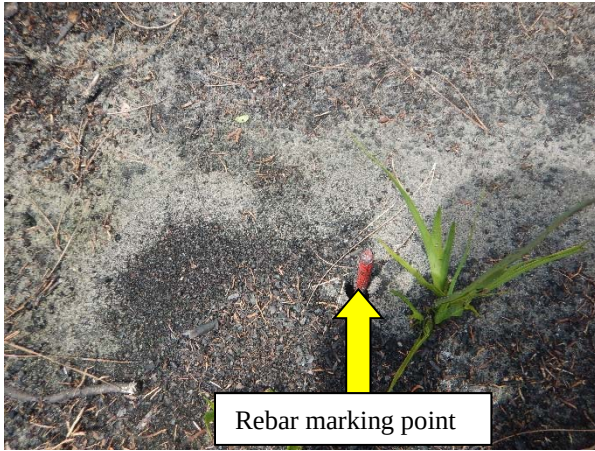
| Soil Transects – LM1 2 Transect Group |                                   |                                              |
|---------------------------------------|-----------------------------------|----------------------------------------------|
| <b>LM1 2.3</b>                        | <b>Muck at Surface</b>            |                                              |
| LATITUDE: 28° 06' 05.23601" (N)       | LONGITUDE: 081° 30' 42.79463" (W) |                                              |
| NORTHING: 1369936.15                  | EASTING: 491139.50                |                                              |
| ELEVATION: 76.52 ft. (NAVD 88)        | 23.323 m                          | RTK GPS                                      |
| ELEVATION: 77.49 ft. (NGVD 29)        | 23.619 m                          | 0.971 ft. (conversion factor) Corpscon 6.0.1 |





# LAKE MARION CREEK EAST

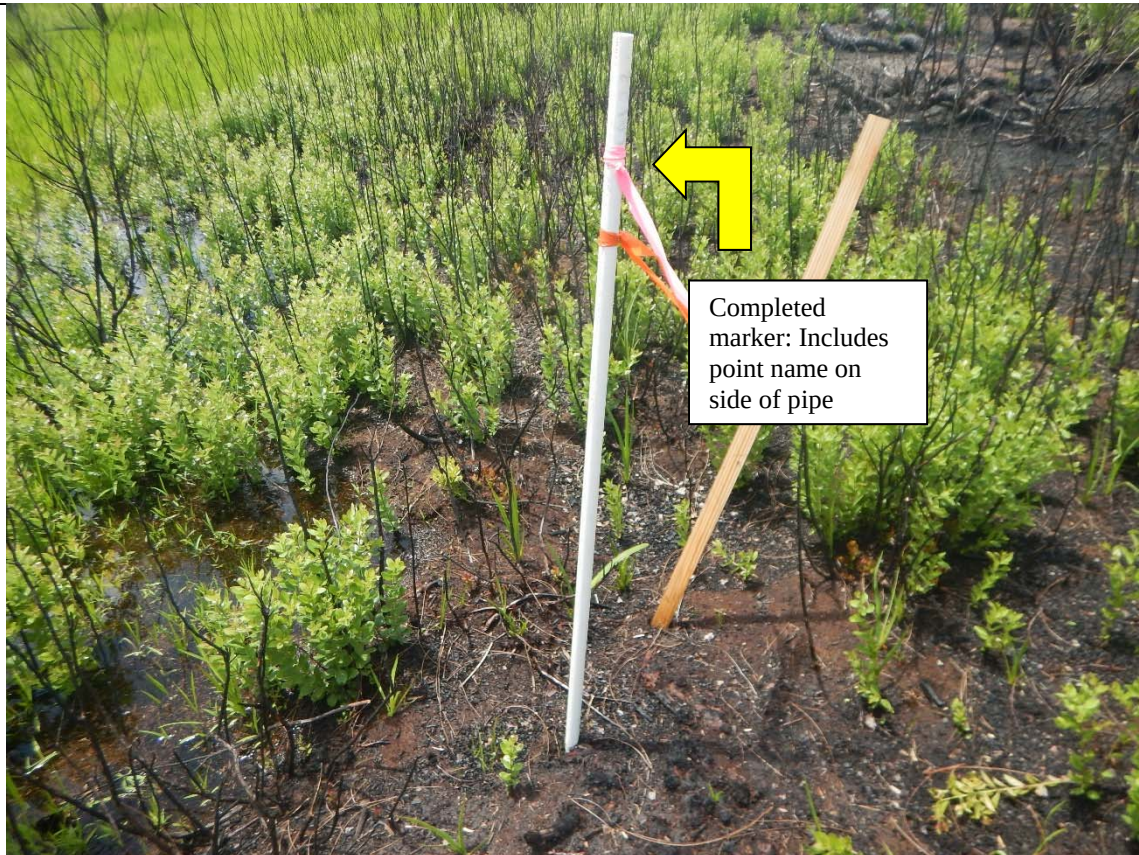
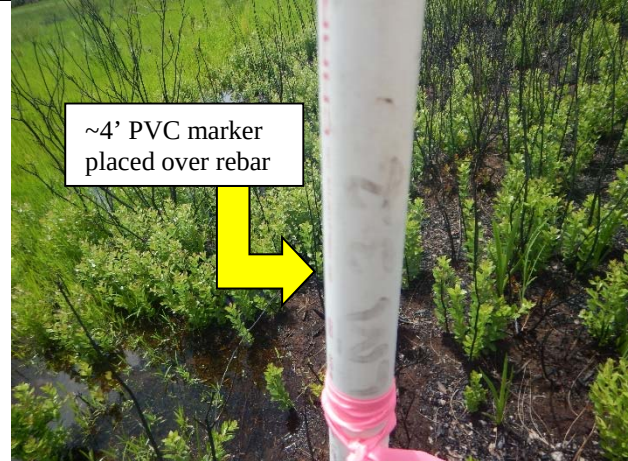
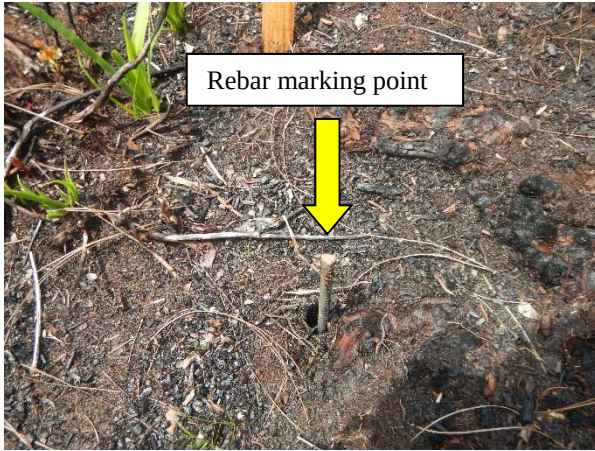
| Soil Transects – LM1 3 Transect Group |                                   |                                              |
|---------------------------------------|-----------------------------------|----------------------------------------------|
| <b>LM1 3.1</b>                        | <b>Wetland Boundary</b>           |                                              |
| LATITUDE: 28° 06' 03.49063" (N)       | LONGITUDE: 081° 30' 43.81653" (W) |                                              |
| NORTHING: 1369760.27                  | EASTING: 491047.24                |                                              |
| ELEVATION: 78.78ft. (NAVD 88)         | 24.012 m                          | RTK GPS                                      |
| ELEVATION: 79.75 ft. (NGVD 29)        | 24.308 m                          | 0.971 ft. (conversion factor) Corpscon 6.0.1 |





# LAKE MARION CREEK EAST

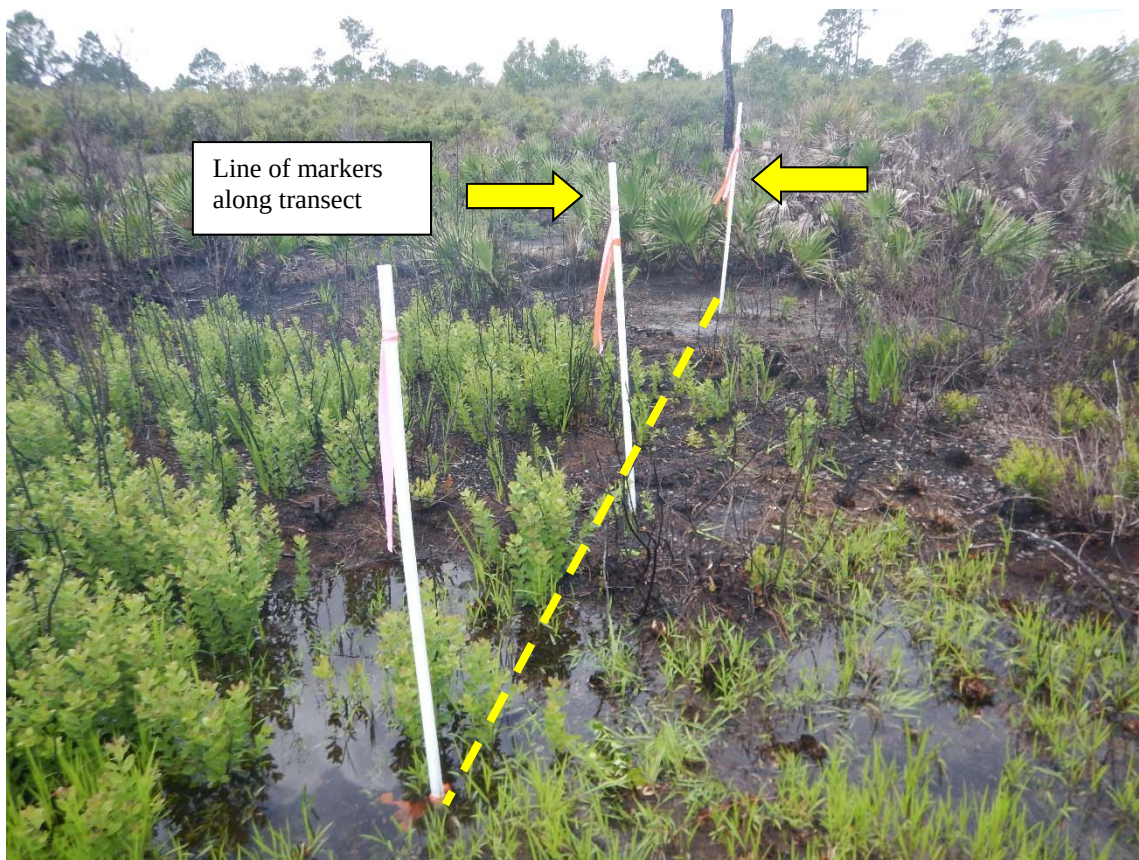
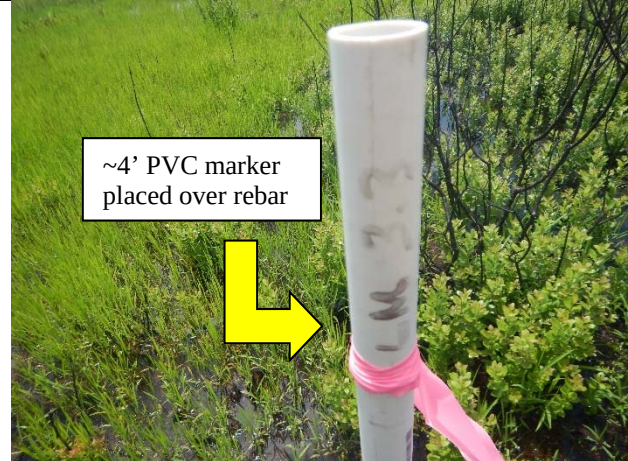
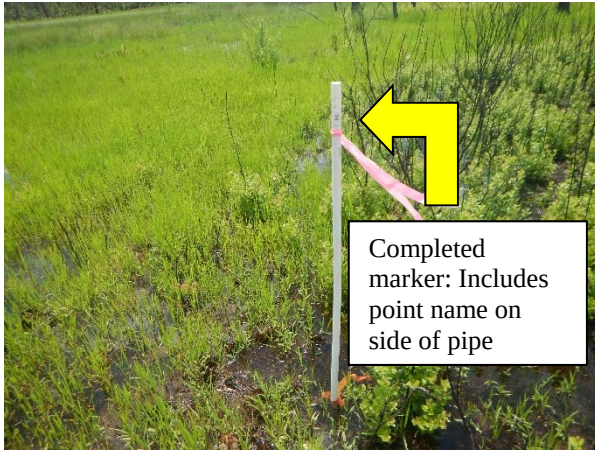
| Soil Transects – LM1 3 Transect Group |                                   |                                              |
|---------------------------------------|-----------------------------------|----------------------------------------------|
| <b>LM1 3.2</b>                        | <b>Hydric at Surface</b>          |                                              |
| LATITUDE: 28° 06' 03.51785" (N)       | LONGITUDE: 081° 30' 43.70355" (W) |                                              |
| NORTHING: 1369762.98                  | EASTING: 491057.37                |                                              |
| ELEVATION: 78.35 ft. (NAVD 88)        | 23.881 m                          | RTK GPS                                      |
| ELEVATION: 79.32 ft. (NGVD 29)        | 24.177 m                          | 0.971 ft. (conversion factor) Corpscon 6.0.1 |





# LAKE MARION CREEK EAST

| Soil Transects – LM1 3 Transect Group |                                   |                                              |
|---------------------------------------|-----------------------------------|----------------------------------------------|
| <b>LM1 3.3</b>                        | <b>Muck at Surface</b>            |                                              |
| LATITUDE: 28° 06' 03.52509" (N)       | LONGITUDE: 081° 30' 43.64926" (W) |                                              |
| NORTHING: 1369763.69                  | EASTING: 491062.24                |                                              |
| ELEVATION: 78.01 ft. (NAVD 88)        | 23.777 m                          | RTK GPS                                      |
| ELEVATION: 78.98 ft. (NGVD 29)        | 24.073 m                          | 0.971 ft. (conversion factor) Corpscon 6.0.1 |





# LAKE MARION CREEK EAST

| SEEP                                                                                 |                                           |                                              |
|--------------------------------------------------------------------------------------|-------------------------------------------|----------------------------------------------|
| LM1 SP                                                                               | Seep/Sand boils located in shallow ravine |                                              |
| CENTER OF SEEP                                                                       |                                           |                                              |
| LATITUDE: 28° 06' 08.28830" (N)                                                      | LONGITUDE: 081° 30' 41.25227" (W)         |                                              |
| NORTHING: 1370243.83                                                                 | EASTING: 491278.92                        |                                              |
| ELEVATION: 72.00 ft. (NAVD 88)                                                       | 21.946 m                                  | RTK GPS                                      |
| ELEVATION: 72.97 ft. (NGVD 29)                                                       | 22.242 m                                  | 0.971 ft. (conversion factor) Corpscon 6.0.1 |
|   |                                           |                                              |
|  |                                           |                                              |



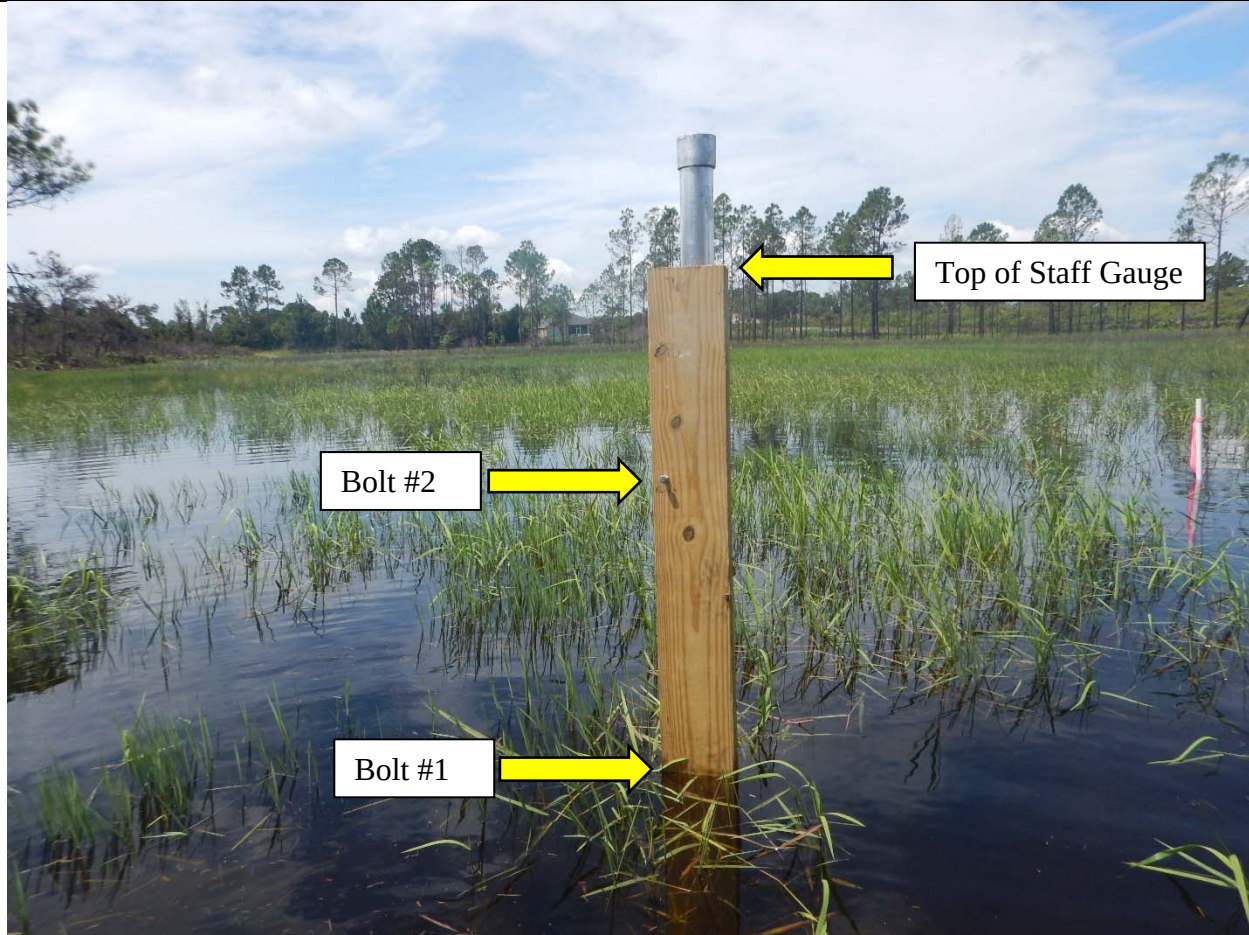
# LAKE MARION CREEK EAST

| Seasonal High-Water Marks                                                            |                                   |                                              |
|--------------------------------------------------------------------------------------|-----------------------------------|----------------------------------------------|
| LM1 SH 1                                                                             | Seasonal HW Elevation             |                                              |
| LATITUDE: 28° 06' 00.10365" (N)                                                      | LONGITUDE: 081° 30' 40.87355" (W) |                                              |
| NORTHING: 1369417.10                                                                 | EASTING: 491309.36                |                                              |
| ELEVATION: 78.13 ft. (NAVD 88)                                                       | 23.814 m                          | RTK GPS                                      |
| ELEVATION: 79.10 ft. (NGVD 29)                                                       | 24.110 m                          | 0.971 ft. (conversion factor) Corpscon 6.0.1 |
|   |                                   |                                              |
|  |                                   |                                              |



# SNELL CREEK EAST

| Staff Gauge                     |                                |                                               |                                              |
|---------------------------------|--------------------------------|-----------------------------------------------|----------------------------------------------|
| LM1 SG                          |                                | Located towards wetland interior from LM1 1.3 |                                              |
| TOP OF BOARD                    |                                |                                               |                                              |
| LATITUDE: 28° 06' 03.66706" (N) |                                | LONGITUDE: 081° 30' 40.11629" (W)             |                                              |
| NORTHING: 1369776.69            |                                | EASTING: 491378.69                            |                                              |
| ELEVATION: 81.27 ft. (NAVD 88)  |                                | 24.771m                                       | RTK GPS                                      |
| ELEVATION: 82.24 ft. (NGVD 29)  |                                | 25.067 m                                      | 0.971 ft. (conversion factor) Corpscon 6.0.1 |
|                                 |                                |                                               |                                              |
| BOLT #1                         | ELEVATION: 77.45 ft. (NAVD 88) | 23.607 m                                      | RTK GPS                                      |
|                                 | ELEVATION: 78.42 ft. (NGVD 29) | 23.903 m                                      |                                              |
| BOLT #2                         | ELEVATION: 80.12 ft. (NAVD 88) | 24.421 m                                      | RTK GPS                                      |
|                                 | ELEVATION: 81.09 ft. (NGVD 29) | 24.717 m                                      |                                              |
|                                 |                                |                                               |                                              |



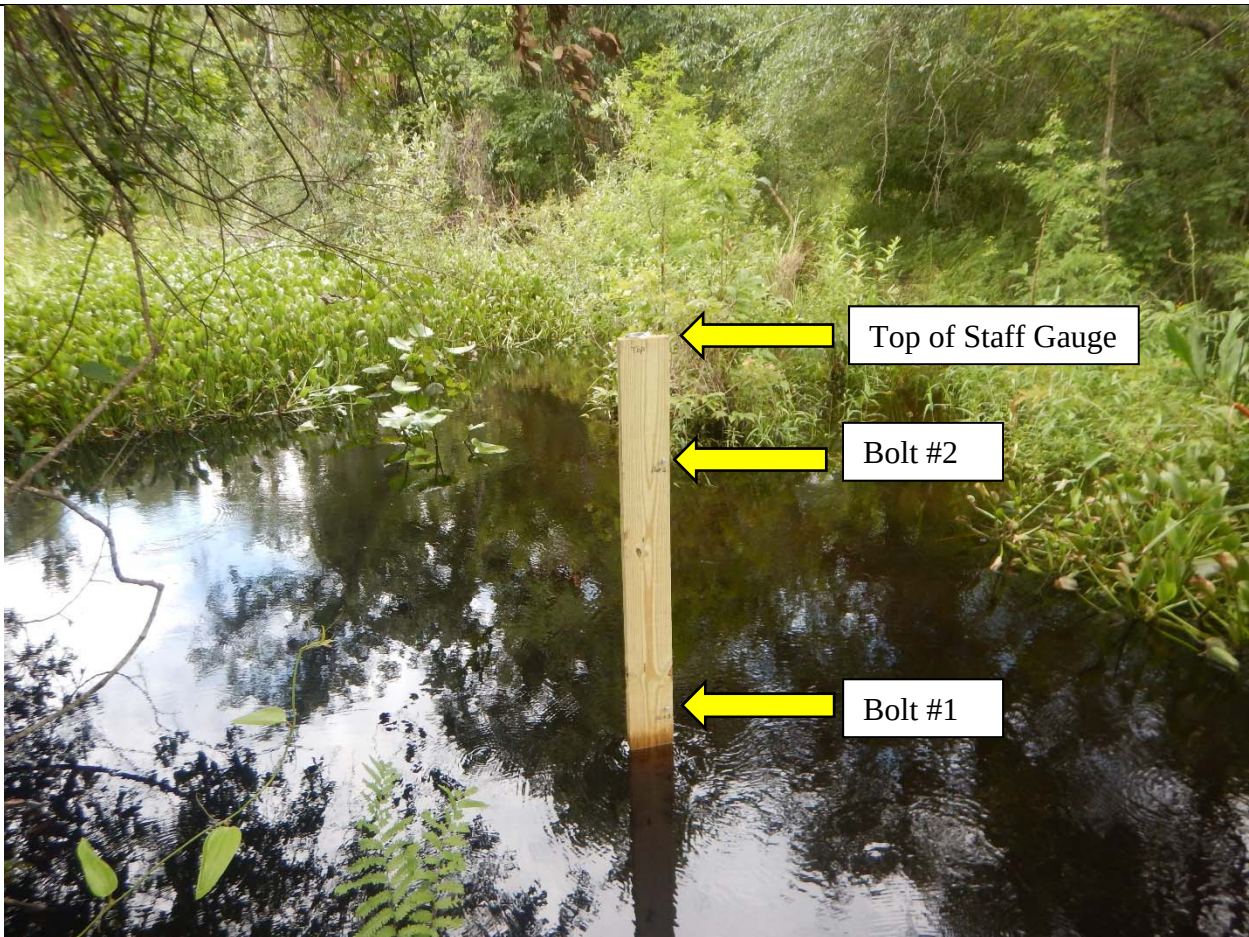
## SNELL CREEK EAST





# SNELL CREEK EAST

| Staff Gauge                     |                                |                                             |                                              |
|---------------------------------|--------------------------------|---------------------------------------------|----------------------------------------------|
| LM1 SG                          |                                | Located in Lake Marion Creek (actual creek) |                                              |
| TOP OF BOARD                    |                                |                                             |                                              |
| LATITUDE: 28° 06' 10.42121" (N) |                                | LONGITUDE: 081° 30' 40.33079" (W)           |                                              |
| NORTHING: 1370458.89            |                                | EASTING: 491362.35                          |                                              |
| ELEVATION: 67.21 ft. (NAVD 88)  |                                | 20.486m                                     | RTK GPS                                      |
| ELEVATION: 68.18 ft. (NGVD 29)  |                                | 20.782 m                                    | 0.971 ft. (conversion factor) Corpscon 6.0.1 |
|                                 |                                |                                             |                                              |
| BOLT #1                         | ELEVATION: 63.46 ft. (NAVD 88) | 19.343 m                                    | RTK GPS                                      |
|                                 | ELEVATION: 64.43 ft. (NGVD 29) | 19.639 m                                    |                                              |
| BOLT #2                         | ELEVATION: 66.12 ft. (NAVD 88) | 20.153 m                                    | RTK GPS                                      |
|                                 | ELEVATION: 67.09 ft. (NGVD 29) | 20.449 m                                    |                                              |



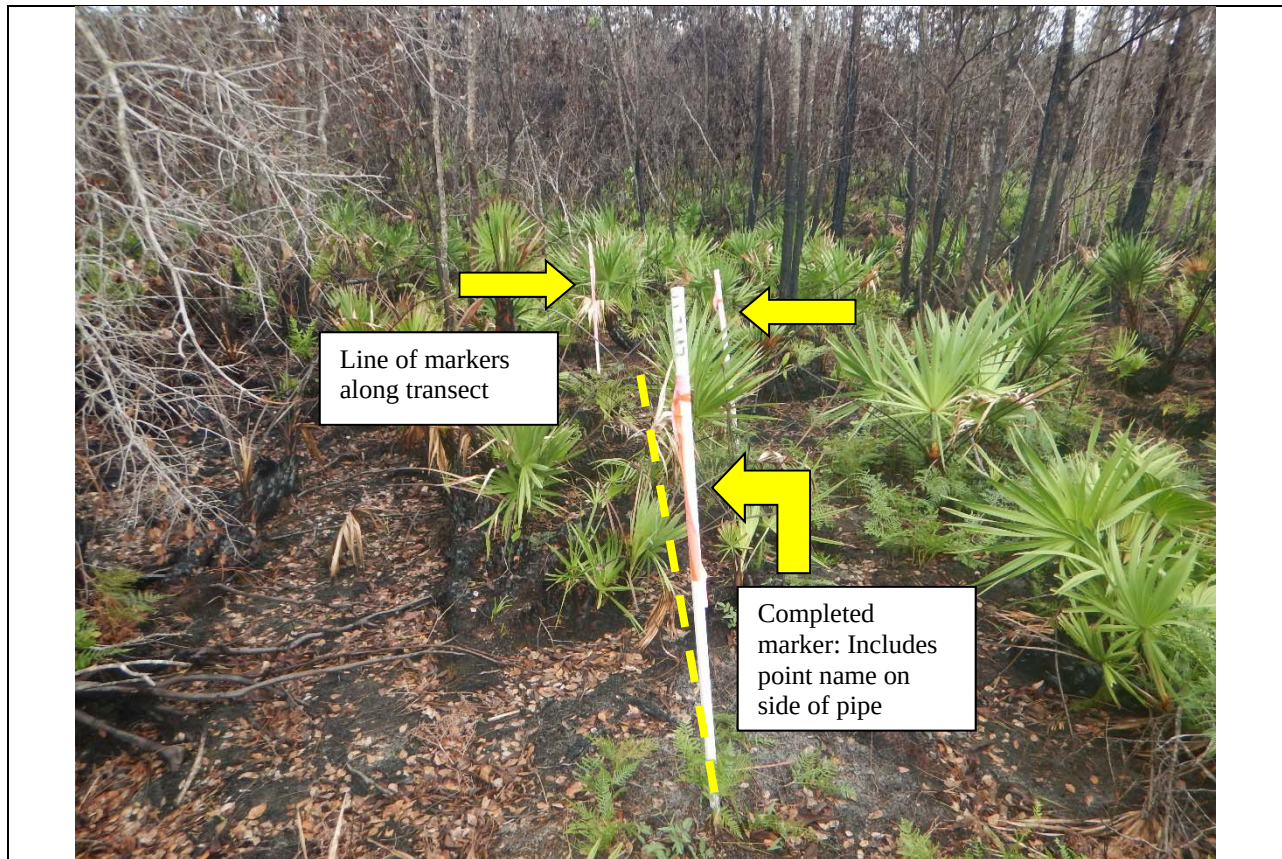
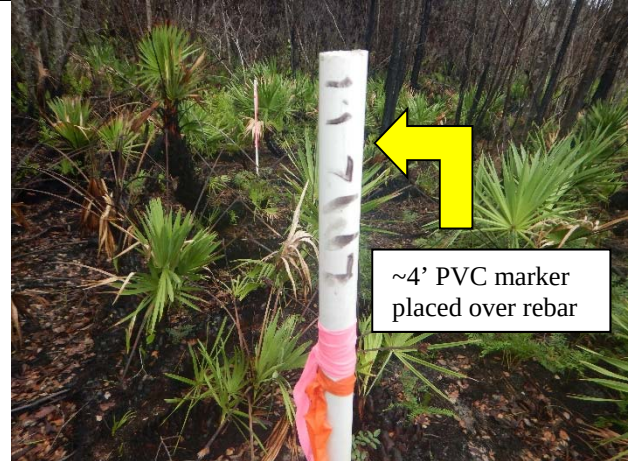
## SNELL CREEK EAST





# LAKE MARION CREEK WEST

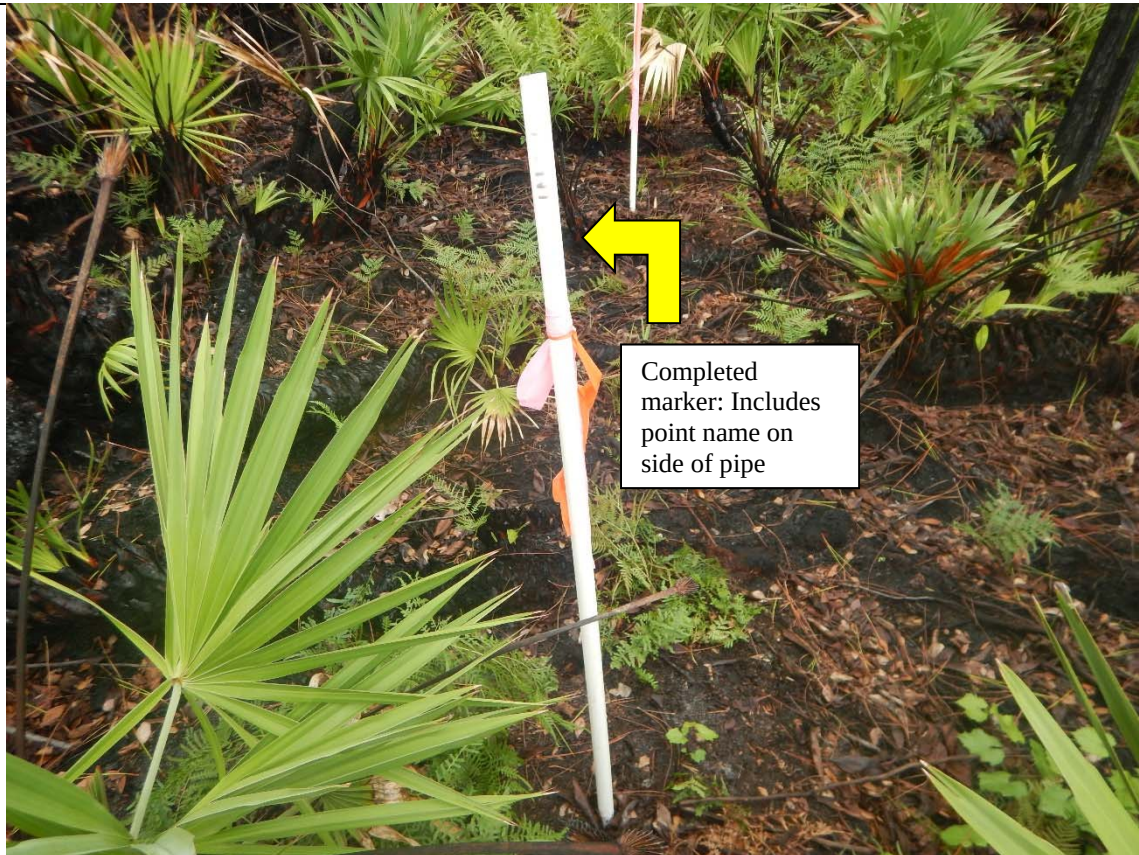
| Soil Transects – LM2 1 Transect Group |                                   |                                              |
|---------------------------------------|-----------------------------------|----------------------------------------------|
| <b>LM2 1.1</b>                        | <b>Wetland Boundary</b>           |                                              |
| LATITUDE: 28° 06' 16.92280" (N)       | LONGITUDE: 081° 30' 57.83197" (W) |                                              |
| NORTHING: 1371122.12                  | EASTING: 489797.86                |                                              |
| ELEVATION: 77.24 ft. (NAVD 88)        | 23.543 m                          | RTK GPS                                      |
| ELEVATION: 78.21 ft. (NGVD 29)        | 23.839 m                          | 0.971 ft. (conversion factor) Corpscon 6.0.1 |





# LAKE MARION CREEK WEST

| Soil Transects – LM2 1 Transect Group |                                   |                                              |
|---------------------------------------|-----------------------------------|----------------------------------------------|
| <b>LM2 1.2</b>                        | <b>Hydric at Surface</b>          |                                              |
| LATITUDE: 28° 06' 16.94802" (N)       | LONGITUDE: 081° 30' 57.74154" (W) |                                              |
| NORTHING: 1371124.63                  | EASTING: 489805.96                |                                              |
| ELEVATION: 76.19 ft. (NAVD 88)        | 23.223 m                          | RTK GPS                                      |
| ELEVATION: 77.16 ft. (NGVD 29)        | 23.519 m                          | 0.971 ft. (conversion factor) Corpscon 6.0.1 |





# LAKE MARION CREEK WEST

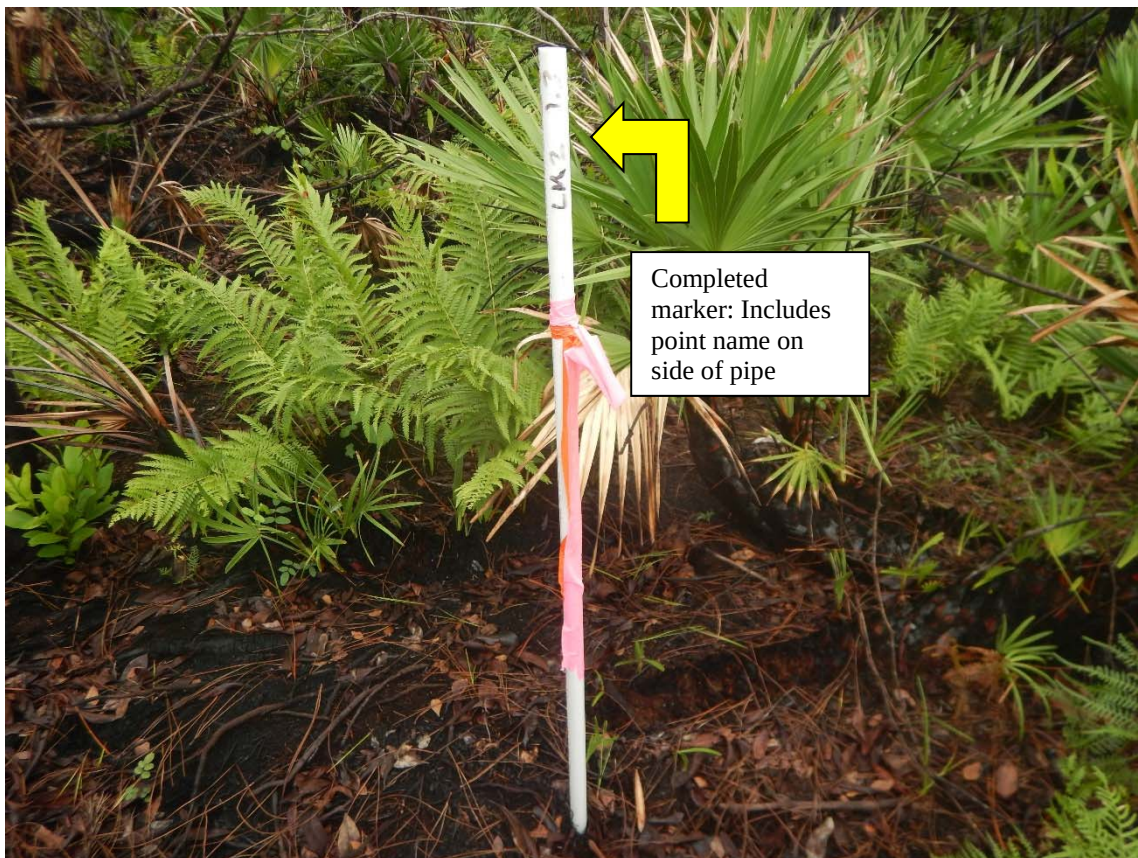
| Soil Transects – LM2 1 Transect Group |                                   |                                              |
|---------------------------------------|-----------------------------------|----------------------------------------------|
| <b>LM2 1.3</b>                        | <b>Muck at Surface</b>            |                                              |
| LATITUDE: 28° 06' 17.01465" (N)       | LONGITUDE: 081° 30' 57.66663" (W) |                                              |
| NORTHING: 1371131.33                  | EASTING: 489812.70                |                                              |
| ELEVATION: 75.33 ft. (NAVD 88)        | 22.961 m                          | RTK GPS                                      |
| ELEVATION: 76.30 ft. (NGVD 29)        | 23.257 m                          | 0.971 ft. (conversion factor) Corpscon 6.0.1 |



Rebar marking point



~4' PVC marker placed over rebar

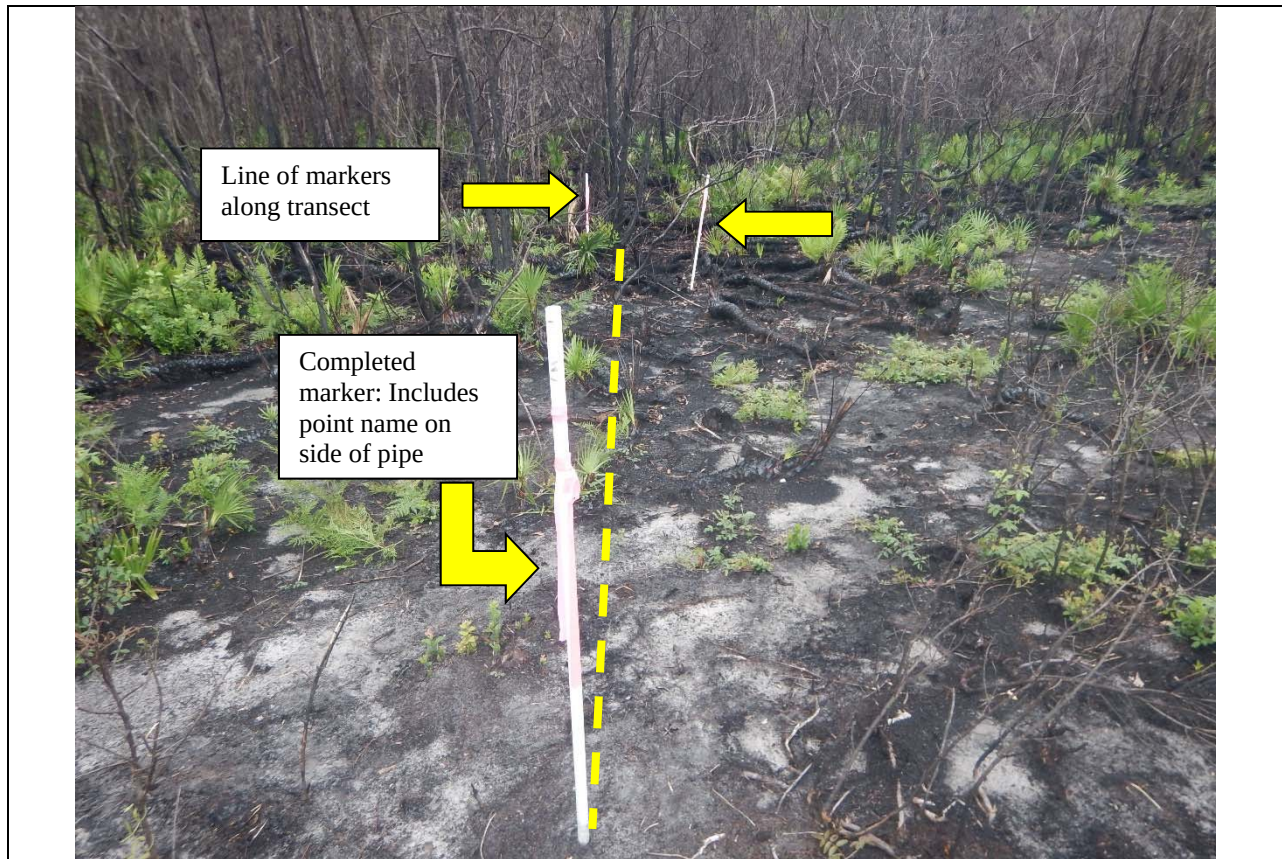
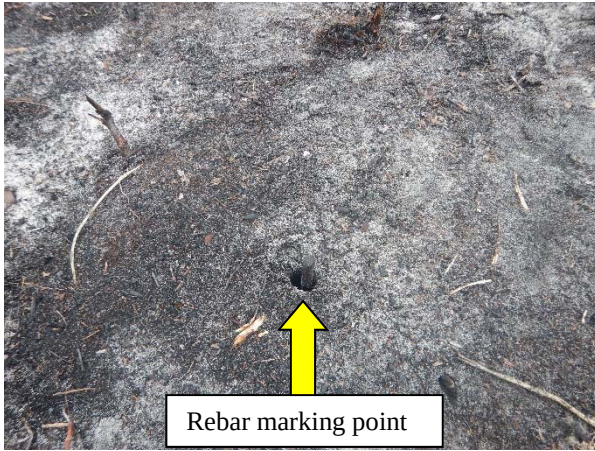


Completed marker: Includes point name on side of pipe



# LAKE MARION CREEK WEST

| Soil Transects – LM2 2 Transect Group |                                   |                                              |
|---------------------------------------|-----------------------------------|----------------------------------------------|
| <b>LM2 2.1</b>                        | <b>Wetland Boundary</b>           |                                              |
| LATITUDE: 28° 06' 13.54637" (N)       | LONGITUDE: 081° 30' 55.97606" (W) |                                              |
| NORTHING: 1370780.42                  | EASTING: 489962.61                |                                              |
| ELEVATION: 79.74 ft. (NAVD 88)        | 24.305 m                          | RTK GPS                                      |
| ELEVATION: 80.71 ft. (NGVD 29)        | 24.601 m                          | 0.971 ft. (conversion factor) Corpscon 6.0.1 |





# LAKE MARION CREEK WEST

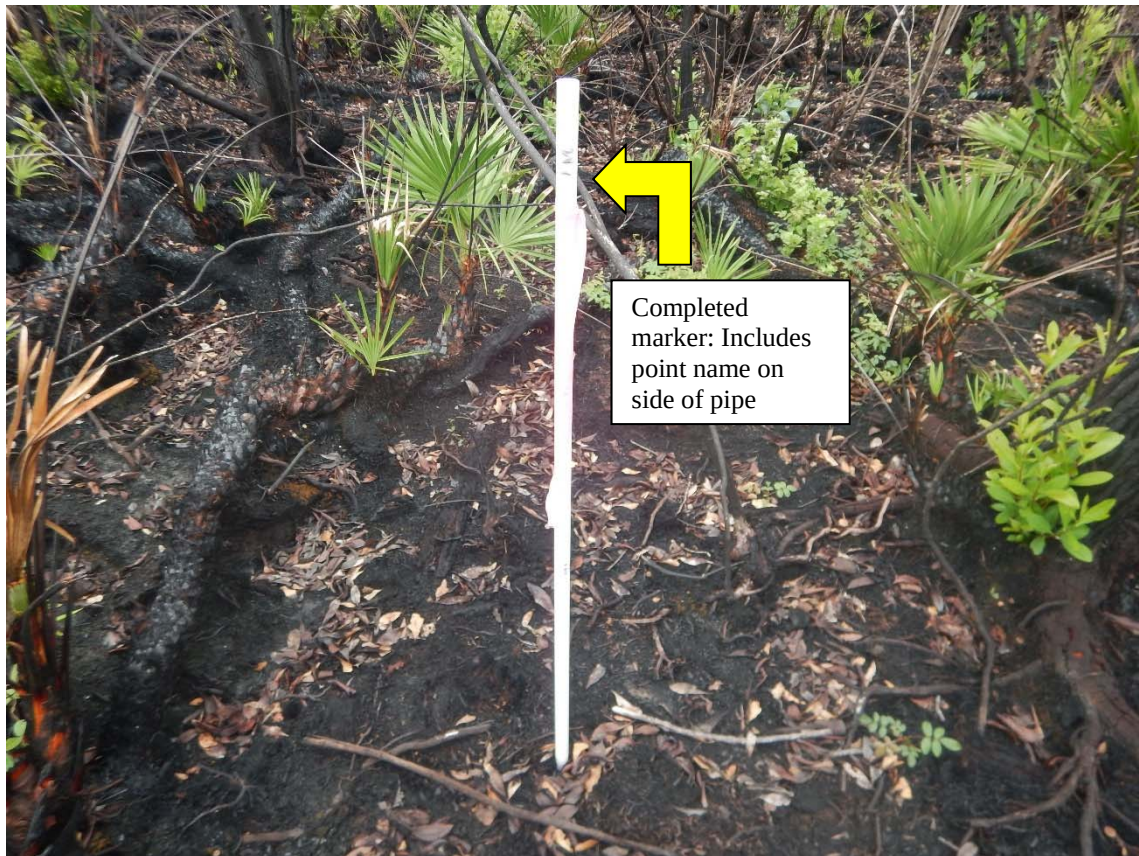
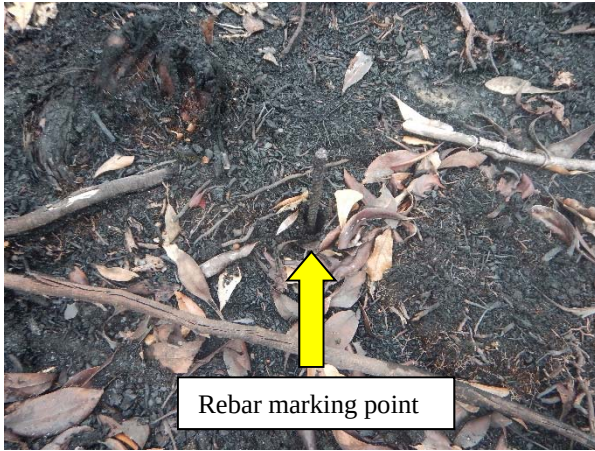
| Soil Transects – LM2 2 Transect Group |                                   |                                              |
|---------------------------------------|-----------------------------------|----------------------------------------------|
| <b>LM2 2.2</b>                        | <b>Hydric at Surface</b>          |                                              |
| LATITUDE: 28° 06' 13.62362" (N)       | LONGITUDE: 081° 30' 55.69486" (W) |                                              |
| NORTHING: 1370788.12                  | EASTING: 489987.83                |                                              |
| ELEVATION: 77.00 ft. (NAVD 88)        | 23.470 m                          | RTK GPS                                      |
| ELEVATION: 77.97 ft. (NGVD 29)        | 23.766 m                          | 0.971 ft. (conversion factor) Corpscon 6.0.1 |





# LAKE MARION CREEK WEST

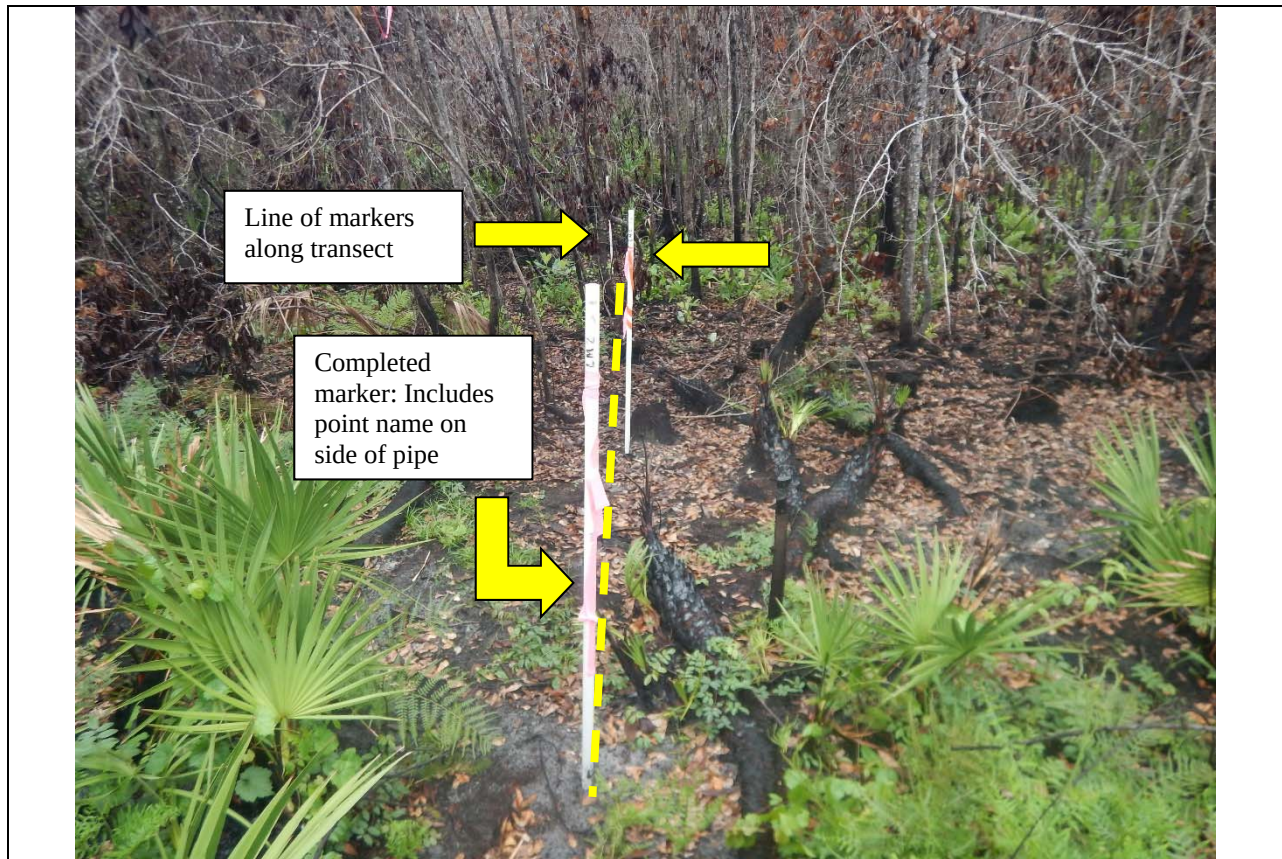
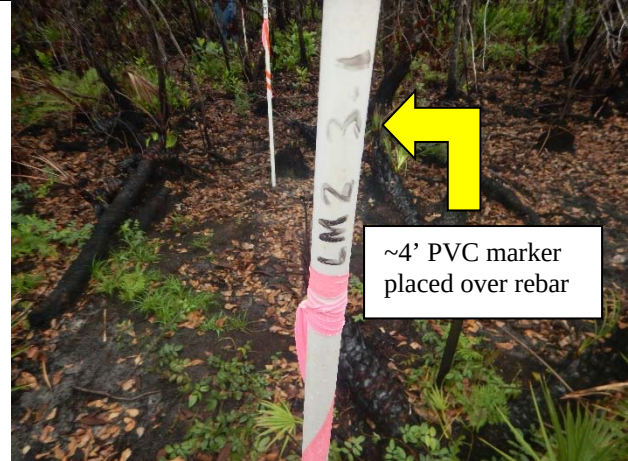
| Soil Transects – LM2 2 Transect Group |                                   |                                              |
|---------------------------------------|-----------------------------------|----------------------------------------------|
| <b>LM2 2.3</b>                        | <b>Muck at Surface</b>            |                                              |
| LATITUDE: 28° 06' 13.67956" (N)       | LONGITUDE: 081° 30' 55.66457" (W) |                                              |
| NORTHING: 1370793.75                  | EASTING: 489990.56                |                                              |
| ELEVATION: 76.21 ft. (NAVD 88)        | 23.229 m                          | RTK GPS                                      |
| ELEVATION: 77.18 ft. (NGVD 29)        | 23.525 m                          | 0.971 ft. (conversion factor) Corpscon 6.0.1 |





# LAKE MARION CREEK WEST

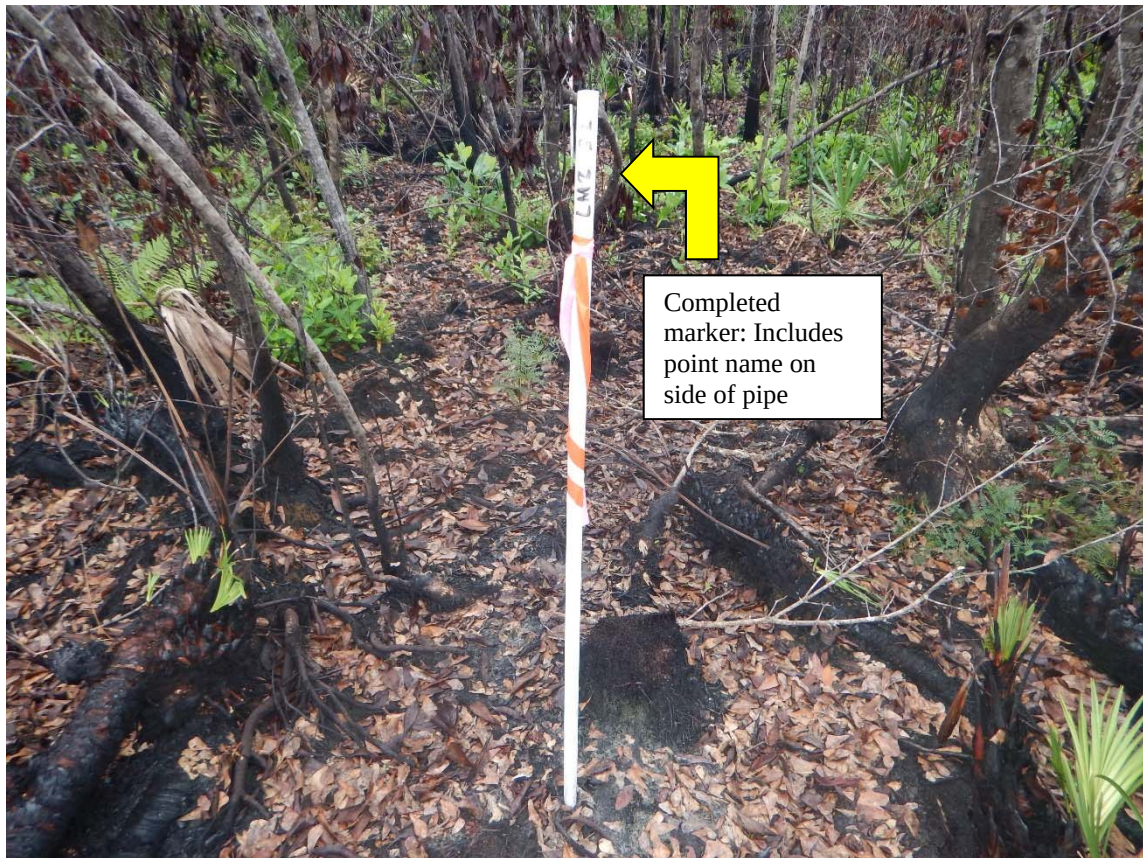
| Soil Transects – LM2 3 Transect Group |                                   |                                              |
|---------------------------------------|-----------------------------------|----------------------------------------------|
| <b>LM2 3.1</b>                        | <b>Wetland Boundary</b>           |                                              |
| LATITUDE: 28° 06' 18.86711" (N)       | LONGITUDE: 081° 31' 00.50594" (W) |                                              |
| NORTHING: 1371319.50                  | EASTING: 489559.23                |                                              |
| ELEVATION: 79.03 ft. (NAVD 88)        | 24.088 m                          | RTK GPS                                      |
| ELEVATION: 80.00 ft. (NGVD 29)        | 24.384 m                          | 0.971 ft. (conversion factor) Corpscon 6.0.1 |





# LAKE MARION CREEK WEST

| Soil Transects – LM2 3 Transect Group |                                   |                                              |
|---------------------------------------|-----------------------------------|----------------------------------------------|
| <b>LM2 3.2</b>                        | <b>Hydric at Surface</b>          |                                              |
| LATITUDE: 28° 06' 18.95064" (N)       | LONGITUDE: 081° 31' 00.47769" (W) |                                              |
| NORTHING: 1371327.92                  | EASTING: 489561.80                |                                              |
| ELEVATION: 77.18 ft. (NAVD 88)        | 23.525 m                          | RTK GPS                                      |
| ELEVATION: 78.15 ft. (NGVD 29)        | 23.820 m                          | 0.971 ft. (conversion factor) Corpscon 6.0.1 |





# LAKE MARION CREEK WEST

| Soil Transects – LM2 3 Transect Group |                                   |                                              |
|---------------------------------------|-----------------------------------|----------------------------------------------|
| <b>LM2 3.3</b>                        | <b>Muck at Surface</b>            |                                              |
| LATITUDE: 28° 06' 19.17070" (N)       | LONGITUDE: 081° 31' 00.42361" (W) |                                              |
| NORTHING: 1371350.13                  | EASTING: 489566.74                |                                              |
| ELEVATION: 73.67 ft. (NAVD 88)        | 22.455 m                          | RTK GPS                                      |
| ELEVATION: 74.64 ft. (NGVD 29)        | 22.751 m                          | 0.971 ft. (conversion factor) Corpscon 6.0.1 |





# LAKE MARION CREEK WEST

| Seasonal High-Water Marks       |                                   |                                              |
|---------------------------------|-----------------------------------|----------------------------------------------|
| LM2 SH 1                        | Seasonal HW Elevation             |                                              |
| LATITUDE: 28° 06' 21.06283" (N) | LONGITUDE: 081° 30' 50.66222" (W) |                                              |
| NORTHING: 1371537.51            | EASTING: 490441.68                |                                              |
| ELEVATION: 64.70 ft. (NAVD 88)  | 19.721 m                          | RTK GPS                                      |
| ELEVATION: 65.67 ft. (NGVD 29)  | 20.017 m                          | 0.971 ft. (conversion factor) Corpscon 6.0.1 |





## LAKE MARION CREEK WEST

| Seasonal High-Water Marks       |                                   |                                              |
|---------------------------------|-----------------------------------|----------------------------------------------|
| LM2 SH 2                        | Seasonal HW Elevation             |                                              |
| LATITUDE: 28° 06' 21.08006" (N) | LONGITUDE: 081° 30' 50.62864" (W) |                                              |
| NORTHING: 1371539.24            | EASTING: 490444.70                |                                              |
| ELEVATION: 64.82 ft. (NAVD 88)  | 19.757 m                          | RTK GPS                                      |
| ELEVATION: 65.79 ft. (NGVD 29)  | 20.053 m                          | 0.971 ft. (conversion factor) Corpscon 6.0.1 |



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# **SURVEYOR'S REPORT**

---

## **CENTRAL FLORIDA WATER INITIATIVE (CFWI) SURVEYS**

### **SUMICA NORTH WELL, TRANSECTS & SEASONAL HIGH-WATER MARKS SURVEY**

**County: Polk  
Location Name: SUMICA**

**Prepared for:**

**South Florida Water Management District  
WORK ORDER NO. 4600003702-WO2**

**Prepared by:**



|                             |                       |
|-----------------------------|-----------------------|
| <b>P&amp;A PROJECT NO.:</b> | <b>18998</b>          |
| <b>FIELD DATES:</b>         | <b>5/1 –6/06/2019</b> |
| <b>DATE OF THIS REPORT:</b> | <b>06/14/2019</b>     |



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**PROJECT DESCRIPTION**

This survey was prepared to document the horizontal and vertical location of a new monitoring well (POS-20) and benchmark established by District's Data, Monitoring, and Investigations Team (DMIT), establish an additional benchmark near the associated wetlands to be monitored, and locate transects and seasonal high water markers at the wetland site.

The benchmark at the well is a standard SFWMD 2" survey marker disk stamped "POS-20" imbedded in the corner of the concrete well pad. The additional benchmark is a standard SFWMD 2" survey marker disk set in the top of a 1 ¼ " iron pipe in concrete stamped "POS-20 A"

**LOCATION:**

The SUMICA NORTH well is located at the SUMICA County Park in Polk County. The park entrance is located approximately 13.6 miles east along State Road 60 from US Highway 27 in Lake Wales. (See "To Reach" Description on Benchmark Form and location sketch included further on in this report)

**HORIZONTAL DATUM:**

The horizontal position of the POS-20 mark was determined by using the average of two separate observations of 180 epochs with a Trimble R-10 receiver using a subscription-based Network Real Time Kinematic GPS solution (NRTK-GPS). Using the resulting position, a base-rover RTK-GPS was used to check to the nearest published NGS mark, K102 (PID-AF7629), with a resulting horizontal difference of 0.03 feet over 2.5 miles. The initial average value determined by NRTK-GPS was held as observed.

Horizontal coordinate values are referenced to the East Zone of the Florida State Plane Coordinate System, North American Datum of 1983, Adjustment of 2011 (Epoch 2010.0000), US Survey Feet. (sFT)

**VERTICAL DATUM:**

Elevations were determined by differential leveling using third order methods with a digital level and a bar code rod. The allowable error for the level run is 0.02' √miles per SFWMD specifications for this work order. Prior to running a level loop through mark POS-20, a level run was made between two published NGS marks to verify accuracy. The run originated on Y 504 (PID – AJ6627) and closed on H 686 (PID – DJ8319) with a closure of .001' which was well below the allowable tolerance. The published elevation for H 686 was held for a level loop that ran through mark POS-20 back to H 686. The total run was 2.9 miles and had an allowable tolerance of 0.034 feet. Closure was 0.004 feet and no adjustment was made to the loop. The elevation of POS-20A was determined by double run differential leveling from POS-20.

Vertical elevations were established in the North American Vertical Datum of 1988 (NAVD 88). Units are in feet.



**POS-20 Benchmark and Well Summary**  
**Elevations are NAVD 88 (feet)**

Latitude: 27° 51' 22.86492"                      Longitude: 81° 22' 31.54491"  
Northing: 1,280,665.513 sFT                      Easting: 534,858.704 sFT  
BM Elevation: 67.42'                      Well Measure point elevation: 70.63'  
Pad Elevation: 67.41'                      Ground Elevation: 67.1'  
Measure down to water from well measure point on May 14, 2019.      7.20'

**POS-20A Benchmark Summary**

Latitude: 27° 51' 20.68112"                      Longitude: 81° 22' 30.82492"  
Northing: 1,280,444.778 sFT                      Easting: 534,922.653 sFT  
BM Elevation: 66.09'

**EQUIPMENT USED**

- Trimble DiNi 22 Level Serial Number 772842 (digital level)
- Trimble GPS unit R-10, Serial Number 0079 (RTK)
- Trimble GPS unit R-10, Serial Number 2948 (RTK)
- Trimble Total Station, Serial Number 36820056 (optical)

See attached following documents:

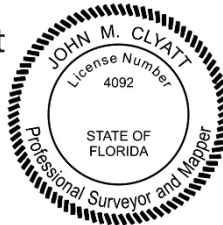
- Well and Benchmark Photos
- SFWMD Benchmark forms
- SFWMD Site Form
- Survey Maps



Digitally signed  
by John M. Clyatt

---

John M. Clyatt P.S.M.  
Florida Registration No. 4092  
Pickett & Associates, Inc.  
Florida Registration No. LB 364



June 14, 2019

---

Survey Date

## WELL PHOTOS







Benchmark POS-20  
EL 67.42' (NAVD 88)

POS 20  
PICKETT

Sumica N  
01 May 2019, 08:45:32





☉ 27°51'23.2"N, 81°22'31.8"W ±16.4ft



POS 20  
PICKETT

Sumica N  
01 May 2019, 08:49:49











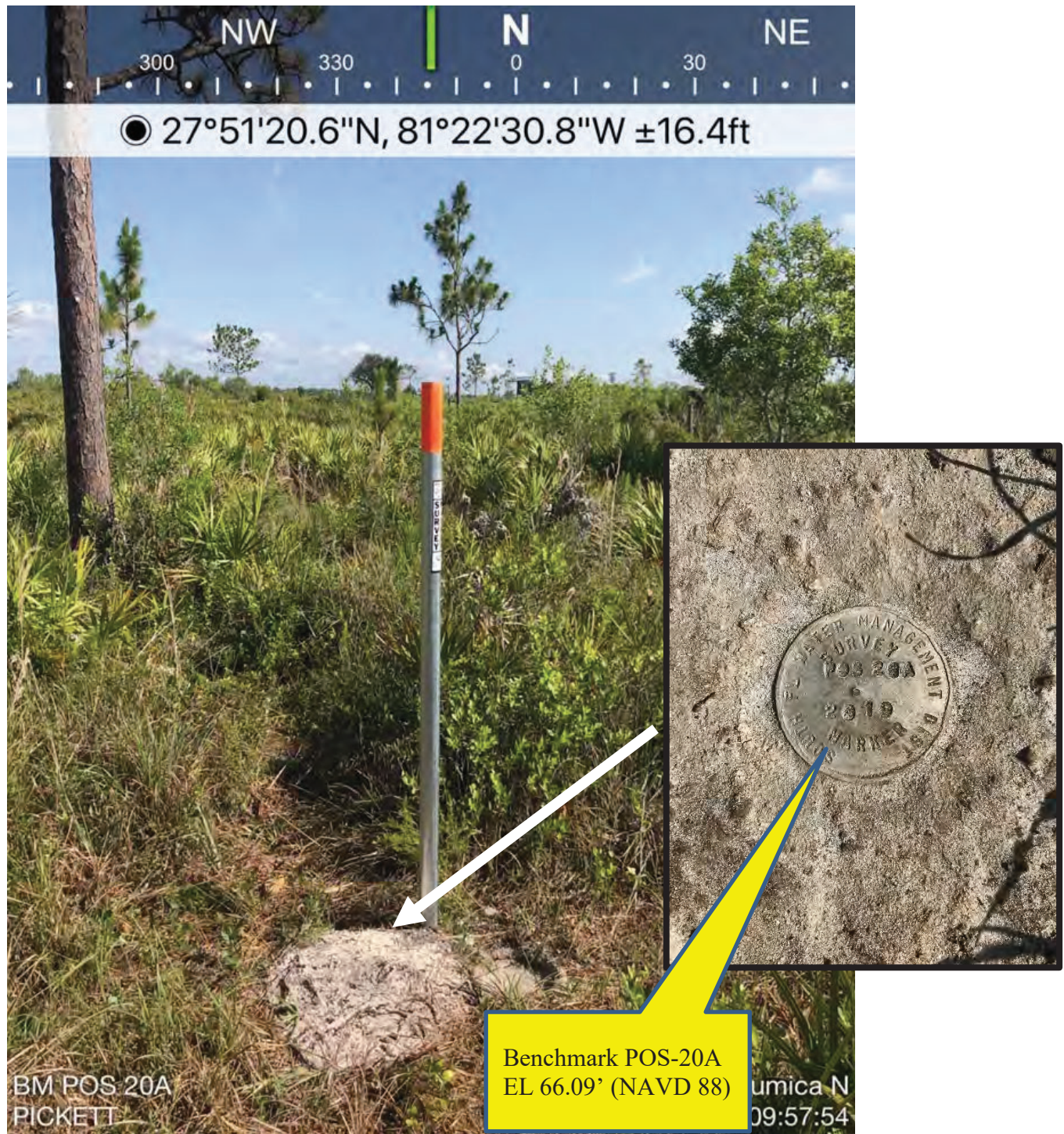


## POS -20 WELL ENCLOSURE STAND-PIPE





## BENCHMARK POS-20 A



## TRANSECT POINTS AND SEASONAL HIGH-WATER MARKS SUMMARY TABLE

| Transect         | Point ID  | Attribute             | Elevation | LAT - LONG                             | SPC Coord                     |
|------------------|-----------|-----------------------|-----------|----------------------------------------|-------------------------------|
| 1                | SUM1 1.1  | Wetland boundary      | 65.57'    | 27°51' 20.42893"<br>81° 22' 30.61517"  | N 1280419.252<br>E 534941.401 |
|                  | SUM1 1.2  | Hydric at surface     | 65.45'    | 27° 51' 20.41514"<br>81° 22' 30.56945" | N 1280417.847<br>E 534945.50  |
|                  | SUM1 1.3  | Muck at surface       | 65.35'    | 27° 51'20.47694"<br>81° 22' 30.51854"  | N 1280424.074<br>E 534950.089 |
| 2                | SUM1 2.1  | Wetland boundary      | 65.73'    | 27° 51' 18.31544"<br>81° 22' 28.68886" | N 1280205.287<br>E 535113.647 |
|                  | SUM1 2.2  | Hydric at surface     | 65.47'    | 27° 51' 18.47144"<br>81° 22' 28.72669" | N 1280221.052<br>E 535110.300 |
|                  | SUM1 2.3  | Muck at surface       | 65.43'    | 27° 51' 18.54294"<br>81° 22' 28.69736" | N 1280228.264<br>E 535112.955 |
| 3                | SUM1 3.1  | Wetland boundary      | 65.47'    | 27° 51' 22.44066"<br>81° 22' 27.77201" | N 1280621.632<br>E 535197.213 |
|                  | SUM1 3.2  | Hydric at surface     | 65.44'    | 27° 51' 22.36825"<br>81° 22' 27.81910" | N 1280614.333<br>E 535192.964 |
|                  | SUM1 3.3  | Muck at surface       | 65.33'    | 27° 51' 22.30481"<br>81° 22' 27.90846" | N 1280607.95<br>E 535184.924  |
| High Water Marks | SUM1 SH 1 | Seasonal HW elevation | 66.30'    | 27° 51' 21.25851"<br>81° 22' 29.04187" | N 1280502.598<br>E 535082.871 |
|                  | SUM1 SH 2 | Seasonal HW elevation | 66.45'    | 27° 51' 21.32810"<br>81° 22' 29.34159" | N 1280509.708<br>E 535055.99  |
|                  | SUM1 SH 3 | Seasonal HW elevation | 66.27'    | 27° 51' 21.24853"<br>81° 22' 29.33870" | N 1280501.671<br>E 535056.225 |

**NOTE:**

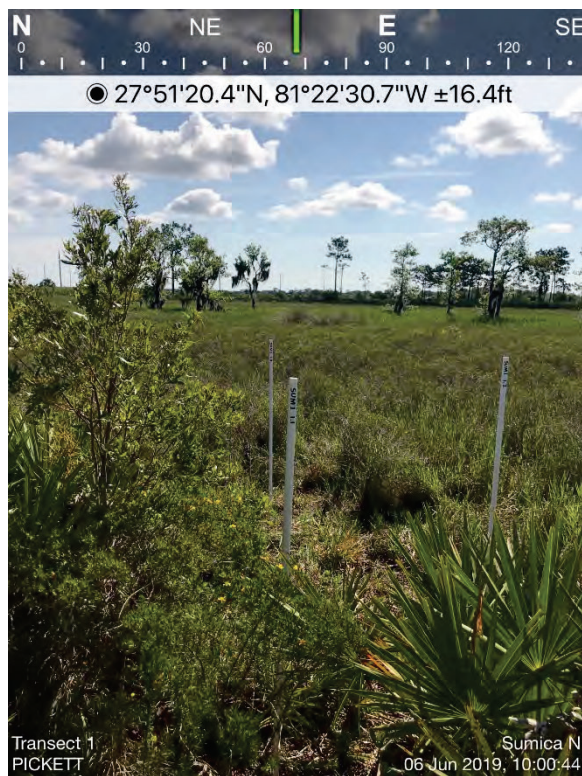
The horizontal locations of all the above points were determined by base-rover RTK-GPS with an estimated horizontal accuracy of +/- 0.10 feet.

The estimated vertical accuracy of all transect points is +/- 0.10 '. Seasonal High-Water marks were determined by differential leveling and have an estimated vertical accuracy of +/- .01'.

See General Location Map and Transects & Seasonal High-Water Marks Map included herein.

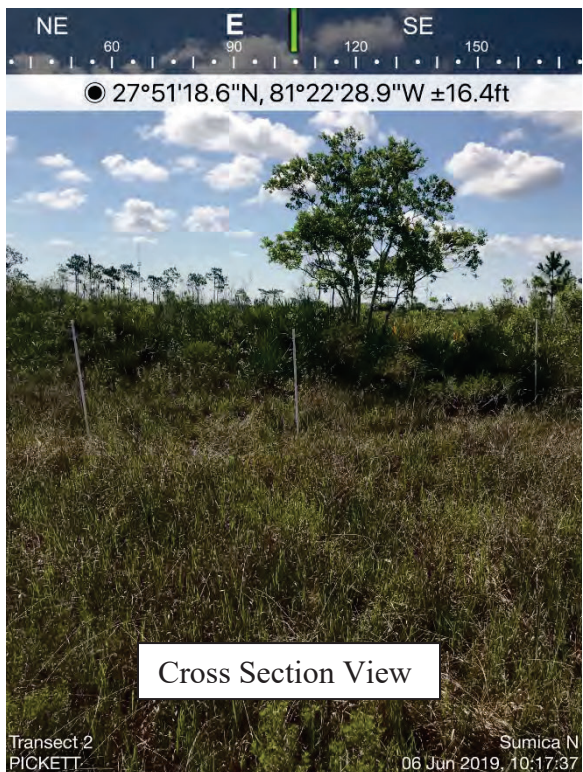


## TRANSECT 1 PHOTOS



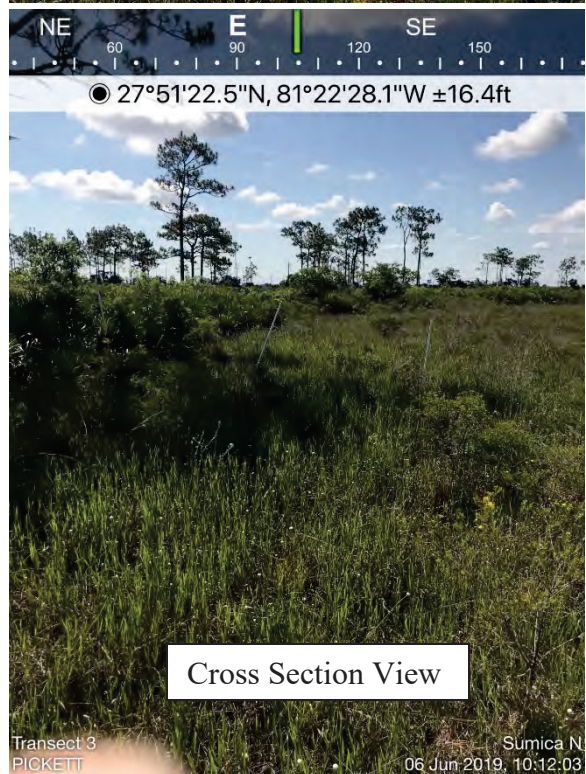


## TRANSECT 2 PHOTOS



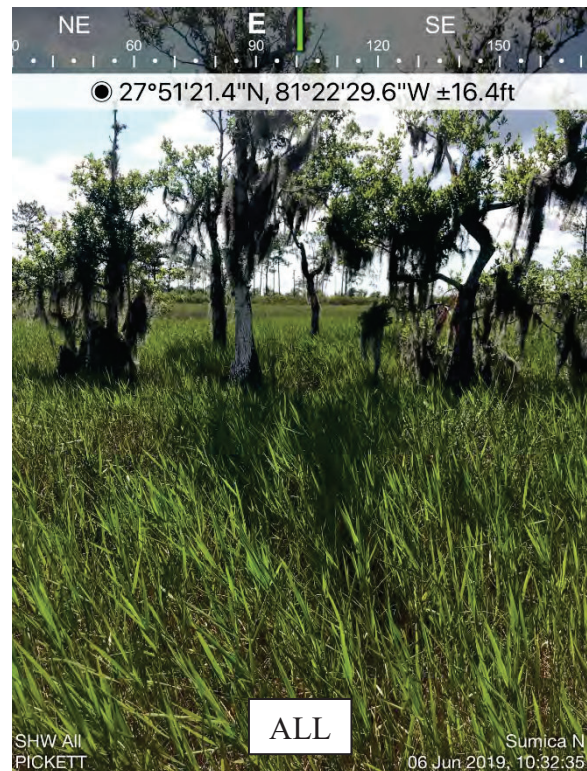
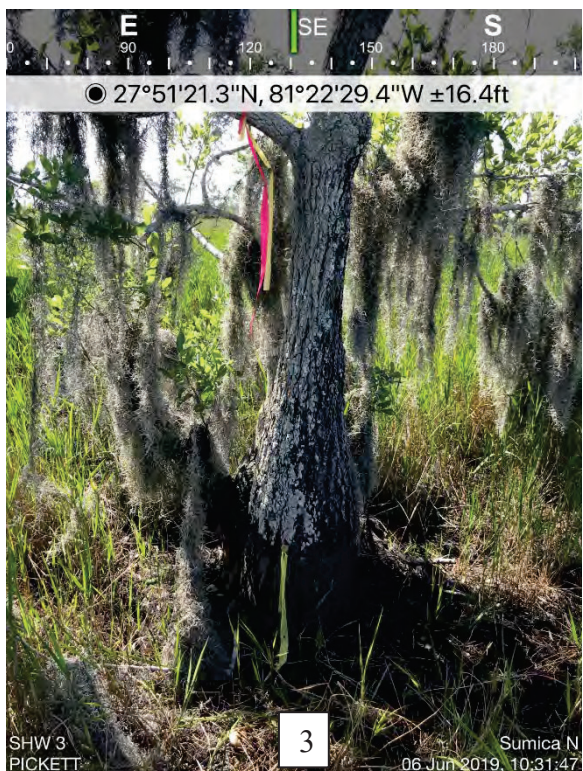
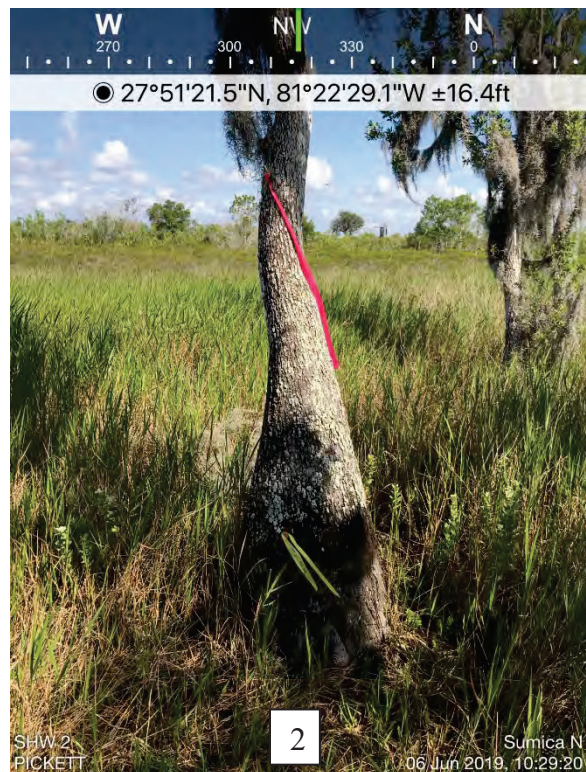
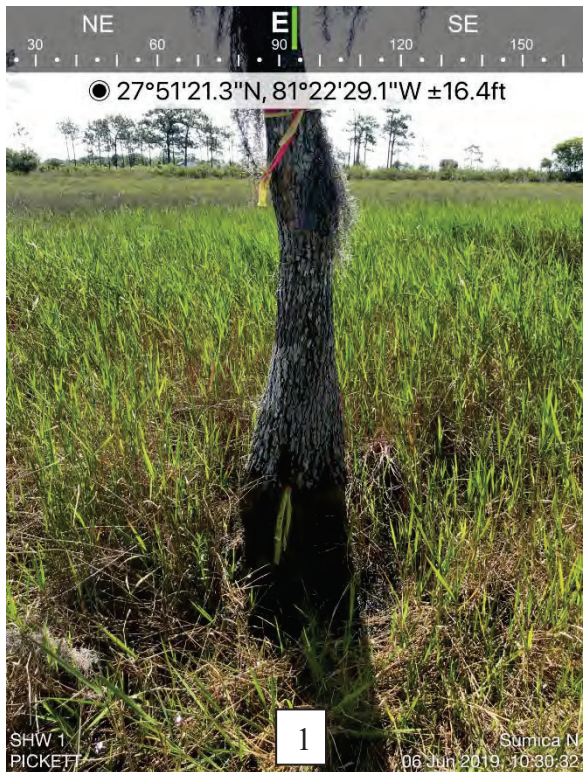


## TRANSECT 3 PHOTOS





## SEASONAL HIGH-WATER MARKS







# SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Rev. 1/16

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                             |                                         |                                                      |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|-----------------------------------------|------------------------------------------------------|
| DESIGNATION: <b>POS-20</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                             | PROJECT: <b>CFWI SUMICA-N</b>           |                                                      |
| ESTABLISHED BY: <b>PICKETT &amp; ASSOCIATES, INC.</b>                                                                                                                                                                                                                                                                                                                                                                                                                            |                                             | SURVEYOR: <b>John M. Clyatt</b>         |                                                      |
| RECOVERED BY:                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                             | DATE: <b>May 06, 2019</b>               |                                                      |
| <b>GEOGRAPHIC POSITION</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                             |                                         |                                                      |
| SECTION <b>24</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                | TOWNSHIP <b>30 SOUTH</b>                    | RANGE <b>29 EAST</b>                    |                                                      |
| COUNTY: <b>Polk</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                              | NAME OF QUADRANGLE: <b>Lake Weohyakapka</b> |                                         |                                                      |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | GEOGRAPHIC INDEX OF QUAD: <b>3112</b>       |                                         |                                                      |
| HORIZONTAL DATUM: 1927 <u>(1983)</u> 2022 Other _____ (circle one) ZONE <u>(E)</u> or W                                                                                                                                                                                                                                                                                                                                                                                          |                                             |                                         |                                                      |
| VERTICAL DATUM: MSL 1929 <u>(1988)</u> 2022 Other _____ (circle one)                                                                                                                                                                                                                                                                                                                                                                                                             |                                             |                                         |                                                      |
| VERTICAL ACCURACY: 1 2 <u>(3)</u>                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                             |                                         |                                                      |
| STATE PLANE COORDINATE                                                                                                                                                                                                                                                                                                                                                                                                                                                           | (N) Y= <b>1,280,665.513</b>                 | (E) X= <b>534,858.704</b>               | NAVD 88 EL. <b>67.42</b><br>NGVD 29 EL. <b>68.60</b> |
| CORPSCON 6.0.1 CONVERSION FACTOR (NAVD88 TO NGVD29): <b>+ 1.178'</b><br>(A U.S. Army Corps of Engineers Engineering Research and Development Center Topographic Engineering Center Alexandria, Virginia Windows-based program to convert coordinates and elevations between datum's using vertcon05.txt and vertcon05.05 files supplied by the U.S. Army Corps of Engineers South Atlantic Division, Jacksonville FL.)<br>ACTUAL NGS or (ngvd29.txt file)      OPUS Ortho Height |                                             |                                         |                                                      |
| LATITUDE: <b>27° 51' 22.86492" (N)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                             | LONGITUDE: <b>81° 22' 31.54491" (W)</b> | (NAD 83 (2011) EPOCH:2010.0000)                      |
| <b>RECOVERY DATA</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                             |                                         |                                                      |
| Stamping: POS-20 2019                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                             |                                         |                                                      |
| <b>To Reach:</b> From the intersection of Sam Keen Road and S.R. 60, go NW along S.R. 60 towards Lake Wales 0.6 miles to entrance to Polk County Park known as SUMICA; turn left into park and go SW approximately 900 feet to rear of parking lot and gate with SFWMD lock. Go through gate and mark is on the left approximately 80 feet in open mowed area. Mark is a standard SFWMD aluminum disk set in the NE corner of 3'X3' concrete well pad.                           |                                             |                                         |                                                      |
| NOTABLE LAND MARKS: SUMICA County Park                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                             |                                         |                                                      |
| NGS-SOURCE BENCHMARK: H 686 (PID DJ8319)                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                             |                                         |                                                      |
| FIELD BOOK <b>972 PAGE 1-14</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                             |                                         |                                                      |
| <b>PICTURES</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                             |                                         |                                                      |
| <div><div>Aerial Overall Site<br/>From: Google Earth<br/>Imagery date:2/11/17</div><div></div></div>                                                                                                                                                                                                                                                                                         |                                             |                                         |                                                      |





# SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Rev. 1/16



View looking at SUMICA parking lot



Top View





# SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Rev. 1/16

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                      |                                                                         |                                                      |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|-------------------------------------------------------------------------|------------------------------------------------------|
| DESIGNATION: <b>POS-20A</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                      | PROJECT: <b>CFWI SUMICA-N</b>                                           |                                                      |
| ESTABLISHED BY: <b>PICKETT &amp; ASSOCIATES, INC.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                      | SURVEYOR: <b>John M. Clyatt</b>                                         |                                                      |
| RECOVERED BY:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                      | DATE: <b>May 06, 2019</b>                                               |                                                      |
| <b>GEOGRAPHIC POSITION</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                      |                                                                         |                                                      |
| SECTION <b>24</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | TOWNSHIP <b>30 SOUTH</b>                                                             | RANGE <b>29 EAST</b>                                                    |                                                      |
| COUNTY: <b>Polk</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | NAME OF QUADRANGLE: <b>Lake Weohyakapka</b><br>GEOGRAPHIC INDEX OF QUAD: <b>3112</b> |                                                                         |                                                      |
| HORIZONTAL DATUM: 1927 <u>(1983)</u> 2022 Other _____ (circle one) ZONE <u>(E)</u> or W                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                      |                                                                         |                                                      |
| VERTICAL DATUM: MSL 1929 <u>(1988)</u> 2022 Other _____ (circle one)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                      |                                                                         |                                                      |
| VERTICAL ACCURACY: 1 2 <u>(3)</u>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                      |                                                                         |                                                      |
| STATE PLANE<br>COORDINATE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | (N) Y= <b>1,280,444.778</b>                                                          | (E) X= <b>534,922.653</b>                                               | NAVD 88 EL. <b>66.09</b><br>NGVD 29 EL. <b>67.27</b> |
| CORPSCON 6.0.1 CONVERSION FACTOR (NAVD88 TO NGVD29): <b>+ 1.178</b><br><small>(A U.S. Army Corps of Engineers Engineering Research and Development Center Topographic Engineering Center Alexandria, Virginia Windows-based program to convert coordinates and elevations between datum's using vertcon05.txt and vertcon05.05 files supplied by the U.S. Army Corps of Engineers South Atlantic Division, Jacksonville Fl.)</small><br>ACTUAL NGS or (ngvd29.txt file) OPUS Ortho Height                                                                                                                                                                     |                                                                                      |                                                                         |                                                      |
| LATITUDE: <b>27° 51' 20.68112" (N)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                      | LONGITUDE: <b>81° 22' 30.82492" (W)</b> (NAD 83 (2011) EPOCH:2010.0000) |                                                      |
| <b>RECOVERY DATA</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                      |                                                                         |                                                      |
| Stamping: POS-20A 2019                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                      |                                                                         |                                                      |
| <b>To Reach:</b> From the intersection of Sam Keen Road and S.R. 60, go NW along S.R. 60 towards Lake Wales 0.6 miles to entrance to Polk County Park known as SUMICA; turn left into park and go SW approximately 900 feet to rear of parking lot and gate with SFWMD lock. Go through gate and go SE approximately 80 feet to Well POS-20, go SSE approximately 230 feet to mark set on the westerly edge of a wet-weather pond. Mark is a standard SFWMD aluminum disk set in a 1-1/4" pipe with a concrete collar 3" below ground surface.<br>S 38°E, 16.8' from a 12" Pine; N31°E, 34.9' from a 12" pine; 1' east of metal post with survey marker decal |                                                                                      |                                                                         |                                                      |
| NOTABLE LAND MARKS: SUMICA County Park                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                      |                                                                         |                                                      |
| NGS-SOURCE BENCHMARK: H 686 (PID DJ8319)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                      |                                                                         |                                                      |
| FIELD BOOK <b>972 PAGE 20</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                      |                                                                         |                                                      |
| <b>PICTURES</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                      |                                                                         |                                                      |
| Aerial of Overall Site<br>from Google Earth<br>Imagery date: 2/11/17                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                      |                                                                         |                                                      |





# SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Rev. 1/16

## BENCHMARK PHOTOS







# SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Rev. 1/16

|                                          |                                       |                       |                                        |
|------------------------------------------|---------------------------------------|-----------------------|----------------------------------------|
| SCADA RTU Station Name:<br><b>POS-20</b> | DB Hydro Site Name:<br><b>SUMICAN</b> | Agency:<br><b>WMD</b> | Date of Field Work:<br><b>06/14/19</b> |
| Party Chief: <b>Dustin Lanier</b>        | Field Book: <b>972</b>                | Page(s): <b>1-14</b>  | Prepared by: <b>John Clyatt</b>        |

## SITE SPECIFIC DATA

|                                                   |                                                                |                                                                        |
|---------------------------------------------------|----------------------------------------------------------------|------------------------------------------------------------------------|
| Site Benchmark:<br><b>POS-20</b>                  | Benchmark Elevation (NAVD88)<br><b>67.42</b>                   | Corpscon 6.0.1 Conversion Factor (NAVD88 to NGVD29)<br><b>+ 1.178'</b> |
| Reference Elevation(s) (NAVD88):<br><b>70.63'</b> | Existing Brass Tag Elevation (Datum):<br><b>Not Applicable</b> | Calibration Port Elevation(s) (NAVD88):<br><b>Not Applicable</b>       |
| Ground Elevation (NAVD88): <b>67.1</b>            | Pad Elevation (NAVD88): <b>67.41</b>                           |                                                                        |

## GEOGRAPHIC DATA

|                   |                                           |                                          |                                      |
|-------------------|-------------------------------------------|------------------------------------------|--------------------------------------|
| Section <b>24</b> | Township <b>30</b> South                  |                                          | Range <b>29</b> East                 |
| <b>Well</b>       | Latitude:<br><b>27° 51' 22.86492" (N)</b> | Longitude:<br><b>81°22' 31.5449" (W)</b> | Source: NRTK GPS – NAD 83(2011)      |
|                   | State Plane Coordinates                   | Northing (Y) =<br><b>1,280,665.51 ft</b> | Easting (X) =<br><b>534858.70 ft</b> |

### Notes:

**NAVD88** – North American Vertical Datum of 1988

**NGVD29**- National Geodetic Vertical Datum of 1929

**Corpscon 6.0.1** - A U.S. Army Corps of Engineers Engineering Research and Development Center Topographic Engineering Center Alexandria, Virginia Windows-based program to convert coordinates and elevations between datum's using vertcon05.txt and vertcon05.05 files supplied by the U.S. Army Corps of Engineers South Atlantic Division, Jacksonville FL.

## PICTURES

Aerial Overall Site



Not to scale (Google Earth product)





# SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Rev. 1/16



POS- 20 WELL



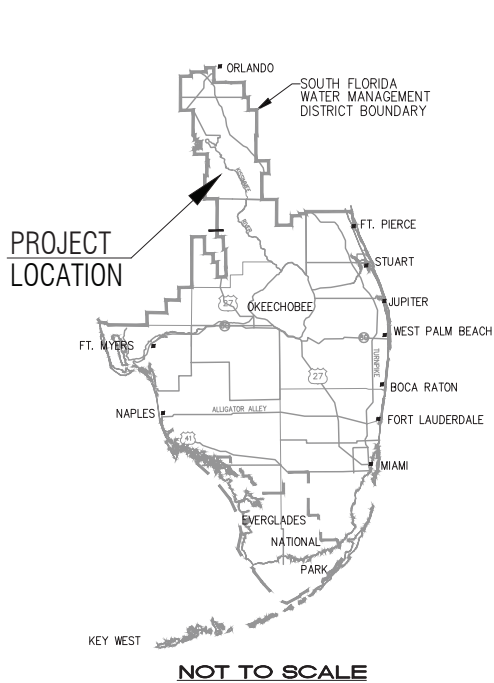


# SOUTH FLORIDA WATER MANAGEMENT DISTRICT

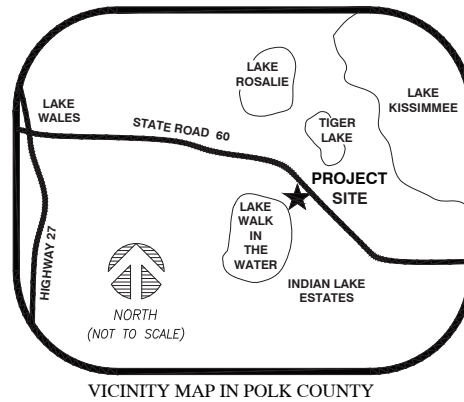
Rev. 1/16



POS-20 WELL



LOCATION MAP  
CENTRAL FLORIDA WATER INITIATIVE (CFWI) SURVEYS  
**SUMICA NORTH**  
SECTION 24, TOWNSHIP 30 S, RANGE 29 E,  
POLK COUNTY, FL



LEGEND:

NGS NATIONAL GEODETIC SURVEY  
BM BENCHMARK



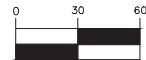
SHEET 1 OF 2

|       |         |      |           |
|-------|---------|------|-----------|
|       |         |      |           |
|       |         |      |           |
|       |         |      |           |
| DRAWN | CHECKED | DATE | REVISIONS |

CENTRAL FLORIDA WATER INITIATIVE (CFWI)  
SUMICA NORTH  
WELL, TRANSECTS & SEASONAL  
HIGH-WATER MARKS SURVEY

SOUTH FLORIDA WATER MANAGEMENT DISTRICT  
INFRASTRUCTURE MANAGEMENT BUREAU-SURVEY & MAPPING SECTION  
P.O. BOX 24680, 3301 GUN CLUB ROAD  
WEST PALM BEACH, FLORIDA 33416-4680





( IN FEET )  
1 inch = 60 ft.

GRAPHIC & INTENDED DISPLAY SCALE

CENTRAL FLORIDA WATER INITIATIVE (CFWI) SURVEYS  
**SUMICA NORTH**  
TRANSECTS & SEASONAL HIGH WATER MARKS



SHEET 2 OF 2

|       |         |      |           |
|-------|---------|------|-----------|
|       |         |      |           |
|       |         |      |           |
|       |         |      |           |
| DRAWN | CHECKED | DATE | REVISIONS |

CENTRAL FLORIDA WATER INITIATIVE (CFWI)  
SUMICA NORTH  
WELL, TRANSECTS & SEASONAL  
HIGH-WATER MARKS SURVEY

SOUTH FLORIDA WATER MANAGEMENT DISTRICT  
INFRASTRUCTURE MANAGEMENT BUREAU-SURVEY & MAPPING SECTION  
P.O. BOX 24680, 3301 GUN CLUB ROAD  
WEST PALM BEACH, FLORIDA 33416-4680

---

# **SURVEYOR'S REPORT**

---

## **CENTRAL FLORIDA WATER INITIATIVE (CFWI) SURVEYS**

### **SUMICA SOUTH WELL, TRANSECTS & SEASONAL HIGH-WATER MARKS SURVEY**

**County: Polk  
Location Name: SUMICA**

**Prepared for:**

**South Florida Water Management District  
WORK ORDER NO. 4600003702-WO2**

**Prepared by:**



|                             |                       |
|-----------------------------|-----------------------|
| <b>P&amp;A PROJECT NO.:</b> | <b>18999</b>          |
| <b>FIELD DATES:</b>         | <b>5/1 –6/06/2019</b> |
| <b>DATE OF THIS REPORT:</b> | <b>06/21/2019</b>     |



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**PROJECT DESCRIPTION**

This survey was prepared to document the horizontal and vertical location of a new monitoring well and benchmark established by District's Data, Monitoring, and Investigations Team (DMIT), establish an additional benchmark near the associated wetlands to be monitored, and locate transects and seasonal high water markers at the wetland site.

The benchmark at the well is a standard SFWMD 2" survey marker disk stamped "POS-20" imbedded in the corner of the concrete well pad. The additional benchmark is a standard SFWMD 2" survey marker disk set in the top of a 1 ¼ " iron pipe in concrete stamped "POS-20 A"

**LOCATION:**

The SUMICA SOUTH well is located at the SUMICA County Park in Polk County. The park entrance is located approximately 13.6 miles east along State Road 60 from US Highway 27 in Lake Wales. (See "To Reach" Description on Benchmark Form and location sketch included in this report)

**HORIZONTAL DATUM:**

The horizontal position of the POS-21 mark was established by base-rover RTK-GPS using previously established POS-20 as the base (see report for SUMICA NORTH). POS-20 was determined by using the average of two separate observations of 180 epochs with a Trimble R-10 receiver using a subscription-based Network Real Time Kinematic GPS solution (NRTK-GPS). Using the resulting position, a base-rover RTK-GPS was used to check to the nearest published NGS mark, K102 (PID-AF7629), with a resulting horizontal difference of 0.03 feet over 2.5 miles. The initial average value determined by NRTK-GPS was held as observed. All horizontal positions were determined by RTK-GPS from POS-20.

Horizontal coordinate values are referenced to the East Zone of the Florida State Plane Coordinate System, North American Datum of 1983, Adjustment of 2011 (Epoch 2010.0000), US Survey Feet. (sFT)

**VERTICAL DATUM:**

Elevations were determined by differential leveling using third order methods with a digital level and a bar code rod. The allowable error for the level run is 0.02' √miles per SFWMD specifications for this work order. Prior to running a level loop through mark POS-21, a level run was made between two published NGS marks to verify accuracy. The run originated on Y 504 (PID – AJ6627) and closed on H 686 (PID – DJ8319) with a closure of .001' which was well below the allowable tolerance. The published elevation for H 686 was held for a level loop that ran through mark POS-21 back to H 686. The total run was 2.9 miles and had an allowable tolerance of 0.034 feet. Closure was 0.004 feet and no adjustment was made to the loop. The elevation of POS-21A was determined by double run differential leveling from POS-20.

Vertical elevations were established in the North American Vertical Datum of 1988 (NAVD 88). Units are in feet.



**POS-21 Benchmark and Well Summary**  
**Elevations are NAVD 88 (feet)**

Latitude: 27° 50' 40.39606"      Longitude: 81° 22' 25.24113"  
Northing: 1,276,374.957 sFT      Easting: 535,411.437 sFT  
BM Elevation: 68.38'      Well Measure point elevation: 71.32'  
Pad Elevation: 68.38'      Ground Elevation: 68.12'  
Measure down to water from well measure point on May 14, 2019.      9.00'

**POS-21A Benchmark Summary**

Latitude: 27° 50' 44.39062"      Longitude: 81° 22' 27.24067"  
Northing: 1,276,778.905 sFT      Easting: 535,233.178 sFT  
BM Elevation: 67.39'

**EQUIPMENT USED**

- Trimble DiNi 22 Level Serial Number 772842 (digital level)
- Trimble GPS unit R-10, Serial Number 0079 (RTK)
- Trimble GPS unit R-10, Serial Number 2948 (RTK)
- Trimble Total Station, Serial Number 36820056 (optical)

See attached following documents:

- Well and Benchmark Photos
- SFWMD Benchmark forms
- SFWMD Site Form
- Survey Maps



Digitally signed  
by John M. Clyatt

---

John M. Clyatt P.S.M.  
Florida Registration No. 4092  
Pickett & Associates, Inc.  
Florida Registration No. LB 364



June 5, 2019

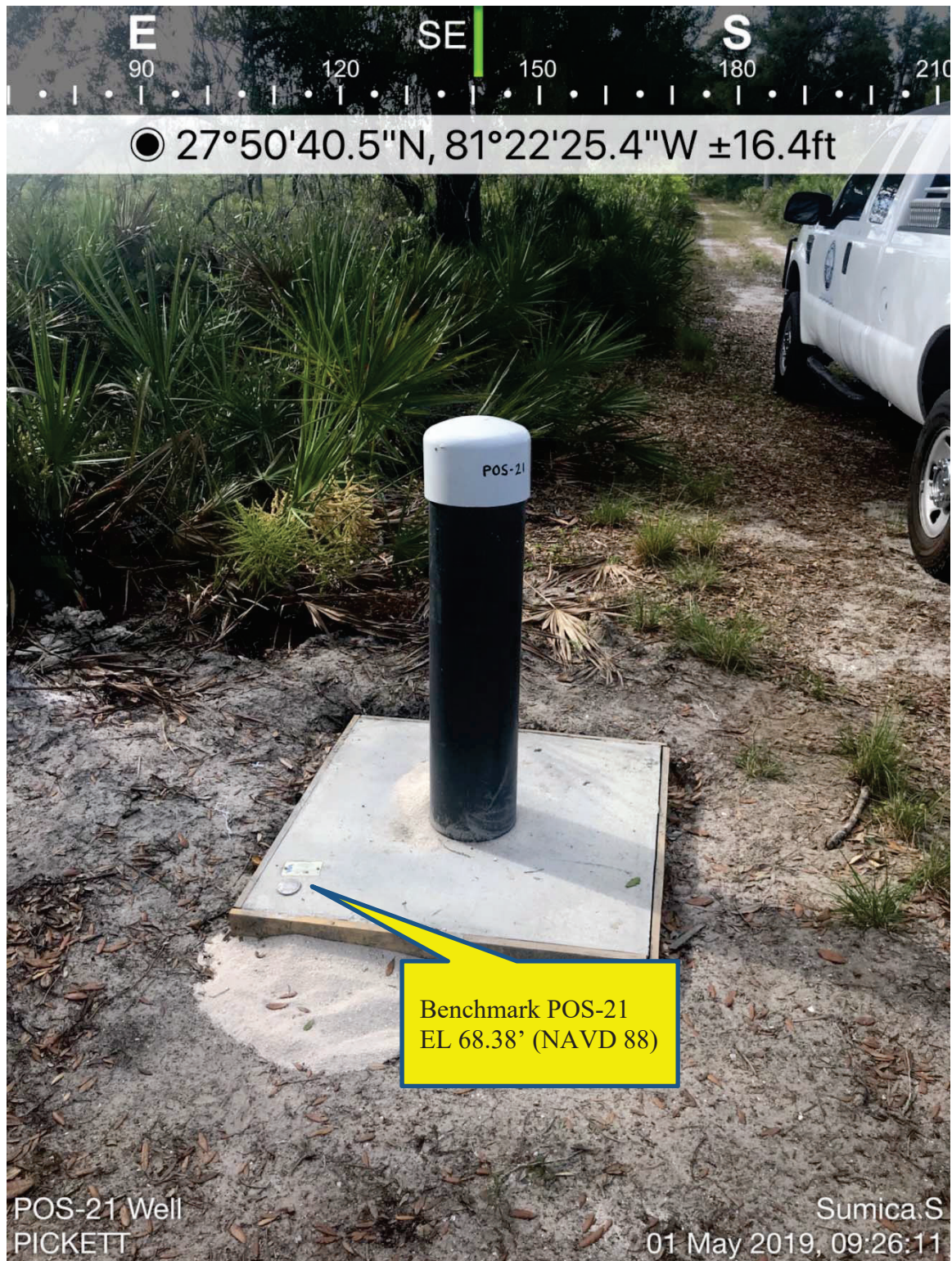
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Survey Date

# WELL PHOTOS



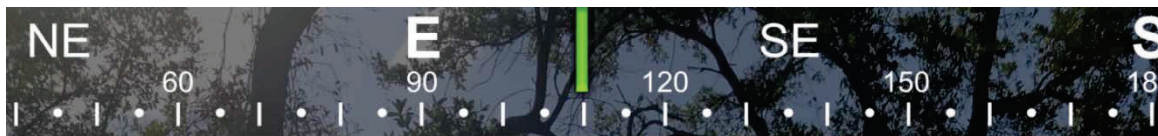












◎ 27°50'40.5"N, 81°22'25.4"W ±16.4ft



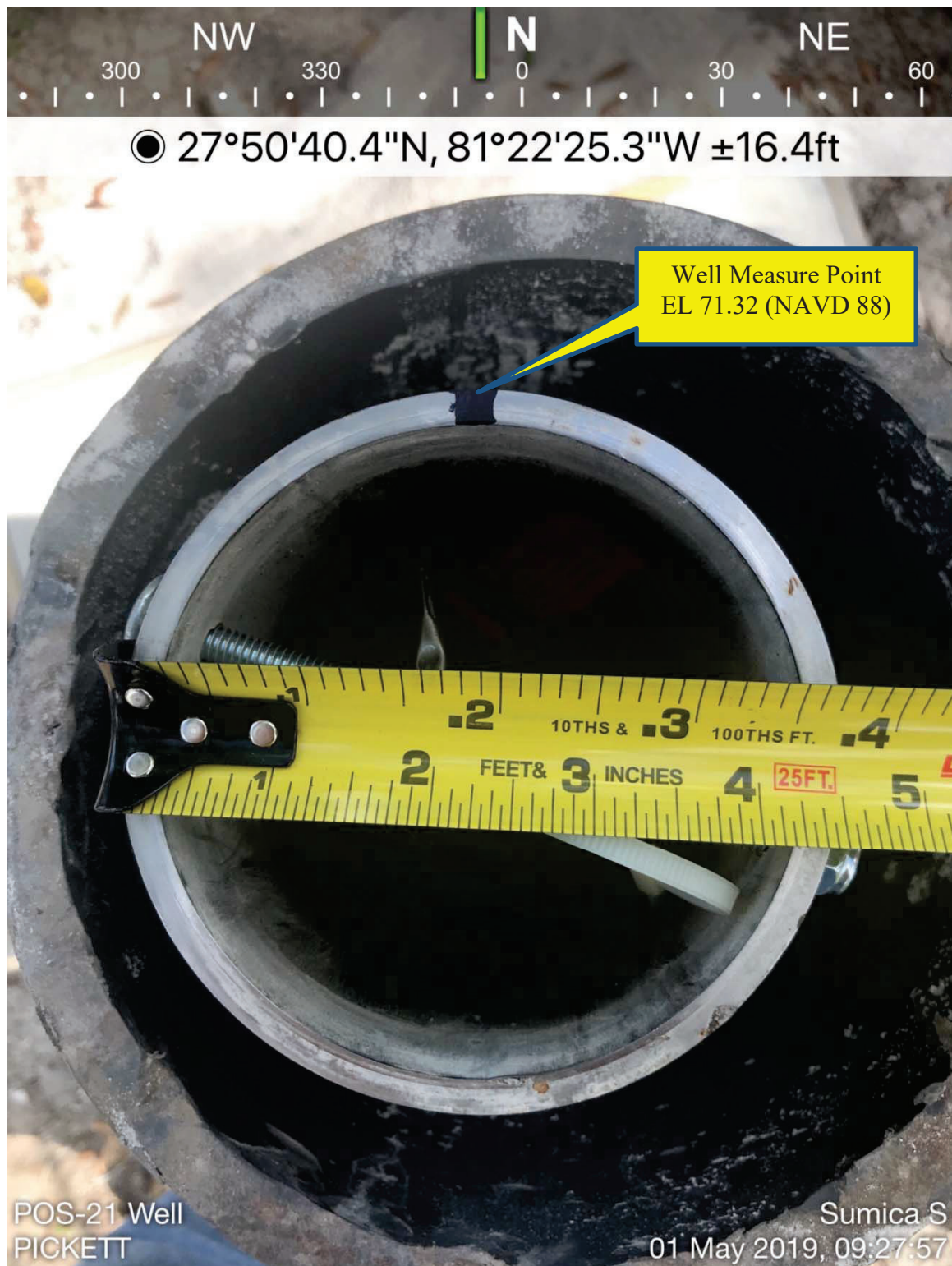
POS-21 Well  
PICKETT

Sumica S  
01 May 2019, 09:25:08











## BENCHMARK POS-21 A





## TRANSECT POINTS AND SEASONAL HIGH-WATER MARKS SUMMARY TABLE

| Transect         | Point ID  | Attribute             | Elevation | LAT - LONG                             | SPC Coord                     |
|------------------|-----------|-----------------------|-----------|----------------------------------------|-------------------------------|
| 1                | SUM2 1.1  | Wetland boundary      | 64.76'    | 27°50' 40.28785"<br>81° 22' 26.36824"  | N 1276364.338<br>E 535310.228 |
|                  | SUM2 1.2  | Hydric at surface     | 64.05'    | 27° 50' 40.10267"<br>81° 22' 26.53830" | N 1276345.684<br>E 535294.906 |
|                  | SUM2 1.3  | Muck at surface       | 63.93'    | 27° 50' 41.13678"<br>81° 22' 26.60112" | N 1276349.145<br>E 535289.277 |
| 2                | SUM2 2.1  | Wetland boundary      | 64.25'    | 27° 50' 41.19617"<br>81° 22' 27.18060" | N 1276456.289<br>E 535237.586 |
|                  | SUM2 2.2  | Hydric at surface     | 63.87'    | 27° 50' 41.16766"<br>81° 22' 27.24198" | N 1276453.427<br>E 535232.068 |
|                  | SUM2 2.3  | Muck at surface       | 63.72'    | 27° 50' 41.12188"<br>81° 22' 27.24290" | N 1276448.804<br>E 535231.971 |
| 3                | SUM2 3.1  | Wetland boundary      | 64.68'    | 27° 50' 42.92760"<br>81° 22' 28.20859" | N 1276631.424<br>E 535145.842 |
|                  | SUM2 3.2  | Hydric at surface     | 64.45'    | 27° 50' 42.87361"<br>81° 22' 28.33423" | N 1276626.006<br>E 535134.548 |
|                  | SUM2 3.3  | Muck at surface       | 64.19'    | 27° 50' 42.77152"<br>81° 22' 28.44137" | N 1276615.725<br>E 535124.899 |
| High Water Marks | SUM2 SH 1 | Seasonal HW elevation | 64.93'    | 27° 50' 39.78635"<br>81° 22' 26.91578" | N 1276313.842<br>E 535260.924 |
|                  | SUM2 SH 2 | Seasonal HW elevation | 64.58'    | 27° 50' 41.28743"<br>81° 22' 27.43507" | N 1276465.575<br>E 535214.772 |
|                  | SUM2 SH 3 | Seasonal HW elevation | 64.34'    | 27° 50' 42.36424"<br>81° 22' 29.20316" | N 1276574.804<br>E 535056.391 |

**NOTE:**

The horizontal locations of all the above points were determined by base-rover RTK-GPS with an estimated horizontal accuracy of +/- 0.10 feet.

The estimated vertical accuracy of all transect points is +/- 0.10 '. Seasonal High-Water marks were determined by differential leveling and have an estimated vertical accuracy of +/- .01'.

See General Location Map and Transects & Seasonal High-Water Marks Map included herein.



## TRANSECT 1 PHOTOS



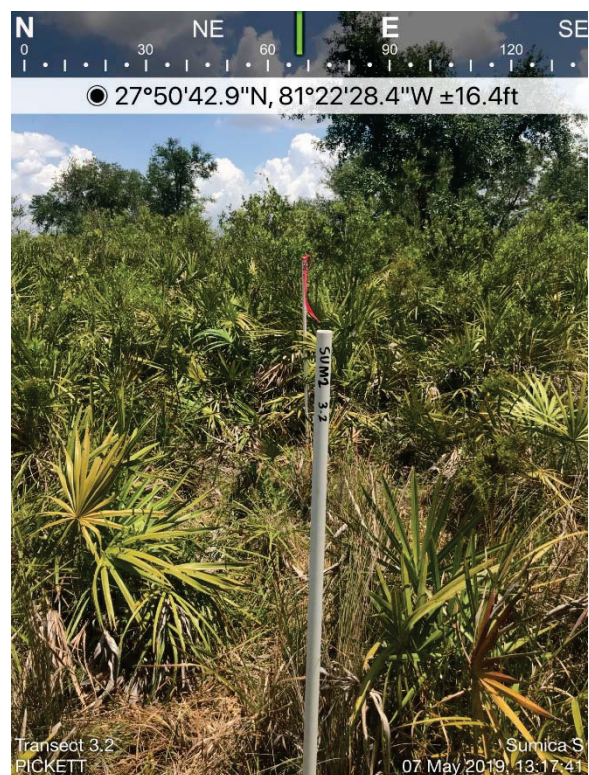
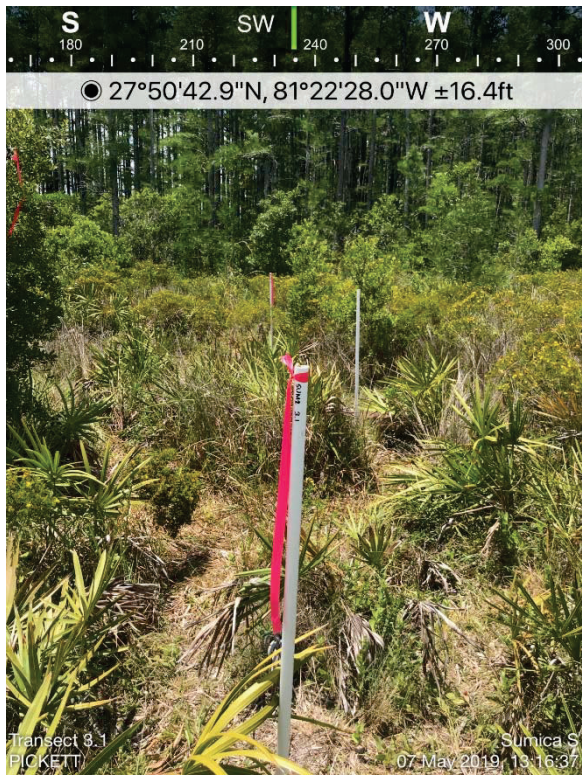


## TRANSECT 2 PHOTOS



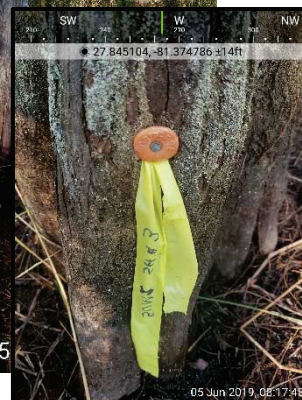
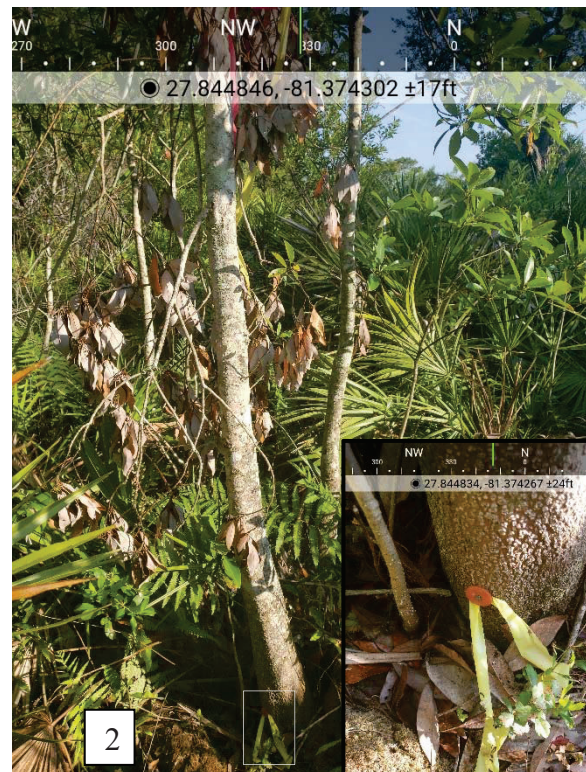


## TRANSECT 3 PHOTOS





## SEASONAL HIGH-WATER MARKS







# SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Rev. 1/16

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                |                                         |                                                      |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|-----------------------------------------|------------------------------------------------------|
| DESIGNATION: <b>POS-21</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                | PROJECT: <b>CFWI SUMICA-S</b>           |                                                      |
| ESTABLISHED BY: <b>PICKETT AND ASSOCIATES, INC.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                | SURVEYOR: <b>John M. Clyatt</b>         |                                                      |
| RECOVERED BY:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                | DATE: <b>May 06, 2019</b>               |                                                      |
| <b>GEOGRAPHIC POSITION</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                |                                         |                                                      |
| SECTION <b>24</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | TOWNSHIP <b>30 SOUTH</b>                       | RANGE <b>29 EAST</b>                    |                                                      |
| COUNTY: <b>Polk</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | NAME OF QUADRANGLE: <b>Lake Weohyakapka SE</b> |                                         |                                                      |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | GEOGRAPHIC INDEX OF QUAD: <b>3111</b>          |                                         |                                                      |
| HORIZONTAL DATUM: 1927 <b>(1983)</b> 2022 Other _____ (circle one) ZONE <b>(E)</b> or W                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                |                                         |                                                      |
| VERTICAL DATUM: MSL 1929 <b>(1988)</b> 2022 Other _____ (circle one)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                |                                         |                                                      |
| VERTICAL ACCURACY: 1 2 <b>(3)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                |                                         |                                                      |
| STATE PLANE COORDINATE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | (N) Y= <b>1,276,374.957</b>                    | (E) X= <b>535,411.437</b>               | NAVD 88 EL. <b>68.38</b><br>NGVD 29 EL. <b>69.56</b> |
| CORPSCON 6.0.1 CONVERSION FACTOR (NAVD88 TO NGVD29): <b>+ 1.178'</b><br>(A U.S. Army Corps of Engineers Engineering Research and Development Center Topographic Engineering Center Alexandria, Virginia Windows-based program to convert coordinates and elevations between datum's using vertcon05.txt and vertcon05.05 files supplied by the U.S. Army Corps of Engineers South Atlantic Division, Jacksonville FL.)<br>ACTUAL NGS or (ngvd29.txt file) OPUS Ortho Height                                                                                     |                                                |                                         |                                                      |
| LATITUDE: <b>27° 50' 40.39606" (N)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                | LONGITUDE: <b>81° 22' 25.24113" (W)</b> | (NAD 83 (2011) EPOCH:2010.0000)                      |
| <b>RECOVERY DATA</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                |                                         |                                                      |
| Stamping: POS-21 2019                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                |                                         |                                                      |
| <b>To Reach:</b> From the intersection of Sam Keen Road and S.R. 60, go NW along S.R. 60 towards Lake Wales 0.6 miles to entrance to Polk County Park known as SUMICA; turn left into park and go SW approximately 900 feet to rear of parking lot and gate with SFWMD lock. Continue through gate approximately 0.25 miles to intersection with an old railroad grade; turn left and continue approximately 0.8 miles to mark is located on the east side of the road. Mark is a standard SFWMD aluminum disk set in the NE corner of 3'X3' concrete well pad. |                                                |                                         |                                                      |
| NOTABLE LAND MARKS: SUMICA County Park                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                |                                         |                                                      |
| NGS-SOURCE BENCHMARK: H 686 (PID DJ8319)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                |                                         |                                                      |
| FIELD BOOK <b>972 PAGE 15-18, 21</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                |                                         |                                                      |
| <b>PICTURES</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                |                                         |                                                      |
| Aerial Overall Site<br>From: Google Earth<br>Imagery date:2/11/17                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                |                                         |                                                      |





# SOUTH FLORIDA WATER MANAGEMENT DISTRICT

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Benchmark "POS-21"  
EL. 68.38 (NAVD 88)



View looking up road towards SUMICA parking lot

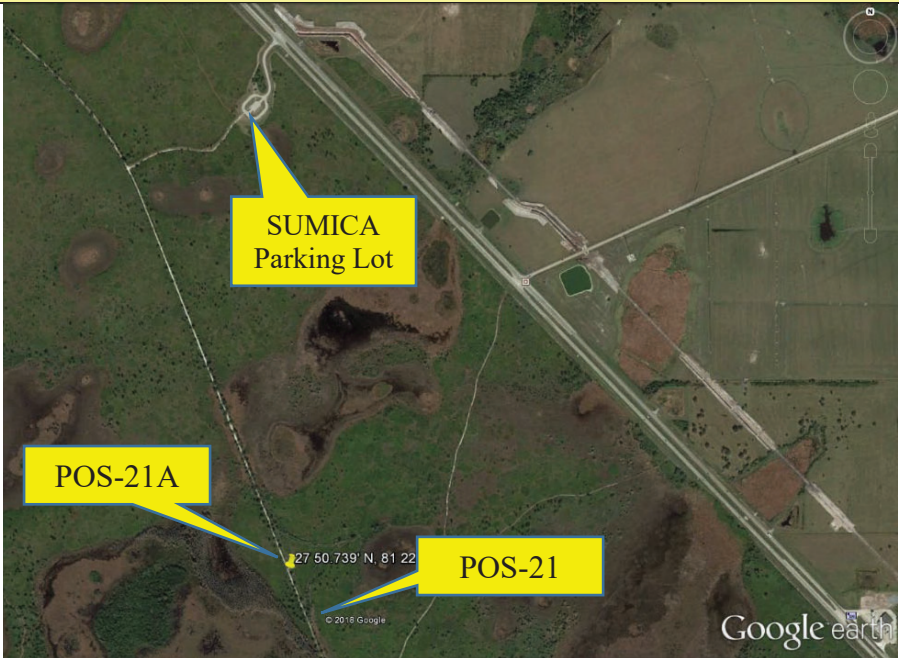


Top View



# SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Rev. 1/16

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                         |                                                              |                                                      |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|--------------------------------------------------------------|------------------------------------------------------|
| DESIGNATION: <b>POS-21 A</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                         | PROJECT: <b>CFWI SUMICA-S</b>                                |                                                      |
| ESTABLISHED BY: <b>PICKETT AND ASSOCIATES, INC</b><br>RECOVERED BY:.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                         | SURVEYOR: <b>John M. Clyatt</b><br>DATE: <b>May 06, 2019</b> |                                                      |
| GEOGRAPHIC POSITION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                         |                                                              |                                                      |
| SECTION <b>25</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | TOWNSHIP <b>30 SOUTH</b>                                                                | RANGE <b>29 EAST</b>                                         |                                                      |
| COUNTY: <b>Polk</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | NAME OF QUADRANGLE: <b>Lake Weohyakapka SE</b><br>GEOGRAPHIC INDEX OF QUAD: <b>3111</b> |                                                              |                                                      |
| HORIZONTAL DATUM: 1927 <b>(1983)</b> 2022 Other _____ (circle one) ZONE <b>(E)</b> or W                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                         |                                                              |                                                      |
| VERTICAL DATUM: MSL 1929 <b>(1988)</b> 2022 Other _____ (circle one)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                         |                                                              |                                                      |
| VERTICAL ACCURACY: 1 2 <b>(3)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                         |                                                              |                                                      |
| STATE PLANE COORDINATE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | (N) Y= <b>1,276,778.905</b>                                                             | (E) X= <b>535,233.178</b>                                    | NAVD 88 EL. <b>67.39</b><br>NGVD 29 EL. <b>68.57</b> |
| CORPSCON 6.0.1 CONVERSION FACTOR (NAVD88 TO NGVD29): <b>+ 1.178'</b><br>(A U.S. Army Corps of Engineers Engineering Research and Development Center Topographic Engineering Center Alexandria, Virginia Windows-based program to convert coordinates and elevations between datum's using vertcon05.txt and vertcon05.05 files supplied by the U.S. Army Corps of Engineers South Atlantic Division, Jacksonville FL.)<br>ACTUAL NGS or (ngvd29.txt file) OPUS Ortho Height                                                                                                                         |                                                                                         |                                                              |                                                      |
| LATITUDE: <b>27° 50' 44.39062" (N)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                         | LONGITUDE: <b>81° 22' 27.24067" (W)</b>                      | (NAD 83 (2011) EPOCH:2010.0000)                      |
| RECOVERY DATA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                         |                                                              |                                                      |
| Stamping: POS-21A 2019                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                         |                                                              |                                                      |
| <b>To Reach:</b> From the intersection of Sam Keen Road and S.R. 60, go NW along S.R. 60 towards Lake Wales 0.6 miles to entrance to Polk County Park known as SUMICA; turn left into park and go SW approximately 900 feet to rear of parking lot and gate with SFWMD lock. Continue through gate approximately 0.25 miles to an intersection with an old railroad grade; turn left and continue approximately 0.7 miles to mark is located on the west of the road. Mark is a standard SFWMD aluminum disk set in a 1-1/4" iron pipe with a concrete collar and a Carsonite witness post 1' west. |                                                                                         |                                                              |                                                      |
| NOTABLE LAND MARKS: SUMICA County Park                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                         |                                                              |                                                      |
| NGS-SOURCE BENCHMARK: H 686 (PID DJ8319)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                         |                                                              |                                                      |
| FIELD BOOK <b>972 PAGE 21</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                         |                                                              |                                                      |
| PICTURES                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                         |                                                              |                                                      |
| Aerial of Overall Site<br>From: Google Earth<br>Imagery date:2/11/17                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |     |                                                              |                                                      |





## SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Rev. 1/16





# SOUTH FLORIDA WATER MANAGEMENT DISTRICT

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|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                           |                                                                |                                                                        |                                                                  |                                        |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|----------------------------------------------------------------|------------------------------------------------------------------------|------------------------------------------------------------------|----------------------------------------|
| SCADA RTU Station Name:<br><b>POS-21</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                           | DB Hydro Site Name:<br><b>SUMICAS</b>                          |                                                                        | Agency:<br><b>WMD</b>                                            | Date of Field Work:<br><b>06/14/19</b> |
| Party Chief: <b>Dustin Lanier</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                           | Field Book: <b>972</b>                                         | Page(s): <b>1-14</b>                                                   |                                                                  | Prepared by: <b>John Ciyatt</b>        |
| SITE SPECIFIC DATA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                           |                                                                |                                                                        |                                                                  |                                        |
| Site Benchmark:<br><b>POS-21</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                           | Benchmark Elevation (NAVD88)<br><b>68.38</b>                   | Corpscon 6.0.1 Conversion Factor (NAVD88 to NGVD29)<br><b>+ 1.178'</b> |                                                                  |                                        |
| Reference Elevation(s) (NAVD88):<br><b>71.32</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                           | Existing Brass Tag Elevation (Datum):<br><b>Not Applicable</b> |                                                                        | Calibration Port Elevation(s) (NAVD88):<br><b>Not Applicable</b> |                                        |
| Ground Elevation (NAVD88): <b>68.1</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                           |                                                                | Pad Elevation (NAVD88): <b>68.38</b>                                   |                                                                  |                                        |
| GEOGRAPHIC DATA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                           |                                                                |                                                                        |                                                                  |                                        |
| Section <b>24</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                           | Township <b>30</b> South                                       |                                                                        | Range <b>29</b> East                                             |                                        |
| Well                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Latitude:<br><b>27° 50' 40.39606" (N)</b> |                                                                | Longitude:<br><b>81°22' 25.24113" (W)</b>                              |                                                                  | Source: RTK GPS – NAD 83(2011)         |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | State Plane Coordinates                   |                                                                | Northing (Y) =<br><b>1,276,374.957 ft</b>                              |                                                                  | Easting (X) =<br><b>535411.437 ft</b>  |
| <p>Notes:</p> <p><b>NAVD88</b> – North American Vertical Datum of 1988</p> <p><b>NGVD29</b>- National Geodetic Vertical Datum of 1929</p> <p><b>Corpscon 6.0.1</b> - A U.S. Army Corps of Engineers Engineering Research and Development Center Topographic Engineering Center Alexandria, Virginia Windows-based program to convert coordinates and elevations between datum's using vertcon05.txt and vertcon05.05 files supplied by the U.S. Army Corps of Engineers South Atlantic Division, Jacksonville FL.</p> |                                           |                                                                |                                                                        |                                                                  |                                        |
| PICTURES                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                           |                                                                |                                                                        |                                                                  |                                        |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                           |                                                                |                                                                        |                                                                  |                                        |





## SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Rev. 1/16



POS- 21 WELL





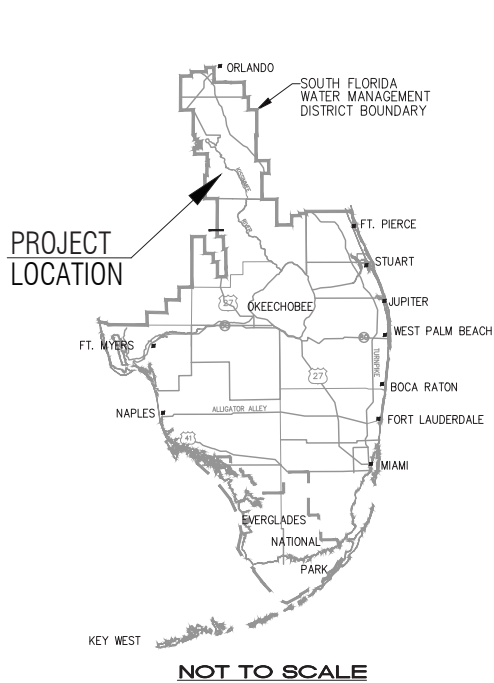
# SOUTH FLORIDA WATER MANAGEMENT DISTRICT

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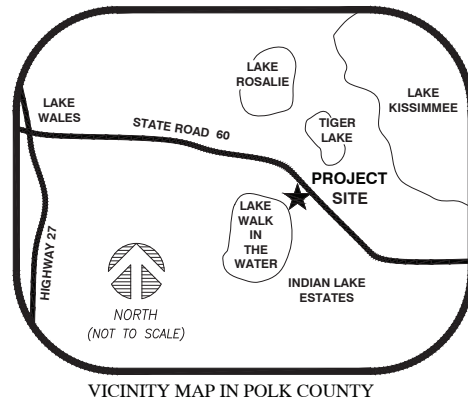


POS-21 WELL





LOCATION MAP  
CENTRAL FLORIDA WATER INITIATIVE (CFWI) SURVEYS  
**SUMICA SOUTH**  
SECTION 24, TOWNSHIP 30 S, RANGE 29 E,  
POLK COUNTY, FL



**LEGEND:**  
NGS NATIONAL GEODETIC SURVEY  
BM BENCHMARK



SHEET 1 OF 2

|       |         |      |           |
|-------|---------|------|-----------|
|       |         |      |           |
|       |         |      |           |
|       |         |      |           |
| DRAWN | CHECKED | DATE | REVISIONS |

CENTRAL FLORIDA WATER INITIATIVE (CFWI)  
SUMICA SOUTH  
WELL, TRANSECTS & SEASONAL  
HIGH-WATER MARKS SURVEY

SOUTH FLORIDA WATER MANAGEMENT DISTRICT  
INFRASTRUCTURE MANAGEMENT BUREAU-SURVEY & MAPPING SECTION  
P.O. BOX 24680, 3301 GUN CLUB ROAD  
WEST PALM BEACH, FLORIDA 33416-4680





0 30 60  
( IN FEET )  
1 inch = 60 ft.  
GRAPHIC & INTENDED DISPLAY SCALE

CENTRAL FLORIDA WATER INITIATIVE (CFWI) SURVEYS  
**SUMICA SOUTH**  
TRANSECTS & SEASONAL HIGH WATER MARKS



SHEET 2 OF 2

|       |         |      |           |
|-------|---------|------|-----------|
|       |         |      |           |
|       |         |      |           |
|       |         |      |           |
| DRAWN | CHECKED | DATE | REVISIONS |

CENTRAL FLORIDA WATER INITIATIVE (CFWI)  
SUMICA SOUTH  
WELL, TRANSECTS & SEASONAL  
HIGH-WATER MARKS SURVEY

SOUTH FLORIDA WATER MANAGEMENT DISTRICT  
INFRASTRUCTURE MANAGEMENT BUREAU-SURVEY & MAPPING SECTION  
P.O. BOX 24680, 3301 GUN CLUB ROAD  
WEST PALM BEACH, FLORIDA 33416-4680





## **SURVEYOR'S REPORT**

Specific Purpose Survey of the CFWI DMIT Wetland  
East Pine Island  
in  
Orange County, Florida

**Prepared for:**

**South Florida Water Management District**

3301 Gun -Club Road  
West Palm Beach, Florida 33406  
Ph. (561) 686-8800 (ext. 2978)  
Fax (561) 682-0066

**Prepared by:**

**Gregory A. Prather, PSM**

Florida Professional Surveyor and Mapper  
License Number 5135  
State of Florida

Pickett and Associates, Inc. LB No 364  
475 South First Avenue, Bartow, FL. 33830  
Tel (863) 533-9095

Field Date: July 28, 2018  
Report Date: August 02, 2018

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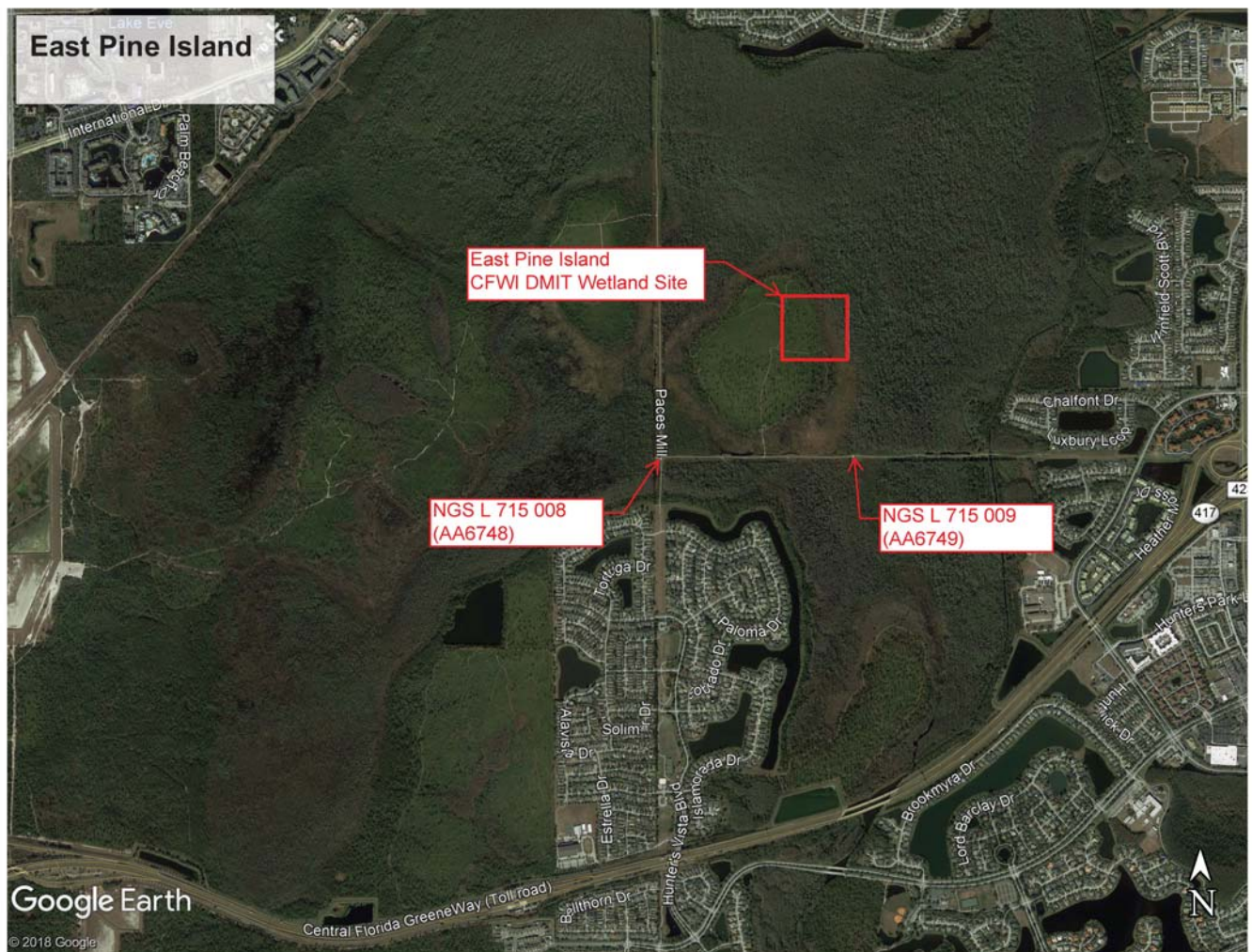


## **PURPOSE**

The purpose of this survey is to measure horizontal and vertical components of wetland, muck locations, transects and seasonal high water marks at the East Pine Island location.

## **LOCATION OF PROJECT**

The CFWI DMIT Wetland East Pine Island site is located in Section 19, Township 24 South, Range 29 East, Orange County, Florida.



**General Location (Intended Display Scale is “Not to Scale”)**

**PROJECT VERTICAL DATUM**

The project vertical datum is the North American Vertical Datum of 1988 (NAVD 88).

To convert the NAVD 88 elevation to National Geodetic Vertical Datum of 1929 (NGVD 29) **add 0.909'** to the NAVD 88 elevation.

[NAVD 88 elevation + 0.909' = NGVD 29 elevation]

This value conversion factor is based on Corpscon 6.0.1 a US Army Corps of Engineers Engineering Research and Development Center Topographic Engineering Center Alexandria, Virginia Windows-based program to convert coordinates and elevations between datum's using vertcon05.txt and vertcon05.05 files supplied by the U.S. Army Corps of Engineers South Atlantic Division, Jacksonville, FL.

**PROJECT HORIZONTAL DATUM**

The project horizontal datum is North American Datum 83 (NAD 83 (2011) (EPOCH:2010.0000))

**LEVELING METHODS FOR VERTICAL CONTROL**

The leveling for this project was formed in accordance with standard survey practice using conventional third order method, techniques and equipment.

The allowable error on this project meets or exceeds third order closures (.02  $\sqrt{\text{miles}}$ ) as required by SFWMD for this project per executed SOW for 4600003702-WO1. A level loop was run from the National Geodetic Survey (NGS) monument "L 715 008 (AA6748)" to the site benchmark TBM 1 (GPS # 230) and then closing on NGS monument "L 715 009 (AA6749)". Another level run was performed from the established benchmark "TBM 1 GPS 230" (a set 5/8" steel rod and cap stamped "REF. PT. LB 364") to a second set benchmark and the benchmark at Well ORS-8, then closing back on "TBM 1 GPS 230". The measurements were hand written in Pickett and Associates, Inc. Field Book 928 pages 9-18, dated June 25, 2018. The data was also collected electronically.

**GPS METHODS FOR HORIZONTAL CONTROL**

Latitude and Longitude for Benchmark at Well ORS-8 and the base check were established by observing a 4 -hour session of Static GPS data using a Trimble R-8 set over the point June 22, 2018. Rinex files containing the collected data were uploaded through the OPUS website and a report containing the final coordinates were obtained on July 17, 2018.



**COORDINATES AND ELEVATIONS FOR WETLAND FEATURES**

RTK GPS was used to establish coordinates and elevations for the wetland transects and seasonal high elevations. Measurements were made on the ground adjacent to the rebar and pipes marking the point. In areas where tree canopy prevented a fixed RTK GPS solution, an optical total station was used. Control for the optical work was established with RTK GPS.

**EQUIPMENT USED**

- Trimble GPS unit R-8, Serial Number 6916 (static)
- Trimble GPS unit R-8, Serial Number 2534 (static)
- Trimble DiNi 22 Level Serial Number 772842 (level)
- Trimble GPS unit R-10, Serial Number 7093 (RTK)
- Trimble GPS unit R-10, Serial Number 5003 (RTK)
- Trimble Total Station, Serial Number 36820056 (optical)

**VERTICAL CONTROL POINT**

The Vertical Control point utilized and set as part of this survey is the:

| NGS BM L 715 008 (PID AA6748)                                                                                                                                                                                                                                                                                                                                                                                                                                 |                             |           |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|-----------|
| LATITUDE: 28° 22' 20" (N)                                                                                                                                                                                                                                                                                                                                                                                                                                     | LONGITUDE: 081° 27' 10" (W) | Published |
| ELEVATION: 78.32 ft. (NAVD 88)                                                                                                                                                                                                                                                                                                                                                                                                                                | 23.873 m                    | Published |
| <div data-bbox="215 504 781 1073" data-label="Image"> </div> <div data-bbox="816 548 1352 852" data-label="Text"> <p>THE MARK IS SET IN EAST CORNER OF TOWER FOOT PAD (ROUND), 65 FT (19.8 M) SOUTH OF BARB WIRE FENCE LINE, 70 FT (21.3 M) EAST OF BARB WIRE FENCE LINE (NOTE, POWER LINES START WITH TOWER RUNNING NORTH AND EAST, 3.6 MI (5.8 KM) EAST OF SR 535, AND 1.5 WEST OF JOHN YOUNG). IN SECTION 30, TOWNSHIP 24 SOUTH, RANGE 29 EAST.</p> </div> |                             |           |

| NGS BM L 715 009 (PID AA6749)                                                                                                                                                                                                                                                                                                                                                                                                                                 |                             |           |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|-----------|
| LATITUDE: 28° 22' 18" (N)                                                                                                                                                                                                                                                                                                                                                                                                                                     | LONGITUDE: 081° 26' 41" (W) | Published |
| ELEVATION: 76.48 ft. (NAVD 88)                                                                                                                                                                                                                                                                                                                                                                                                                                | 23.311 m                    | Published |
| <div data-bbox="203 1329 808 1885" data-label="Image"> </div> <div data-bbox="816 1360 1357 1638" data-label="Text"> <p>THE MARK IS SET IN NW CORNER FOOT PAD FOR TOWER NUMBER 43, 1.1 MI (1.8 KM) WEST OF JOHN YOUNG, 4.1 MI (6.6 KM) EAST OF SR 535, 20 FT (6.1 M) SOUTH OF CENTER LINE, 65 FT (19.8 M) NORTH OF WOODS LINE TO THE SOUTH, AND 10 FT (3.0 M) NORTH OF CENTER LINE OF POWER LINE. IN SECTION 30, TOWNSHIP 24 SOUTH, RANGE 29 EAST.</p> </div> |                             |           |



|                                                                                   |                                   |                                                                                                                                                                                                                                                                                                          |
|-----------------------------------------------------------------------------------|-----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| BM: ORS-8 (WELL) (Located as part of this survey)                                 |                                   |                                                                                                                                                                                                                                                                                                          |
| LATITUDE: 28° 22' 44.27666" (N)                                                   | LONGITUDE: 081° 26' 49.86964" (W) |                                                                                                                                                                                                                                                                                                          |
| OPUS - NAD_83 (2011)(EPOCH:2010.0000)                                             |                                   |                                                                                                                                                                                                                                                                                                          |
| ELEVATION: 78.765 ft. (NAVD 88)                                                   | 24.008 m                          | Level Run                                                                                                                                                                                                                                                                                                |
| ELEVATION: 79.674 ft. (NGVD 29)                                                   | 24.285 m                          | 0.909 ft. (conversion factor)                                                                                                                                                                                                                                                                            |
|  |                                   | Corpscon 6.0.1                                                                                                                                                                                                                                                                                           |
|                                                                                   |                                   | From the intersection of Town Center Blvd and Hunter's Vista Blvd North 0.9 Mi to Flora Vista Dr. Northeast 180 ft to Islamorada Dr. North 1,260 feet to Tarragona Dr. West 500 feet to Paces Mill (dirt road) North 1,000 ft to dirt road East 1,500 feet to dirt road North 2,000 feet to mark on Left |

| Field Book 928, Page 15                                                                                               |                  |         |               |
|-----------------------------------------------------------------------------------------------------------------------|------------------|---------|---------------|
| 15/928                                                                                                                | SWFWMD           | 6-26-18 | 8:00          |
|                                                                                                                       | 18680            | TUESDAY | Partly Cloudy |
|                                                                                                                       | EAST PINE ISLAND |         | 16/928        |
|                                                                                                                       |                  |         | BICKEL CHAIRS |
| +                                                                                                                     | HI               | -       | EL            |
| 4.715                                                                                                                 | 83.434           | 5.292   | 78.719        |
| BM1                                                                                                                   | 4.899            | 83.664  | 4.669         |
|                                                                                                                       |                  |         | 78.765        |
| 3.555                                                                                                                 | 82.593           | 4.626   | 79.038        |
| 4.210                                                                                                                 | 80.961           | 5.842   | 76.751        |
| 6.112                                                                                                                 | 81.776           | 5.797   | 75.664        |
| 5.729                                                                                                                 | 83.911           | 3.594   | 78.182        |
| <div style="border: 2px solid red; padding: 5px; display: inline-block;"> <b>BM WELL ORS-8<br/>EL. 78.765'</b> </div> |                  |         |               |
| Find 1/4" BRASS DISC IN THE NE CORNER OF CONCRETE PAD AT WELL ORS-8                                                   |                  |         |               |
| TURTLE                                                                                                                |                  |         |               |
| TURTLE                                                                                                                |                  |         |               |
| TURTLE                                                                                                                |                  |         |               |
| 7/8" SIRC REFLECTOR (BASECK)                                                                                          |                  |         |               |
| TURTLE                                                                                                                |                  |         |               |

|                                                                                   |          |                                                                                                                                                                                                                                                                                                                                  |
|-----------------------------------------------------------------------------------|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>BM: BASE CHECK (Located as part of this survey)</b>                            |          |                                                                                                                                                                                                                                                                                                                                  |
| LATITUDE: 28° 22' 40.13846" (N)                                                   |          | LONGITUDE: 081° 26' 43.38236" (W)                                                                                                                                                                                                                                                                                                |
| OPUS - NAD 83 (2011)(EPOCH:2010.0000)                                             |          |                                                                                                                                                                                                                                                                                                                                  |
| ELEVATION: 75.664 ft. (NAVD 88)                                                   | 23.062 m | Level Run                                                                                                                                                                                                                                                                                                                        |
| ELEVATION: 76.573 ft. (NGVD 29)                                                   | 23.339 m | 0.909 ft. (conversion factor)<br>Corpscon 6.0.1                                                                                                                                                                                                                                                                                  |
|  |          | From the intersection of Town Center Blvd and Hunter's Vista Blvd North 0.9 Mi to Flora Vista Dr. Northeast 180 ft to Islamorada Dr. North 1,260 feet to Tarragona Dr. West 500 feet to Paces Mill (dirt road) North 1,000 ft to dirt road East 1,500 feet to dirt road North 1,600 ft to dirt road East 750 ft to mark on Right |

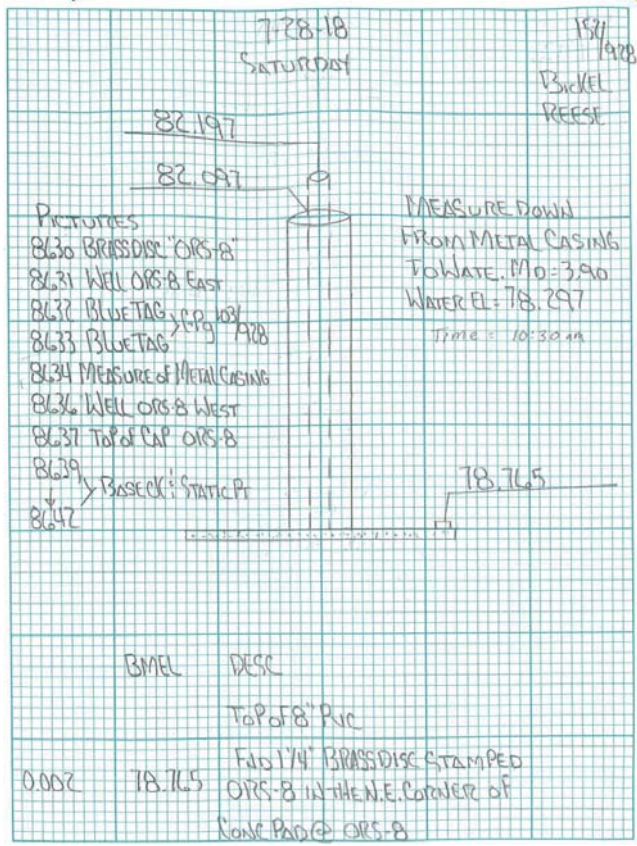
## Field Book 928, Page 15

|        |                                       |        |       |                    |                                                                         |                           |
|--------|---------------------------------------|--------|-------|--------------------|-------------------------------------------------------------------------|---------------------------|
| 15/928 | SWIRLMID<br>18680<br>EAST Pine Island |        |       | 6-26-18<br>TUESDAY | Big<br>Partly Cloudy                                                    | 16/928<br>BUCKEL<br>CHANN |
|        | +                                     | HI     | -     | EL                 | BM EL DESC                                                              |                           |
|        | 4.715                                 | 83.434 | 5.292 | 78.719             | Turtle                                                                  |                           |
| BM1    | 4.899                                 | 83.664 | 4.669 | 78.765             | FND 1 1/4" BRASS DISC IN TILE<br>NE CORNER OF CONE PAD AT<br>WELL OPS-8 |                           |
|        | 3.555                                 | 82.593 | 4.626 | 79.038             | Turtle                                                                  |                           |
|        | 4.210                                 | 80.961 | 5.842 | 76.751             | Turtle                                                                  |                           |
|        | 6.112                                 | 81.716 | 5.291 | 75.664             | 7/8" SPEC REFLECTOR (BASECK)                                            |                           |
|        | 5.129                                 | 83.911 | 3.594 | 78.182             | Turtle                                                                  |                           |

**BM BASE CHECK  
EL. 75.664'**



**PROJECT RESULTS**

| Reference and Ground Elevations:                                                    |                  |                                                                                     |                             |                    |
|-------------------------------------------------------------------------------------|------------------|-------------------------------------------------------------------------------------|-----------------------------|--------------------|
| Well                                                                                | Ground Elevation | Reference Elevation                                                                 | Comments                    |                    |
| ORS-8                                                                               | 78.7 ft          | 82.20 ft                                                                            | Top of Metal                |                    |
| Elevation on four (4) corners of the concrete well pad                              |                  |                                                                                     |                             |                    |
| NE Corner                                                                           | SE Corner        | SW Corner                                                                           | NW Corner                   |                    |
| 78.8 ft                                                                             | 78.8 ft          | 78.8 ft                                                                             | 78.9 ft                     |                    |
| Well Diameter                                                                       |                  | Casing material                                                                     | DTW                         |                    |
| 4 3/16"                                                                             |                  | METAL                                                                               | 3.90 ft (7/28/18, 10:30 am) |                    |
|   |                  |  |                             |                    |
|  |                  |                                                                                     |                             |                    |
| Source & Site Benchmark                                                             |                  | NAVD 88                                                                             | NGVD 29 (Published)         | NGVD 29 (Corpscon) |
| NGS L 715 008 (AA6748)                                                              |                  | 78.32 ft.                                                                           |                             |                    |
| NGS L 715 009 (AA6749)                                                              |                  | 76.48 ft.                                                                           |                             |                    |
| ORS-8 Well                                                                          |                  | 78.77 ft.                                                                           |                             | 79.68 ft           |

Surveyor's Notes:

1. All measurements are U.S. Survey feet unless stated otherwise.
2. Underground improvements, encroachments, foundations and/or utilities were not located as a part of this survey.
3. Additions or deletions to survey maps or reports by other than the signing party or parties is prohibited without written consent of the signing party or parties.
4. This Report is not valid without the original signature and the raised seal or the electronic signature and computer-generated seal of a Florida Licensed Surveyor and Mapper.
5. To convert from NAVD 88 to NGVD 29 add 0.909 feet. This value is based on Corpscon 6.0.1, U.S. Army Corps of Engineers Engineering Research and Development Center Topographic Engineering Center Alexandria, Virginia Windows-based program to convert coordinates and elevations between datum's using vertcon05.txt and vertcon05.05 files supplied by the U.S. Army Corps of Engineers South Atlantic Division, Jacksonville, FL.
6. Date of last field work: July 28, 2018
7. SFWMD Data records (on file at the District's headquarters)
  - A. Electronic Data files:
    - Miscellaneous picture files
    - Digital level run named "18680.DAT"
    - Miscellaneous data files
  - B. Conventional reporting
    - Field Book: 928 Pages: 1-2, 9-27, 103-104, 149-154

Abbreviations:

**EL.** Elevation

**DTW** Distance to the water table inside the well

**PVC** Polyvinyl Chloride Pipe

**RTK GPS** Real-Time Kinematic Global Positioning System

**NAVD 88** North American Vertical Datum of 1988

**NGVD 29** National Geodetic Vertical Datum of 1929

**NGS** National Geodetic Survey

**PSM** Professional Surveyor & Mapper

**PID** Permanent Identifiers

**SFWMD** South Florida Water Management District

**USGS** United States Geological Survey

**CFWI** Central Florida Water Initiative.

**DMIT** Data, Monitoring and Investigations Team

**NGS** National Geodetic Survey



## SURVEYOR'S CERTIFICATION

In my professional opinion this Specific Purpose Survey meets applicable portions of the Standards of Practice set forth by the Florida Board of Professional Surveyors and Mappers in Chapter 5J, Florida Administrative Code. This report is prepared for the sole and specific use of the South Florida Water Management District and is not assignable.

July 28, 2018

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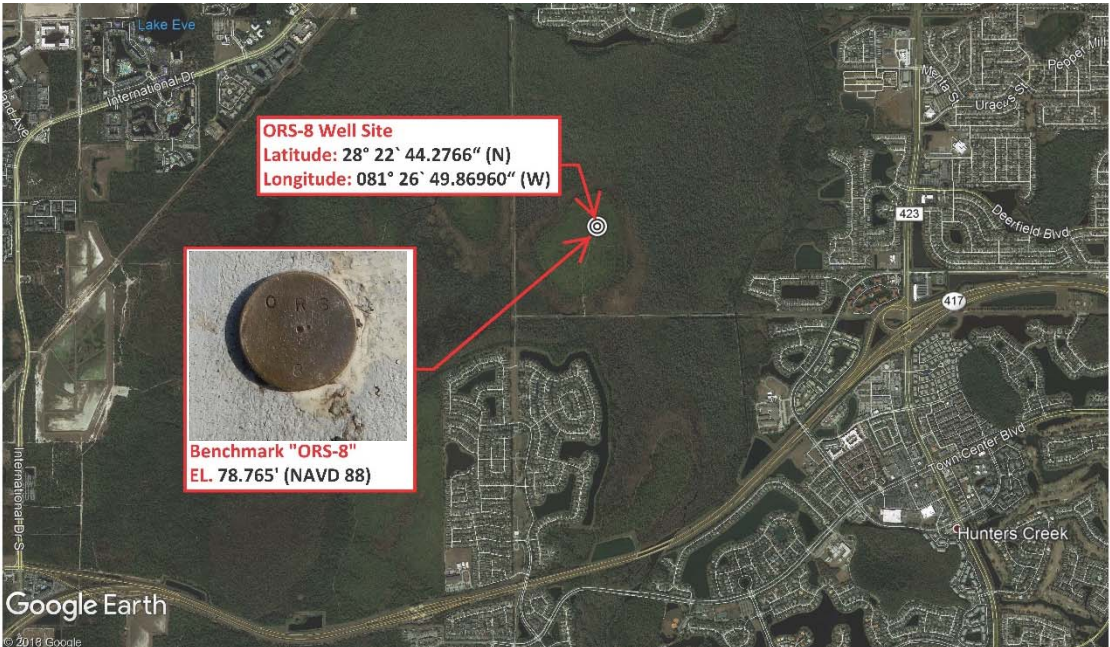
GREGORY A. PRATHER, PSM  
FLORIDA REGISTRATION NO. 5135  
PICKETT AND ASSOCIATES, INC.  
FLORIDA REGISTRATION NO. 364

SURVEY DATE



# SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Rev. 1/16

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                    |                                                    |                                                        |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|----------------------------------------------------|--------------------------------------------------------|
| DESIGNATION: <b>ORS-8</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                    | PROJECT: <b>CFWI DMIT Wetland East Pine Island</b> |                                                        |
| ESTABLISHED BY: <b>SOUTH FLORIDA WATER MANAGEMENT DISTRICT</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                    | SURVEYOR: <b>Gregory A. Prather</b>                |                                                        |
| RECOVERED BY: <b>PICKETT AND ASSOCIATES, INC.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                    | DATE: <b>June 06, 2018</b>                         |                                                        |
| <b>GEOGRAPHIC POSITION</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                    |                                                    |                                                        |
| SECTION <b>19</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | TOWNSHIP <b>24 SOUTH</b>                                                           | RANGE <b>29 EAST</b>                               |                                                        |
| COUNTY: <b>Orange</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | NAME OF QUADRANGLE: <b>Lake Jessamine</b><br>GEOGRAPHIC INDEX OF QUAD: <b>3612</b> |                                                    |                                                        |
| HORIZONTAL DATUM: 1927 <u>(1983)</u> 2022 Other _____ (circle one) ZONE <u>(E)</u> or W                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                    |                                                    |                                                        |
| VERTICAL DATUM: MSL 1929 <u>(1988)</u> 2022 Other _____ (circle one)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                    |                                                    |                                                        |
| VERTICAL ACCURACY: 1 2 <u>(3)</u>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                    |                                                    |                                                        |
| STATE PLANE COORDINATE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | (N) Y= <b>1470750.825</b>                                                          | (E) X= <b>512371.436</b>                           | NAVD 88 EL. <b>78.765</b><br>NGVD 29 EL. <b>79.674</b> |
| CORPSCON 6.0.1 CONVERSION FACTOR (NAVD88 TO NGVD29): <b>0.909'</b><br>(A U.S. Army Corps of Engineers Engineering Research and Development Center Topographic Engineering Center Alexandria, Virginia Windows-based program to convert coordinates and elevations between datum's using vertcon05.txt and vertcon05.05 files supplied by the U.S. Army Corps of Engineers South Atlantic Division, Jacksonville FL.)<br>ACTUAL NGS or (ngvd29.txt file)<br>OPUS Ortho Height                                                                                                       |                                                                                    |                                                    |                                                        |
| LATITUDE: <b>28° 22' 44.27666" (N)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                    | LONGITUDE: <b>81° 26' 49.86960" (W)</b>            | (OPUS – NAD_83 (2011)<br>EPOCH:2010.0000)              |
| <b>RECOVERY DATA</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                    |                                                    |                                                        |
| Stamping: ORS-8                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                    |                                                    |                                                        |
| To Reach: From the intersection of Town Center Blvd and Hunter's Vista Blvd North 0.9 Mi to Flora Vista Dr. Northeast 180 ft to Islamorada Dr. North 1,260 feet to Tarragona Dr. West 500 feet to Paces Mill (dirt road) North 1,000 ft to dirt road East 1,500 feet to dirt road North 2,000 feet to mark on Left.                                                                                                                                                                                                                                                                |                                                                                    |                                                    |                                                        |
| NOTABLE LAND MARKS:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                    |                                                    |                                                        |
| NGS-SOURCE BENCHMARK: L 715 008 (PID AA6748)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                    |                                                    |                                                        |
| FIELD BOOK <b>928 PAGE 1-18</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                    |                                                    |                                                        |
| <b>PICTURES</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                    |                                                    |                                                        |
| Aerial Overall Site                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                    |                                                    |                                                        |
|  <div style="position: absolute; top: 10px; left: 10px; border: 1px solid red; padding: 5px; color: red; font-weight: bold;">             ORS-8 Well Site<br/>             Latitude: 28° 22' 44.2766" (N)<br/>             Longitude: 081° 26' 49.86960" (W)         </div> <div style="position: absolute; top: 300px; left: 150px; border: 1px solid red; padding: 5px; color: red; font-weight: bold;">             Benchmark "ORS-8"<br/>             EL. 78.765' (NAVD 88)         </div> |                                                                                    |                                                    |                                                        |





## SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Rev. 1/16



Looking North (Oblique not to scale) (June 26, 2018)



Top View (Not to Scale) (June 26, 2018)



Top View (Not to Scale) (June 26, 2018)





# SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Rev. 1/16

|                                         |                                      |                                       |                                        |
|-----------------------------------------|--------------------------------------|---------------------------------------|----------------------------------------|
| SCADA RTU Station Name:<br><b>ORS-8</b> | DB Hydro Site Name:<br><b>SHINGN</b> | Agency:<br><b>WMD</b>                 | Date of Field Work:<br><b>07/28/18</b> |
| Party Chief: <b>Robby Bickel</b>        | Field Book: <b>928</b>               | Page(s) <b>1-28, 103-104, 151-153</b> | Prepared by: <b>Sherry Grymko</b>      |

## SITE SPECIFIC DATA

|                                                   |                                                                |                                                                      |
|---------------------------------------------------|----------------------------------------------------------------|----------------------------------------------------------------------|
| Site Benchmark:<br><b>ORS-8</b>                   | Benchmark Elevation (NAVD88)<br><b>78.765'</b>                 | Corpscon 6.0.1 Conversion Factor (NAVD88 to NGVD29)<br><b>0.909'</b> |
| Reference Elevation(s) (NAVD88):<br><b>82.20'</b> | Existing Brass Tag Elevation (Datum):<br><b>Not Applicable</b> | Calibration Port Elevation(s) (NAVD88):<br><b>Not Applicable</b>     |
| Ground Elevation (NAVD88): <b>78.7'</b>           | Pad Elevation (NAVD88): <b>78.8'</b>                           |                                                                      |

## GEOGRAPHIC DATA

| Section 19 |                                  | Township 24 South                 |  | Range 29 East                                    |  |
|------------|----------------------------------|-----------------------------------|--|--------------------------------------------------|--|
| Well       | Latitude:<br>28°22'44.27127" (N) | Longitude:<br>81°26'49.88377" (W) |  | Source: OPUS - NAD_83<br>(2011)(EPOCH:2010.0000) |  |
|            | State Plane Coordinates          | Northing (Y) =<br>1470750.29 ft   |  | Easting (X) =<br>512370.17 ft                    |  |

### Notes:

**NAVD88** – North American Vertical Datum of 1988

**NGVD29**- National Geodetic Vertical Datum of 1929

**Corpscon 6.0.1** - A U.S. Army Corps of Engineers Engineering Research and Development Center Topographic Engineering Center Alexandria, Virginia Windows-based program to convert coordinates and elevations between datum's using vertcon05.txt and vertcon05.05 files supplied by the U.S. Army Corps of Engineers South Atlantic Division, Jacksonville FL.

## PICTURES

### Aerial Overall Site



Not to scale (Google Earth product)

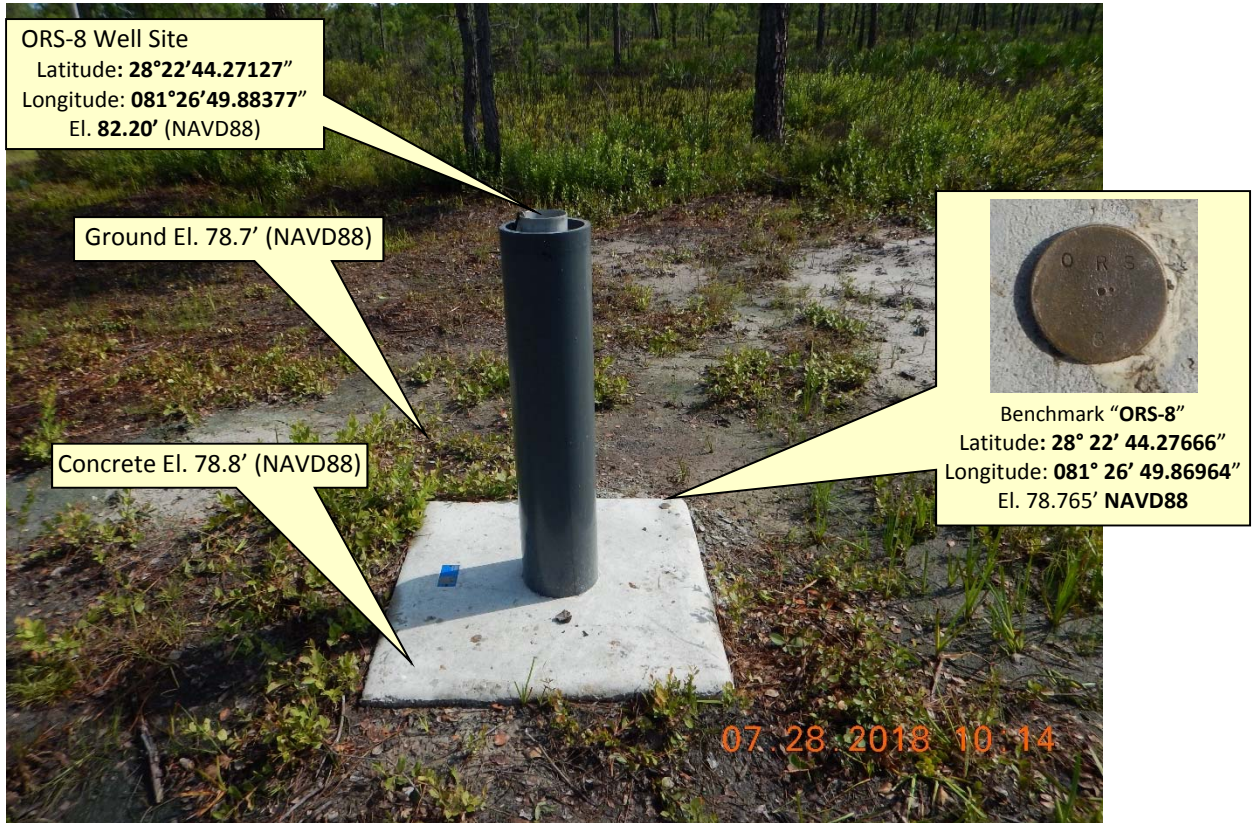




## SOUTH FLORIDA WATER MANAGEMENT DISTRICT

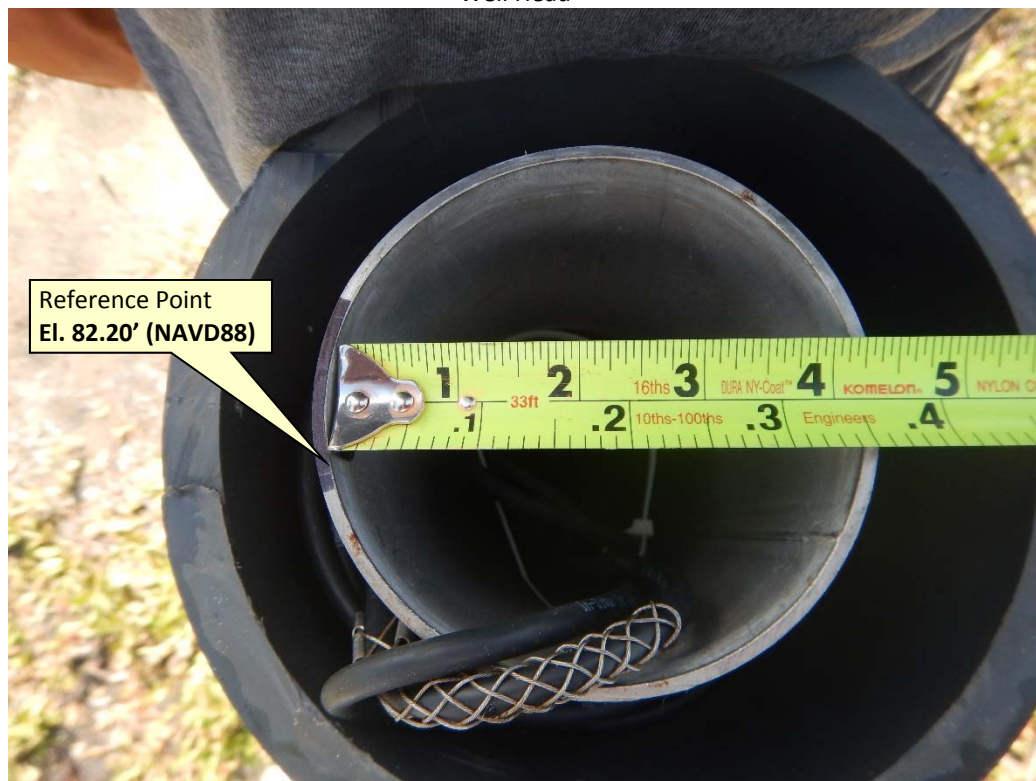
Rev. 1/16

Overall



Looking Northerly (oblique not to scale) (28-July-18)

Well Head



Looking Northerly (oblique not to scale) (19-July-18)

# Office

## Project

3 July 2018

### INPUT

Geographic, flhp gn - Florida HPGN  
Vertical - NAVD88, U.S. Feet

### OUTPUT

State Plane, flhp gn - Florida HPGN  
0901 - Florida East, U.S. Feet  
Vertical - NGVD29 (Vertcon94), U.S. Feet

---

## ORS-8 Well

1/1

**Latitude:** 28 22 44.27666  
**Longitude:** 81 26 49.86960  
**Elevation/Z:** 0

**Northing/Y:** 1470750.825  
**Easting/X:** 512371.435  
**Elevation/Z:** 0.909  
**Convergence:** -0 12 45.18524  
**Scale Factor:** 0.999964876  
**Combined Factor:** 0.999969182

---

**Remark:**



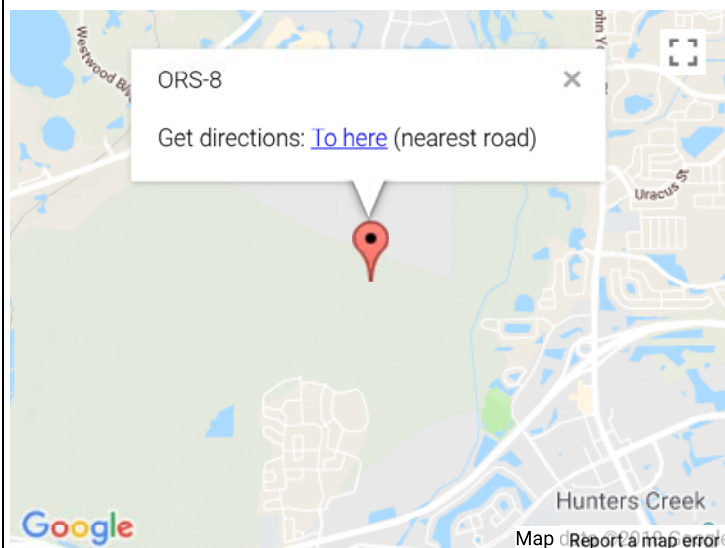
## Shared Solution

**PID:** BBGB11**Designation:** ORS-8**Stamping:** ORS-8**Stability:** May hold, commonly subject to ground movement**Setting:** Set in top of concrete monument

**Description:** From the intersection of Town Center Blvd and Hunter's Vista Blvd North 0.9 Mi to Flora Vista Dr. Northeast 180 ft to Islamorada Dr. North 1,260 feet to Tarragona Dr. West 500 feet to Paces Mill (dirt road) North 1,000 ft to dirt road East 1,500 feet to dirt road North 2,000 feet to mark on Left

**Observed:** 2018-06-22T15:46:00Z**Source:** OPUS - page5 1603.24**Close-up View**

| REF_FRAME:                               | EPOCH:    | SOURCE:                                       | UNITS: | SET     | DETAILS |
|------------------------------------------|-----------|-----------------------------------------------|--------|---------|---------|
| NAD_83(2011)                             | 2010.0000 | NAVD88 (Computed using GEOID12B)              | m      | PROFILE |         |
| <b>LAT:</b> 28° 22' 44.27666" ± 0.029 m  |           | <b>UTM 17 SPC 901(FL E)</b>                   |        |         |         |
| <b>LON:</b> -81° 26' 49.86964" ± 0.017 m |           | <b>NORTHING:</b> 3139264.776m 448285.748m     |        |         |         |
| <b>ELL HT:</b> -3.721 ± 0.034 m          |           | <b>EASTING:</b> 456186.079m 156171.125m       |        |         |         |
| <b>X:</b> 835198.895 ± 0.022 m           |           | <b>CONVERGENCE:</b> -0.21255278° -0.21255278° |        |         |         |
| <b>Y:</b> -5553424.226 ± 0.038 m         |           | <b>POINT SCALE:</b> 0.99962369 0.99996488     |        |         |         |
| <b>Z:</b> 3013520.009 ± 0.016 m          |           | <b>COMBINED FACTOR:</b> 0.99962427 0.99996546 |        |         |         |
| <b>ORTHO HT:</b> 24.028 ± 0.041 m        |           |                                               |        |         |         |

**CONTRIBUTED BY**[sgrymko](#)[Pickett & Associates, Inc.](#)**Horizon View**

The numerical values for this position solution have satisfied the quality control criteria of the National Geodetic Survey. The contributor has verified that the information submitted is accurate and complete.

# EAST PINE ISLAND WELL

FILE: 69161731.DAT OP1531857840457

## NGS OPUS SOLUTION REPORT

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All computed coordinate accuracies are listed as peak-to-peak values.

For additional information: <https://www.ngs.noaa.gov/OPUS/about.jsp#accuracy>

USER: [sgrymko@pickettusa.com](mailto:sgrymko@pickettusa.com)  
RINEX FILE: 6916173p.18o

DATE: July 17, 2018  
TIME: 20:04:43 UTC

SOFTWARE: page5 1603.24 master96.pl 160321 START: 2018/06/22 15:46:00  
EPHEMERIS: igs20065.eph [precise] STOP: 2018/06/22 20:04:00  
NAV FILE: brdc1730.18n OBS USED: 10602 / 12700 : 83%  
ANT NAME: TRM5800 NONE # FIXED AMB: 63 / 71 : 89%  
ARP HEIGHT: 1.9964 OVERALL RMS: 0.020(m)

REF FRAME: NAD\_83(2011)(EPOCH:2010.0000)

IGS08 (EPOCH:2018.4733)

|    |                 |          |                 |          |
|----|-----------------|----------|-----------------|----------|
| X: | 835198.895(m)   | 0.022(m) | 835198.079(m)   | 0.022(m) |
| Y: | -5553424.226(m) | 0.038(m) | -5553422.666(m) | 0.038(m) |
| Z: | 3013520.009(m)  | 0.016(m) | 3013519.849(m)  | 0.016(m) |

|            |                 |                                                    |                                    |          |
|------------|-----------------|----------------------------------------------------|------------------------------------|----------|
| LAT:       | 28 22 44.27666  | 0.029(m)                                           | 28 22 44.29776                     | 0.029(m) |
| E LON:     | 278 33 10.13036 | 0.017(m)                                           | 278 33 10.10927                    | 0.017(m) |
| W LON:     | 81 26 49.86964  | 0.017(m)                                           | 81 26 49.89073                     | 0.017(m) |
| EL HGT:    | -3.721(m)       | 0.034(m)                                           | -5.261(m)                          | 0.034(m) |
| ORTHO HGT: | 24.028(m)       | 0.041(m)                                           | [NAVD88 (Computed using GEOID12B)] |          |
|            | EL. 78.832 ft   | Leveled elevation used for this project =78.765 ft |                                    |          |

|                       | UTM COORDINATES | STATE PLANE COORDINATES |                  |
|-----------------------|-----------------|-------------------------|------------------|
|                       | UTM (Zone 17)   | SPC (0901 FL E)         |                  |
| Northing (Y) [meters] | 3139264.776     | 448285.748              | Y=1470750.825 ft |
| Easting (X) [meters]  | 456186.079      | 156171.125              | X= 512371.433 ft |
| Convergence [degrees] | -0.21255278     | -0.21255278             |                  |
| Point Scale           | 0.99962369      | 0.99996488              |                  |
| Combined Factor       | 0.99962427      | 0.99996546              |                  |

US NATIONAL GRID DESIGNATOR: 17RMM5618639264(NAD 83)

## BASE STATIONS USED

| PID    | DESIGNATION                    | LATITUDE    | LONGITUDE    | DISTANCE(m) |
|--------|--------------------------------|-------------|--------------|-------------|
| DQ7965 | FLWE WEDGEFIELD FL CORS ARP    | N282626.477 | W0810533.176 | 35416.7     |
| DI3564 | CCV6 CAPE CANAVERAL 6 CORS ARP | N282735.827 | W0803243.702 | 88802.0     |
| DF7990 | ZEFR ZEPHYRHILLS CORS ARP      | N281339.322 | W0820952.671 | 72342.2     |



NEAREST NGS PUBLISHED CONTROL POINT  
AA6749 L 715 009 N282218.000 W0812641.000 844.2

#### BASE STATION INFORMATION

STATION NAME: flwe a 1 (Wedgefield FL; Wedgefield, Florida USA)

MONUMENT: NO DOMES NUMBER

XYZ 869051.5075 -5544931.6670 3019536.5449 MON @ 2005.0000 (M)  
XYZ -0.0120 -0.0007 0.0021 VEL (M/YR)  
NEU 0.0000 0.0000 0.0000 MON TO ARP (M)  
NEU 0.0013 -0.0007 0.0888 ARP TO L1 PHASE CENTER (M)  
NEU 0.0005 0.0002 0.0818 ARP TO L2 PHASE CENTER (M)  
XYZ -0.1617 -0.0094 0.0283 VEL TIMES 13.4726 YRS  
XYZ 0.0000 0.0000 0.0000 MON TO ARP  
XYZ 0.0113 -0.0767 0.0434 ARP TO L1 PHASE CENTER  
XYZ 869051.3571 -5544931.7531 3019536.6166 L1 PHS CEN @ 2018.4733  
XYZ -0.0000 0.0000 0.0000 + XYZ ADJUSTMENTS  
XYZ 869051.3571 -5544931.7531 3019536.6167 NEW L1 PHS CEN @ 2018.4733  
XYZ 869051.3458 -5544931.6764 3019536.5732 NEW ARP @ 2018.4733  
XYZ 869051.3458 -5544931.6764 3019536.5732 NEW MON @ 2018.4733  
LLH 28 26 26.49879 278 54 26.80295 -4.9944 NEW L1 PHS CEN @ 2018.4733  
LLH 28 26 26.49875 278 54 26.80298 -5.0833 NEW ARP @ 2018.4733  
LLH 28 26 26.49875 278 54 26.80298 -5.0833 NEW MON @ 2018.4733

STATION NAME: ccv6 a 3 (Cape Canaveral 6; Cape Canaveral, Florida USA)

MONUMENT: NO DOMES NUMBER

XYZ 921785.8210 -5535361.2150 3021404.5386 MON @ 2005.0000 (M)  
XYZ -0.0137 0.0027 0.0008 VEL (M/YR)  
NEU 0.0000 0.0000 0.0000 MON TO ARP (M)  
NEU -0.0028 -0.0023 0.0631 ARP TO L1 PHASE CENTER (M)  
NEU -0.0038 -0.0021 0.0612 ARP TO L2 PHASE CENTER (M)  
XYZ -0.1845 0.0366 0.0113 VEL TIMES 13.4726 YRS  
XYZ 0.0000 0.0000 0.0000 MON TO ARP  
XYZ 0.0071 -0.0565 0.0276 ARP TO L1 PHASE CENTER  
XYZ 921785.6436 -5535361.2348 3021404.5776 L1 PHS CEN @ 2018.4733  
XYZ -0.0000 -0.0000 0.0000 + XYZ ADJUSTMENTS  
XYZ 921785.6436 -5535361.2348 3021404.5776 NEW L1 PHS CEN @ 2018.4733  
XYZ 921785.6365 -5535361.1783 3021404.5500 NEW ARP @ 2018.4733  
XYZ 921785.6365 -5535361.1783 3021404.5500 NEW MON @ 2018.4733  
LLH 28 27 35.84894 279 27 16.27678 -24.2130 NEW L1 PHS CEN @ 2018.4733  
LLH 28 27 35.84903 279 27 16.27687 -24.2761 NEW ARP @ 2018.4733  
LLH 28 27 35.84903 279 27 16.27687 -24.2761 NEW MON @ 2018.4733

STATION NAME: zefr a 2 (ZEPHYRHILLS; Zephyrhills, Florida, U.S.A.)

MONUMENT: 49526S001

XYZ 766680.6677 -5571328.4297 2998751.0226 MON @ 2005.0000 (M)  
XYZ -0.0123 0.0005 0.0010 VEL (M/YR)  
NEU 0.0000 0.0000 0.0000 MON TO ARP (M)  
NEU 0.0001 -0.0008 0.1242 ARP TO L1 PHASE CENTER (M)  
NEU -0.0000 -0.0008 0.1337 ARP TO L2 PHASE CENTER (M)

|     |                |                |              |                            |
|-----|----------------|----------------|--------------|----------------------------|
| XYZ | -0.1653        | 0.0072         | 0.0132       | VEL TIMES 13.4726 YRS      |
| XYZ | 0.0000         | 0.0000         | 0.0000       | MON TO ARP                 |
| XYZ | 0.0142         | -0.1085        | 0.0589       | ARP TO L1 PHASE CENTER     |
| XYZ | 766680.5165    | -5571328.5310  | 2998751.0947 | L1 PHS CEN @ 2018.4733     |
| XYZ | 0.0000         | -0.0000        | -0.0000      | + XYZ ADJUSTMENTS          |
| XYZ | 766680.5165    | -5571328.5310  | 2998751.0947 | NEW L1 PHS CEN @ 2018.4733 |
| XYZ | 766680.5024    | -5571328.4225  | 2998751.0358 | NEW ARP @ 2018.4733        |
| XYZ | 766680.5024    | -5571328.4225  | 2998751.0358 | NEW MON @ 2018.4733        |
| LLH | 28 13 39.34290 | 277 50 7.30648 | -1.3997      | NEW L1 PHS CEN @ 2018.4733 |
| LLH | 28 13 39.34289 | 277 50 7.30651 | -1.5240      | NEW ARP @ 2018.4733        |
| LLH | 28 13 39.34289 | 277 50 7.30651 | -1.5240      | NEW MON @ 2018.4733        |

#### REMOTE STATION INFORMATION

STATION NAME: 6916 1

MONUMENT: NO DOMES NUMBER

|     |             |               |              |                            |
|-----|-------------|---------------|--------------|----------------------------|
| XYZ | 835197.9300 | -5553422.8387 | 3013519.9879 | MON @ 2018.4730 (M)        |
| NEU | -0.0008     | -0.0011       | 1.9965       | MON TO ARP (M)             |
| NEU | 0.0008      | 0.0011        | 0.0748       | ARP TO L1 PHASE CENTER (M) |
| NEU | 0.0001      | -0.0022       | 0.0772       | ARP TO L2 PHASE CENTER (M) |
| XYZ | 0.2602      | -1.7375       | 0.9482       | MON TO ARP                 |
| XYZ | 0.0109      | -0.0646       | 0.0363       | ARP TO L1 PHASE CENTER     |
| XYZ | 835198.2010 | -5553424.6408 | 3013520.9724 | L1 PHS CEN @ 2018.4733     |

BASELINE NAME: flwe 6916

|     |                |                 |              |                            |
|-----|----------------|-----------------|--------------|----------------------------|
| XYZ | 0.1408         | 0.1781          | -0.1293      | + XYZ ADJUSTMENTS          |
| XYZ | 835198.3418    | -5553424.4627   | 3013520.8431 | NEW L1 PHS CEN @ 2018.4733 |
| XYZ | 835198.3309    | -5553424.3981   | 3013520.8068 | NEW ARP @ 2018.4733        |
| XYZ | 835198.0708    | -5553422.6606   | 3013519.8586 | NEW MON @ 2018.4733        |
| LLH | 28 22 44.29815 | 278 33 10.10898 | -3.1914      | NEW L1 PHS CEN @ 2018.4733 |
| LLH | 28 22 44.29813 | 278 33 10.10894 | -3.2662      | NEW ARP @ 2018.4733        |
| LLH | 28 22 44.29815 | 278 33 10.10898 | -5.2627      | NEW MON @ 2018.4733        |

BASELINE NAME: ccv6 6916

|     |                |                 |              |                            |
|-----|----------------|-----------------|--------------|----------------------------|
| XYZ | 0.1431         | 0.1885          | -0.1420      | + XYZ ADJUSTMENTS          |
| XYZ | 835198.3441    | -5553424.4523   | 3013520.8304 | NEW L1 PHS CEN @ 2018.4733 |
| XYZ | 835198.3332    | -5553424.3877   | 3013520.7942 | NEW ARP @ 2018.4733        |
| XYZ | 835198.0731    | -5553422.6502   | 3013519.8459 | NEW MON @ 2018.4733        |
| LLH | 28 22 44.29794 | 278 33 10.10912 | -3.2061      | NEW L1 PHS CEN @ 2018.4733 |
| LLH | 28 22 44.29792 | 278 33 10.10908 | -3.2810      | NEW ARP @ 2018.4733        |
| LLH | 28 22 44.29794 | 278 33 10.10912 | -5.2774      | NEW MON @ 2018.4733        |

BASELINE NAME: zefr 6916

|     |                |                 |              |                            |
|-----|----------------|-----------------|--------------|----------------------------|
| XYZ | 0.1623         | 0.1501          | -0.1455      | + XYZ ADJUSTMENTS          |
| XYZ | 835198.3633    | -5553424.4907   | 3013520.8269 | NEW L1 PHS CEN @ 2018.4733 |
| XYZ | 835198.3525    | -5553424.4261   | 3013520.7907 | NEW ARP @ 2018.4733        |
| XYZ | 835198.0923    | -5553422.6886   | 3013519.8424 | NEW MON @ 2018.4733        |
| LLH | 28 22 44.29722 | 278 33 10.10961 | -3.1719      | NEW L1 PHS CEN @ 2018.4733 |
| LLH | 28 22 44.29719 | 278 33 10.10957 | -3.2467      | NEW ARP @ 2018.4733        |
| LLH | 28 22 44.29722 | 278 33 10.10961 | -5.2432      | NEW MON @ 2018.4733        |



Axx2018 622 18 622

B2018 6221545 18 62220 4 1 page5 v1603.24IGS 126 1 2 27NGS 2018 717IFDDPX  
IIGS08\_1930 IGS 20170101  
C00090004 338532751 11 84909842 37 60167146 22 X1738A6916X1738AFLWE  
D 1 2 -6391082 1 3 6585998 2 3 -9461799

Axx2018 622 18 622

B2018 6221545 18 62220 4 1 page5 v1603.24IGS 126 1 2 27NGS 2018 717IFDDPX  
IIGS08\_1930 IGS 20170101  
C00090005 865875635 12 180614719 39 78847040 23 X1738A6916X1738ACCV6  
D 1 2 -6544871 1 3 6676888 2 3 -9505631

Axx2018 622 18 622

B2018 6221545 18 62220 4 1 page5 v1603.24IGS 126 1 2 27NGS 2018 717IFDDPX  
IIGS08\_1930 IGS 20170101  
C00090001 -685175899 13 -179057339 43 -147688066 26 X1738A6916X1738AZEFR  
D 1 2 -6147534 1 3 6484014 2 3 -9519276

#### POST-FIT RMS BY SATELLITE VS. BASELINE

| OVERALL   | 01    | 02    | 03    | 06    | 07    | 08    | 09    | 11  |       |
|-----------|-------|-------|-------|-------|-------|-------|-------|-----|-------|
| flwe-6916 | 0.019 | 0.018 | 0.026 | 0.021 | 0.015 | 0.018 | 0.026 | ... | 0.024 |
|           | 12    | 13    | 17    | 18    | 19    | 22    | 24    | 28  | 30    |
| flwe-6916 | ...   | 0.023 | 0.015 | 0.021 | 0.017 | 0.022 | 0.027 | ... | 0.017 |

| OVERALL   | 01    | 02    | 03    | 06    | 07    | 08    | 09    | 11  |       |
|-----------|-------|-------|-------|-------|-------|-------|-------|-----|-------|
| ccv6-6916 | 0.021 | 0.022 | 0.029 | 0.022 | 0.016 | 0.021 | 0.029 | ... | 0.020 |
|           | 12    | 13    | 17    | 18    | 19    | 22    | 24    | 28  | 30    |
| ccv6-6916 | ...   | 0.038 | 0.019 | 0.022 | 0.018 | 0.021 | 0.029 | ... | 0.018 |

| OVERALL   | 01    | 02    | 03    | 06    | 07    | 08    | 09    | 11  |       |
|-----------|-------|-------|-------|-------|-------|-------|-------|-----|-------|
| zefr-6916 | 0.020 | 0.019 | 0.029 | 0.025 | 0.023 | 0.022 | 0.025 | ... | 0.018 |
|           | 12    | 13    | 17    | 18    | 19    | 22    | 24    | 28  | 30    |
| zefr-6916 | ...   | ...   | 0.021 | 0.017 | 0.020 | 0.020 | 0.023 | ... | 0.016 |

#### OBS BY SATELLITE VS. BASELINE

| OVERALL   | 01   | 02  | 03  | 06  | 07  | 08  | 09  | 11  |     |
|-----------|------|-----|-----|-----|-----|-----|-----|-----|-----|
| flwe-6916 | 3581 | 365 | 67  | 303 | 307 | 294 | 101 | ... | 322 |
|           | 12   | 13  | 17  | 18  | 19  | 22  | 24  | 28  | 30  |
| flwe-6916 | ...  | 46  | 430 | 246 | 366 | 228 | 95  | ... | 411 |
| OVERALL   | 01   | 02  | 03  | 06  | 07  | 08  | 09  | 11  |     |
| ccv6-6916 | 3700 | 373 | 72  | 347 | 295 | 300 | 114 | ... | 311 |
|           | 12   | 13  | 17  | 18  | 19  | 22  | 24  | 28  | 30  |
| ccv6-6916 | ...  | 32  | 430 | 257 | 380 | 265 | 109 | ... | 415 |
| OVERALL   | 01   | 02  | 03  | 06  | 07  | 08  | 09  | 11  |     |
| zefr-6916 | 3321 | 349 | 56  | 323 | 296 | 297 | 59  | ... | 242 |
|           | 12   | 13  | 17  | 18  | 19  | 22  | 24  | 28  | 30  |
| zefr-6916 | ...  | ... | 423 | 225 | 355 | 210 | 72  | ... | 414 |

ITRF position of 6916 as determined by individual baselines

X Y Z

|      |            |              |             |
|------|------------|--------------|-------------|
| flwe | 835198.071 | -5553422.661 | 3013519.859 |
| ccv6 | 835198.073 | -5553422.650 | 3013519.846 |
| zefr | 835198.092 | -5553422.689 | 3013519.842 |

Residuals of position determined by individual baselines from the final position

|      | X      | Y      | Z      | East   | North  | Up     |
|------|--------|--------|--------|--------|--------|--------|
| flwe | -0.008 | 0.006  | 0.010  | -0.007 | 0.012  | -0.002 |
| ccv6 | -0.006 | 0.016  | -0.003 | -0.003 | 0.005  | -0.016 |
| zefr | 0.014  | -0.022 | -0.007 | 0.010  | -0.017 | 0.018  |

Covariance Matrix for the xyz OPUS Position (meters^2).

|               |               |               |
|---------------|---------------|---------------|
| 0.0000007356  | -0.0000001669 | 0.0000001071  |
| -0.0000001669 | 0.0000103867  | -0.0000005775 |
| 0.0000001071  | -0.0000005775 | 0.0000038578  |

Covariance Matrix for the enu OPUS Position (meters^2).

|               |               |               |
|---------------|---------------|---------------|
| 0.0000008999  | 0.0000006133  | -0.0000011007 |
| 0.0000006133  | 0.0000047915  | -0.0000023271 |
| -0.0000011007 | -0.0000023271 | 0.0000092885  |

Horizontal network accuracy = 0.00443 meters.

Vertical network accuracy = 0.00598 meters.

#### Derivation of NAD 83 vector components

Position of reference station ARP in NAD\_83(2011)(EPOCH:2010.0000).

|      | Xa(m)        | Ya(m)          | Za(m)         |         |  |
|------|--------------|----------------|---------------|---------|--|
| FLWE | 869052.16380 | -5544933.23814 | 3019536.73114 | 2010.00 |  |
| CCV6 | 921786.46925 | -5535362.77131 | 3021404.71661 | 2010.00 |  |
| ZEFR | 766681.32093 | -5571329.99195 | 2998751.20655 | 2010.00 |  |

Position of reference station monument in NAD\_83(2011)(EPOCH:2010.0000).

|      | Xr(m)        | Yr(m)          | Zr(m)         |         |  |
|------|--------------|----------------|---------------|---------|--|
| FLWE | 869052.16380 | -5544933.23814 | 3019536.73114 | 2010.00 |  |
| CCV6 | 921786.46925 | -5535362.77131 | 3021404.71661 | 2010.00 |  |
| ZEFR | 766681.32093 | -5571329.99195 | 2998751.20655 | 2010.00 |  |

Velocity of reference station monument in NAD\_83(2011)(EPOCH:2010.0000).

|      | Vx (m/yr) | Vy (m/yr) | Vz (m/yr) |
|------|-----------|-----------|-----------|
| FLWE | -0.01200  | -0.00070  | 0.00210   |
| CCV6 | -0.01370  | 0.00270   | 0.00080   |
| ZEFR | -0.01230  | 0.00050   | 0.00100   |

Vectors from unknown station monument to reference station monument in NAD\_83(2011)(EPOCH:2010.0000).

|      | Xr-X= DX(m)  | Yr-Y= DY(m)  | Zr-Z= DZ(m)  |         |  |
|------|--------------|--------------|--------------|---------|--|
| FLWE | 33853.26880  | 8490.98786   | 6016.72214   | 2010.00 |  |
| CCV6 | 86587.57425  | 18061.45469  | 7884.70761   | 2010.00 |  |
| ZEFR | -68517.57407 | -17905.76595 | -14768.80245 | 2010.00 |  |

STATE PLANE COORDINATES - U.S. Survey Foot



SPC (0901 FL E)  
Northing (Y) [feet] 1470750.825  
Easting (X) [feet] 512371.433  
Convergence [degrees] -0.21255278  
Point Scale 0.99996488  
Combined Factor 0.99996546

\*\*\*\*\* New Reference Frame Preview \*\*\*\*\*

We are replacing the nation's NAD 83 and NAVD 88 datums, to improve access and accuracy of the National Spatial Reference System. More at <https://geodesy.noaa.gov/datums/newdatums/>

Below are approximate coordinates for this solution in the new frames:

APPROX ORTHO HGT: 23.999 (m) [PROTOTYPE (Computed using xGeoid17B,GRS80,IGS08)]

This position and the above vector components were computed without any knowledge by the National Geodetic Survey regarding the equipment or field operating procedures used.

# EAST PINE ISLAND CHECK POINT

FILE: 25341730.DAT OP1532007601886

## NGS OPUS SOLUTION REPORT

=====

All computed coordinate accuracies are listed as peak-to-peak values.

For additional information: <https://www.ngs.noaa.gov/OPUS/about.jsp#accuracy>

USER: [sgrymko@pickettusa.com](mailto:sgrymko@pickettusa.com)  
RINEX FILE: 2534173q.18o

DATE: July 19, 2018  
TIME: 13:40:46 UTC

SOFTWARE: page5 1603.24 master59.pl 160321 START: 2018/06/22 16:24:00  
EPHEMERIS: igs20065.eph [precise] STOP: 2018/06/22 20:30:00  
NAV FILE: brdc1730.18n OBS USED: 11113 / 12240 : 91%  
ANT NAME: TRM5800 NONE # FIXED AMB: 67 / 83 : 81%  
ARP HEIGHT: 1.9964 OVERALL RMS: 0.020(m)

REF FRAME: NAD\_83(2011)(EPOCH:2010.0000)

IGS08 (EPOCH:2018.4733)

|                             |                          |
|-----------------------------|--------------------------|
| X: 835382.436(m) 0.011(m)   | 835381.620(m) 0.011(m)   |
| Y: -5553456.987(m) 0.040(m) | -5553455.427(m) 0.040(m) |
| Z: 3013407.464(m) 0.026(m)  | 3013407.304(m) 0.026(m)  |

|                                 |                          |
|---------------------------------|--------------------------|
| LAT: 28 22 40.13846 0.012(m)    | 28 22 40.15960 0.012(m)  |
| E LON: 278 33 16.61764 0.011(m) | 278 33 16.59650 0.011(m) |
| W LON: 81 26 43.38236 0.011(m)  | 81 26 43.40350 0.011(m)  |
| EL HGT: -4.691(m) 0.047(m)      | -6.231(m) 0.047(m)       |

ORTHO HGT: 23.062(m) 0.053(m) [NAVD88 (Computed using GEOID12B)]

EL. 75.663 ft

### UTM COORDINATES STATE PLANE COORDINATES

|                       | UTM (Zone 17) | SPC (0901 FL E) |
|-----------------------|---------------|-----------------|
| Northing (Y) [meters] | 3139136.778   | 448157.706      |
| Easting (X) [meters]  | 456362.167    | 156347.273      |
| Convergence [degrees] | -0.21168611   | -0.21168611     |
| Point Scale           | 0.99962350    | 0.99996469      |
| Combined Factor       | 0.99962424    | 0.99996543      |

Y=1470330.74 ft  
X= 512949.35 ft

US NATIONAL GRID DESIGNATOR: 17RMM5636239136(NAD 83)

### BASE STATIONS USED

| PID    | DESIGNATION                    | LATITUDE    | LONGITUDE    | DISTANCE(m) |
|--------|--------------------------------|-------------|--------------|-------------|
| DQ7965 | FLWE WEDGEFIELD FL CORS ARP    | N282626.477 | W0810533.176 | 35268.6     |
| DF7046 | BRTW BARTOW CORS ARP           | N275658.642 | W0814658.200 | 57880.7     |
| DI3564 | CCV6 CAPE CANAVERAL 6 CORS ARP | N282735.827 | W0803243.702 | 88639.8     |



NEAREST NGS PUBLISHED CONTROL POINT  
AA6749 L 715 009 N282218.000 W0812641.000 684.6

#### BASE STATION INFORMATION

STATION NAME: flwe a 1 (Wedgefield FL; Wedgefield, Florida USA)

MONUMENT: NO DOMES NUMBER

XYZ 869051.5075 -5544931.6670 3019536.5449 MON @ 2005.0000 (M)  
XYZ -0.0120 -0.0007 0.0021 VEL (M/YR)  
NEU 0.0000 0.0000 0.0000 MON TO ARP (M)  
NEU 0.0013 -0.0007 0.0888 ARP TO L1 PHASE CENTER (M)  
NEU 0.0005 0.0002 0.0818 ARP TO L2 PHASE CENTER (M)  
XYZ -0.1617 -0.0094 0.0283 VEL TIMES 13.4726 YRS  
XYZ 0.0000 0.0000 0.0000 MON TO ARP  
XYZ 0.0113 -0.0767 0.0434 ARP TO L1 PHASE CENTER  
XYZ 869051.3571 -5544931.7531 3019536.6166 L1 PHS CEN @ 2018.4733  
XYZ -0.0001 0.0000 0.0000 + XYZ ADJUSTMENTS  
XYZ 869051.3571 -5544931.7531 3019536.6167 NEW L1 PHS CEN @ 2018.4733  
XYZ 869051.3458 -5544931.6764 3019536.5732 NEW ARP @ 2018.4733  
XYZ 869051.3458 -5544931.6764 3019536.5732 NEW MON @ 2018.4733  
LLH 28 26 26.49879 278 54 26.80295 -4.9944 NEW L1 PHS CEN @ 2018.4733  
LLH 28 26 26.49875 278 54 26.80298 -5.0833 NEW ARP @ 2018.4733  
LLH 28 26 26.49875 278 54 26.80298 -5.0833 NEW MON @ 2018.4733

STATION NAME: brtw a 3 (BARTOW; Bartow, Florida, U.S.A.)

MONUMENT: 49529S001

XYZ 805863.2966 -5580462.7024 2971581.0305 MON @ 2005.0000 (M)  
XYZ -0.0121 -0.0008 0.0002 VEL (M/YR)  
NEU 0.0000 0.0000 0.0000 MON TO ARP (M)  
NEU 0.0001 -0.0008 0.1242 ARP TO L1 PHASE CENTER (M)  
NEU -0.0000 -0.0008 0.1337 ARP TO L2 PHASE CENTER (M)  
XYZ -0.1630 -0.0103 0.0021 VEL TIMES 13.4726 YRS  
XYZ 0.0000 0.0000 0.0000 MON TO ARP  
XYZ 0.0149 -0.1087 0.0584 ARP TO L1 PHASE CENTER  
XYZ 805863.1486 -5580462.8214 2971581.0909 L1 PHS CEN @ 2018.4733  
XYZ 0.0000 -0.0000 -0.0000 + XYZ ADJUSTMENTS  
XYZ 805863.1486 -5580462.8214 2971581.0909 NEW L1 PHS CEN @ 2018.4733  
XYZ 805863.1337 -5580462.7127 2971581.0326 NEW ARP @ 2018.4733  
XYZ 805863.1337 -5580462.7127 2971581.0326 NEW MON @ 2018.4733  
LLH 27 56 58.66235 278 13 1.77786 12.1453 NEW L1 PHS CEN @ 2018.4733  
LLH 27 56 58.66235 278 13 1.77789 12.0211 NEW ARP @ 2018.4733  
LLH 27 56 58.66235 278 13 1.77789 12.0211 NEW MON @ 2018.4733

STATION NAME: ccv6 a 3 (Cape Canaveral 6; Cape Canaveral, Florida USA)

MONUMENT: NO DOMES NUMBER

XYZ 921785.8210 -5535361.2150 3021404.5386 MON @ 2005.0000 (M)  
XYZ -0.0137 0.0027 0.0008 VEL (M/YR)  
NEU 0.0000 0.0000 0.0000 MON TO ARP (M)  
NEU -0.0028 -0.0023 0.0631 ARP TO L1 PHASE CENTER (M)  
NEU -0.0038 -0.0021 0.0613 ARP TO L2 PHASE CENTER (M)

|     |                |                 |              |                            |
|-----|----------------|-----------------|--------------|----------------------------|
| XYZ | -0.1845        | 0.0366          | 0.0113       | VEL TIMES 13.4726 YRS      |
| XYZ | 0.0000         | 0.0000          | 0.0000       | MON TO ARP                 |
| XYZ | 0.0071         | -0.0565         | 0.0276       | ARP TO L1 PHASE CENTER     |
| XYZ | 921785.6436    | -5535361.2348   | 3021404.5776 | L1 PHS CEN @ 2018.4733     |
| XYZ | -0.0000        | 0.0000          | 0.0000       | + XYZ ADJUSTMENTS          |
| XYZ | 921785.6436    | -5535361.2348   | 3021404.5776 | NEW L1 PHS CEN @ 2018.4733 |
| XYZ | 921785.6365    | -5535361.1783   | 3021404.5500 | NEW ARP @ 2018.4733        |
| XYZ | 921785.6365    | -5535361.1783   | 3021404.5500 | NEW MON @ 2018.4733        |
| LLH | 28 27 35.84894 | 279 27 16.27678 | -24.2130     | NEW L1 PHS CEN @ 2018.4733 |
| LLH | 28 27 35.84903 | 279 27 16.27687 | -24.2761     | NEW ARP @ 2018.4733        |
| LLH | 28 27 35.84903 | 279 27 16.27687 | -24.2761     | NEW MON @ 2018.4733        |

#### REMOTE STATION INFORMATION

STATION NAME: 2534 1

MONUMENT: NO DOMES NUMBER

|     |             |               |              |                            |
|-----|-------------|---------------|--------------|----------------------------|
| XYZ | 835381.4347 | -5553455.5177 | 3013407.3421 | MON @ 2018.4731 (M)        |
| NEU | -0.0008     | -0.0011       | 1.9964       | MON TO ARP (M)             |
| NEU | 0.0008      | 0.0011        | 0.0748       | ARP TO L1 PHASE CENTER (M) |
| NEU | 0.0001      | -0.0022       | 0.0772       | ARP TO L2 PHASE CENTER (M) |
| XYZ | 0.2602      | -1.7375       | 0.9482       | MON TO ARP                 |
| XYZ | 0.0109      | -0.0646       | 0.0363       | ARP TO L1 PHASE CENTER     |
| XYZ | 835381.7058 | -5553457.3198 | 3013408.3266 | L1 PHS CEN @ 2018.4733     |

BASELINE NAME: flwe 2534

|     |                |                 |              |                            |
|-----|----------------|-----------------|--------------|----------------------------|
| XYZ | 0.1824         | 0.0767          | -0.0239      | + XYZ ADJUSTMENTS          |
| XYZ | 835381.8882    | -5553457.2431   | 3013408.3026 | NEW L1 PHS CEN @ 2018.4733 |
| XYZ | 835381.8774    | -5553457.1785   | 3013408.2664 | NEW ARP @ 2018.4733        |
| XYZ | 835381.6171    | -5553455.4410   | 3013407.3182 | NEW MON @ 2018.4733        |
| LLH | 28 22 40.15980 | 278 33 16.59634 | -4.1413      | NEW L1 PHS CEN @ 2018.4733 |
| LLH | 28 22 40.15977 | 278 33 16.59630 | -4.2162      | NEW ARP @ 2018.4733        |
| LLH | 28 22 40.15980 | 278 33 16.59634 | -6.2126      | NEW MON @ 2018.4733        |

BASELINE NAME: brtw 2534

|     |                |                 |              |                            |
|-----|----------------|-----------------|--------------|----------------------------|
| XYZ | 0.1930         | 0.0803          | -0.0390      | + XYZ ADJUSTMENTS          |
| XYZ | 835381.8987    | -5553457.2396   | 3013408.2876 | NEW L1 PHS CEN @ 2018.4733 |
| XYZ | 835381.8879    | -5553457.1750   | 3013408.2513 | NEW ARP @ 2018.4733        |
| XYZ | 835381.6277    | -5553455.4374   | 3013407.3031 | NEW MON @ 2018.4733        |
| LLH | 28 22 40.15940 | 278 33 16.59674 | -4.1502      | NEW L1 PHS CEN @ 2018.4733 |
| LLH | 28 22 40.15937 | 278 33 16.59670 | -4.2251      | NEW ARP @ 2018.4733        |
| LLH | 28 22 40.15940 | 278 33 16.59674 | -6.2215      | NEW MON @ 2018.4733        |

BASELINE NAME: ccv6 2534

|     |                |                 |              |                            |
|-----|----------------|-----------------|--------------|----------------------------|
| XYZ | 0.1817         | 0.1165          | -0.0501      | + XYZ ADJUSTMENTS          |
| XYZ | 835381.8875    | -5553457.2034   | 3013408.2765 | NEW L1 PHS CEN @ 2018.4733 |
| XYZ | 835381.8766    | -5553457.1388   | 3013408.2402 | NEW ARP @ 2018.4733        |
| XYZ | 835381.6164    | -5553455.4012   | 3013407.2920 | NEW MON @ 2018.4733        |
| LLH | 28 22 40.15966 | 278 33 16.59653 | -4.1885      | NEW L1 PHS CEN @ 2018.4733 |
| LLH | 28 22 40.15963 | 278 33 16.59649 | -4.2633      | NEW ARP @ 2018.4733        |
| LLH | 28 22 40.15966 | 278 33 16.59653 | -6.2598      | NEW MON @ 2018.4733        |



Axx2018 622 18 622

B2018 6221624 18 6222029 1 page5 v1603.24IGS 126 1 2 27NGS 2018 719IFDDPX  
IIGS08\_1930 IGS 20170101  
C00090004 336697286 10 85237646 36 61292550 20 X1738A2534X1738AFLWE  
D 1 2 -4391302 1 3 4814993 2 3 -9256384

Axx2018 622 18 622

B2018 6221624 18 6222029 1 page5 v1603.24IGS 126 1 2 27NGS 2018 719IFDDPX  
IIGS08\_1930 IGS 20170101  
C00090002 -295184940 8 -270072753 29 -418262705 18 X1738A2534X1738ABRTW  
D 1 2 -5919804 1 3 6316529 2 3 -8928251

Axx2018 622 18 622

B2018 6221624 18 6222029 1 page5 v1603.24IGS 126 1 2 27NGS 2018 719IFDDPX  
IIGS08\_1930 IGS 20170101  
C00090005 864040201 11 180942229 36 79972579 21 X1738A2534X1738ACCV6  
D 1 2 -5671888 1 3 5702928 2 3 -9449124

#### POST-FIT RMS BY SATELLITE VS. BASELINE

| OVERALL   | 01    | 02    | 03    | 05    | 06    | 07    | 08    | 11          |
|-----------|-------|-------|-------|-------|-------|-------|-------|-------------|
| flwe-2534 | 0.020 | 0.018 | 0.023 | 0.020 | ...   | 0.019 | 0.019 | 0.043 0.019 |
|           | 12    | 13    | 17    | 18    | 19    | 22    | 24    | 28 30       |
| flwe-2534 | 0.038 | 0.032 | 0.013 | 0.017 | 0.019 | 0.031 | 0.034 | 0.016 0.031 |

| OVERALL   | 01    | 02    | 03    | 05    | 06    | 07    | 08    | 11          |
|-----------|-------|-------|-------|-------|-------|-------|-------|-------------|
| brtw-2534 | 0.019 | 0.015 | 0.022 | 0.020 | ...   | 0.018 | 0.019 | 0.022 0.015 |
|           | 12    | 13    | 17    | 18    | 19    | 22    | 24    | 28 30       |
| brtw-2534 | 0.039 | 0.025 | 0.012 | 0.015 | 0.019 | 0.029 | 0.035 | 0.016 0.021 |

| OVERALL   | 01    | 02    | 03    | 05    | 06    | 07    | 08    | 11          |
|-----------|-------|-------|-------|-------|-------|-------|-------|-------------|
| ccv6-2534 | 0.021 | 0.021 | 0.026 | 0.019 | ...   | 0.019 | 0.018 | 0.027 0.020 |
|           | 12    | 13    | 17    | 18    | 19    | 22    | 24    | 28 30       |
| ccv6-2534 | 0.022 | 0.026 | 0.019 | 0.019 | 0.019 | 0.026 | 0.037 | 0.019 0.019 |

#### OBS BY SATELLITE VS. BASELINE

| OVERALL   | 01   | 02  | 03  | 05  | 06  | 07  | 08  | 11     |
|-----------|------|-----|-----|-----|-----|-----|-----|--------|
| flwe-2534 | 3644 | 292 | 173 | 369 | ... | 358 | 212 | 79 251 |
|           | 12   | 13  | 17  | 18  | 19  | 22  | 24  | 28 30  |
| flwe-2534 | 28   | 64  | 288 | 138 | 450 | 307 | 105 | 489 41 |
| OVERALL   | 01   | 02  | 03  | 05  | 06  | 07  | 08  | 11     |
| brtw-2534 | 3729 | 278 | 171 | 371 | ... | 360 | 235 | 57 251 |
|           | 12   | 13  | 17  | 18  | 19  | 22  | 24  | 28 30  |
| brtw-2534 | 41   | 64  | 287 | 188 | 452 | 314 | 121 | 489 50 |
| OVERALL   | 01   | 02  | 03  | 05  | 06  | 07  | 08  | 11     |
| ccv6-2534 | 3740 | 322 | 170 | 363 | ... | 348 | 221 | 66 252 |
|           | 12   | 13  | 17  | 18  | 19  | 22  | 24  | 28 30  |
| ccv6-2534 | 55   | 54  | 288 | 177 | 462 | 294 | 133 | 489 46 |

ITRF position of 2534 as determined by individual baselines

X Y Z

|      |            |              |             |
|------|------------|--------------|-------------|
| flwe | 835381.617 | -5553455.441 | 3013407.318 |
| brtw | 835381.628 | -5553455.437 | 3013407.303 |
| ccv6 | 835381.616 | -5553455.401 | 3013407.292 |

Residuals of position determined by individual baselines from the final position

|      | X      | Y      | Z      | East   | North  | Up     |
|------|--------|--------|--------|--------|--------|--------|
| flwe | -0.003 | -0.014 | 0.014  | -0.005 | 0.006  | 0.019  |
| brtw | 0.007  | -0.011 | -0.001 | 0.006  | -0.007 | 0.010  |
| ccv6 | -0.004 | 0.025  | -0.012 | -0.000 | 0.001  | -0.028 |

Covariance Matrix for the xyz OPUS Position (meters^2).

|               |               |               |
|---------------|---------------|---------------|
| 0.0000006333  | -0.0000001444 | 0.0000000908  |
| -0.0000001444 | 0.0000009244  | -0.0000005578 |
| 0.0000000908  | -0.0000005578 | 0.0000037644  |

Covariance Matrix for the enu OPUS Position (meters^2).

|               |               |               |
|---------------|---------------|---------------|
| 0.0000007964  | 0.0000005870  | -0.0000010795 |
| 0.0000005870  | 0.0000046342  | -0.0000021860 |
| -0.0000010795 | -0.0000021860 | 0.0000088915  |

Horizontal network accuracy = 0.00435 meters.

Vertical network accuracy = 0.00585 meters.

#### Derivation of NAD 83 vector components

Position of reference station ARP in NAD\_83(2011)(EPOCH:2010.0000).

|      | Xa(m)        | Ya(m)          | Za(m)         |         |  |
|------|--------------|----------------|---------------|---------|--|
| FLWE | 869052.16380 | -5544933.23814 | 3019536.73114 | 2010.00 |  |
| BRTW | 805863.95044 | -5580464.27627 | 2971581.21134 | 2010.00 |  |
| CCV6 | 921786.46925 | -5535362.77131 | 3021404.71661 | 2010.00 |  |

Position of reference station monument in NAD\_83(2011)(EPOCH:2010.0000).

|      | Xr(m)        | Yr(m)          | Zr(m)         |         |  |
|------|--------------|----------------|---------------|---------|--|
| FLWE | 869052.16380 | -5544933.23814 | 3019536.73114 | 2010.00 |  |
| BRTW | 805863.95044 | -5580464.27627 | 2971581.21134 | 2010.00 |  |
| CCV6 | 921786.46925 | -5535362.77131 | 3021404.71661 | 2010.00 |  |

Velocity of reference station monument in NAD\_83(2011)(EPOCH:2010.0000).

|      | Vx (m/yr) | Vy (m/yr) | Vz (m/yr) |
|------|-----------|-----------|-----------|
| FLWE | -0.01200  | -0.00070  | 0.00210   |
| BRTW | -0.01210  | -0.00080  | 0.00020   |
| CCV6 | -0.01370  | 0.00270   | 0.00080   |

Vectors from unknown station monument to reference station monument in NAD\_83(2011)(EPOCH:2010.0000).

|      | Xr-X= DX(m)  | Yr-Y= DY(m)  | Zr-Z= DZ(m)  |         |  |
|------|--------------|--------------|--------------|---------|--|
| FLWE | 33669.72780  | 8523.74886   | 6129.26714   | 2010.00 |  |
| BRTW | -29518.48556 | -27007.28927 | -41826.25266 | 2010.00 |  |
| CCV6 | 86404.03325  | 18094.21569  | 7997.25261   | 2010.00 |  |



STATE PLANE COORDINATES - U.S. Survey Foot  
SPC (0901 FL E)  
Northing (Y) [feet] 1470330.740  
Easting (X) [feet] 512949.345  
Convergence [degrees] -0.21168611  
Point Scale 0.99996469  
Combined Factor 0.99996543

\*\*\*\*\* New Reference Frame Preview \*\*\*\*\*

We are replacing the nation's NAD 83 and NAVD 88 datums, to improve access and accuracy of the National Spatial Reference System. More at <https://geodesy.noaa.gov/datums/newdatums/>

Below are approximate coordinates for this solution in the new frames:

APPROX ORTHO HGT: 23.032 (m) [PROTOTYPE (Computed using xGeoid17B,GRS80,IGS08)]

This position and the above vector components were computed without any knowledge by the National Geodetic Survey regarding the equipment or field operating procedures used.

## Trimble DiNi digital level RAW DATA

18680.DAT

Dynamic Height  
Starting Elevation of  
78.21' used.  
Adjusted to Ortho  
Height 78.32'

| For | M5 Adr | 69 T0     | Start-Line           | BF | 13      |            |    |         |
|-----|--------|-----------|----------------------|----|---------|------------|----|---------|
| For | M5 Adr | 70 KD1    | 100                  | TP | 13      |            |    |         |
|     | Z      | 78.210 ft |                      |    |         |            |    |         |
| For | M5 Adr | 71 KD1    | 100                  | TP | 1 13 Rb | 4.612 ft   | HD | 243.60  |
| ft  |        |           |                      |    |         |            |    |         |
| For | M5 Adr | 72 KD1    | 101                  | TP | 1 13 Rf | 5.239 ft   | HD | 236.42  |
| ft  |        |           |                      |    |         |            |    |         |
| For | M5 Adr | 73 KD1    | 101                  | TP | 13      |            |    |         |
|     | Z      | 77.583 ft |                      |    |         |            |    |         |
| For | M5 Adr | 74 KD1    | 101                  | TP | 1 13 Rb | 4.792 ft   | HD | 238.65  |
| ft  |        |           |                      |    |         |            |    |         |
| For | M5 Adr | 75 KD1    | 103                  | TP | 1 13 Rf | 4.700 ft   | HD | 223.82  |
| ft  |        |           |                      |    |         |            |    |         |
| For | M5 Adr | 76 KD1    | 103                  | TP | 13      |            |    |         |
|     | Z      | 77.675 ft |                      |    |         |            |    |         |
| For | M5 Adr | 77 KD1    | 103                  | TP | 1 13 Rb | 4.674 ft   | HD | 251.77  |
| ft  |        |           |                      |    |         |            |    |         |
| For | M5 Adr | 78 KD1    | 104                  | TP | 1 13 Rf | 5.947 ft   | HD | 258.99  |
| ft  |        |           |                      |    |         |            |    |         |
| For | M5 Adr | 79 KD1    | 104                  | TP | 13      |            |    |         |
|     | Z      | 76.402 ft |                      |    |         |            |    |         |
| For | M5 Adr | 80 KD1    | 104                  | TP | 1 13 Rb | 5.694 ft   | HD | 254.30  |
| ft  |        |           |                      |    |         |            |    |         |
| For | M5 Adr | 81 KD1    | 105                  | TP | 1 13 Rf | 4.934 ft   | HD | 223.52  |
| ft  |        |           |                      |    |         |            |    |         |
| For | M5 Adr | 82 KD1    | 105                  | TP | 13      |            |    |         |
|     | Z      | 77.162 ft |                      |    |         |            |    |         |
| For | M5 Adr | 83 KD1    | 105                  | TP | 1 13 Rb | 5.174 ft   | HD | 226.94  |
| ft  |        |           |                      |    |         |            |    |         |
| For | M5 Adr | 84 KD1    | 106                  | TP | 1 13 Rf | 5.117 ft   | HD | 210.73  |
| ft  |        |           |                      |    |         |            |    |         |
| For | M5 Adr | 85 KD1    | 106                  | TP | 13      |            |    |         |
|     | Z      | 77.218 ft |                      |    |         |            |    |         |
| For | M5 Adr | 86 KD1    | 106                  | TP | 1 13 Rb | 5.182 ft   | HD | 231.33  |
| ft  |        |           |                      |    |         |            |    |         |
| For | M5 Adr | 87 KD1    | 107                  | TP | 1 13 Rf | 4.856 ft   | HD | 161.35  |
| ft  |        |           |                      |    |         |            |    |         |
| For | M5 Adr | 88 KD1    | 107                  | TP | 13      |            |    |         |
|     | Z      | 77.545 ft |                      |    |         |            |    |         |
| For | M5 Adr | 89 KD1    | 107                  | TP | 1 13 Rb | 3.918 ft   | HD | 169.32  |
| ft  |        |           |                      |    |         |            |    |         |
| For | M5 Adr | 90 KD1    | 108#####             |    | 1 13 Rf | 5.093 ft   | HD | 54.72   |
| ft  |        |           |                      |    |         |            |    |         |
| For | M5 Adr | 91 KD1    | 108#####             |    | 13      |            |    |         |
|     | Z      | 76.371 ft |                      |    |         |            |    |         |
| For | M5 Adr | 92 T0     | Measurement repeated |    | 13      |            |    |         |
|     |        |           |                      |    |         |            |    |         |
| For | M5 Adr | 93 KD1    | 108                  | TP | 1 13 Rf | 5.093 ft   | HD | 54.76   |
| ft  |        |           |                      |    |         |            |    |         |
| For | M5 Adr | 94 KD1    | 108                  | TP | 13      |            |    |         |
|     | Z      | 76.371 ft |                      |    |         |            |    |         |
| For | M5 Adr | 95 KD1    | 108                  | TP | 13 Sh   | -1.839 ft  | dz | -0.001  |
| ft  | Z      | 76.370 ft |                      |    |         |            |    |         |
| For | M5 Adr | 96 KD2    | 108                  | TP | 7 13 Db | 1615.91 ft | Df | 1369.58 |
| ft  | Z      | 76.371 ft |                      |    |         |            |    |         |
| For | M5 Adr | 97 T0     | End-Line             |    | 13      |            |    |         |
|     |        |           |                      |    |         |            |    |         |
| For | M5 Adr | 98 T0     | Start-Line           | BF | 14      |            |    |         |
|     |        |           |                      |    |         |            |    |         |
| For | M5 Adr | 99 KD1    | 100                  | TP | 14      |            |    |         |
|     | Z      | 76.402 ft |                      |    |         |            |    |         |
| For | M5 Adr | 100 KD1   | 100                  | TP | 1 14 Rb | 5.600 ft   | HD | 132.97  |
| ft  |        |           |                      |    |         |            |    |         |
| For | M5 Adr | 101 KD1   | 101                  | TP | 1 14 Rf | 5.542 ft   | HD | 118.57  |
| ft  |        |           |                      |    |         |            |    |         |
| For | M5 Adr | 102 KD1   | 101                  | TP | 14      |            |    |         |
|     | Z      | 76.460 ft |                      |    |         |            |    |         |



|     |        |           |     |    |           |       |          |           |
|-----|--------|-----------|-----|----|-----------|-------|----------|-----------|
| For | M5 Adr | 103 KD1   | 101 | TP | 18680.DAT |       |          |           |
| ft  |        |           |     |    | 1         | 14 Rb | 4.925 ft | HD 227.26 |
| For | M5 Adr | 104 KD1   | 102 | TP | 1         | 14 Rf | 3.365 ft | HD 224.84 |
| ft  |        |           |     |    |           |       |          |           |
| For | M5 Adr | 105 KD1   | 102 | TP |           | 14    |          |           |
|     | Z      | 78.019 ft |     |    |           |       |          |           |
| For | M5 Adr | 106 KD1   | 102 | TP | 1         | 14 Rb | 6.045 ft | HD 232.74 |
| ft  |        |           |     |    |           |       |          |           |
| For | M5 Adr | 107 KD1   | 103 | TP | 1         | 14 Rf | 4.716 ft | HD 221.36 |
| ft  |        |           |     |    |           |       |          |           |
| For | M5 Adr | 108 KD1   | 103 | TP |           | 14    |          |           |
|     | Z      | 79.348 ft |     |    |           |       |          |           |
| For | M5 Adr | 109 KD1   | 103 | TP | 1         | 14 Rb | 5.244 ft | HD 229.86 |
| ft  |        |           |     |    |           |       |          |           |
| For | M5 Adr | 110 KD1   | 104 | TP | 1         | 14 Rf | 5.123 ft | HD 225.46 |
| ft  |        |           |     |    |           |       |          |           |
| For | M5 Adr | 111 KD1   | 104 | TP |           | 14    |          |           |
|     | Z      | 79.470 ft |     |    |           |       |          |           |
| For | M5 Adr | 112 KD1   | 104 | TP | 1         | 14 Rb | 4.431 ft | HD 218.63 |
| ft  |        |           |     |    |           |       |          |           |
| For | M5 Adr | 113 KD1   | 105 | TP | 1         | 14 Rf | 5.292 ft | HD 172.15 |
| ft  |        |           |     |    |           |       |          |           |
| For | M5 Adr | 114 KD1   | 105 | TP |           | 14    |          |           |
|     | Z      | 78.609 ft |     |    |           |       |          |           |
| For | M5 Adr | 115 KD1   | 105 | TP | 1         | 14 Rb | 4.715 ft | HD 64.60  |
| ft  |        |           |     |    |           |       |          |           |
| For | M5 Adr | 116 KD1   | 106 | TP | 1         | 14 Rf | 4.669 ft | HD 66.21  |
| ft  |        |           |     |    |           |       |          |           |
| For | M5 Adr | 117 KD1   | 106 | TP |           | 14    |          |           |
|     | Z      | 78.655 ft |     |    |           |       |          |           |
| For | M5 Adr | 118 KD1   | 106 | TP | 1         | 14 Rb | 4.899 ft | HD 172.15 |
| ft  |        |           |     |    |           |       |          |           |
| For | M5 Adr | 119 KD1   | 107 | TP | 1         | 14 Rf | 4.626 ft | HD 243.77 |
| ft  |        |           |     |    |           |       |          |           |
| For | M5 Adr | 120 KD1   | 107 | TP |           | 14    |          |           |
|     | Z      | 78.928 ft |     |    |           |       |          |           |
| For | M5 Adr | 121 KD1   | 107 | TP | 1         | 14 Rb | 3.555 ft | HD 236.58 |
| ft  |        |           |     |    |           |       |          |           |
| For | M5 Adr | 122 KD1   | 108 | TP | 1         | 14 Rf | 5.842 ft | HD 206.59 |
| ft  |        |           |     |    |           |       |          |           |
| For | M5 Adr | 123 KD1   | 108 | TP |           | 14    |          |           |
|     | Z      | 76.641 ft |     |    |           |       |          |           |
| For | M5 Adr | 124 KD1   | 108 | TP | 1         | 14 Rb | 4.210 ft | HD 71.23  |
| ft  |        |           |     |    |           |       |          |           |
| For | M5 Adr | 125 KD1   | 109 | TP | 1         | 14 Rf | 5.297 ft | HD 64.44  |
| ft  |        |           |     |    |           |       |          |           |
| For | M5 Adr | 126 KD1   | 109 | TP |           | 14    |          |           |
|     | Z      | 75.554 ft |     |    |           |       |          |           |
| For | M5 Adr | 127 KD1   | 109 | TP | 1         | 14 Rb | 6.112 ft | HD 179.53 |
| ft  |        |           |     |    |           |       |          |           |
| For | M5 Adr | 128 KD1   | 110 | TP | 1         | 14 Rf | 3.594 ft | HD 244.16 |
| ft  |        |           |     |    |           |       |          |           |
| For | M5 Adr | 129 KD1   | 110 | TP |           | 14    |          |           |
|     | Z      | 78.072 ft |     |    |           |       |          |           |
| For | M5 Adr | 130 KD1   | 110 | TP | 1         | 14 Rb | 5.729 ft | HD 229.99 |
| ft  |        |           |     |    |           |       |          |           |
| For | M5 Adr | 131 KD1   | 111 | TP | 1         | 14 Rf | 4.088 ft | HD 242.62 |
| ft  |        |           |     |    |           |       |          |           |
| For | M5 Adr | 132 KD1   | 111 | TP |           | 14    |          |           |
|     | Z      | 79.713 ft |     |    |           |       |          |           |
| For | M5 Adr | 133 KD1   | 111 | TP | 1         | 14 Rb | 4.760 ft | HD 238.12 |
| ft  |        |           |     |    |           |       |          |           |
| For | M5 Adr | 134 KD1   | 112 | TP | 1         | 14 Rf | 5.130 ft | HD 76.67  |
| ft  |        |           |     |    |           |       |          |           |
| For | M5 Adr | 135 KD1   | 112 | TP |           | 14    |          |           |
|     | Z      | 79.343 ft |     |    |           |       |          |           |
| For | M5 Adr | 136 KD1   | 112 | TP | 1         | 14 Rb | 4.468 ft | HD 245.77 |
| ft  |        |           |     |    |           |       |          |           |
| For | M5 Adr | 137 KD1   | 113 | TP | 1         | 14 Rf | 5.751 ft | HD 213.55 |
| ft  |        |           |     |    |           |       |          |           |

|            |                 |     |    |           |       |            |            |
|------------|-----------------|-----|----|-----------|-------|------------|------------|
| For M5 Adr | 138 KD1         | 113 | TP | 18680.DAT |       |            |            |
| Z          | 78.061 ft       |     |    | 14        |       |            |            |
| For M5 Adr | 139 KD1         | 113 | TP | 1         | 14 Rb | 3.294 ft   | HD 235.70  |
| ft         |                 |     |    |           |       |            |            |
| For M5 Adr | 140 KD1         | 114 | TP | 1         | 14 Rf | 4.824 ft   | HD 190.39  |
| ft         |                 |     |    |           |       |            |            |
| For M5 Adr | 141 KD1         | 114 | TP |           | 14    |            |            |
| Z          | 76.530 ft       |     |    |           |       |            |            |
| For M5 Adr | 142 KD1         | 114 | TP | 1         | 14 Rb | 5.442 ft   | HD 139.86  |
| ft         |                 |     |    |           |       |            |            |
| For M5 Adr | 143 KD1         | 115 | TP | 1         | 14 Rf | 5.574 ft   | HD 132.55  |
| ft         |                 |     |    |           |       |            |            |
| For M5 Adr | 144 KD1         | 115 | TP |           | 14    |            |            |
| Z          | 76.398 ft       |     |    |           |       |            |            |
| For M5 Adr | 145 KD1         | 115 | TP |           | 14 Sh | -0.004 ft  | dz 0.004   |
| ft  Z      | 76.402 ft       |     |    |           |       |            |            |
| For M5 Adr | 146 KD2         | 115 | TP | 15        | 14 Db | 2854.98 ft | Df 2643.30 |
| ft  Z      | 76.398 ft       |     |    |           |       |            |            |
| For M5 Adr | 147 T0 End-Line |     |    |           | 14    |            |            |
|            |                 |     |    |           |       |            |            |



1/928

SWFWIND  
EAST PINE ISLAND  
18680

R8  
6916

ORS-8 ALUM DISC @ WELL  
START TIME 11:42 AM  
HI: 6.55  
End time 4:01 PM

R8  
2534

BASE CK 518 SRC "REFL B364"  
START TIME 12:19 PM  
HI: 6.55  
End time 4:26

6-22-18  
FRIDAY

2/928  
PRATHER  
BUCKEL  
CHAVIS



9/928

SWFWMD

18680

LINE 13

EAST PINE ISLAND

TRIMBLE  
Ditch

BENCH RUN FROM

L 715008 → L 715009

+

H1

EL

4.612

82.932

4.792

82.485

5.239

77.693

4.674

82.459

4.700

77.785

TBM1

5.694

82.206

5.947

76.512

6-25-18  
Monday89°  
Partly Cloudy

10/1928

BICKEL  
CHAVIS

BMEL

DESC

NAVD 88

PICTURE 7934-7936

78.32

78.21

L 715008 FID 2" ORANGE  
COUNTY DISK (BRASS) IN EAST CORNER  
OF TOWER FOOTPAD, 0.2 MILES  
NORTH OF TARRAGONA DR. FIRST  
LATTLES TOWER OF LOCK GATE

TURTLE

TURTLE

SET 5/8" SRC "REF LB 364"



11/928

SWEWIND  
18680  
EAST PINE ISLAND

| +     | HI     | -     | EL     |
|-------|--------|-------|--------|
| 5.174 | 82.446 | 4.934 | 77.272 |
| 5.182 | 82.511 | 5.117 | 77.329 |
| 3.918 | 81.573 | 4.856 | 77.655 |
|       |        | 5.093 | 76.48  |

6-25-18  
Monday91°  
Partly Cloudy12/928  
BICKEL  
CHAINS

BMEL DESC

TURTLE

TURTLE

TURTLE

76.48 L 715009 Fwd 2" "ORANGE  
COUNTY CONTROL DISC IN NW  
CORNER FOOT PAD FOR TOWER  
NUMBER 43 ± 0.5 MILE EAST  
OF L 715008 PICTURE  
7637-7639



13/928

SWFWMD

18680

LINE 14

EAST PINE ISLAND

BENCH RUN FROM  
5/8" SRC "REF LB 364 TO WELL OPS-8

+

H

EL

TBM1  
GPS 230

5.600

82.112

4.925

81.495

5.542

76.570

6.045

84.175

3.365

78.130

TBM2  
GPS 228

5.244

84.703

4.716

79.459

4.431

84.011

5.123

79.580

6-25-18

Monday

14/1928

BICKEL  
CHAVIS

BMEL

DESC

76.512

5/8" SRC "REF LB 364 0.3 MILE WEST  
OF TOWER 43. SEE Pg 13/928. 95'± WEST  
OF SHINGLE CREEK TRAIL PINE ISLAND  
EAST LOOP. SOUTH SIDE OF BERRY RD

TURTLE

TURTLE

SET 5/8" SRC "REF LB 364"  
GPS # 228

TURTLE



15/928

SWFWMD  
18680  
EAST PINE ISLAND

|  | +     | HI     | -     | EL     |
|--|-------|--------|-------|--------|
|  | 4.715 | 83.434 | 5.292 | 78.119 |

|     |       |        |       |        |
|-----|-------|--------|-------|--------|
| BM1 | 4.899 | 83.664 | 4.669 | 78.765 |
|-----|-------|--------|-------|--------|

|  |       |        |       |        |
|--|-------|--------|-------|--------|
|  | 3.555 | 82.593 | 4.626 | 79.038 |
|--|-------|--------|-------|--------|

|  |       |        |       |        |
|--|-------|--------|-------|--------|
|  | 4.210 | 80.961 | 5.842 | 76.751 |
|--|-------|--------|-------|--------|

|  |       |        |       |        |
|--|-------|--------|-------|--------|
|  | 6.112 | 81.776 | 5.297 | 75.664 |
|--|-------|--------|-------|--------|

|  |       |        |       |        |
|--|-------|--------|-------|--------|
|  | 5.729 | 83.911 | 3.594 | 78.182 |
|--|-------|--------|-------|--------|

6-26-18  
TUESDAY86°  
Partly Cloudy

16/928

BUCKEL  
CHANNIS

BMEL DESC

TURTLE

END 1/4" BRASS DISC IN THE  
NE CORNER OF CONC PAD AT  
WELL OPS-8

TURTLE

TURTLE

5/8" SRC" REF LB 364 (BASECK)

TURTLE



17/928

SWF WIND  
18680  
EAST PINE ISLAND

+ HI - EL

4.760 84.583 4.088 79.823

TBM2

4.468 83.921 5.13 79.453

3.294 81.464 5.751 78.170

5.442 82.064 4.842 76.620

TBM1

5.574 76.49

6-26-18  
TUESDAY

89°  
Partly Cloudy  
18/928  
Buckel  
CHAVIS

BMEL DESC

TURTLE

FND 5/8" SRC "LB364" TBM2  
GPS#228

TURTLE

TURTLE

0.022

76.512

TBM1 5/8" SRC "REF LB364"  
SEE Pg 14/928



19/1928

SWFWMD

18680

EAST PINE ISLAND

TRIMBLE

RIO BASE 7093

Rtk File: 18680-062618

RIO ROVER 5003

BASE@100 (OPS-SWELL)

HI=2M

FIXED ROD=6.90

200 BASE CHECK@101

201 EPI 1.1

202 EPI 1.2

203 EPI 1.3

204 SHW1

205 SHW2

206 SHW3

207 CK204

208 PWL

209 CK205

210 BAD

211 CK206

212 CK203

213 CK202

214 CK201

6-26-18

TUESDAY

20/1928

BICKEL  
CHAVIS

215 EPI 2.1

216 EPI 2.2

217 EPI 2.3

218 EPI 3.1

219 EPI 3.2

220 EPI 3.3

221 CK220

222 CK219

223 CK218

224 CK217

225 CK216

226 CK215

227 BASE CK@101

228 5/8" SRC "REFLB364" TBM2

229 CK228

230 5/8" SRC "REFLB364" TBM1

231 CK230

232 Fwd 2 1/2 DISC "ORANGE COUNTY L715008"

233 CK231

234 Fwd 2 1/2 DISC "ORANGE COUNTY L715009"

235 CK234



21/928

SWEWIND  
18680  
EAST PINE ISLAND

|     | +    | HI     | - | EL |
|-----|------|--------|---|----|
| BM1 | 4.54 | 83.195 |   |    |

|  |  |       |        |
|--|--|-------|--------|
|  |  | 1.110 | 82.085 |
|--|--|-------|--------|

|      |        |      |        |
|------|--------|------|--------|
| 4.42 | 83.085 | 4.53 | 78.665 |
|------|--------|------|--------|

|  |  |      |        |
|--|--|------|--------|
|  |  | 4.43 | 78.655 |
|--|--|------|--------|

6-26-18  
TUESDAY

22/928

BICKEL  
CHAMPS

BMEL DESC

|        |                                                                    |
|--------|--------------------------------------------------------------------|
| 78.655 | FOUND 1/4" BRASS DISC ON<br>NE CORNER OF CONE PAD AT<br>WELL ORS-8 |
|--------|--------------------------------------------------------------------|

|  |                                             |
|--|---------------------------------------------|
|  | NORTH RIM OF 4 3/8" METAL<br>CASING (ORS-8) |
|--|---------------------------------------------|

|  |                                              |
|--|----------------------------------------------|
|  | SHOT ON NORTH SIDE OF (ORS-8)<br>ON CONE PAD |
|--|----------------------------------------------|

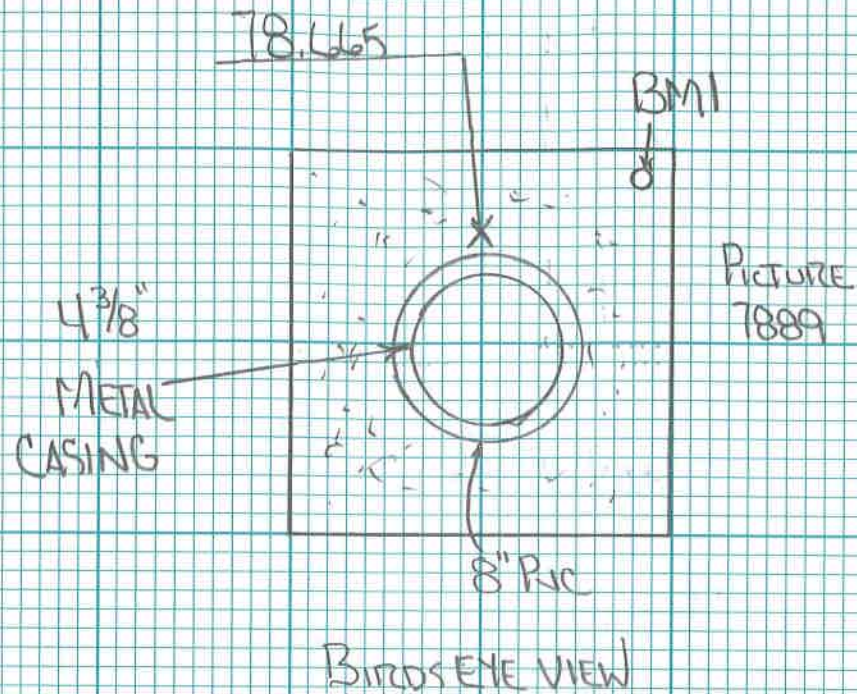
|        |               |
|--------|---------------|
| 78.655 | BM1 SEE ABOVE |
|--------|---------------|



23/9/8

SWEWMD  
186.80  
EAST PINE ISLAND

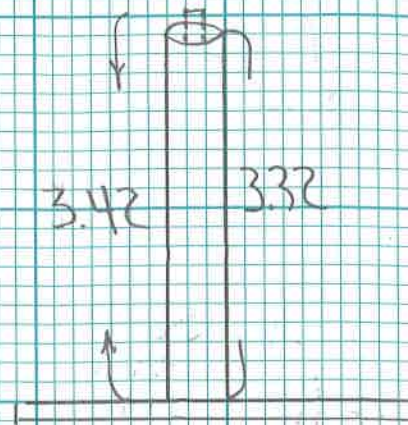
OPS-8



6-26-18  
TUESDAY

24/9/8

Bracket  
CHAIR



LOOKING EAST

PICTURE  
7940-7942



25/928

SWEWMD  
18680  
EAST PINE ISLAND

°  
EPI 3.1  
PICTURE  
7922-7925

°  
EPI 3.2  
PICTURE  
7926-7929

°  
EPI 2.1  
PICTURE  
7909-7912

°  
EPI 2.2  
PICTURE  
7913-7917

°  
EPI 2.3  
PICTURE  
7918-7921

°  
EPI 1.1  
PICTURE  
7891-7893

°  
EPI 1.2  
PICTURE  
7894-7896

6-26-18  
TUESDAY

°  
EPI 3.3  
PICTURE 7930-7932

°  
EPI 1.3  
PICTURE  
7897-7902

SHW 1 PICTURE 7903-7904  
°  
SHW 2 PICTURE 7905-7906  
°  
SHW 3 PICTURE 7907-7908

26/928  
BICKEL  
CHAVIS





27/1928

SWFWMD

18680

EAST PINE ISLAND

RIO ROVER

5006

VRS FILE = 18680-062618

300 CK 230

301 ~~CK 228~~ BAD

STORMS MOVING W

6-26-18

TUESDAY

28/1928

BUCKET  
CLAVIS



103  
928

18680 SWFWMD

7-19-18  
Chavis  
D.D. on

| PIC | ORS-8 | well       | North    |
|-----|-------|------------|----------|
| 649 | ORS-8 | well       | North    |
| 650 | ORS-8 | well       | North    |
| 651 | ORS-8 | Stamp Cap  | North    |
| 652 | ORS-8 | Inner Ring | East     |
| 653 | ORS-8 | 4 1/8 In   | East     |
|     |       | 4.12       |          |
|     |       | 7-19-18    | 10:07 AM |

655 well Id# Pine Island  
Date Installed 4-9-18  
well Diameter 4"  
To of Casing WWC 9417  
total well Depth 26'  
Screened Interval 16'-26'

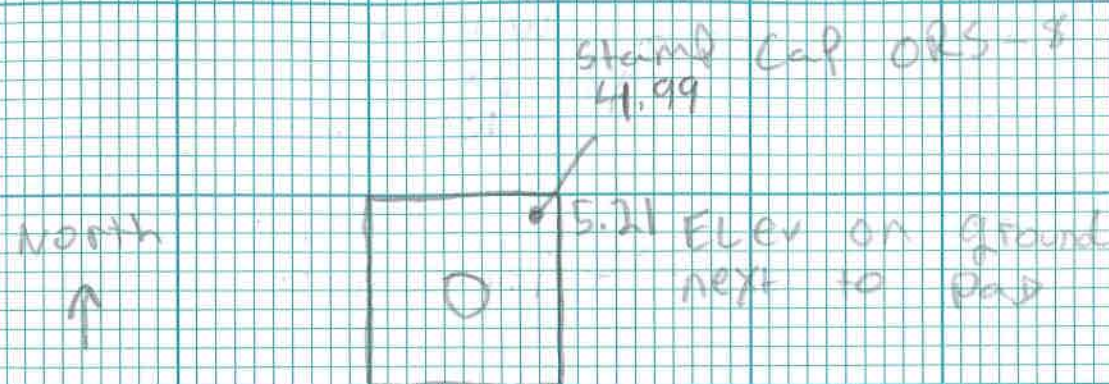
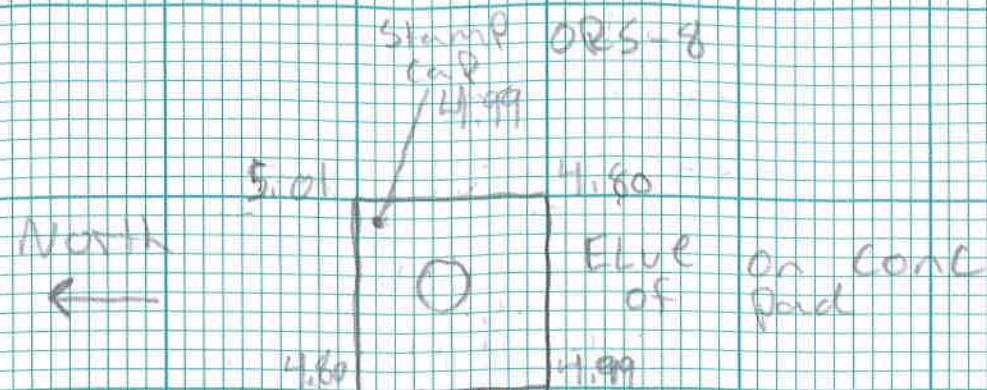
656 } Base Check Point 3 South  
657 }  
658 }

654 Measure Down From Top of Metal Casing To water  
62 1/2 In  
5.22

7-19-18

18680 SWFWMD

104  
928  
Chavis  
D.D. on





149/928

SWFWMD  
18680  
EAST PINE ISLAND

| +     | HI     | EL     |
|-------|--------|--------|
| 4.612 | 83.377 |        |
|       | 1.18   | 82.197 |
|       | 4.65   | 78.727 |
|       | 4.61   | 78.767 |
|       | 4.61   | 78.777 |
|       | 4.60   | 78.767 |
|       | 4.84   | 78.537 |
|       | 4.80   | 78.577 |
|       | 4.70   | 78.677 |
|       | 4.72   | 78.657 |

7-28-18  
SATURDAY

150/928  
BICKEL  
REESE

BMEL 78.765  
DESC FND 1 1/4" DIA BRASS DISC STAMPED "ORS-8"  
IN THE N.E. CORNER OF CONC  
PAD AT WELL ORS-8 C-Pg 15/928

TOP OF 4 3/4" METAL CASING

N.E. CORNER OF CONC PAD

S.E. CORNER OF CONC PAD

S.W. CORNER OF CONC PAD

N.W. CORNER OF CONC PAD

N.E. GRND

S.E. GRND

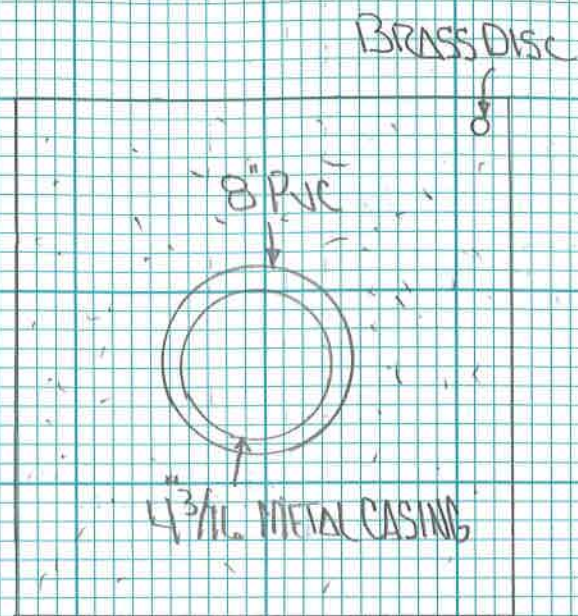
Cont. on Pg 152/928 SW GRND

NW GRND



151/928

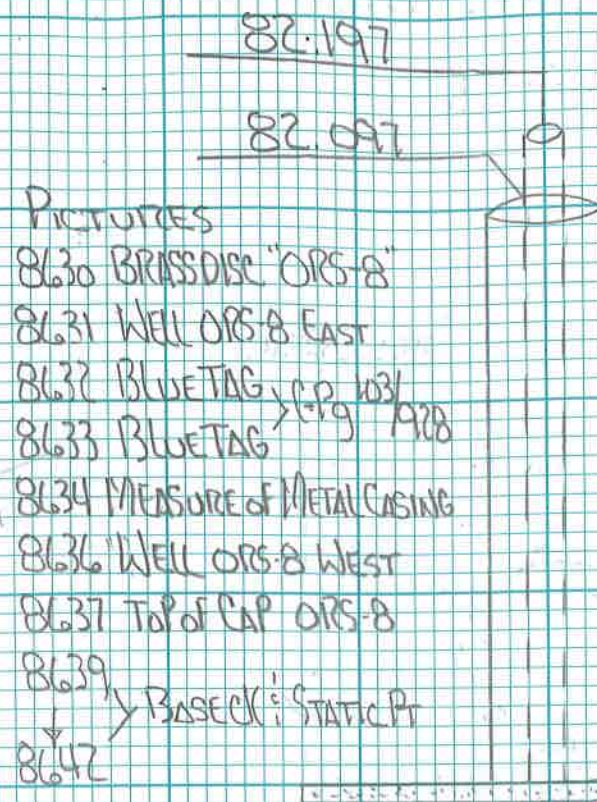
SW FARM  
18680  
EAST PINE ISLAND  
ORS-8



| +    | HI     | -     | EL     |
|------|--------|-------|--------|
| 1.20 | 83.297 | 1.280 | 82.097 |
|      |        | 4.53  | 78.767 |

7-28-18  
SATURDAY

151/928  
BUCKEL  
REESE



| BMEL  | DESC                                                                        |
|-------|-----------------------------------------------------------------------------|
|       | TOP OF 8" PVC                                                               |
| 0.002 | 78.765                                                                      |
|       | Find 1 1/4" BRASS DISC STAMPED ORS-8 IN THE N.E. CORNER OF CONC PAD @ ORS-8 |



153/1928

SWFWMD

18680

EAST PINE ISLAND

VIRS FILE-18680-072818

240 FND 1 1/4" BRASS DISC STAMPED  
"ORS-8" @ N.E. CORNER OF  
CONC PAD (WELL ORS-8)

241 WELL ORS-8 LOCATION ONLY

242

↓  
245 > LOCATION OF CONC PAD

246

↓  
249 > GRIND SPOT NEAR CONC PAD

250 CK 240

251 CK 240

7-28-18  
SATURDAY

154/1928

BICKEL  
REESE



# The NGS Data Sheet

See file [dsdata.pdf](#) for more information about the datasheet.

PROGRAM = datasheet95, VERSION = 8.12.5

1 National Geodetic Survey, Retrieval Date = JUNE 29, 2018

AA6748 \*\*\*\*\*

AA6748 DESIGNATION - L 715 008

AA6748 PID - AA6748

AA6748 STATE/COUNTY- FL/ORANGE

AA6748 COUNTRY - US

AA6748 USGS QUAD - KISSIMMEE (1987)

AA6748

AA6748 \*CURRENT SURVEY CONTROL

AA6748

AA6748\* NAD 83(1986) POSITION- 28 22 20. (N) 081 27 10. (W) SCALED

AA6748\* [NAVD 88](#) ORTHO HEIGHT - 23.873 (meters) 78.32 (feet) ADJUSTED

AA6748

AA6748 GEOID HEIGHT - -27.746 (meters) GEOID12B

AA6748 DYNAMIC HEIGHT - 23.838 (meters) 78.21 (feet) COMP

AA6748 MODELED GRAVITY - 979,176.6 (mgal) NAVD 88

AA6748

AA6748 VERT ORDER - SECOND CLASS I

AA6748

AA6748.The horizontal coordinates were scaled from a topographic map and have  
AA6748.an estimated accuracy of +/- 6 seconds.

AA6748.

AA6748.The orthometric height was determined by differential leveling and  
AA6748.adjusted by the NATIONAL GEODETIC SURVEY

AA6748.in December 1995.

AA6748

AA6748.Significant digits in the geoid height do not necessarily reflect accuracy.

AA6748.GEOID12B height accuracy estimate available [here](#).

AA6748

AA6748.The dynamic height is computed by dividing the NAVD 88

AA6748.geopotential number by the normal gravity value computed on the

AA6748.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45

AA6748.degrees latitude (g = 980.6199 gals.).

AA6748

AA6748.The modeled gravity was interpolated from observed gravity values.

AA6748

AA6748; North East Units Estimated Accuracy

AA6748;SPC FL E - 447,540. 155,620. MT (+/- 180 meters Scaled)

AA6748

AA6748\_U.S. NATIONAL GRID SPATIAL ADDRESS: 17RMM556385(NAD 83)

AA6748

AA6748 SUPERSEDED SURVEY CONTROL

AA6748

AA6748.No superseded survey control is available for this station.

AA6748

AA6748\_MARKER: DD = SURVEY DISK

AA6748\_SETTING: 34 = SET IN THE FOOTINGS OF SMALL/MEDIUM STRUCTURES

AA6748\_SP\_SET: FOOT PAD FOR TOWER

AA6748\_STAMPING: L-715-008

AA6748\_MARK LOGO: FL-095

AA6748\_MAGNETIC: 0 = OTHER; SEE DESCRIPTION

AA6748\_STABILITY: B = PROBABLY HOLD POSITION/ELEVATION WELL



AA6748  
AA6748 HISTORY - Date Condition Report By  
AA6748 HISTORY - 1991 MONUMENTED FL-095  
AA6748 HISTORY - 20050917 GOOD GEOCAC

AA6748

AA6748 STATION DESCRIPTION

AA6748

AA6748'DESCRIBED BY ORANGE COUNTY FLORIDA 1991 (SPL)

AA6748'SET 2-INCH ORANGE COUNTY CONTROL DISK (BRASS) IN EAST CORNER OF TOWER

AA6748'FOOT PAD (ROUND), 65 FT (19.8 M) SOUTH OF BARB WIRE FENCE LINE, 70 FT

AA6748'(21.3 M) EAST OF BARB WIRE FENCE LINE (NOTE, POWER LINES START WITH

AA6748'TOWER RUNNING NORTH AND EAST, 3.6 MI (5.8 KM) EAST OF SR 535, AND 1.5

AA6748'WEST OF JOHN YOUNG). IN SECTION 30, TOWNSHIP 24 SOUTH, RANGE 29 EAST.

AA6748'SITE SUITABILITY FOR GPS OCCUPATION NOT DETERMINED. (DESCRIPTION

AA6748'SOURCE--THE ORANGE COUNTY ENGINEERING DEPARTMENT.)

AA6748

AA6748 STATION RECOVERY (2005)

AA6748

AA6748'RECOVERY NOTE BY GEOCACHING 2005 (MAG)

AA6748'RECOVERED IN GOOD CONDITION.

\*\*\* retrieval complete.

Elapsed Time = 00:00:03

# The NGS Data Sheet

See file [dsdata.pdf](#) for more information about the datasheet.

PROGRAM = datasheet95, VERSION = 8.12.5

1 National Geodetic Survey, Retrieval Date = JUNE 29, 2018

AA6749 \*\*\*\*\*

AA6749 DESIGNATION - L 715 009

AA6749 PID - AA6749

AA6749 STATE/COUNTY- FL/ORANGE

AA6749 COUNTRY - US

AA6749 USGS QUAD - KISSIMMEE (1987)

AA6749

AA6749 \*CURRENT SURVEY CONTROL

AA6749

AA6749\* NAD 83(1986) POSITION- 28 22 18. (N) 081 26 41. (W) SCALED

AA6749\* [NAVD 88](#) ORTHO HEIGHT - 23.311 (meters) 76.48 (feet) ADJUSTED

AA6749

AA6749 GEOID HEIGHT - -27.758 (meters) GEOID12B

AA6749 DYNAMIC HEIGHT - 23.277 (meters) 76.37 (feet) COMP

AA6749 MODELED GRAVITY - 979,176.5 (mgal) NAVD 88

AA6749

AA6749 VERT ORDER - SECOND CLASS I

AA6749

AA6749.The horizontal coordinates were scaled from a topographic map and have  
AA6749.an estimated accuracy of +/- 6 seconds.

AA6749.

AA6749.The orthometric height was determined by differential leveling and  
AA6749.adjusted by the NATIONAL GEODETIC SURVEY

AA6749.in December 1995.

AA6749

AA6749.Significant digits in the geoid height do not necessarily reflect accuracy.

AA6749.GEOID12B height accuracy estimate available [here](#).

AA6749

AA6749.The dynamic height is computed by dividing the NAVD 88

AA6749.geopotential number by the normal gravity value computed on the

AA6749.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45

AA6749.degrees latitude (g = 980.6199 gals.).

AA6749

AA6749.The modeled gravity was interpolated from observed gravity values.

AA6749

AA6749; North East Units Estimated Accuracy

AA6749;SPC FL E - 447,480. 156,410. MT (+/- 180 meters Scaled)

AA6749

AA6749\_U.S. NATIONAL GRID SPATIAL ADDRESS: 17RMM564384(NAD 83)

AA6749

AA6749 SUPERSEDED SURVEY CONTROL

AA6749

AA6749.No superseded survey control is available for this station.

AA6749

AA6749\_MARKER: DD = SURVEY DISK

AA6749\_SETTING: 34 = SET IN THE FOOTINGS OF SMALL/MEDIUM STRUCTURES

AA6749\_SP\_SET: FOOT PAD FOR TOWER

AA6749\_STAMPING: L-715-009

AA6749\_MARK LOGO: FL-095

AA6749\_MAGNETIC: 0 = OTHER; SEE DESCRIPTION

AA6749\_STABILITY: B = PROBABLY HOLD POSITION/ELEVATION WELL



AA6749

| AA6749 | HISTORY | - Date     | Condition  | Report By |
|--------|---------|------------|------------|-----------|
| AA6749 | HISTORY | - 1991     | MONUMENTED | FL-095    |
| AA6749 | HISTORY | - 20100412 | GOOD       | FL-095    |

AA6749

AA6749

## STATION DESCRIPTION

AA6749

AA6749'DESCRIBED BY ORANGE COUNTY FLORIDA 1991 (SPL)

AA6749'SET 2-INCH ORANGE COUNTY CONTROL DISK (BRASS) IN NW CORNER FOOT PAD

AA6749'FOR TOWER NUMBER 43, 1.1 MI (1.8 KM) WEST OF JOHN YOUNG, 4.1 MI (6.6  
AA6749'KM) EAST OF SR 535, 20 FT (6.1 M) SOUTH OF CENTER LINE, 65 FT (19.8 M)

AA6749'NORTH OF WOODS LINE TO THE SOUTH, AND 10 FT (3.0 M) NORTH OF CENTER

AA6749'LINE OF POWER LINE. IN SECTION 30, TOWNSHIP 24 SOUTH, RANGE 29 EAST.

AA6749'SITE SUITABILITY FOR GPS OCCUPATION NOT DETERMINED. (DESCRIPTION

AA6749'SOURCE--THE ORANGE COUNTY ENGINEERING DEPARTMENT.)

AA6749

AA6749

## STATION RECOVERY (2010)

AA6749

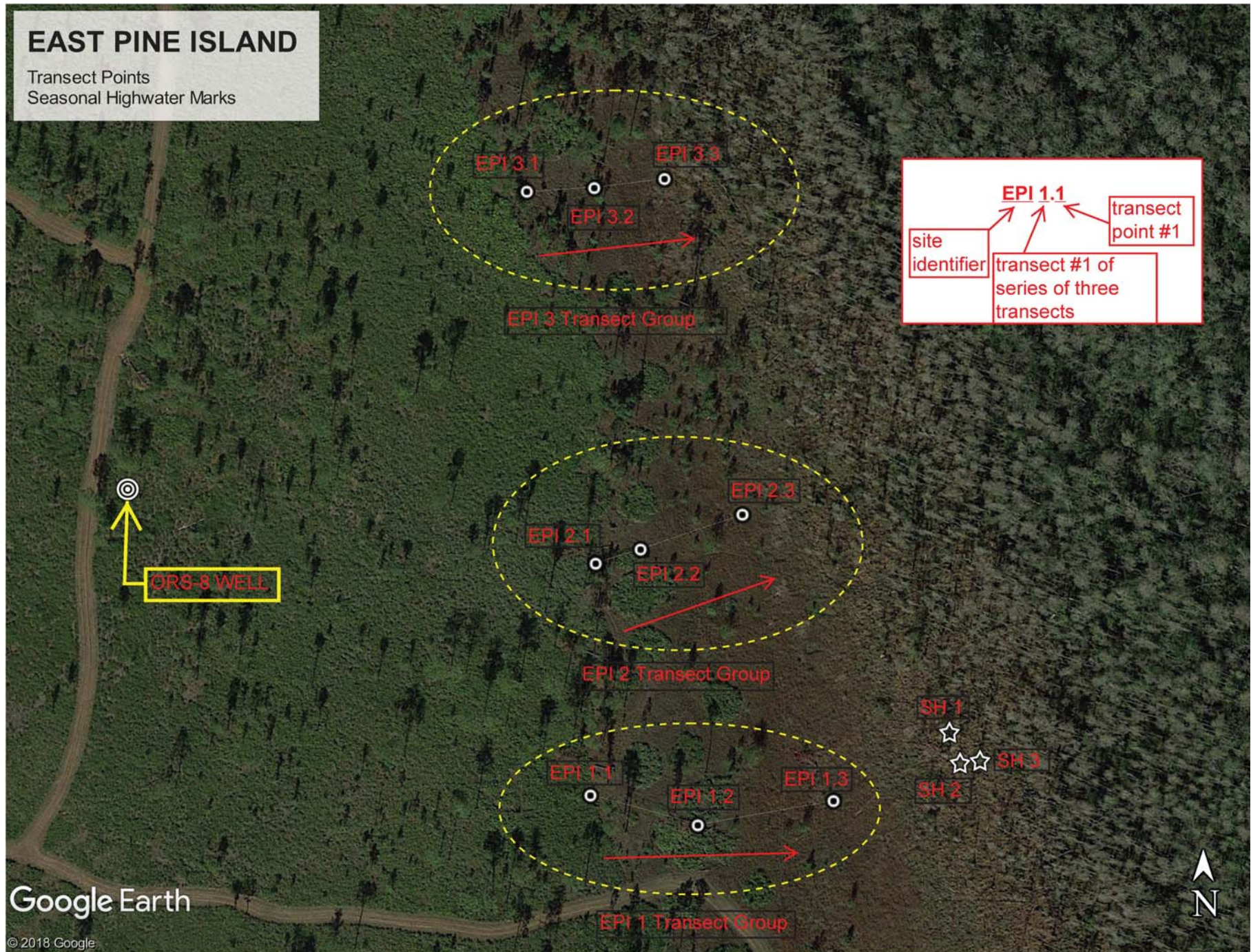
AA6749'RECOVERY NOTE BY ORANGE COUNTY FLORIDA 2010 (DES)

AA6749'RECOVERED IN GOOD CONDITION.

\*\*\* retrieval complete.

Elapsed Time = 00:00:03

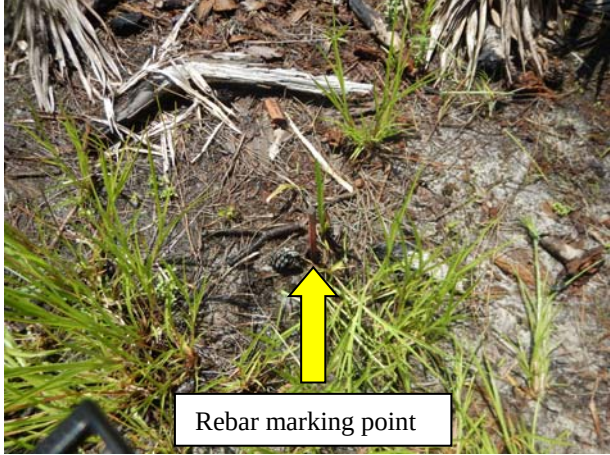
# EAST PINE ISLAND



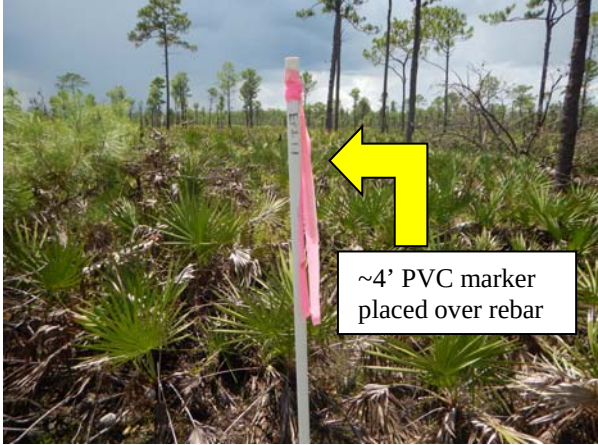


# EAST PINE ISLAND

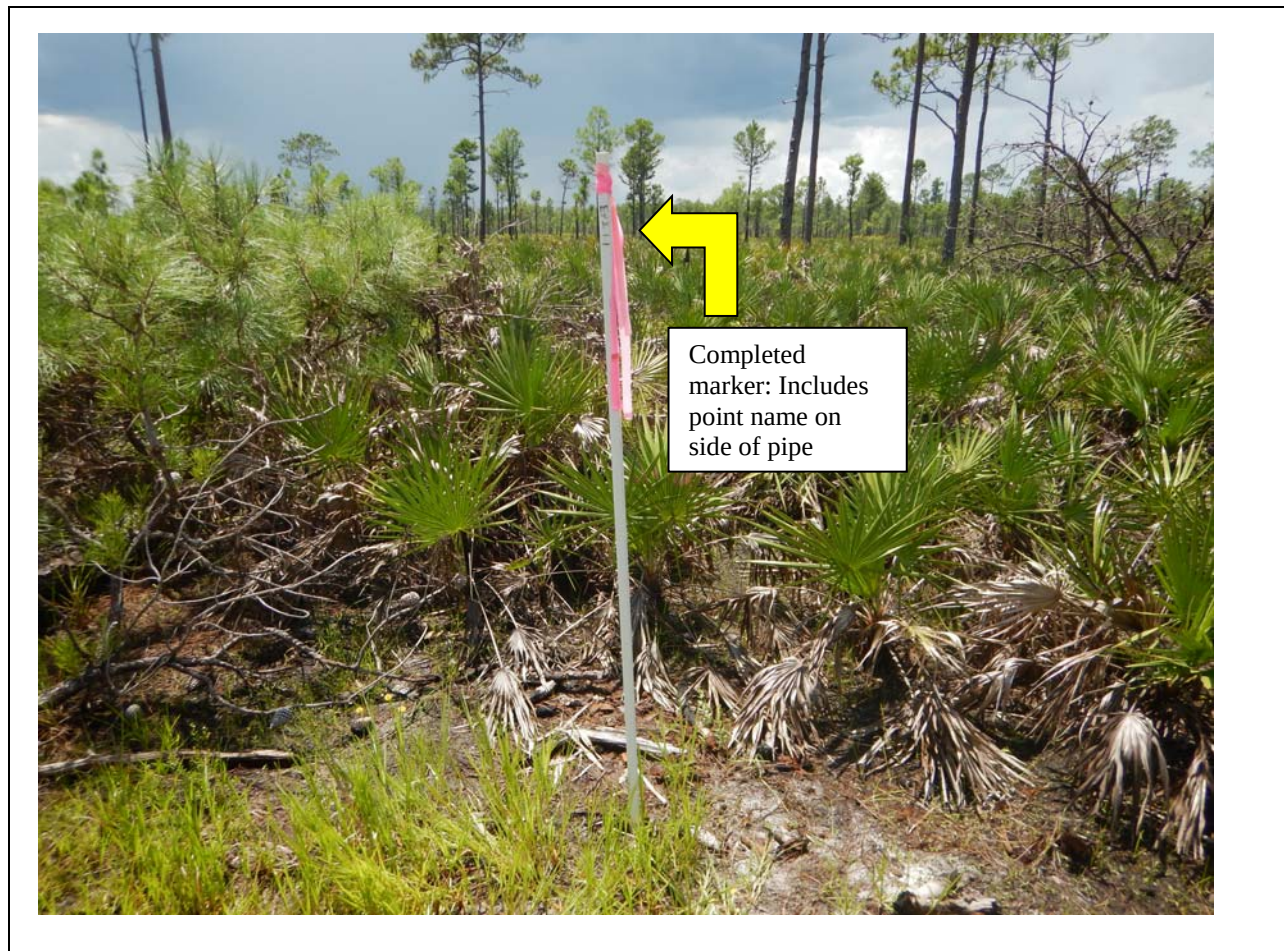
| Soil Transects - EPI 1 Transect Group |                                   |                                              |
|---------------------------------------|-----------------------------------|----------------------------------------------|
| <b>EPI 1.1</b>                        | <b>Wetland Boundary</b>           |                                              |
| LATITUDE: 28° 22' 41.25326" (N)       | LONGITUDE: 081° 26' 44.66028" (W) |                                              |
| NORTHING: 1470443.75                  | EASTING: 512835.61                |                                              |
| ELEVATION: 76.34 ft. (NAVD 88)        | 23.268 m                          | RTK GPS                                      |
| ELEVATION: 77.25 ft. (NGVD 29)        | 23.546 m                          | 0.909 ft. (conversion factor) Corpscon 6.0.1 |



Rebar marking point



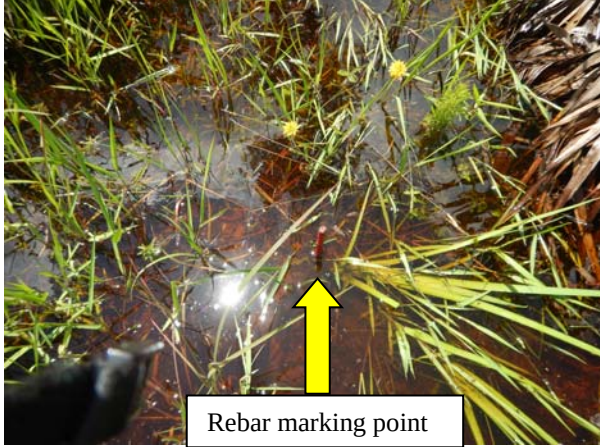
~4' PVC marker placed over rebar



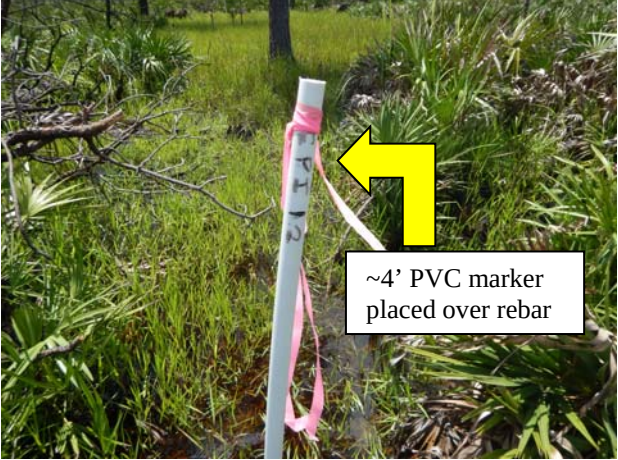


# EAST PINE ISLAND

| Soil Transects - EPI 1 Transect Group |                                   |                                              |
|---------------------------------------|-----------------------------------|----------------------------------------------|
| <b>EPI 1.2</b>                        | <b>Hydric at Surface</b>          |                                              |
| LATITUDE: 28° 22' 40.95486" (N)       | LONGITUDE: 081° 26' 43.44719" (W) |                                              |
| NORTHING: 1470413.21                  | EASTING: 512943.86                |                                              |
| ELEVATION: 75.71 ft. (NAVD 88)        | 23.076 m                          | RTK GPS                                      |
| ELEVATION: 76.62 ft. (NGVD 29)        | 23.354 m                          | 0.909 ft. (conversion factor) Corpscon 6.0.1 |



Rebar marking point



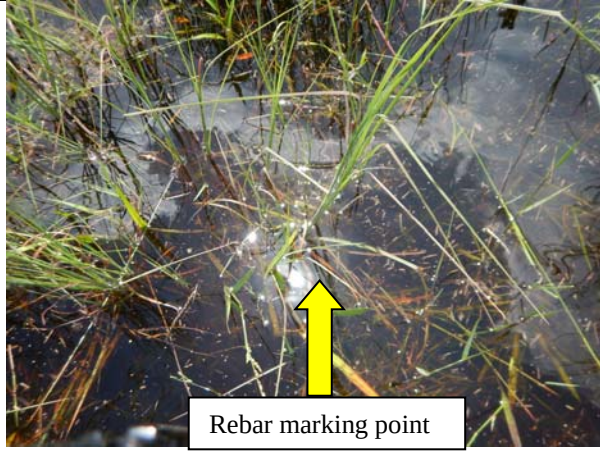
~4' PVC marker placed over rebar





# EAST PINE ISLAND

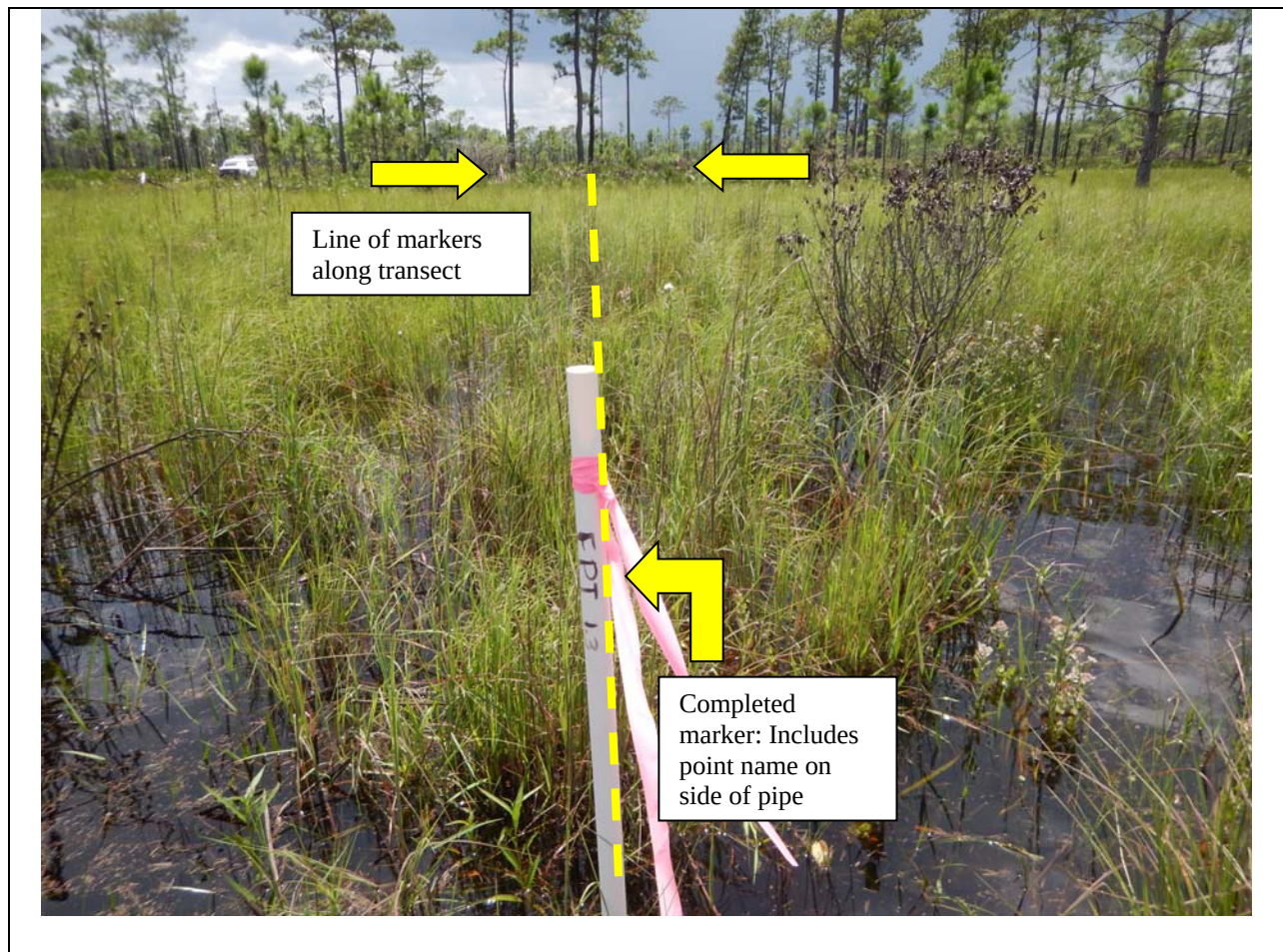
| Soil Transects - EPI 1 Transect Group |                                   |                                              |
|---------------------------------------|-----------------------------------|----------------------------------------------|
| <b>EPI 1.3</b>                        | <b>Muck at Surface</b>            |                                              |
| LATITUDE: 28° 22' 41.18583" (N)       | LONGITUDE: 081° 26' 41.93007" (W) |                                              |
| NORTHING: 1470436.04                  | EASTING: 513079.46                |                                              |
| ELEVATION: 74.89 ft. (NAVD 88)        | 22.827 m                          | RTK GPS                                      |
| ELEVATION: 75.80 ft. (NGVD 29)        | 23.104 m                          | 0.909 ft. (conversion factor) Corpscon 6.0.1 |



Rebar marking point

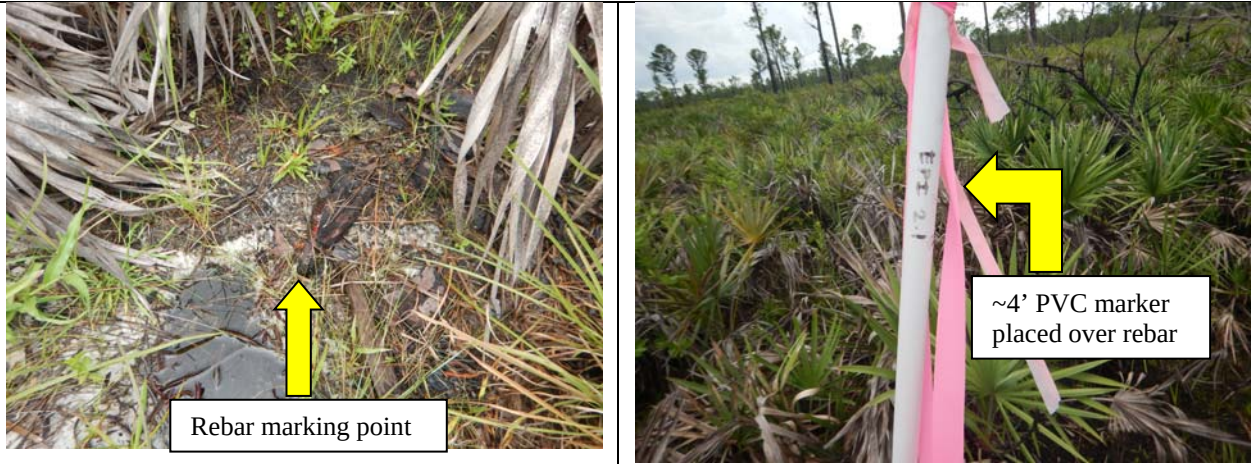


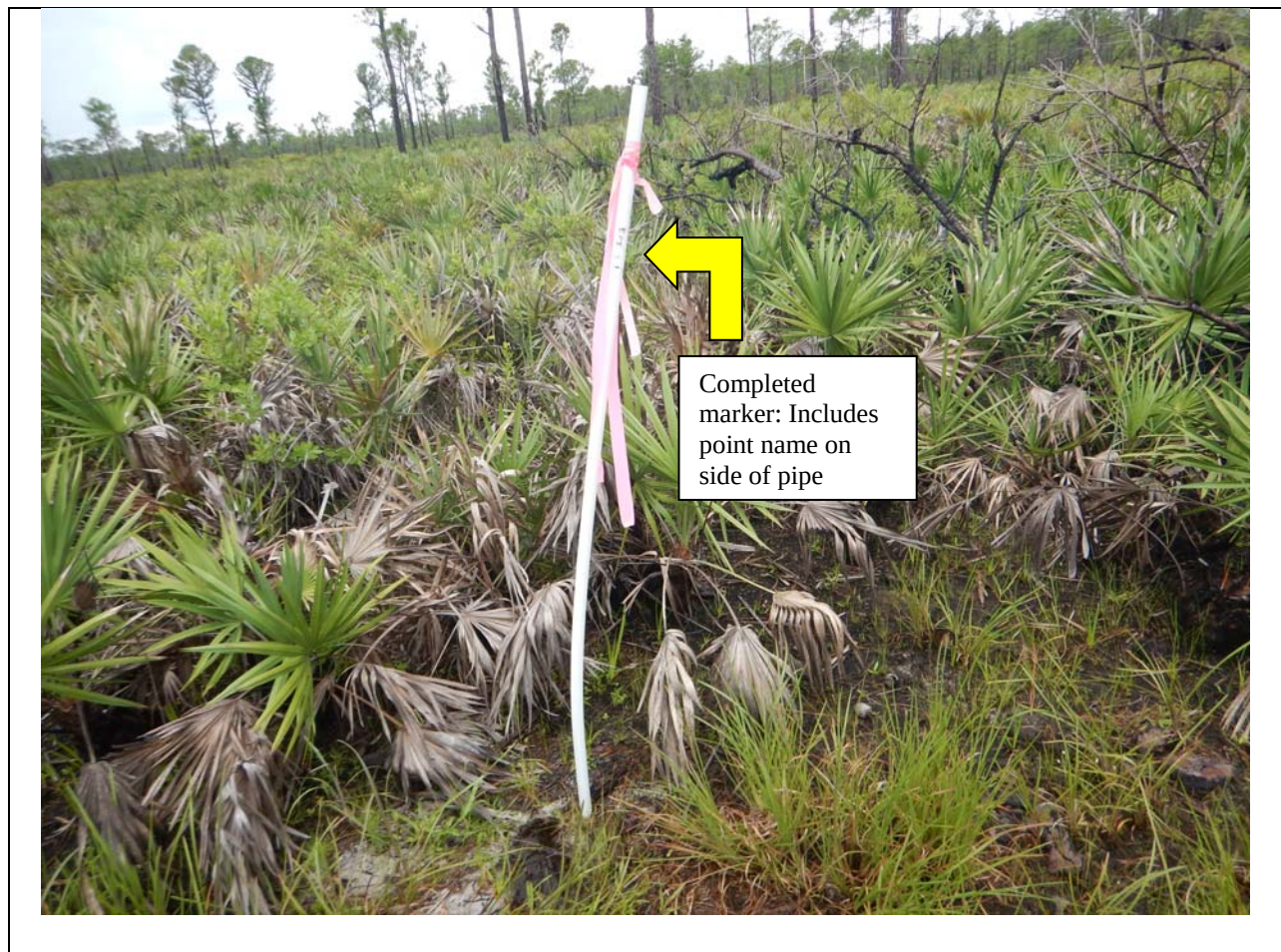
~4' PVC marker placed over rebar





## EAST PINE ISLAND

| Soil Transects - EPI 2 Transect Group                                              |                                   |                                              |
|------------------------------------------------------------------------------------|-----------------------------------|----------------------------------------------|
| EPI 2.1                                                                            | Wetland Boundary                  |                                              |
| LATITUDE: 28° 22' 43.55140" (N)                                                    | LONGITUDE: 081° 26' 44.58675" (W) |                                              |
| NORTHING: 1470675.83                                                               | EASTING: 512843.04                |                                              |
| ELEVATION: 76.19 ft. (NAVD 88)                                                     | 23.222 m                          | RTK GPS                                      |
| ELEVATION: 77.10 ft. (NGVD 29)                                                     | 23.500 m                          | 0.909 ft. (conversion factor) Corpscon 6.0.1 |
|                                                                                    |                                   |                                              |
|  |                                   |                                              |





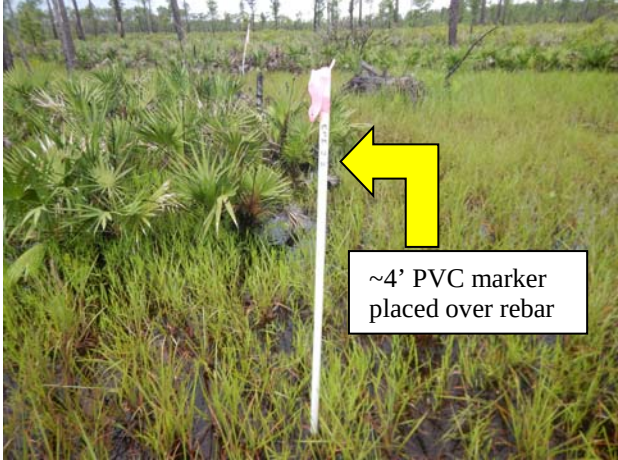
# EAST PINE ISLAND

| Soil Transects - EPI 2 Transect Group |                                   |                                              |
|---------------------------------------|-----------------------------------|----------------------------------------------|
| <b>EPI 2.2</b>                        | <b>Hydric at Surface</b>          |                                              |
| LATITUDE: 28° 22' 43.68262" (N)       | LONGITUDE: 081° 26' 44.10746" (W) |                                              |
| NORTHING: 1470688.92                  | EASTING: 512885.90                |                                              |
| ELEVATION: 75.70 ft. (NAVD 88)        | 23.073 m                          | RTK GPS                                      |
| ELEVATION: 76.61 ft. (NGVD 29)        | 23.350 m                          | 0.909 ft. (conversion factor) Corpscon 6.0.1 |

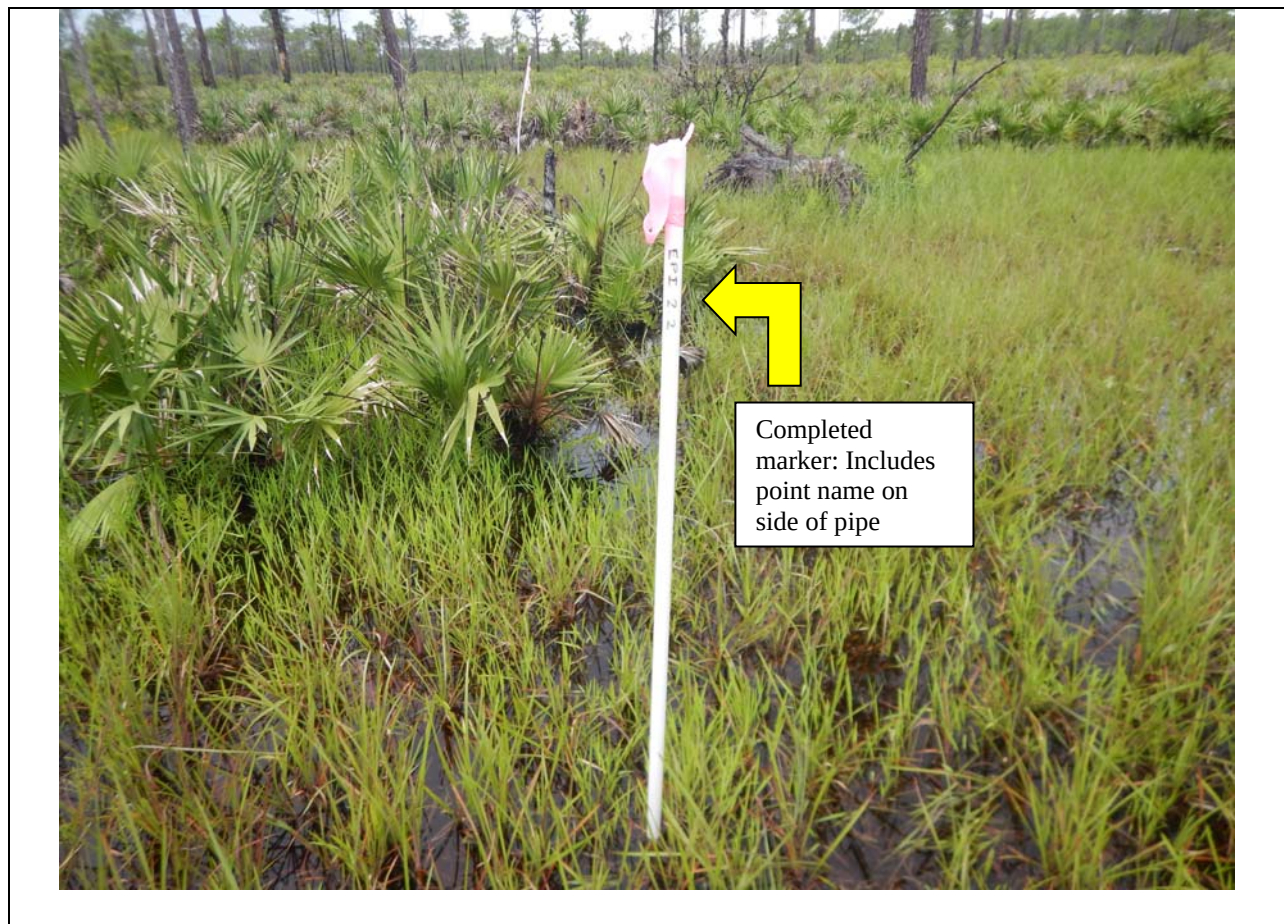
  



Rebar marking point



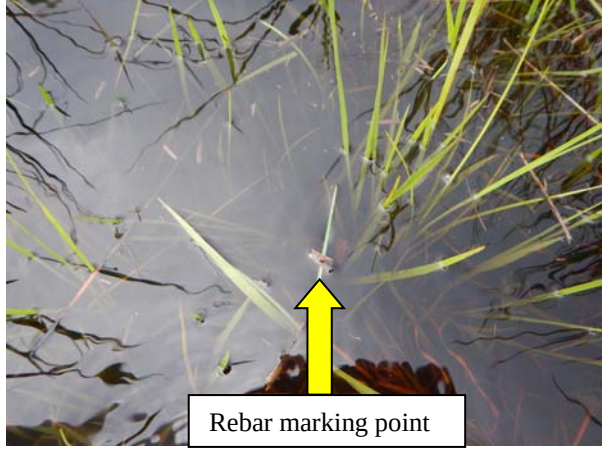
~4' PVC marker placed over rebar



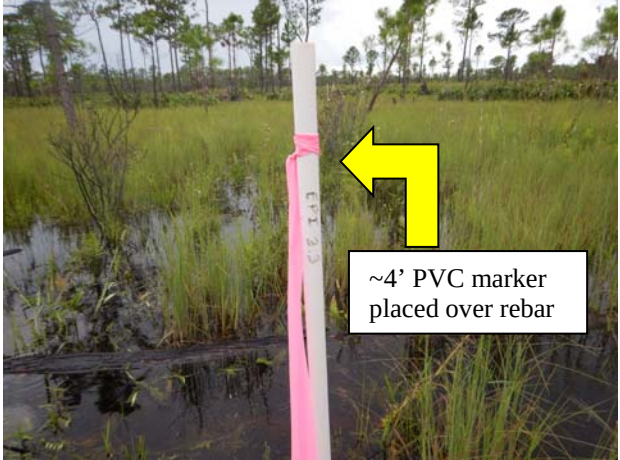


# EAST PINE ISLAND

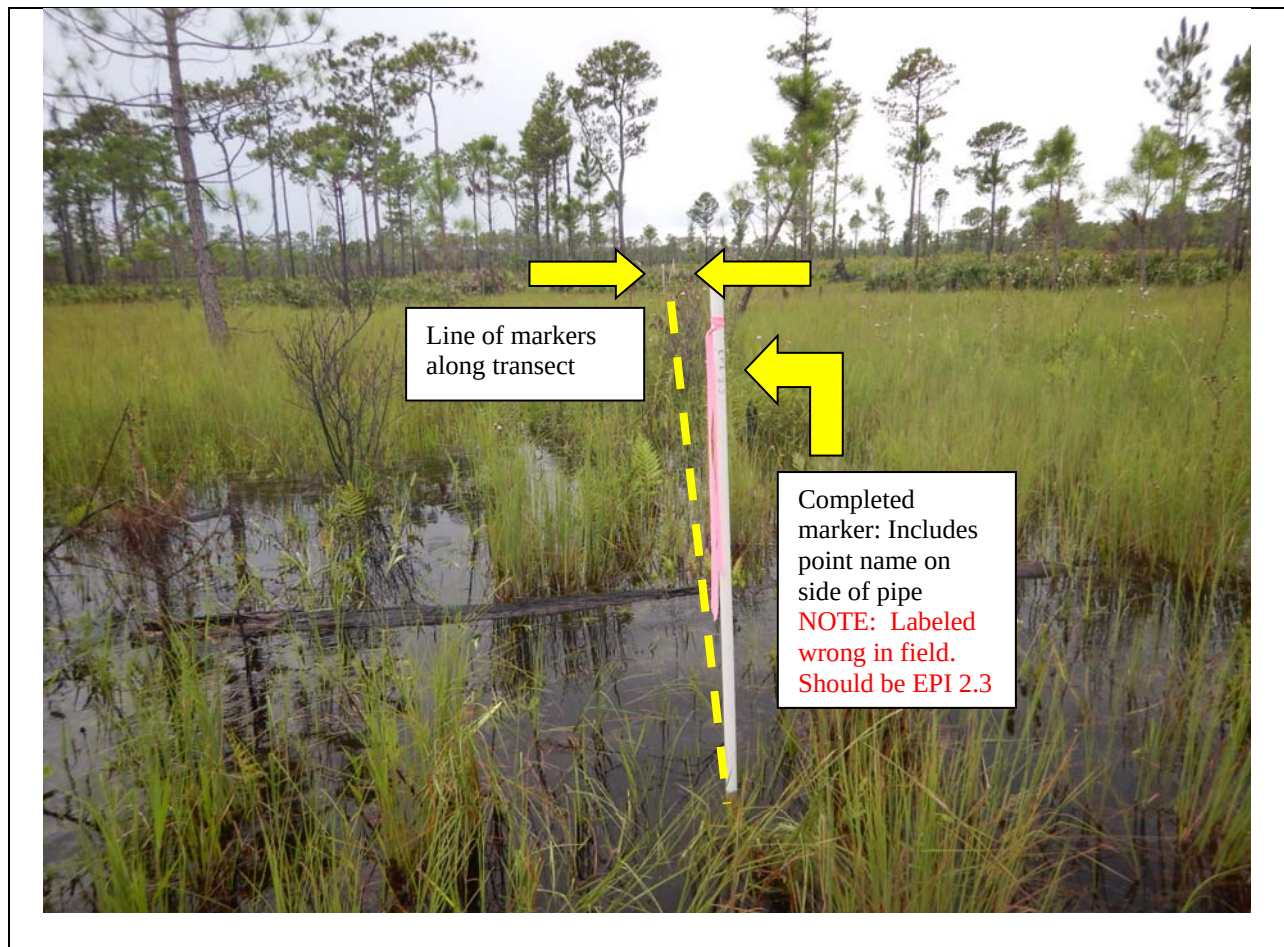
| Soil Transects - EPI 2 Transect Group |                                   |                                              |
|---------------------------------------|-----------------------------------|----------------------------------------------|
| <b>EPI 2.3</b>                        | <b>Muck at Surface</b>            |                                              |
| LATITUDE: 28° 22' 44.02698" (N)       | LONGITUDE: 081° 26' 42.95106" (W) |                                              |
| NORTHING: 1470723.32                  | EASTING: 512989.32                |                                              |
| ELEVATION: 74.98 ft. (NAVD 88)        | 22.854 m                          | RTK GPS                                      |
| ELEVATION: 75.89 ft. (NGVD 29)        | 23.131 m                          | 0.909 ft. (conversion factor) Corpscon 6.0.1 |



Rebar marking point



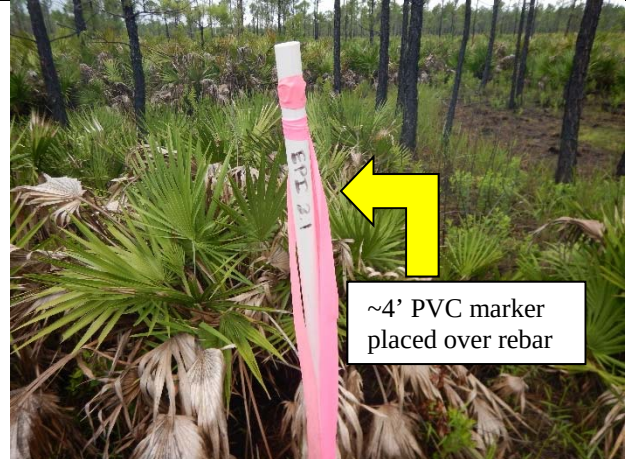
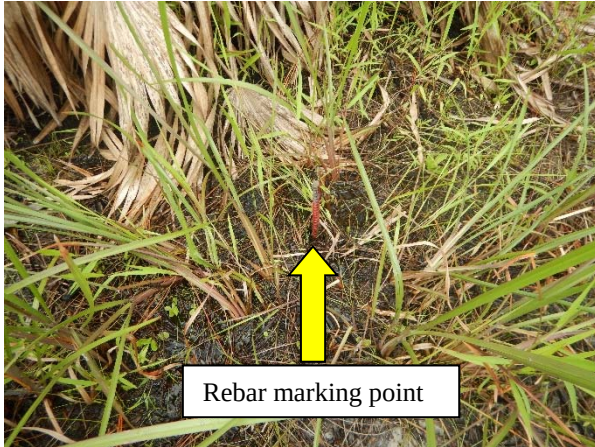
~4' PVC marker placed over rebar





# EAST PINE ISLAND

| Soil Transects - EPI 3 Transect Group |                                   |                                              |
|---------------------------------------|-----------------------------------|----------------------------------------------|
| <b>EPI 3.1</b>                        | <b>Wetland Boundary</b>           |                                              |
| LATITUDE: 28° 22' 47.22228" (N)       | LONGITUDE: 081° 26' 45.34790" (W) |                                              |
| NORTHING: 1471046.83                  | EASTING: 512776.42                |                                              |
| ELEVATION: 76.06 ft. (NAVD 88)        | 23.183 m                          | RTK GPS                                      |
| ELEVATION: 76.97 ft. (NGVD 29)        | 23.460 m                          | 0.909 ft. (conversion factor) Corpscon 6.0.1 |





# EAST PINE ISLAND

| Soil Transects - EPI 3 Transect Group |                                   |                                              |
|---------------------------------------|-----------------------------------|----------------------------------------------|
| <b>EPI 3.2</b>                        | <b>Hydric at Surface</b>          |                                              |
| LATITUDE: 28° 22' 47.26972" (N)       | LONGITUDE: 081° 26' 44.56540" (W) |                                              |
| NORTHING: 1471051.36                  | EASTING: 512846.33                |                                              |
| ELEVATION: 75.20 ft. (NAVD 88)        | 22.921 m                          | RTK GPS                                      |
| ELEVATION: 76.11 ft. (NGVD 29)        | 23.198 m                          | 0.909 ft. (conversion factor) Corpscon 6.0.1 |



Rebar marking point



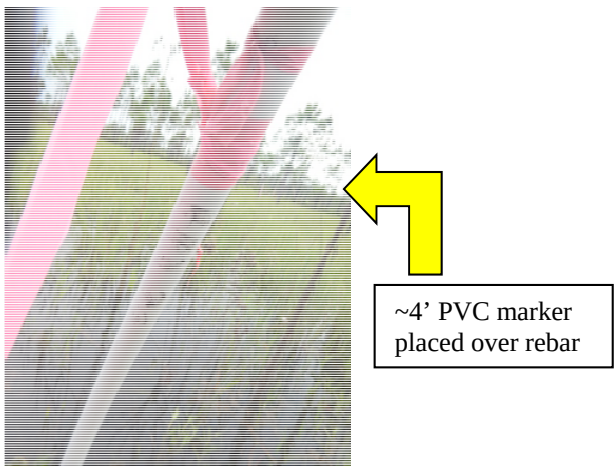
~4' PVC marker placed over rebar

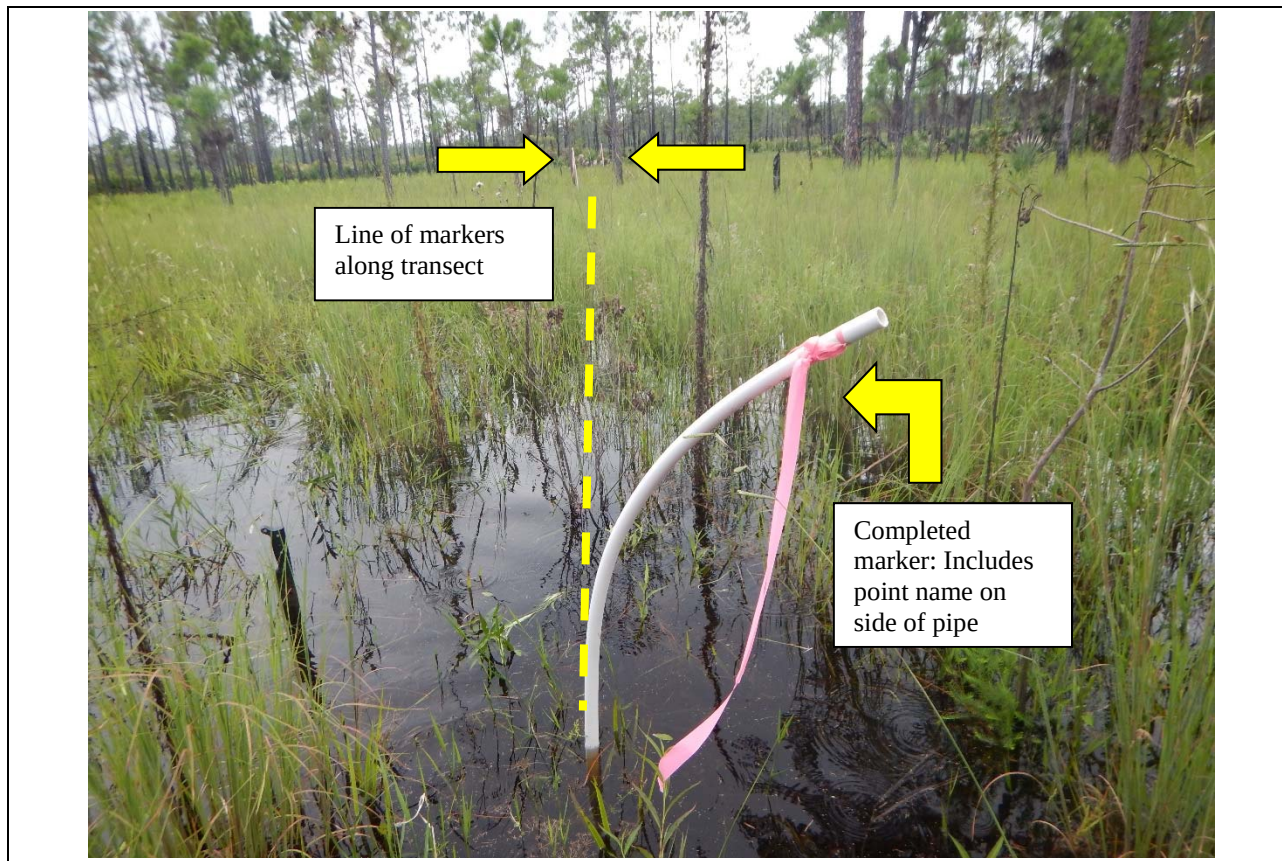




# EAST PINE ISLAND

| Soil Transects - EPI 3 Transect Group |                                   |                                              |
|---------------------------------------|-----------------------------------|----------------------------------------------|
| <b>EPI 3.3</b>                        | <b>Muck at Surface</b>            |                                              |
| LATITUDE: 28° 22' 47.35449" (N)       | LONGITUDE: 081° 26' 43.81931" (W) |                                              |
| NORTHING: 1471059.67                  | EASTING: 512913.01                |                                              |
| ELEVATION: 74.87 ft. (NAVD 88)        | 22.820 m                          | RTK GPS                                      |
| ELEVATION: 75.78 ft. (NGVD 29)        | 23.097 m                          | 0.909 ft. (conversion factor) Corpscon 6.0.1 |





# EAST PINE ISLAND

| Seasonal High-Water Marks       |                                   |                                              |
|---------------------------------|-----------------------------------|----------------------------------------------|
| EPI SH 1                        | Seasonal HW Elevation             |                                              |
| LATITUDE: 28° 22' 41.86485" (N) | LONGITUDE: 081° 26' 40.62022" (W) |                                              |
| NORTHING: 1470504.19            | EASTING: 513196.71                |                                              |
| ELEVATION: 75.41 ft. (NAVD 88)  | 22.985 m                          | RTK GPS                                      |
| ELEVATION: 76.32 ft. (NGVD 29)  | 23.262 m                          | 0.909 ft. (conversion factor) Corpscon 6.0.1 |





## EAST PINE ISLAND

| Seasonal High-Water Marks       |                                   |                                              |
|---------------------------------|-----------------------------------|----------------------------------------------|
| EPI SH 2                        | Seasonal HW Elevation             |                                              |
| LATITUDE: 28° 22' 41.56215" (N) | LONGITUDE: 081° 26' 40.50127" (W) |                                              |
| NORTHING: 1470473.58            | EASTING: 513207.22                |                                              |
| ELEVATION: 75.44 ft. (NAVD 88)  | 22.994 m                          | RTK GPS                                      |
| ELEVATION: 76.35 ft. (NGVD 29)  | 23.271 m                          | 0.909 ft. (conversion factor) Corpscon 6.0.1 |





## EAST PINE ISLAND

| Seasonal High-Water Marks       |                                   |                                              |
|---------------------------------|-----------------------------------|----------------------------------------------|
| EPI SH 3                        | Seasonal HW Elevation             |                                              |
| LATITUDE: 28° 22' 41.58582" (N) | LONGITUDE: 081° 26' 40.28032" (W) |                                              |
| NORTHING: 1470475.89            | EASTING: 513226.97                |                                              |
| ELEVATION: 75.40 ft. (NAVD 88)  | 22.982 m                          | RTK GPS                                      |
| ELEVATION: 76.31 ft. (NGVD 29)  | 23.259 m                          | 0.909 ft. (conversion factor) Corpscon 6.0.1 |







# SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Rev. 1/16

|                                           |                                           |                                     |                                      |                                           |
|-------------------------------------------|-------------------------------------------|-------------------------------------|--------------------------------------|-------------------------------------------|
| SCADA RTU Station Name:<br><b>CAMPLOW</b> | DB Hydro Station Name:<br><b>OSS-1 GW</b> | DB Hydro Site Name:<br><b>OSS-1</b> | Agency:<br><b>S.F.W.M.D</b>          | Dates of Field Work:<br><b>04/22/2020</b> |
| Party Chief: <b>STRICKLAND</b>            | Field Book: <b>SCADA FB#13</b>            | Page(s): <b>58-59</b>               | Report Prepared by: <b>A.Schauer</b> |                                           |
| Surveyors Notes:                          |                                           | Surveyor's Certification:           |                                      |                                           |

## SITE SPECIFIC DATA

|                                                                         |                                                                                                                                           |                                                                      |                                                                           |
|-------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|---------------------------------------------------------------------------|
| Reference Elevation(s) (NAVD88):<br><b>OSS-1 (CAMPLOW) = 81.05 feet</b> | Site Benchmark(s)/Elevation(s) (NAVD88):<br><b>BM OSS-1 2020 = 77.49 feet</b><br><b>OSS 1A = 76.60 feet</b><br><b>OSS 1B = 76.10 feet</b> | Source Benchmark(s) /Elev(s) (NAVD88):<br><b>OSS 1B = 76.10 feet</b> |                                                                           |
| Calibration Port Elev(s) (NAVD88):<br><b>N/A</b>                        | Ground Elevation (NAVD88):<br><b>76.8 feet</b>                                                                                            | Pad Elevation (NAVD88):<br><b>77.46 feet</b>                         | Corpscon 6.0.1 Conversion Factor (NAVD88 to NGVD29):<br><b>+1.11 feet</b> |

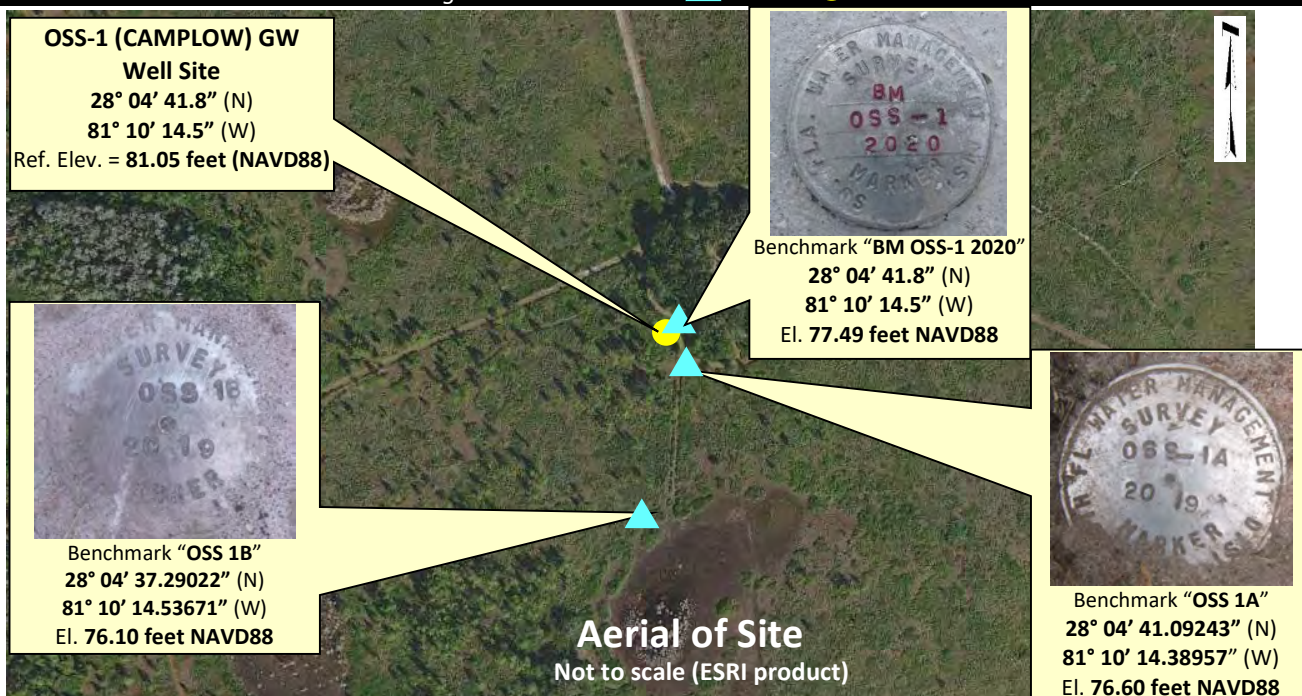
## GEOGRAPHIC DATA

| SECTION 1 AND DATA                                                                         |                                          |                                            |                             |                            |  |
|--------------------------------------------------------------------------------------------|------------------------------------------|--------------------------------------------|-----------------------------|----------------------------|--|
| Section <b>1</b>                                                                           |                                          | Township <b>28 South</b>                   |                             | Range <b>31 East</b>       |  |
| <u>  <b>X</b>  </u> Well(s) <u>      </u> Gate(s)                                          | Latitude:<br><b>GW WELL: 28°04'41.8"</b> | Longitude:<br><b>GW WELL: -81°10'14.6"</b> | Northing (Y):<br><b>N/A</b> | Easting (X):<br><b>N/A</b> |  |
| <u>  <b>X</b>  </u> Benchmark                                                              |                                          |                                            |                             |                            |  |
| Position (horizontal) Source:<br><b>ESRI Pick Point &amp; Garmin<br/>Handheld GPSMAP78</b> |                                          |                                            |                             |                            |  |

Notes: **NAVD88** – North American Vertical Datum of 1988; **NGVD29**- National Geodetic Vertical Datum of 1929; **Corpscon 6.0.1** - A U.S. Army Corps of Engineers Engineering Research and Development Center Topographic Engineering Center Alexandria, Virginia Windows-based program to convert coordinates and elevations between datum's using vertcon05.txt and vertcon05.05 files supplied by the U.S. Army Corps of Engineers South Atlantic Division, Jacksonville FL.

## PICTURES

Legend: SFWMD Disk = Well =







# SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Rev. 1/16

## OSS-1 CAMFLOW Well



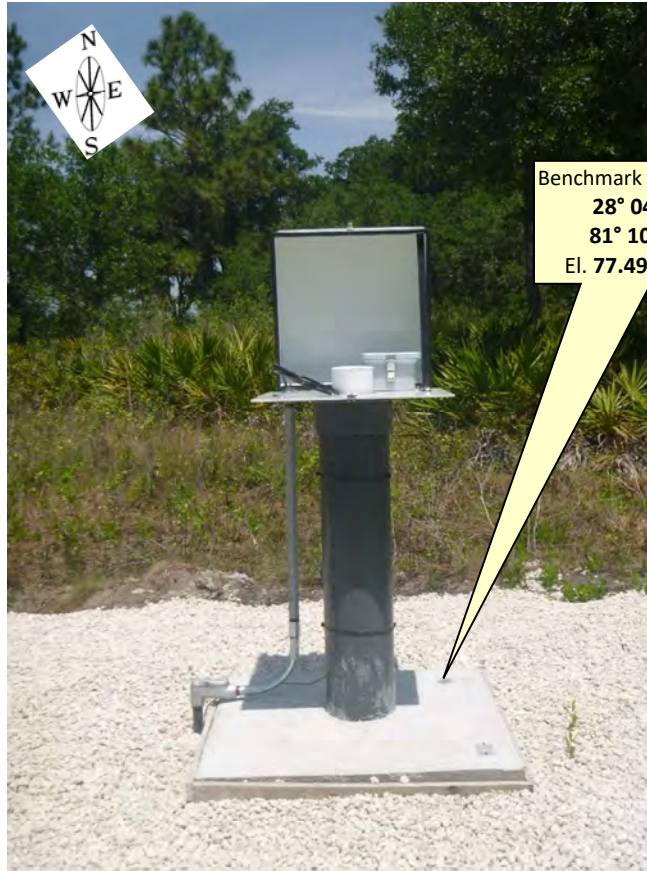




## SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Rev. 1/16

OSS-1 CAMPLOW SITE BENCHMARK "BM OSS-1 2020" El. = 77.49 feet (NAVD88)



Benchmark "BM OSS-1 2020"  
28° 04' 41.8" (N)  
81° 10' 14.5" (W)  
El. 77.49 feet NAVD88



Benchmark "BM OSS-1 2020"  
28° 04' 41.8" (N)  
81° 10' 14.5" (W)  
El. 77.49 feet NAVD88



## SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Rev. 1/16

OSS-1 CAMFLOW SITE BENC HMARK "OSS 1A" El. = 76.60 feet (NAVD88)



Benchmark "OSS 1A"  
28° 04' 41.09243" (N)  
81° 10' 14.38957" (W)  
El. 76.60 feet NAVD88



Benchmark "OSS 1A"  
28° 04' 41.09243" (N)  
81° 10' 14.38957" (W)  
El. 76.60 feet NAVD88

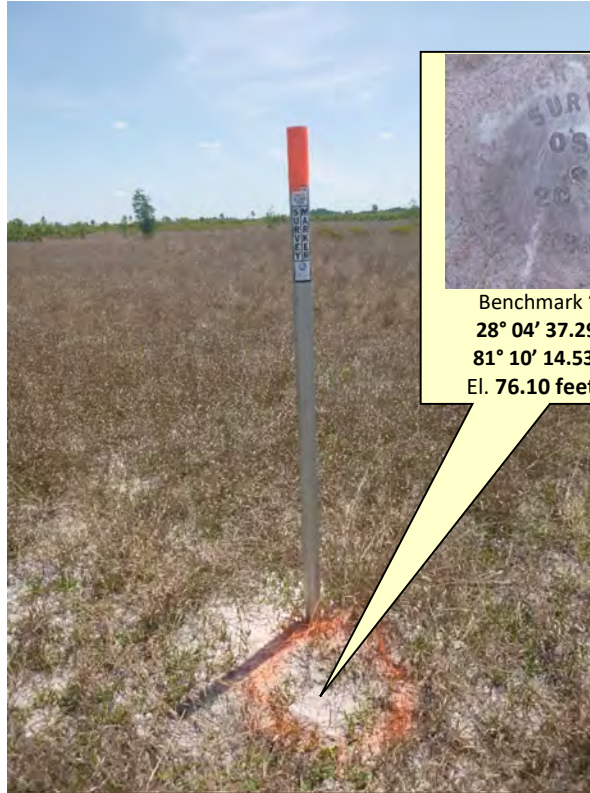




## SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Rev. 1/16

### OSS-1 CAMPLOW SITE BENCHMARK "OSS 1B" El. = 76.10 feet (NAVD88)



Benchmark "OSS 1B"  
28° 04' 37.29022" (N)  
81° 10' 14.53671" (W)  
El. 76.10 feet NAVD88



Benchmark "OSS 1B"  
28° 04' 37.29022" (N)  
81° 10' 14.53671" (W)  
El. 76.10 feet NAVD88



# South Florida Water Management District Benchmark Datasheet

Designation: **BM OSS-1 2020**  
Stamping: **BM OSS-1 2020**  
Established By: **SFWMD**  
Surveyor: **STRICKLAND**

Project Name: **CFWI WELL CAMPLOW**  
Field Book Name: **SCADA13**  
Recovered By: **STRICKLAND**  
Established Date: **04/22/20**

Type: **V**  
Field Book Page: **58**  
Recovery Date:   
Status: **New**

State Plane Zone: **FL East**

## GEOGRAPHIC POSITION INFORMATION

|                                       |                                  |                                  |
|---------------------------------------|----------------------------------|----------------------------------|
| Section: <b>1</b>                     | Township: <b>28 SOUTH</b>        | Range: <b>31 EAST</b>            |
| County: <b>OSCEOLA</b>                | Quadrangle: <b></b>              | Quad Index: <b></b>              |
| NAD83 Adj. Year: <b></b>              | Vertical Datum: <b>NAVD1988</b>  | Horizontal Datum: <b>NAD1983</b> |
| NAVD88 Elevation (feet): <b>77.49</b> | NGVD29 Elevation (feet): <b></b> | 2022 Elevation: <b></b>          |
| NAVD88 Class: <b></b>                 | NGVD29 Class: <b></b>            | Other Elevation: <b></b>         |
| NAVD88 Order: <b></b>                 | NGVD29 Order: <b></b>            | Other Elevation Type: <b></b>    |

CORPSCON 6.0.1 CONVERSION FACTOR (NAVD88 TO NGVD29): (A U.S. Army Corps of Engineers Engineering Research and Development Center Topographic Engineering Center Alexandria, Virginia Windows-based program to convert coordinates and elevations between datum's using vertcon05.txt and vertcon05.05 files supplied by the U.S. Army Corps of Engineers South Atlantic Division, Jacksonville FL)

|                                                |                                                  |                                         |
|------------------------------------------------|--------------------------------------------------|-----------------------------------------|
| Vertical Datum Offset: + <b>1.11</b>           | Actual NGS Elevation or ngvd29.txt file: <b></b> | OPUS Ortho Height: <b></b>              |
| Northing (Y) (feet): <b></b>                   | Easting (X) (feet): <b></b>                      | Source of Latitude & Longitude: <b></b> |
| Latitude: <b>28</b>                            | Longitude: <b>81</b>                             | <b>10</b>                               |
| DD°                                            | MM'                                              | SS"                                     |
| Latitude (Decimal Degrees): <b>28.07827778</b> | Longitude (Decimal Degrees): <b>-81.17069444</b> |                                         |

## RECOVERY DATA

How to Reach: From St. Cloud, travel south on Canoe Creek Road approximately 16 miles to an unpaved road drive running east from Canoe Creek Road and under the Florida Turnpike. Go easterly along dirt road 2 entrance to Camp Lonesome Conservation Area. Enter and go northerly .4 miles to locked access gate. Go through gate and go west and follow marked trail road approximately 3.5 miles to area known as Piss-Pot Hammock, turn southerly and go along a trail road approximately 380 feet to mark on the right. Mark is a standard SFWMD aluminum disk set in northeast corner of 3x3 concrete well pad for OSS-1 (CAMPLOW). SFWMD key is required for gate into property. Gate Code: #8659

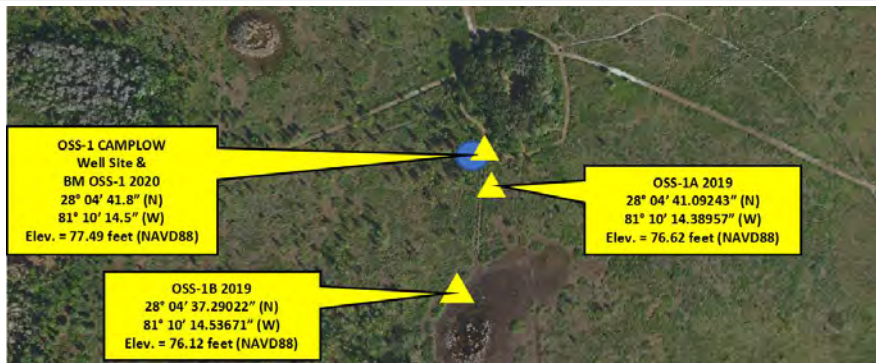
Description/Notes:

Notable Landmarks: **Well Site OSS-1 (CAMPLOW)**

Other Source Benchmarks: **SFWMD Alum. Disks: OSS 1A 2019 Elev. = 76.62 feet (88) and OSS 1B 2019 Elev. = 76.12 feet (88)**

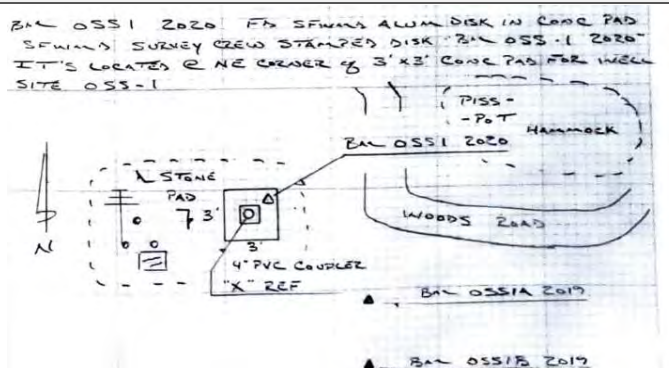
## PICTURES

Aerial View of Overall Site



## PICTURES

Site Sketch







# SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Rev. 1/16

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                      |                                         |                                                        |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|-----------------------------------------|--------------------------------------------------------|
| DESIGNATION: <b>OSS-1A</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                      | PROJECT: <b>CFWI CAMP LONESOME WEST</b> |                                                        |
| ESTABLISHED BY: <b>PICKETT AND ASSOCIATES, INC</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                      | SURVEYOR: <b>John M. Clyatt</b>         |                                                        |
| RECOVERED BY:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                      | DATE: <b>May 16, 2019</b>               |                                                        |
| <b>GEOGRAPHIC POSITION</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                      |                                         |                                                        |
| SECTION 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | TOWNSHIP <b>28</b> SOUTH                                                             | RANGE <b>31</b> EAST                    |                                                        |
| COUNTY: <b>OSCEOLA</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | NAME OF QUADRANGLE: <b>HOLOPAW SW</b><br>GEOGRAPHIC INDEX OF QUAD: <b>3310</b>       |                                         |                                                        |
| HORIZONTAL DATUM: 1927 <u>(1983)</u> 2022 Other _____ (circle one) ZONE <b>(E)</b> or W                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                      |                                         |                                                        |
| VERTICAL DATUM: MSL 1929 <u>(1988)</u> 2022 Other _____ (circle one)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                      |                                         |                                                        |
| VERTICAL ACCURACY: 1 2 <u>(3)</u>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                      |                                         |                                                        |
| STATE PLANE COORDINATE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | (N) Y= <b>1,361,129.833</b>                                                          | (E) X= <b>601,134.890</b>               | NAVD 88 EL. <b>76.60'</b><br>NGVD 29 EL. <b>77.72'</b> |
| CORPSCON 6.0.1 CONVERSION FACTOR (NAVD88 TO NGVD29): <b>+ 1.115'</b><br>(A U.S. Army Corps of Engineers Engineering Research and Development Center Topographic Engineering Center Alexandria, Virginia Windows-based program to convert coordinates and elevations between datum's using vertcon05.txt and vertcon05.05 files supplied by the U.S. Army Corps of Engineers South Atlantic Division, Jacksonville FL.)<br>ACTUAL NGS or (ngvd29.txt file) OPUS Ortho Height = 23.355 meters                                                                                                                                                                                                                                 |                                                                                      |                                         |                                                        |
| LATITUDE: <b>28° 04' 41.09243" (N)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                      | LONGITUDE: <b>81° 10' 14.38957" (W)</b> | (NAD_83 (2011) EPOCH:2010.0000)                        |
| <b>RECOVERY DATA</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                      |                                         |                                                        |
| Stamping: <b>OSS-1A 2019</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                      |                                         |                                                        |
| <b>To Reach:</b> From St. Cloud, travel south on Canoe Creek Road approximately 16 miles to an unpaved road drive running east from Canoe Creek Road and under the Florida Turnpike. Go easterly along dirt road 2 entrance to Camp Lonesome Conservation Area. Enter and go northerly .4 miles to locked access gate. Go through gate and go west and follow marked trail road approximately 3.5 miles to area known as Piss-Pot Hammock, turn southerly and go along a trail road 400 feet to mark on the left. Mark is a standard SFWMD aluminum disk set in a 1-1/4" pipe with a concrete collar 3" below ground surface, 1' west of metal post with survey marker decal. SFWMD key is required for gate into property. |                                                                                      |                                         |                                                        |
| NOTABLE LAND MARKS: Camp Lonesome Conservation Area ; Piss Pot Hammock                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                      |                                         |                                                        |
| NGS-SOURCE BENCHMARK: N/A - Determined by OPUS Solution                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                      |                                         |                                                        |
| FIELD BOOK <b>972 PAGE 37</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                      |                                         |                                                        |
| <b>PICTURES</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                      |                                         |                                                        |
| Aerial Overall Site<br>From: Google Earth<br>Imagery Date:2/11/17                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  |                                         |                                                        |



## SOUTH FLORIDA WATER MANAGEMENT DISTRICT

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Top View





# SOUTH FLORIDA WATER MANAGEMENT DISTRICT

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|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                  |                                         |                                                        |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|--------------------------------------------------------|
| DESIGNATION: <b>OSS-1B</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                  | PROJECT: <b>CFWI CAMP LONESOME WEST</b> |                                                        |
| ESTABLISHED BY: <b>PICKETT AND ASSOCIATES, INC</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                  | SURVEYOR: <b>John M. Clyatt</b>         |                                                        |
| RECOVERED BY:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                  | DATE: <b>May 16, 2019</b>               |                                                        |
| GEOGRAPHIC POSITION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                  |                                         |                                                        |
| SECTION 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | TOWNSHIP <b>28</b> SOUTH                                                                                                                                                         | RANGE <b>31</b> EAST                    |                                                        |
| COUNTY: <b>OSCEOLA</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | NAME OF QUADRANGLE: <b>HOLOPAW SW</b><br>GEOGRAPHIC INDEX OF QUAD: <b>3310</b>                                                                                                   |                                         |                                                        |
| HORIZONTAL DATUM: 1927 <b>(1983)</b> 2022 Other <u>      </u> (circle one) ZONE <b>(E)</b> or W                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                  |                                         |                                                        |
| VERTICAL DATUM: MSL 1929 <b>(1988)</b> 2022 Other <u>      </u> (circle one)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                  |                                         |                                                        |
| VERTICAL ACCURACY: 1 2 <b>(3)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                  |                                         |                                                        |
| STATE PLANE COORDINATE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | (N) Y= <b>1,360,745.887</b>                                                                                                                                                      | (E) X= <b>601,107.762</b>               | NAVD 88 EL. <b>76.10'</b><br>NGVD 29 EL. <b>77.21'</b> |
| CORPSCON 6.0.1 CONVERSION FACTOR (NAVD88 TO NGVD29): <b>+ 1.115'</b><br>(A U.S. Army Corps of Engineers Engineering Research and Development Center Topographic Engineering Center Alexandria, Virginia Windows-based program to convert coordinates and elevations between datum's using vertcon05.txt and vertcon05.05 files supplied by the U.S. Army Corps of Engineers South Atlantic Division, Jacksonville FL.)<br>ACTUAL NGS or (ngvd29.txt file) OPUS Ortho Height = 23.355 meters                                                                                                                                                                                                                                                                    |                                                                                                                                                                                  |                                         |                                                        |
| LATITUDE: <b>28° 04' 37.29022" (N)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                  | LONGITUDE: <b>81° 10' 14.53671" (W)</b> | (NAD_83 (2011) EPOCH:2010.0000)                        |
| RECOVERY DATA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                  |                                         |                                                        |
| Stamping: <b>OSS-1B 2019</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                  |                                         |                                                        |
| <b>To Reach:</b> From St. Cloud, travel south on Canoe Creek Road approximately 16 miles to an unpaved road drive running east from Canoe Creek Road and under the Florida Turnpike. Go easterly along dirt road 2 entrance to Camp Lonesome Conservation Area. Enter and go northerly .4 miles to locked access gate. Go through gate and go west and follow marked trail road approximately 3.5 miles to area known as Piss-Pot Hammock, turn southerly and go along a trail road 800 feet past mark OSS-1A to mark at the opening of the wetland. Mark is a standard SFWMD aluminum disk set in a 1-1/4" pipe with a concrete collar 3" below ground surface, 1' west of metal post with survey marker decal. SFWMD key is required for gate into property. |                                                                                                                                                                                  |                                         |                                                        |
| NOTABLE LAND MARKS: Camp Lonesome Conservation Area ; Piss Pot Hammock                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                  |                                         |                                                        |
| NGS-SOURCE BENCHMARK: N/A - Determined by OPUS Solution                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                  |                                         |                                                        |
| FIELD BOOK <b>972 PAGE 37</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                  |                                         |                                                        |
| PICTURES                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                  |                                         |                                                        |
| Aerial Overall Site<br>From: Google Earth<br>Imagery Date:2/11/17                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |  <div style="position: absolute; top: 700px; right: 50px; text-align: center;">↑<br/>N</div> |                                         |                                                        |



## SOUTH FLORIDA WATER MANAGEMENT DISTRICT

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Top View



SEC 1 TRIP 28 RGE 31

ESTABLISH VERTICAL CONTROL ON FD  
SFUND ALUM DISK ON CONC PAD & WELL  
SITE OSS-1 & REF MARK FOR WELL

FILE NAME: OSS1

EQUIPMENT USED:  
DINI LEVEL  
SERIAL # 7712950  
BAR CODE ROD  
EL BM EL

| STA   | PT# | EL             | BM EL            |
|-------|-----|----------------|------------------|
| OSS1B | 1   |                | 76.12<br>NAVO 88 |
| OSS1A | 2   | 76.636         | 76.62            |
|       |     | ERROR = -0.016 |                  |
| OSS1A | 3   |                | 76.62            |
| OSS1  | 4   | 77.489         |                  |

OSS1A

5

ERROR: 0.001  
CONT'D ON PG. 59

76.619 76.62

DET STRICKLAND  
K WISE  
SCHAVER

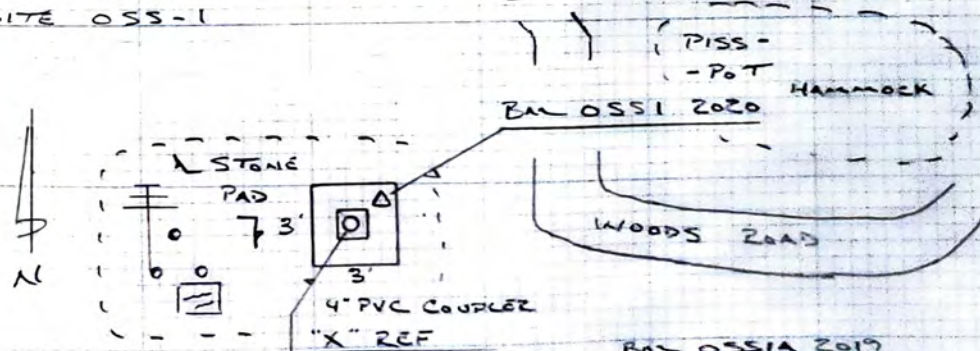
# COMMENTS

BAL OSS1B 2019 FD SFUND ALUM CAP IN CONC GOOD COND

BAL OSS1A 2019 " " " " "

BAL OSS1A 2019 AS ABOVE

BAL OSS1 2020 FD SFUND ALUM DISK IN CONC PAD  
SFUND SURVEY CREW STAMPED DISK BAL OSS-1 2020  
IT'S LOCATED @ NE CORNER OF 3'X3' CONC PAD FOR WELL  
SITE OSS-1



BAL OSS1A 2019

BAL OSS1B 2019

BAL OSS1A 2019 AS ABOVE



SEC 1 TWP 28 RGE 31  
CONT'D FROM PAGE - 58

| STA             | PT# | EL     | BAL EL |
|-----------------|-----|--------|--------|
| OSSIA           | 28  |        | 76.62  |
| REF MARK<br>"X" | 29  | 81.051 |        |
| NE CONC         |     | 77.461 |        |
| SE PAD          |     | 77.447 |        |
| SW CONC         |     | 77.436 |        |
| NW PAD          |     | 77.482 |        |
| NE NATL         |     | 76.9   |        |
| SE GRASS        |     | 76.9   |        |
| SW NATL         |     | 76.7   |        |
| NW GRASS        |     | 76.7   |        |
| OSSIA           | 18  | 76.62  | 76.62  |

STRECKMAN  
KIRSE  
SCHAUER

## COMMENTS

BAL OSSIA 2019 SEE PG. 58

REF "X" MARK CHISEL ON S. SIDE of 4" PVC COUPLER

NE CONC PAD  
SE " "  
SW " "  
NW " "

NE NATURAL GRASS PALMETTOS  
SE " " "  
SW " " "  
NW " " "

BAL OSSIA 2019 AS ABOVE



REGISTRATION WORKSHEET - CAMPLOW Survey Registration

Site Name:

CAMPLOW

Today's Date:

4/2/2020

Type Recorder:

CR1000

Activity:

Survey Registration

Effective Date:

Start Date of Data :

Customer:

Carlos Gomez

Bus. Area:

SCADA

Agency:

SFWMD

Project Manager:

A.Schauer

Bus. Area:

Eng. Construction Bure

Agency:

SFWMD

Project Name:

Legal Mandate:

Site Parameters:

Short Common Name / Description:

Proj. Mgr. Notes:

Gate Code #8659. CAMPLOW Osceola County St. Cloud Field Station. Latitude: 28° 4' 42.23"" Longitude: -81° 10' 14.46"" Directions: Follow Florida's Turnpike to SR-60W in Osceola County. Take exit 193 (Yeehaw Junction) and turn right onto SR 441. Follow SR441 north for 14.1 miles to Old Canoe Creek Road in Kenansville. Turn left onto Canoe Creek road and proceed for 19.1 mile to the entrance to Camp Lonesome on the right. Turn into the camp. go

Site Directions:

Site Address (if any):

Lock type or combination:

Transportation:

Std

Structure Type:

Recorder Location/Purpose:

Configuration table attached:

SURVEY INFORMATION

B.M. Elevation:

77.49 feet

B.M Year:

2020

Stamp:

BM OSS-1 2020

NAVD88 Offset:

1.11 feet

Agency:

SFWMD

Type:

ALUMINUM DISK

Datum:

NAVD88

Benchmark Location/ Description

SFWMD ALUMINUM DISK IN NORTHEAST CORNER OF 3X3 CONCRETE PAD OF OSS-1 WELL.

COMMUNICATIONS INFORMATION

Communication:

Loggernet Server:

Tower #1:

Communication Type #1:

Tower #2:

Communication Type #2:

RTU Address:

| WELL INFORMATION |                 |            |           |             |                |             |                |                 |                                                   |  |
|------------------|-----------------|------------|-----------|-------------|----------------|-------------|----------------|-----------------|---------------------------------------------------|--|
| Sensor           | DBHydro Station | Ref Elev   | Elev Date | Top of Well | Bottom of Well | Ground Elev | Benchmark Elev | Benchmark Datum | Ref Elevation Location                            |  |
| GW               | OSS-1           | 81.05 feet | 4/22/2020 | 81.05 feet  |                | 76.8 feet   | 77.49 feet     | NAVD88          | X-cut set on top of well denoted by aluminum tag. |  |

| Sensor | GW Sensor Location Offset | Meas Pt Elevation | GW Land Elevation | Depth of Well | Type of Well | Top of Monitored Interval | Base of Monitored Interval | Parameter Transmitted |  |  |  |  |  |  |  |  |  |
|--------|---------------------------|-------------------|-------------------|---------------|--------------|---------------------------|----------------------------|-----------------------|--|--|--|--|--|--|--|--|--|
| GW     |                           |                   |                   |               |              |                           |                            |                       |  |  |  |  |  |  |  |  |  |
| GW     |                           |                   |                   |               |              |                           |                            |                       |  |  |  |  |  |  |  |  |  |

| COORDINATE INFORMATION |             |              |         |         |     |           |         |      |       |  |         |             |  |  |  |
|------------------------|-------------|--------------|---------|---------|-----|-----------|---------|------|-------|--|---------|-------------|--|--|--|
| Item/Param             | Lat         | Long         | X-Coord | Y-Coord | Sec | Township  | Range   | Quad | Basin |  | County  | Description |  |  |  |
| GW                     | 28°04'41.8" | -81°10'14.6" |         |         |     | 128 SOUTH | 31 EAST |      |       |  | OSCEOLA |             |  |  |  |



# SOUTH FLORIDA WATER MANAGEMENT DISTRICT

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|                                           |                                           |                                     |                                      |                                          |
|-------------------------------------------|-------------------------------------------|-------------------------------------|--------------------------------------|------------------------------------------|
| SCADA RTU Station Name:<br><b>CAMPLOE</b> | DB Hydro Station Name:<br><b>OSS-2 GW</b> | DB Hydro Site Name:<br><b>OSS-2</b> | Agency:<br><b>S.F.W.M.D</b>          | Date of Field Work:<br><b>04/22/2020</b> |
| Party Chief: <b>STRICKLAND</b>            | Field Book: <b>SCADA FB#13</b>            | Page(s): <b>56-57</b>               | Report Prepared by: <b>A.Schauer</b> |                                          |
| Surveyors Notes:                          |                                           | Surveyor's Certification:           |                                      |                                          |

## SITE SPECIFIC DATA

|                                                                         |                                                                                                                                           |                                                                      |                                                                           |
|-------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|---------------------------------------------------------------------------|
| Reference Elevation(s) (NAVD88):<br><b>OSS-2 (CAMPLOE) = 84.11 feet</b> | Site Benchmark(s)/Elevation(s) (NAVD88):<br><b>BM OSS-2 2020 = 79.98 feet</b><br><b>OSS 2A = 79.97 feet</b><br><b>OSS 2B = 78.59 feet</b> | Source Benchmark(s) /Elev(s) (NAVD88):<br><b>OSS 2B = 78.59 feet</b> |                                                                           |
| Calibration Port Elev(s) (NAVD88):<br><b>N/A</b>                        | Ground Elevation (NAVD88):<br><b>79.5 feet</b>                                                                                            | Pad Elevation (NAVD88):<br><b>79.95 feet</b>                         | Corpscon 6.0.1 Conversion Factor (NAVD88 to NGVD29):<br><b>+1.11 feet</b> |

## GEOGRAPHIC DATA

| Section 6                                                                                  |  |                                          |  |                                            |  | Township 28 South           |  | Range 32 East              |  |
|--------------------------------------------------------------------------------------------|--|------------------------------------------|--|--------------------------------------------|--|-----------------------------|--|----------------------------|--|
| <u>  X  </u> Well(s) <u>      </u> Gate(s)                                                 |  | Latitude:<br><b>GW WELL: 28°04'59.5"</b> |  | Longitude:<br><b>GW WELL: -81°09'43.4"</b> |  | Northing (Y):<br><b>N/A</b> |  | Easting (X):<br><b>N/A</b> |  |
| <u>  X  </u> Benchmark                                                                     |  |                                          |  |                                            |  |                             |  |                            |  |
| Position (horizontal) Source:<br><b>ESRI Pick Point &amp; Garmin<br/>Handheld GPSMAP78</b> |  |                                          |  |                                            |  |                             |  |                            |  |

Notes: **NAVD88** – North American Vertical Datum of 1988; **NGVD29**- National Geodetic Vertical Datum of 1929; **Corpscon 6.0.1** - A U.S. Army Corps of Engineers Engineering Research and Development Center Topographic Engineering Center Alexandria, Virginia Windows-based program to convert coordinates and elevations between datum's using vertcon05.txt and vertcon05.05 files supplied by the U.S. Army Corps of Engineers South Atlantic Division, Jacksonville FL.

## PICTURES

Legend: SFWMD Disk = Well =



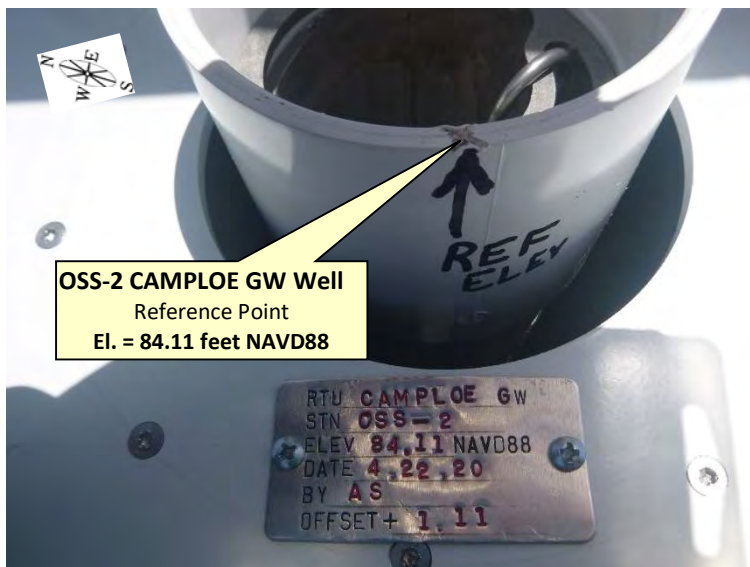
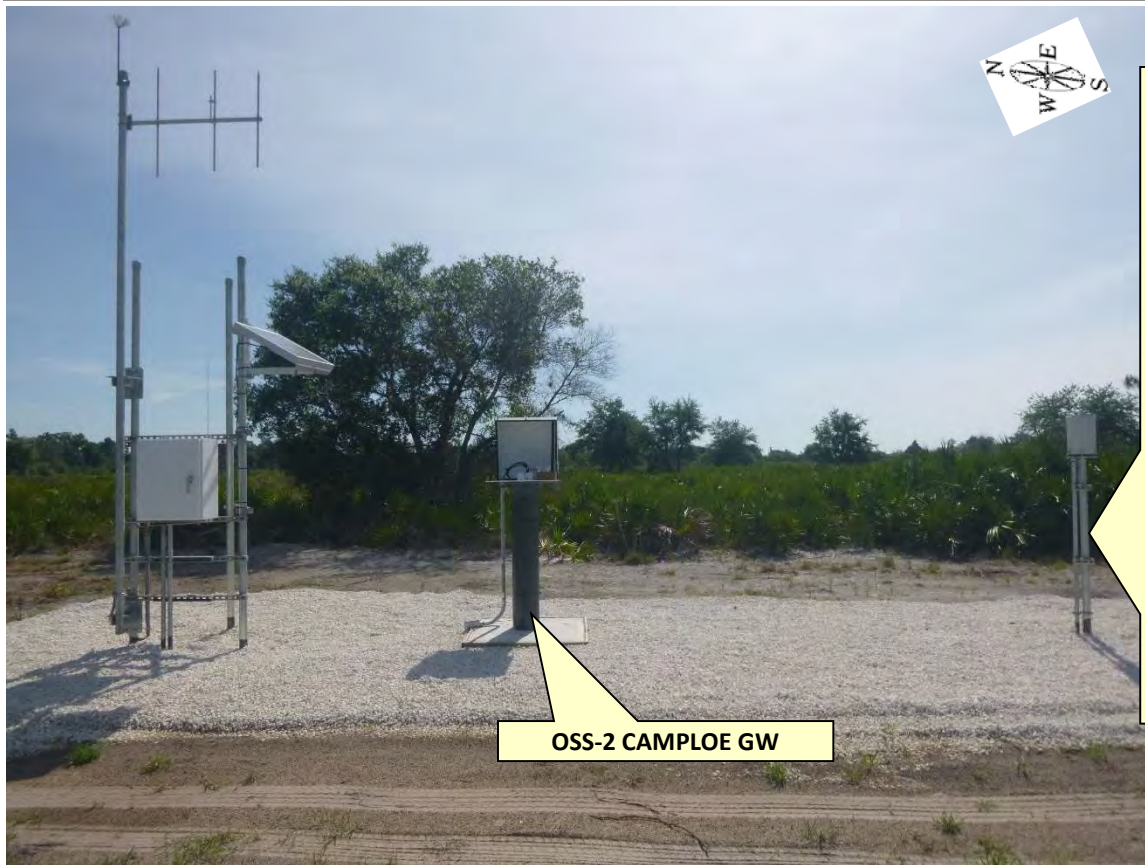




# SOUTH FLORIDA WATER MANAGEMENT DISTRICT

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## OSS-2 CAMPLOE Well







## SOUTH FLORIDA WATER MANAGEMENT DISTRICT

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OSS-2 CAMPLOE SITE BENCHMARK "BM OSS-2 2020" El. = 79.98 feet (NAVD88)

Benchmark "BM OSS-2 2020"  
28°04'59.5" (N)  
81° 09'43.4" (W)  
Elev. = 79.98 feet (NAVD88)



Benchmark "BM OSS-2 2020"  
28°04'59.5" (N)  
81° 09'43.4" (W)  
Elev. = 79.98 feet (NAVD88)





## SOUTH FLORIDA WATER MANAGEMENT DISTRICT

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OSS-2 CAMPLOE SITE BENCHMARK "OSS 2A" El. = 78.97 feet (NAVD88)



Benchmark "OSS 2A"  
28° 04' 58.91205" (N)  
81° 09' 43.63076" (W)  
Elev. = 78.97 feet (NAVD88)



Benchmark "OSS 2A"  
28° 04' 58.91205" (N)  
81° 09' 43.63076" (W)  
Elev. = 78.97 feet (NAVD88)



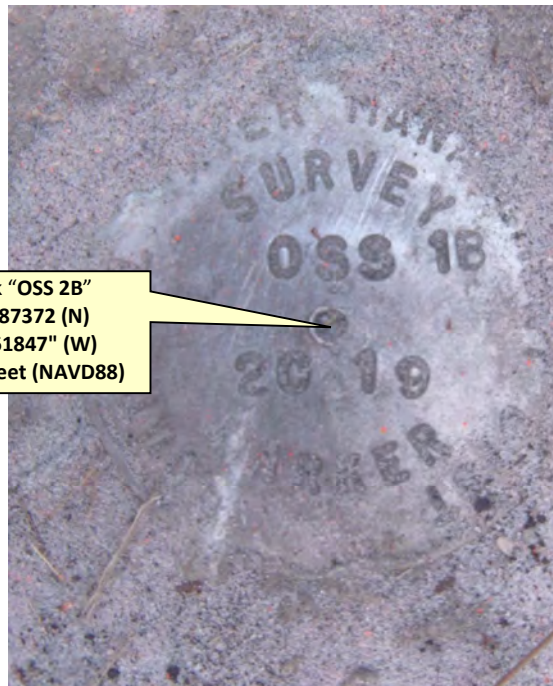
## SOUTH FLORIDA WATER MANAGEMENT DISTRICT

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OSS-2 CAMPLOE SITE BENCHMARK "OSS 2B" El. = 78.59 feet (NAVD88)



Benchmark "OSS 2B"  
28° 04' 49.87372 (N)  
81° 09' 43.61847" (W)  
Elev. = 78.59 feet (NAVD88)



Benchmark "OSS 2B"  
28° 04' 49.87372 (N)  
81° 09' 43.61847" (W)  
Elev. = 78.59 feet (NAVD88)





# South Florida Water Management District Benchmark Datasheet

Designation: **BM OSS-2 2020**  
Stamping: **BM OSS-2 2020**  
Established By: **SFWMD**  
Surveyor: **STRICKLAND**

Project Name: **CFWI WELL CAMPLOE**  
Field Book Name: **SCADA13**  
Recovered By: **STRICKLAND**  
Established Date: **04/22/20**

Type: **V**  
Field Book Page: **56**  
Recovery Date:   
Status: **New**

State Plane Zone: **FL East**

## GEOGRAPHIC POSITION INFORMATION

Section: **6** Township: **28 SOUTH** Range: **32 EAST**  
County: **OSCEOLA** Quadrange:   
NAD83 Adj. Year:   
Vertical Datum: **NAVD1988** Quad Index:   
NAVD88 Elevation (feet): **79.98** NGVD29 Elevation (feet):   
NGVD88 Class:   
NGVD29 Class:   
NGVD88 Order:   
NGVD29 Order:   
Horizontal Datum: **NAD1983** NGS Source BM(s): **OSS 2B 2019**  
2022 Elevation:   
Other Elevation:   
Other Elevation Type:   
NGS PID(s):   
NGS NAVD88 Elev (ft): **78.59**  
NGS NAVD88 Elev (m):   
NGS 2022 Elev (ft):

CORPSCON 6.0.1 CONVERSION FACTOR (NAVD88 TO NGVD29): (A U.S. Army Corps of Engineers Engineering Research and Development Center Topographic Engineering Center Alexandria, Virginia Windows-based program to convert coordinates and elevations between datum's using vertcon05.txt and vertcon05.05 files supplied by the U.S. Army Corps of Engineers South Atlantic Division, Jacksonville FL)

Vertical Datum Offset: + **1.11** Actual NGS Elevation or ngvd29.txt file:   
OPUS Ortho Height:   
Northing (Y) (feet):   
Latitude: **28** **4** **59.5** Source of Latitude & Longitude:   
Longitude: **81** **9** **43.4**  
DD° MM' SS" DD° MM' SS"  
Latitude (Decimal Degrees): **28.08319444** Longitude (Decimal Degrees): **-81.16205556**

## RECOVERY DATA

How to Reach: **From St. Cloud, travel south on Canoe Creek Road approximately 16 miles to an unpaved road drive running east from Canoe Creek Road and under the Florida Turnpike. Go easterly along dirt road 2 entrance to Camp Lonesome Conservation Area. Enter and go northerly .4 miles to locked access gate. Go through gate and go west and follow marked trail road approximately 3.5 miles to area known as Piss-Pot Hammock, go NNW .4 miles to north line of Conservation area; go east along trail road .6 miles to trail leading south; go south 0.1 miles to mark on the left. Mark is a standard SFWMD aluminum disk set in northeast corner of concrete well pad OSS-2 (CAMPLOE). SFWMD key is required for gate into property. Gate code #8659.**

Description/Notes:

Notable Landmarks: **Well Site OSS-2 (CAMPLOE)**  
Other Source Benchmarks: **SFWMD Alum. Disks: OSS 2A 2019 Elev. = 78.97 feet (88) and OSS 2B 2019 Elev. = 78.59 feet (88)**

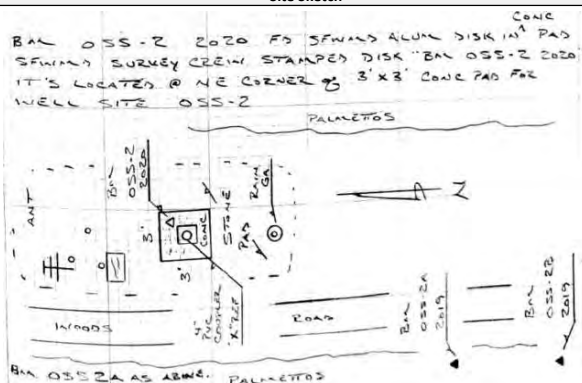
## PICTURES

Aerial View of Overall Site



## PICTURES

Site Sketch





# SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Rev. 1/16

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                |                                         |                                                        |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|-----------------------------------------|--------------------------------------------------------|
| DESIGNATION: <b>OSS-2A</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                | PROJECT: <b>CFWI CAMP LONESOME EAST</b> |                                                        |
| ESTABLISHED BY: <b>PICKETT AND ASSOCIATES, INC</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                | SURVEYOR: <b>John M. Clyatt</b>         |                                                        |
| RECOVERED BY:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                | DATE: <b>May 16, 2019</b>               |                                                        |
| <b>GEOGRAPHIC POSITION</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                |                                         |                                                        |
| SECTION <b>6</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | TOWNSHIP <b>28 SOUTH</b>                                                       | RANGE <b>32 EAST</b>                    |                                                        |
| COUNTY: <b>OSCEOLA</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | NAME OF QUADRANGLE: <b>HOLOPAW SW</b><br>GEOGRAPHIC INDEX OF QUAD: <b>3310</b> |                                         |                                                        |
| HORIZONTAL DATUM: 1927 <b>(1983)</b> 2022 Other <u>      </u> (circle one) ZONE <b>(E)</b> or W                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                |                                         |                                                        |
| VERTICAL DATUM: MSL 1929 <b>(1988)</b> 2022 Other <u>      </u> (circle one)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                |                                         |                                                        |
| VERTICAL ACCURACY: 1 2 <b>(3)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                |                                         |                                                        |
| STATE PLANE COORDINATE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | (N) Y= <b>1,362,925.671</b>                                                    | (E) X= <b>603,892.404</b>               | NAVD 88 EL. <b>78.97'</b><br>NGVD 29 EL. <b>80.08'</b> |
| CORPSCON 6.0.1 CONVERSION FACTOR (NAVD88 TO NGVD29): <b>1.112'</b><br>(A U.S. Army Corps of Engineers Engineering Research and Development Center Topographic Engineering Center Alexandria, Virginia Windows-based program to convert coordinates and elevations between datum's using vertcon05.txt and vertcon05.05 files supplied by the U.S. Army Corps of Engineers South Atlantic Division, Jacksonville FL.) ACTUAL NGS or (ngvd29.txt file) OPUS Ortho Height = 23.355 meters                                                                                                                                                                                                                                                                                                                        |                                                                                |                                         |                                                        |
| LATITUDE: <b>28° 04' 58.91205" (N)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                | LONGITUDE: <b>81° 09' 43.63076" (W)</b> | (NAD_83 (2011) EPOCH:2010.0000)                        |
| <b>RECOVERY DATA</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                |                                         |                                                        |
| Stamping: <b>OSS-2A 2019</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                |                                         |                                                        |
| <b>To Reach:</b> From St. Cloud, travel south on Canoe Creek Road approximately 16 miles to an unpaved road drive running east from Canoe Creek Road and under the Florida Turnpike. Go easterly along dirt road 2 entrance to Camp Lonesome Conservation Area. Enter and go northerly .4 miles to locked access gate. Go through gate and go west and follow marked trail road approximately 3.5 miles to area known as Piss-Pot Hammock, go NNW .4 miles to north line of Conservation area; go east along trail road .6 miles to trail leading south; go south 0.1 miles to mark on the right. Mark is a standard SFWMD aluminum disk set in a 1-1/4" pipe with a concrete collar 3" below ground surface, 1' east of a metal post with survey marker decal. SFWMD key is required for gate into property. |                                                                                |                                         |                                                        |
| NOTABLE LAND MARKS: Camp Lonesome Conservation Area ; Piss Pot Hammock                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                |                                         |                                                        |
| NGS-SOURCE BENCHMARK: N/A Determined by OPUS Solution                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                |                                         |                                                        |
| FIELD BOOK <b>972 PAGE 37</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                |                                         |                                                        |
| <b>PICTURES</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                |                                         |                                                        |
| Aerial Overall Site<br>From: Google Earth<br>Imagery Date:2/11/17                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                |                                         |                                                        |





## SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Rev. 1/16



Top View



# SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Rev. 1/16

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                |                                         |                                                        |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|-----------------------------------------|--------------------------------------------------------|
| DESIGNATION: <b>OSS-2B</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                | PROJECT: <b>CFWI CAMP LONESOME EAST</b> |                                                        |
| ESTABLISHED BY: <b>PICKETT AND ASSOCIATES, INC</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                | SURVEYOR: <b>John M. Clyatt</b>         |                                                        |
| RECOVERED BY:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                | DATE: <b>May 16, 2019</b>               |                                                        |
| GEOGRAPHIC POSITION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                |                                         |                                                        |
| SECTION <b>6</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | TOWNSHIP <b>28 SOUTH</b>                                                       | RANGE <b>32 EAST</b>                    |                                                        |
| COUNTY: <b>OSCEOLA</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | NAME OF QUADRANGLE: <b>HOLOPAW SW</b><br>GEOGRAPHIC INDEX OF QUAD: <b>3310</b> |                                         |                                                        |
| HORIZONTAL DATUM: 1927 <u>(1983)</u> 2022 Other _____ (circle one) ZONE <b>(E)</b> or W                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                |                                         |                                                        |
| VERTICAL DATUM: MSL 1929 <u>(1988)</u> 2022 Other _____ (circle one)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                |                                         |                                                        |
| VERTICAL ACCURACY: 1 2 <u>(3)</u>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                |                                         |                                                        |
| STATE PLANE COORDINATE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | (N) Y= <b>1,362,012.889</b>                                                    | (E) X= <b>603,892.289</b>               | NAVD 88 EL. <b>78.59'</b><br>NGVD 29 EL. <b>79.70'</b> |
| CORPSCON 6.0.1 CONVERSION FACTOR (NAVD88 TO NGVD29): <b>+ 1.112'</b><br><small>(A U.S. Army Corps of Engineers Engineering Research and Development Center Topographic Engineering Center Alexandria, Virginia Windows-based program to convert coordinates and elevations between datum's using vertcon05.txt and vertcon05.05 files supplied by the U.S. Army Corps of Engineers South Atlantic Division, Jacksonville FL.) ACTUAL NGS or (ngvd29.txt file) OPUS Ortho Height = 23.355 meters</small>                                                                                                                                                                                                                                                                                                        |                                                                                |                                         |                                                        |
| LATITUDE: <b>28° 04' 49.87372" (N)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                | LONGITUDE: <b>81° 09' 43.61847" (W)</b> | (NAD 83 (2011) EPOCH:2010.0000)                        |
| RECOVERY DATA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                |                                         |                                                        |
| Stamping: <b>OSS-2B 2019</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                |                                         |                                                        |
| <b>To Reach:</b> From St. Cloud, travel south on Canoe Creek Road approximately 16 miles to an unpaved road drive running east from Canoe Creek Road and under the Florida Turnpike. Go easterly along dirt road 2 entrance to Camp Lonesome Conservation Area. Enter and go northerly .4 miles to locked access gate. Go through gate and go west and follow marked trail road approximately 3.5 miles to area known as Piss-Pot Hammock, go NNW .4 miles to north line of Conservation area; go east along trail road .6 miles to trail leading south; go south 0.25 miles to mark on the right. Mark is a standard SFWMD aluminum disk set in a 1-1/4" pipe with a concrete collar 3" below ground surface, 1' east of a metal post with survey marker decal. SFWMD key is required for gate into property. |                                                                                |                                         |                                                        |
| NOTABLE LAND MARKS: Camp Lonesome Conservation Area ; Piss Pot Hammock                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                |                                         |                                                        |
| NGS-SOURCE BENCHMARK: N/A Determined by OPUS Solution                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                |                                         |                                                        |
| FIELD BOOK <b>972 PAGE 37</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                |                                         |                                                        |
| PICTURES                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                |                                         |                                                        |
| Aerial Overall Site<br>From: Google Earth<br>Imagery Date:2/11/17                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                |                                         |                                                        |





## SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Rev. 1/16



Top View

SEC 6 TWP 28 RGE 32

ESTABLISH VERTICAL CONTROL ON FD  
SFUND ALUM CAP ON CONC PAD & WELL  
SITE OSS-2 & REF MARK FOR WELL

EQUIPMENT USED:  
DINI LEVEL  
SERIAL # 771295 &  
BAR CODE ROD

FILE NAME: OSS2

| STA    | PT # | EL             | BAL EL           |
|--------|------|----------------|------------------|
| OSS 2B | 1    |                | 78.59<br>NAVD 83 |
| OSS 2A | 3    | 78.976         | 78.97            |
|        |      | ERROR = 0.006' |                  |
| OSS 2A | 4    |                | 78.97            |
| OSS 2  | 5    | 79.982         |                  |

OSS 2A

6

78.969

78.97

ERROR = -0.001

CONT'D ON PG. 51

STICKLAND  
WISE  
SCHAUER

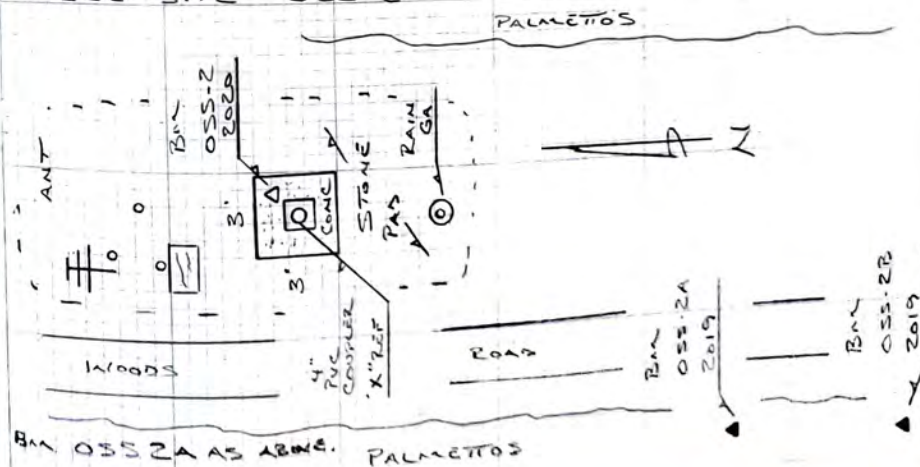
### COMMENTS

BAL OSS-2B 2019 FD SFUND ALUM CAP IN CONC  
Good COND

BAL OSS-2A 2019 FD " " " " " "  
Good COND

BAL OSS-2A 2019 AS ABOVE

BAL OSS-2 2020 FD SFUND ALUM DISK IN<sup>1</sup> PAD  
SFUND SURVEY CREW STAMPED DISK "BAL OSS-2 2020"  
IT'S LOCATED @ NE CORNER of 3'x3' CONC PAD FOR  
WELL SITE OSS-2



BAL OSS 2A AS ABOVE. PALMETTOS



| SEC      | INP    | 28     | ZGE    | 32 |
|----------|--------|--------|--------|----|
|          | CONT'D | FROM   | PG-56  |    |
| STA      | PT #   | EL     | BAL EL |    |
| OSS 2A   | 4      |        | 78.97  |    |
| REF MARK | 7      | 84.106 |        |    |
| "X"      |        |        |        |    |
| NE CONC  | 8      | 79.985 |        |    |
| SE PAD   | 9      | 79.97  |        |    |
| SW CONC  | 10     | 79.916 |        |    |
| NW PAD   | 11     | 79.924 |        |    |
| NE NATL  | 12     | 79.7   |        |    |
| SE GRDS  | 13     | 79.3   |        |    |
| SW NATL  | 14     | 79.2   |        |    |
| NW GRDS  | 15     | 79.7   |        |    |
| OSS 2A   | 16     | 78.97  | 78.97  |    |

☐ STRICKLAND  
☐ WISE  
☐ SCHAUER

## COMMENTS

BAL OSS-2A 2019 SEE PG-56

REF "X" MARK CHISELED ON WEST SIDE of 4" PVC COUPLER

NE CONC PAD

SE " "

SW " "

NW " "

NE NATURAL GRDS PALMETTOS

SE " " " "

SW " " " "

NW " " " "

BAL OSS-2A 2019 AS ABOVE

---

# **SURVEYOR'S REPORT**

---

**CENTRAL FLORIDA WATER INITIATIVE (CFWI) SURVEYS**

## **GARDNER COBB (GARDNER) WELL, TRANSECTS & SEASONAL HIGH-WATER MARK SURVEY**

**County: OSCEOLA  
Location Name: GARDNER**

**Prepared for:**

**South Florida Water Management District  
WORK ORDER NO. 4600003702-WO2**

**Prepared by:**



|                             |                        |
|-----------------------------|------------------------|
| <b>P&amp;A PROJECT NO.:</b> | <b>18995</b>           |
| <b>FIELD DATES:</b>         | <b>05/1-05/16/2019</b> |
| <b>DATE OF THIS REPORT:</b> | <b>06/18/2019</b>      |



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**PROJECT DESCRIPTION**

This survey was prepared to document the horizontal and vertical location of a new monitoring well (OSS-3) and benchmark established by District's Data, Monitoring, and Investigations Team (DMIT), establish an additional benchmark near the associated wetlands to be monitored, and locate transects and seasonal high water markers at the wetland site.

The benchmark at the well is a standard SFWMD 2" survey marker disk stamped "OSS-3" imbedded in the corner of the concrete well pad. The additional benchmark is a standard SFWMD 2" survey marker disk set in the top of a 1 1/4" iron pipe in concrete stamped "OSS-3 A"

**LOCATION:**

The GARDNER OSS-3 well is located on South Florida Water Management District lands in an area known as Gardner Cobb Marsh in Osceola County. From St. Cloud, travel south on Canoe Creek Road approximately 10 miles to Lake Cypress Road, go west on Lake Cypress Road approximately 0.8 miles to entrance road leading south. Go south and westerly along main road 5.1 miles to well on the right.

**HORIZONTAL DATUM:**

The horizontal position of the OSS-3 mark was established by base-rover RTK-GPS using published NGS mark R 513 (PID DF6726) as the base. Prior to using R 513, it was confirmed with a Trimble R-10 receiver using a subscription-based Network Real Time Kinematic GPS solution (NRTK-GPS). The horizontal position checked within 0.06 feet. The published values for R 513 were used for the GPS base to establish the horizontal values for OSS-3. Using the resulting position, OSS-3 was used as a base for all subsequent field location work at this well and wetland site. All horizontal positions were determined by Base-Rover RTK-GPS from OSS-3. As a final redundant check, R 513 was re-measured using OSS-3 as a base and checked within 0.05' of published values.

Horizontal coordinate values are referenced to the East Zone of the Florida State Plane Coordinate System, North American Datum of 1983, Adjustment of 2011 (Epoch 2010.0000), US Survey Feet. (sFT)

**VERTICAL DATUM:**

Elevations were determined by differential leveling using third order methods with a digital level and a bar code rod. The allowable error for the level run is 0.02' √miles per SFWMD specifications for this work order. The run originated on Z 506 (PID – AJ6685) and closed on A 507 (PID – AJ6686) with a closure of 0.028' (low) which exceeded the closure tolerance by 0.008'. After consulting with the District Survey Project Manager, the published elevation for A 507 was held for a level loop to OSS-3 that closed back to A507 within .001'. No further adjustment was made. The elevation of OSS-3A was determined by double run differential leveling from OSS-3.

Vertical elevations were established in the North American Vertical Datum of 1988 (NAVD 88). Units are in feet.



**OSS-3 Benchmark and Well Summary**  
**Elevations are NAVD 88 (feet)**

Latitude: 28° 02' 40.66877" (N)      Longitude: 81° 19' 47.05347" (W)  
Northing: 1,349,073.632 sFT      Easting: 549, 807.38 sFT  
BM Elevation: 55.54'      Well Measure point elevation: 58.87  
Pad Elevation: 55.51'      Ground Elevation: 55.2  
Measure down to water from well measure point on May 16, 2019.      8.40'

**OSS-3A Benchmark Summary**

Latitude: 28° 02' 43.62607"(N)      Longitude: 81° 19' 44.39261" (W)  
Northing: 1,349,371.646sFT      Easting: 550,046.599 sFT  
BM Elevation: 54.73

**EQUIPMENT USED**

- Trimble DiNi 22 Level Serial Number 772842 (digital level)
- Trimble GPS unit R-10, Serial Number 0079 (RTK)
- Trimble GPS unit R-10, Serial Number 2948 (RTK)
- Trimble Total Station, Serial Number 36820056 (optical)

See attached following documents:

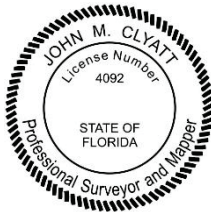
- Well and Benchmark Photos
- SFWMD Benchmark forms
- SFWMD Site Form
- Survey Maps



Digitally signed  
by John M. Clyatt

---

John M. Clyatt P.S.M.  
Florida Registration No. 4092  
Pickett & Associates, Inc.  
Florida Registration No. LB 364



---

June 14, 2019  
Survey Date

## OSS-3 WELL PHOTOS





## OSS-3 WELL PHOTOS





## OSS-3 WELL PHOTOS



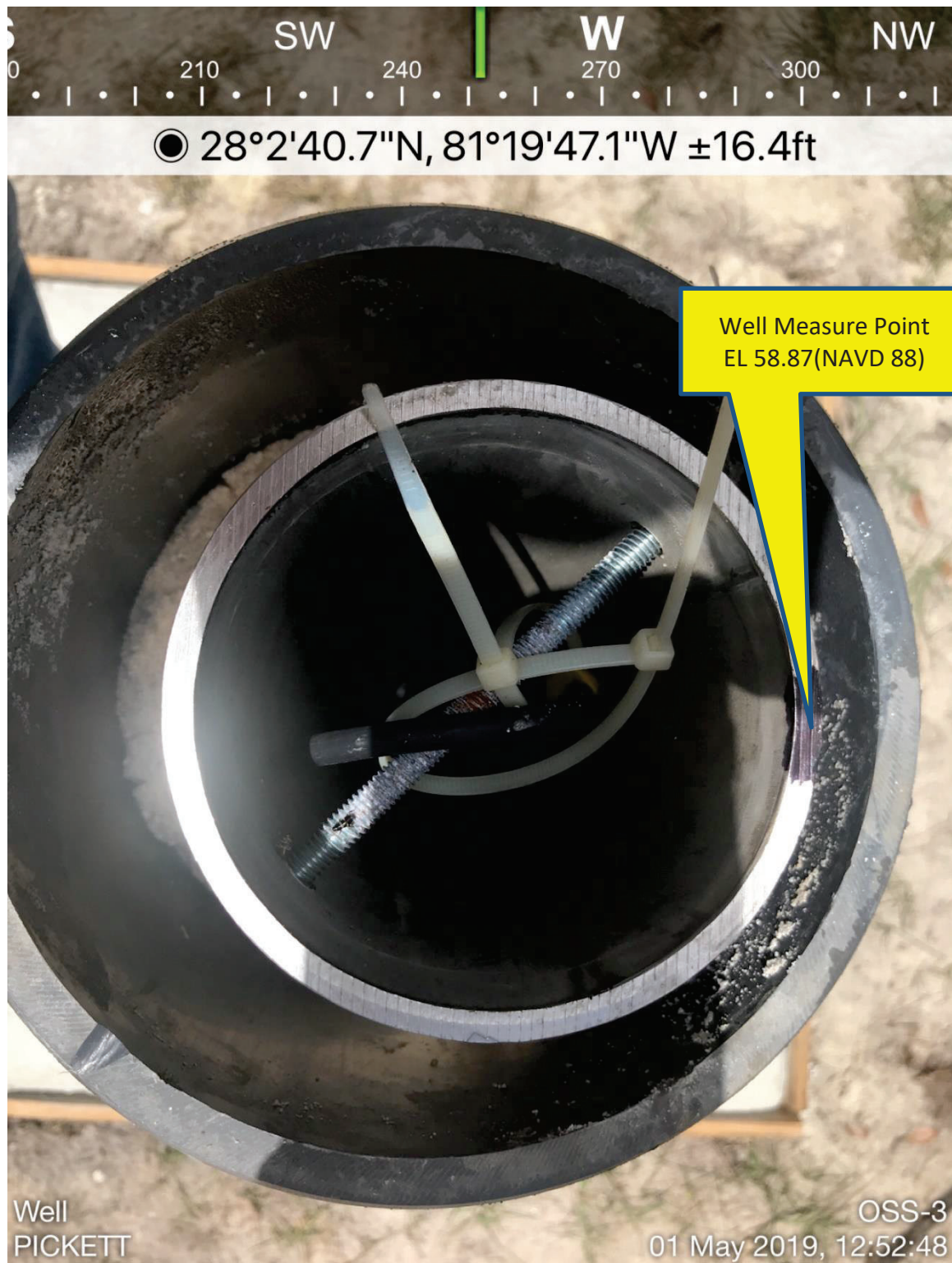


## OSS-3 WELL PHOTOS





## OSS-3 WELL PHOTOS





## OSS-3 WELL PHOTOS



## OSS-3 WELL ENCLOSURE STAND-PIPE





**BENCHMARK OSS-3A**

Benchmark OSS-3A  
EL 54.73' (NAVD 88)

## TRANSECT POINTS AND SEASONAL HIGH-WATER MARKS SUMMARY TABLE

| Transect         | Point ID                                 | Attribute             | Elevation | LAT - LONG                             | SPC Coord                     |
|------------------|------------------------------------------|-----------------------|-----------|----------------------------------------|-------------------------------|
| 1                | GC 1.1                                   | Wetland boundary      | 55.1'     | 28° 02' 42.12153"<br>81° 19' 45.79148" | N 1349220.04<br>E 549920.850  |
|                  | GC 1.2                                   | Hydric at surface     | 54.6'     | 28° 02' 43.09048"<br>81° 19' 46.24546" | N 1349318.005<br>E 549880.439 |
|                  | GC 1.3                                   | Muck at surface       | 53.7'     | 28° 02' 43.74400"<br>81° 19' 46.12814" | N 1349383.976<br>E 549891.129 |
| 2                | GC 2.1                                   | Wetland boundary      | 54.8'     | 28° 02' 44.15246"<br>81° 19' 51.01274" | N 1349426.412<br>E 549453.585 |
|                  | GC 2.2                                   | Hydric at surface     | 54.5'     | 28° 02' 44.52311"<br>81° 19' 50.20894" | N 1349463.648<br>E 549525.706 |
|                  | GC 2.3                                   | Muck at surface       | 54.1'     | 28° 02' 44.67761"<br>81° 19' 50.05347" | N 1349479.214<br>E 549539.678 |
| 3                | GC 3.1                                   | Wetland boundary      | 55.1'     | 28° 02' 48.25826"<br>81° 19' 49.96906" | N 1349840.804<br>E 549548.222 |
|                  | GC 3.2                                   | Hydric at surface     | 54.6'     | 28° 02' 48.22698"<br>81° 19' 49.67058" | N 1349837.572<br>E 549574.957 |
|                  | GC 3.3                                   | Muck at surface       | 54.4'     | 28° 02' 48.14581"<br>81° 19' 49.48345" | N 1349829.329<br>E 549591.701 |
| High Water Marks | GC SH 1                                  | Seasonal HW elevation | 56.37'    | 28° 02' 44.24911"<br>81° 19' 45.68752" | N 1349434.880<br>E 549930.746 |
|                  | <i>ONLY ONE SEASONAL HIGH WATER MARK</i> |                       |           |                                        |                               |

**NOTE:**

The horizontal locations of all the above points were determined by base-rover RTK-GPS with an estimated horizontal accuracy of +/- 0.10 feet.

The estimated vertical accuracy of all transect points is +/- 0.10 '. Seasonal High-Water marks were determined by differential leveling and have an estimated vertical accuracy of +/- .01'.

See General Location Map and Transects & Seasonal High-Water Marks Map included herein.



## TRANSECT 1 PHOTOS





## TRANSECT 2 PHOTOS





## TRANSECT 3 PHOTOS





**SEASONAL HIGH-WATER MARK****ONLY ONE SEASONAL HIGH AT THIS SITE**





# SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Rev. 1/16

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                         |                                         |                                                        |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|-----------------------------------------|--------------------------------------------------------|
| DESIGNATION: <b>OSS-3</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                         | PROJECT: <b>CFWI GARDNER COBB</b>       |                                                        |
| ESTABLISHED BY: <b>PICKETT AND ASSOCIATES, INC.</b>                                                                                                                                                                                                                                                                                                                                                                                                                         |                                         | SURVEYOR: <b>John M. Clyatt</b>         |                                                        |
| RECOVERED BY:                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                         | DATE: <b>May 16, 2019</b>               |                                                        |
| <b>GEOGRAPHIC POSITION</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                         |                                         |                                                        |
| SECTION <b>16</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                           | TOWNSHIP <b>28 SOUTH</b>                | RANGE <b>30 EAST</b>                    |                                                        |
| COUNTY: <b>Osceola</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                      | NAME OF QUADRANGLE: <b>CYPRESS LAKE</b> |                                         |                                                        |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | GEOGRAPHIC INDEX OF QUAD: <b>3311</b>   |                                         |                                                        |
| HORIZONTAL DATUM: 1927 <b>(1983)</b> 2022 Other _____ (circle one) ZONE <b>(E)</b> or W                                                                                                                                                                                                                                                                                                                                                                                     |                                         |                                         |                                                        |
| VERTICAL DATUM: MSL 1929 <b>(1988)</b> 2022 Other _____ (circle one)                                                                                                                                                                                                                                                                                                                                                                                                        |                                         |                                         |                                                        |
| VERTICAL ACCURACY: 1 2 <b>(3)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                         |                                         |                                                        |
| STATE PLANE COORDINATE                                                                                                                                                                                                                                                                                                                                                                                                                                                      | (N) Y= <b>1,349,073.632</b>             | (E) X= <b>549,807.38</b>                | NAVD 88 EL. <b>55.54'</b><br>NGVD 29 EL. <b>56.69'</b> |
| CORPSCON 6.0.1 CONVERSION FACTOR (NAVD88 TO NGVD29): <b>+ 1.148'</b><br>(A U.S. Army Corps of Engineers Engineering Research and Development Center Topographic Engineering Center Alexandria, Virginia Windows-based program to convert coordinates and elevations between datum's using vertcon05.txt and vertcon05.05 files supplied by the U.S. Army Corps of Engineers South Atlantic Division, Jacksonville FL.)<br>ACTUAL NGS or (ngvd29.txt file) OPUS Ortho Height |                                         |                                         |                                                        |
| LATITUDE: <b>28° 02' 40.66877" (N)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                         | LONGITUDE: <b>81° 19' 47.05347" (W)</b> | (NAD_83 (2011) EPOCH:2010.0000)                        |
| <b>RECOVERY DATA</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                         |                                         |                                                        |
| Stamping: <b>OSS-3 2019</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                         |                                         |                                                        |
| <b>To Reach:</b> From St. Cloud, travel south on Canoe Creek Road approximately 10 miles to Lake Cypress Road, go west on Lake Cypress Road approximately 0.8 miles to entrance road leading south into Gardner Cobb Marsh Management Area. Go south and westerly along dirt road 5.1 miles to well on right. Requires SFWMD key for gate into property.                                                                                                                    |                                         |                                         |                                                        |
| NOTABLE LAND MARKS: Cypress Lake                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                         |                                         |                                                        |
| NGS-SOURCE BENCHMARK: A 507 (PID AJ6686)                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                         |                                         |                                                        |
| FIELD BOOK <b>972</b> PAGE <b>24-35</b>                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                         |                                         |                                                        |
| <b>PICTURES</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                         |                                         |                                                        |
| <div style="display: flex;"> <div style="flex: 1;"> <p>Aerial Overall Site<br/>From: Google Earth<br/>Imagery Date:12/17/18</p> </div> <div style="flex: 3;"> </div> </div>                                                                                                                                                                                                                                                                                                 |                                         |                                         |                                                        |



# SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Rev. 1/16



View Looking From Road



Top View





# SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Rev. 1/16

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                  |                                         |                                                        |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|-----------------------------------------|--------------------------------------------------------|
| DESIGNATION: <b>OSS-3A</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                  | PROJECT: <b>CFWI GARDNER COBB</b>       |                                                        |
| ESTABLISHED BY: <b>PICKETT AND ASSOCIATES, INC.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                  | SURVEYOR: <b>John M. Clyatt</b>         |                                                        |
| RECOVERED BY:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                  | DATE: <b>May 16, 2019</b>               |                                                        |
| <b>GEOGRAPHIC POSITION</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                  |                                         |                                                        |
| SECTION <b>16</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | TOWNSHIP <b>28 SOUTH</b>                                                         | RANGE <b>30 EAST</b>                    |                                                        |
| COUNTY: <b>Osceola</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | NAME OF QUADRANGLE: <b>CYPRESS LAKE</b><br>GEOGRAPHIC INDEX OF QUAD: <b>3311</b> |                                         |                                                        |
| HORIZONTAL DATUM: 1927 <b>(1983)</b> 2022 Other <u>      </u> (circle one) ZONE <b>(E)</b> or W                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                  |                                         |                                                        |
| VERTICAL DATUM: MSL 1929 <b>(1988)</b> 2022 Other <u>      </u> (circle one)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                  |                                         |                                                        |
| VERTICAL ACCURACY: 1 2 <b>(3)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                  |                                         |                                                        |
| STATE PLANE COORDINATE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | (N) Y= <b>1,349,371.646</b>                                                      | (E) X= <b>550,046.599</b>               | NAVD 88 EL. <b>54.73'</b><br>NGVD 29 EL. <b>55.88'</b> |
| CORPSCON 6.0.1 CONVERSION FACTOR (NAVD88 TO NGVD29): <b>+ 1.148'</b><br>(A U.S. Army Corps of Engineers Engineering Research and Development Center Topographic Engineering Center Alexandria, Virginia Windows-based program to convert coordinates and elevations between datum's using vertcon05.txt and vertcon05.05 files supplied by the U.S. Army Corps of Engineers South Atlantic Division, Jacksonville FL.)<br>ACTUAL NGS or (ngvd29.txt file) OPUS Ortho Height                                                                                                                                                                                                                                                                                                                                                          |                                                                                  |                                         |                                                        |
| LATITUDE: <b>28° 02' 43.62607" (N)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                  | LONGITUDE: <b>81° 19' 44.39261" (W)</b> | (NAD_83 (2011) EPOCH:2010.0000)                        |
| <b>RECOVERY DATA</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                  |                                         |                                                        |
| Stamping: <b>OSS-3A 2019</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                  |                                         |                                                        |
| <b>To Reach:</b> From St. Cloud, travel south on Canoe Creek Road approximately 10 miles to Lake Cypress Road, go west on Lake Cypress Road approximately 0.8 miles to entrance road leading south into Gardner Cobb Marsh Management Area. Go south and westerly along dirt road 5.1 miles to OSS-3 well on right. From well, go north 200 feet to margin of wetland and then east 250' to mark on southerly margin of wetland. Requires SFWMD key for gate into property.                                                                                                                                                                                                                                                                                                                                                          |                                                                                  |                                         |                                                        |
| NOTABLE LAND MARKS: Cypress Lake                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                  |                                         |                                                        |
| NGS-SOURCE BENCHMARK: A 507 (PID AJ6686)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                  |                                         |                                                        |
| FIELD BOOK <b>972</b> PAGE <b>24-35</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                  |                                         |                                                        |
| <b>PICTURES</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                  |                                         |                                                        |
| <div><div><p>Aerial Overall Site<br/>From: Google Earth<br/>Imagery Date:12/17/18</p></div><div><p>The image is an aerial satellite view of a wetland area. A large, dark, irregularly shaped lake is the central feature, labeled 'Cypress Lake'. To the east of the lake, a road labeled 'Lake Cypress Rd' runs horizontally. Further east, another road labeled 'Canoe Creek Rd' runs diagonally. Highway markers for '523' and '91' are visible on Canoe Creek Rd. A yellow callout box labeled 'ENTRANCE GATE' points to a location on Lake Cypress Rd. Another yellow callout box labeled 'OSS-3A Benchmark' points to a location south of the lake. Other labels include 'Rough Island' to the southwest and 'Ike Hammock' to the south of the lake. A north arrow is located on the right side of the image.</p></div></div> |                                                                                  |                                         |                                                        |



## SOUTH FLORIDA WATER MANAGEMENT DISTRICT

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# SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Rev. 1/16

|                                                   |                                                                |                                                                        |                                        |
|---------------------------------------------------|----------------------------------------------------------------|------------------------------------------------------------------------|----------------------------------------|
| SCADA RTU Station Name:<br><b>OSS-3</b>           | DB Hydro Site Name:<br><b>GARDNER</b>                          | Agency:<br><b>WMD</b>                                                  | Date of Field Work:<br><b>06/14/19</b> |
| Party Chief: <b>Dustin Lanier</b>                 | Field Book: <b>972</b>                                         | Page(s): <b>1-14</b>                                                   | Prepared by: <b>John Clyatt</b>        |
| SITE SPECIFIC DATA                                |                                                                |                                                                        |                                        |
| Site Benchmark:<br><b>OSS-3</b>                   | Benchmark Elevation (NAVD88)<br><b>55.54</b>                   | Corpscon 6.0.1 Conversion Factor (NAVD88 to NGVD29)<br><b>+ 1.148'</b> |                                        |
| Reference Elevation(s) (NAVD88):<br><b>58.87'</b> | Existing Brass Tag Elevation (Datum):<br><b>Not Applicable</b> | Calibration Port Elevation(s) (NAVD88):<br><b>Not Applicable</b>       |                                        |
| Ground Elevation (NAVD88): <b>55.2</b>            |                                                                | Pad Elevation (NAVD88): <b>67.41</b>                                   |                                        |
| GEOGRAPHIC DATA                                   |                                                                |                                                                        |                                        |
| Section <b>24</b>                                 |                                                                | Township <b>30</b> South                                               | Range <b>29</b> East                   |
| Well                                              | Latitude:<br><b>28° 02' 40.6877" (N)</b>                       | Longitude:<br><b>81°19' 47.05347" (W)</b>                              | Source: RTK GPS – NAD 83(2011)         |
|                                                   | State Plane Coordinates                                        | Northing (Y) =<br><b>1,349,073.632 ft</b>                              | Easting (X) =<br><b>549,807.380 ft</b> |

## Notes:

**NAVD88** – North American Vertical Datum of 1988

**NGVD29**- National Geodetic Vertical Datum of 1929

**Corpscon 6.0.1** - A U.S. Army Corps of Engineers Engineering Research and Development Center Topographic Engineering Center Alexandria, Virginia Windows-based program to convert coordinates and elevations between datum's using vertcon05.txt and vertcon05.05 files supplied by the U.S. Army Corps of Engineers South Atlantic Division, Jacksonville FL.

## PICTURES

Aerial Overall Site **Not to scale (Google Earth product)**







## SOUTH FLORIDA WATER MANAGEMENT DISTRICT

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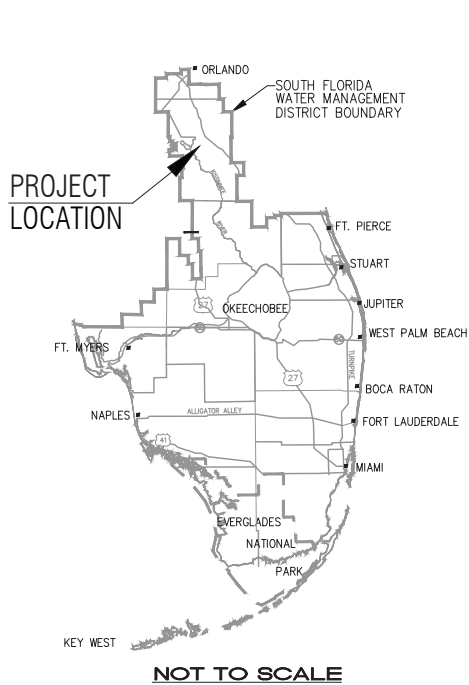




# SOUTH FLORIDA WATER MANAGEMENT DISTRICT

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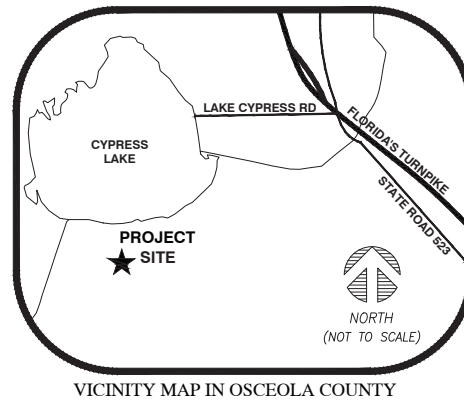


LOCATION MAP

CENTRAL FLORIDA WATER INITIATIVE (CFWI) SURVEYS

**GARDNER COBB**

SECTION 16, TOWNSHIP 28 S, RANGE 30 E,  
OSCEOLA COUNTY, FL



LEGEND:

NGS NATIONAL GEODETIC SURVEY  
 BENCHMARK



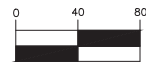
SHEET 1 OF 2

|       |         |      |           |
|-------|---------|------|-----------|
|       |         |      |           |
|       |         |      |           |
|       |         |      |           |
| DRAWN | CHECKED | DATE | REVISIONS |

CENTRAL FLORIDA WATER INITIATIVE (CFWI)  
 GARDNER COBB  
 WELL, TRANSECTS & SEASONAL  
 HIGH-WATER MARKS SURVEY

SOUTH FLORIDA WATER MANAGEMENT DISTRICT  
 INFRASTRUCTURE MANAGEMENT BUREAU-SURVEY & MAPPING SECTION  
 P.O. BOX 24680, 3301 GUN CLUB ROAD  
 WEST PALM BEACH, FLORIDA 33416-4680





( IN FEET )  
1 inch = 80 ft.

GRAPHIC & INTENDED DISPLAY SCALE

CENTRAL FLORIDA WATER INITIATIVE (CFWI) SURVEYS  
**GARDNER COBB**  
TRANSECTS & SEASONAL HIGH WATER MARKS

**LEGEND:**

(SYMBOLS NOT TO SCALE)

- ⊕ BENCHMARK
- SEASONAL HIGH WATER MARK
- MONITORING POINT
- × INTERMEDIATE GROUND ELEVATION



SHEET 2 OF 2

|       |         |      |           |
|-------|---------|------|-----------|
|       |         |      |           |
|       |         |      |           |
|       |         |      |           |
| DRAWN | CHECKED | DATE | REVISIONS |

CENTRAL FLORIDA WATER INITIATIVE (CFWI)  
GARDNER COBB  
WELL, TRANSECTS & SEASONAL  
HIGH-WATER MARKS SURVEY

SOUTH FLORIDA WATER MANAGEMENT DISTRICT  
INFRASTRUCTURE MANAGEMENT BUREAU-SURVEY & MAPPING SECTION  
P.O. BOX 24680, 3301 GUN CLUB ROAD  
WEST PALM BEACH, FLORIDA 33416-4680

**APPENDIX E:  
FIELD VERIFICATION FORMS**





## Monitoring Well Field Verification Form Hydrogeology Unit

### PART I: GENERAL INFORMATION

|                                                                                                                    |                                           |                                                                                                                                            |
|--------------------------------------------------------------------------------------------------------------------|-------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| Well ID: <u>POS-16</u>                                                                                             | Site Name / Project: <u>DMIT (SUELLE)</u> | County: <u>Polk</u>                                                                                                                        |
| Date: <u>04/03/25</u>                                                                                              | Time: <u>0825</u>                         | Staff Group: <u>SP, GC</u>                                                                                                                 |
| Location: (Please select)<br><input type="checkbox"/> DMS <input type="checkbox"/> DD <input type="checkbox"/> DDM | Latitude: _____<br>Longitude: _____       | Source:<br><input type="checkbox"/> Phone / Tablet<br><input type="checkbox"/> GPS Unit<br><input type="checkbox"/> Other (explain): _____ |

### PART II: WELL DETAILS

#### Well Purpose Explanation:

Is the well:

|                                                          |    |                                                                   |
|----------------------------------------------------------|----|-------------------------------------------------------------------|
| <input type="checkbox"/> A Flowing Artesian Well         | or | <input checked="" type="checkbox"/> A Non-flowing Artesian Well   |
| <input type="checkbox"/> Stick up (above land surface)   |    | <input checked="" type="checkbox"/> Simple top casing             |
| <input type="checkbox"/> In a vault (below land surface) |    | <input checked="" type="checkbox"/> Stick up (above land surface) |
|                                                          |    | <input type="checkbox"/> In a vault (below land surface)          |
|                                                          |    | <input type="checkbox"/> Other (explain): _____                   |

**Note:** all units are in decimal feet, except for casing diameter (in)

#### Please take photos!

Photo Labeling Example:  
2024-10-02\_GL-332\_Project\_Hernandez

Is the existing well in DBHydro?

Please mark: ☒ Yes ☐ No

If YES:

Please write DBKEY: A0595

Is the well surveyed in DBHydro?

Please mark: ☒ Yes ☐ No

If YES, what is the Ref. Point Elevation?

NGVD29 ☒ 78.82

Are field parameters collected?

Please mark: ☒ Yes ☐ No

- |                                  |                                |
|----------------------------------|--------------------------------|
| • pH: <u>4.34</u>                | • Temp (°C): <u>23.310</u>     |
| • SPC (µS/cm): <u>51.5</u>       | • Turbidity (NTU): <u>3.18</u> |
| • YSI - EXO ID: <u>13H100001</u> | • Sounder ID: _____            |

Additional Notes / Sketch:

well casing inside  
8 inch grey surface  
casing.

Land Surface

Measuring Point (MP)

MP Description: Black Mark at TOC

MP Distance to Land Surface: SP 45.5" 3.79  
4/13/26

Casing Diameter: ID: 4 (in) OD: \_\_\_\_\_ (in) Casing Material: PVC

DTW from MP: 9.24 (ft)

E-Tape ID: Carolina

If Camera used:  
☐ Screen  
☐ Open Hole

Top from MP: \_\_\_\_\_ (ft)

Bottom from MP: \_\_\_\_\_ (ft)

Total Depth from MP:  
34.41 + 0.77 = 35.18 (ft)  
(reading) + (weight) = (total)

Total Depth:

Tag: ☐ Soft ☒ ~~Normal~~ ☐ Hard

**Note:** Not to Scale



# Monitoring Well Field Verification Form

## Hydrogeology Unit

### PART I: GENERAL INFORMATION

|                                                                                                                    |                                           |                                                                                                                                            |
|--------------------------------------------------------------------------------------------------------------------|-------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| Well ID: <u>POS-17</u>                                                                                             | Site Name / Project: <u>DMIT (SNELLW)</u> | County: <u>Polk</u>                                                                                                                        |
| Date: <u>04/03/25</u>                                                                                              | Time: <u>0908</u>                         | Staff Group: <u>SP, GC</u>                                                                                                                 |
| Location: (Please select)<br><input type="checkbox"/> DMS <input type="checkbox"/> DD <input type="checkbox"/> DDM | Latitude: _____<br>Longitude: _____       | Source:<br><input type="checkbox"/> Phone / Tablet<br><input type="checkbox"/> GPS Unit<br><input type="checkbox"/> Other (explain): _____ |

### PART II: WELL DETAILS

#### Well Purpose Explanation:

Is the well:

|                                                          |    |                                                                                                                         |
|----------------------------------------------------------|----|-------------------------------------------------------------------------------------------------------------------------|
| <input type="checkbox"/> A Flowing Artesian Well         | or | <input checked="" type="checkbox"/> A Non-flowing Artesian Well                                                         |
| <input type="checkbox"/> Stick up (above land surface)   |    | <input checked="" type="checkbox"/> Simple top casing <input checked="" type="checkbox"/> Stick up (above land surface) |
| <input type="checkbox"/> In a vault (below land surface) |    | <input type="checkbox"/> Other (explain): _____ <input type="checkbox"/> In a vault (below land surface)                |

Note: all units are in decimal feet, except for casing diameter (in)

#### Please take photos!

Photo Labeling Example:  
2024-10-02\_GL-332\_Project\_Hernandez

Is the existing well in DBHydro?

Please mark: ☒ Yes ☐ No

If YES:

Please write DBKEY: A0597

Is the well surveyed in DBHydro?

Please mark: ☒ Yes ☐ No

If YES, what is the Ref. Point Elevation?

☒ NGVD29 ☒ NAVD88 78.82

Are field parameters collected?

Please mark: ☒ Yes ☐ No

- |                                  |                                |
|----------------------------------|--------------------------------|
| • pH: <u>6.58</u>                | • Temp (°C): <u>23.71</u>      |
| • SPC (µS/cm): <u>154.0</u>      | • Turbidity (NTU): <u>48.9</u> |
| • YSI - EXO ID: <u>134100001</u> | • Sounder ID: _____            |

Additional Notes / Sketch:

Land Surface

Measuring Point (MP)

MP Description: Black Mark at TOC

MP Distance to Land Surface: SP 51.5" 4.24  
4/13/26

Casing Diameter: ID: 4 (in)  
OD: \_\_\_\_\_ (in)  
Casing Material: \_\_\_\_\_

DTW from MP: 8.42 (ft)

E-Tape ID: Carolina

If Camera used:  
☐ Screen  
☐ Open Hole

Top from MP: \_\_\_\_\_ (ft)  
Bottom from MP: \_\_\_\_\_ (ft)

Total Depth from MP:  
32.05 + 0.77 = 32.82 (ft)  
(reading) + (weight) = (total)

Total Depth:

Tag: ☐ Soft ☒ ☐ Hard

Note: Not to Scale





# Monitoring Well Field Verification Form

## Hydrogeology Unit

### PART I: GENERAL INFORMATION

|                                                                                                                    |                                           |                                                                                                                                            |
|--------------------------------------------------------------------------------------------------------------------|-------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| Well ID: <u>POS-18</u>                                                                                             | Site Name / Project: <u>DMIT (LACRIE)</u> | County: <u>Polk</u>                                                                                                                        |
| Date: <u>04/03/25</u>                                                                                              | Time: <u>1235</u>                         | Staff Group: <u>SP, GC</u>                                                                                                                 |
| Location: (Please select)<br><input type="checkbox"/> DMS <input type="checkbox"/> DD <input type="checkbox"/> DDM | Latitude: _____<br>Longitude: _____       | Source:<br><input type="checkbox"/> Phone / Tablet<br><input type="checkbox"/> GPS Unit<br><input type="checkbox"/> Other (explain): _____ |

### PART II: WELL DETAILS

#### Well Purpose Explanation:

Is the well:

☐ A Flowing Artesian Well

or

☒ A Non-flowing Artesian Well

☐ Stick up  
(above land surface)

☐ In a vault  
(below land surface)

☒ Simple top casing

☐ Other (explain): \_\_\_\_\_

☒ Stick up  
(above land surface)

☐ In a vault  
(below land surface)

**Note:** all units are in decimal feet, except for casing diameter (in)

**Please take photos!**

Photo Labeling Example:  
2024-10-02\_GL-332\_Project\_Hernandez

Is the existing well in DBHydro?

Please mark: ☒ YES ☐ NO

If YES:

Please write DBKEY: A0598

Is the well surveyed in DBHydro?

Please mark: ☒ YES ☐ NO

If YES, what is the Ref. Point Elevation?

☐ NGVD29 ☒ ~~NAVD83~~ 86.1

Are field parameters collected?

Please mark: ☒ YES ☐ NO

- pH: 4.42
- Temp (°C): 23.740
- SPC (µS/cm): 31.7
- Turbidity (NTU): 176
- YSI - EXO ID: 13A10001
- Sounder ID: \_\_\_\_\_

Additional Notes / Sketch:

Measuring Point  
(MP)

MP Description:

Black Mark  
at TOC

MP Distance to  
Land Surface:

SP 45.25  
4/13/26  
3.77

Casing Diameter:

ID: 4 (in)

OD: \_\_\_\_\_ (in)

Casing Material:

PVC

DTW from MP:

10.87 (ft)

E-Tape ID:

Carolina

If Camera used:

☐ Screen

☐ Open Hole

Top from MP:

\_\_\_\_\_ (ft)

Bottom from MP:

\_\_\_\_\_ (ft)

Total Depth from MP:

33.81 + 0.77 = 34.58 (ft)  
(reading) + (weight) = (total)

Total Depth:

Tag: ☐ Soft ☒ ~~Medium~~ ☐ Hard

**Note:** Not to Scale



## Monitoring Well Field Verification Form

### Hydrogeology Unit

#### PART I: GENERAL INFORMATION

|                                                                                                                    |                                           |                                                                                                                                            |
|--------------------------------------------------------------------------------------------------------------------|-------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| Well ID: <u>POS-19</u>                                                                                             | Site Name / Project: <u>DMIT (LMCRHW)</u> | County: <u>Polk</u>                                                                                                                        |
| Date: <u>04/03/25</u>                                                                                              | Time: <u>1108</u>                         | Staff Group: <u>SP, GC</u>                                                                                                                 |
| Location: (Please select)<br><input type="checkbox"/> DMS <input type="checkbox"/> DD <input type="checkbox"/> DDM | Latitude: _____<br>Longitude: _____       | Source:<br><input type="checkbox"/> Phone / Tablet<br><input type="checkbox"/> GPS Unit<br><input type="checkbox"/> Other (explain): _____ |

#### PART II: WELL DETAILS

##### Well Purpose Explanation:

Is the well:

|                                                          |    |                                                                   |
|----------------------------------------------------------|----|-------------------------------------------------------------------|
| <input type="checkbox"/> A Flowing Artesian Well         | or | <input checked="" type="checkbox"/> A Non-flowing Artesian Well   |
| <input type="checkbox"/> Stick up (above land surface)   |    | <input checked="" type="checkbox"/> Simple top casing             |
| <input type="checkbox"/> In a vault (below land surface) |    | <input checked="" type="checkbox"/> Stick up (above land surface) |
|                                                          |    | <input type="checkbox"/> In a vault (below land surface)          |
|                                                          |    | <input type="checkbox"/> Other (explain): _____                   |

Note: all units are in decimal feet, except for casing diameter (in)

##### Please take photos!

Photo Labeling Example:  
2024-10-02\_GL-332\_Project\_Hernandez

Is the existing well in DBHydro?

Please mark: ☒ Yes ☐ No

If YES:

Please write DBKEY: AO 600

Is the well surveyed in DBHydro?

Please mark: ☒ Yes ☐ No

If YES, what is the Ref. Point Elevation?

☐ NGVD29 ☒ NAVD88 86.10

Are field parameters collected?

Please mark: ☒ Yes ☐ No

- pH: 4.30
- Temp (°C): 27.19
- SPC (µS/cm): 26.4
- Turbidity (NTU): 119
- YSI - EXO ID: 13#100001
- Sounder ID: \_\_\_\_\_

Additional Notes / Sketch:

Land Surface

Measuring Point (MP)

MP Description: Black mark at TOC

MP Distance to Land Surface: SP 49" 4.08  
4/13/26

Casing Diameter: ID: 4 (in)  
OD: \_\_\_\_\_ (in)  
Casing Material: \_\_\_\_\_

DTW from MP: 9.89 (ft)

E-Tape ID: Carolina

If Camera used:  
☐ Screen  
☐ Open Hole

Top from MP: \_\_\_\_\_ (ft)  
Bottom from MP: \_\_\_\_\_ (ft)

Total Depth from MP:  
33.72 + 0.77 = 34.49 (ft)  
(reading) + (weight) = (total)

Total Depth:

Tag: ☐ Soft ☒ Medium ☐ Hard

Note: Not to Scale





# Monitoring Well Field Verification Form

## Hydrogeology Unit

### PART I: GENERAL INFORMATION

|                                                                                                                    |                                            |                                                                                                                                            |
|--------------------------------------------------------------------------------------------------------------------|--------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| Well ID: <u>POS-20</u>                                                                                             | Site Name / Project: <u>DMIT (SUMICAM)</u> | County: <u>Polk</u>                                                                                                                        |
| Date: <u>04/02/25</u>                                                                                              | Time: <u>1100</u>                          | Staff Group: <u>SP, GC</u>                                                                                                                 |
| Location: (Please select)<br><input type="checkbox"/> DMS <input type="checkbox"/> DD <input type="checkbox"/> DDM | Latitude: _____<br>Longitude: _____        | Source:<br><input type="checkbox"/> Phone / Tablet<br><input type="checkbox"/> GPS Unit<br><input type="checkbox"/> Other (explain): _____ |

### PART II: WELL DETAILS

#### Well Purpose Explanation:

Is the well:

|                                                          |    |                                                                   |
|----------------------------------------------------------|----|-------------------------------------------------------------------|
| <input type="checkbox"/> A Flowing Artesian Well         | or | <input checked="" type="checkbox"/> A Non-flowing Artesian Well   |
| <input type="checkbox"/> Stick up (above land surface)   |    | <input checked="" type="checkbox"/> Simple top casing             |
| <input type="checkbox"/> In a vault (below land surface) |    | <input checked="" type="checkbox"/> Stick up (above land surface) |
|                                                          |    | <input type="checkbox"/> In a vault (below land surface)          |
|                                                          |    | <input type="checkbox"/> Other (explain): _____                   |

**Note:** all units are in decimal feet, except for casing diameter (in)

#### Please take photos!

Photo Labeling Example:  
2024-10-02\_GL-332\_Project\_Hernandez

Is the existing well in DBHydro?

Please mark: ☒ Yes ☐ No

If YES:

Please write DBKEY: 39281

Is the well surveyed in DBHydro?

Please mark: ☒ Yes ☐ No

If YES, what is the Ref. Point Elevation?

☒ NGVD29 ☒ ~~NAVD83~~ 70.63

Are field parameters collected?

Please mark: ☒ Yes ☐ No

- pH: 5.77
- Temp (°C): 24.26
- SPC (µS/cm): 139.6
- Turbidity (NTU): 2.29
- YSI - EXO ID: 134100001
- Sounder ID: \_\_\_\_\_

Additional Notes / Sketch:

Land Surface

Measuring Point (MP)

MP Description: Black mark at TOC

MP Distance to Land Surface: SP 40" 3.33  
4/13/26

Casing Diameter: ID: 4 (in)  
OD: \_\_\_\_\_ (in)  
Casing Material: PVC

DTW from MP: 7.13 (ft)

E-Tape ID: Carolina

If Camera used:  
☐ Screen  
☐ Open Hole

Top from MP: \_\_\_\_\_ (ft)  
Bottom from MP: \_\_\_\_\_ (ft)

Total Depth from MP:  
33.44 + 0.77 = 34.21 (ft)  
(reading) + (weight) = (total)

Total Depth:

Tag: ☐ Soft ☒ ~~Medium~~ ☐ Hard

**Note:** Not to Scale



# Monitoring Well Field Verification Form

## Hydrogeology Unit

### PART I: GENERAL INFORMATION

|                                                                                                                    |                                            |                                                                                                                                            |
|--------------------------------------------------------------------------------------------------------------------|--------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| Well ID: <u>POS-21</u>                                                                                             | Site Name / Project: <u>DMIT (SUMICAS)</u> | County: <u>POLK</u>                                                                                                                        |
| Date: <u>04/02/25</u>                                                                                              | Time: <u>1211</u>                          | Staff Group: <u>SP, GL</u>                                                                                                                 |
| Location: (Please select)<br><input type="checkbox"/> DMS <input type="checkbox"/> DD <input type="checkbox"/> DDM | Latitude: _____<br>Longitude: _____        | Source:<br><input type="checkbox"/> Phone / Tablet<br><input type="checkbox"/> GPS Unit<br><input type="checkbox"/> Other (explain): _____ |

### PART II: WELL DETAILS

#### Well Purpose Explanation:

Is the well:

☐ A Flowing Artesian Well

or

☒ A Non-flowing Artesian Well

☐ Stick up  
(above land surface)

☐ In a vault  
(below land surface)

☒ Simple top casing

☐ Other (explain): \_\_\_\_\_

☒ Stick up  
(above land surface)

☐ In a vault  
(below land surface)

**Note:** all units are in decimal feet, except for casing diameter (in)

#### Please take photos!

Photo Labeling Example:  
2024-10-02\_GL-332\_Project\_Hernandez

Is the existing well in DBHydro?

Please mark: ☒ YES ☐ NO

If YES:

Please write DBKEY: 39283

Is the well surveyed in DBHydro?

Please mark: ☒ YES ☐ NO

If YES, what is the Ref. Point Elevation?

NGVD29 ☒ NAVD83 71.32

Are field parameters collected?

Please mark: ☒ YES ☐ NO

- pH: 5.82
- Temp (°C): 23.621
- SPC (µS/cm): 522
- Turbidity (NTU): 1.95
- YSI - EXO ID: 13 H100001
- Sounder ID: \_\_\_\_\_

Additional Notes / Sketch:

Measuring Point  
(MP)

MP Description:

Black mark  
at TOC

MP Distance to  
Land Surface:

SP 38.5" 3.21  
4/13/26

Casing Diameter:

ID: 4 (in)

OD: \_\_\_\_\_ (in)

Casing Material:

PVC

DTW from MP:

8.67 (ft)

E-Tape ID:

Carolina

If Camera used:

☐ Screen

☐ Open Hole

Top from MP:

\_\_\_\_\_ (ft)

Bottom from MP:

\_\_\_\_\_ (ft)

Total Depth from MP:

33.81 + 0.77 = 34.58 (ft)  
(reading) + (weight) = (total)

Total Depth:

Tag: ☐ Soft ☒ Medium ☐ Hard

**Note:** Not to Scale





## Monitoring Well Field Verification Form Hydrogeology Unit

### PART I: GENERAL INFORMATION

|                                                                                                                    |                                           |                                                                                                                                            |
|--------------------------------------------------------------------------------------------------------------------|-------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| Well ID: <u>ORS-8</u>                                                                                              | Site Name / Project: <u>DMIT (SHINGA)</u> | County: <u>orange</u>                                                                                                                      |
| Date: <u>04/03/25</u>                                                                                              | Time: <u>1440</u>                         | Staff Group: <u>SP, GC</u>                                                                                                                 |
| Location: (Please select)<br><input type="checkbox"/> DMS <input type="checkbox"/> DD <input type="checkbox"/> DDM | Latitude: _____<br>Longitude: _____       | Source:<br><input type="checkbox"/> Phone / Tablet<br><input type="checkbox"/> GPS Unit<br><input type="checkbox"/> Other (explain): _____ |

### PART II: WELL DETAILS

#### Well Purpose Explanation:

Is the well:

|                                                          |    |                                                                   |
|----------------------------------------------------------|----|-------------------------------------------------------------------|
| <input type="checkbox"/> A Flowing Artesian Well         | or | <input checked="" type="checkbox"/> A Non-flowing Artesian Well   |
| <input type="checkbox"/> Stick up (above land surface)   |    | <input checked="" type="checkbox"/> Simple top casing             |
| <input type="checkbox"/> In a vault (below land surface) |    | <input checked="" type="checkbox"/> Stick up (above land surface) |
|                                                          |    | <input type="checkbox"/> In a vault (below land surface)          |
|                                                          |    | <input type="checkbox"/> Other (explain): _____                   |

**Note:** all units are in decimal feet, except for casing diameter (in)

#### Please take photos!

Photo Labeling Example:  
2024-10-02\_GL-332\_Project\_Hernandez

Is the existing well in DBHydro?

Please mark: ☒ YES ☐ NO

If YES:

Please write DBKEY: A0592

Is the well surveyed in DBHydro?

Please mark: ☒ YES ☐ NO

If YES, what is the Ref. Point Elevation?

☐ NGVD29

☒ NAVD88

Are field parameters collected?

Please mark: ☒ YES ☐ NO

- pH: 5.54
- Temp (°C): 23.61
- SPC (µS/cm): 88.3
- Turbidity (NTU): 354
- YSI - EXO ID: 13H100601
- Sounder ID: \_\_\_\_\_

Additional Notes / Sketch:

Land Surface

Measuring Point (MP)

MP Description: Black mark at TOC

MP Distance to Land Surface: SP 43" 3.58  
4/13/26

Casing Diameter:  
ID: 4 (in)  
OD: \_\_\_\_\_ (in)  
Casing Material: PVC

DTW from MP: 7.51 (ft)

E-Tape ID: carolina

If Camera used:  
☐ Screen  
☐ Open Hole

Top from MP: \_\_\_\_\_ (ft)

Bottom from MP: \_\_\_\_\_ (ft)

Total Depth from MP:  
29.78 + 0.77 = 30.55 (ft)  
(reading) + (weight) = (total)

Total Depth:

Tag: ☐ Soft ☒ Hard

**Note:** Not to Scale



## Monitoring Well Field Verification Form Hydrogeology Unit

### PART I: GENERAL INFORMATION

|                                                                                                                    |                                     |                                                                                                                                                                |
|--------------------------------------------------------------------------------------------------------------------|-------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Well ID: <u>055-1</u>                                                                                              | Site Name / Project: <u>OMIT</u>    | County: <u>Osceola</u>                                                                                                                                         |
| Date: <u>07/10/25</u>                                                                                              | Time: <u>1219</u>                   | Staff Group: <u>SPCHB</u>                                                                                                                                      |
| Location: (Please select)<br><input type="checkbox"/> DMS <input type="checkbox"/> DD <input type="checkbox"/> DDM | Latitude: _____<br>Longitude: _____ | Source:<br><input type="checkbox"/> Phone / Tablet<br><input type="checkbox"/> GPS Unit<br><input checked="" type="checkbox"/> Other (explain): <u>DBHydro</u> |

### PART II: WELL DETAILS

#### Well Purpose Explanation:

Is the well:

|                                                          |    |                                                                   |
|----------------------------------------------------------|----|-------------------------------------------------------------------|
| <input type="checkbox"/> A Flowing Artesian Well         | or | <input checked="" type="checkbox"/> A Non-flowing Artesian Well   |
| <input type="checkbox"/> Stick up (above land surface)   |    | <input checked="" type="checkbox"/> Stick up (above land surface) |
| <input type="checkbox"/> In a vault (below land surface) |    | <input type="checkbox"/> In a vault (below land surface)          |
|                                                          |    | <input type="checkbox"/> Simple top casing                        |
|                                                          |    | <input type="checkbox"/> Other (explain): _____                   |

**Note: all units are in decimal feet, except for casing diameter (in)**

Land Surface

Measuring Point (MP)  
MP Description: 11x11 inch on TOC

Casing Diameter:  
ID: 4 (in)  
OD: 8 (in)  
Casing Material: PVC

DTW from MP: 7.40 (ft)  
E-Tape ID: \_\_\_\_\_

If Camera used:  
☐ Screen  
☐ Open Hole

Top from MP: ~31 (ft)  
Bottom from MP: ~35.9 (ft)

Total Depth from MP:  
34.77 + 0.77 = \_\_\_\_\_ (ft)  
(reading) + (weight) = (total)

Total Depth: \_\_\_\_\_

Tag: ☒ Soft ☐ Normal ☐ Hard

#### Please take photos!

Photo Labeling Example:  
2024-10-02\_GL-332\_Project\_Hernandez

Is the existing well in DBHydro?  
Please mark: ☒ Yes ☐ No

If YES:

Please write DBKEY: \_\_\_\_\_

Is the well surveyed in DBHydro?

Please mark: ☒ Yes ☐ No

If YES, what is the Ref. Point Elevation?

☐ NGVD29

☐ NAVD88

Are field parameters collected?

Please mark: ☒ Yes ☐ No

- pH: 4.35
- Temp (°C): 23.10
- SPC (µS/cm): 49.3
- Turbidity (NTU): \_\_\_\_\_
- YSI - EXO ID: 196103877
- Sounder ID: \_\_\_\_\_

Additional Notes / Sketch:

Borehole cam @ 1220  
@ 1221-1223  
Screen @ 31 ft  
bottom @ 35.9 ft

Key Required to Access Site:

Please mark: ☒ Yes ☐ No

Observation: SCADA

**Note: Not to Scale**





## Monitoring Well Field Verification Form

### Hydrogeology Unit

#### PART I: GENERAL INFORMATION

|                                                                                                                    |                                                     |                                                                                                                                                                |
|--------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Well ID: <u>DSS-2</u>                                                                                              | Site Name / Project: <u>DMT</u>                     | County: <u>Osceola</u>                                                                                                                                         |
| Date: <u>07 / 10 / 25</u>                                                                                          | Time: <u>1107</u>                                   | Staff Group: <u>SP, CHB</u>                                                                                                                                    |
| Location: (Please select)<br><input type="checkbox"/> DMS <input type="checkbox"/> DD <input type="checkbox"/> DDM | Latitude: <u>      </u><br>Longitude: <u>      </u> | Source:<br><input type="checkbox"/> Phone / Tablet<br><input type="checkbox"/> GPS Unit<br><input checked="" type="checkbox"/> Other (explain): <u>DBHydro</u> |

#### PART II: WELL DETAILS

|                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                    |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Well Purpose Explanation:                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                    |
| Is the well:<br><input type="checkbox"/> A Flowing Artesian Well<br><input type="checkbox"/> Stick up (above land surface)<br><input type="checkbox"/> In a vault (below land surface)                                                                                                                                     |                                                                                                                                                                                                                                                                                                    |
| or<br><input checked="" type="checkbox"/> A Non-flowing Artesian Well<br><input checked="" type="checkbox"/> Simple top casing<br><input type="checkbox"/> Other (explain): <u>      </u><br><input checked="" type="checkbox"/> Stick up (above land surface)<br><input type="checkbox"/> In a vault (below land surface) |                                                                                                                                                                                                                                                                                                    |
| <b>Note: all units are in decimal feet, except for casing diameter (in)</b>                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                    |
|                                                                                                                                                                                                                                                                                                                            | <b>Please take photos!</b><br>Photo Labeling Example:<br>2024-10-02_GL-332_Project_Hernandez                                                                                                                                                                                                       |
| <b>Measuring Point (MP)</b><br>MP Description:<br><u>"X" on TDC</u>                                                                                                                                                                                                                                                        | Is the existing well in DBHydro?<br>Please mark: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No<br>If YES:<br>Please <b>write</b> DBKEY: <u>      </u>                                                                                                                        |
| <b>If Camera used:</b><br><input type="checkbox"/> Screen<br><input type="checkbox"/> Open Hole                                                                                                                                                                                                                            | Is the well surveyed in DBHydro?<br>Please mark: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No<br>If YES, what is the Ref. Point Elevation?<br><input type="checkbox"/> NGVD29 <input type="checkbox"/> NAVD88 <u>      </u>                                                 |
| <b>Top from MP:</b><br><u>~30.9</u> (ft)<br><b>Bottom from MP:</b><br><u>~35</u> (ft)                                                                                                                                                                                                                                      | Are field parameters collected?<br>Please mark: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No<br>• pH: <u>4.18</u> • Temp (°C): <u>24.10</u><br>• SPC (µS/cm): <u>32.9</u> • Turbidity (NTU): <u>      </u><br>• YSI - EXO ID: <u>196-103877</u> • Sounder ID: <u>      </u> |
| <b>Total Depth from MP:</b><br><u>33.95</u> + 0.77 = <u>      </u> (ft)<br>(reading) + (weight) = (total)                                                                                                                                                                                                                  | <b>Additional Notes / Sketch:</b><br><u>Borehole cam @ 1113-1114</u><br><u>Screen @ 30.9</u><br><u>bottom @ 35</u>                                                                                                                                                                                 |
| <b>Total Depth:</b><br>Tag: <input type="checkbox"/> Soft <input checked="" type="checkbox"/> Normal <input type="checkbox"/> Hard                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                    |
| <b>Note: Not to Scale</b>                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                    |



# Monitoring Well Field Verification Form

## Hydrogeology Unit

### PART I: GENERAL INFORMATION

|                                                                                                                    |                                            |                                                                                                                                            |
|--------------------------------------------------------------------------------------------------------------------|--------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| Well ID: <u>055-3</u>                                                                                              | Site Name / Project: <u>DMIT (Gardner)</u> | County: <u>OSCEOLA</u>                                                                                                                     |
| Date: <u>04/02/25</u>                                                                                              | Time: <u>1350</u>                          | Staff Group: <u>SP, GL</u>                                                                                                                 |
| Location: (Please select)<br><input type="checkbox"/> DMS <input type="checkbox"/> DD <input type="checkbox"/> DDM | Latitude: _____<br>Longitude: _____        | Source:<br><input type="checkbox"/> Phone / Tablet<br><input type="checkbox"/> GPS Unit<br><input type="checkbox"/> Other (explain): _____ |

### PART II: WELL DETAILS

#### Well Purpose Explanation:

Is the well:

☐ A Flowing Artesian Well

or

☒ A Non-flowing Artesian Well

☐ Stick up  
(above land surface)

☐ In a vault  
(below land surface)

☒ Simple top casing

☐ Other (explain): \_\_\_\_\_

☒ Stick up  
(above land surface)

☐ In a vault  
(below land surface)

**Note:** all units are in decimal feet, except for casing diameter (in)

**Please take photos!**

Photo Labeling Example:  
2024-10-02\_GL-332\_Project\_Hernandez

Is the existing well in DBHydro?

Please mark: ☒ YES ☐ NO

If YES:

Please write DBKEY: 39286

Is the well surveyed in DBHydro?

Please mark: ☒ YES ☐ NO

If YES, what is the Ref. Point Elevation?

☐ NGVD29 ☒ NAVD88 58.87

Are field parameters collected?

Please mark: ☒ YES ☐ NO

• pH: 6.64 • Temp (°C): 23.926

• SPC (µS/cm): 1339 • Turbidity (NTU): 1.67

• YSI - EXO ID: 13410001 • Sounder ID: \_\_\_\_\_

Additional Notes / Sketch:

Measuring Point  
(MP)

MP Description:

Black mark  
at TOC

MP Distance to  
Land Surface:

SP 43.5' 3.63  
4/13/26

Casing Diameter:

ID: 4 (in)

OD: \_\_\_\_\_ (in)

Casing Material:

PVC

DTW from MP:

8.96 (ft)

E-Tape ID:

Carolina

If Camera used:

☐ Screen

☐ Open Hole

Top from MP:

\_\_\_\_\_ (ft)

Bottom from MP:

\_\_\_\_\_ (ft)

Total Depth from MP:

34.54 + 0.77 = 35.31 (ft)  
(reading) + (weight) = (total)

Total Depth:

Tag: ☐ Soft ☒ Medium ☐ Hard

**Note:** Not to Scale



**APPENDIX F:  
CHEMICAL WATER QUALITY FIELD FORMS**

## Lab P #:

Project Name: DMIT

Date: 4/3/25

Start Time: 8:25

End Time: \_\_\_\_\_

Pre-purge DTW: 9.24

Post-purge DTW:

Casing Diameter (in): 4

Hole / Screen Diameter (in):

\_\_\_\_\_

Inner Casing Diameter (in):

Outer Casing Diameter (in):

$$= (\text{_____ feet} - \text{_____ feet}) \times \text{_____ gallons/foot} = \text{_____ gallons}$$

Total Purged Volume (gallons):

Pump Method:

Q [gpm]:

Pump Name:

(tolerance btwn last 3 readings as  $\pm$

Sampling Start Time: \_\_\_\_\_ Sampling End Time: \_\_\_\_\_

Additional Comments:

Useful Purge Calculators: <https://hydro-terra.com/well-volume-calculator/>



## Lab P #:

Project Name: DMTT

Date: 4/5/25

Start Time: 9:15

End Time: \_\_\_\_\_

Pre-purge DTW: 8.12

Post-purge DTW:

Casing Diameter (in):

Hole / Screen Diameter (in):

---

Inner Casing Diameter (in):

Outer Casing Diameter (in):

$$= (\text{feet} - \text{feet}) \times \text{gallons/foot} = \text{gallons}$$

|                                |              |
|--------------------------------|--------------|
| Total Purged Volume (gallons): | Pump Method: |
|--------------------------------|--------------|

Q [gpm]: \_\_\_\_\_ Pump Name: \_\_\_\_\_

EXO Sonde ID: (tolerance btwn last 3 readings as  $\pm$

(tolerance btwn last 3 readings as  $\pm$

|                      |                    |
|----------------------|--------------------|
| Sampling Start Time: | Sampling End Time: |
|----------------------|--------------------|

Additional Comments:

updated 03-03-2025 by Aurora Bouchier (1/4 volume between readings - but not less than 2-min intervals)

## Lab P #:

Project Name: DM17

Date: 4/3/25

Start Time: 17:35

End Time: \_\_\_\_\_

Pre-purge DTW: 10.87

Post-purge DTW:

Casing Diameter (in): 4

Hole / Screen Diameter (in):

\_\_\_\_\_

Inner Casing Diameter (in):

Outer Casing Diameter (in):

$$= (\text{feet} - \text{feet}) \times \text{gallons/foot} = \text{gallons}$$

Total Purged Volume (gallons):

Pump Method:

Q [gpm]:

Pump Name:

(tolerance btwn last 3 readings as  $\pm$

Sampling Start Time: Sampling End Time:

Additional Comments:

Useful Purge Calculators: <https://hydro-terra.com/well-volume-calculator/>



## Lab P #:

## Project Name:

Date: \_\_\_\_\_

Start Time: \_\_\_\_\_

End Time: \_\_\_\_\_

Pre-purge DTW: 8.98

Post-purge DTW:

Casing Diameter (in):

Hole / Screen Diameter (in):

---

Inner Casing Diameter (in):

Outer Casing Diameter (in):

$$= (\text{feet} - \text{feet}) \times \text{gallons/foot} = \text{gallons}$$

|                                |              |
|--------------------------------|--------------|
| Total Purged Volume (gallons): | Pump Method: |
|--------------------------------|--------------|

Q [gpm]: \_\_\_\_\_ Pump Name: \_\_\_\_\_

EXO Sonde ID: (tolerance btwn last 3 readings as  $\pm$

(tolerance btwn last 3 readings as  $\pm$

Sampling Start Time: Sampling End Time:

Additional Comments:

Useful Purge Calculators: <https://hydro-terra.com/well-volume-calculator/>

## Lab P #:

Project Name: DMTT

Date: 4/27/25

Start Time: 11:26

End Time: \_\_\_\_\_

Pre-purge DTW: 7.03

Casing Diameter (in): 4

Hole / Screen Diameter (in):

Casing Depth (ft bmp):

## Well Depth (ft bmp):

Inner Casing Diameter (in):

Casing Depth (ft bmp):

Outer Casing Diameter (in):

$$= (32 \text{ feet} - 25 \text{ feet}) \times \text{gallons/foot} = 16 \text{ gallons}$$

well capacity (gallons/foot) : 2" = 0.16, 3" = 0.37, 4" = 0.65, 5" = 1.02, 6" = 1.47, 8" = 2.61, 10" = 4.08, 12" = 5.87, 16" = 10.44

Total Purged Volume (gallons):

Pump Method:

Q [gpm]:

Pump Name:

## EXO Sonde ID:

(tolerance btwn last 3 readings as  $\pm$

Sampling Start Time: \_\_\_\_\_ Sampling End Time: \_\_\_\_\_

Additional Comments:

Camera @ 11:13

Useful Purge Calculators: <https://hydro-terra.com/well-volume-calculator/>



## Lab P #:

## Project Name: D.M.T

Date: 4/2/25

Start Time: 12:20

End Time:

Pre-purge DTW: 8.67

Post-purge DTW: \_\_\_\_\_

## Stick up (ft als):

Casing Diameter (in):

Hole / Screen Diameter (in):

---

## Well Depth (ft bmp):

Inner Casing Diameter (in):

Outer Casing Diameter (in):

$$= (44.3 \text{ feet} - 8.7 \text{ feet}) \times .65 \text{ gallons/foot} = 24 \text{ gallons}$$

Total Purged Volume (gallons): \_\_\_\_\_ Pump Method: Submersible

Q [gpm]: 31.5 CPM Pump Name: 2-20-16-3150

EXO Sonde ID: (tolerance btwn last 3 readings as  $\pm$

## EXO Sonde ID:

(tolerance btwn last 3 readings as  $\pm$

Sampling Start Time:                      Sampling End Time:

Sampling Start Time: \_\_\_\_\_ Sampling End Time: \_\_\_\_\_

Useful Purge Calculators: <https://hydro-terra.com/well-volume-calculator/>

## Lab P #:

Project Name: DMIT

Date: 9/3/25  
Start Time: 14:45  
End Time:

Pre-purge DTW: 7.51  
Post-purge DTW:

|                     |                              |                                   |
|---------------------|------------------------------|-----------------------------------|
| <b>Annular Zone</b> | Well Depth (ft bmp): _____   | Inner Casing Diameter (in): _____ |
|                     | Casing Depth (ft bmp): _____ | Outer Casing Diameter (in): _____ |

Total Purged Volume (gallons): \_\_\_\_\_ Pump Method: submersible  
Q [gpm]: .75 Pump Name: \_\_\_\_\_

(tolerance btwn last 3 readings as  $\pm$

[illegible]

Sampling Start Time: \_\_\_\_\_ Sampling End Time: \_\_\_\_\_

Additional Comments:

Useful Purge Calculators: <https://hydro-terra.com/well-volume-calculator/>





## Lab P #:

Project Name: DMIT

Date: 10/07/25

Start Time: 1125.

End Time: 11:55

Pre-purge DTW: 10.81

Post-purge DTW: 10.84

Casing Diameter (in): 4

Hole / Screen Diameter (in):

1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100, 2101, 2102, 2103, 2104, 2105, 2106, 2107, 2108, 2109, 2110, 2111, 2112, 2113, 2114, 2115, 2116, 2117, 2118, 2119, 2120, 2121, 2122, 2123, 2124, 2125, 2126, 2127, 2128, 2129, 2130, 2131, 2132, 2133, 2134, 2135, 2136, 2137, 2138, 2139, 2140, 2141, 2142, 2143, 2144, 2145, 2146, 2147, 2148, 2149, 2150, 2151, 2152, 2153, 2154, 2155, 2156, 2157, 2158, 2159, 2160, 2161, 2162, 2163, 2164, 2165, 2166, 2167, 2168, 2169, 2170, 2171, 2172, 2173, 2174, 2175, 2176, 2177, 2178, 2179, 2180, 2181, 2182, 2183, 2184, 2185, 2186, 2187, 2188, 2189, 2190, 2191, 2192, 2193, 2194, 2195, 2196, 2197, 2198, 2199, 2200, 2201, 2202, 2203, 2204, 2205, 2206, 2207, 2208, 2209, 2210, 2211, 2212, 2213, 2214, 2215, 2216, 2217, 2218, 2219, 2220, 2221, 2222, 2223, 2224, 2225, 2226, 2227, 2228, 2229, 2230, 2231, 2232, 2233, 2234, 2235, 2236, 2237, 2238, 2239, 2240, 2241, 2242, 2243, 2244, 2245, 2246, 2247, 2248, 2249, 2250, 2251, 2252, 2253, 2254, 2255, 2256, 2257, 2258, 2259, 2260, 2261, 2262, 2263, 2264, 2265, 2266, 2267, 2268, 2269, 2270, 2271, 2272, 2273, 2274, 2275, 2276, 2277, 2278, 2279, 2280, 2281, 2282, 2283, 2284, 2285, 2286, 2287, 2288, 2289, 2290, 2291, 2292, 2293, 2294, 2295, 2296, 2297, 2298, 2299, 2300, 2301, 2302, 2303, 2304, 2305, 2306, 2307, 2308, 2309, 2310, 2311, 2312, 2313, 2314, 2315, 2316, 2317, 2318, 2319, 2320, 2321, 2322, 2323, 2324, 2325, 2326, 2327, 2328, 2329, 2330, 2331, 2332, 2333, 2334, 2335, 2336, 2337, 2338, 2339, 2340, 2341, 2342, 2343, 2344, 2345, 2346, 2347, 2348, 2349, 2350, 2351, 2352, 2353, 2354, 2355, 2356, 2357, 2358, 2359, 2360, 2361, 2362, 2363, 2364, 2365, 2366, 2367, 2368, 2369, 2370, 2371, 2372, 2373, 2374, 2375, 2376, 2377, 2378, 2379, 2380, 2381, 2382, 2383, 2384, 2385, 2386, 2387, 2388, 2389, 2390, 2391, 2392, 2393, 2394, 2395, 2396, 2397, 2398, 2399, 2400, 2401, 2402, 2403, 2404, 2405, 2406, 2407, 2408, 2409, 2410, 2411, 2412, 2413, 2414, 2415, 2416, 2417, 2418, 2419, 2420, 2421, 2422, 2423, 2424, 2425, 2426, 2427, 2428, 2429, 2430, 2431, 2432, 2433, 2434, 2435, 2436, 2437, 2438, 2439, 2440, 2441, 2442, 2443, 2444, 2445, 2446, 2447, 2448, 2449, 2450, 2451, 2452, 2453, 2454, 2455, 2456, 2457, 2458, 2459, 2460, 2461, 2462, 2463, 2464, 2465, 2466, 2467, 2468, 2469, 2470, 2471, 2472, 2473, 2474, 2475, 2476, 2477, 2478, 2479, 2480, 2481, 2482, 2483, 2484, 2485, 2486, 2487, 2488, 2489, 2490, 2491, 2492, 2493, 2494, 2495, 2496, 2497, 2498, 2499, 2500, 2501, 2502, 2503, 2504, 2505, 2506, 2507, 2508, 2509, 2510, 2511, 2512, 2513, 2514, 2515, 2516, 2517, 2518, 2519, 2520, 2521, 2522, 2523, 2524, 2525, 2526, 2527, 2528, 2529, 2530, 2531, 2532, 2533, 2534, 2535, 2536, 2537, 2538, 2539, 2540, 2541, 2542, 2543, 2544, 2545, 2546, 2547, 2548, 2549, 2550, 2551, 2552, 2553, 2554, 2555, 2556, 2557, 2558, 2559, 2560, 2561, 2562, 2563, 2564, 2565, 2566, 2567, 2568, 2569, 2570, 2571, 2572, 2573, 2574, 2575, 2576, 2577, 2578, 2579, 2580, 2581, 2582, 2583, 2584, 2585, 2586, 2587, 2588, 2589, 2590, 2591, 2592, 2593, 2594, 2595, 2596, 2597, 2598, 2599, 2600, 2601, 2602, 2603, 2604, 2605, 2606, 2607, 2608, 2609, 2610, 2611, 2612, 2613, 2614, 2615, 2616, 2617, 2618, 2619, 2620, 2621, 2622, 2623, 2624, 2625, 2626, 2627, 2628, 2629, 2630, 2631, 2632, 2633, 2634, 2635, 2636, 2637, 2638, 2639, 2640, 2641, 2642, 2643, 2644, 2645, 2646, 2647, 2648, 2649, 2650, 2651, 2652, 2653, 2654, 2655, 2656, 2657, 2658, 2659, 2660, 2661, 2662, 2663, 2664, 2665, 2666, 2667, 2668, 2669, 2670, 2671, 2672, 2673, 2674, 2675, 2676, 2677, 2678, 2679, 26

Inner Casing Diameter (in):

Outer Casing Diameter (in):

$$= (31 \text{ feet} - 10.81 \text{ feet}) \times 0.65 \text{ gallons/foot} = 13.12 \text{ gallons}$$

well capacity (gallons/foot) : 2" = 0.16, 3" = 0.37, 4" = 0.65, 5" = 1.02, 6" = 1.47, 8" = 2.61, 10" = 4.08, 12" = 5.87, 16" = 10.44

Pump Method: Submersible

Pump Name:

(tolerance btwn last 3 readings as  $\pm$

Sampling Start Time: Sampling End Time:
$$5 \text{ min} = 2 \text{ min} + 25 \text{ sec}$$

$$\left| \frac{5}{2.41} \right|_{\text{min}} = 2.074 \text{ gpm}$$

$$13.12 \times 3 = 39.36 / 2.074 \text{ gpm} = \sim 18 \text{ min.}$$

**Useful Purge Calculators:** <https://hydro-terra.com/well-volume-calculator/>

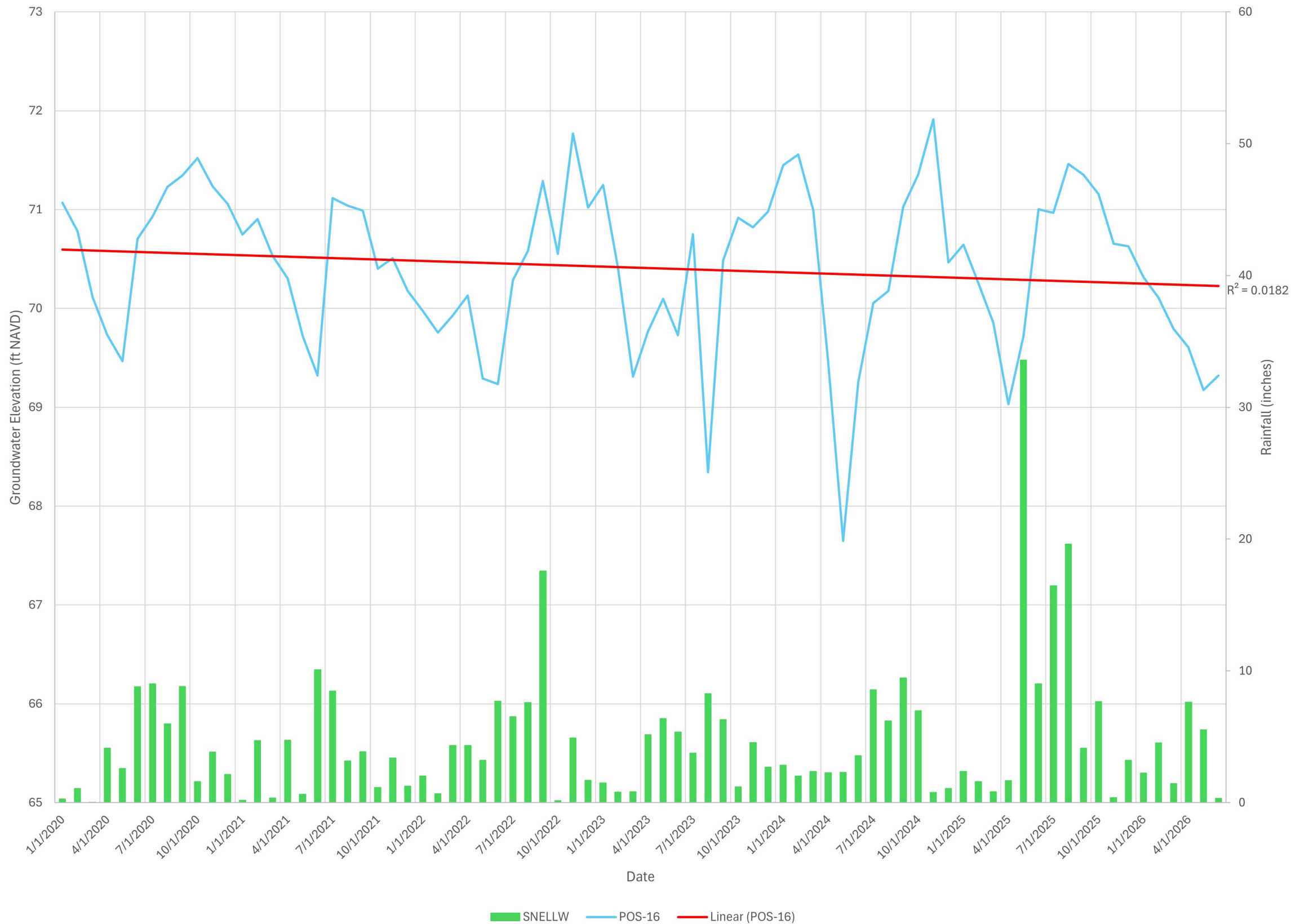


| Chemical Stability Monitoring                                                                                                                                                                                                                                                                               |       |              |                        | Lab P #: _____                     |                          |                          |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|--------------|------------------------|------------------------------------|--------------------------|--------------------------|
| <b>General Information</b>                                                                                                                                                                                                                                                                                  |       |              |                        | Project Name: <u>DMIT</u>          |                          |                          |
| Well: <u>055-3</u>                                                                                                                                                                                                                                                                                          |       |              |                        | Date: <u>4/2/25</u>                |                          |                          |
| Sampler(s): <u>S. Porter</u><br><u>G. Cook</u>                                                                                                                                                                                                                                                              |       |              |                        | Start Time: <u>14:05</u>           |                          |                          |
| Documenter: _____                                                                                                                                                                                                                                                                                           |       |              |                        | End Time: _____                    |                          |                          |
| Interval Type: <u>Open-hole or Screen or Annular Space</u>                                                                                                                                                                                                                                                  |       |              |                        | Pre-purge DTW: _____               |                          |                          |
|                                                                                                                                                                                                                                                                                                             |       |              |                        | Post-purge DTW: _____              |                          |                          |
| <b>Open Hole / Screen</b>                                                                                                                                                                                                                                                                                   |       |              |                        | Stick up (ft als): _____           |                          |                          |
|                                                                                                                                                                                                                                                                                                             |       |              |                        | Casing Diameter (in): <u>4</u>     |                          |                          |
|                                                                                                                                                                                                                                                                                                             |       |              |                        | Well Depth (ft bmp): <u>35.32</u>  |                          |                          |
|                                                                                                                                                                                                                                                                                                             |       |              |                        | Hole / Screen Diameter (in): _____ |                          |                          |
|                                                                                                                                                                                                                                                                                                             |       |              |                        | Casing Depth (ft bmp): _____       |                          |                          |
| <b>Annular Zone</b>                                                                                                                                                                                                                                                                                         |       |              |                        | Well Depth (ft bmp): _____         |                          |                          |
|                                                                                                                                                                                                                                                                                                             |       |              |                        | Inner Casing Diameter (in): _____  |                          |                          |
|                                                                                                                                                                                                                                                                                                             |       |              |                        | Casing Depth (ft bmp): _____       |                          |                          |
|                                                                                                                                                                                                                                                                                                             |       |              |                        | Outer Casing Diameter (in): _____  |                          |                          |
| <b>Well Volume:</b> 1 well volume = (total well depth - static depth to water) X Well Capacity<br>= ( _____ feet - _____ feet) X _____ gallons/foot = _____ gallons<br>well capacity (gallons/foot) : 2" = 0.16, 3" = 0.37, 4" = 0.65, 5" = 1.02, 6" = 1.47, 8" = 2.61, 10" = 4.08, 12" = 5.87, 16" = 10.44 |       |              |                        |                                    |                          |                          |
| Total Purged Volume (gallons): _____                                                                                                                                                                                                                                                                        |       |              |                        | Pump Method: <u>Submersible</u>    |                          |                          |
| Q [gpm]: _____                                                                                                                                                                                                                                                                                              |       |              |                        | Pump Name: _____                   |                          |                          |
| <b>Stability Measurements</b> <div style="display: flex; justify-content: space-between;"> <div>EXO Sonde ID: _____</div> <div>(tolerance btwn last 3 readings as ±</div> </div>                                                                                                                            |       |              |                        |                                    |                          |                          |
| #                                                                                                                                                                                                                                                                                                           | Time  | pH<br>(±0.2) | Temp [deg C]<br>(±0.2) | Sp Cond [µS/cm]<br>(±5%)           | Turbidity [NTU]<br>(≤20) | Comment (odor, color...) |
| 1                                                                                                                                                                                                                                                                                                           | 14:20 | 6.65         | 23.39                  | 1340                               | 1.94                     | 134100001                |
| 2                                                                                                                                                                                                                                                                                                           | 14:25 | 6.64         | 23.92                  | 1340                               | 2.05                     |                          |
| 3                                                                                                                                                                                                                                                                                                           | 14:30 | 6.64         | 23.92                  | 1339                               | 1.67                     |                          |
|                                                                                                                                                                                                                                                                                                             |       |              |                        |                                    |                          |                          |
|                                                                                                                                                                                                                                                                                                             |       |              |                        |                                    |                          |                          |
|                                                                                                                                                                                                                                                                                                             |       |              |                        |                                    |                          |                          |
|                                                                                                                                                                                                                                                                                                             |       |              |                        |                                    |                          |                          |
|                                                                                                                                                                                                                                                                                                             |       |              |                        |                                    |                          |                          |
|                                                                                                                                                                                                                                                                                                             |       |              |                        |                                    |                          |                          |
|                                                                                                                                                                                                                                                                                                             |       |              |                        |                                    |                          |                          |
|                                                                                                                                                                                                                                                                                                             |       |              |                        |                                    |                          |                          |
|                                                                                                                                                                                                                                                                                                             |       |              |                        |                                    |                          |                          |
|                                                                                                                                                                                                                                                                                                             |       |              |                        |                                    |                          |                          |
|                                                                                                                                                                                                                                                                                                             |       |              |                        |                                    |                          |                          |
|                                                                                                                                                                                                                                                                                                             |       |              |                        |                                    |                          |                          |
|                                                                                                                                                                                                                                                                                                             |       |              |                        |                                    |                          |                          |
|                                                                                                                                                                                                                                                                                                             |       |              |                        |                                    |                          |                          |
|                                                                                                                                                                                                                                                                                                             |       |              |                        |                                    |                          |                          |
|                                                                                                                                                                                                                                                                                                             |       |              |                        |                                    |                          |                          |
|                                                                                                                                                                                                                                                                                                             |       |              |                        |                                    |                          |                          |
| Sampling Start Time: _____ Sampling End Time: _____                                                                                                                                                                                                                                                         |       |              |                        |                                    |                          |                          |
| Additional Comments:                                                                                                                                                                                                                                                                                        |       |              |                        |                                    |                          |                          |
| Useful Purge Calculators: <a href="https://hydro-terra.com/well-volume-calculator/">https://hydro-terra.com/well-volume-calculator/</a>                                                                                                                                                                     |       |              |                        |                                    |                          |                          |

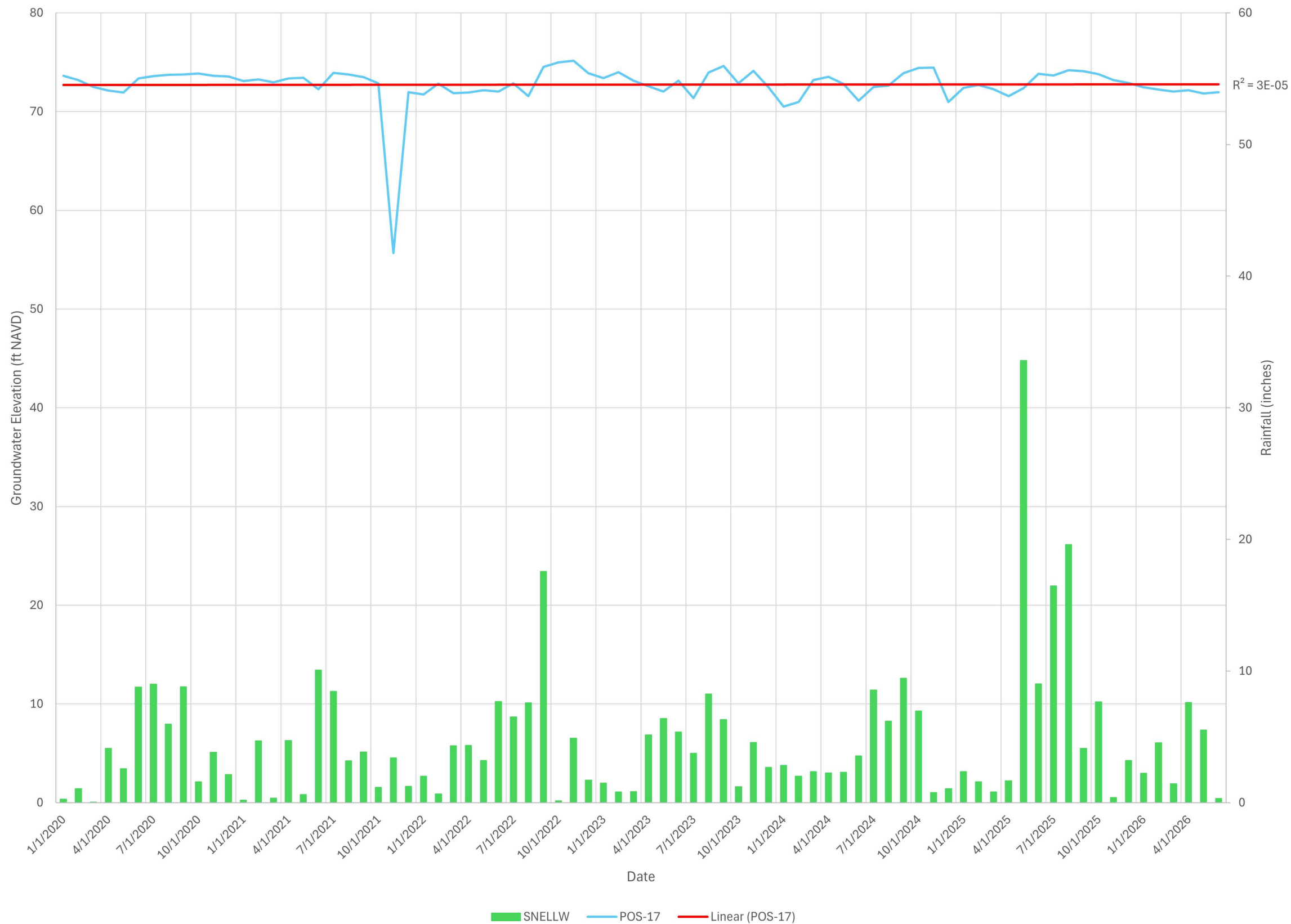
**APPENDIX G:  
GROUNDWATER ELEVATION TIME-SERIES HYDROGRAPHS**



# POS-16 Hydrograph and Rainfall Data

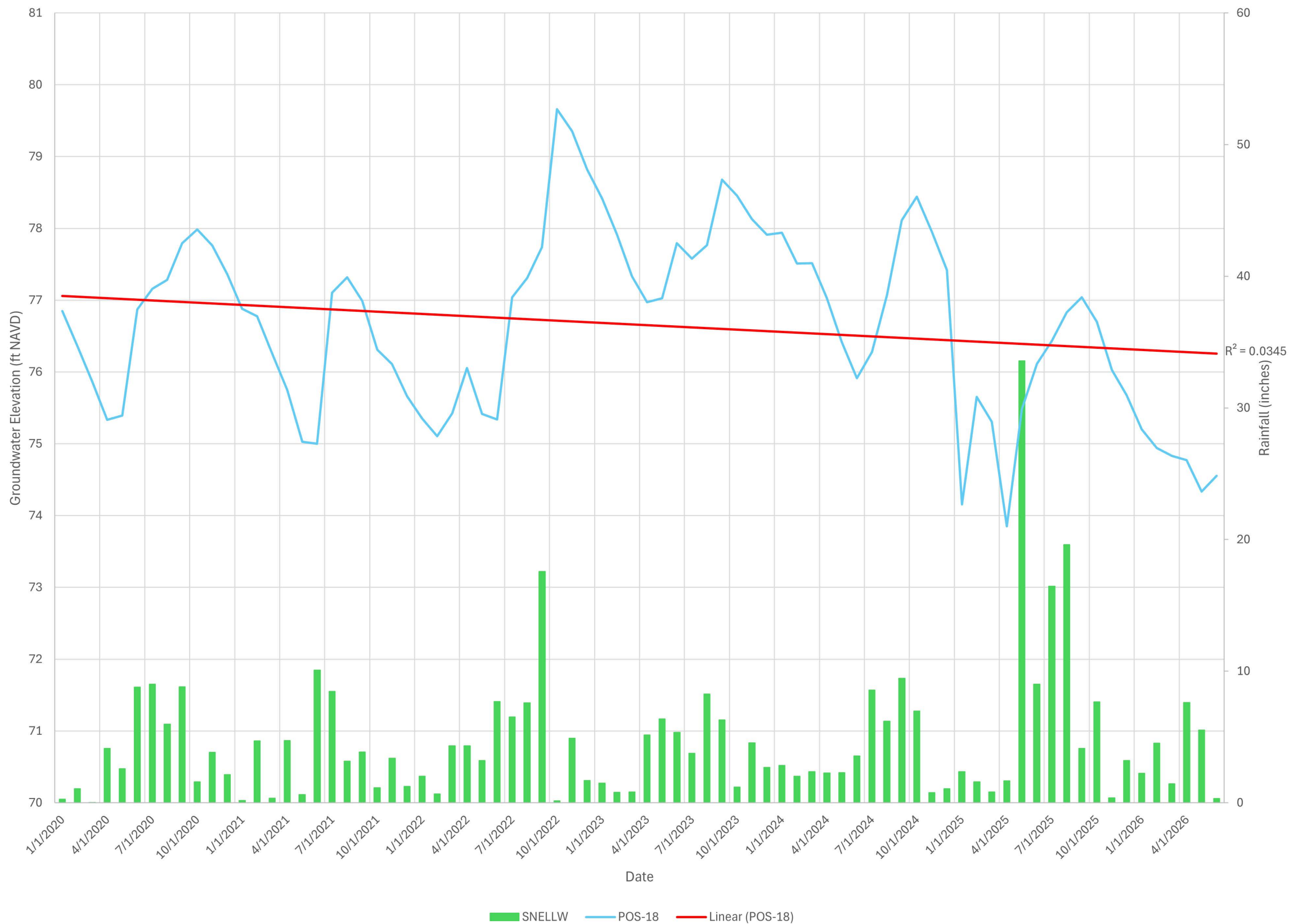


# POS-17 Hydrograph and Rainfall Data

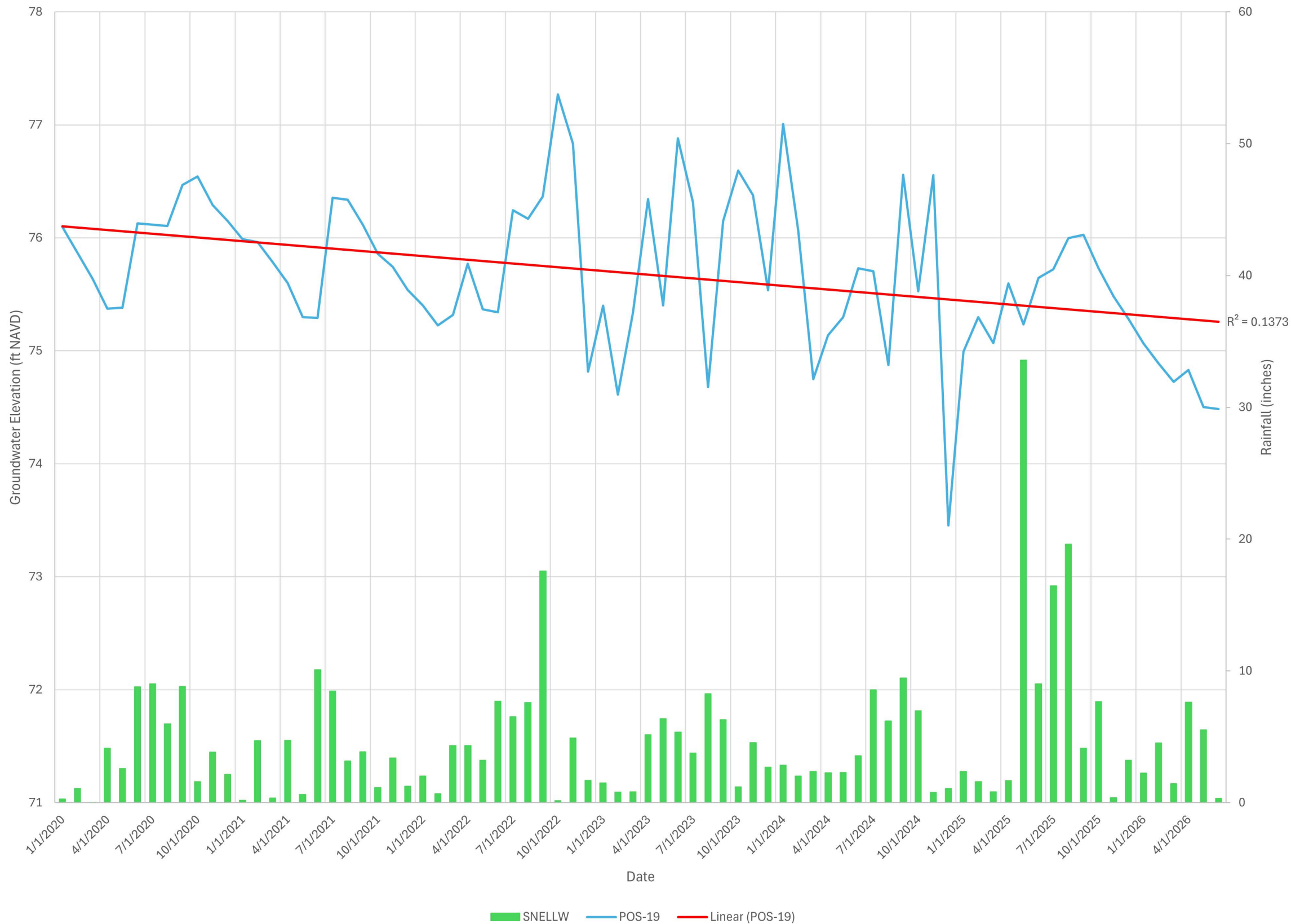




# POS-18 Hydrograph and Rainfall Data

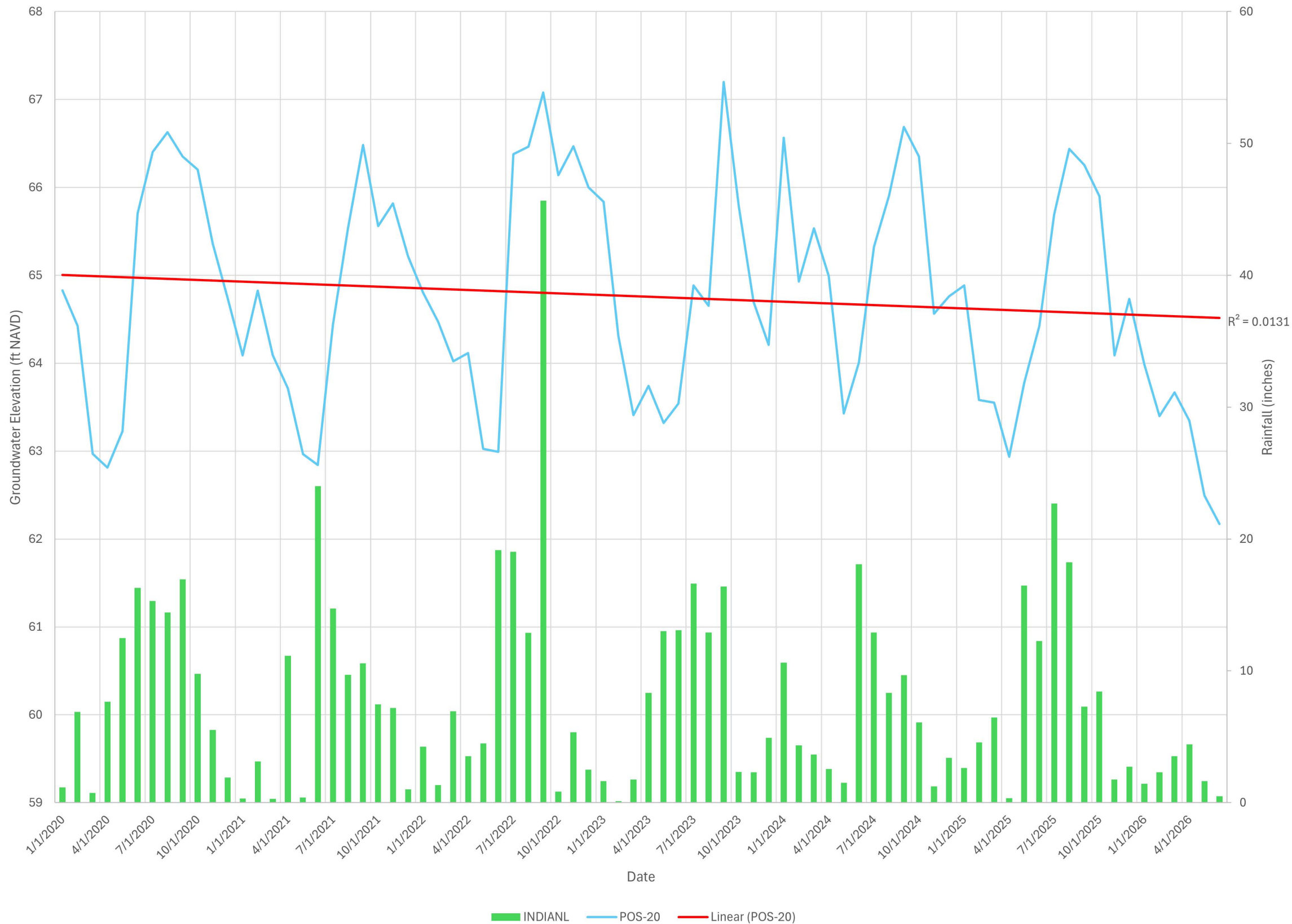


# POS-19 Hydrograph and Rainfall Data

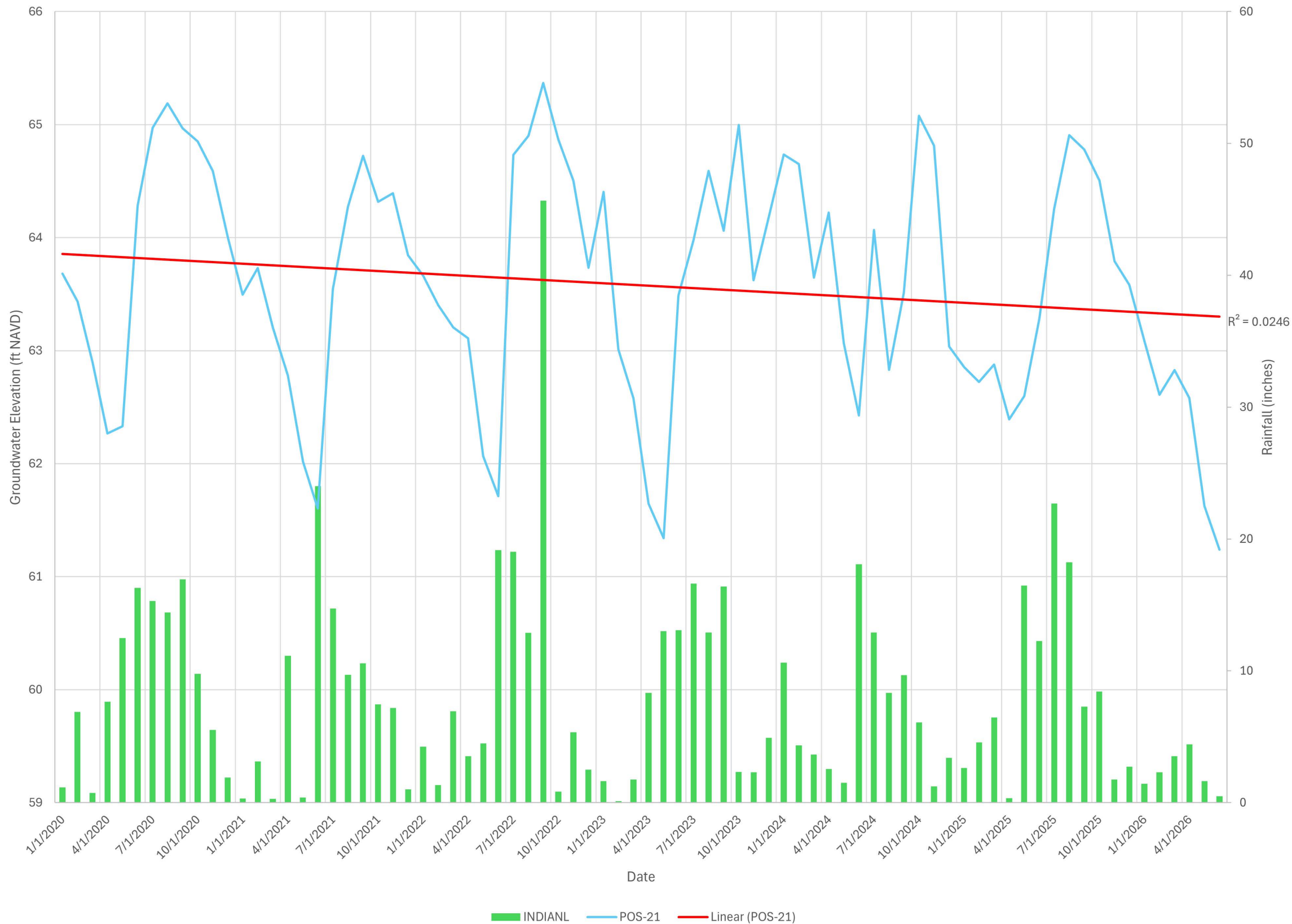




# POS-20 Hydrograph and Rainfall Data

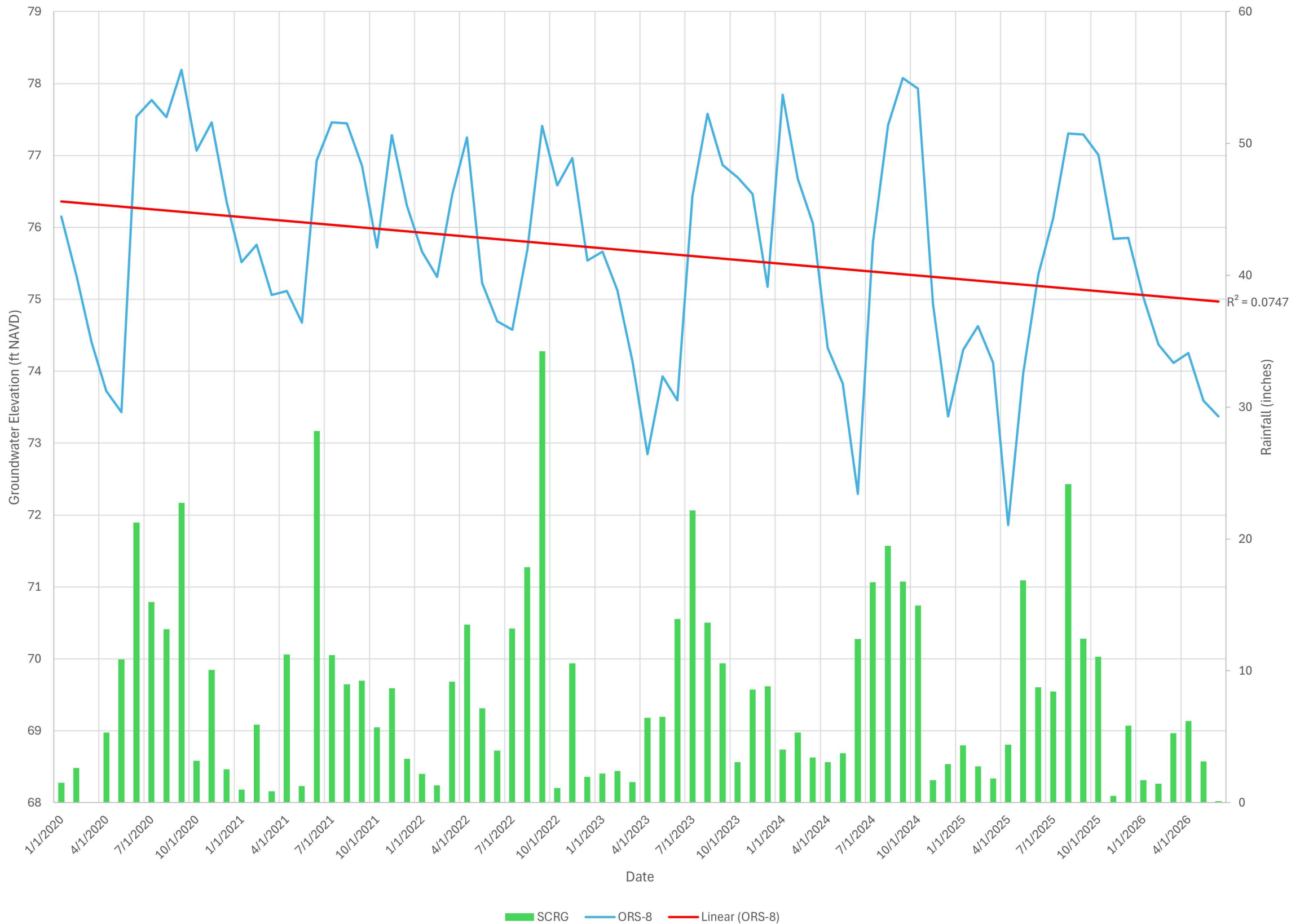


# POS-21 Hydrograph and Rainfall Data

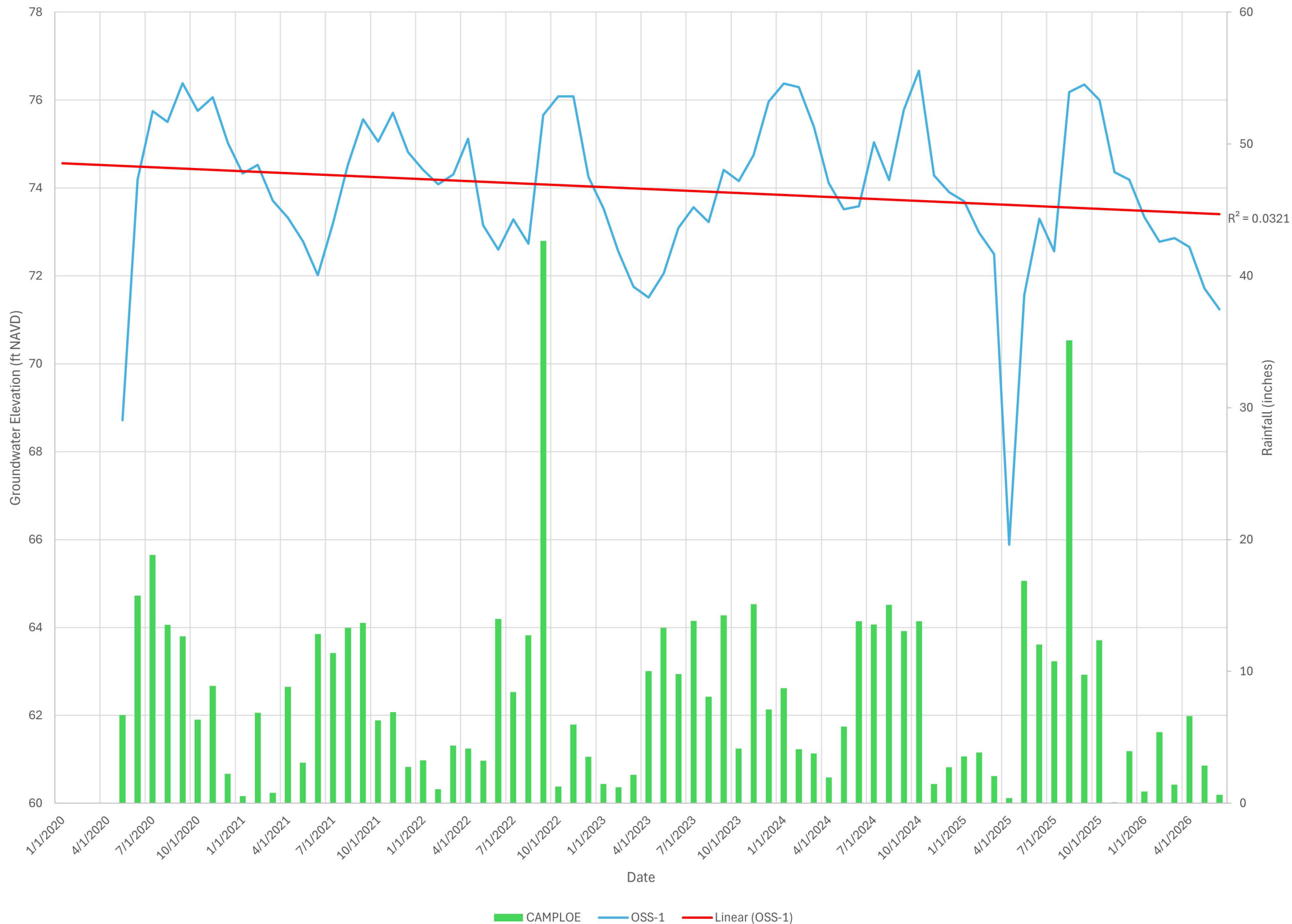




# ORS-8 Hydrograph and Rainfall Data

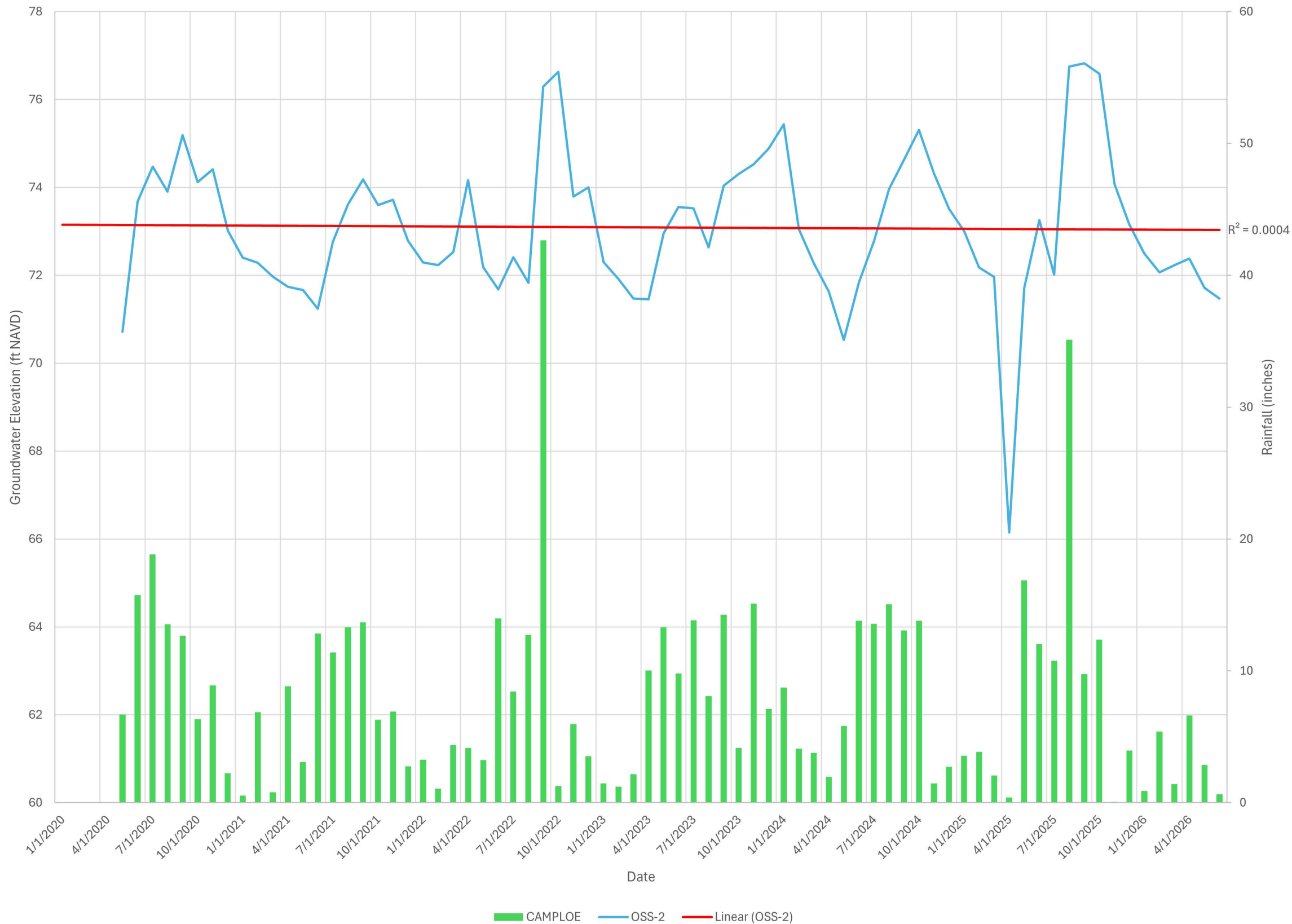


# OSS-1 Hydrograph and Rainfall Data





OSS-2 Hydrograph and Rainfall Data



# OSS-3 Hydrograph and Rainfall Data

