

**SOUTH REPEATER BUILDING (SWMU 121)  
PILOT STUDY WORK PLAN  
KENNEDY SPACE CENTER, FLORIDA**

**Prepared for:**



**Environmental Assurance Branch  
National Aeronautics and Space Administration  
Kennedy Space Center, Florida**

**A-E Contract 80KSC019D0010  
Task Order 80KSC021F0096**

**April 2023  
Revision: 0**

**Prepared by:  
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In accordance with the provisions of Florida Statutes, Chapter 471, this Pilot Study Work Plan for the Kennedy Space Center South Repeater Building site located in Merritt Island, Florida, has been prepared under the direct supervision of a Professional Engineer registered in the State of Florida. This work was performed in accordance with generally accepted professional engineering practices pursuant to Chapter 471 of the Florida Statutes. The data, findings, recommendations, specifications, or professional opinions were prepared solely for the use of the National Aeronautics and Space Administration and the Florida Department of Environmental Protection. AECOM Technical Services, Inc. makes no other warranty, either expressed or implied, and is not responsible for the interpretation by others of these data.

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## ABBREVIATIONS, ACRONYMS, AND SYMBOLS

ADP	Advance data package
ASTM	ASTM International
bls	below land surface
CCF	Component Compressor Facility
DoD	Department of Defense
FDEP	Florida Department of Environmental Protection
GAC	granular activated carbon
HFPO-DA	Hexafluoropropylene oxide dimer acid
IDW	Investigation Derived Waste
KSC	Kennedy Space Center
KSCRT	KSC Remediation Team
MDEQ	Michigan Department of Environmental Quality
NASA	National Aeronautics and Space Administration
PFAS	Per- and Polyfluoroalkyl Substances
PFBS	Perfluorobutanesulfonic acid
PFHxS	Perfluorohexanesulfonic Acid
PFNA	Perfluorononanoic acid
PFOS	Perfluorooctanesulfonic Acid
PVC	polyvinyl chloride
QSM	Quality Systems Manual
RCRA	Resource Conservation and Recovery Act
RSL	Regional Screening Level
SAP	Sampling and Analysis Plan
SOP	standard operating procedure
SWMU	Solid Waste Management Unit
USEPA	U.S. Environmental Protection Agency

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## 1. INTRODUCTION

### 1.1 OVERVIEW

This document is a Pilot Study Work Plan for a groundwater remediation system at the South Repeater Building (the Site) located at the John F. Kennedy Space Center (KSC), Florida, as shown on **Figure 1-1**. The Site has been designated as Solid Waste Management Unit (SWMU) 121 under KSC's Resource Conservation and Recovery Act (RCRA) Corrective Action program. The Site is located along the southwestern edge of KSC on the east side of B Avenue SW/Tel-4 Road, shown on **Figure 1-2**. Private residential properties are located to the west and southwest of the site.

Per- and polyfluoroalkyl substances (PFAS) Phase II and III SWMU Assessment and Confirmatory Sampling were conducted at KSC from 2020 through 2022 (National Aeronautics and Space Administration [NASA] 2022). As part of these activities, one monitoring well was sampled at the site. The results were screened against the United States Environmental Protection Agency (USEPA) Regional Screening Levels (RSLs) for six PFAS compounds, including perfluorooctanoic acid (PFOA), perfluorooctanesulfonic acid (PFOS), perfluorobutanesulfonic acid (PFBS), perfluorononanoic acid (PFNA), perfluorohexanesulfonic acid (PFHxS), and hexafluoropropylene oxide dimer acid (HFPO-DA) (commonly referred to as GenX). PFOS and PFHxS concentrations were present in excess of the RSLs, and the site advanced to site assessment activities. Additional assessment activities were completed in 2022, which were summarized in the October 2022 PFAS Site Assessment Progress Report advance data package (ADP); relevant figures are provided in **Appendix A**.

KSC is planning to design and install a groundwater remediation system to address the potential for off-Center migration of PFAS compounds in groundwater. This Pilot Study Work Plan outlines subsurface hydrogeologic data that will be collected to use in the construction of a groundwater flow model that will guide the design of a full-scale remediation system. This document was prepared by AECOM Technical Services, Inc., for NASA under Indefinite Delivery Indefinite Quantity Contract 80KSC019D0010, Task Order 80KSC019F0096. An Advance Data Package (ADP) presentation of the elements of this Pilot Study Work Plan will be presented to the KSC Remediation Team (KSCRT) in spring 2023. Meeting minutes are included in **Appendix B**.

### 1.2 PURPOSE

The focus area of the pumping test activities will be west of Tel-4 Road and north of D'albora Road, where groundwater impacts are migrating to the west. The impacts appear to be isolated within the surficial aquifer system, above the confining layer of estuarine clay.

### **1.3 PILOT TEST OBJECTIVES**

The objectives of this pilot study are to provide information on aquifer characteristics and to aid in future modeling and remedial design activities to prevent further off-Center migration of PFAS compounds. The specific goals of the Pilot Study are to:

- Develop information on characteristics of the surficial aquifer system, specifically transmissivity (T), storage coefficient (S), hydraulic conductivity (K), and vertical hydraulic conductivity (K') (unconfined only)
- Obtain data to support construction and calibration of a groundwater flow model
- Acquire design parameters necessary for future remedial design activities, specifically radius of influence (r), drawdown (s), flow rates (Q), and pump settings

In addition to gathering data on aquifer hydraulics, water quality samples will be collected during each test to provide data for the groundwater treatment system design.

### **1.4 PILOT STUDY WORK PLAN ORGANIZATION**

This Pilot Study Work Plan is organized as follows:

**Chapter 1** – Introduction

**Chapter 2** – Pilot Study Design

**Chapter 3** – Pilot Study Operations, Monitoring, and Reporting

**Chapter 4** - References

## 2. PILOT STUDY DESIGN

This chapter provides details on the proposed extraction and observation wells that will be installed for the pilot study, along with information on the equipment that will be used. Three extraction and nine observation wells will be installed. Background water quality data will be collected prior to initiating testing. Slug tests will be completed first for each extraction and observation well, followed by step testing and a three-day pumping test for each extraction wells.

### 2.1 WELL DESIGN

#### 2.1.1 Well Placement

The pilot study includes the construction of extraction wells and observation wells, the locations and depths of which are based on the site-specific subsurface stratigraphy and proximity of the plume to the KSC property boundary. Three soil cores have been completed at the site. Silty fine sand was encountered at thicknesses of 5 feet below land surface (bls) to 10 feet bls. This silty fine sand was followed by a highly permeable layer of poorly graded gravel with sand approximately 15 feet thick (shallow zone). Underlying this permeable zone is a lower permeability zone of clayey sand and clay approximately 3 feet to 10 feet in thickness. Another permeable zone of poorly graded gravel with sand and shell hash is encountered beneath the sandy clay, occurring between 30 feet bls and 55 feet bls (intermediate zone). Underlying this second permeable interval is another low permeable zone of clayey sand and clay of the estuarine clay. **Figure 2-1** presents the location of the soil cores, and **Figure 2-2** provides lithologic cross-section details. The boring logs can be found in **Appendix C**.

Three extraction and nine observation wells will be located on the west side of Tel-4 Road across the road from the South Repeater Building, north of the KSC property line, and side gradient to the source area, as shown on **Figure 2-3**. The three extraction wells, one placed above the first gravel unit and one each placed to correspond with the permeable layers of gravel with sand, will be located in the same general area. The associated observation wells, nine total, will be located with one location in the upgradient location and two locations in the downgradient area.

#### 2.1.2 Dig Permit and Utility Locate

Prior to implementing any intrusive activities, a dig permit will be obtained for clearing and ground penetrating work by submitting an Excavation/Utility Locate Permit Request to KSC's permit office. Upon approval, activities will commence in adherence to any comments attached to the approved Dig Permit. Utility locates by both the KSC Utility Locate office and Florida's Sunshine 811 will be completed with enough lead time to allow for any changes that may become apparent during utility locate efforts. In addition, dig permit applications will include in-person marking of the locations for intrusive work and presence on-site during the locate. Ground penetrating work will not commence until utility locates are complete and the Excavation/Utility Locate Permit Request is signed by a KSC locator.

### 2.1.3 Vegetation Clearing

Prior to the initiation of well installation activities, vegetation clearing activities will be required to provide access to the proposed well locations and sufficient space for pump testing equipment. Prior to clearing, the areas proposed will be marked for inspection and ecological survey. Well locations may be shifted as necessary based on the results of the ecological survey.

### 2.1.4 Well Construction

The well construction details presented in this section are based on the current understanding of the subsurface hydrogeology. During installation of a soil core completed in the same area as the pilot study wells will be installed, samples were collected from each gravel layer and submitted to the laboratory for grain size analysis to aid in selecting an optimized filter pack material and slot size for the screened intervals. A copy of the laboratory analytical report for the grain size analyses is provided in **Appendix D**.

All well installation activities will be completed by a licensed well drilling contractor using rotonomic drilling technology. The licensed driller will obtain all necessary well installation permits prior to installation. Investigation derived waste (IDW) will be drummed for temporary storage on-site. Well installation activities will be performed in accordance with the KSC Sampling and Analysis Plan (SAP) (NASA 2017).

#### 2.1.4.1 Extraction Wells

One extraction well will be installed to an approximate depth of 10 feet bls, to capture the shallow, silty fine sand layer that occurs above the first gravel layer due to nearby groundwater sample location results. The other two extraction wells will be installed to 25 and 55 feet bls, respectively. **Figure 2-4** presents the well construction details for the extraction wells.

Construction details include the following:

- Minimum borehole diameter is 10 inches.
- Each extraction well will be constructed of 6-inch diameter Schedule 80 polyvinyl chloride (PVC) casing followed by a stainless-steel continuous wire-wrapped screen. Schedule 80 PVC casing and stainless-steel screen is recommended since the extraction wells will be used in a full-scale system application. These materials provide better longevity when pulling pumps for servicing and/or redevelopment with chemicals.
- The well installed to 10 feet bls will be constructed of five feet of 0.010 slot screen with 20/30 filter pack, based on experience with operating wells installed in similar lithology
- The results of the grain size analysis were shared with Johnson Screens to aid in determining the well slot and filter pack materials for the 25 feet and 55 feet bls wells using standard sizing methodology (Johnson Screens 2007). The well screen for the 25 feet bls well will be 0.020 slot screen with a Southern Products #1A filter pack (or equivalent). The well screen for the 55 feet bls well will be 0.035 slot screen with a Southern Products #2 filter pack. Specification for the well screens and filter packs are provided in **Appendix E**.



- The casing sections will be flush joint threaded with a Neoprene O-ring or other means of rendering the joint airtight.
- A 1-foot PVC well sump, designed to collect intruding fines within the well casing, will be installed below the screen.
- The filter pack will be installed in the annular space around the well screen and extend approximately 6 inches above the top of screen.
- A bentonite clay seal, consisting of either pressed pellet or chip bentonite clay, will be installed through the inside of the drive casing via tremie pipe during well installation activities. The drive casing will be raised as the bentonite seal is installed, taking care to not raise the casing above the bentonite seal before the seal is set. The bentonite seal will be installed to the full borehole diameter achieving a minimum thickness of 3 feet. The depth of the top of the bentonite seal will be confirmed by direct measurement during installation. The bentonite seal will be left to hydrate for the time recommended by the manufacturer before continuing well installation activities.
- Type I/II Portland cement (grout), mixed with potable water using a 1:1 grout to water ratio, will then be installed from the bentonite seal to land surface. The filter pack and grout will be installed using a tremie pipe to ensure a continuous filter and seal free of voids.
- Aboveground well completion with guard posts is recommended due to the heavy brush in the area.

#### 2.1.4.2 Observation Wells

Observation well details are shown on **Figure 2-5**. Three observation wells each will be installed to depths of 10, 25, and 55 feet bls. Construction details include the following:

- Minimum borehole diameter is 6 inches.
- Each observation well will be constructed of 2-inch diameter Schedule 40 PVC casing with 0.010-inch slot Schedule 40 mill-slot screen.
- Casing sections will be flush joint threaded with a Neoprene O-ring or other means of rendering the joint airtight.
- A 1-foot PVC well sump, designed to collect intruding fines within the well casing, will be installed below the screen.
- The filter pack will be installed in the annular space around the well screen and extend approximately 6 inches above the top of screen. The filter pack will be 20/30 silica sand (ASTM International 2017).
- A bentonite clay seal, consisting of either pressed pellet or chip bentonite clay, will be installed through the inside of the drive casing via tremie pipe during well installation activities. The drive casing will be raised as the bentonite seal is installed, taking care to not raise the casing above the bentonite seal before the seal is set. The bentonite seal will be installed to the full borehole diameter achieving a minimum thickness of 3 feet. The depth of the top of the bentonite seal will be confirmed by direct measurement during installation. The bentonite seal will be left to hydrate for the time recommended by the manufacturer before continuing well installation activities.

- Type I/II Portland cement (grout), mixed with potable water using a 1:1 grout to water ratio, will then be installed from the bentonite seal to land surface. The filter pack and grout will be installed using a tremie pipe to ensure a continuous filter and seal free of voids.
- Aboveground well completion with guard posts is recommended due to the heavy brush in the area.

### **2.1.5 Well Development**

The wells will be developed to the degree appropriate for their intended purpose. Each well will be developed for up to 4 hours, each with air surge and pumping using a centrifugal pump. Well development activities will be performed no sooner than 24 hours after installation to allow sufficient time for grout curing. The suction line will be lowered to the total depth of the well while extracting, with groundwater extraction continuing for a minimum of 5 minutes or until the water is visually free of heavy sediments. The development process will be repeated until the well is visibly free of silt and sand. The groundwater removed during well development will be containerized in 55-gallon drums. The 55-gallon drums will be positioned over contaminated groundwater; therefore, secondary containment will not be recommended at this time.

### **2.1.6 IDW Management**

Drill cuttings will be containerized separately from extracted groundwater generated during well development. Drums will be utilized. One sample will be collected from each drum of drill cuttings for analysis by USEPA Method 537 Modified Department of Defense (DoD) Quality Systems Manual (QSM) 5.3 for 29 PFAS compounds. One sample will be collected from each drum of extracted groundwater for analysis by DoD QSM 5.3 for 29 PFAS compounds, nitrates (USEPA Method 300.0), and total phosphorus (USEPA Method 365.4).

## **2.2 PILOT EQUIPMENT**

Extraction well piping will run from the extraction pump to a fractionation tank. The piping will include a flow valve, flow meter, and a sample port with a valve. The well pump will be powered by a generator, due to the short duration of the pilot study. **Figure 2-6** provides a schematic diagram of the pilot test equipment.

### **2.2.1 Pipe Selection and Sizing**

Extraction well piping will be 2-inch flexible PVC piping. Piping was sized to overcome hydraulic head and maintain flow. Extraction well piping calculations are provided in **Appendix F**.

### **2.2.2 Pilot Study Equipment**

A rented submersible pump will be utilized to recover groundwater from the extraction wells. The proposed pump is a Grundfos Redi-Flo4, or equivalent. This pump is capable of pumping up

to 45 gallons per minute. **Appendix G** includes the specification sheets for the recommended pump.

A flow throttling valve (e.g., globe valve) will be placed downflow of the wellhead to allow adjustment of the pumping flow rate. This will be followed by a flow meter to allow meter readings to be made during the pumping phase. The flowmeter will have a local display and be capable of displaying instantaneous rate and totalized flow. A plumbing wye connector with a valved sampling port will be placed downflow of the flow meter to allow for effluent sample collection.

The generator will be diesel-powered and enclosed within a secondary containment barrier. Generator refueling will be performed as needed by a third party.

The recovered groundwater will be treated on-site through granular activated carbon (GAC). Influent will be pumped initially to a weir tank (~18,000 gallons) for removal of sediments, then through bag filters (10 micron) for further removal of sediments. The water will be pumped from the bag filters into large fractionation tanks (~21,000 gallons) to await treatment. Treated water will be stored in smaller fractionation tanks (~9,000 gallons) to await analytical results. Six large and eight smaller fractionation tanks will be staged within individual containment berms.

Treatment will occur in batches of about 5,000 gallons. Recovered groundwater will be pumped from the fractionation tank through bag filters (10 micron) for further removal of particulates and then into the beds of GAC for removal of PFAS. There will be two 500-pound aqueous phase GAC canisters in series, with samples collected in front of the first canister (influent) and after the first canister (effluent). If analysis demonstrates that those compounds with EPA Regional Screening Levels (RSLs) have been reduced below their respective RSLs, that batch of water will be discharged to grade on the east side of B Avenue SW/Tel-4 Road to the north of the Repeater Building (Figure x). The swale in that location will be temporarily dammed on the north and south to allow the treated water to percolate into an area where PFAS-affected groundwater is already present. If results are not below RSLs, the batch of water will be re-treated.

The water storage and treatment system will be set up on the east side of B Avenue SW/Tel-4 Road, as the drainage ditch and soft sand on the west side is not suitable. Hose ramps will be utilized over the road to allow traffic to proceed while protecting the discharge water hoses. Tanks will be cleaned prior to demobilization, with washwater treated through the on-site system. Sediment will be analyzed and, if results are below commercial/industrial RSLs, returned to the site.

Fourteen Aqua TROLL Conductivity, Temperature, Plus Water Level Logging transducers will be deployed, one for each extraction and observation well, and two for background wells (A3RB-MW0001 and A3RB-MW0003). The transducers have a minimum recording interval of

1 second and have the capability to make logarithmic measurements. The transducers are also capable of logging conductivity to monitor for brackish water intrusion. **Appendix G** includes the specification sheets for the proposed transducers.

### **2.3 TEMPORARY SECURITY**

The location of the pumping test and associated activities is in a remote part of KSC. However, to provide a secure area for staff during pilot study activities, a temporary security fence will be installed starting with the well drilling phase of the project until the pumping tests are completed. Plastic mesh construction fencing will be used with a minimum height of 42 inches. The fencing will be maintained throughout the pilot study.

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### **3. PILOT STUDY OPERATIONS, MONITORING, AND REPORTING**

This section details the operational details for the pilot study, as well as the reporting activities that will be conducted following the study.

#### **3.1 BASELINE GROUNDWATER SAMPLING**

Following well installation activities, but prior to initiation of the pilot activities, baseline sampling will be completed. Samples will be collected from each of the extraction and observation wells. The samples will be submitted for analysis by USEPA Method 537 Modified DoD QSM 5.3 for 29 PFAS compounds. Additionally, the samples from the extraction wells will be analyzed for physical analytes, including anions (bicarbonate, chloride, and sulfate), cations (calcium, magnesium, sodium, and potassium), iron, total dissolved solids, total suspended solids, biochemical oxygen demand, and hardness as calcium carbonate.

Field activities will be performed in accordance with the Florida Department of Environmental Protection (FDEP) Standard Operating Procedures (SOPs) (FDEP 2005, 2018), PFAS sampling guidelines provided by the Michigan Department of Environmental Quality (MDEQ) (2018), and the KSC SAP (NASA 2017).

#### **3.2 SLUG TESTING**

Slug testing will be performed on the three extraction wells and all nine observation wells to provide an estimate of the spatial distribution of hydraulic properties of the aquifer. Prior to each slug test, a transducer will be deployed within the well being tested, as well as background monitoring wells (A3RB-MW0001 and A3RB-MW0003) to collect water levels throughout the test period. The background well was selected such that it is located far enough from the test wells that it will not be influenced by either the slug or pumping tests.

The transducers will be configured to record measurements in a logarithmic manner, with short time intervals at the beginning of the stress event (i.e., slug in, slug out, pump start, pump stop) and longer duration intervals at the end of the stress event. This will be achieved by setting transducers in "Event" mode. This programming method allows the transducer to continuously read pressure, but only record data when a specified pressure differential is reached. Transducers will be programmed to read every second and record values when a pressure change of  $\pm 0.01$  feet of water is recorded. This method will allow for the automatic logging of the groundwater level throughout the various stages of testing. Transducers will be deployed a minimum of 24 hours before all tests to record background water levels and will remain in wells throughout the entire pilot study (slug, step and 72-hour). Each transducer will be fitted with either a direct read cable or wireless communication device to allow for periodic data downloads and status checks (e.g., battery life, memory storage capacity). The transducers will be checked each morning to ensure proper operation and data capture. A companion barometric pressure data logger will be deployed to correct for atmospheric pressure fluctuations.

Using the falling head slug testing setup, a slug, attached by a rope or cable, will be set up at the top of the well casing, above the top of the groundwater level. When the slug is released (slug in), the transducer will automatically adjust recording to capture rapid pressure changes. The transducer will record conductivity, temperature, and water level data. Once the groundwater level has returned to static level, the slug will be pulled up (slug out).

After each slug test, the data will be downloaded from the transducer and then processed/analyzed with the appropriate software. The slug will be decontaminated before use in the next well.

### **3.3 STEP TESTING**

Slug test data results will be utilized to establish appropriate step test flowrates and duration. Prior to step testing, the fractionation tank and piping must be on-site and set up, as shown on **Figure 2-6**. A trial pumping period will also be performed prior to step testing. This will allow for field personnel to identify valve settings that produce a specific flowrate, which will allow for minimal adjustment of flowrate during testing. Step testing will be performed to estimate the pumping rate that can be sustained for the 72-hour pumping test. The step test will consist of three 2-hour pumping periods with successively greater pumping rates that span the range of possible pumping rates estimated from the slug tests. The step test will be conducted in each of the extraction wells, one at a time. Transducers will be deployed in the three extraction wells, nine observation wells, and two background wells (A3RB-MW0001 A3RB-MW0003) during each step test to assess the groundwater level changes due to the pumping and recovery. As with slug testing, the transducers will record conductivity, temperature, and water level data. After each step test is completed, the transducer data will be downloaded. The pumping rate will be checked and recorded every 15 minutes throughout each step.

The shallowest pumping well will be tested first, and the other two extractions wells will act as observation wells. Manual groundwater level measurements will be made before each test begins, several times during the pumping phases, just prior to the end of the pumping phase, and during the first hour of the recovery phase. Once the pump is installed and connected to the discharge piping, the pump will be started at the pumping rate specified for the first step. Following operation for 2 hours, the pumping rate will be increased to the next step for an additional 2 hours. The third step pumping rate will be performed similarly. Following completion of the three step tests, the pump will be shut down and the aquifer will be allowed to recharge overnight. The transducers will operate overnight to record aquifer recovery.

The step test will be repeated the next two days in the same manner, with the remaining two extraction wells.

The drawdown data will be processed and graphed to assess the groundwater level decline during each pumping step. The goal of the step test is to find a pumping rate for each extraction well that determines a flowrate that will adequately stress (i.e., drawdown water levels) without completely dewatering the well. The drawdown curves for each of the three steps will be plotted

and the drawdown trend lines will be extrapolated to 72 hours. The estimated drawdown at 72 hours will be compared with the available saturated thickness in the three extraction wells. The highest pumping rate that will not lower the groundwater level below the extraction well pump intake will be selected for the 72-hour test.

### **3.4 EXTRACTION TESTING**

Three 72-hour extraction tests will be conducted, the first test with the shallowest extraction well and proceeding with the next two extraction wells. The setup for the tests will be similar to the step tests. Transducers will be deployed in the three extraction wells, nine observation wells, and two background wells (A3RB-MW0001 and A3RB-MW0003) during each step test to assess the groundwater level changes due to the pumping and recovery. Manual groundwater level measurements will also be made before each test begins, several times during the pumping phase of the test, just prior to the end of the pumping phase, and during the first hour of the recovery phase. The pump will be set to the pumping rate determined from the step test data analysis, which will include trial pumping tests to verify the pumping rate with respect to valve settings.

At the start of each pumping test, one field staff will start the pump and the other field staff will collect manual water levels every 10 minutes for the first hour and once an hour for the rest of the pumping period. The pumping rate and totalized flow will be checked and recorded at least once every hour throughout the test. If the pumping rate is changing, the flow valve will be adjusted to bring flow back to the specified rate. Notations must be made in the field notes for the time and amount for each flow rate adjustment. During the pumping period, the depth to water in the fractionation tank will be recorded every 4 hours. At the pumping test time milestones of 24 hours, 48 hours, and 71 hours, the operational water quality samples will be collected via the sample port. Groundwater samples will be analyzed using USEPA Method 537 Modified DoD QSM 5.3 for 29 PFAS compounds. Additionally, one sample from each test will be analyzed for physical analytes, including anions (bicarbonate, chloride, and sulfate), cations (calcium, magnesium, sodium, and potassium), iron, total dissolved solids, total suspended solids, biological oxygen demand, and hardness as calcium carbonate.

When the pumping phase of the test reaches the 72-hour milestone, the transition to the recovery mode will be started. Immediately prior to turning off the pump, manual groundwater level measurements will be made in all wells along with a final pumping flow rate reading. One field staff will turn off the pump and the other field staff will collect manual water levels every 10 minutes for the first hour.

After the recovery phase starts for the shallow pumping test, the pump will remain in the well for a 72-hour recovery period. When the recovery phase is completed, data will again be downloaded from the transducers.

The procedures for the next two extraction wells are the same as that for the shallow extraction well test.



### **3.5 REPORTING**

Following completion of the pilot study, a Pilot Study Implementation Report will be prepared documenting testing procedures and any problems encountered; results of the slug tests, step tests, and 72-hour pumping tests; and a summary of the findings and recommendations for full-scale implementation. An ADP will also be prepared to summarize the results and recommendations for presentation to the KSCRT.

#### 4. REFERENCES

ASTM. 2017. *Standard Practice for Design and Installation of Groundwater Monitoring Wells*. American Society for Testing and Materials. October 2017.

Department of Defense (DoD), Department of Energy (DOE). 2019. *Consolidated Quality Systems Manual (QSM) for Environmental Laboratories*. DoD Quality Systems Manual Version 5.3. 2019.

FDEP. 2005. *Groundwater Sampling Standard Operating Procedures Variances and Clarifications for Bureau of Petroleum Storage Systems Sites, SOP PCS-006*. Florida Department of Environmental Protection Bureau of Petroleum Storage Systems Petroleum Cleanup Program. May 2005.

FDEP. 2018. *Department of Environmental Protection Standard Operating Procedures for Field Activities*. DEP-SOP-001/01. Florida Department of Environmental Protection. April 2018.

Johnson Screens. 2017. *Groundwater and Wells*. Edited by Robert J. Sterrett, 3<sup>rd</sup> Edition. Johnson Screens, A Weatherford Company, New Brighton, MN.

MDEQ. 2018. *PFAS Sampling Guidelines*. Michigan Department of Environmental Quality.

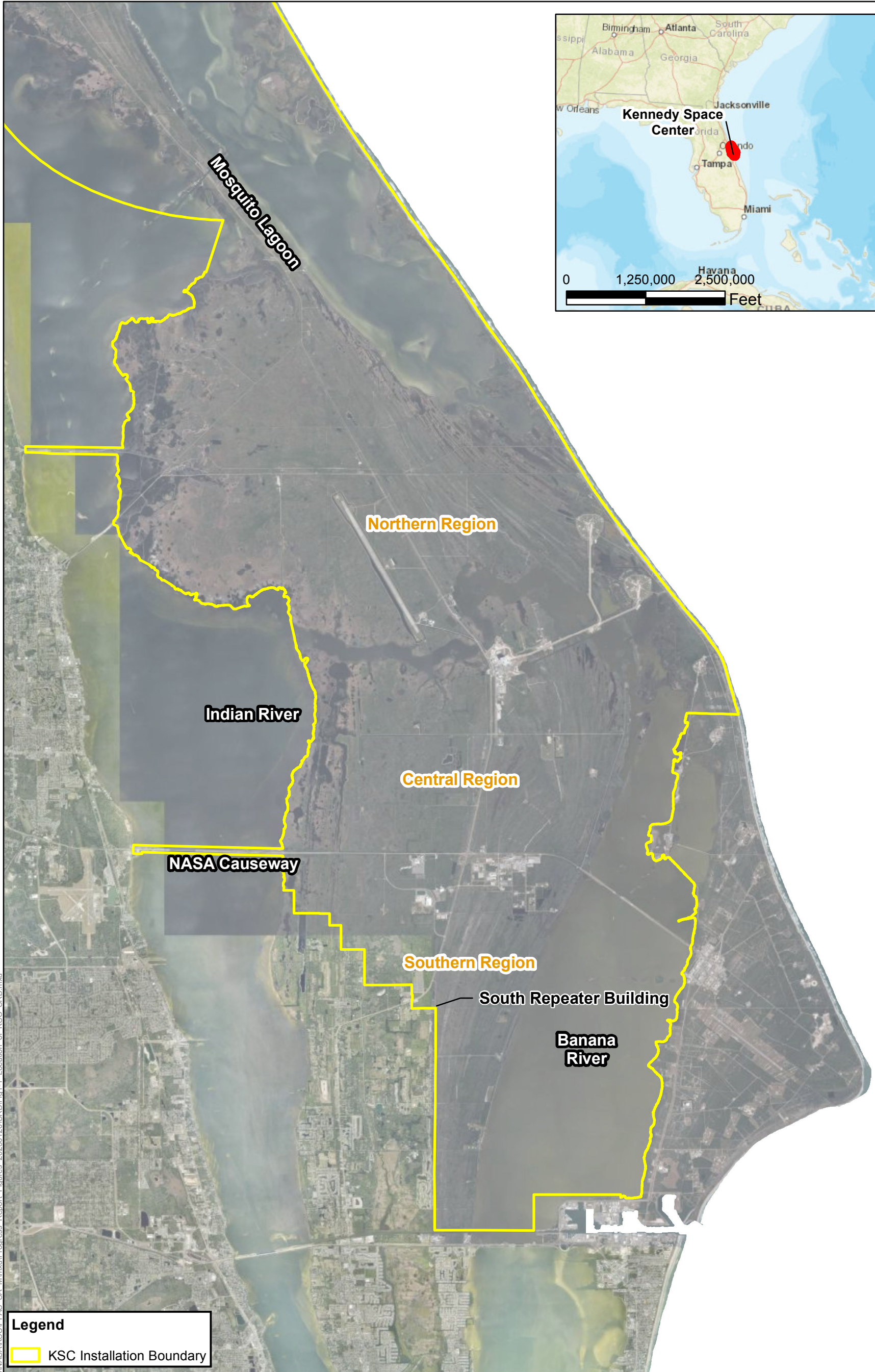
NASA. 2017. *Sampling and Analysis Plan for the RCRA Corrective Action Program at the Kennedy Space Center*. August 2017.

NASA. 2022. *Phase II and III SWMU Assessment and Confirmatory Sampling Report, Center-Wide PFAS PRL 237*. Prepared by AECOM. May 2022.

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## **FIGURES**

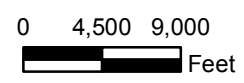
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Document Path: Y:\Projects\NASA\KSC\PEAS\_SA\_M\mxd\Progress\_Report\_Figures\_20230126\SRBI\Fig1-1\_Location\_of\_KSC\_SRB.mxd

**Legend**  
 KSC Installation Boundary

Mapping Notes:  
 -Orthimagery Source: Brevard County, 2018.  
 -Projection: NAD 1983 StatePlane Florida East FIPS 0901  
 -Scale: 1 Inch = 11,000 Feet



**JOHN F. KENNEDY  
 SPACE CENTER  
 MERRITT ISLAND, FLORIDA**

DATE: 2/9/2023      DRWN BY: SD

**FIGURE 1-1  
 LOCATION OF KENNEDY SPACE  
 CENTER  
 AND SOUTH REPEATER BUILDING**







Document Path: Y:\Project\NASAS\KSC\PPAS\_SA\_Mixed\Cross\_Section\F2-1\_Litho\_Location.mxd



**LEGEND**

- Shallow Monitoring Well
- Soil Boring Location
- Lithologic Cross-Section Location

Notes:  
 1. bis = Below land surface  
 2. Aerial Source: FDOT 2018  
 3. Groundwater Countour Interval = 0.5 feet  
 4. Vertical Datum is NAVD88 (US foot)



0 40 80 Feet

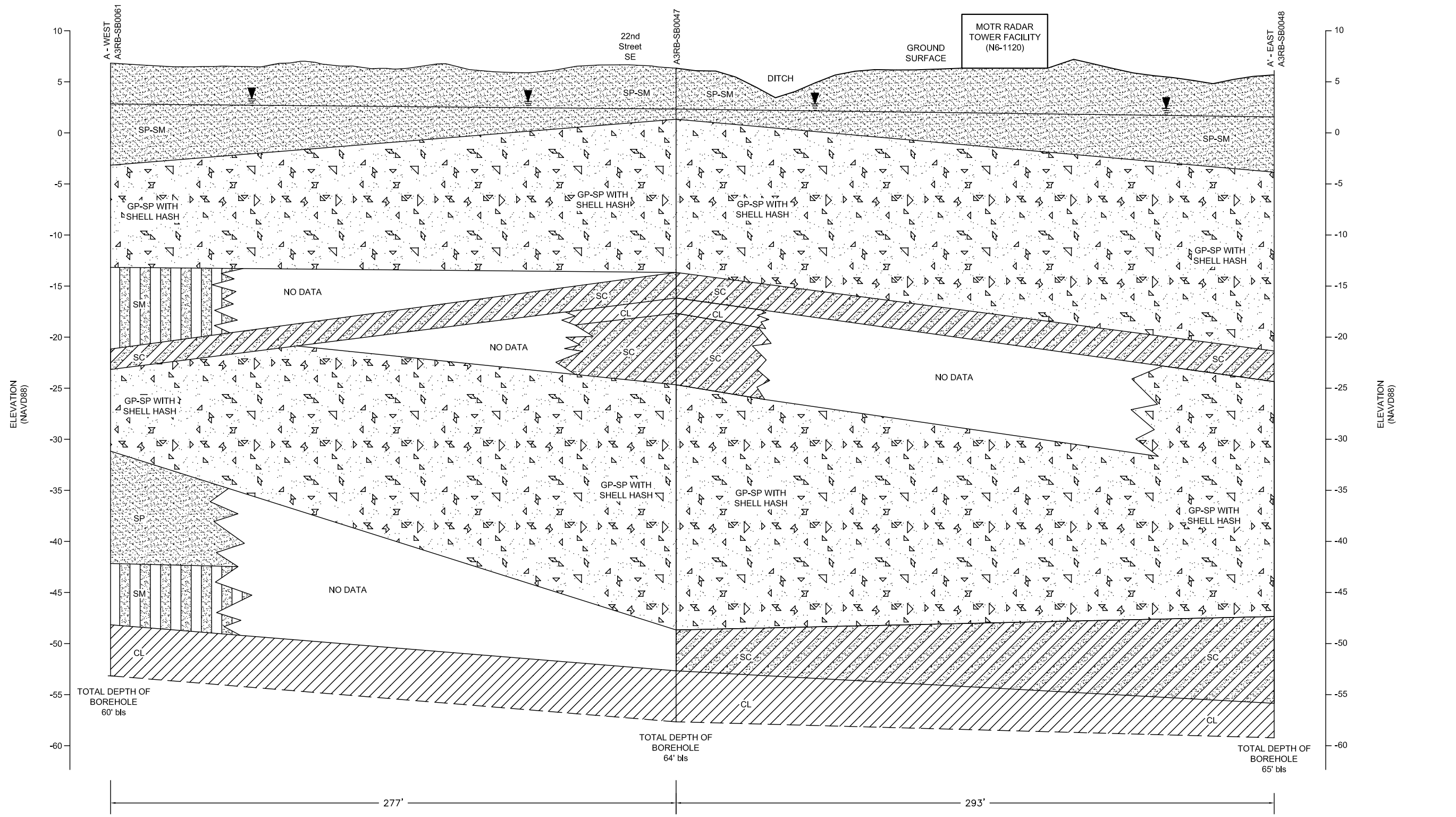
Source  
 Orthoimagery from Brevard County, 2018.

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DATE: 4/5/2023 | DRWN: SD

FIGURE 2-1  
 LITHOLOGIC CROSS-SECTION LOCATION

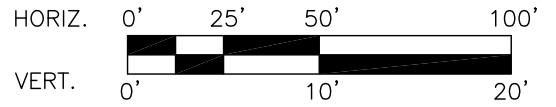




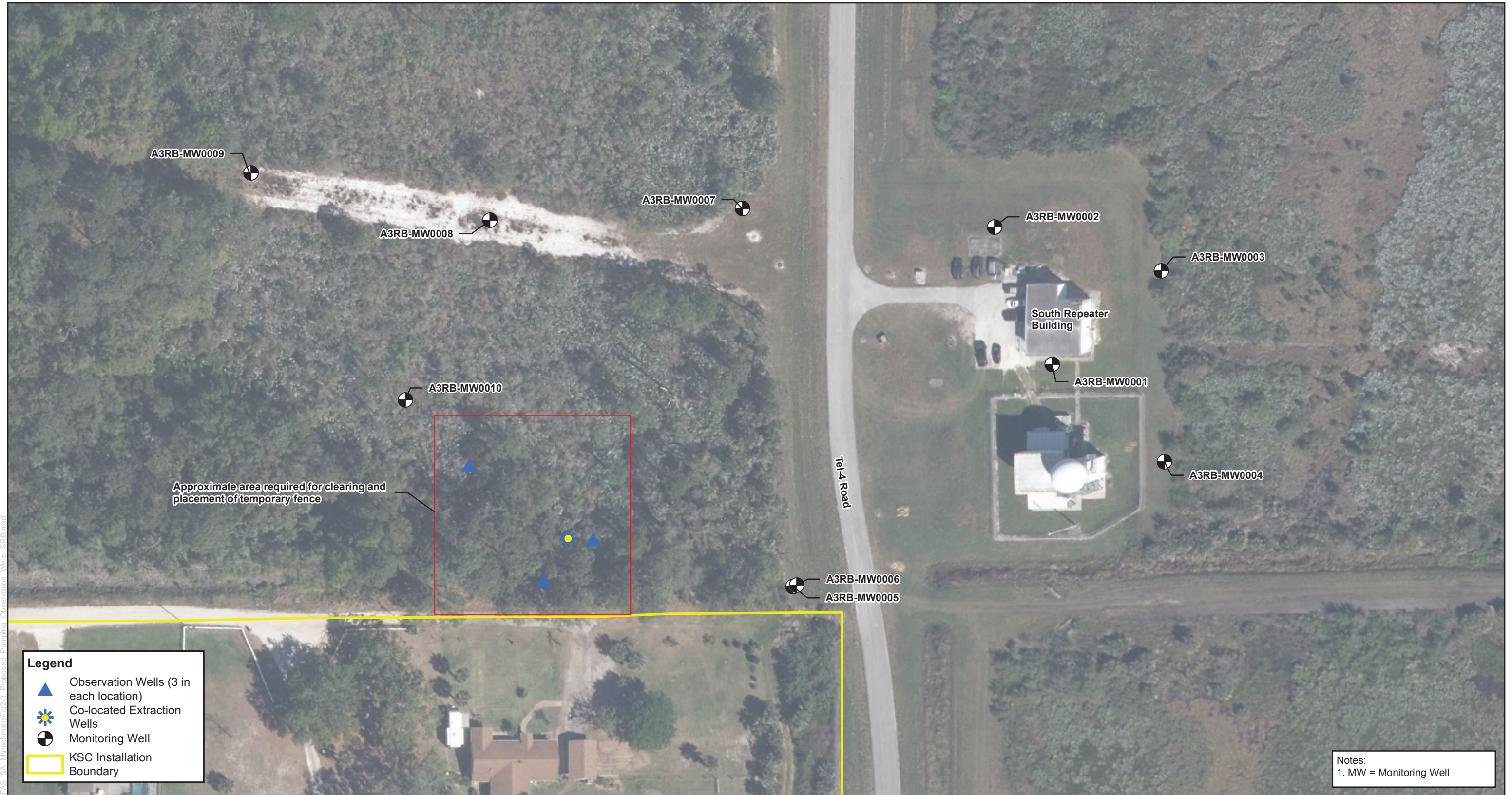
LEGEND:

- |                                |  |  |  |
|--------------------------------|--|--|--|
| POORLY GRADED SILTY FINE SAND  |  | POORLY GRADED SAND                     |  |
| POORLY GRADED GRAVEL WITH SAND |  | SILTY SAND                             |  |
| LEAN CLAY (NATIVE)             |  |  |  |
| CLAYEY SAND                    |  |  |  |
|                                |  | WATER TABLE<br>(DASHED WHERE INFERRED) |  |

- NOTES:
- WATER LEVEL GAUGED ON MAY 31, 2022
  - bls = BELOW LAND SURFACE







**Legend**

- Observation Wells (3 in each location)
- Co-located Extraction Wells
- Monitoring Well
- KSC Installation Boundary

Notes:  
1. MW = Monitoring Well

MAPPING NOTES:  
 -Basemap Source  
 Orthoimagery from Brevard County, 2018.  
 -Projection  
 Coordinate System: NAD 1983 StatePlane Florida East FIPS 0901  
 -Scale  
 1 Inch = 75 Feet



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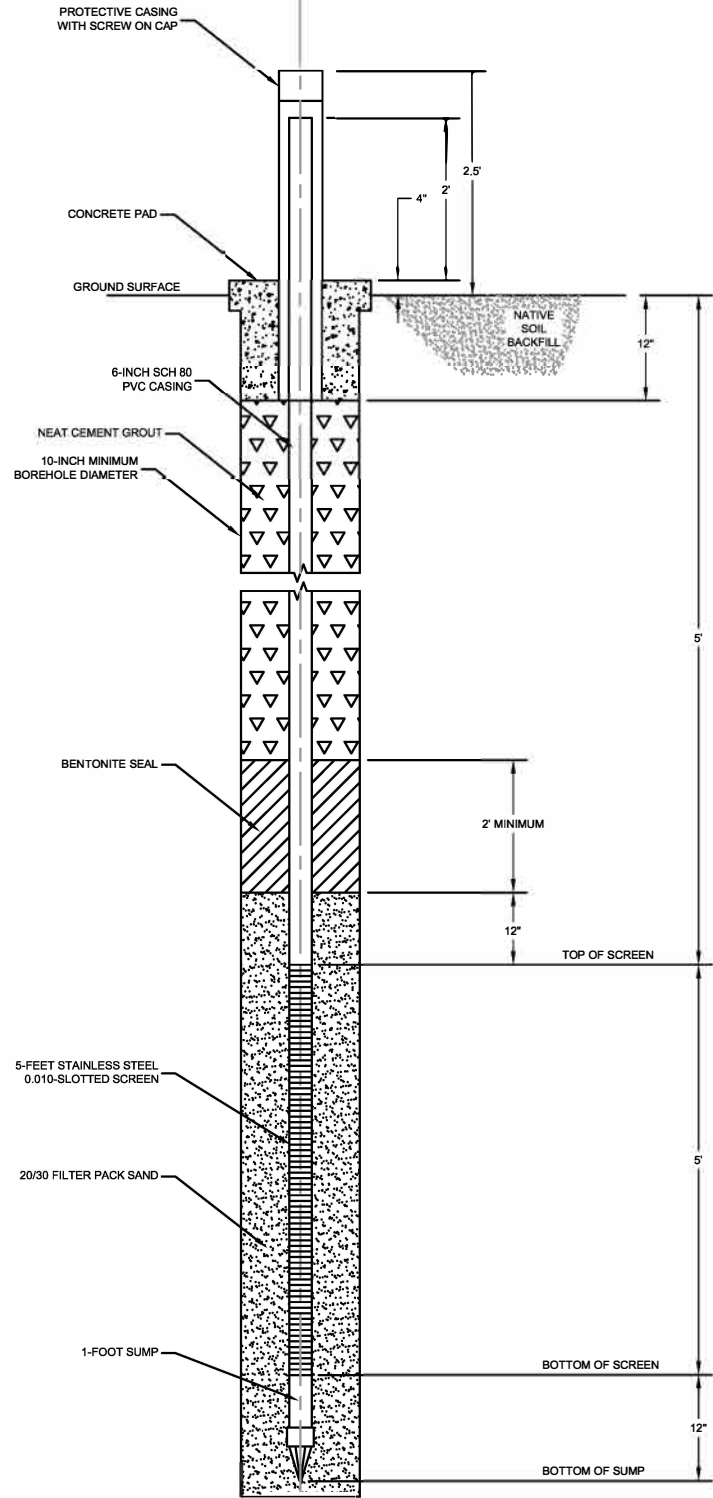
Drawn By: SD

Date Saved: 4/3/2023

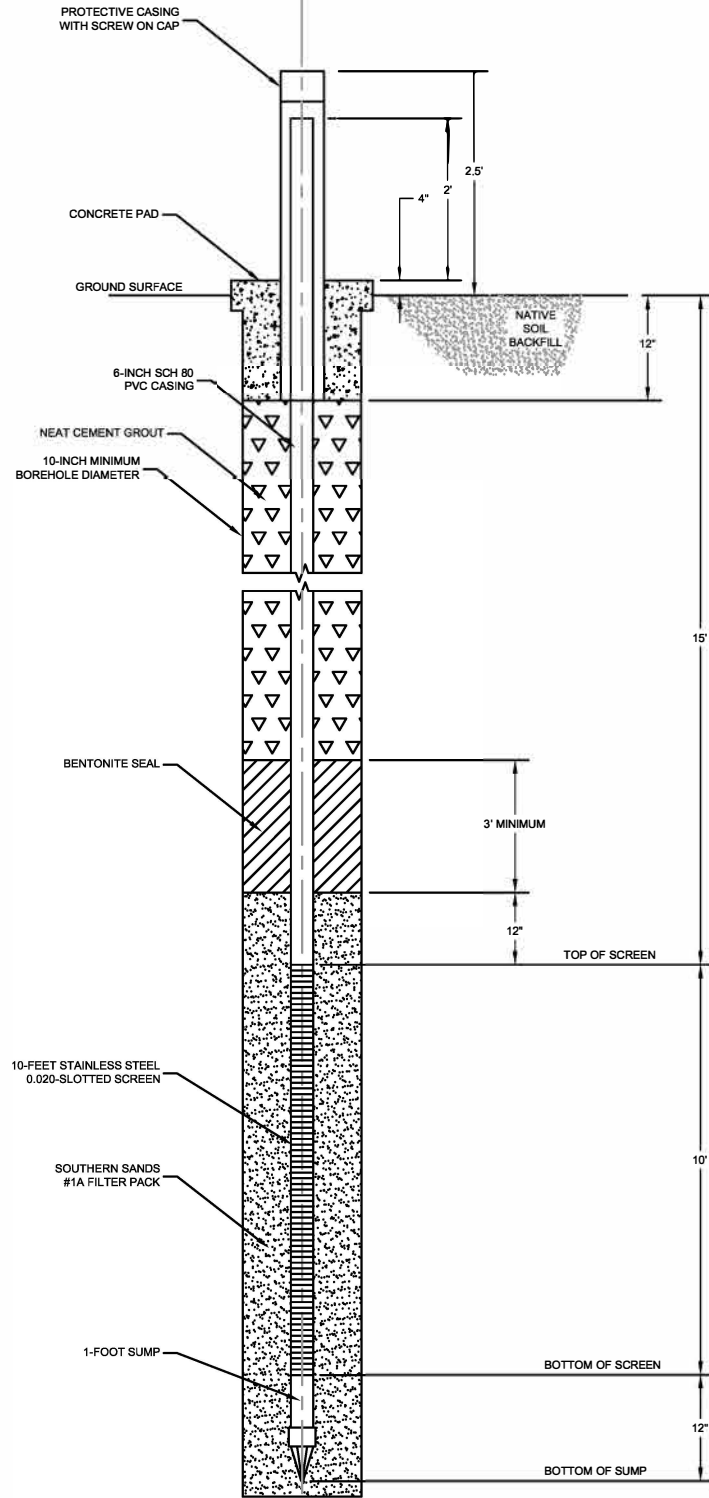
**FIGURE 2-3  
 PROPOSED PUMPING TEST WELL  
 LOCATIONS  
 MAY 2022**



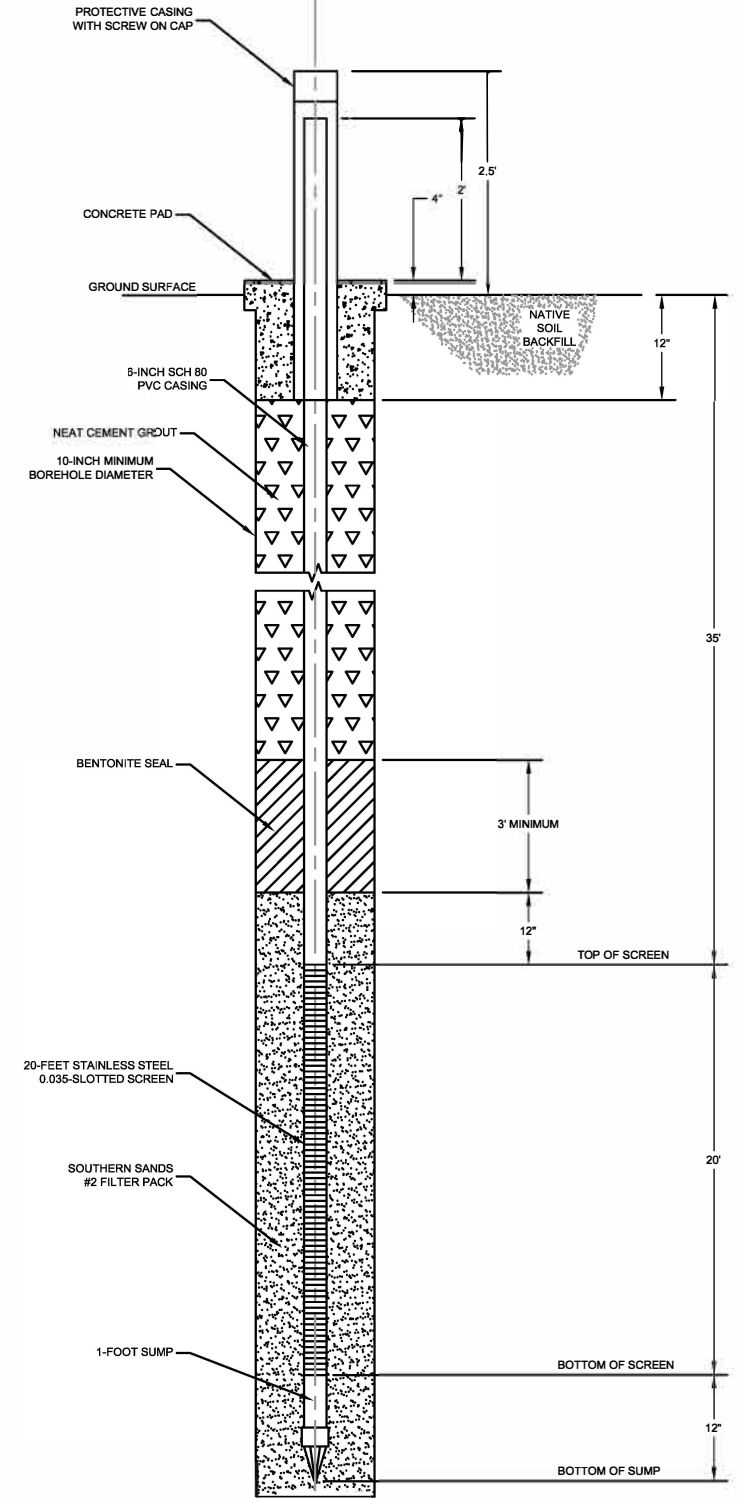
C:\Users\lurchj\Desktop\Misc\Projects\NASA\South Repeater Building\F2-4\_EXTRACTION\_WELL\_DIA (rev2).dwg 04/05/23



**TYPICAL EXTRACTION WELL - ABOVE GRADE**  
**10 FEET BLS**  
**NOT TO SCALE**



**TYPICAL EXTRACTION WELL - ABOVE GRADE**  
**25 FEET BLS**  
**NOT TO SCALE**

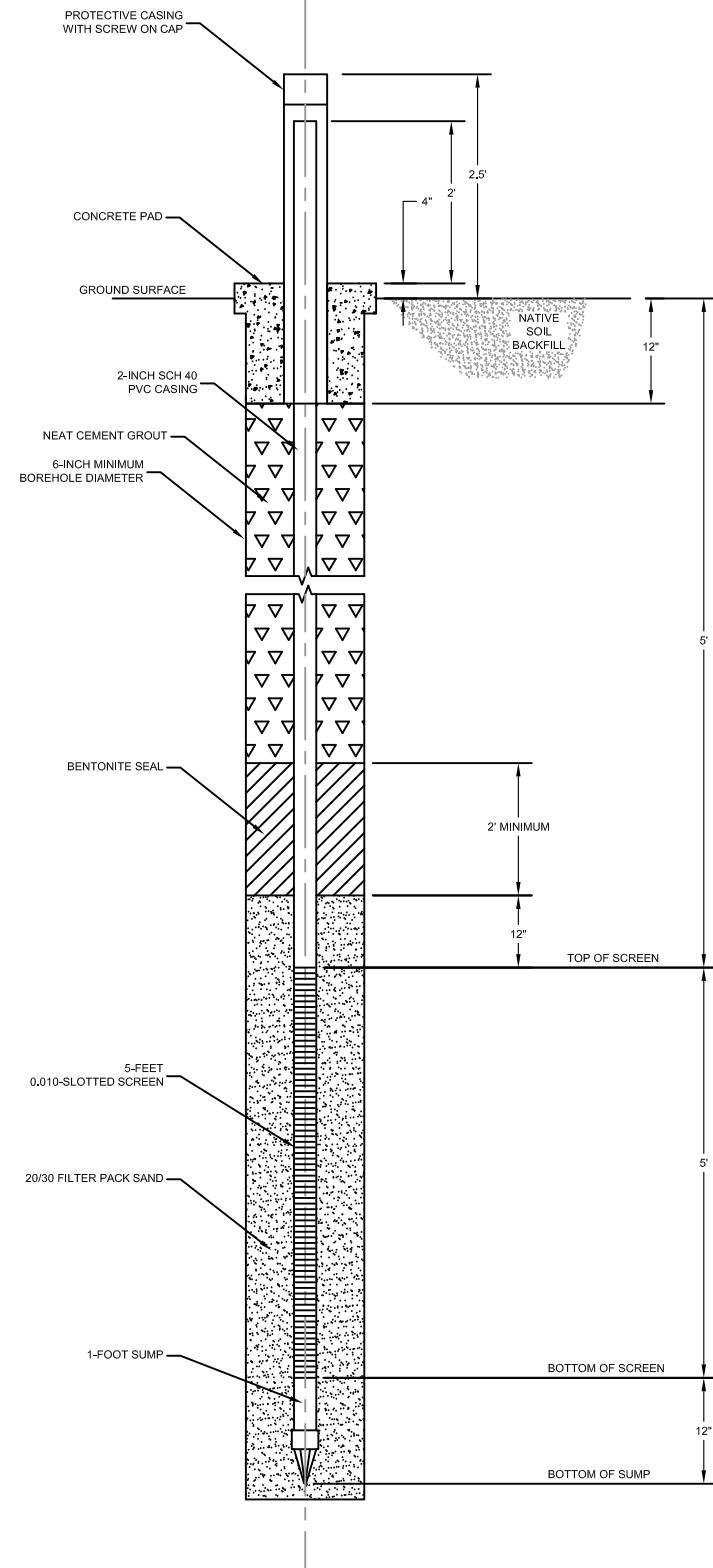


**TYPICAL EXTRACTION WELL - ABOVE GRADE**  
**55 FEET BLS**  
**NOT TO SCALE**

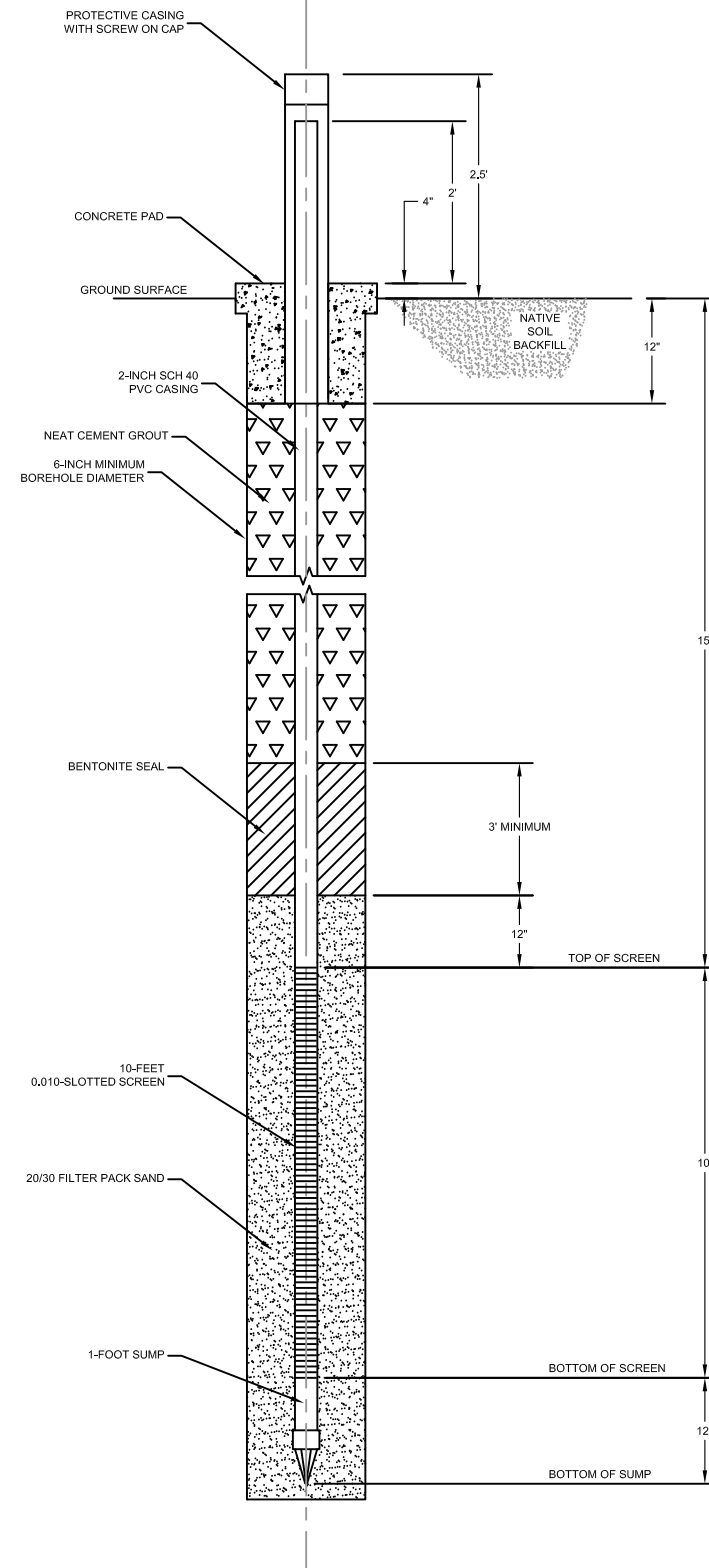
NOTE:  
 1. Depth of extraction well screens is provided in feet below land surface (FT BLS).

**FIGURE 2-4**  
 Extraction Well Construction Details  
 South Repeater Building  
 NASA Kennedy Space Center, Florida

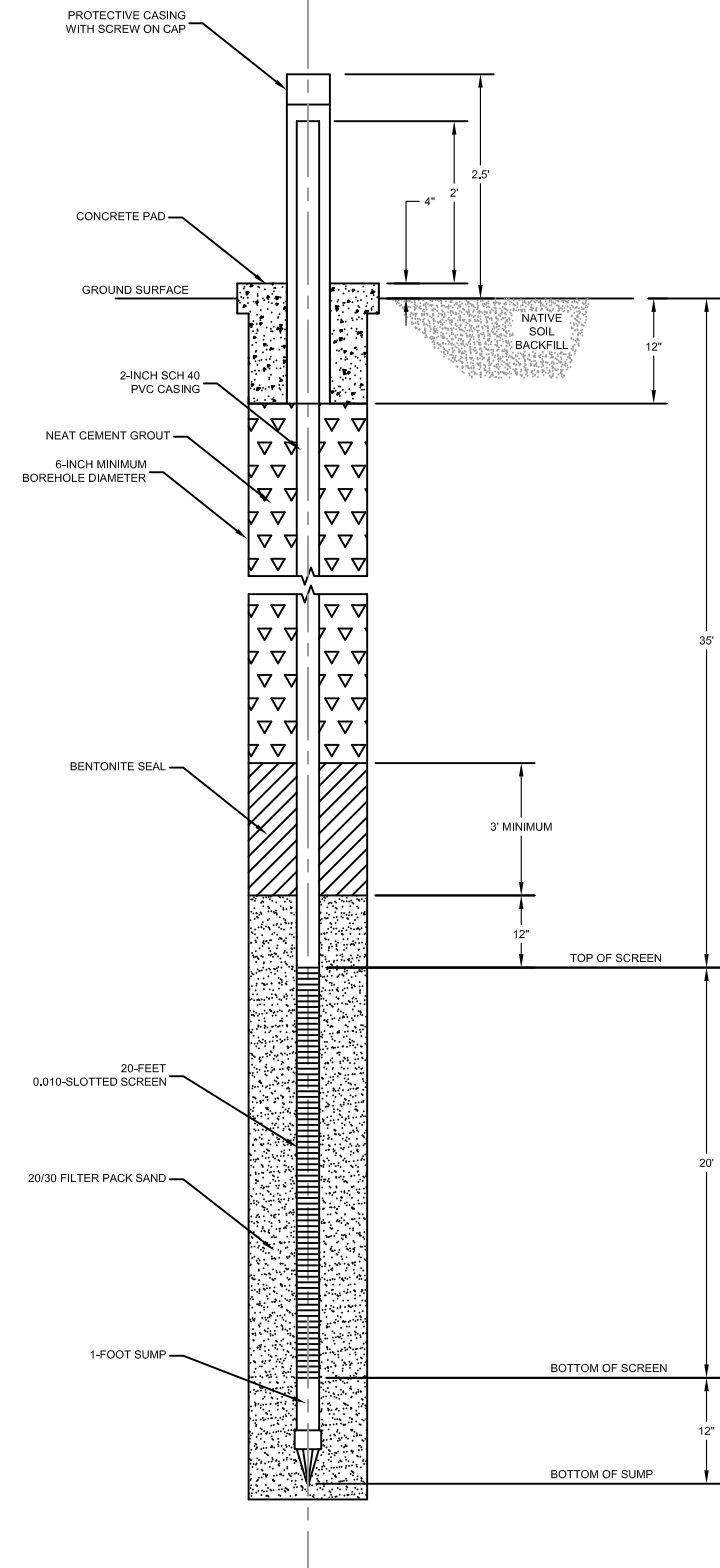
C:\Users\lrcrj\Desktop\Misc\Projects\NASA\South Repeater Building\F2-5-OBSERVATION\_WELL\_DIA (rev1).dwg 04/05/23



**TYPICAL OBSERVATION WELL - ABOVE GRADE**  
**10 FEET BLS**  
**NOT TO SCALE**



**TYPICAL OBSERVATION WELL - ABOVE GRADE**  
**25 FEET BLS**  
**NOT TO SCALE**



**TYPICAL OBSERVATION WELL - ABOVE GRADE**  
**55 FEET BLS**  
**NOT TO SCALE**

**NOTE:**

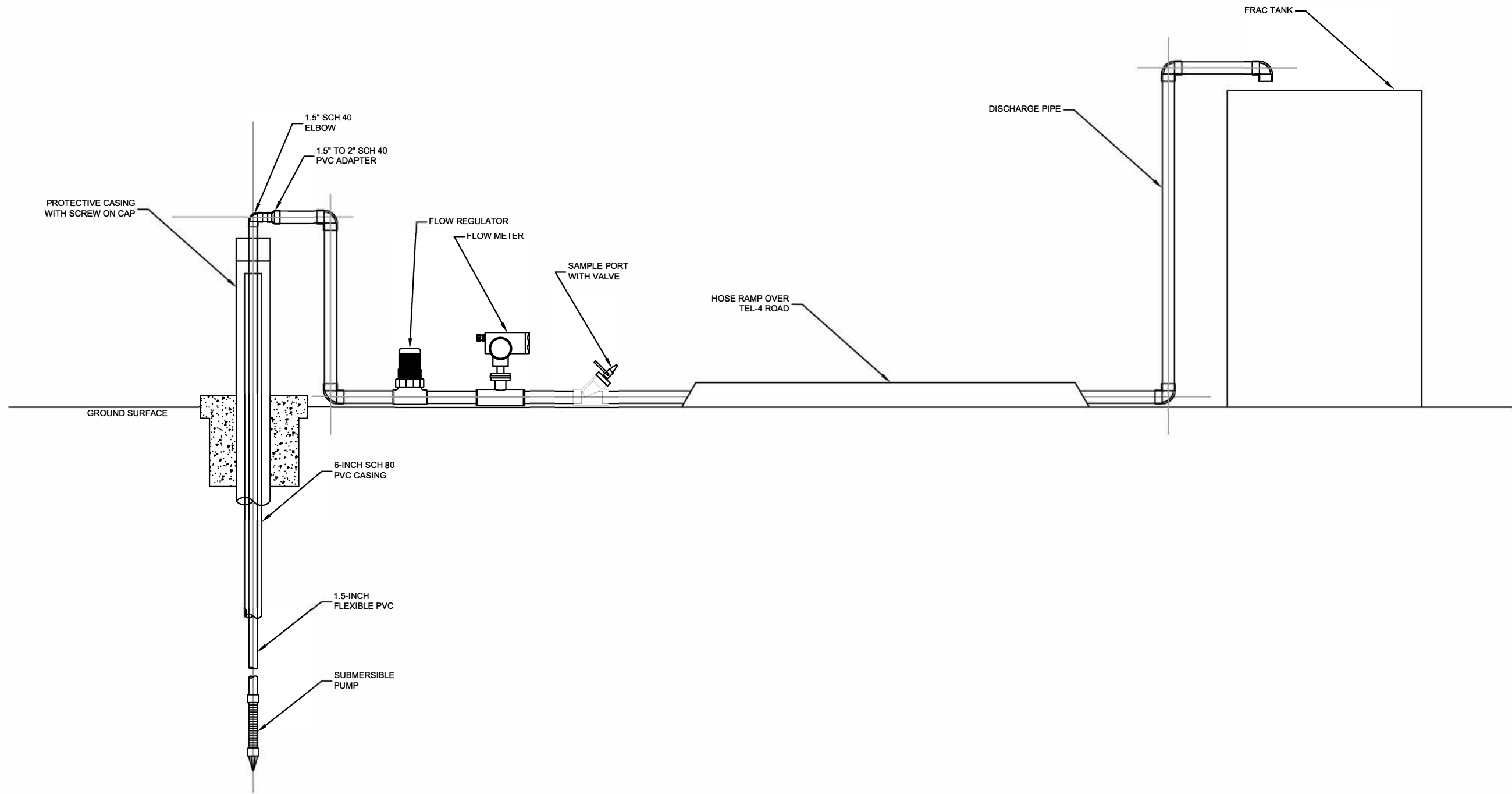
1. Depth of observation well screens is provided in feet below land surface (FT BLS).
2. Well construction details are based on the current understanding of the subsurface hydrogeology. An additional soil core will be completed closer to the area of the extraction wells before the Pilot Study begins. If the boring log data shows a significant lithologic difference from the current understanding, the depths and screen intervals proposed may be modified in the field.

**FIGURE 2-5**

Observation Well Construction Details

**South Repeater Building**  
**NASA Kennedy Space Center, Florida**

C:\Users\lcrchj\Desktop\Misc\Projects\NASA\South Repeater Building\F2-6\_EQUIPMENT\_DIA (rev1).dwg 04/06/23



**EQUIPMENT DIAGRAM - ABOVE GRADE**  
**NOT TO SCALE**

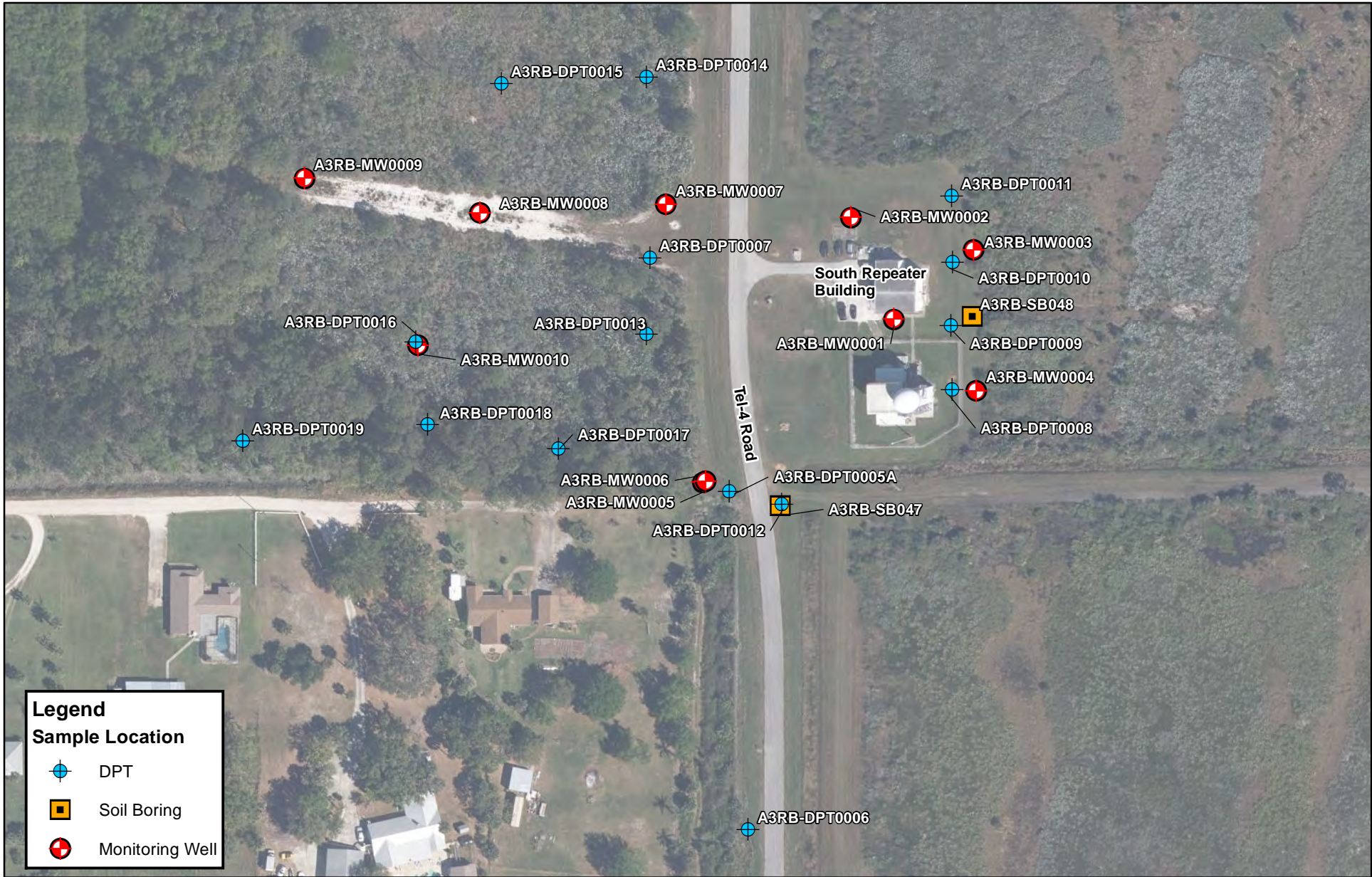
NOTE:

1. Depth of observation well screens is provided in feet below land surface (FT BLS).
2. Location and screen interval for observation wells is provided in Table 3-1.
3. SWMU = Solid Waste Management Unit

**FIGURE 2-6**  
**Equipment Diagram**  
**South Repeater Building**  
**NASA Kennedy Space Center, Florida**




**APPENDIX A**  
**Select Figures from PFAS Site Assessment Progress Report ADP**

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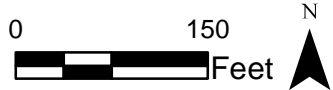


**Legend**

**Sample Location**

-  DPT
-  Soil Boring
-  Monitoring Well

MAPPING NOTES:  
 -Basemap Source  
 Orthoimagery from Brevard County, 2018.  
 -Projection  
 Coordinate System: NAD 1983 StatePlane Florida East FIPS 0901  
 -Scale  
 1 Inch = 150 Feet



**AECOM**

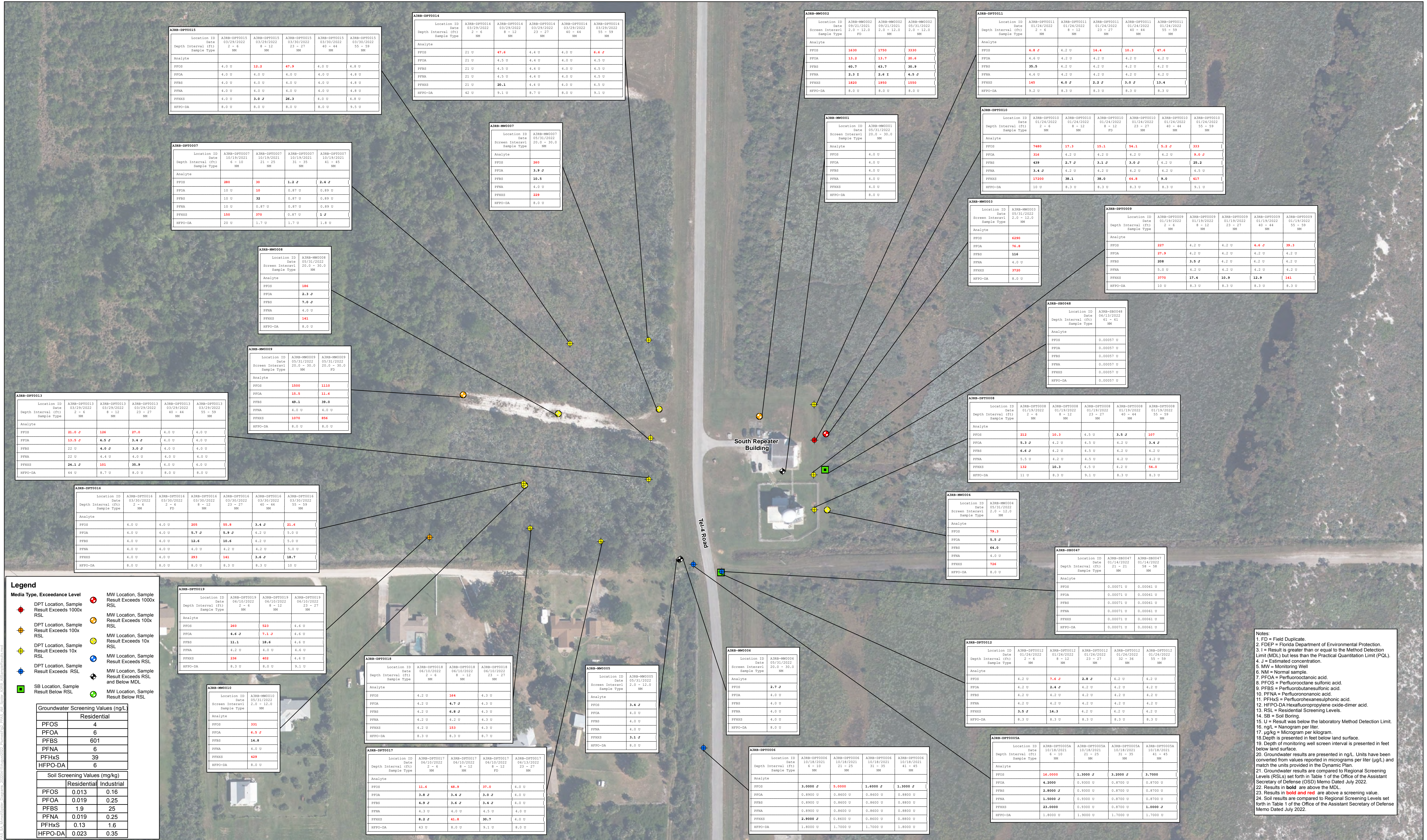
JOHN F. KENNEDY  
 SPACE CENTER  
 MERRITT ISLAND, FLORIDA

Drawn By: AD

Date Saved: 9/22/2022

**FIGURE 1**  
**SAMPLING LOCATIONS**  
**SOUTH REPEATER BUILDING**





Location ID	Date	Depth Interval (ft)	Sample Type	PFOS	PFOA	PFBS	PFNA	PFHxS	HFPO-DA
A38B-DPT0015	03/29/2022	2 - 4	NM						
A38B-DPT0015	03/29/2022	8 - 12	NM	32.2	47.9				
A38B-DPT0015	03/29/2022	23 - 27	NM						
A38B-DPT0015	03/29/2022	40 - 44	NM						
A38B-DPT0015	03/29/2022	55 - 59	NM						

Location ID	Date	Depth Interval (ft)	Sample Type	PFOS	PFOA	PFBS	PFNA	PFHxS	HFPO-DA
A38B-DPT0014	03/29/2022	2 - 4	NM						
A38B-DPT0014	03/29/2022	8 - 12	NM	47.6	4.4	4.0	4.0	6.6	J
A38B-DPT0014	03/29/2022	23 - 27	NM						
A38B-DPT0014	03/29/2022	40 - 44	NM						
A38B-DPT0014	03/29/2022	55 - 59	NM						

Location ID	Date	Depth Interval (ft)	Sample Type	PFOS	PFOA	PFBS	PFNA	PFHxS	HFPO-DA
A38B-MW0002	03/21/2022	2.0 - 12.0	NM						
A38B-MW0002	03/21/2022	2.0 - 12.0	NM	1630	1750	3330			
A38B-MW0002	03/21/2022	2.0 - 12.0	NM	13.2	13.7	20.6			
A38B-MW0002	03/21/2022	2.0 - 12.0	NM	60.7	63.7	30.9			
A38B-MW0002	03/21/2022	2.0 - 12.0	NM	2.3	2.6	4.5			
A38B-MW0002	03/21/2022	2.0 - 12.0	NM	1820	1950	1550			
A38B-MW0002	03/21/2022	2.0 - 12.0	NM						

Location ID	Date	Depth Interval (ft)	Sample Type	PFOS	PFOA	PFBS	PFNA	PFHxS	HFPO-DA
A38B-DPT0011	03/24/2022	2 - 6	NM	4.8	4.2	4.2	4.2	4.2	
A38B-DPT0011	03/24/2022	8 - 12	NM						
A38B-DPT0011	03/24/2022	23 - 27	NM	14.4	10.3	47.6			
A38B-DPT0011	03/24/2022	40 - 44	NM						
A38B-DPT0011	03/24/2022	55 - 59	NM						

Location ID	Date	Depth Interval (ft)	Sample Type	PFOS	PFOA	PFBS	PFNA	PFHxS	HFPO-DA
A38B-DPT0007	10/19/2021	6 - 10	NM	280	30	1.2	2.4		
A38B-DPT0007	10/19/2021	21 - 25	NM						
A38B-DPT0007	10/19/2021	31 - 35	NM						
A38B-DPT0007	10/19/2021	41 - 45	NM						

Location ID	Date	Depth Interval (ft)	Sample Type	PFOS	PFOA	PFBS	PFNA	PFHxS	HFPO-DA
A38B-MW0007	05/31/2022	20.0 - 30.0	NM						
A38B-MW0007	05/31/2022	20.0 - 30.0	NM	260					
A38B-MW0007	05/31/2022	20.0 - 30.0	NM	3.9					
A38B-MW0007	05/31/2022	20.0 - 30.0	NM	10.5					
A38B-MW0007	05/31/2022	20.0 - 30.0	NM	4.0					
A38B-MW0007	05/31/2022	20.0 - 30.0	NM	229					
A38B-MW0007	05/31/2022	20.0 - 30.0	NM						

Location ID	Date	Depth Interval (ft)	Sample Type	PFOS	PFOA	PFBS	PFNA	PFHxS	HFPO-DA
A38B-MW0001	03/31/2022	20.0 - 30.0	NM						
A38B-MW0001	03/31/2022	20.0 - 30.0	NM	4.0					
A38B-MW0001	03/31/2022	20.0 - 30.0	NM	4.0					
A38B-MW0001	03/31/2022	20.0 - 30.0	NM	4.0					
A38B-MW0001	03/31/2022	20.0 - 30.0	NM	4.0					
A38B-MW0001	03/31/2022	20.0 - 30.0	NM	4.0					
A38B-MW0001	03/31/2022	20.0 - 30.0	NM	4.0					

Location ID	Date	Depth Interval (ft)	Sample Type	PFOS	PFOA	PFBS	PFNA	PFHxS	HFPO-DA
A38B-DPT0010	03/24/2022	2 - 6	NM	7480	17.3	15.1	54.1	5.3	333
A38B-DPT0010	03/24/2022	8 - 12	NM						
A38B-DPT0010	03/24/2022	23 - 27	NM						
A38B-DPT0010	03/24/2022	40 - 44	NM						
A38B-DPT0010	03/24/2022	55 - 59	NM						

Location ID	Date	Depth Interval (ft)	Sample Type	PFOS	PFOA	PFBS	PFNA	PFHxS	HFPO-DA
A38B-MW0008	05/31/2022	20.0 - 30.0	NM						
A38B-MW0008	05/31/2022	20.0 - 30.0	NM	186					
A38B-MW0008	05/31/2022	20.0 - 30.0	NM	2.3					
A38B-MW0008	05/31/2022	20.0 - 30.0	NM	7.0					
A38B-MW0008	05/31/2022	20.0 - 30.0	NM	4.0					
A38B-MW0008	05/31/2022	20.0 - 30.0	NM	141					
A38B-MW0008	05/31/2022	20.0 - 30.0	NM						

Location ID	Date	Depth Interval (ft)	Sample Type	PFOS	PFOA	PFBS	PFNA	PFHxS	HFPO-DA
A38B-MW0009	05/31/2022	20.0 - 30.0	NM						
A38B-MW0009	05/31/2022	20.0 - 30.0	NM	1500	1110				
A38B-MW0009	05/31/2022	20.0 - 30.0	NM	15.5	11.6				
A38B-MW0009	05/31/2022	20.0 - 30.0	NM	49.1	39.0				
A38B-MW0009	05/31/2022	20.0 - 30.0	NM	4.0	4.0				
A38B-MW0009	05/31/2022	20.0 - 30.0	NM	1076	856				
A38B-MW0009	05/31/2022	20.0 - 30.0	NM						

Location ID	Date	Depth Interval (ft)	Sample Type	PFOS	PFOA	PFBS	PFNA	PFHxS	HFPO-DA
A38B-DPT0013	03/29/2022	2 - 6	NM	21.0	27.8				
A38B-DPT0013	03/29/2022	8 - 12	NM	4.5	3.4				
A38B-DPT0013	03/29/2022	23 - 27	NM						
A38B-DPT0013	03/29/2022	40 - 44	NM						
A38B-DPT0013	03/29/2022	55 - 59	NM						

Location ID	Date	Depth Interval (ft)	Sample Type	PFOS	PFOA	PFBS	PFNA	PFHxS	HFPO-DA
A38B-DPT0016	03/30/2022	2 - 6	NM	205	35.8	3.4	21.6		
A38B-DPT0016	03/30/2022	8 - 12	NM						
A38B-DPT0016	03/30/2022	23 - 27	NM						
A38B-DPT0016	03/30/2022	40 - 44	NM						
A38B-DPT0016	03/30/2022	55 - 59	NM						

Location ID	Date	Depth Interval (ft)	Sample Type	PFOS	PFOA	PFBS	PFNA	PFHxS	HFPO-DA
A38B-MW0004	03/31/2022	2.0 - 12.0	NM						
A38B-MW0004	03/31/2022	2.0 - 12.0	NM	79.3					
A38B-MW0004	03/31/2022	2.0 - 12.0	NM	5.5					
A38B-MW0004	03/31/2022	2.0 - 12.0	NM	64.0					
A38B-MW0004	03/31/2022	2.0 - 12.0	NM	4.0					
A38B-MW0004	03/31/2022	2.0 - 12.0	NM	736					
A38B-MW0004	03/31/2022	2.0 - 12.0	NM						

- Legend**
- DPT Location, Sample Result Exceeds 1000x RSL
  - MW Location, Sample Result Exceeds 100x RSL
  - DPT Location, Sample Result Exceeds 10x RSL
  - MW Location, Sample Result Exceeds RSL
  - DPT Location, Sample Result Exceeds RSL and Below MDL
  - SB Location, Sample Result Below RSL
  - MW Location, Sample Result Below RSL

Groundwater Screening Values (ng/L)	
PFOS	4
PFOA	6
PFBS	601
PFNA	6
PFHxS	39
HFPO-DA	6

Soil Screening Values (mg/kg)	
PFOS	0.013
PFOA	0.019
PFBS	1.9
PFNA	0.019
PFHxS	0.13
HFPO-DA	0.023

Location ID	Date	Depth Interval (ft)	Sample Type	PFOS	PFOA	PFBS	PFNA	PFHxS	HFPO-DA
A38B-DPT0019	06/10/2022	2 - 6	NM	260	923				
A38B-DPT0019	06/10/2022	8 - 12	NM						
A38B-DPT0019	06/10/2022	23 - 27	NM						
A38B-DPT0019	06/10/2022	40 - 44	NM						
A38B-DPT0019	06/10/2022	55 - 59	NM						

Location ID	Date	Depth Interval (ft)	Sample Type	PFOS	PFOA	PFBS	PFNA	PFHxS	HFPO-DA
A38B-DPT0018	06/10/2022	2 - 6	NM	4.2	3.4				
A38B-DPT0018	06/10/2022	8 - 12	NM						
A38B-DPT0018	06/10/2022	23 - 27	NM						
A38B-DPT0018	06/10/2022	40 - 44	NM						
A38B-DPT0018	06/10/2022	55 - 59	NM						

Location ID	Date	Depth Interval (ft)	Sample Type	PFOS	PFOA	PFBS	PFNA	PFHxS	HFPO-DA
A38B-MW0005	03/31/2022	2.0 - 12.0	NM						
A38B-MW0005	03/31/2022	2.0 - 12.0	NM	3.4					
A38B-MW0005	03/31/2022	2.0 - 12.0	NM	4.8					
A38B-MW0005	03/31/2022	2.0 - 12.0	NM	4.0					
A38B-MW0005	03/31/2022	2.0 - 12.0	NM	4.0					
A38B-MW0005	03/31/2022	2.0 - 12.0	NM	4.0					
A38B-MW0005	03/31/2022	2.0 - 12.0	NM	4.0					

Location ID	Date	Depth Interval (ft)	Sample Type	PFOS	PFOA	PFBS	PFNA	PFHxS	HFPO-DA
A38B-DPT0017	06/10/2022	2 - 6	NM	11.6	48.9	37.0			
A38B-DPT0017	06/10/2022	8 - 12	NM						
A38B-DPT0017	06/10/2022	23 - 27	NM						
A38B-DPT0017	06/10/2022	40 - 44	NM						
A38B-DPT0017	06/10/2022	55 - 59	NM						




Location ID	Date	Depth Interval (ft)	Sample Type	PFOS	PFOA	PFBS	PFNA	PFHx
-------------	------	---------------------	-------------	------	------	------	------	------



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**LEGEND**

-  Monitoring Well
-  Soil Boring Location
-  Lithologic Cross-Section Location

- Notes:
1. bls = Below land surface
  2. Aerial Source: FDOT 2018
  3. Groundwater Countour Interval = 0.5 feet
  4. Vertical Datum is NAVD88 (US foot)



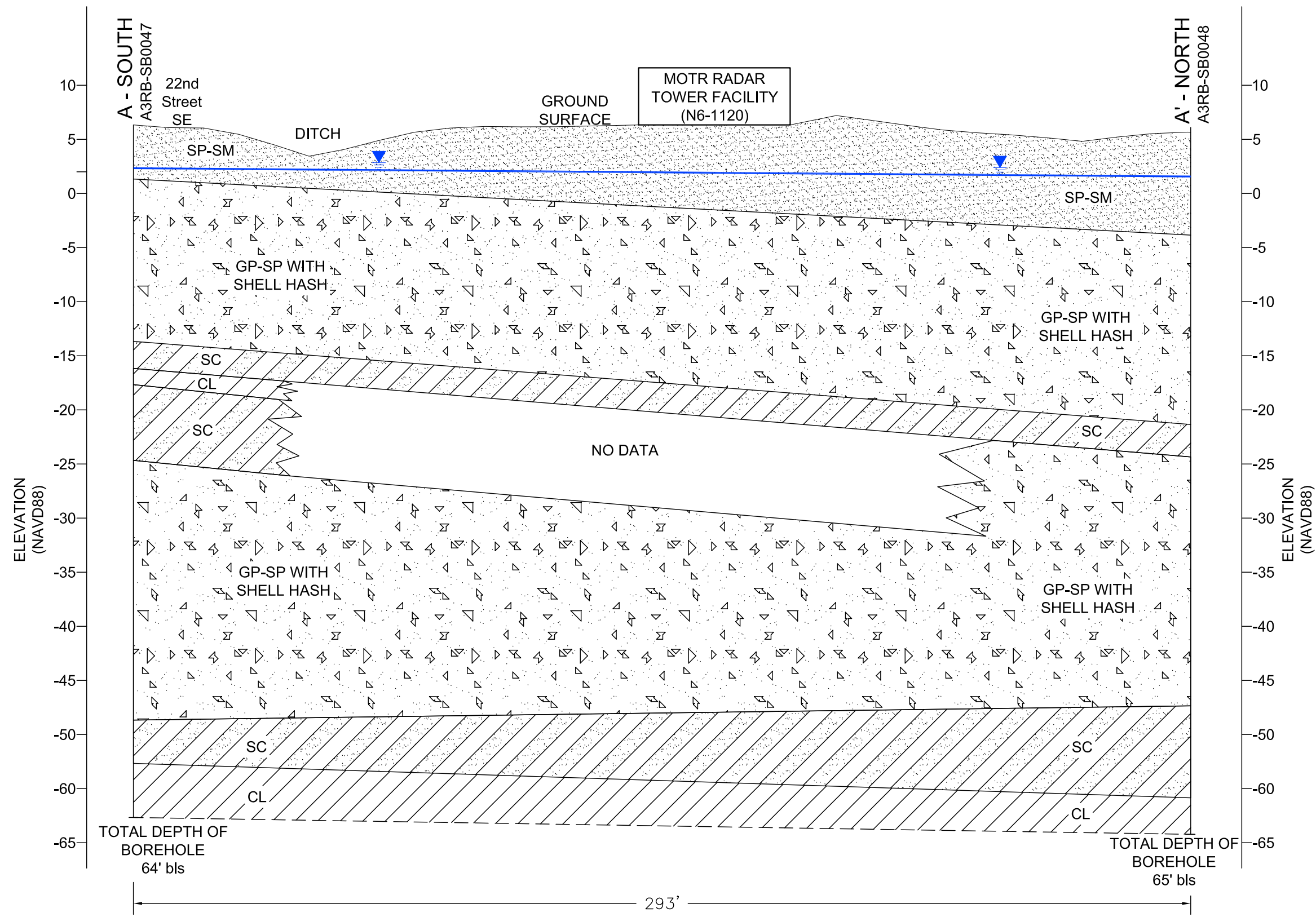
0 40 80  
  
 Feet  
 Source  
 Orthoimagery from Brevard County, 2018.



JOHN F. KENNEDY  
 SPACE CENTER  
 MERRITT ISLAND, FLORIDA  
 DATE: 8/31/2022 DRWN: SD

FIGURE 1  
 LITHOLOGIC CROSS-SECTION LOCATION





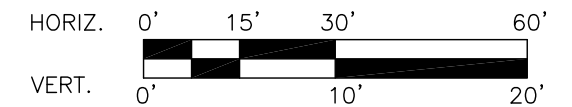
LEGEND:

- DARK BROWN POORLY GRADED SILTY FINE SAND
- GRAY POORLY GRADED GRAVEL WITH SAND
- GRAY LEAN CLAY (NATIVE)
- GRAY CLAYEY SAND

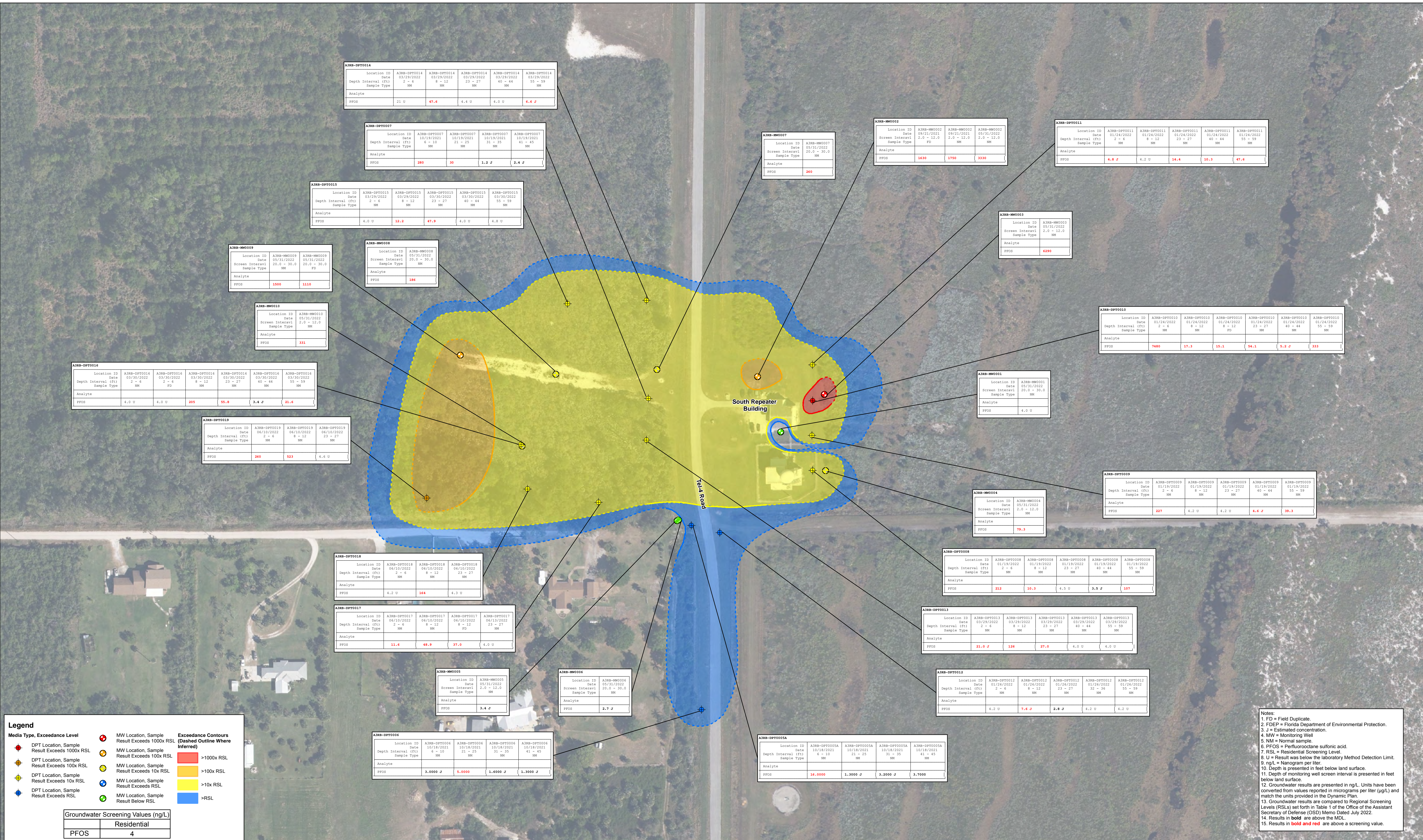
WATER TABLE  
(DASHED WHERE INFERRED)

NOTES:

- WATER LEVEL GAUGED ON MAY 31, 2022
- bls = BELOW LAND SURFACE







**Legend**

**Media Type, Exceedance Level**

- Red circle: DPT Location, Sample Result Exceeds 1000x RSL
- Orange circle: DPT Location, Sample Result Exceeds 100x RSL
- Yellow circle: DPT Location, Sample Result Exceeds 10x RSL
- Green circle: DPT Location, Sample Result Exceeds RSL
- Blue circle: DPT Location, Sample Result Below RSL

**MW Location, Sample Result Exceeds 1000x RSL**

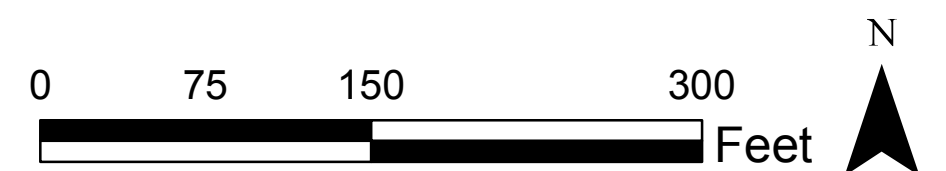
- Red circle: MW Location, Sample Result Exceeds 1000x RSL
- Orange circle: MW Location, Sample Result Exceeds 100x RSL
- Yellow circle: MW Location, Sample Result Exceeds 10x RSL
- Green circle: MW Location, Sample Result Exceeds RSL
- Blue circle: MW Location, Sample Result Below RSL

**Exceedance Contours (Dashed Outline Where Inferred)**

- Red: >1000x RSL
- Orange: >100x RSL
- Yellow: >10x RSL
- Green: >1x RSL
- Blue: >RSL

Groundwater Screening Values (ng/L)	
Media Type	Residential
PFOS	4

MAPPING NOTES:  
 -Basemap Source  
 -Orthoimagery from Brevard County, 2018.  
 -Projection  
 -Coordinate System: NAD 1983 StatePlane Florida East FIPS 0901  
 -Scale  
 1 Inch = 87 Feet



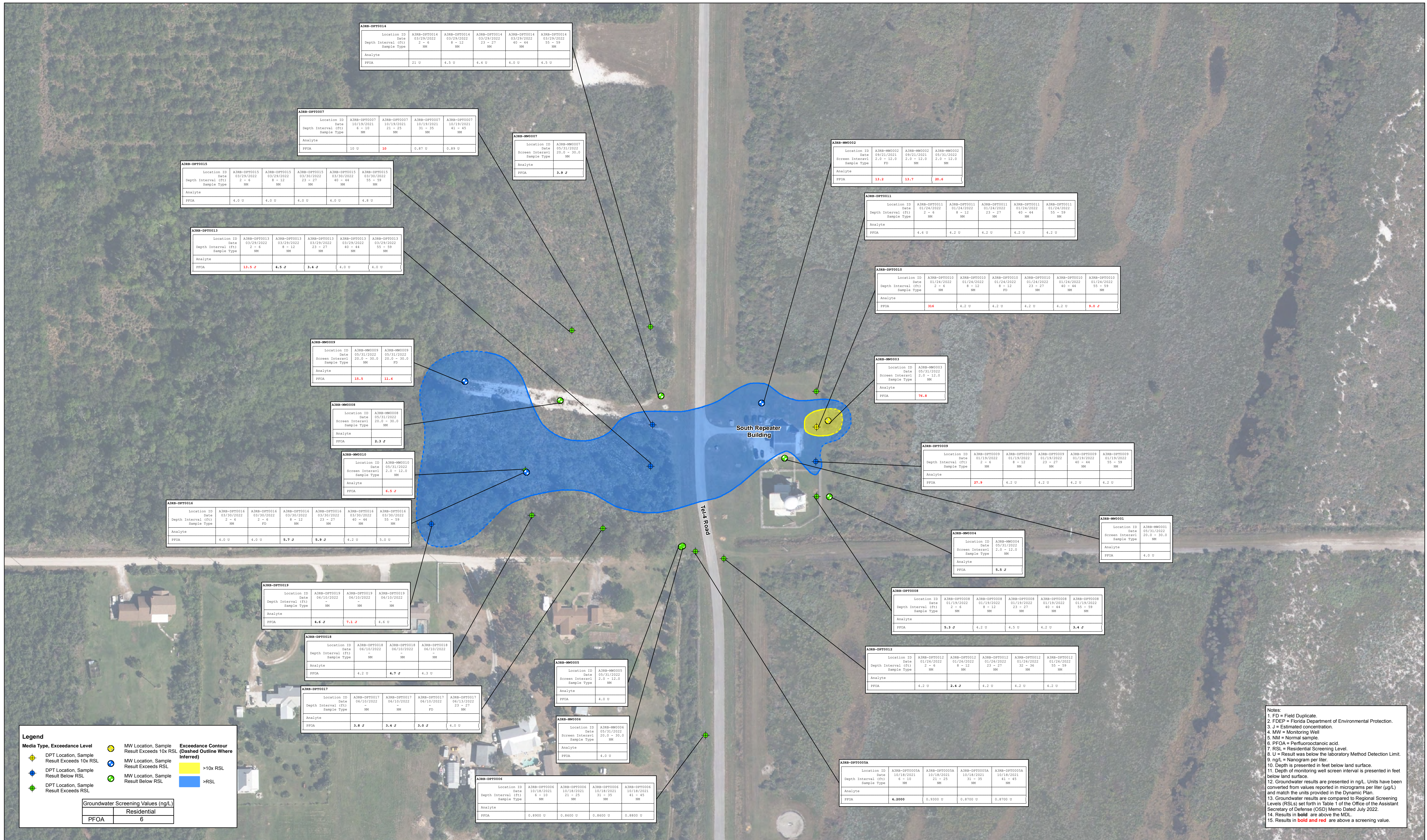
JOHN F. KENNEDY  
 SPACE CENTER  
 MERRITT ISLAND, FLORIDA

Drawn By: AD      Date Saved: 9/12/2022

**FIGURE 3  
 PFOS SAMPLING RESULTS  
 SOUTH REPEATER BUILDING**

- Notes:**
1. FD = Field Duplicate.
  2. FDEP = Florida Department of Environmental Protection.
  3. J = Estimated concentration.
  4. MW = Monitoring Well
  5. NM = Normal sample
  6. PFOS = Perfluorooctane sulfonic acid.
  7. RSL = Residential Screening Level.
  8. U = Result was below the laboratory Method Detection Limit.
  9. ngl = Nanogram per liter.
  10. Depth is presented in feet below land surface.
  11. Depth of monitoring well screen interval is presented in feet below land surface.
  12. Groundwater results are presented in ngl/L. Units have been converted from values reported in micrograms per liter (ug/L) and match the units provided in the Dynamic Plan.
  13. Groundwater results are compared to Regional Screening Levels (RSLs) set forth in Table 1 of the Office of the Assistant Secretary of Defense (OSD) Memo Dated July 2022.
  14. Results in bold are above the MDL.
  15. Results in bold and red are above a screening value.





**Legend**

**Media Type, Exceedance Level**

- DPT Location, Sample Result Exceeds 10x RSL
- DPT Location, Sample Result Below RSL
- MW Location, Sample Result Exceeds RSL
- MW Location, Sample Result Below RSL

**Exceedance Contour (Dashed Outline Where Inferred)**

- >10x RSL
- >RSL

**Groundwater Screening Values (ng/L)**

	Residential
PFOA	6

- Notes:**
1. FD = Field Duplicate
  2. FDEP = Florida Department of Environmental Protection.
  3. J = Estimated concentration.
  4. MW = Monitoring Well
  5. NM = Normal sample.
  6. PFOA = Perfluorooctanoic acid.
  7. RSL = Residential Screening Level.
  8. U = Result was below the laboratory Method Detection Limit.
  9. ng/L = Nanogram per liter.
  10. Depth is presented in feet below land surface.
  11. Depth of monitoring well screen interval is presented in feet below land surface.
  12. Groundwater results are presented in ng/L. Units have been converted from values reported in micrograms per liter (µg/L) and match the units provided in the Dynamic Plan.
  13. Groundwater results are compared to Regional Screening Levels (RSLs) set forth in Table 1 of the Office of the Assistant Secretary of Defense (OSD) Memo Dated July 2022.
  14. Results in bold are above the MDL.
  15. Results in bold and red are above a screening value.

**MAPPING NOTES:**  
 -Basemap Source  
 Orthoimagery from Brevard County, 2018.  
 -projection  
 Coordinate System: NAD 1983 StatePlane Florida East FIPS 0901  
 -Scale  
 1 Inch = 87 Feet



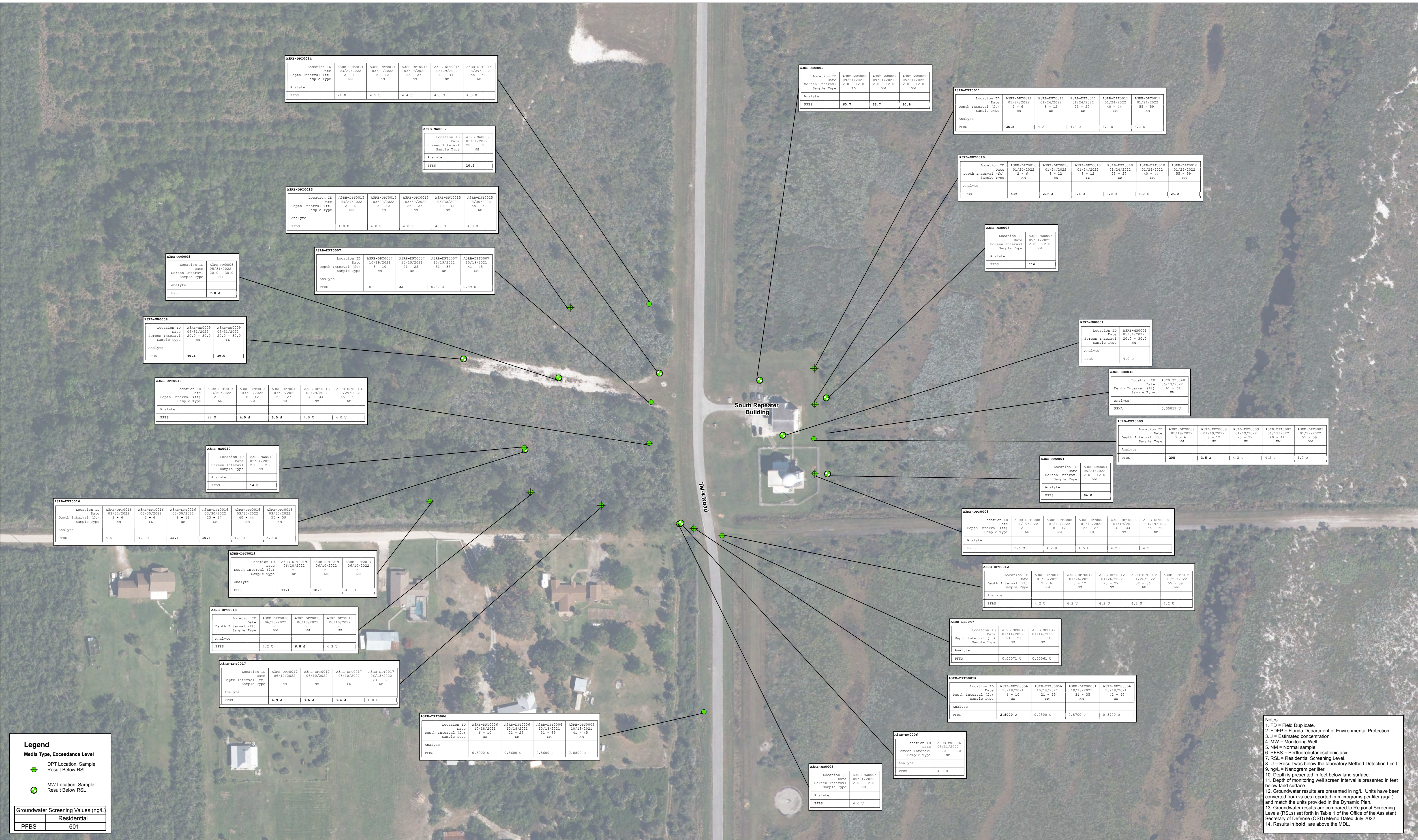
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**FIGURE 4**  
**PFOA SAMPLING RESULTS**  
**SOUTH REPEATER BUILDING**







A38B-DPT0014					
Location ID	Date	Depth Interval (ft)	Sample Type	Analyte	PFBS
A38B-DPT0014	03/29/2022	2 - 6	NM		
A38B-DPT0014	03/29/2022	8 - 12	NM		4.5 U
A38B-DPT0014	03/29/2022	23 - 27	NM		4.4 U
A38B-DPT0014	03/29/2022	40 - 44	NM		4.0 U
A38B-DPT0014	03/29/2022	55 - 59	NM		4.5 U

A38B-MW0002				
Location ID	Date	Screen Interval	Sample Type	Analyte
A38B-MW0002	09/21/2021	2.0 - 12.0	FD	
A38B-MW0002	09/21/2021	2.0 - 12.0	NM	
A38B-MW0002	05/31/2022	2.0 - 12.0	NM	
				PFBS
				60.7
				63.7
				30.9

A38B-DPT0011					
Location ID	Date	Depth Interval (ft)	Sample Type	Analyte	PFBS
A38B-DPT0011	01/24/2022	2 - 6	NM		
A38B-DPT0011	01/24/2022	8 - 12	NM		35.5
A38B-DPT0011	01/24/2022	23 - 27	NM		4.2 U
A38B-DPT0011	01/24/2022	40 - 44	NM		4.2 U
A38B-DPT0011	01/24/2022	55 - 59	NM		4.2 U

A38B-DPT0010					
Location ID	Date	Depth Interval (ft)	Sample Type	Analyte	PFBS
A38B-DPT0010	01/24/2022	2 - 6	NM		439
A38B-DPT0010	01/24/2022	8 - 12	NM		2.7 J
A38B-DPT0010	01/24/2022	23 - 27	FD		3.1 J
A38B-DPT0010	01/24/2022	40 - 44	NM		3.0 J
A38B-DPT0010	01/24/2022	55 - 59	NM		4.2 U
A38B-DPT0010	01/24/2022	55 - 59	NM		25.2

A38B-MW0008		
Location ID	Date	Screen Interval
A38B-MW0008	05/31/2022	20.0 - 30.0
		Sample Type
		NM
		Analyte
		PFBS
		7.0 J

A38B-DPT0015					
Location ID	Date	Depth Interval (ft)	Sample Type	Analyte	PFBS
A38B-DPT0015	03/29/2022	2 - 6	NM		4.0 U
A38B-DPT0015	03/29/2022	8 - 12	NM		4.0 U
A38B-DPT0015	03/29/2022	23 - 27	NM		4.0 U
A38B-DPT0015	03/30/2022	40 - 44	NM		4.0 U
A38B-DPT0015	03/30/2022	55 - 59	NM		4.8 U

A38B-DPT0007				
Location ID	Date	Depth Interval (ft)	Sample Type	Analyte
A38B-DPT0007	10/19/2021	6 - 10	NM	
A38B-DPT0007	10/19/2021	21 - 25	NM	
A38B-DPT0007	10/19/2021	31 - 35	NM	
A38B-DPT0007	10/19/2021	41 - 45	NM	
				PFBS
				10 U
				32
				0.87 U
				0.89 U

A38B-MW0009		
Location ID	Date	Screen Interval
A38B-MW0009	05/31/2022	20.0 - 30.0
		Sample Type
		FD
		Analyte
		PFBS
		49.1
		39.0

A38B-DPT0013					
Location ID	Date	Depth Interval (ft)	Sample Type	Analyte	PFBS
A38B-DPT0013	03/29/2022	2 - 6	NM		22 U
A38B-DPT0013	03/29/2022	8 - 12	NM		4.0 J
A38B-DPT0013	03/29/2022	23 - 27	NM		3.0 J
A38B-DPT0013	03/29/2022	40 - 44	NM		4.0 U
A38B-DPT0013	03/29/2022	55 - 59	NM		4.0 U

A38B-MW0010		
Location ID	Date	Screen Interval
A38B-MW0010	05/31/2022	2.0 - 12.0
		Sample Type
		NM
		Analyte
		PFBS
		14.8

A38B-DPT0016					
Location ID	Date	Depth Interval (ft)	Sample Type	Analyte	PFBS
A38B-DPT0016	03/30/2022	2 - 6	NM		4.0 U
A38B-DPT0016	03/30/2022	2 - 6	FD		4.0 U
A38B-DPT0016	03/30/2022	8 - 12	NM		12.6
A38B-DPT0016	03/30/2022	23 - 27	NM		10.6
A38B-DPT0016	03/30/2022	40 - 44	NM		4.2 U
A38B-DPT0016	03/30/2022	55 - 59	NM		5.0 U

A38B-DPT0019				
Location ID	Date	Depth Interval (ft)	Sample Type	Analyte
A38B-DPT0019	06/10/2022	-	NM	
A38B-DPT0019	06/10/2022	-	NM	
A38B-DPT0019	06/10/2022	-	NM	
				PFBS
				11.1
				18.6
				4.8 U

A38B-DPT0018				
Location ID	Date	Depth Interval (ft)	Sample Type	Analyte
A38B-DPT0018	06/10/2022	6 - 10	NM	
A38B-DPT0018	06/10/2022	6 - 10	NM	
A38B-DPT0018	06/10/2022	6 - 10	NM	
				PFBS
				4.0 U
				6.8 J
				4.3 U

A38B-DPT0017				
Location ID	Date	Depth Interval (ft)	Sample Type	Analyte
A38B-DPT0017	06/10/2022	6 - 10	NM	
A38B-DPT0017	06/10/2022	6 - 10	NM	
A38B-DPT0017	06/10/2022	6 - 10	NM	
A38B-DPT0017	06/13/2022	23 - 27	FD	
A38B-DPT0017	06/13/2022	23 - 27	NM	
				PFBS
				4.9 J
				3.6 J
				3.4 J
				4.0 U

A38B-DPT0006				
Location ID	Date	Depth Interval (ft)	Sample Type	Analyte
A38B-DPT0006	10/18/2021	6 - 10	NM	
A38B-DPT0006	10/18/2021	21 - 25	NM	
A38B-DPT0006	10/18/2021	31 - 35	NM	
A38B-DPT0006	10/18/2021	41 - 45	NM	
				PFBS
				0.8900 U
				0.8600 U
				0.8400 U
				0.8800 U

A38B-DPT0008					
Location ID	Date	Depth Interval (ft)	Sample Type	Analyte	PFBS
A38B-DPT0008	01/19/2022	2 - 6	NM		6.6 J
A38B-DPT0008	01/19/2022	8 - 12	NM		4.2 U
A38B-DPT0008	01/19/2022	23 - 27	NM		4.5 U
A38B-DPT0008	01/19/2022	40 - 44	NM		4.2 U
A38B-DPT0008	01/19/2022	55 - 59	NM		4.2 U

A38B-DPT0012					
Location ID	Date	Depth Interval (ft)	Sample Type	Analyte	PFBS
A38B-DPT0012	01/26/2022	2 - 6	NM		4.2 U
A38B-DPT0012	01/26/2022	8 - 12	NM		4.2 U
A38B-DPT0012	01/26/2022	23 - 27	NM		4.2 U
A38B-DPT0012	01/26/2022	32 - 36	NM		4.2 U
A38B-DPT0012	01/26/2022	55 - 59	NM		4.2 U

A38B-SM0047		
Location ID	Date	Depth Interval (ft)
A38B-SM0047	01/14/2022	21 - 21
		Sample Type
		NM
		Analyte
		PFBS
		0.00071 U
		0.00061 U

A38B-DPT0005A				
Location ID	Date	Depth Interval (ft)	Sample Type	Analyte
A38B-DPT0005A	10/18/2021	6 - 10	NM	
A38B-DPT0005A	10/18/2021	21 - 25	NM	
A38B-DPT0005A	10/18/2021	31 - 35	NM	
A38B-DPT0005A	10/18/2021	41 - 45	NM	
				PFBS
				2,800 J
				0.9300 U
				0.8700 U
				0.8700 U

A38B-MW0006		
Location ID	Date	Screen Interval
A38B-MW0006	05/31/2022	20.0 - 30.0
		Sample Type
		NM
		Analyte
		PFBS
		4.0 U

A38B-MW0005		
Location ID	Date	Screen Interval
A38B-MW0005	05/31/2022	2.0 - 12.0
		Sample Type
		NM
		Analyte
		PFBS
		4.0 U

**Legend**

**Media Type, Exceedance Level**

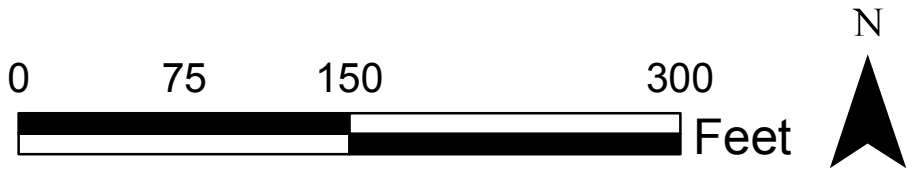
- DPT Location, Sample Result Below RSL
- MW Location, Sample Result Below RSL

Groundwater Screening Values (ng/L)	
Residential	PFBS
	601

**Notes:**

1. FD = Field Duplicate.
2. FDEP = Florida Department of Environmental Protection.
3. J = Estimated concentration.
4. MW = Monitoring Well.
5. NM = Normal sample.
6. PFBS = Perfluorobutanesulfonic acid.
7. RSL = Residential Screening Level.
8. U = Result was below the laboratory Method Detection Limit.
9. ng/L = Nanogram per liter.
10. Depth is presented in feet below land surface.
11. Depth of monitoring well screen interval is presented in feet below land surface.
12. Groundwater results are presented in ng/L. Units have been converted from values reported in micrograms per liter (µg/L) and match the units provided in the Dynamic Plan.
13. Groundwater results are compared to Regional Screening Levels (RSLs) set forth in Table 1 of the Office of the Assistant Secretary of Defense (OSD) Memo Dated July 2022.
14. Results in bold are above the MDL.

MAPPING NOTES:  
 -Basemap Source  
 Orthimagery from Brevard County, 2018.  
 -Projection  
 Coordinate System: NAD 1983 StatePlane Florida East FIPS 0901  
 -Scale  
 1 Inch = 87 Feet



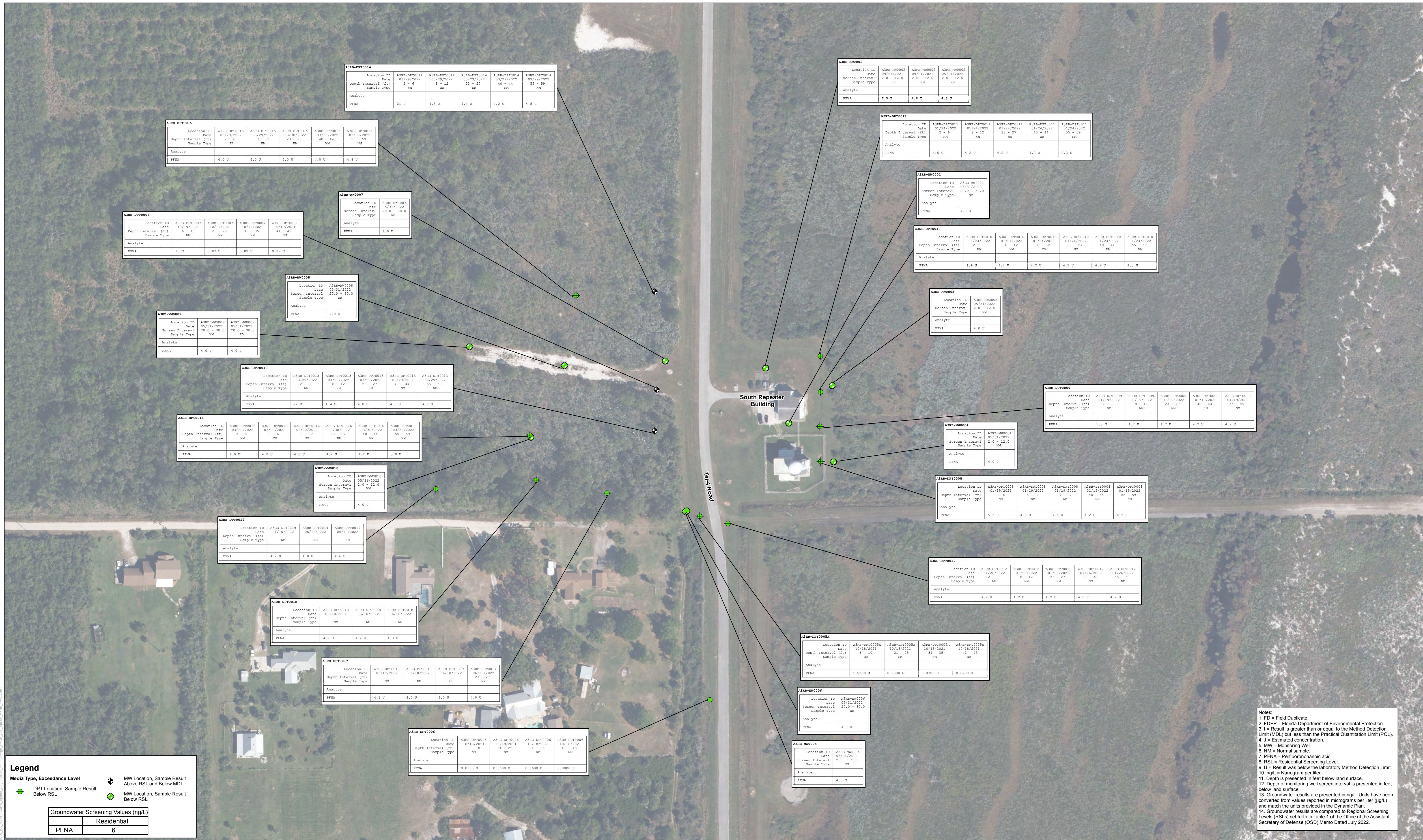
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**FIGURE 5**  
**PFBS SAMPLING RESULTS**  
**SOUTH REPEATER BUILDING**







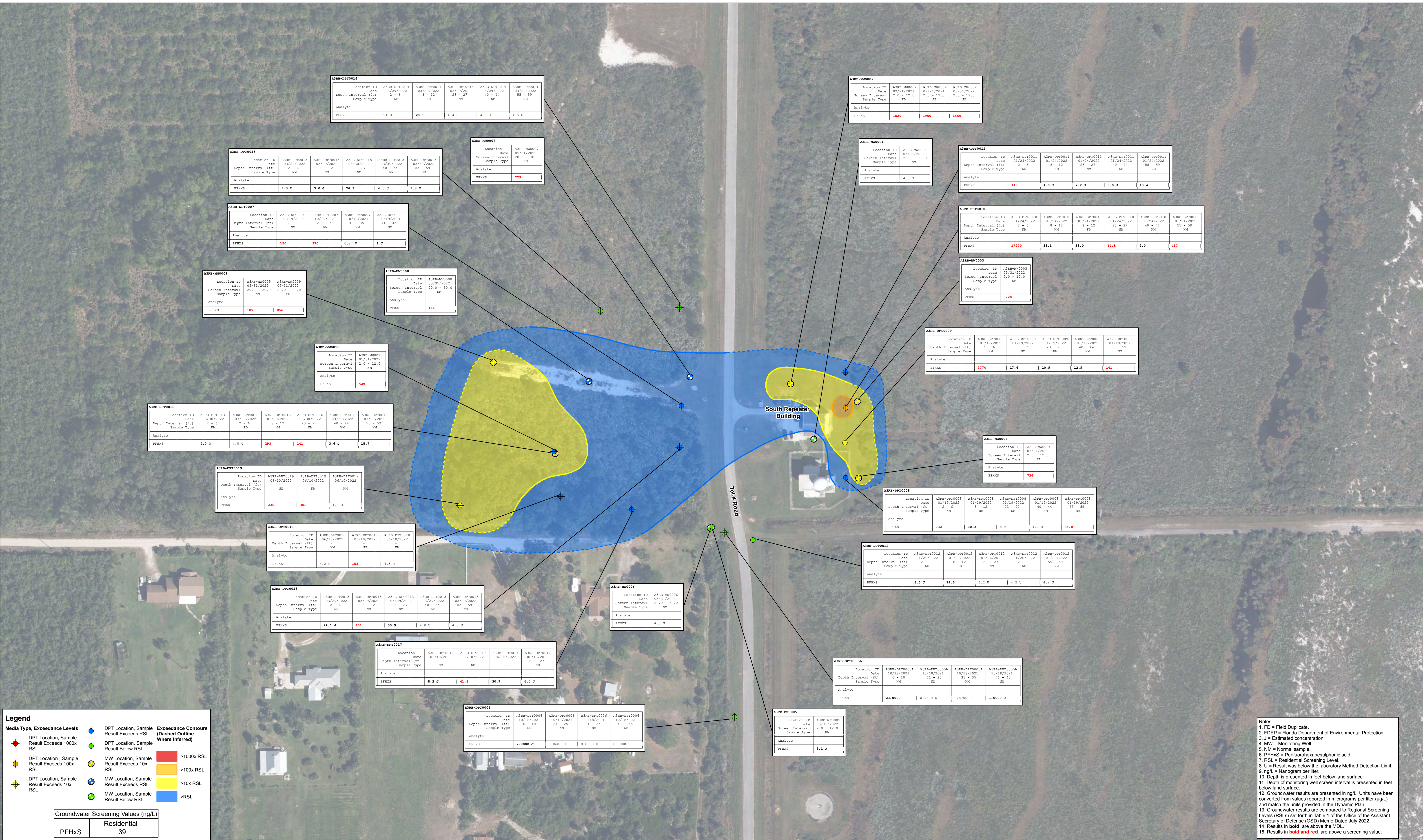
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**FIGURE 6**  
**PFNA SAMPLING RESULTS**  
**SOUTH REPEATER BUILDING**







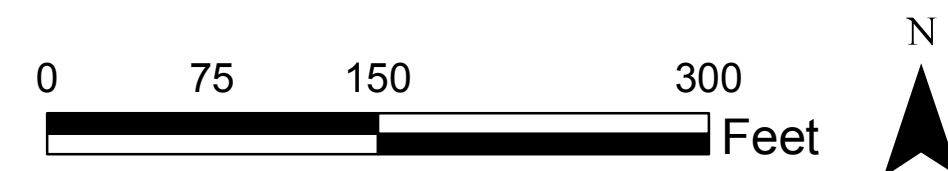
**Legend**

1. FD	DPT Location, Sample Result Exceeds RSL	Exceedance Contours (Dashed Outline Where Inferred)
2. J	DPT Location, Sample Result Exceeds 100x RSL	>1000x RSL
3. J	DPT Location, Sample Result Exceeds 10x RSL	>100x RSL
4. J	DPT Location, Sample Result Exceeds 10x RSL	>10x RSL
5. J	DPT Location, Sample Result Exceeds 10x RSL	>RSL
6. J	MW Location, Sample Result Exceeds RSL	
7. J	MW Location, Sample Result Below RSL	

Groundwater Screening Values (ng/L)	
	Residential
PFHxS	39

MAPPING NOTES:  
 -Basemap Source  
 -Orthimagery from Brevard County, 2018.  
 -Projection  
 -Coordinate System: NAD 1983 StatePlane Florida East FIPS 0901  
 -Scale  
 1 Inch = 87 Feet



- Notes:**
1. FD = Field Duplicate.
  2. FDEP = Florida Department of Environmental Protection.
  3. J = Estimated concentration.
  4. MW = Monitoring Well.
  5. NM = Normal sample.
  6. PFHxS = Perfluorohexanesulphonic acid.
  7. RSL = Residential Screening Level.
  8. U = Result was below the laboratory Method Detection Limit.
  9. ng/L = Nanogram per liter.
  10. Depth is presented in feet below land surface.
  11. Depth of monitoring well screen interval is presented in feet below land surface.
  12. Groundwater results are presented in ng/L. Units have been converted from values reported in micrograms per liter (µg/L) and match the units provided in the Dynamic Plan.
  13. Groundwater results are compared to Regional Screening Levels (RSLs) set forth in Table 1 of the Office of the Assistant Secretary of Defense (OSD) Memo Dated July 2022.
  14. Results in bold are above the MDL.
  15. Results in bold and red are above a screening value.

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**FIGURE 7**  
**PFHxS SAMPLING RESULTS**  
**SOUTH REPEATER BUILDING**



A38B-DPT0015					
Location ID	Date	A38B-DPT0015	A38B-DPT0015	A38B-DPT0015	A38B-DPT0015
Depth Interval (ft)	03/29/2022	2 - 6	8 - 12	23 - 27	40 - 44
Sample Type	NM	NM	NM	NM	NM
Analyte					
HFPO-DA	8.0 U	8.0 U	8.0 U	8.0 U	9.5 U

A38B-DPT0014					
Location ID	Date	A38B-DPT0014	A38B-DPT0014	A38B-DPT0014	A38B-DPT0014
Depth Interval (ft)	03/29/2022	2 - 6	8 - 12	23 - 27	40 - 44
Sample Type	NM	NM	NM	NM	NM
Analyte					
HFPO-DA	42 U	9.1 U	8.7 U	8.0 U	9.1 U

A38B-MW0008	
Location ID	Date
A38B-MW0008	05/31/2022
Screen Interval	20.0 - 30.0
Sample Type	NM
Analyte	
HFPO-DA	8.0 U

A38B-MW0007	
Location ID	Date
A38B-MW0007	05/31/2022
Screen Interval	20.0 - 30.0
Sample Type	NM
Analyte	
HFPO-DA	8.0 U

A38B-MW0002			
Location ID	Date	A38B-MW0002	A38B-MW0002
A38B-MW0002	09/21/2021	09/21/2021	05/31/2022
Screen Interval	2.0 - 12.0	2.0 - 12.0	2.0 - 12.0
Sample Type	FD	NM	NM
Analyte			
HFPO-DA	8.0 U	8.0 U	8.0 U

A38B-DPT0011					
Location ID	Date	A38B-DPT0011	A38B-DPT0011	A38B-DPT0011	A38B-DPT0011
Depth Interval (ft)	01/24/2022	2 - 6	8 - 12	23 - 27	40 - 44
Sample Type	NM	NM	NM	NM	NM
Analyte					
HFPO-DA	9.2 U	8.3 U	8.3 U	8.3 U	8.3 U

A38B-MW0001	
Location ID	Date
A38B-MW0001	03/31/2022
Screen Interval	20.0 - 30.0
Sample Type	NM
Analyte	
HFPO-DA	8.0 U

A38B-DPT0010						
Location ID	Date	A38B-DPT0010	A38B-DPT0010	A38B-DPT0010	A38B-DPT0010	A38B-DPT0010
Depth Interval (ft)	01/24/2022	2 - 6	8 - 12	8 - 12	23 - 27	40 - 44
Sample Type	NM	NM	FD	NM	NM	NM
Analyte						
HFPO-DA	10 U	8.3 U	8.3 U	8.3 U	8.3 U	9.1 U

A38B-MW0009		
Location ID	Date	A38B-MW0009
A38B-MW0009	05/31/2022	05/31/2022
Screen Interval	20.0 - 30.0	20.0 - 30.0
Sample Type	NM	FD
Analyte		
HFPO-DA	8.0 U	8.0 U

A38B-MW0003	
Location ID	Date
A38B-MW0003	05/31/2022
Screen Interval	2.0 - 12.0
Sample Type	NM
Analyte	
HFPO-DA	8.0 U

A38B-DPT0007				
Location ID	Date	A38B-DPT0007	A38B-DPT0007	A38B-DPT0007
Depth Interval (ft)	10/19/2021	6 - 10	21 - 25	31 - 35
Sample Type	NM	NM	NM	NM
Analyte				
HFPO-DA	20 U	1.7 U	1.7 U	1.8 U

A38B-DPT0016						
Location ID	Date	A38B-DPT0016	A38B-DPT0016	A38B-DPT0016	A38B-DPT0016	A38B-DPT0016
Depth Interval (ft)	03/09/2022	2 - 6	8 - 12	23 - 27	40 - 44	55 - 59
Sample Type	NM	FD	NM	NM	NM	NM
Analyte						
HFPO-DA	8.0 U	8.0 U	8.0 U	8.3 U	8.3 U	10 U

A38B-MW0010	
Location ID	Date
A38B-MW0010	05/31/2022
Screen Interval	2.0 - 12.0
Sample Type	NM
Analyte	
HFPO-DA	8.0 U

A38B-DPT0009					
Location ID	Date	A38B-DPT0009	A38B-DPT0009	A38B-DPT0009	A38B-DPT0009
Depth Interval (ft)	03/29/2022	2 - 6	8 - 12	23 - 27	40 - 44
Sample Type	NM	NM	NM	NM	NM
Analyte					
HFPO-DA	10 U	8.3 U	8.3 U	8.3 U	8.3 U

A38B-MW0004	
Location ID	Date
A38B-MW0004	05/31/2022
Screen Interval	2.0 - 12.0
Sample Type	NM
Analyte	
HFPO-DA	8.0 U

A38B-DPT0019			
Location ID	Date	A38B-DPT0019	A38B-DPT0019
Depth Interval (ft)	06/10/2022	8 - 12	23 - 27
Sample Type	NM	NM	NM
Analyte			
HFPO-DA	8.3 U	8.0 U	9.1 U

A38B-DPT0008					
Location ID	Date	A38B-DPT0008	A38B-DPT0008	A38B-DPT0008	A38B-DPT0008
Depth Interval (ft)	01/19/2022	2 - 6	8 - 12	23 - 27	40 - 44
Sample Type	NM	NM	NM	NM	NM
Analyte					
HFPO-DA	11 U	8.3 U	9.1 U	8.3 U	8.3 U

A38B-DPT0018			
Location ID	Date	A38B-DPT0018	A38B-DPT0018
Depth Interval (ft)	06/10/2022	8 - 12	23 - 27
Sample Type	NM	NM	NM
Analyte			
HFPO-DA	8.3 U	8.3 U	8.7 U

A38B-MW0005	
Location ID	Date
A38B-MW0005	05/31/2022
Screen Interval	2.0 - 12.0
Sample Type	NM
Analyte	
HFPO-DA	8.0 U

A38B-DPT0012				
Location ID	Date	A38B-DPT0012	A38B-DPT0012	A38B-DPT0012
Depth Interval (ft)	01/26/2022	2 - 6	8 - 12	23 - 27
Sample Type	NM	NM	NM	NM
Analyte				
HFPO-DA	8.3 U	8.3 U	8.3 U	8.3 U

A38B-DPT0013					
Location ID	Date	A38B-DPT0013	A38B-DPT0013	A38B-DPT0013	A38B-DPT0013
Depth Interval (ft)	03/29/2022	2 - 6	8 - 12	23 - 27	40 - 44
Sample Type	NM	NM	NM	NM	NM
Analyte					
HFPO-DA	44 U	8.7 U	8.0 U	8.0 U	8.0 U

A38B-DPT0005A			
Location ID	Date	A38B-DPT0005A	A38B-DPT0005A
Depth Interval (ft)	10/18/2021	6 - 10	21 - 25
Sample Type	NM	NM	NM
Analyte			
HFPO-DA	1,800 U	1,900 U	1,700 U

A38B-DPT0017				
Location ID	Date	A38B-DPT0017	A38B-DPT0017	A38B-DPT0017
Depth Interval (ft)	06/10/2022	8 - 12	23 - 27	40 - 44
Sample Type	NM	NM	FD	NM
Analyte				
HFPO-DA	43 U	8.0 U	9.1 U	8.0 U

A38B-DPT0006			
Location ID	Date	A38B-DPT0006	A38B-DPT0006
Depth Interval (ft)	10/18/2021	6 - 10	21 - 25
Sample Type	NM	NM	NM
Analyte			
HFPO-DA	1,800 U	1,700 U	1,800 U

A38B-MW0006	
Location ID	Date
A38B-MW0006	05/31/2022
Screen Interval	20.0 - 30.0
Sample Type	NM
Analyte	
HFPO-DA	8.0 U

Notes:  
 1. FD = Field Duplicate.  
 2. FDEP = Florida Department of Environmental Protection.  
 3. MW = Monitoring Well.  
 4. NM = Normal sample.  
 5. HFPO-DA Hexachloro-cyclopropane oxide-dimer acid.  
 6. RSL = Residential Screening Level.  
 7. U = Result was below the laboratory Method Detection Limit.  
 8. ng/L = Nanogram per liter.  
 9. Depth is presented in feet below land surface.  
 10. Depth of monitoring well screen interval is presented in feet below land surface.  
 11. Groundwater results are presented in ng/L. Units have been converted from values reported in micrograms per liter (µg/L) and match the units provided in the Dynamic Plan.  
 12. Groundwater results are compared to Regional Screening Levels (RSLs) set forth in Table 1 of the Office of the Assistant Secretary of Defense (OSD) Memo Dated July 2022.

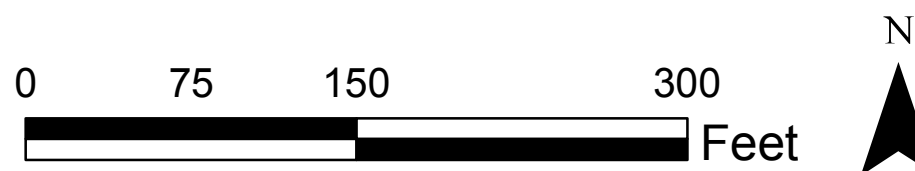
**Legend**

Media Type, Exceedance Level

- DPT Location, Sample Results Below RSL
- DPT Location, Sample Results Exceed RSL but Below MDL
- MW Location, Sample Results Exceed RSL but Below MDL

Groundwater Screening Values (ng/L)	
Residential	
HFPO-DA	6

MAPPING NOTES:  
 -Basemap Source  
 -Orthimagery from Brevard County, 2018.  
 -Projection  
 -Coordinate System: NAD 1983 StatePlane Florida East FIPS 0901  
 -Scale  
 1 Inch = 87 Feet



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**FIGURE 8**  
**HFPO-DA SAMPLING RESULTS**  
**SOUTH REPEATER BUILDING**



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A3RB-SB0047		
Location ID	A3RB-SB0047	A3RB-SB0047
Date	01/14/2022	01/14/2022
Depth Interval (ft)	21 - 21	58 - 58
Sample Type	NM	NM
Analyte		
PFOS	0.00071 U	0.00061 U
PFOA	0.00071 U	0.00061 U
PFBS	0.00071 U	0.00061 U
PFNA	0.00071 U	0.00061 U
PFHXS	0.00071 U	0.00061 U
HFPO-DA	0.00071 U	0.00061 U


A3RB-SB0048	
Location ID	A3RB-SB0048
Date	06/13/2022
Depth Interval (ft)	61 - 61
Sample Type	NM
Analyte	
PFOS	0.00057 U
PFOA	0.00057 U
PFBS	0.00057 U
PFNA	0.00057 U
PFHXS	0.00057 U
HFPO-DA	0.00057 U

South Repeater Building

Tel-A Road

**Legend**

**Media Type, Exceedance Level**

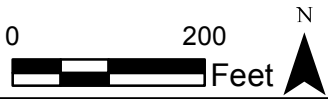
 SB Location, Sample Result Below RSL

Soil Screening Values (mg/kg)		
	Residential	Industrial
PFOS	0.013	0.16
PFOA	0.019	0.25
PFBS	1.9	25
PFNA	0.019	0.25
PFHxS	0.13	1.6
HFPO-DA	0.023	0.35

**Notes:**

1. NM = Normal sample.
2. PFOA = Perfluorooctanoic acid.
3. PFOS = Perfluorooctane sulfonic acid.
4. PFBS = Perfluorobutanesulfonic acid.
5. PFNA = Perfluorononanoic acid.
6. PFHxS = Perfluorohexanesulphonic acid.
7. HFPO-DA Hexafluoropropylene oxide-dimer acid.
8. RSL = Residential Screening Levels.
9. SB = Soil Boring.
10. U = Result was below the laboratory Method Detection Limit.
11. mg/kg = Milligram per kilogram.
12. Depth is presented in feet below land surface.
13. Soil results are compared to Regional Screening Levels set forth in Table 1 of the Office of the Assistant Secretary of Defense Memo Dated July 2022.
14. Soil results are presented in µg/kg. Soil units have been converted from values reported in milligrams per kilogram (mg/kg) and Dynamic Plan screening values have been converted accordingly.

MAPPING NOTES:  
 -Basemap Source  
 Orthoimagery from Brevard County, 2018.  
 -Projection  
 Coordinate System: NAD 1983 StatePlane Florida East FIPS 0901  
 -Scale  
 1 Inch = 200 Feet



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**FIGURE 9  
 SOIL BORING SAMPLING RESULTS  
 SOUTH REPEATER BUILDING**





**Legend**

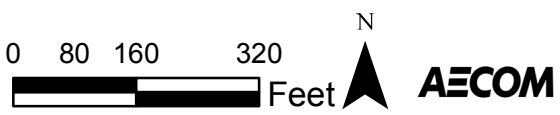
**Media Type, Exceedance Level**

-  DPT Location, Sample Result Exceeds 10x RSL
-  DPT Location, Sample Result Exceeds RSL

**Notes:**

1. FDEP = Florida Department of Environmental Protection.
2. PFOS = Perfluorooctane sulfonic acid.
3. RSL = Residential Screening Levels.
4. ng/L = Nanogram per liter.
5. Depth of monitoring well screen interval is presented in feet below land surface.
6. Groundwater results are presented in ng/L. Units have been converted from values reported in micrograms per liter (µg/L) and match the units provided in the Dynamic Plan.
7. Groundwater results are compared to Regional Screening Levels (RSLs) set forth in Table 1 of the Office of the Assistant Secretary of Defense (OSD) Memo Dated July 2022.

MAPPING NOTES:  
 -Basemap Source  
 Orthoimagery from Brevard County, 2018.  
 -Projection  
 Coordinate System: NAD 1983 StatePlane Florida East FIPS 0901  
 -Scale  
 1 Inch = 250 Feet



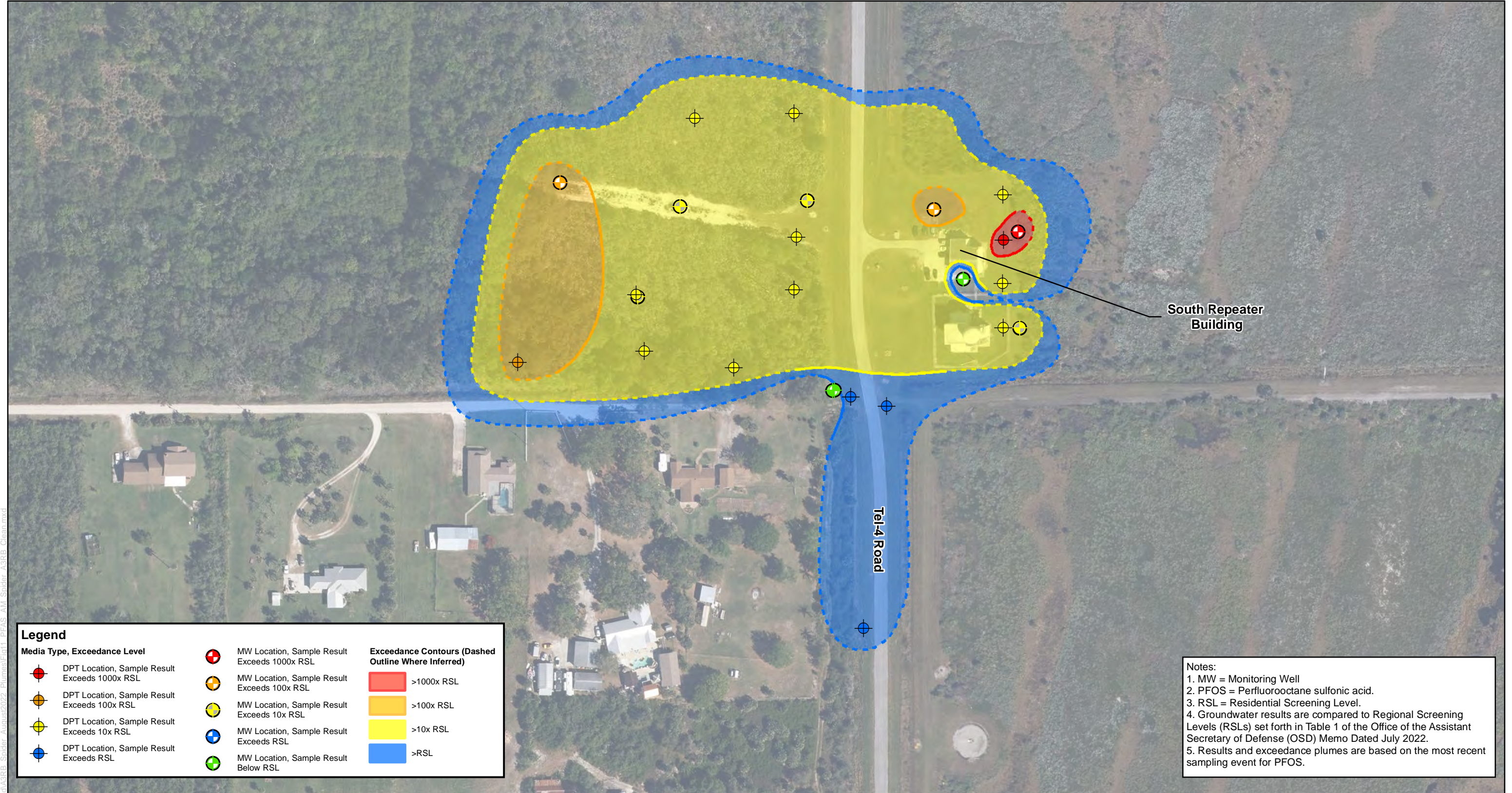
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**FIGURE 10**  
**TETRATECH SAMPLING RESULTS**  
**SOUTH REPEATER BUILDING**

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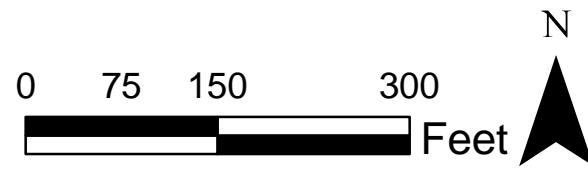




Legend		Exceedance Contours (Dashed Outline Where Inferred)	
	DPT Location, Sample Result Exceeds 1000x RSL		>1000x RSL
	DPT Location, Sample Result Exceeds 100x RSL		>100x RSL
	DPT Location, Sample Result Exceeds 10x RSL		>10x RSL
	DPT Location, Sample Result Exceeds RSL		>RSL
	MW Location, Sample Result Exceeds 1000x RSL		
	MW Location, Sample Result Exceeds 100x RSL		
	MW Location, Sample Result Exceeds 10x RSL		
	MW Location, Sample Result Exceeds RSL		
	MW Location, Sample Result Below RSL		

Notes:  
 1. MW = Monitoring Well  
 2. PFOS = Perfluorooctane sulfonic acid.  
 3. RSL = Residential Screening Level.  
 4. Groundwater results are compared to Regional Screening Levels (RSLs) set forth in Table 1 of the Office of the Assistant Secretary of Defense (OSD) Memo Dated July 2022.  
 5. Results and exceedance plumes are based on the most recent sampling event for PFOS.

MAPPING NOTES:  
 -Basemap Source  
 Orthoimagery from Brevard County, 2018.  
 -Projection  
 Coordinate System: NAD 1983 StatePlane Florida East FIPS 0901  
 -Scale  
 1 Inch = 150 Feet



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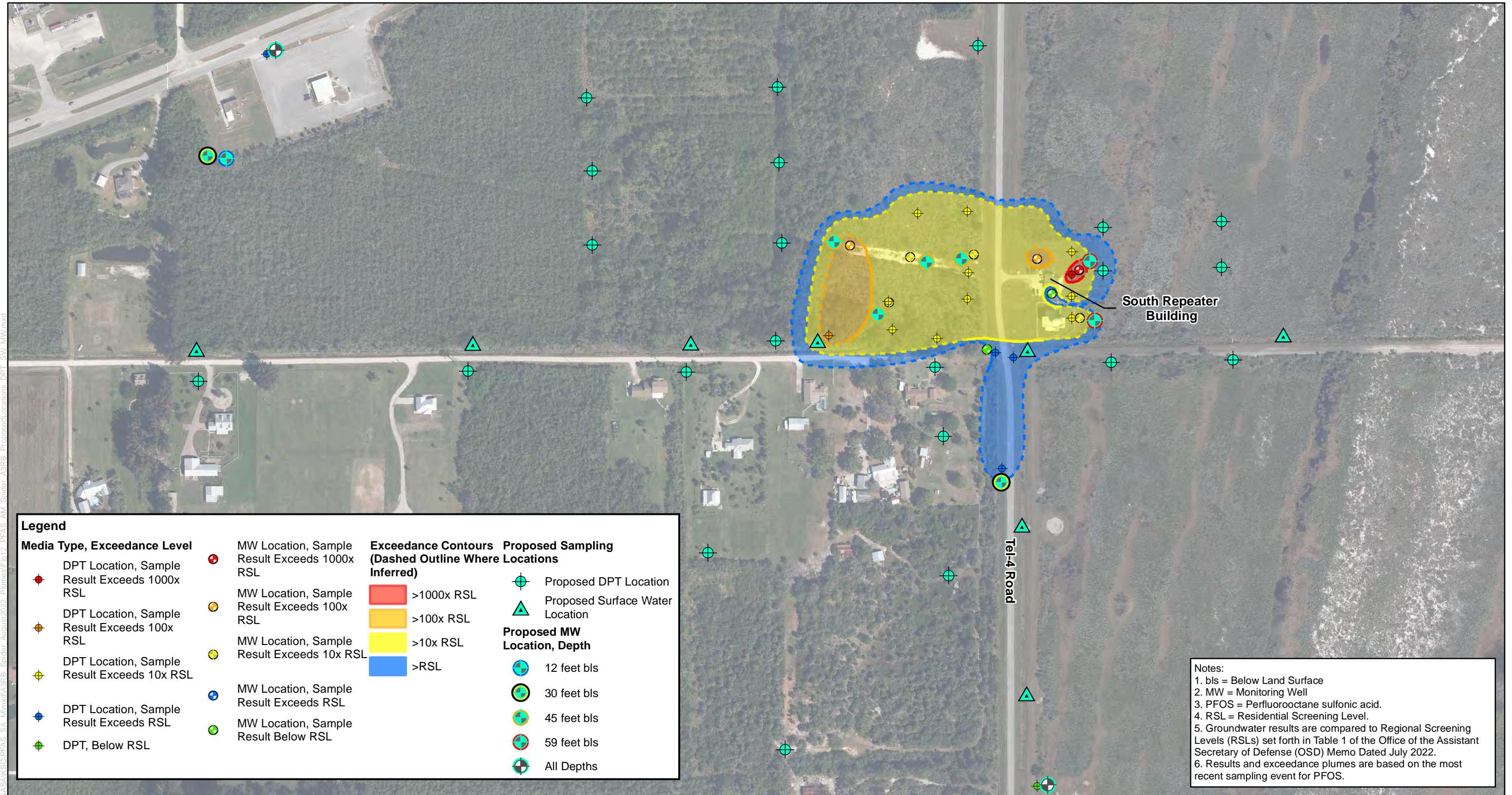
**FIGURE 11  
 CONTAMINATION PLUME  
 SOUTH REPEATER BUILDING**

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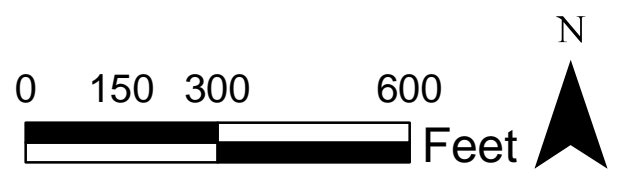
**Legend**

<b>Media Type, Exceedance Level</b>	<ul style="list-style-type: none"> <li><span style="color: red;">●</span> DPT Location, Sample Result Exceeds 1000x RSL</li> <li><span style="color: orange;">●</span> DPT Location, Sample Result Exceeds 100x RSL</li> <li><span style="color: yellow;">●</span> DPT Location, Sample Result Exceeds 10x RSL</li> <li><span style="color: blue;">●</span> DPT Location, Sample Result Exceeds RSL</li> <li><span style="color: green;">●</span> DPT, Below RSL</li> </ul>	<ul style="list-style-type: none"> <li><span style="color: red;">⊕</span> MW Location, Sample Result Exceeds 1000x RSL</li> <li><span style="color: orange;">⊕</span> MW Location, Sample Result Exceeds 100x RSL</li> <li><span style="color: yellow;">⊕</span> MW Location, Sample Result Exceeds 10x RSL</li> <li><span style="color: blue;">⊕</span> MW Location, Sample Result Exceeds RSL</li> <li><span style="color: green;">⊕</span> MW Location, Sample Result Below RSL</li> </ul>	<p><b>Exceedance Contours (Dashed Outline Where Inferred)</b></p> <ul style="list-style-type: none"> <li><span style="background-color: red; border: 1px solid black; display: inline-block; width: 15px; height: 10px;"></span> &gt;1000x RSL</li> <li><span style="background-color: orange; border: 1px solid black; display: inline-block; width: 15px; height: 10px;"></span> &gt;100x RSL</li> <li><span style="background-color: yellow; border: 1px solid black; display: inline-block; width: 15px; height: 10px;"></span> &gt;10x RSL</li> <li><span style="background-color: blue; border: 1px solid black; display: inline-block; width: 15px; height: 10px;"></span> &gt;RSL</li> </ul>	<p><b>Proposed Sampling Locations</b></p> <ul style="list-style-type: none"> <li><span style="color: cyan;">⊕</span> Proposed DPT Location</li> <li><span style="color: cyan;">▲</span> Proposed Surface Water Location</li> </ul> <p><b>Proposed MW Location, Depth</b></p> <ul style="list-style-type: none"> <li><span style="color: cyan;">⊕</span> 12 feet bls</li> <li><span style="color: orange;">⊕</span> 30 feet bls</li> <li><span style="color: yellow;">⊕</span> 45 feet bls</li> <li><span style="color: red;">⊕</span> 59 feet bls</li> <li><span style="color: green;">⊕</span> All Depths</li> </ul>
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**Notes:**

1. bls = Below Land Surface
2. MW = Monitoring Well
3. PFOS = Perfluorooctane sulfonic acid.
4. RSL = Residential Screening Level.
5. Groundwater results are compared to Regional Screening Levels (RSLs) set forth in Table 1 of the Office of the Assistant Secretary of Defense (OSD) Memo Dated July 2022.
6. Results and exceedance plumes are based on the most recent sampling event for PFOS.

**MAPPING NOTES:**  
 -Basemap Source  
 Orthoimagery from Brevard County, 2018.  
 -Projection  
 Coordinate System: NAD 1983 StatePlane Florida East FIPS 0901  
 -Scale  
 1 Inch = 300 Feet



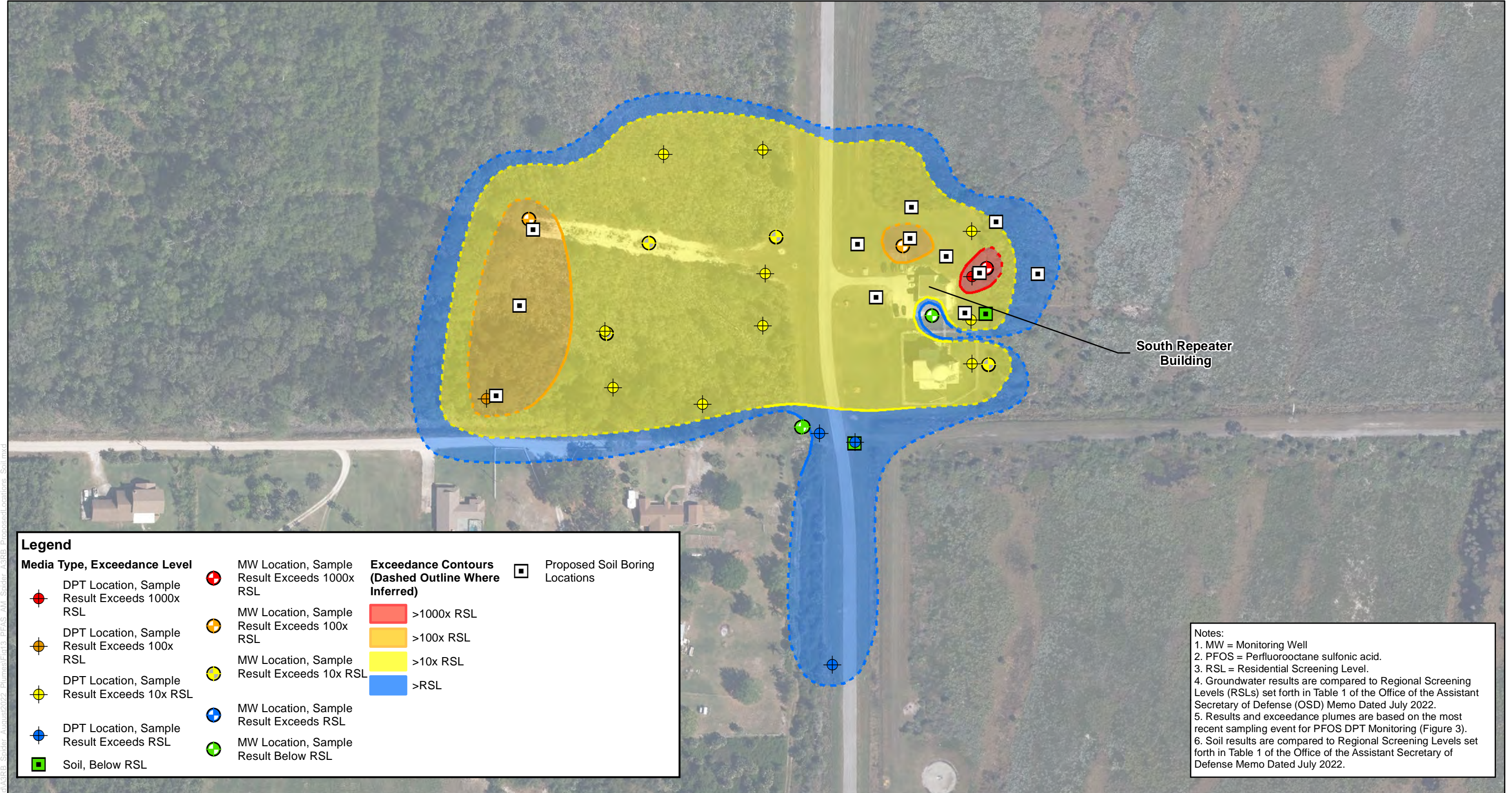
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**FIGURE 12  
 PROPOSED SAMPLING LOCATIONS  
 DPT AND SURFACE WATER  
 SOUTH REPEATER BUILDING**





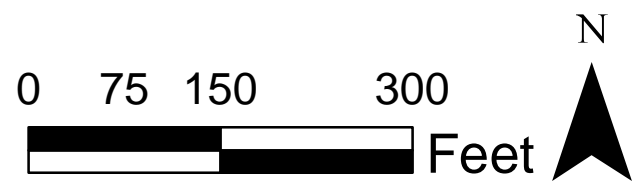
**Legend**

<b>Media Type, Exceedance Level</b>	MW Location, Sample Result Exceeds 1000x RSL	Exceedance Contours (>1000x RSL)	Proposed Soil Boring Locations
DPT Location, Sample Result Exceeds 100x RSL	MW Location, Sample Result Exceeds 100x RSL	>100x RSL	
DPT Location, Sample Result Exceeds 10x RSL	MW Location, Sample Result Exceeds 10x RSL	>10x RSL	
DPT Location, Sample Result Exceeds RSL	MW Location, Sample Result Exceeds RSL	>RSL	
Soil, Below RSL	MW Location, Sample Result Below RSL		

Notes:

1. MW = Monitoring Well
2. PFOS = Perfluorooctane sulfonic acid.
3. RSL = Residential Screening Level.
4. Groundwater results are compared to Regional Screening Levels (RSLs) set forth in Table 1 of the Office of the Assistant Secretary of Defense (OSD) Memo Dated July 2022.
5. Results and exceedance plumes are based on the most recent sampling event for PFOS DPT Monitoring (Figure 3).
6. Soil results are compared to Regional Screening Levels set forth in Table 1 of the Office of the Assistant Secretary of Defense Memo Dated July 2022.

MAPPING NOTES:  
 -Basemap Source  
 Orthoimagery from Brevard County, 2018.  
 -Projection  
 Coordinate System: NAD 1983 StatePlane Florida East FIPS 0901  
 -Scale  
 1 Inch = 150 Feet



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**FIGURE 13**  
**PROPOSED SAMPLING LOCATIONS**  
**SOIL BORINGS**  
**SOUTH REPEATER BUILDING**



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**APPENDIX B**  
**KSCRT Meeting Minutes**



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**Revision 2 Meeting Minutes for June 28<sup>th</sup> & 29<sup>th</sup>, 2023**

Attendees:

1. Evan Miller/FDEP
2. Jason French/FDEP
3. TJ Touran/FDEP
4. Ryan O’Meara/NASA
5. Deda Johansen/NASA
6. Natasha Darre/NASA
7. Anne Chrest/NASA
8. Michelle Moore/NEMCON
9. Mark Jonnet/Tetra Tech
10. Mark Speranza/Tetra Tech
11. Andrew Walters/Tetra Tech
12. Sarah Dampousse/Tetra Tech
13. Chris Pike/Tetra Tech
14. Scott Anderson/Tetra Tech
15. Jennifer Gootee/AECOM
16. Chris Marshall/AECOM
17. Chad Lee/AECOM
18. Linnea King Clark/AECOM
19. Megan Garcia/AECOM
20. Jennifer Buel/AECOM
21. Richard Smith/HGL
22. Howard Fowler/HGL
23. Robert Lynch/HGL
24. Bruce Moore/HGL

**2306-M01 Michelle Moore/NEMCON**

**Meeting Minutes and Miscellaneous Items**

**Objective:**

Reviewed the outstanding consensus items. Obtained consensus that Revision 1 of the April 2023 KSCRT meeting minutes and action items are final. Team members are aware and do not object that meeting minutes and decision/action items may become public as part of a report at a later date **(2306-D01)**.

**Discussion:**

Open action items were reviewed and the following were closed out:

**Launch Complex 39A (SWMU 008) and Launch Complex 39B (SWMU 009) Performance Monitoring, February 2023:** Action item for NASA to provide a list of wells that will be sampled for PFAS at LC39A to FDEP prior to conducting the sampling.

The list of wells were provided to FDEP to close this action item out **(2302-A01)**.

**Launch Complex 39A (SWMU 008) and Launch Complex 39B (SWMU 009) Performance Monitoring, February 2023:** Action item for NASA to provide a list of wells that will be sampled for PFAS at LC39B to FDEP prior to conducting the sampling.

The list of wells were provided to FDEP to close this action item out (2302-A02).

**GSA Reclamation Yard (GSRY) 2022 Groundwater Monitoring Results:** NASA to provide FDEP approval emails or correspondence regarding lack of pre-injection data at the site and the selection of MW0002IS as a site-specific background well.

NASA provided emails to FDEP on this topic (2304-A01).

**Results: Decision Items 2306-D01**

**2306-M02 Jason French & Evan Miller/FDEP**

**Program Update:**

Prefaced the meeting with addressing the current process of obtaining test consensus at the Kennedy Space Center (KSC) Remediation Team (KSCRT) meetings. The Florida Department of Environmental Protection (FDEP) caveats their approvals with the fact that they reserve the right to request additional information or revise their stance based upon later reviews of site reports issued post-meetings. To be clear, the FDEP doesn't want NASA to incur additional costs based on potential decisional changes once reports are received.

NASA replied with their understanding, adding that they use this preliminary concurrence for a more definitive path forward when investigating the sites. NASA understands there is a level of risk associated with proceeding in this way.

No new Per- and Polyfluoroalkyl Substances (PFAS) regulations have passed yet per FDEP. They are in the process of cleaning up the institutional control layers in their records. May reach out to the Remediation Program if there are any NASA specific sites that FDEP needs more information on.

FDEP is working on their site geographic information system (GIS) information. If inaccuracies are noted, please reach out and let FDEP know. They would like to keep this data as accurate as possible.

FDEP will try to work out a visit to KSC in the near future and may be present in person for the July KSCRT meeting.

NASA stated their focus is the upcoming public PFAS meeting. Those dates are set for July 13 and 25<sup>th</sup> 2023. NASA had to adjust some Correction Action Management Plan (CAMP) dates due to NASA's document export control review that delayed the delivery of these reports. This export control review can take up to six weeks sometimes. The note sections of the CAMP spreadsheet sent out to the Team for review will make references to these changes when these dates have to get moved around a little bit.

**2306-M03 Megan Garcia & Jennifer Gootee/AECOM**

**South Repeater Building (SWMU #121) Per- and Polyfluoroalkyl Substances (PFAS) Site Assessment and Mitigation; Assessment Update and Pilot Study Work Plan, June 2023**

**Objective:**

The objective of the advance data package (ADP) is to summarize PFAS sampling activities completed to date and propose a pilot study.

**Discussion:**

Center-Wide SWMU Assessment and Confirmatory Sampling (CS) of Per- and Polyfluoroalkyl Substances (PFAS) was completed in 2018-2022. One South Repeater Building monitoring well was sampled for PFAS in 2021, at in advance of the site closure (A3RB-MW0002). PFAS analytes were detected at the site. Interviews and research during the PFAS preliminary assessment did not identify South Repeater Building as a potential PFAS usage or storage location. Based on the monitoring well data, the former Kennedy Space Center (KSC) fire chief was contacted to ask about any potential fires in the area. The fire chief recalled a wildfire at this location during which an unknown volume of Aqueous Film-Forming Foam (AFFF) was used to extinguish the fire.

The AFFF applied during the 1998 wildfire in the vicinity of the South Repeater Building occurred to the north-northeast of building N6-1118. An unknown amount of AFFF was used to extinguish the fire. The fire did not cross Tel-IV Road, and the fire chief reported no equipment was stored in the sandy area to the west of the site.

Following receipt of MW0002 PFAS results, three direct push technology (DPT) locations were completed in October 2021. Sampling intervals included 6-10, 21-25, 31-35, and 41-45 feet below land surface (bls). At the time, the results were compared to State of Florida provisional Groundwater Cleanup Target Levels (GCTLs). Exceedances for perfluorooctanesulfonic acid (PFOS) and for the sum of perfluorooctanoic acid (PFOA) and PFOS at a single location west of N6-1118 were detected. Three DPT locations near the residential area on the west side of Tel-IV Road yielded results below the provisional GCTLs. NASA initiated PFAS confirmatory sampling activities at the site as a result.

Previous Confirmatory Sampling activities included 70 DPT groundwater samples collected from 16 locations from January 2022 through March 2022. Samples were collected from screen centerpoints of 4, 10, 25, 42, 57 feet bls. Eight monitoring wells were installed at the South Repeater Building area in May 2022. Ten monitoring well samples were collected from South Repeater Building in May 2022 (two existing wells plus the new wells). Three soil samples were collected from two locations in January 2022 and June 2022. The samples were collected during soil core activities at varying depths.

Sampling locations were constrained by scrub jay habitat and nesting season, particularly to the east and north of the reported source area. A total of 55 DPT groundwater samples were collected from 10 locations in December 2022. Samples were collected from screen centerpoints of 4, 10, 25, 42, and 57 bls or at 4, 10, 18, 25, 42, and 57 feet bls. A total of 8 surface water samples were collected from 8 locations in December 2022. A total of 24 soil samples were collected from 12 locations in December 2022. All other soil samples were collected from 0-0.5 and 0.5-2 feet bls. Samples were analyzed by USEPA Method 537 Modified Department of Defense (DOD) Quality Systems Manual (QSM) 5.3 in the Orlando, Florida SGS North America, Inc. Laboratory for a 29-compound PFAS list.

In summary, PFOS, PFOA, and perfluorohexanesulfonic acid (PFHxS) are present at concentrations exceeding the May 2023 EPA Regional Screening Levels (RSLs) for tap water. The plume is not delineated horizontally in any direction or vertically. The AFFF applied during the wildfire appears to be the major PFAS source, however, the possibility of a secondary source associated with former citrus groves is being evaluated.

### **Path Forward**

The path forward for assessment will include collection of additional shallow soil samples, delineation of the PFOS residential soil RSL exceedance in A3RB-SB0057, and evaluation of a possible residual source of groundwater contamination.

Additional monitoring wells for horizontal and vertical delineation of PFAS will be installed. Additional DPT groundwater sampling north of D'albora Road and northwest of South Repeater Building will be conducted. Additional surface water samples will be taken northwest of South Repeater Building along Tel-IV Road. Further evaluation of groundwater flow direction will be conducted, and additional sample collection off-Center to the west/southwest is proposed. NASA will seek owner consent for sampling access on private property.

### **Pilot Study Objectives**

NASA is planning a pumping test as part of a pilot study for hydraulic control of groundwater. Objectives of the pilot study are to provide information on aquifer characteristics and to aid in future modeling and remedial design activities to prevent further off-Center migration of PFAS compounds

### **Specific Goals**

Develop information on characteristics of the surficial aquifer system, specifically transmissivity (T), storage coefficient (S), hydraulic conductivity (K), and vertical hydraulic conductivity (K') (unconfined only). Obtain data to support construction and calibration of a groundwater flow model. Acquire design parameters necessary for future remedial design activities, specifically radius of influence (r), drawdown (s), flow rates (Q), and pump settings.

In addition to gathering data on aquifer hydraulics, water quality samples will be collected during each test to provide data for future groundwater treatment design. The Pilot Study will include slug testing, step testing, and extraction testing. Slug testing will provide an estimate of the spatial distribution of the hydraulic properties of the aquifer. Step testing will be performed to estimate the pumping rate that can be sustained for the 72-hour extraction test. NASA plans to use the mobile treatment system for PFAS-affected investigative derived waste (IDW) to treat water generated by the pilot study.

Current FDEP representatives were not aware of the PFAS on-site IDW treatment system. They inquired what the system included. Tetra Tech stated the system includes holding tanks, air strippers, granulated activated charcoal (GAC) tanks and an effluent holding tank, where once non-detect is achieved from sampling the effluent, the processed water is discharged to the Hydrocarbon Burn Facility (HBF) area.

FDEP inquired if this was a full-scale pump and treat or hydraulic containment. NASA stated it is both. If PFAS has migrated off KSC, we will take action to reverse or limit the flow direction of the plume.

**2306-M04     Howard Fowler/HGL**

**False Cape Data Collection Annex (SWMU 113) Monitoring Well Network, June 2023**

**Objective:** This advance data package (ADP) provides a brief background for the referenced areas, summarizes the recent directional push technology (DPT) groundwater sampling and lithologic boring data, and proposes locations for monitoring well installations.

**Discussion:**

False Cape Data Collection Annex (SWMU #113) is located on the west side of Cape Road, approximately 1 mile north of the Cape Canaveral Space Force Station boundary. It is approximately 6.45 acres in size. It was developed by the U.S. Air Force (USAF) in 1958 and included five buildings. The main function of the complex

was to collect photographic trajectory data during launches. The site was acquired by NASA in 1962. Buildings were demolished in 1978; the site has been unused since. Electrical substations were built at the site in 1998. The site contains ecological habitat.

SWMU Assessment of SWMU #113 was completed in 2013 and identified 6 locations of concern (LOCs). Soil and groundwater sampling was performed at all 6 LOCs between October 2018 and May 2019, and a Confirmatory Sampling Report (CSR) and Interim Measure Work Plan (IMWP) was submitted in September 2019 and approved by the Florida Department of Environmental Protection (FDEP).

No Further Action was recommended for LOC 1 (Former Warehouse underground storage tank [UST]) based on 4 direct push technology (DPT) groundwater samples collected at 1 location. Samples were analyzed for volatile organic compounds (VOCs), and the shallow interval was also analyzed for polynuclear aromatic hydrocarbons (PAHs) and total recoverable petroleum hydrocarbons (TRPH). All results were below groundwater cleanup target levels (GCTLs).

No Further Action was also recommended for LOC 4 (Electrical Substations K8-0841 and K8-0843) based on 8 soil samples collected around the 2 transformer pads. Samples were analyzed for polychlorinated biphenyls (PCBs) and TRPH and were below industrial and residential soil cleanup target levels (SCTLs).

At LOC 5 (Dry Well), an Interim Measure (IM) was recommended to remove the dry well contents (<1 cubic yard) based on an elevated lead concentration detected in a sample collected from within the dry well. Lead concentrations in soil adjacent to the dry well were below FDEP SCTLs. The IM was conducted in April 2023.

Soil sampling at LOC 2 and LOC 3 revealed widespread PAH concentrations above SCTLs and 1 soil sample location with lead concentrations above the residential SCTL. A soil removal IM was recommended for LOC 2 and LOC 3 to reduce PAH and lead concentrations below residential SCTLs. Based on the presence of identified data gaps, additional soil sampling was performed between June 2020 and June 2021. The results of the soil sampling were summarized in a CSR Addendum (CSRA) which included a revised



IMWP. The Florida DEP approved the CSRA and IMWP on July 22, 2022. A soil IM was conducted in April 2023.

At LOC 6 (Site Groundwater), further investigation of groundwater was recommended to assess the extent of low level chlorinated volatile organic compounds (CVOCs) identified above GCTLs. Groundwater contamination at LOC 6 is being addressed in this RCRA Facility Investigation (RFI).

### **DPT Groundwater Sampling Activities at LOC 6**

Between July 2020 and June 2022, DPT groundwater samples were collected from 52 locations and analyzed for VOCs. In general, samples were collected from the 8'-12', 23'-27', 33'-37' and 43'-47' intervals. Vinyl chloride exceeded the GCTL of 1 ug/L in 20 samples at 14 locations. The maximum concentration was 27.1 ug/L in DPT0029 at 25 feet bls. Cis-1,2-dichloroethene (cis-1,2-DCE) exceeded the GCTL of 70 ug/L in 2 samples at 2 locations. The maximum concentration was 103 ug/L in DPT0043 at 35 feet bls. Vinyl chloride and cis-1,2-DCE GCTL exceedances are confined to the 25' depth interval (eastern and western portions of the plume) and 35' interval (central portion of plume). Trans-1,2-DCE did not exceed the GCTL of 100 ug/L in any of the samples. Trichloroethene (TCE) was not detected in any of the samples. The source of VOC impacts has not been identified.

### **Lithologic Boring**

One lithologic boring was advanced in April 2023 to a depth of 40 feet using a sonic drilling rig. The lithology consisted of fine to medium sand and shell fragments from land surface to 25 feet and grey silt from 25 to 40 feet below land surface.

### **Proposed Monitoring Wells**

Nine monitoring wells are proposed to confirm the extent of CVOCs above GCTLs and for Long-Term Monitoring. Monitoring wells are proposed to be screened 20' to 30' (three wells), 25' to 35', (three wells) and 30' to 40' (three wells).

### **Path Forward**

The path forward includes obtaining Team consensus on proposed monitoring well locations, installing and sampling monitoring wells

for VOCs, preparing a RCRA Facility Investigation Report, preparing a Long-Term Monitoring Plan, and preparing a Land Use Control Implementation Plan (LUCIP) for the site.

FDEP inquired if there are any wells proposed deeper than what is on Slide 21 (40 feet). The concern is that there is no clay confining layer at that depth. DPT samples alone are not sufficient to establish vertical extent at the site. The Rule (Chapter 62-780, Florida Administrative Code) requires a permanent well to verify vertical extent of impacts. Just one well is required for verification.

HGL stated they could install a well and asked where it should be located. NASA asked where the deepest DPT was located at the site. Slide 18 was referenced and reviewed; FDEP recommended the well installation at the MW-F location as shown on Slide 18.

Team consensus was reached to install monitoring wells at the recommended locations on Slide 21, with the addition of a well installed for vertical delineation at location MW-F (**2306-D02**). NASA will confirm the depth in an email to FDEP, too (**2306-A01**).

**Results: Decision Item 2306-D02  
Action Item 2306-A01**

**2306-M05 Chad Lee/AECOM**

**Soil Interim Measures at Various Sites (South Water Pump Station [PRL 213]), June 2023**

**Objective:** The goal of this Advance Data Package (ADP) is to provide a summary of the activities performed for the Soil Interim Measures (IM) Implementation at the South Water Pump Station, Potential Release Location (PRL) 213 LOC 2 Site Assessment.

**Discussion:**

**South Water Pump Station – PRL 213**

At SWPS, an IM for polychlorinated biphenyl (PCB) contaminated soil had been planned for LOC 2 (electrical substation SS-145) at the time the substation was taken out of service following construction of a new pump station. Demolition of the former pump station disturbed the substation area. To determine current PCB soil

concentrations, two soil samples were collected from two locations SWPS-SB0005 (single point of soil cleanup target level (SCTL) exceedance) and SWPS-SB0018 (beneath the former slab near SB0005) at 0 to 0.5 feet bls for analysis of PCBs; installation of one new monitoring well SWPS-MW0001 immediately adjacent to SWPS-SB0005, and collection of a groundwater sample from monitoring well SWPS-MW0001 for analysis of PCBs.

Analytical results indicate that PCB concentrations in the soils and groundwater were below the State of Florida SCTLs in the soil samples collected, and below State of Florida Groundwater Cleanup Target Levels in the groundwater sample collected.

The Team reached consensus for No Further Action (NFA) for soil and groundwater at the site **(2306-D03)**.

The Team reached consensus that a Site Rehabilitation Completion Order Request Letter will be prepared **(2306-D04)**.

**Results: Decision Items 2306-D03, D04)**

**2306-M06 Mark Jonnet/Tetra Tech**

**Convertor/Compressor Building (SWMU 089) Annual Performance Monitoring Update, June 2023**

**Objective:** The objective of the advance data package (ADP) is to summarize the annual performance monitoring and groundwater results for 2022, and test consensus on a path forward.

**Discussion:**

In 2022, Year 2 of Performance Monitoring (PM) was conducted at the site. Excluding the MW0021 area, the interim measure (IM) objective has been achieved with all volatile organic compound (VOC) concentrations below their respective natural attenuation default concentrations (NADC).

Water levels were collected at the site in November 2022. Flow north of the railroad tracks is to the northeast; flow south of the railroad tracks is to the south-southeast, which is similar to the historic sitewide groundwater study conducted in 2019.

## **2022 Performance Monitoring Plan**

December 2022 sampling was planned to include 25 wells (sampled annually) and 23 wells (sampled biennially), with all 48 wells analyzed for VOCs. Twenty-four of the wells are located in former Hot Spots 1, 2, and 5. Twenty wells are located in former Hot Spots 3 and 4. Four wells are located downgradient.

### **Sampling Summary**

Forty-one wells were sampled in December 2022. There were seven inaccessible wells at that time that were subsequently sampled in February 2023. Twenty-five annual wells located in interior portions of plume have the highest concentrations. Twenty-three biennial wells are located around plume boundaries. All results were below NADCs except trichloroethene (TCE) at 2,300 µg/L in MW0021. An IM Work Plan (IMWP) was presented to the KSC Remediation Team during April 2023 meeting. TCE exceeded its groundwater cleanup target level (GCTL) in 11 wells, cis-1,2-dichloroethene (cDCE) exceeded its GCTL in 3 wells, and vinyl chloride (VC) exceeded its GCTL in 15 wells.

### **2022 Groundwater Results for Hot Spots 1, 2, and 5**

At Hot Spot 1, groundwater Site Characterization maximum direct push technology (DPT) detections for TCE, cDCE, and VC were 191,000, 8,200, and 2,800 µg/L. Groundwater flows from Hot Spot 1 into Hot Spot 2. In Hot Spot 1, MW0026 current results for TCE, cDCE, and VC are 80, 0.84 I, and 0.64 U µg/L.

At Hot Spot 2, Site Characterization maximum groundwater DPT detections for TCE, cDCE, and VC were 46,800, 24,900, and 2,200 µg/L. Current maximum results for TCE, cDCE, and VC are 56 (MW61), 110 (MW67), and 43 (MW67) µg/L. Downgradient well MW0114 results have been less than GCTLs since April 2016.

At Hot Spot 5, Site Characterization maximum DPT groundwater detections for TCE, cDCE, and VC were 52, 4,000, and 1,800 µg/L in the 40 to 50 ft bls zone. Current maximum results for TCE, cDCE, and VC are 0.79 U, 0.88 I, and 1.3 I µg/L in MW0025. Note the proposed IM for the MW0021 area is to address VOCs in the 8 to 16 ft bls zone.



For the Hot Spots 1, 2 and 5 plume, propose adding existing wells for vertical monitoring in areas with highest TCE, cDCE, and/or VC concentrations. An IM is planned at MW21, which had the maximum TCE and cDCE concentrations of 2,300 and 570 µg/L; a sampling program will follow the IM.

Propose adding MW62 screened 30 to 40 ft bls to monitor beneath MW26 screened 13 to 23 ft bls. MW26 currently has the second highest TCE detection of 80 µg/L. Air sparging occurred beneath MW62 since the last sample results of TCE, cDCE, VC of 10 U, 110, and 2,000 µg/L in February 2012. MW29 currently sampled annually is screened 40 to 50 ft bls to monitor beneath MW61 (screened 25 to 35 ft bls), that currently has third highest TCE detection of 56 µg/L and cDCE of 93 µg/L. Air sparging occurred beneath MW61; MW29 is located 40 feet from MW61, most recent MW29 sample results of TCE, cDCE, VC of 1.1 I, 2.6, and 8.2 µg/L in December 2022.

Propose adding MW64 screened 40 to 50 ft bls to monitor beneath MW34 screened 20 to 30 ft bls that currently has sixth highest TCE detection of 10 µg/L in this area. MW64 recent sample results of TCE, cDCE, VC of 0.22 U, 1.8, and 0.71 J µg/L in 12/2020. MW67 screened 20 to 30 ft bls has cDCE and VC of 110 and 43 µg/L, MW68 screened 40 to 50 ft bls has cDCE and VC of 4.4 and 21 µg/L. Propose continued monitoring of MW68 to vertically assess MW67.

FDEP inquired if there was still sparging at this location. Tetra Tech responded that air sparging ended in 2019, which was noted on previous slides of ADP.

FDEP inquired if the goal for the site is to reach FDEP groundwater cleanup target levels (GCTLs). Tetra Tech responded they will continue annual or biennial monitoring until the site achieves GCTLs. There is no plan to close this site out with conditions.

FDEP is concern with increasing VC trends since VC doesn't tend to achieve below GCTLs without some help. Tetra Tech will continue to monitor and won't be surprised if there is not a lot of movement in the results.

FDEP noted that it is proposed to replace a well with a 5ft screen with a 10ft screen. DPT results were clean all the way down to 50ft.

Is there a clay layer (retarding unit) across the Fluid Servicing Road area? Tetra Tech stated that for the most part this material is present throughout the site and acts like a retarding unit, but noted that some VC has made its way through.

The Team reached consensus to transition from PM to LTM with next reporting period (January 2023 – December 2023) as Year 1 of LTM **(2306-D05)**.

The Team reached consensus to continue sampling 25 wells plus MW62 and MW64 annually in December 2023 and 23 wells biennially in December 2024 to monitor VOC contaminant trends; well IDs and sampling frequency are shown on Slide 18 of the presentation. Sampling results will be presented to the KSCRT prior to submittal of 2023 Annual LTM Report **(2306-D06)**.

**Results: Decision Items 2306-D05, D06**

**2306-M07 Chris Marshall/AECOM**

**Industrial Area (IA) Long-Term Monitoring (LTM) Update, June 2023**

**Objective:** The purpose of this advance data package (ADP) is to present activities and data associated with eleven IA LTM sites: Ransom Road Landfill (RRLF) (Solid Waste Management Unit [SWMU] 003), Building M7-0505 Treatment Tank Area (M505) (SWMU 039), Operations and Checkout Building (O&C) (SWMU 076), Vertical Processing Facility (VPF) (SWMU 077), Environmental Health Facility (EHF) (SWMU 079), Kennedy Athletic, Recreation, and Social Park 1 LOC 9 (KARS Park 1) (SWMU 084), Engineering Development Laboratory (EDL) (SWMU 085), Mobil Service Station (MOBIL) (SWMU 093), General Services Administration Seized Property (GSSP) (SWMU 095), Space Station Processing Facility (SSPF) (SWMU 098), and Fuel Storage Area #1 Underground Storage Tank [Building 1044] (FS1) (Potential Release Location [PRL] 157).

**Discussion:**

Field efforts summarized in this ADP include LTM sampling from May 2022 through November 2022 and Direct Push Technology (DPT) groundwater assessment activities in January 2023 and March 2023. The objective of this ADP is to evaluate the groundwater quality based on current data and trends in order to determine if modifications to the sampling schedule and/or additional measures are warranted.

Fourteen sites are currently in the IA LTM Program and are sampled at various frequencies. These sites were grouped together for convenience in order to combine field efforts and reduce quantities of ADPs and reports.

### **RRLF**

Vinyl chloride (VC) is the contaminant of concern (COC) at RRLF. Groundwater elevation measurements from 14 monitoring wells (MWs) and groundwater samples collected from four MWs in May 2022. Flow direction toward the west-southwest for shallow and toward the west for intermediate groundwater.

Vinyl chloride (VC) was below its Florida groundwater cleanup target level (GCTL) at three MWs (RRLF-MW0033, RRLF-MW0038I, and RRLF-MW0040I) in May 2022. It was recommended to continue monitored natural attenuation (MNA) in the LTM program. The next sampling event at RRLF will be completed in November 2024.

The Team reached consensus to install a new monitoring well with a screen interval of 15 to 25 feet bls at the RRLF-DPT0024 location for RRLF **(2306-D07)**.

The Team reached consensus to continue biennial LTM sampling frequency at the RRLF with now five monitoring wells for vinyl chloride (VC) and collection of 16 water level measurements in November 2024. **(2306-D08)**.

### **M505**

Trichloroethene (TCE), cis-1,2-dichloroethene (cis-1,2-DCE) and VC are the COCs at M505. Groundwater samples were collected from 8 MWs in May 2022. TCE and cis-1,2-DCE results are below GCTLs at the site. VC was greater than GCTL at three MWs (M505-

MW0013, M505-MW0032, and M505-MW0055) in May 2022. M505 is scheduled for a sampling event in November 2024. It was recommended to continue MNA of the site in the LTM program and adding downgradient monitoring well M505-MW0029 for analysis of TCE, cis-1,2-DCE, and VC.

The Team reached consensus to continue biennial LTM sampling of now nine monitoring wells (which includes addition of M505-MW0029) for trichloroethylene (TCE), cis-1,2-dichloroethene (DCE, and VC and collection of 35 water level measurements in November 2024 at Building M505 (SWMU 039) **(2306-D09)**.

FDEP noted they would like to continue reviewing the data for this site.

### **O&C**

(Note: The sample prefix for this site is O\_C.) VC is the COC at O&C. Groundwater samples were collected from two monitoring wells in May 2022. VC was greater than GCTLs at both MWs (O\_C-MW0005I and O\_C-MW0007I) in May 2022. The O&C is scheduled for a sampling event in November 2024. Recommend continuing MNA in the LTM program and adding downgradient O\_C-MW0006I to the water level measurements and sampling schedule.

The Team reached consensus to continue biennial LTM sampling with now three monitoring wells (which includes addition of O\_C-MW0006I) for vinyl chloride and collection of five water level measurements in November 2024 for the O&C site (SWMU 076) **(2306-D10)**.

FDEP inquired when was last time water level was gauged in MW06I? How downgradient is this? AECOM stated this well is a distance away and we would like to get one more set of data for MW07I. FDEP contemplated if MW06I data will be meaningful but stated to go ahead and sample as proposed and we will discuss whether MW06I should be added to the monitoring network when results are available.

### **VPF**

TCE, cis-1,2-DCE and VC are the COCs at VPF. Groundwater samples were collected from 6 MWs in May 2022. TCE was greater than GCTLs at three MWs (VPF-MW0021, VPF-MW0025, and VPF-MW0027) in May 2022. Cis-1,2-DCE remains less than GCTLs. VC was greater than GCTLs at two MWs (VPF-IW0018I and VPF-MW0022) in May 2022. The VPF is scheduled for a sampling event in November 2024. Recommend continuing MNA in the LTM program and adding monitoring wells VPF-IW0008D and VPF-IW0010I to the sampling schedule. Recommend installing a shallow monitoring well downgradient of VPF-MW0022 adjacent to VPF-MW0023 with a screen interval of 3-13 feet bls.

The Team reached consensus to install a new monitoring well with a screen interval of 3 to 13 feet bls adjacent to VPF-MW0023 at the VPF site (SWMU 077) **(2306-D11)**.

Test consensus to continue biennial LTM sampling with now nine monitoring wells for TCE, cis-1,2-DCE, and VC and collection of 35 water level measurements in November 2024 at the VPF site (SWMU 077) **(2306-D12)**.

### **EHF**

VC is the COC at EHF. Groundwater samples were collected from 3 MWs in November 2022. VC was greater than its GCTL at EHF-MW0004 in November 2022 and below GCTL at EHF-MW0001 and EHF-MW0005. The EHF is scheduled for a sampling event in November 2024. Recommend continuing MNA in the LTM program.

DPT groundwater sampling was conducted earlier this year at three locations outside the LTM monitoring well locations. VC was detected above its GCTL at EHF-DPT005 to the west of MW04. The Team reached consensus to install a new monitoring well with a screen interval of 15 to 25 feet bls at EHF-DPT0005 location (SWMU 079) **(2306-D13)**.

The Team reached consensus to continue biennial LTM sampling frequency with now four monitoring wells for VC and collection of seven water level measurements in November 2024 at the EHF site (SWMU 079) **(2306-D14)**.

### **KARS Park 1 Location of Concern 9 (LOC 9)**



Lead is the COC at KARS Park 1 LOC 9. LOC 9 groundwater is on a 5-year monitoring frequency. In 2021, an atypical increase in the lead result for the downgradient well (KP1-MW0022) was observed. The sampling team also noted a slight blockage in the MW. For those reasons, MW0022 was re-developed in May 2022 and sampled. Lead was not detected.

This briefing was originally schedule for April 2023 but the meeting was abbreviated. There was a recommendation to accelerate the next sample for MW0022 to May 2023 in that briefing. NASA decided to proceed at risk. Lead was not detected in the May 2023 sample. The May 2023 sampling event details are to be presented in the 2024 ADP and LTM Report.

Monitoring wells KP1-MW0003 and KP1-MW0035 had two consecutive sampling events with lead results below GCTL in November 2020 and September 2021. The total lead concentrations dropped to non-detect at KP1-MW0022 in May 2022 and May 2023. Therefore, recommend discontinuing MNA of groundwater for KARS Park I LOC 9, which will result in all groundwater monitoring at KARS Park I being complete. Other LOCs with groundwater concerns have achieved GCTLs, and soils have been remediated to the residential soil cleanup target levels.

KP1-MW0017 was found destroyed during the May 2023 sampling event. Recommend proper abandonment of this well. FDEP asked whether there was there an exceedance at MW17? AECOM stated it had two consecutive clean events in 2005 and 2006.

The Team reached consensus to discontinue MNA of groundwater at KARS Park I (SWMU 084) **(2306-D15)**. FDEP will review the report before formal approval.

The Team reached consensus to abandon monitoring well KP1-MW0017 at KARS Park I (SWMU 084) **(2306-D16)**.

### **EDL**

VC is the COC at EDL. DPT groundwater sampling at three locations along the south side of the site to evaluate adequacy of the current monitoring well network. VC was not detected above its GCTL at any location. VC horizontal delineation is complete with recent DPT sampling along the southern boundary.

VC is greater than GCTL at the two MWs (EDL-MW0004 and EDL-MW0006R) currently in the LTM program in November 2022. The EDL is scheduled for a sampling event in November 2024. Recommend continuing MNA in the LTM program.

The Team reached consensus to continue current sampling schedule, which includes November 2024 LTM sampling of two monitoring wells (EDL-MW0004 and EDL-MW0006R) for VC and collection of four water level measurements at the EDL site (SWMU 085) **(2306-D17)**.

FDEP inquired during DPT investigation why did you not go to the north side as well? NASA responded that the north side of the plume had been investigated by DPT as part of the historical delineation at the site. During a data gap evaluation, NASA identified that the southern boundary was not investigated in the way the rest of the site was. That is why we did the southern side only. NASA can provide the package pulled together for FDEP's former Project Manager for KSC and provide to FDEP for review.

The 1.5 µg/L result at monitoring well EDL-MW006R was noted to be really low. The Team will continue to monitor until we are two rounds clean.

## **MOBIL**

(Note: The sample prefix for this site is CGO since the service station was formerly a Citgo station.) The COCs at Mobil are benzene, 1,2,4-trimethylbenzene (1,2,4-TMB), xylenes, methyl tert butyl ether (MTBE), naphthalene, 1- and 2-methylnaphthalene. LTM samples were collected from 3 monitoring wells in May 2022. 1,2,4-TMB and MTBE were greater than GCTLs at CGO-MW0018 in May 2022. CGO-MW0019 was added to the sampling schedule following the 2020 sampling event; analytes were below GCTLs in May 2022. The MOBIL is scheduled for a sampling event in November 2024. Recommend continuing MNA in the LTM program and abandoning 9 historically clean perimeter monitoring wells (CGO-MW0002, CGO-MW0003, CGO-MW0004, CGO-MW0008, CGO-MW0009, CGO-MW0010, CGO-MW0012, CGO-MW0013, and CGO-MW0016).

The Team reached consensus to continue biennial LTM sampling of CGO-MW0018 and CGO-MW0019 for select volatile organic compounds (VOCs) (benzene; 1,2,4-TMB; xylenes; and MTBE) and CGO-MW0006 for the same VOCs plus naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene, and collection of nine water level measurements in November 2024 at the MOBIL site (SWMU 093) **(2306-D18)**.

The Team reached tentative consensus to abandon nine historically clean perimeter monitoring wells (CGO-MW0002, CGO-MW0003, CGO-MW0004, CGO-MW0008, CGO-MW0009, CGO-MW0010, CGO-MW0012, CGO-MW0013, and CGO-MW0016) at the MOBIL site (SWMU 093) **(2306-D19)**.

FDEP reserves the right to review the upcoming report before concurring with the well abandonment.

### **GSSP**

The COCs at GSSP are tetrachloroethene (PCE), TCE, cis-1,2-DCE, trans-1,2-DCE, VC and naphthalene. Groundwater samples were collected from 14 MWs in November 2022. VC results were greater than GCTLs at 5 MWs (GSSP-MW0019, GSSP-MW0020, GSSP-MW0035, GSSPMW0053, and GSSP-MW0062) and also above the natural attenuation default concentration (NADC) at GSSP-MW0020. Naphthalene is greater than GCTL at GSSP-MW0024R. Other analytes were below their GCTLs for at least the fourth consecutive sampling event. Recommend reducing site COCs to VC and naphthalene

Recommend continuing MNA in the LTM program. GSSP is scheduled for a regular sampling event in November 2023. A 5-year expanded sampling event is scheduled for November 2024, when 23 MWs will be sampled.

FDEP inquired if there was a closed loop injection at this location. AECOM stated there was a recirculation system with both injection and extraction wells so believe it was a closed loop. FDEP inquired if there was petroleum at this location. AECOM responded there was the only known release was PCE. NASA stated that the naphthalene is downgradient in two wells and may have been the result of mowing operations.

FDEP inquired when was the last time GSSP-MW0027 and GSSP-MW0028 were sampled? Monitoring well GSSP-MW0054 is also high too. If it has been more than a decade you may want to sample those wells again. Action item for AECOM to get back with FDEP with this information **(2306-A02)**.

The Team reached consensus to continue annual LTM sampling of 14 monitoring wells for VC with three select monitoring wells also sampled for naphthalene and collect 33 water level measurements in November 2023 at the GSSP site (SWMU 095) **(2306-D20)**.

FDEP inquired if we want more VOCs thrown in we can add in November. Are there additional costs to only run VC or is it the suite? AECOM stated it is all the same cost. FDEP agrees with this for November and, if needed, to add more later on.

### **SSPF**

Ammonia is the COC at SSPF. Groundwater samples were collected from 5 MWs in May 2022. Ammonia was greater than GCTLs at four MWs and greater than twice the KSC background in three MWs (SSPF-MW0006, SSPF-MW0014, and SSPF-MW0016) in May 2022, yet continue overall stable and decreasing trends. Recommend continuing MNA in the LTM program. Next sampling event is scheduled for November 2024.

FDEP inquired if the alternative cleanup target level (CTL) calculations are being used for ammonia at this site. That number may be higher than the background levels. NASA is happy to look at the alternative CTL based on the potential to eliminate this site.

The Team reached consensus to continue biennial sampling of five monitoring wells for ammonia and collect 15 water level measurements in November 2024 at the SSPF site (SWMU 095) **(2306-D21)**.

FDEP inquired if conditional closure has been considered for this location? NASA stated for the program they typically look for unconditional closure. The Department prefers that as well and understands if that is the chosen path forward.

### **FSA1**

The COCs at FSA 1 are benzene, ethylbenzene, isopropylbenzene, 1- and 2-methylnaphthalene, naphthalene, and total petroleum hydrocarbons (TPH). Groundwater samples were collected from 10 MWs in May 2022. Isopropylbenzene was greater than GCTLs at four MWs (FSA1-MW0001, FSA1-MW0002, FSA1-MW0017A, and FSA1-MW0021) and greater than NADC at FSA1-MW0001. 1- and 2-Methylnaphthalene were greater than GCTLs at FSA1-MW0001 in May 2022. Recommend discontinuing naphthalene (which has been below its GCTL since 2019) and TPH (which has been below its GCTL since 2021) analyses. Recommend continuing annual LTM sampling in alternating seasons. The next scheduled sampling event at FSA1 is November 2023.

FDEP inquired if fluctuations correlate with depth to water at this site. AECOM confirmed they do.

The Team reached consensus to continue annual LTM sampling of 10 monitoring wells for select VOCs (isopropylbenzene) and select polynuclear aromatic hydrocarbons (1-methylnaphthalene and 2-methylnaphthalene) and collect 18 water level measurements in November 2023 at the FSA1 site (PRL 157) **(2306-D22)**.

FDEP inquired if there were naphthalene spikes on the last samples. AECOM confirmed there was a little bump up in the numbers.

FDEP inquired if the Team has naphthalene trends on the ADP to which the response was there are not.

**Results: Decision Items 2306-D7 through D22  
Action Item 2306-A02**

**2306-M08 Mark Jonnet/Tetra Tech**

**Area South of K7-0516 (SWMU 100) Interim Measure  
Operation, Maintenance and Groundwater Monitoring Update,  
June 2023**

**Objective:** This advance data package (ADP) provides a summary of the air sparge treatment system operations and maintenance, performance groundwater sampling, and test consensus statements for a path forward.

## **Discussion:**

A summary of air sparge system operations was presented for the period from January 1 through December 31, 2022. Air sparging is being performed to protect the Outstanding Florida Waters (OFW) in the Barge Canal at the toe of the Eastern and Western Plumes. Air sparging also operates in the former Hot Spot of the Eastern Plume as a barrier to treat volatile organic compounds (VOCs) migrating toward the Barge Canal.

### **Eastern Plume**

In and up- and down-gradient of the former Hot Spot, 32 wells were sampled in December 2022. At the OFW sparge area, 8 monitoring wells and 3 surface water samples were collected in June and December 2022.

### **Upgradient of the Hot Spot Treatment Area**

Upgradient of the Hot Spot Treatment Area, vinyl chloride (VC) exceeds its natural attenuation default concentration (NADC) in four of six wells ranging from 110 to 310 µg/L, the remaining two wells have VC concentrations of 6.5 and 91 µg/L. Trans-1,2-dichloroethene (tDCE) exceeds its groundwater cleanup target level (GCTL) in three of six wells ranging from 180 to 260 µg/L. VC and tDCE were not detected in the vertical extent well, MW81. Due to the presences of the Crawlerway, Saturn Causeway, and mission-critical utilities, treatment is not proposed for the upgradient area.

The Team reached consensus to continue annual monitoring of MWs 01, 02, 07ID, 44, 45, 46, and 81 in the upgradient Eastern plume area with samples analyzed for VOCs by 8260B (**2306-D23**).

### **Hot Spot Treatment Area**

The interim measure (IM) objective is to remediate contaminated groundwater within treatment zone (former Hot Spot and surrounding high concentration plume [HCP]) to support transition to long-term monitoring (LTM). The site transitioned to current operations in 2017 once GCTLs were achieved in treatment area. The 2022 groundwater results continue to support maintaining current operations. VC is the only contaminant exceeding GCTL and remains stable in MWs 11, 12, 20, 47, 72 at 2.4, 11, 4.9, 5.5, and 5.0



µg/L. MWs 04, 05, 10, 48, 49, 71, 73, and 74 remain less than GCTLs.

The Team reached consensus that the IM is operating as designed and to continue operation of the same sparging wells operated in 2022 to prevent upgradient contamination from impacting the treated zone **(2306-D24)**.

The Team reached consensus to conduct semi-annual sampling of MW21R to determine if VC decreases to less than GCTLs **(2306-D25)**.

The Team reached consensus to continue annual sampling of wells 09, 10, 11, 12, 20, 49, 71, and 72 with all groundwater samples to be analyzed for VOCs by 8260B **(2306-D26)**.

The Team reached consensus to continue biennial sampling of wells 04, 05, 06, 47, 48, 73, and 74 with all groundwater samples to be analyzed for VOCs by 8260B. December 2023 will be the annual sampling event and December 2024 will be the biennial sampling event **(2306-D27)**.

#### **Downgradient of Hot Spot Treatment Area**

VC was the only contaminant exceeding GCTL in MWs 09, 11, 50, 51, and 76, ranging from 6.0 to 28 µg/L. MW51 decreased from 140 µg/L (exceeding NADC) in December 2021 to less than NADC at 28 µg/L in November 2022.

The Team reached consensus to continue annual monitoring of MWs 13, 14, 15, 19, 50, 51, 70, 75, and 76 downgradient of the Hot Spot Treatment Area with samples analyzed for VOCs by 8260B **(2306-D28)**.

#### **Eastern Plume OFW Area**

The IM objective to prevent VOC migration into the Barge Canal is being met, based on results for two of the four monitoring wells adjacent to Barge Canal being below detection limits during both events while remaining two wells had low-level DCE detections. Surface water results were all below detection limits.

The Team reached consensus to continue annual monitoring of MWs 13, 14, 15, 19, 50, 51, 70, 75, and 76 downgradient of the Hot Spot

Treatment Area with samples analyzed for VOCs by 8260B **(2306-D29)**.

The Team reached consensus that the IM is operating as designed and to continue operation of the air sparging barrier as operated in 2023 to prevent upgradient contamination from impacting Barge Canal **(2306-D30)**.

The Team reached consensus to continue semi-annual sampling of MWs 16, 18, 54, 59, 60, 61, 77, and 78 to monitor the effectiveness of the sparging barrier preventing groundwater contamination discharge to Barge Canal. All groundwater and surface water samples to be analyzed for VOCs by 8260B, SWs 06, 07, and 08 will no longer be sampled based on all results BDLs. **(2306-D31)**.

### **Western Plume**

Interim Groundwater Monitoring of area upgradient of the OFW IM shows that VC is the only contaminant exceeding GCTLs, with a maximum concentration in MW42 at 58 µg/L. All results were non-detect in adjacent vertical delineation well MW82. Plume centerline wells have shown a decreasing trend over time and continue not to warrant active remediation.

The Team reached consensus to continue annual monitoring of MWs 23, 24, 25R, 27, 29, 30R, 37, 38, 39, 40, 41, 42, and 82, with samples to be analyzed for VOCs by 8260B **(2306-D32)**.

### **Western OFW Area**

The IM objective to prevent VOC migration into the Barge Canal is being met, based on four of the five monitoring wells adjacent to Barge Canal had low-level cis- and trans-DCE detections with VC not detected; the fifth canal-side monitoring well (MW84) exceeded VC GCTL at 2.9 µg/L. VC concentrations in MW84 are expected to decrease once new air sparging wells are activated. New air sparging wells approved in prior KSCRT meeting (2302-D02). Surface water results were all below detection limits.

The Team reached consensus to continue annual monitoring of western upgradient MWs 23, 24, 25R, 27, 29, 30R, 37, 38, 39, 40, 41, 42, and 82, samples analyzed for VOCs by 8260B **(2306-D33)**.

The Team reached consensus that the IM is operating as designed and to continue operation of the air sparging barrier as operated in 2023 and the new eastern expansion to the barrier to prevent upgradient contamination from impacting Barge Canal **(2306-D34)**.

FDEP, referencing slide 29 of the presentation, noted that the VC result for MW84 exceeds 2.4 ug/L, which is the surface water cleanup target level (SWCTL) for VC. FDEP would like to continue sampling surface water in that location. Tetra Tech stated they will continue with sampling surface water at locations SW9 and SW10 at least until MW84 detections are less than 2.4 ug/L.

The Team reached consensus to continue semi-annual sampling of MWs 31, 32, 33, 35, 36, 63, 68, 79, 80, 83, and 84 and SWs 09, and 10 to support the effectiveness of the sparging barrier preventing groundwater contamination discharge to Barge Canal. All groundwater and surface water samples to be analyzed for VOCs by 8260B, SWs 03, 04, and 05 will no longer be sampled based on all results BDLs **(2306-D35)**.

FDEP appreciates keeping VOCs from discharging to the OFW and inquired if the east/west end wells are within the ROIs of the air sparge barriers. Tetra Tech stated that monitoring wells 77 and 61 are beyond the radius of influence of the air sparge wells. MW69 was to the side of the sparge wall and its results led to extending the sparge barrier.

**Results: Decision Items 2306-D23 through D35**

## **DAY 2**

**2306-M09 Chad Lee/AECOM**

### **GSA Reclamation Yard (SWMU 10) Shallow Soil Polychlorinated Biphenyl (PCB) Site Assessment and Proposed Interim Measures (IM) Work Plan, June 2023**

**Objective:** This advance data package (ADP) provides a brief background for the referenced areas, summarizes soil site assessment related work performed from 2020 through 2022, and presents consensus statements.

**Discussion:**

As part of the background information, FDEP (referencing Slide 10) inquired if there was dewatering at the site during the 2018 Northeast Area IM. NASA replied that the soil removal was accomplished using caissons driven to 25 ft and no dewatering occurred. While there was some conventional excavation, most of the soil removal was accomplished with a large diameter auger. The excavated material was allowed to decant before being disposed. Flowable fill was placed back in.

AECOM mentioned (since it was not in the presentation for background purposes) that the ditches in the northeast area have been excavated as well.

To delineate PCBs in the shallow soils outside of paved areas, a total of 330 soil samples from 118 boring locations were collected for analysis of PCBs using Environmental Protection Agency Method 8082A. Analytical results indicate that PCBs were above the State of Florida Direct Exposure Residential Soil Cleanup Target Levels (SCTLs) in three areas at GSRY: Northeast PCB Soil Plume Area, Southeast PCB Plume Area, and the Western PCB Plume area.

In conclusion, the Northeast Shallow Soil PCB Plume is delineated to the east, north, and west, and is bordered by a paved asphalt surface to the south. The Southeast Shallow Soil PCB Plume is delineated to the north and south, is bordered by a paved asphalt surface or a building to the west, and is bordered by the Ransom Road Sandblast Yard (SWMU 021) to the east. The West Shallow Soil PCB Plume is delineated in the northern portion to the north and west, is bordered by buildings or a paved asphalt surface to the east, and is bordered by the General Services Administration Reclamation Yard West (SWMU 036) to the west. Additional sampling is needed to completely delineate PCBs in shallow soil beyond the fence line on the south side of the West Area. The shallow soil plumes are delineated vertically in the areas proposed for Soil IM.

Chapter 62-780 of the Florida Administrative Code requires delineation to below CTLs in every direction. Buildings and paved surfaces are being used in some areas as boundaries of the proposed excavation areas, and delineation is not complete beyond the southwest fence line. AECOM will need to take a look at that (southwest corner) **(2306-A03)**.

FDEP stated that NASA can proceed with the excavation and inquired if that asphalt was going to be used as an engineering control. AECOM confirmed that it would be used as an engineering control. FDEP agreed that was fine and stated we need to assume that there is contamination to some extent based on this data. If we want to assume asphalt is the control for the underlying PCB-contaminated soil, then you wouldn't have to take confirmatory sampling to the south. FDEP want to see a professional engineering seal on any land use control submitted. FDEP also wants to see a couple of green dots for delineation.

NASA stated they might need to take a look and discuss; there might already be PCB land use controls in place at SWMU 021 (Ransom Road Sandblast Yard). Any additional concerns may be covered under that site's Land Use Control Implementation Plan (LUCIP).

FDEP stated if we have data to show this we just need to see it. We need the assurance that it does not go beyond the control data.

NASA will look at historical information and if required we can sample and delineate.

The Team reached consensus to conduct additional shallow soil sampling beyond the south and southwest fence line **(2306-D36)**.

The Team reached consensus to present data to the Team once PCBs are delineated **(2306-D37)**.

The Team reached consensus to conduct soil IM removal and disposal for the PCB-contaminated soils at the Northeast, Southeast, and Western Shallow Soil PCB Plume areas. See the ADP presentation for the proposed soil removal areas and the proposed IM Work Plan for each area **(2306-D38)**.

The proposed IM Work Plan for the Northeast Plume Area includes removal of soils above the residential SCTL, removal of approximately 30 cubic yards of PCB-contaminated soil, and 1.0-foot total depth. If encountered, soil removal will be terminated at the water table. No additional sampling is required, the fence will not be removed, monitoring wells will not be removed, and due to the small area and underground utilities, the use of heavy machinery may not be feasible; soft digging by hand or vacuum may be required. The area will be restored to existing conditions.

The proposed IM Work Plan for the Southeast Plume Area includes removal of soils above the residential SCTL at GSRY and above the industrial SCTL at RRSY, removal of approximately 360 cubic yards of PCB-contaminated soil, and 2.0-foot total depth. If encountered, soil removal will be terminated at the water table. No additional sampling is required under this IM, if encountered, soil removal will be terminated at the water table, the excavation will occur during the dry season, the fence will be removed and reinstalled and a daily temporary fence will be required to maintain site security, due to extensive underground utilities, the use of heavy machinery may be limited in certain areas; soft digging by hand or vacuum may be required. The area will be restored to existing conditions.

The proposed IM Work Plan for the Western Plume Area includes removal of soils above the residential SCTL, removal of approximately 3,500 cubic yards of PCB-contaminated soil, and 3.0-foot total depth. If encountered, soil removal will be terminated at the water table. The fence will be temporarily removed and reinstalled and a daily temporary fence will be required to maintain site security, monitoring wells will not be removed, verification sampling will be conducted at the shoulders of the ditch along the southern and southwestern borders of the excavation extents; proposed locations are presented on the figure, underground utilities are known to reside in the northern and eastern areas; soft digging by hand or vacuum may be required to verify utility locations before heavy machinery can be used. The area will be restored to existing conditions.

Team consensus was reached to install one new monitoring well GSRY-MW0079, screened from 2 to 12 feet bls, at the GSRY-SB4164 location, which had the highest PCB concentration of 28 mg/kg at 0.5-1.0 feet bls, which is above Leachability for Groundwater, and collect a groundwater sample from GSRY-MW0079 for analysis of PCBs **(2306-D39)**.

FDEP stated if you are going to use the entire asphalt area as a control may not need any more samples in the Northeast area. If NASA wants to sample under the asphalt, the land use control area might be reduced, but NASA might simply manage the whole. No sampling on the east side is going to be required.



NASA responded they would just keep the asphalt and maintain inspecting that control since the Ransom Road Sandblast Yard next door also has a LUCIP in place.

**Results: Decision Items 2306-D36 through D39  
Action Item 2306-A03**

**2306-M10 Scott Anderson/Tetra Tech**

**Hydrocarbon Burn Facility (HBF) Groundwater Modeling  
Update, June 2023**

**Objective:** This advance data package (ADP) provides an update on per- and polyfluorinated alkyl substances (PFAS) assessment activities and the data generated to support development of a Conceptual Site Model and a groundwater model. It is for informational purposes.

**Discussion:**

There is perfluorooctanesulfonic acid (PFOS) throughout the site, some of which will be addressed under other investigations. The main focus of this presentation is the shallow and intermediate zones within the centralized portion of the HBF.

Plumes appear to generally trend north/south and in line with depressions that fill up with water. That is also observed at Schwartz Road Landfill (which falls under another study) to the northwest of HBF.

Recent assessment activities focused on the shallow and intermediate zones. An updated site conceptual model was developed.

During precipitation events in the dry season and during wet season, there appears to be migration from the intermediate (I) to the shallow (S) zone into the surface water features southeast of the source area/burn pan area. During the wet season, contaminant loading to surface water features is maximized. There appears to be lateral spread within the surface water features and strong downward migrations in source area/burn pan area above the clay unit.

A total of 96 groundwater monitoring wells area are present at the HBF. The wells occur in clusters in three distinct zones; less than 10ft (shallow [S]), 10-30ft 9intermediate [I]), and greater than 30 ft

(lower intermediate [LI]). For the transducer study synoptic event, seventeen pressure transducers were installed in well clusters across the site to provide spatial and vertical resolution of groundwater elevations through time. Three pressure transducers were installed in surface water (stilling wells). One barometric pressure transducer was installed at the site to record atmospheric pressure. Transducers collected data a 5-minute intervals from November 2022 to January 2023 (approximately 6 weeks). Precipitation data was collected over the same time period.

Comparison of long-term water level analysis determined that the direction of gradient flips with downward trend from March to May and upward trend November to January in the north-central area of the site.

In summary, transducers collected data during the dry season and wet season. Each study was approximately 6 weeks long and approximately six months apart. The tidal influence is more apparent in dry season, though doesn't impact gradients/flow. Vertical gradients at well clusters typically downward during the dry season with direction flipping upward during precipitation events, returning downward after a few days (return to static conditions). Vertical upgradients at well clusters within the site (not along Static Test Road) are typically upward during wet season. Larger (increased) vertical gradients between S and I/LI zones for well clusters along Static Test Road during wet season. However, many of these well clusters exhibit upward gradients between I and LI zones. Precipitation events and wet season drive vertical gradients, which contribute to groundwater flow and contaminant migration, including discharge to the Banana River. Horizontal gradients and groundwater flow directions are generally consistent from on-site to Banana River though both wet and dry seasons.

Next steps include staff gauges being installed to evaluate linear surface water features in the area of the PFAS plume. Synoptic water levels will be recorded from staff gauges and HBF wells and analyzed to better simulate groundwater flow from the HBF area. This staff gauge data, Conceptual Site Model and groundwater modeling will be presented in the next PFAS Assessment Report Addendum.

**GSA Reclamation Yard West (SWMU 036) Confirmatory Sampling (CS) Results and Interim Measures (IM) Work Plan, June 2023**

**Objective:** This advance data package (ADP) is to present the CS activities conducted between 2021 and 2022 and the proposed soil IM. Based upon evaluation of the data, recommendations are presented to obtain consensus on the proposed IM to remove soils that exceed the industrial soil cleanup target levels (iSCTLs) for lead (Pb) and benzo(a)pyrene equivalent (BAPE).#

**Discussion:  
Confirmatory Sampling**

The CS activities conducted between April 19, 2021, and October 10, 2022, at the GSA Reclamation Yard West (GSRW) site included the collection of 40 groundwater samples from 10 direct push technology (DPT) boring locations; 217 soil samples screened with a photoionization detector (PID) from 82 borings for organic vapor analysis (OVA); and the collection of 120 soil samples from 91 boring locations. CS activities were conducted to determine presence or absence of contaminants of potential concern (COPCs) identified by the SWMU Assessment (SA)/CS Work Plan (CSWP); delineate contaminants of concern (COCs); and close data gaps.

**Groundwater Sampling**

**LOC 8 (Diesel Above Ground Storage Tank [AST]Area) and LOC 10 (Vinyl Chloride Groundwater Exceedance Area)**

CS groundwater activities were completed in April 2021. DPT groundwater samples were collected from 1 boring at Location of Concern (LOC) 8 and 9 borings at LOC 10. Samples were collected from screen centerpoints at 10, 20, 30, and 40 feet (ft.) below ground surface (bgs). The samples from LOC 8 were analyzed for volatile organic compounds (VOCs), and the sample from the shallowest interval was additionally analyzed for total recoverable petroleum hydrocarbons (TRPH). The groundwater samples from LOC 10 were analyzed for vinyl chloride (VC) only. All groundwater analytical results were either non-detect or below Florida Department of Environmental Protection (FDEP) groundwater cleanup target levels

(GCTLs). No further assessment of groundwater for VOCs and TRPH at LOC 8 or VC at LOC 10 is recommended.

### **OVA Screening**

HGL conducted OVA screening using a PID at 42 borings at LOC 7 (Northern Staging Area); 4 borings at LOC 8 (Diesel AST); 5 borings at LOC 11 (Hydrocarbon Odor); and 31 borings at LOC 12 (Stormwater Runoff Areas). Each boring was screened at 0 to 0.5 ft bgs; 0.5 to 2 ft bgs; and then every 1-ft interval down to the water table. On average, the water table was encountered between 2 and 3 ft bgs. PID readings ranged between 0 and 19.2 parts per million. Results of the OVA screenings were used to assess/identify CS soil sampling locations.

### **Soil Sampling**

Initial CS activities in 2021 involved the collection of soil samples from all 5 LOCs where soil contamination was thought or known to be possible. Soils were analyzed for various COPCs identified by the SA/CSWP (HGL, 2021): metals, polynuclear aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), TRPH, and VOCs. Various SCTL exceedances were detected (metals; BAPE; and total PCBs). By October 2022, delineation to residential SCTLs (rSCTLs) was achieved. The analytical results for each LOC are summarized below.

#### **LOC 7-1 – East End of Northern Staging Area**

Detections of BAPE and PCBs at SB0001 and SB0002 exceeded their respective rSCTLs. Lateral and vertical delineation to the rSCTLs was achieved for the 2 COCs. All BAPE and PCB concentrations were less than their respective leachability SCTL (lSCTL) and iSCTL. Analytical results for all vertical step-down soil samples were below SCTLs. No further assessment for BAPE and PCBs is recommended for LOC 7-1.

#### **LOC 7-2 – Central Part of Northern Staging Area**

Detections of arsenic (As) above the rSCTL were noted in 2 borings (maximum detection was 5.7 mg/kg at SB0006 in the 0 to 0.5 ft bgs interval). Detections of PCBs above the rSCTL were noted in 5 borings (maximum detection was 1.6 mg/kg at SB0004 in the 0 to

0.5 ft bgs interval). Delineation to the rSCTLs for As and PCBs was achieved laterally, and vertically in the 0.5 to 2 ft bgs sample interval.

Concentrations of TRPH exceeded the rSCTL in 1 boring (SB0004). The soil sample was re-collected and analyzed for petroleum hydrocarbon fractionation using the Massachusetts DEP [MADEP] volatile petroleum hydrocarbon [VPH] and extractable petroleum hydrocarbon [EPH] methods. The soil sample was re-collected for TRPH and fractionation analysis in unison. Analytical results for both were below the SCTLs. No further assessment for As, PCBs, and TRPH is recommended for LOC 7-2.

### **LOC 7-3 – West End of Northern Staging Area**

Concentrations of PCBs at SB0007 and SB0045 exceeded the rSCTL. Delineation to the rSCTLs for PCBs was achieved laterally, and vertically in the 0.5 to 2 ft bgs sample interval. No further assessment for PCBs is recommended for LOC 7-3.

### **LOC 8 – Diesel AST Area**

A soil sample was collected from 0 to 0.5 ft. bgs and analyzed for TRPH and VOCs. VOCs were non-detect and TRPH was detected below Florida DEP SCTLs. No further assessment is recommended for LOC 8.

### **LOC 9 – TRPH Exceedance Area**

Two soil samples were collected for TRPH at SB0014 from 0 to 0.5 and 0.5 to 2 ft. bgs. The maximum detection (742 mg/kg at 0-0.5 ft bgs) exceeded the lSCTL and rSCTL. The soil sample was re-collected from 0 to 0.5 ft bgs for TRPH and fractionation in unison. The concentration of TRPH confirmed the initial rSCTL exceedance, but the fractionation results were below SCTLs. No further assessment is recommended for LOC 9.

### **LOC 11 – Hydrocarbon Odor Area**

TRPH exceeded the lSCTL and rSCTL at SB0009 but subsequent fractionation results were below SCTLs. To confirm the fractionation data, a soil sample was re-collected for TRPH and fractionation. The concentration of TRPH confirmed the initial

rSCTL exceedance, but the fractionation results were below SCTLs. No further assessment is recommended for LOC 11.

### **LOC 12-1 – Stormwater Runoff Area**

Soil concentrations were detected above SCTLs for various metals (antimony [Sb], As, chromium [Cr], copper [Cu], and nickel [Ni]), PCBs, and TRPH. All COCs were vertically delineated in the 0.5 to 2 ft bgs sample interval.

Concentrations of TRPH exceeded the ISCTL and rSCTL at 2 borings but subsequent fractionation results were below the SCTLs. In speciation analysis for hexavalent Cr (Cr[VI]), Cr(VI) was not detected, eliminating Cr as a COC.

All soil leachate analytical results for various metal extracts (Sb, As, Cr, Cu, and Ni by Synthetic Precipitation Leaching Procedure [SPLP]) were either non-detect or below GCTLs. The remaining SCTL exceedances of As, Cu, Ni, and PCBs were delineated vertically by 2 step-down samples (0.5 to 2 ft bgs) and 10 lateral step-out samples. No further assessment is recommended for LOC 12-1.

FDEP inquired whether the SPLP extract was analyzed for total or hexavalent chromium. HGL replied that the SPLP for SB12 and SB13 was for total chromium since there is no leachability SCTL for hexavalent chromium.

### **LOC 12-2 – Stormwater Runoff Area**

Originally, soil samples were collected at 3 borings from 0 to 0.5 ft bgs. The only exceedances included Cr and Ni above their respective rSCTLs at 1 boring. Speciation results for Cr(VI) were below SCTLs, eliminating Cr as a COC. Delineation to below the rSCTL for Ni was achieved both laterally and in the 0.5 to 2 ft bgs sample interval vertically. No further assessment is recommended for LOC 12-2.

### **LOC 12-3 – Stormwater Runoff Area**

Originally, soil samples were collected at 3 borings from 0 to 0.5 ft bgs. The only rSCTL exceedances included As and Cu at 1 boring. A ISCTL exceedance of Cr was additionally detected at the same boring. Speciation results for Cr(VI) were below SCTLs, eliminating



Cr as a COC. Vertical delineation to below rSCTLs for both As and Cu was achieved in the 0.5 to 2 ft bgs sample interval. An aluminum pad impeded the collection of a lateral step-out to the east, however, lateral delineation to below the rSCTL was achieved. All soil leachate analytical results reported for metals by SPLP extraction were either non-detect or below GCTLs. No further assessment is recommended for LOC 12-3.

#### **LOC 12-4 – Stormwater Runoff Area**

Originally, soil samples were collected at 3 borings from 0 to 0.5 ft bgs. The only rSCTL exceedance included As. Delineation to the rSCTL for As was achieved laterally and in the 0.5 to 2 ft bgs sample interval vertically. No further assessment is recommended for LOC 12-4.

#### **LOC 12-5 – Stormwater Runoff Area**

Originally, soil samples were collected at 3 borings from 0 to 0.5 ft bgs. Two samples had BAPE and various metals (Cu, Pb, Ni, Sb, and Cr) SCTL exceedances. Speciation results for Cr(VI) were below SCTLs, eliminating Cr as a COC. The concentration of Pb at SB0022 (2,060 mg/kg) and the concentration of BAPE at SB0023 (1.035 mg/kg) exceeded their respective iSCTLs. Vertical delineation to the rSCTLs at SB022 was achieved for Pb (at 0.5 to 2 ft bgs) and Cu (at 2 to 3 ft bgs). Vertical delineation to the rSCTLs for BAPE, Cu and Ni was achieved at SB0023 at 0.5 to 2 ft bgs. Lateral delineation for Cu, Pb, Ni, and BAPE around SB0022 and SB0023 was achieved using 11 step-out samples. All soil SPLP analytical results reported for metals (Sb, Cu, Pb, and Ni) were either non-detect or below GCTLs. A soil interim measure is recommended for LOC 12-5.

#### **Recommendations**

Prepare an IMWP to remove soils that exceed the iSCTL for Pb (SB022) and BAPE (SB0023) at LOC 12-5.

Upon completion of the IM, a Statement of Basis (SB) and Land Use Control Implementation Plan (LUCIP) is recommended to address the remaining rSCTL exceedances of As, Cu, Ni, BAPE, and PCBs onsite.

The soil removal action will enable conditional site closure under Florida Administrative Code Chapter 62-780.680 Risk Management Option Level II.

FDEP noted that there has been awhile since the monitoring wells have been sampled. HGL added that there was a more comprehensive 2021 April event where all were below GCTLs. The full VOCs TRPH, VC was all below limits. FDEP commented that would be good to see.

FDEP total metals analysis was run concurrently with SPLP analysis? HGL believes they did. FDEP noted the statement on Slide 49 that the method detection limits for metals in the SPLP extract was above the associated GCTLs, so that the non-detected values are above GCTLs. FDEP stated this was pretty unusual for metals and will review this carefully when a report is submitted.

#### **Soil IMWP Proposed Footprint**

Soil shall be excavated from 0 to 0.5 ft bgs for the Pb footprint (194.5 sq ft; 3.6 cubic yards) and BAPE footprint (313.7 sq ft; 5.8 cubic yards). The aluminum pad to the south provides engineering controls preventing potential human exposure to potential COCs. If the engineering controls are removed, additional assessment is warranted prior to site closure. FDEP inquired how we ensure the aluminum plate does not move? NASA responded that is addressed with quarterly LUCIP inspections. The inspector can check for potential movement by checking coordinates using a global positioning unit the unit each time if needed. The Remediation Program can also reach out to the Facility Manager to request that if a move is planned, they will reach out to the NASA Remediation Program first. It was also noted that these plates are not easily moved. There are jersey barriers and roll offs staged there so it isn't easy to relocate that plate.

The Team reached consensus that confirmatory sampling activities demonstrated that site groundwater does not exceed GCTLs (**2306-D40**).

The Team reached consensus that confirmatory sampling activities demonstrated that site soils exceeding SCTLs have been fully delineated (**2306-D41**).

The Team reached consensus for the proposed Interim Measure excavation boundaries at LOC 12-5 to remove soils that exceed the iSCTL for:

- a. Pb (SB022); bound by sample locations below iSCTL (SB0062, SB0063, and SB0074); and
- b. BAPE (SB0023); bound by sample locations below iSCTL (SB0064, SB0065, and SB0066) **(2306-D42)**.

The Team reached consensus to prepare a Statement of Basis (SB) and Land Use Control Implementation Plan (LUCIP) to document and maintain land use controls for soils with As, Cu, Ni, BAPE, and PCBs above the rSCTLs **(2306- D43)**.

**Results: Decision Items 2306-D40 through D43**

**2306-M11 Chris Adkison/NASA**

### **CAMP Update, June 2023**

**Objective:** NASA to provide a look-ahead of the upcoming schedule.

**Discussion:**

NASA provided an update of the CAMP and scheduled reports.

If you have updates/changes/mods, please let Chris Adkison know so he can make the changes.

NASA had to cancel one meeting late last year which caused our February meeting to be quite robust. We had to shift to accommodate things and believe we are back to where we need to be moving forward. Deliverables slid to the right.

June turned out to be fairly robust, but with STRIVES (export control) reviews, a lot had to be pushed out to July, August, or September. We have some documents being routed through STRIVES now and FDEP should be receiving those in the next week or so. July becomes light but then August and September will be more robust as a domino effect result from a few months ago.

**Miscellaneous Discussion**

The CCB project team heard back on Provect IR60; it is covered under the previous Provect IR. Tetra Tech will forward FDEP the approval email (to Jason French). It looks like we are good to use that product for the Convertor/Compressor Building MW21 area (2306-A04).

**Results: Action Item 2306-A04**

AECOM

1. MLVP IM Progress Report (Linnea King Clark)(60 min)
2. VAB LTM (Chad Lee) (45 min)
3. Q6 Radar Station Soil IM (Chad Lee) (30 min)
4. MLPV HS RAE (Linnea King Clark/Randy Sillan)(45 min)

HGL

1. CM&S Site Characterization (Jason Bublitz) (45-60 min)
2. Air Sparge Abandonment for the VPF (Jason Bublitz) (30 min)
3. SLF Area PFAS new MW locations (Howard Fowler)

Tetra Tech

1. LC 34 Annual PMR (Mark Jonnet) 60 min
2. East CCF Annual PMR (Mark Jonnet) 45 min
3. HBF IGWM ADP (Jen Buel) 40 min

2023 Meeting Dates (continues to be hybrid option in 2023)

August 3<sup>rd</sup> and 4<sup>th</sup>

October 5<sup>th</sup> and 6<sup>th</sup>

November 30<sup>th</sup> and December 1<sup>st</sup>

**FDEP**

15-20-minute FDEP update by Program Manager

Natasha Darre is the team leader next meeting so email topics to this individual after the meeting is over.

June 2023 Decision Items Rev 2		Decision
Decision No.	Minutes Reference	
2306-D01	2306-M01	<b>Meeting Minutes and Miscellaneous Items:</b> Reviewed the outstanding consensus items. Obtained consensus that Revision 1 of the April 2023 KSCRT meeting minutes and action items are final. Team members are aware and do not object that meeting minutes and decision/action items may become public as part of a report at a later date.
2306-D02	2306-M04	<b>False Cape Data Collection Annex (SWMU 113) Monitoring Well Network:</b> Team consensus was reached to install monitoring wells at the recommended locations on Slide 21, with the addition of a well installed for vertical delineation at location MW-F.
2306-D03	2306-M05	<b>Soil Interim Measures at Various Sites (South Water Pump Station [PRL 213]):</b> The Team reached consensus for No Further Action (NFA) for soil and groundwater at the site.
2306-D04	2306-M05	<b>Soil Interim Measures at Various Sites (South Water Pump Station [PRL 213]):</b> The Team reached consensus that a Site Rehabilitation Completion Order Request Letter will be prepared.
2306-D05	2306-M06	<b>Convertor/Compressor Building (SWMU 089) Annual Performance Monitoring Update:</b> The Team reached consensus to transition from PM to LTM with next reporting period (January 2023 – December 2023) as Year 1 of LTM.
2306-D06	2306-M06	<b>Convertor/Compressor Building (SWMU 089) Annual Performance Monitoring Update:</b> The Team reached consensus to continue sampling 25 wells plus MW62 and MW64 annually in December 2023 and 23 wells biennially in December 2024 to monitor VOC contaminant trends; well IDs and sampling frequency are shown on Slide 18 of the presentation. Sampling results will be presented to the KSCRT prior to submittal of 2023 Annual LTM Report.
2306-D07	2306-M07	<b>Industrial Area (IA) Long-Term Monitoring (LTM) Update:</b> The Team reached consensus to install a new monitoring well with a screen interval of 15 to 25 feet bls at the RRLF-DPT0024 location for RRLF.
2306-D08	2306-M07	<b>Industrial Area (IA) Long-Term Monitoring (LTM) Update:</b> The Team reached consensus to continue biennial LTM sampling frequency at the RRLF with now five monitoring wells for vinyl chloride (VC) and collection of 16 water level measurements in November 2024.
2306-D09	2306-M07	<b>Industrial Area (IA) Long-Term Monitoring (LTM) Update:</b> The Team reached consensus to continue biennial LTM sampling of now nine monitoring wells (which includes addition of M505-MW0029) for trichloroethylene (TCE), cis-1,2-dichloroethene (DCE, and VC and collection of 35 water level measurements in November 2024 at Building M505 (SWMU 039).
2306-D10	2306-M07	<b>Industrial Area (IA) Long-Term Monitoring (LTM) Update:</b> The Team reached consensus to continue biennial LTM sampling with now three monitoring wells (which includes addition of O_C-MW00061) for vinyl chloride and collection of five water level measurements in November 2024 for the O&C site (SWMU 076).
2306-D11	2306-M07	<b>Industrial Area (IA) Long-Term Monitoring (LTM) Update:</b> The Team reached consensus to install a new monitoring well with a screen interval of 3 to 13 feet bls adjacent to VPF-MW0023 at the VPF site (SWMU 077).
2306-D12	2306-M07	<b>Industrial Area (IA) Long-Term Monitoring (LTM) Update:</b> Test consensus to continue biennial LTM sampling with now nine monitoring wells for TCE, cis-1,2-DCE, and VC and collection of 35 water level measurements in November 2024 at the VPF site (SWMU 077).
2306-D13	2306-M07	<b>Industrial Area (IA) Long-Term Monitoring (LTM) Update:</b> Team reached consensus to install a new monitoring well with a screen interval of 15 to 25 feet bls at EHF-DPT0005 location (SWMU 079).
2306-D14	2306-M07	<b>Industrial Area (IA) Long-Term Monitoring (LTM) Update:</b> The Team reached consensus to continue biennial LTM sampling frequency with now four monitoring wells for VC and collection of seven water level measurements in November 2024 at the EHF site (SWMU 079).
2306-D15	2306-M07	<b>Industrial Area (IA) Long-Term Monitoring (LTM) Update:</b> The Team reached consensus to discontinue MNA of groundwater at KARS Park I (SWMU 084).
2306-D16	2306-M07	<b>Industrial Area (IA) Long-Term Monitoring (LTM) Update:</b> The Team reached consensus to abandon monitoring well KP1-MW0017 at KARS Park I (SWMU 084).
2306-D17	2306-M07	<b>Industrial Area (IA) Long-Term Monitoring (LTM) Update:</b> The Team reached consensus to continue current sampling schedule, which includes November 2024 LTM sampling of two monitoring wells (EDL-MW0004 and EDL-MW0006R) for VC and collection of four water level measurements at the EDL site (SWMU 085).
2306-D18	2306-M07	<b>Industrial Area (IA) Long-Term Monitoring (LTM) Update:</b> The Team reached consensus to continue biennial LTM sampling of CGO-MW0018 and CGO-MW0019 for select volatile organic compounds (VOCs) (benzene; 1,2,4-TMB; xylenes; and MTBE) and CGO-MW0006 for the same VOCs plus naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene, and collection of nine water level measurements in November 2024 at the MOBIL site (SWMU 093).
2306-D19	2306-M07	<b>Industrial Area (IA) Long-Term Monitoring (LTM) Update:</b> The Team reached tentative consensus to abandon nine historically clean perimeter monitoring wells (CGO-MW0002, CGO-MW0003, CGO-MW0004, CGO-MW0008, CGO-MW0009, CGO-MW0010, CGO-MW0012, CGO-MW0013, and CGO-MW0016) at the MOBIL site (SWMU 093).
2306-D20	2306-M07	<b>Industrial Area (IA) Long-Term Monitoring (LTM) Update:</b> The Team reached consensus to continue annual LTM sampling of 14 monitoring wells for VC with three select monitoring wells also sampled for naphthalene and collect 33 water level measurements in November 2023 at the GSSP site (SWMU 095).
2306-D21	2306-M07	<b>Industrial Area (IA) Long-Term Monitoring (LTM) Update:</b> The Team reached consensus to continue biennial sampling of five monitoring wells for ammonia and collect 15 water level measurements in November 2024 at the SSPF site (SWMU 095).
2306-D22	2306-M07	<b>Industrial Area (IA) Long-Term Monitoring (LTM) Update:</b> The Team reached consensus to continue annual LTM sampling of 10 monitoring wells for select VOCs (isopropylbenzene) and select polynuclear aromatic hydrocarbons (1-methylnaphthalene and 2-methylnaphthalene) and collect 18 water level measurements in November 2023 at the FSA1 site (PRL 157).
2306-D23	2306-M08	<b>Area South of K7-0516 (SWMU 100) Interim Measure Operation, Maintenance and Groundwater Monitoring Update:</b> The Team reached consensus to continue annual monitoring of MWs 01, 02, 07ID, 44, 45, 46, and 81 in the upgradient Eastern plume area with samples analyzed for VOCs by 8260B.
2306-D24	2306-M08	<b>Area South of K7-0516 (SWMU 100) Interim Measure Operation, Maintenance and Groundwater Monitoring Update:</b> The Team reached consensus that the IM is operating as designed and to continue operation of the same sparging wells operated in 2022 to prevent upgradient contamination from impacting the treated zone.
2306-D25	2306-M08	<b>Area South of K7-0516 (SWMU 100) Interim Measure Operation, Maintenance and Groundwater Monitoring Update:</b> The Team reached consensus to conduct semi-annual sampling of MW21R to determine if VC decreases to less than GCTLs.
2306-D26	2306-M08	<b>Area South of K7-0516 (SWMU 100) Interim Measure Operation, Maintenance and Groundwater Monitoring Update:</b> The Team reached consensus to continue annual sampling of wells 09, 10, 11, 12, 20, 49, 71, and 72 with all groundwater samples to be analyzed for VOCs by 8260B.

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Decision No.	Minutes Reference	
2306-D27	2306-M08	<b>Area South of K7-0516 (SWMU 100) Interim Measure Operation, Maintenance and Groundwater Monitoring Update:</b> The Team reached consensus to continue biennial sampling of wells 04, 05, 06, 47, 48, 73, and 74 with all groundwater samples to be analyzed for VOCs by 8260B. December 2023 will be the annual sampling event and December 2024 will be the biennial sampling event.
2306-D28	2306-M08	<b>Area South of K7-0516 (SWMU 100) Interim Measure Operation, Maintenance and Groundwater Monitoring Update:</b> The Team reached consensus to continue annual monitoring of MWs 13, 14, 15, 19, 50, 51, 70, 75, and 76 downgradient of the Hot Spot Treatment Area with samples analyzed for VOCs by 8260B.
2306-D29	2306-M08	<b>Area South of K7-0516 (SWMU 100) Interim Measure Operation, Maintenance and Groundwater Monitoring Update:</b> The Team reached consensus to continue annual monitoring of MWs 13, 14, 15, 19, 50, 51, 70, 75, and 76 downgradient of the Hot Spot Treatment Area with samples analyzed for VOCs by 8260B.
2306-D30	2306-M08	<b>Area South of K7-0516 (SWMU 100) Interim Measure Operation, Maintenance and Groundwater Monitoring Update:</b> The Team reached consensus that the IM is operating as designed and to continue operation of the air sparging barrier as operated in 2023 to prevent upgradient contamination from impacting Barge Canal.
2306-D31	2306-M08	<b>Area South of K7-0516 (SWMU 100) Interim Measure Operation, Maintenance and Groundwater Monitoring Update:</b> The Team reached consensus to continue semi-annual sampling of MWs 16, 18, 54, 59, 60, 61, 77, and 78 to monitor the effectiveness of the sparging barrier preventing groundwater contamination discharge to Barge Canal. All groundwater and surface water samples to be analyzed for VOCs by 8260B. SWs 06, 07, and 08 will no longer be sampled based on all results BDLs .
2306-D32	2306-M08	<b>Area South of K7-0516 (SWMU 100) Interim Measure Operation, Maintenance and Groundwater Monitoring Update:</b> The Team reached consensus to continue annual monitoring of MWs 23, 24, 25R, 27, 29, 30R, 37, 38, 39, 40, 41, 42, and 82, with samples to be analyzed for VOCs by 8260B.
2306-D33	2306-M08	<b>Area South of K7-0516 (SWMU 100) Interim Measure Operation, Maintenance and Groundwater Monitoring Update:</b> The Team reached consensus to continue annual monitoring of western upgradient MWs 23, 24, 25R, 27, 29, 30R, 37, 38, 39, 40, 41, 42, and 82, samples analyzed for VOCs by 8260B.
2306-D34	2306-M08	<b>Area South of K7-0516 (SWMU 100) Interim Measure Operation, Maintenance and Groundwater Monitoring Update:</b> The Team reached consensus that the IM is operating as designed and to continued operation of the air sparging barrier as operated in 2022 and the new eastern expansion to the barrier to prevent upgradient contamination from impacting Barge Canal.
2306-D35	2306-M08	<b>Area South of K7-0516 (SWMU 100) Interim Measure Operation, Maintenance and Groundwater Monitoring Update:</b> The Team reached consensus to continue semi-annual sampling of MWs 31, 32, 33, 35, 36, 63, 68, 79, 80, 83, and 84 and SWs 09 and 10 to support the effectiveness of the sparging barrier preventing groundwater contamination discharge to Barge Canal. All groundwater and surface water samples to be analyzed for VOCs by 8260B; SWs 03, 04, and 05 will no longer be sampled based on all results BDLs.
2306-D36	2306-M09	<b>GSA Reclamation Yard (SWMU 10) Shallow Soil Polychlorinated Biphenyl (PCB) Site Assessment and Proposed Interim Measures (IM) Work Plan:</b> The Team reached consensus to conduct additional shallow soil sampling beyond the south and southwest fence line.
2306-D37	2306-M09	<b>GSA Reclamation Yard (SWMU 10) Shallow Soil Polychlorinated Biphenyl (PCB) Site Assessment and Proposed Interim Measures (IM) Work Plan:</b> The Team reached consensus to present data to the Team once PCBs are delineated.
2306-D38	2306-M09	<b>GSA Reclamation Yard (SWMU 10) Shallow Soil Polychlorinated Biphenyl (PCB) Site Assessment and Proposed Interim Measures (IM) Work Plan:</b> The Team reached consensus to conduct soil IM removal and disposal for the PCB-contaminated soils at the Northeast, Southeast, and Western Shallow Soil PCB Plume areas. See the ADP presentation for the proposed soil removal areas and the proposed IM Work Plan for each area.
2306-D39	2306-M09	<b>GSA Reclamation Yard (SWMU 10) Shallow Soil Polychlorinated Biphenyl (PCB) Site Assessment and Proposed Interim Measures (IM) Work Plan:</b> Team consensus was reached to install one new monitoring well GSRY-MW0079, screened from 2 to 12 feet bls, at the GSRY-SB4164 location, which had the highest PCB concentration of 28 mg/kg at 0.5-1.0 feet bls, which is above Leachability for Groundwater, and collect a groundwater sample from GSRY-MW0079 for analysis of PCBs.
2306-D40	2306-M11	<b>GSA Reclamation Yard West (SWMU 036) Confirmatory Sampling (CS) Results and Interim Measures (IM) Work Plan:</b> The Team reached consensus that confirmatory sampling activities demonstrated that site groundwater does not exceed GCTLs.
2306-D41	2306-M11	<b>GSA Reclamation Yard West (SWMU 036) Confirmatory Sampling (CS) Results and Interim Measures (IM) Work Plan:</b> The Team reached consensus that confirmatory sampling activities demonstrated that site soils exceeding SCTLs have been fully delineated.
2306-D42	2306-M11	<b>GSA Reclamation Yard West (SWMU 036) Confirmatory Sampling (CS) Results and Interim Measures (IM) Work Plan:</b> The Team reached consensus for the proposed Interim Measure excavation boundaries at LOC 12-5 to remove soils that exceed the iSCTL for: a. Pb (SB022); bound by sample locations below iSCTL (SB0062, SB0063, and SB0074); and b. BAPE (SB0023); bound by sample locations below iSCTL (SB0064, SB0065, and SB0066).
2306-D43	2306-M11	<b>GSA Reclamation Yard West (SWMU 036) Confirmatory Sampling (CS) Results and Interim Measures (IM) Work Plan:</b> The Team reached consensus to prepare a Statement of Basis (SB) and Land Use Control Implementation Plan (LUCIP) to document and maintain land use controls for soils with As, Cu, Ni, BAPE, and PCBs above the rSCTLs.

KSCRT Status of Open Action Items

Action Item No.	Minutes Reference	Responsible Team Member	Action item	Status	Comments
1712-A01	1712-M07	Team	If a document contains materials controlled under EAR99 (as determined by Export Control), the following clause shall be included on the first page (Action item): "EAR99 – NO LICENSE REQUIRED This information or item is controlled under the Export Administration Regulations (EAR) as EAR99. It may be exported without a license, except to embargoed/designated countries (General Provision Six) or entities of concern. The designation of EAR99 does not constitute public release. Per Lori Ray, Reference STI TN#### NASA KSC Export Control Office, 321-867-9209."	Open	Standing Open Item
1810-A01	1810-M01	Team	NASA legal is concerned about copyright infringement regarding the inclusion of lab reports in documents. Reach out to labs to get release statements from them for the lab reports.	Open	Standing Open Item
2002-A03	2002-M10	A&Es	NASA requests that all A&E firms please large file transfer the .pdf and PowerPoint versions of the ADPs being presented so they can be uploaded to the folder and utilized for the team meeting. Cover letters should summarize the goal of the ADPs and the consensus statements should be provided for the minutes.	Open	Standing Open Item
2102-A09	2102-M13	Team	General Comment: FDEP observed that, based on the current monitoring network and plume depiction, one could think the plume is not delineated. Trepidations exist about making decisions without understanding how MNA has progressed. For clarity moving forward, the NASA lead requested that future documents include the end point assessment map that shows that we have plume delineation at a site, as well as a cross-section reference (e.g., what was the last map that brought us to the point of LTM, and where are we now [all the circa data circa]).	Open	Standing Open Item
2102-A07	2102-M13	NASA (RPO)	<b>Industrial Area LTM, February 2021 (ORSY Site):</b> FDEP inquired about past results for monitoring well ORSY-DRM-MW00011. NASA stated they will look into the historical sampling results and get back with the Team.	Open	Findings and recommendations were submitted to FDEP. NASA is implementing the recommendations and will be revisited at a later date.
2102-A08	2102-M13	NASA (RPO)	<b>Industrial Area LTM, February 2021 (EHF Site):</b> FDEP and NASA discussed the site. NASA stated that the MNA program is routinely optimized, but this site was never included in an engineering evaluation process. Mounding takes place at this location, and a building was removed in the past few years. NASA took an action item to review the sampling data in the RFI for this location.	Open	Findings and recommendations were submitted to FDEP. NASA is implementing the recommendations and will be revisited at a later date.
2102-A10	2102-M13	NASA (RPO)	<b>Industrial Area LTM, February 2021 (M7-505 Site):</b> NASA took an action item to investigate if there are deeper data points around the location of MW0033.	Open	Findings and recommendations were submitted to FDEP. NASA is implementing the recommendations and will be revisited at a later date.
2102-A11	2102-M13	NASA (RPO)	<b>Industrial Area LTM, February 2021 (GSSP Site):</b> FDEP inquired if this site was delineated to the northwest of the lake, and if we have vertical delineation at this location. NASA stated a site characterization was performed in 2012. In 2009, DPT55 was placed on the west side of the pond (west of MW0035) and DPT56 was located on the east side of the pond (20ft NW of the location of monitoring wells MW0033, MW0034, and MW0035). On the west side there were no detections, and on the east side there were low detections. Surface water was also sampled here. NASA took an action item to provide this data to FDEP for reference following the meeting.	Open	Findings and recommendations were submitted to FDEP. NASA is implementing the recommendations and will be revisited at a later date.
2102-A12	2102-M13	NASA (RPO)	<b>Industrial Area LTM, February 2021 (KARS Park 1 Site):</b> FDEP inquired if this was a skeet range previously? NASA stated there was a rifle/pistol range with a skeet range to the west (reference slide 154). FDEP inquired on the groundwater in the rifle/pistol range area? NASA stated that the groundwater was not monitored in that area. Tetra Tech pulled up the old wells in a previous presentation figure during the meeting. The only well shown in the area of discussion was in the lead shot area (KP1-MW0007). FDEP stated they would like to know what happened west of LOC 9 if NASA can provide that data. NASA took an action item to look into this.	Open	Findings and recommendations were submitted to FDEP. NASA is implementing the recommendations and will be revisited at a later date.



KSCRT Status of Open Action Items

Action Item No.	Minutes Reference	Responsible Team Member	Action item	Status	Comments
2106-A01	2106-M03	NASA/FDEP	<b>NASA Remediation Program Updates, June 2021:</b> FDEP stated that, regarding the existing Statement of Basis template being acceptable, it would be best for FDEP and NASA to have a follow up meeting to review the current template. FDEP and NASA can decide from there.	Open	
2106-A02	2106-M03	NASA/FDEP	<b>NASA Remediation Program Updates, June 2021:</b> Regarding updating the Statement of Basis (SB) for a site after an IM has taken place (post initial SB publication), FDEP agrees that this is an administrative item and it does have significance. For the Federal Facilities Branch, it may not be critical to see the change in SB post IM, but the RCRA Program may have a different perspective. We need an understanding of what are considered significant changes on the permit, what triggers public notification, etc. That is a conversation NASA and FDEP should have to provide firmer ground on what is required going forward.	Open	Most of this has been addressed in the current permit modification, but still need a follow up meeting with FDEP to discuss the SB requirements.
2203-A05	2203-M09	NASA	<b>Industrial Area (IA) Long-Term Monitoring (LTM) Update, March 2022:</b> FDEP requested a brief letter report with the findings to support discontinuing the MNA at this OSRY (SWMU 004) site for groundwater. NASA confirmed it would provide this.	Open	This is being worked currently.
2210-A01	2210-M02	NASA	<b>C-5 Electrical Substation (SWMU #066) Groundwater Monitoring Report and Long-Term Monitoring Work Plan:</b> NASA stated that the well with the detection is the downgradient well. There was not a detection in the upgradient well; it was a "J" exceedance. There may be surface water and groundwater interaction at that location. Perhaps under the Center-wide investigation, we can do a co-located sample at this location. This will be an action item for NASA and AECOM to discuss	Open	NASA discussed with AECOM (under Center-wide Investigation) who will collect a surface water sample at this location and collect a sample from the existing monitoring well.
2210-A03	2210-M03	NASA	<b>LC39A Operations Support Building Area (AOSB) (SWMU #111) Year One Performance Monitoring, October 2022:</b> The Team reached consensus to include PFAS analyses for MWs 10 and 11 during the semi-annual sampling events. FDEP inquired if this was going to be an effort included under a larger investigation eventually? NASA responded that the center is co-located with water bodies, and the river could be a source. There is a PFAS source associated with a former STP, but that is not located here. It may be worth adding a surface water sample to this area. Let's talk about our Center-wide investigation first and how this might tie in.	Open	This will be addressed under the Center-wide PFAS investigation.
2210-A05	2210-M05	NASA	<b>LC39B (SWMU 009) LOX Area DPT Investigations and Air Sparging:</b> FDEP referring to Slide 27 inquired why staining samples aren't sent to the lab? How do you ascertain whether there is petroleum in that interval? Tetra Tech stated if they didn't see the visual stain, they sent it to the lab for the other contaminants of concern (COCs). However, that is an easy addition to sample for. FDEP instructed the Team to collect from that interval and send the samples to the lab, versus performing a visual inspection.	Open	Soil samples will be collected in the future
2210-A10	2210-M10	NASA	<b>Base Support Building (SWMU 014) and KARS Park II (SWMU #118) PFAS Site Assessment Report:</b> NASA took an action item to sample the borrow pit to the west of KARS Park II.	Open	This will be addressed under the Center-wide PFAS investigation.
2304-A02	2304-M04	NASA	<b>CCB SWMU #089 - MW21 Area Groundwater IMWP:</b> Action item was added to look for this information (sodium and TDS) and submit to FDEP for their information.	Open	TDS sampling was available. Chris Adkison going to check further. If no sodium available then NASA will recommend sampling of three background wells moving forward for sodium and TDS. TDS and sodium were both available but old data. Will include the sampling of background wells for sodium and TDS moving forward.
2304-A03	2304-M04	NASA	<b>CCB SWMU #089 - MW21 Area Groundwater IMWP:</b> Tetra Tech will provide FDEP the trade names of the proposed chemicals to be used at the site via email as soon as possible.	Open	Follow up emails determined the trade name proposed has not been approved yet. Tetra Tech is following the process to get this chemical approved for use at this location and for future use.
2306-A01	2306-M04	NASA	<b>False Cape Data Collection Annex (SWMU 113) Monitoring Well Network:</b> FDEP recommended a well installation at the MW-F location. NASA will confirm the depth of this new well in an email to FDEP.	Open	
2306-A02	2306-M07	NASA	<b>Industrial Area (IA) Long-Term Monitoring (LTM) Update :</b> FDEP inquired when was the last time GSSP-MW0027 and GSSP-MW0028 were sampled? Monitoring well GSSP-MW0054 is also high too. If it has been more than a decade you may want to sample those wells again. Action item to get back with FDEP with this information.	Open	
2306-A03	2306-M09	NASA	<b>GSA Reclamation Yard (SWMU 10) Shallow Soil Polychlorinated Biphenyl (PCB) Site Assessment and Proposed Interim Measures (IM) Work Plan:</b> Chapter 62-780 of the Florida Administrative Code requires delineation to below CTLs in every direction. Buildings and paved surfaces are being used in some areas as boundaries of the proposed excavation areas, and delineation is not complete beyond the southwest fence line. AECOM will need to take a look at that (southwest corner).	Open	
2306-A04	2306-M12	NASA	<b>Miscellaneous Discussion:</b> The CCB project team heard back on Provect IR60; it is covered under the previous Provect IR. Tetra Tech will forward FDEP the approval email (to Jason French). It looks like we are good to use that product for the Converter Compressor Building MW21 area.	Open	

KSCRT Closed Action Items

Action Item No.	Minutes Reference	Responsible Team Member	Action item	Status	Date Closed	Closure Comments
1906-A01	1906-M01	NASA (Ryan O'Meara)	Per FDEP correspondence letter dated (March 22, 2019) RPM Ryan O'Meara will provide a site history of the Visitor Center Maintenance Area (SWMU 099) at a future team meeting.	Closed	10/2/2019	Discussion earlier this month with FDEP
1906-A02	1906-M11	FDEP	Discuss with FDEP Management to ensure Alternative Soil Cleanup Target Levels approved for use by Cape Canaveral Air Force Station for barium and copper may be applies to Kennedy Space Center sites.	Closed	8/8/2019	FDEP indicated that the ASCTLs that have been approved for use at CCAFS by the University of Florida can be referenced and applied to KSC sites. FDEP sent the Team an email on this subject on 6/27/19.
1908-A01	1908-M03	NASA Remediation Program wide	An action item was added for the NASA Remediation Program to begin adding a references section in all new and revised LUCIP documents moving forward.	Closed	2/6/2020	FDEP approved the use of a site-specific document reference within the NASA LUCIPs that states, "Site-specific documentation is available for review by contacting the Environmental Assurance Branch at telephone number (321)867-6971", moving forward.
1908-A02	1908-M04	FDEP	FDEP will check with their records department to add language that requires the preferred submission method of a report cover page with the CD only for report submittals moving forward.	Closed	10/23/2019	No FDEP mentioned record - this submittal method is acceptable.
1910-A01	1910-M02	NASA & TetraTech	Launch Complex (LC) 34 (SWMU CC054): DNAPL Source Zone Site Characterization Engineering Evaluation and Remedial Alternatives Evaluation (RAE) for the DSZ discussed the MWs in Layer 8 vertically delineating the TCE (four existing and four newly installed wells were sampled). The Team discussed the Layer 8 wells and recommended they be sampled as part of the next annual plume-wide sampling event scheduled in Dec 2020. An action item for NASA was added to work with Tetra Tech to make sure the deep wells get incorporated into the sampling program accordingly.	Closed	4/16/2020	These wells have been incorporated
2002-A01	2002-M07	A&Es	NASA requests that any updates to the PFAS six questionnaires be provided to Mark Speranza with Tetra Tech so he can utilize those same questions at other sites where Tetra Tech is investigating PFAS.	Closed	4/16/2020	No updates to questionnaires
2002-A02	2002-M07	FDEP	FDEP to look into the review and responses of the following document "White Paper: Development of Surface Water Criteria for PFOA and PFOS based on the protection of aquatic receptors" published by the Center for Environmental & Human Toxicology at the University of Florida , and provide input back to the Team.	Closed	6/18/2020	John Winters looked into and provided response on 05/22/2020 to the Team.
2008-A01	2008-M02	AECOM	<u>Mobile Launch Platform Rehabilitation Sites/Vehicle Assembly Building Area (MLP/VAB), Solid Waste Management Unit (SWMU #056) Corrective Measures Implementation (CMI) and Interim Measures (IM) Update.</u> <u>August 2020:</u> There seems to be a gap of treatment with regards to wells IS1, 1D and 6IR and if the HS2 area is turned off, is there a concern of contaminants slipping through? AECOM clarified that these sparge wells are spaced closely but not operating at the same time. The ROI distance and spacing in the expansion was based on what was learned from the original system design. Looking at DO and ORP, and performance monitoring, AECOM is not seeing data that this area is not being treated. NASA inquired if the wells 1S, 1D, and 6IR are being sampled? AECOM stated these are not being sampled, but they will take an action to research why and come back with an explanation to FDEP.	Closed	10/8/2020	Teams meeting with AECOM on 8/27/20 - The recently observed ROI of the BS system overlaps at the space between treatment barrier walls, therefore there is not gap in treatment. IW0006IR was not sampled because collective data from previous DPT investigations indicated VOCs > 100 ug/L was not present at the 6IR location and that the ROI of treatment wells was treating the targeted >100 VC plume as designed. IW0001S was not sampled because it is not within the treatment interval. Conclusion: IW0001D and IW0006IR will be included in the upcoming September 2020 sampling event. IW0006IR will continue to be monitored for VOC and dissolved oxygen (DO) during OM&M events.
2008-A03	2008-M02	AE Firms	<u>Mobile Launch Platform Rehabilitation Sites/Vehicle Assembly Building Area (MLP/VAB), Solid Waste Management Unit (SWMU #056) Corrective Measures Implementation (CMI) and Interim Measures (IM) Update.</u> <u>August 2020:</u> NASA asked the AE firms to query their teams to find out what sites are sampling using PDBs.	Closed	10/8/2020	HGL and Tetra Tech are not using PDBs at any of their sites. AECOM to look into the sites where this may be used and will report back to NASA. AECOM followed up with NASA that two sites were planned for use of PDBs to include Wilson Corners and the VAB LTM. Per NASA's request, PDBs will no longer be used in sampling moving forward, but the preferred "low-flow" sampling will be used from this point on.

## KSCRT Closed Action Items

Action Item No.	Minutes Reference	Responsible Team Member	Action item	Status	Date Closed	Closure Comments
2008-A04	2008-M03	AECOM	<u>GSRV Reclamation Yard (SWMU #0010)</u> - An April 2020 approval letter from FDEP regarding UIC at the site stated that since Provect-OX was applied to the saturated subsurface in multiple LDA/caisson excavation cells, monitoring for appropriate Underground Injection Control (UIC) parameters was recommended for a subset of wells, and should be analyzed for the iron, manganese, and sodium. After one year, sampling frequency and locations should be assessed. This means that the Team would need one additional sampling round to meet that year timeframe. AECOM will take an action to update the presentation prior to uploading to RIS for the records	Closed	10/8/2020	AECOM's Jennifer Joyal confirmed this presentation was updated prior to uploading to RIS.
2008-A05	2008-M07	FDEP	FDEP stated that the department has been doing a pilot project beginning with listing out dry cleaner and other cleanup sites. This PFAS tracking spreadsheet has minimal data and link to the reports associated with them, and the state is really trying to identify the max concentrations by media type. It is interesting to see what is coming up. AECOM inquired if the state has a list issued for the hazardous waste sites? AECOM did locate the dry-cleaning list. FDEP stated there are links in the spreadsheet to all different facilities to include landfills and electroplaters. There is an updated version of the tracking sheet, and FDEP will send out a copy to the Team.	Closed	10/8/2020	Laura Barrett (FDEP) provided the latest version of the tracking sheet to the Team.
1906-A03	1906-M09	NASA (Deda Johansen)	<u>Component Refurbishment and Chemical Analysis (CRCA) facility (SWMU #041)</u> Follow-up with NASA Compliance to determine if piping/sumps within the main CRCA building (K6-1696) and adjacent hazardous storage building are double-lined and compliant with Spill Prevention, Control, and Countermeasure (SPCC) requirements.	Closed	12/10/2020	NASA reached out to Jeff Bobersky (NASA Compliance SPCC) on this topic, and was referred to Albert Gibson (NASA Compliance Haz Materials/ Haz Waste) for answers. This piping is not subject to SPCC double-lined requirements, and should be discussed from a hazardous materials/haz waste compliance standpoint. Project has been reassigned from Ryan O'Meara to Deda Johansen
2010-A01	2010-M02	NASA	<u>Components Refurbishment and Chemical Analysis (CRCA) Solid Waste Management Unit (SWMU) #041, Year 1 Operations Maintenance and Monitoring:</u> NASA took an action item to transition MW0032 to quarterly monitoring.	Closed	12/10/2020	MW0032 has been transitioned to quarterly monitoring
2010-A02	2010-M02	NASA (Deda Johansen)	<u>Components Refurbishment and Chemical Analysis (CRCA) Solid Waste Management Unit (SWMU) #041, Year 1 Operations Maintenance and Monitoring:</u> NASA took the action to present a basket item after the next two rounds of quarterly groundwater data, which will take place in October 2020 and January 2021	Closed	12/10/2020	Tetra Tech presented groundwater data in a basket item at the 12/10/2020 KSCRT meeting to update FDEP on the October sample results for monitoring well CRCA-MW0032, and propose installation of MW0033 to monitor the downgradient plume edge west of MW0032
2010-A03	2010-M3	NASA (Anne Chrest)	<u>KSC Headquarters Building Area (KHQA) (SWMU #104) Perimeter Soil IM Completion:</u> NASA will provide a copy of the Interim Measure Work Plan for LOC 2D and 2E to FDEP	Closed	12/10/2020	Anne provided after meeting - FYI only and previously submitted and approved by FDEP earlier regime.
2010-A04	2010-M04	Tetra Tech	<u>LC34 DNAPL Source Zone Remediation Alternative Evaluation (RAE) Discussion and Proposed Pilot Study, October 2020:</u> Aquifer testing was conducted in 2019 for Layer 7. During the test, an upward gradient was observed in well pairs screened in Layers 6 and 8, suggesting an upward gradient. FDEP inquired if the Team recalls how much of a gradient was observe? TetraTech will take an action to provide that information following the meeting to FDEP.	Closed	12/10/2020	Mark Jonnet (Tetra Tech) provided the requested information to Kirk Johnson (FDEP) by email on 10/9/2020. Water level elevations at the paired wells differed by 0.7 to 0.8 ft and the average vertical gradient was 0.02 ft/ft.
2008-A02	2008-M02	AECOM & NASA	<u>Mobile Launch Platform Rehabilitation Sites/Vehicle Assembly Building Area (MLP/VAB), Solid Waste Management Unit (SWMU #056) Corrective Measures Implementation (CMI) and Interim Measures (IM) Update.</u> <u>August 2020:</u> An action item was assigned to NASA and AECOM to convene and review past data and devise a plan to present to the state regarding the data gap in the northwest portion of the site, and the downgradient wells that serve as the points of compliance, where the vinyl chloride results have recently exceeded its groundwater cleanup target level (1 µg/L) and show signs of increasing.	Closed	2/17/2021	AECOM is under contract to conduct additional groundwater assessment and installation of wells to the east of the biosparge barrier and railroad tracks. Up to 10 monitoring wells will be installed based on the results of the groundwater assessment.

KSCRT Closed Action Items

Action Item No.	Minutes Reference	Responsible Team Member	Action item	Status	Date Closed	Closure Comments
2012-A01	2012-M02	NASA (Deda Johansen)	<u>Maintenance and Operations (M&amp;O) Building (SWMU #014) Confirmation Sampling Work Plan for Soil Land Use Control Implementation Plan (LUCIP) Removal, December 2020</u> ; NASA (Deda Johansen) took an action item to look more into the site history for data from the prior investigation	Closed	2/17/2021	A bibliography with brief descriptions of document content was prepared. It will be included in HGL's upcoming Confirmatory Sampling Work Plan for Soil LUCIP Close-out
2012-A02	2012-M03	NASA (Mike Deliz)	<u>Review of Site Status and Deliverables, December 2020</u> ; FDEP inquired if NASA will be going over the outstanding CAMP documents later on, or if a list could be provided. NASA (Mike Deliz) took an action item to consolidate and send the outstanding document summary to FDEP	Closed	2/17/2021	A consolidation of the outstanding CAMP documents was provided to FDEP following the meeting
2102-A01	2102-M05	NASA (DJ)	<u>Contractors Road Heavy Equipment Area (SWMU #055) 2020 Annual Groundwater Monitoring, February 2021</u> : FDEP asked about the TDS and sodium results in the bioremediation area that are above Class GII groundwater standards. NASA responded that the sodium and TDS are compared to the KSC background levels, and took an action to provide the approved plan and data to FDEP for future reference.	Closed	4/28/2021	Completed - NASA sent both the background study and the approval letter to FDEP on 2/19/2021. A follow-up meeting was held between NASA, FDEP and HGL on 3/1/2021. FDEP requested a copy of the Decision Process Document, and as a follow-on later requested a copy of the actual background study. On 4/18/2021, FDEP recommended that NASA identify a suite of wells at the site that can be used to generate site-specific background information. NASA will follow that recommendation.
2102-A02	2102-M05	NASA (DJ)	<u>Contractors Road Heavy Equipment Area (SWMU #055) 2020 Annual Groundwater Monitoring, February 2021</u> : FDEP inquired if NASA has an UIC approval order to identify what NASA is using? NASA stated UIC monitoring was approved as part of the IM work plans that will be provided to FDEP .	Closed	4/28/2021	NASA provided FDEP with the 2016 and 2018 Bioremediation Work Plans that included the UIC Notifications as an appendix in each.
2102-A03	2102-M05	NASA (DJ)	<u>Contractors Road Heavy Equipment Area (SWMU #055) 2020 Annual Groundwater Monitoring, February 2021</u> : FDEP inquired if the Team resampled for benzene and chloroform at the site, and found these not to be a risk? NASA performed a real-time investigation during the KSCRT meeting of past data and did not find resampling of benzene. Since no soil benzene source was identified in soil or groundwater, and the detections did not exceed the commercial level, NASA submitted these sampling results to the NASA Industrial Hygiene Office for review. FDEP would like to see the email to help understand the resampling and rationale of the dropping of these chemicals off the sampling list. NASA will provide this benzene data to FDEP and have a discussion to review the data and also the UIC information from May/June 2014.	Closed	4/28/2021	NASA sent the Vapor Intrusion Memorandum to FDEP on 2/19/2021. A follow-up meeting was held between NASA, FDEP and HGL on 3/1/2021. FDEP's primary concern was that the sub-slab vapor results would be acted on if needed. NASA explained that KSC's Industrial Hygienist was consulted about the findings which FDEP had concerns about and found no need for action, and that vapor sampling results will continue to be provided to KSC's Environmental and Occupational Health organization.
2102-A04	2102-M10	NASA (DJ)	<u>GSA Reclamation Yard (SWMU#010), DPT Results, February 2021</u> : FDEP pointed out that the iron in monitoring well MW0071 exceeded the secondary standard. What is the basis for not including monitoring well MW0071? NASA responded that the results for iron were within the range of background values for KSC, and will provide documentation. FDEP stated that site-specific background data may be needed at some point. NASA took an action item to look at the RFI for that data, and provide to FDEP.	Closed	4/28/2021	The RFI and CMS groundwater metals data for GSRY were reviewed. The majority of the data are from the upper horizon of the aquifer (30 ft. or shallower), while the zone treated with Provect-OX™ was 40-50 ft below ground surface. In the 2021 wet season groundwater sampling event, samples for iron will be collected from a site well outside the treated area.
2102-A05	2102-M13	NASA (RO)	needs to be a downgradient well establishing the extent of the plume at FSA1 (PRL #157). Do we have one? AECOM took an action item to look into that request	Closed	4/28/2021	NASA will be installing a downgradient well.
2102-A06	2102-M13	NASA (RO)	<u>Industrial Area LTM, February 2021 (FSA1 Site)</u> : NASA stated they will take a look into the prior DPT data to see if we need to install that well and provide the Team with an update and make a recommendation	Closed	4/28/2021	NASA will be installing a downgradient well.
2104-A01	2104-M04	NASA (AMC)	<u>Area South of K7-0516 and Eastern Component Cleaning Facility (SWMU #030) Interim Measure, Operation, Maintenance, &amp; Monitoring, and Performance Monitoring and Interim Groundwater Monitoring, April 2021</u> : An action item to incorporate surface water sampling into the CCF monitoring program was assigned to NASA and Tetra Tech	Closed	6/22/2021	This surface water sampling was incorporated in the barge canal sampling program moving forward.

## KSCRT Closed Action Items

Action Item No.	Minutes Reference	Responsible Team Member	Action item	Status	Date Closed	Closure Comments
2012-A03	2012-M03	NASA (MD)	Review of Site Status and Deliverables, December 2020: Mike will summarize the look ahead and send a detailed version to FDEP that will provide site histories, what NASA has completed, and where they are going (plume maps, the works). FDEP inquired if they could also obtain a copy of the slides being presented today. NASA confirmed they would provide the slides via large file transfer	Closed	9/15/2021	Look ahead and maps have been provided to FDEP by NASA
2104-A02	2104-M04	NASA (AMC)	<u>Area South of K7-0516 and Eastern Component Cleaning Facility (SWMU #030) Interim Measure, Operation, Maintenance, &amp; Monitoring, and Performance Monitoring and Interim Groundwater Monitoring, April 2021:</u> FDEP requested that the sampling plans for 2021 be documented in a letter since there will not be a report submitted this year for this site. NASA stated they would put a memo together and provide the work plan for the next year of monitoring	Closed	9/15/2021	FDEP referenced the April 2021 advance data package (ADP) in their review letters dated May 11, 2021 (for CCF, SWMU #030) and May 12, 2021 (for 516S, SWMU #100). Both letters state additional groundwater assessment activities will be conducted in 2021. This work has been delayed and will now occur in early 2022. The proposed sampling plans were presented in the April 2021 ADP. Revisions to the CCF East sampling plan will be presented at the September Team meeting. This meets the intent of this action item.
2106-A03	2106-M03	NASA	<u>NASA Remediation Program Updates, June 2021:</u> FDEP received a request from Florida Today requesting documents associated with PFAS on KSC. NASA stated they will provide the Oculus document/report names to FDEP to assist with the inquiry.	Closed	9/15/2021	NASA assisted FDEP with this inquiry
2012-A04	2012-M04	NASA (MD)	<u>Firex Water Tank (SWMU #069) Confirmation Sampling Work Plan for Soil LUCIP Removal, December 2020:</u> NASA (Mike Deliz) took an action item to see what NASA can find out on these discharge reports	Closed	11/9/2021	Internal discharge records were located and saved to the NASA shared drive. No additional spill records have been located for the release(s). The site entered the RCRA process through a SWMU Assessment and was added to KSC's RCRA Permit Appendix A. A Discharge Report Form does not appear to have been filed.
2109-A02	2109-M09	NASA (MJD)	<u>KSC Center-Wide Per- and Polyfluoroalkyl Substances (PRL 237) Locations of Concern, September 2021:</u> NASA has conducted sampling in the Indian River for PFAS. NASA to provide FDEP with the surface water sample results from the Indian River	Closed	11/9/2021	Sample results provided to FDEP
2109-A01	2109-M09	NASA (AC)	<u>Wilson Corners (SWMU 001) High Concentration Plume Site Characterization and Revised AS System Layout, September 2021:</u> NASA will send historic groundwater sampling data to FDEP.	Closed	1/11/2022	This data was provided to FDEP on November 9, 2021, during the KSCRT meeting.
2109-A03	2109-M14	NASA (DJ)	<u>General Services Administration Reclamation Yard (GSRY) SWMU 010, May/June Groundwater Monitoring Results September 2021:</u> NASA asked that the pre-Interim Measure UIC sample results be added to the applicable figure and requested that AECOM update the table with pre-treatment results in the ADP and get that back to the Team for the records.	Closed	1/11/2022	The pre-Interim Measure UIC results were included in the UIC discussion in the annual groundwater monitoring report that was submitted in November 2021.
2201-A02	2201-M04	NASA	<u>Center-Wide Per- and Polyfluoroalkyl Substances (PRL #237) Phase III Solid Waste Management Unit Site Assessment and Confirmatory Sampling Report Summary, January 2022:</u> NASA will update the summary table for KARS Park I and email back out to the Team.	Closed	5/3/2022	addressed in the meeting minutes
2203-A01	2203-M03	NASA	<u>Contractors Rd Heavy Equipment Area (SWMU 055) 2021 Annual Groundwater Monitoring Report Advanced Data Package, March 2022:</u> FDEP requested that HGL provide information regarding the number of sample points necessary for Mann-Kendall statistical analysis	Closed	5/3/2022	HGL provided the requested information to FDEP in a follow up email on March 8, 2022 to FDEP.
2203-A04	2203-M06	NASA	<u>GSA Reclamation Yard (SWMU 010) Groundwater Monitoring Update, March 2022:</u> FDEP requested a synoptic figure of the last two clean sampling events of the two wells.	Closed	5/3/2022	AECOM provided figure to FDEP on March 9, 2022
2203-A06	2203-M09	NASA	<u>CAMP Deliverables Look-Ahead and Document Requirements, March 2022:</u> FDEP inquired if the CAMP document being presented is the document sent around March 1? NASA confirmed that it was, but that it was revised since then. For PRL 237, there were two errors on dates (inadvertently switched), but will send this after the meeting.	Closed	5/3/2022	NASA provided the updated CAMP to team members
2201-A03	2201-M04	NASA	<u>Center-Wide Per- and Polyfluoroalkyl Substances (PRL #237) Phase III Solid Waste Management Unit Site Assessment and Confirmatory Sampling Report Summary, January 2022:</u> NASA owes FDEP an update on Q6 Radar Station (SWMU #112), so they will put together an ADP to review the RFI they completed.	Closed	6/28/2022	contract was modified and NASA will present results for this in a future presentation

KSCRT Closed Action Items

Action Item No.	Minutes Reference	Responsible Team Member	Action item	Status	Date Closed	Closure Comments
2205-A02	2205-M08	NASA	<u>Wilson Corners (SWMU #001) 2021 Annual Long-Term Monitoring Update, May 2022:</u> FDEP stated that VOC concentrations are increasing to the west but the natural attenuation default concentrations (NADC) footprint hasn't changed much. AECOM confirmed that was correct. Based predominantly on DPT data, the existing wells are appropriate for the extent of the low-concentration plume (LCP). The performance monitoring wells are more on the interior of the plume and will give us a better idea of what is going on with the high concentration plume (HCP). FDEP inquired what the vertical head difference of the zones are that are being referred to. AECOM will look into this question and provide the information.	Closed	6/28/2022	AECOM provided vertical head data for 2019, 2020 and 2021 to FDEP on May 5, 2022.
1810-A02	1810-M04	NASA	<u>Launch Complex 39B (LC39B) (SWMU 009)</u> - revisit team consensus 1810-D13 on weir installation based on permits date expiration and Year 2 PM results. (Team consensus reached to suspend the weir installation since CVOC concentrations adjacent to the pond are below their respective GCTLs and to re-evaluate the need for the weir prior to the SJRWMD and USACE permit expiration (11 July 2023).	Closed	10/6/2022	The Team reached consensus to evaluate Action Item 1810-M04, 1810-A02 in 2022 to re-evaluate the need for a weir near OFW. Tetra Tech resampled for line of evidence and upon reviewing the results presented in an ADP on October 6, 2022, this action was closed out.
2201-A01	2201-M04	NASA	<u>Center-Wide Per- and Polyfluoroalkyl Substances (PRL #237) Phase III Solid Waste Management Unit Site Assessment and Confirmatory Sampling Report Summary, January 2022:</u> NASA stated that the red boundary (PFAS LOC) in the figure on slide 90 is for the fire station, and not for Central Supply. NASA will gather together the figures they are investigating, and provide to FDEP.	Closed	10/6/2022	This was addressed in the submittal of the Center-wide report.
2203-A02	2203-M03	NASA	<u>Contractors Rd Heavy Equipment Area (SWMU 055) 2021 Annual Groundwater Monitoring Report Advanced Data Package, March 2022:</u> FDEP inquired if there is still extensive VC present in the 46-60ft bls interval, which is depicted on a single figure. What is below 60 ft bls? NASA responded that below 60 ft bls is clean and there were no exceedances at that interval. HGL added that DPT results achieved GCTLs at the 56-60 ft depth level. FDEP requested that this information be provided on separate figures (46-56 ft bls and a 56-60 ft bls), to show there is vertical delineation.	Closed	10/6/2022	This information was provided in the report submitted to FDEP on August 23, 2022.
2203-A03	2203-M03	NASA	<u>Contractors Rd Heavy Equipment Area (SWMU 055) 2021 Annual Groundwater Monitoring Report Advanced Data Package, March 2022:</u> FDEP requested a copy of the proposed DPT sample points. FDEP referenced the 2020 DPT in the HS1 area, noting some additional points on the southern side of the plume might be needed in the deeper interval. NASA responded they agree there exists a data gap on the southeast edge. In 2021, HGL collected more data to close those gaps. HGL and NASA will look to see if more data is needed in that locale. FDEP would also like to see the additional proposed points in the northwest area for defining the HC plumes NASA will get FDEP their initial plan when it is prepared.	Closed	10/6/2022	The proposed sampling locations were provided to FDEP on July 1, 2022.
2205-A01	2205-M03	NASA	<u>Annual Update on the Interim Measure Operation, Maintenance, and Monitoring at Area South of K7-516 and Interim Groundwater Monitoring of 516S and Eastern Components Cleaning Facility, May 2022:</u> FDEP recommended a monitoring well with results showing that the groundwater plume is not having an impact on the OFW. Along with the two surface water samples, the monitoring well sample would provide a reasonable assessment. A screen interval similar to the other side of the air sparge curtain (27-37 bls) seems appropriate. HGL suggested consideration with placing the new monitoring well closer to the barge canal, similar to MW36. Tetra Tech will come up with a recommendation and provide a map to FDEP.	Closed	10/6/2022	NASA provided a map with the suggested well locations to FDEP on 06/19/2022. Close out.
2206-A02	2206-M04	NASA	<u>Annual Update on Launch Complex 34 :</u> A brief site history and background were provided on LC34. FDEP inquired if the part of the plume that is above GCTLs discharges to the Atlantic Ocean. Tetra Tech stated they had temporary wells along the ocean. They can go back and pull together the data if this would be helpful. FDEP agreed this would be helpful to understand the history of the site.	Closed	10/6/2022	NASA provided this information by email to FDEP on August 2, 2022.
2206-A03	2206-M04	NASA	<u>Annual Update on Launch Complex 34 :</u> FDEP referenced Slide 15, which gives an overview of the HCS. Are there groundwater flow maps available that present the depth to groundwater and groundwater flow within the capture zone? NASA requested this be captured as an action item to follow up on .	Closed	10/6/2022	NASA provided this information by email to FDEP on August 2, 2022.

KSCRT Closed Action Items

Action Item No.	Minutes Reference	Responsible Team Member	Action item	Status	Date Closed	Closure Comments
2206-A04	2206-M04	NASA	<b>Annual Update on Launch Complex 34 :</b> FDEP inquired if it was possible the northeasterly DSZ finger had been present prior to the 2019 recharacterization, but had been missed by earlier DPT points? Tetra Tech stated that it is possible and they will take an action item to look at the 2019 recharacterization for DPT coverage in that area. Whether it was missed or moved, sampling indicates the plume has not come out from under the blockhouse.	Closed	10/6/2022	NASA provided this information by email to FDEP on August 2, 2022.
2206-A05	2206-M05	NASA	<b>Fluid Servicing Road Area Interim Groundwater Monitoring Summary, June 2022:</b> HGL will provide the 2020 DPT results for this site to the Team at the next meeting.	Closed	10/6/2022	This information was included in the ADP dated September 13, 2022.
2206-A01	2206-M03	NASA	<b>Update on NASA KSC Program:</b> For PFAS, NASA made a commitment to provide an update to this GIS layer semiannually. NASA will consider providing the GIS layer and will follow up with FDEP on this request.	Closed	2/7/2023	The GIS layer was provided to FDEP in November 2022. This will be closed out.
2206-A06	2206-M07	NASA	<b>SLERA Conclusions and Recommendations for the Un-numbered Operational Area (UNOA), PRL #229, June 2022:</b> FDEP stated that they will farm this information out to University of Florida (UF) for review. NASA responded that this SLERA report is already drafted and they will submit the report for review with the details.	Closed	2/7/2023	This has been submitted and will be closed out.
2206-A07	2206-M09	NASA	<b>Stand-alone Electrical Equipment Confirmation Sampling Report Addendum and Interim Measure Work Plan, June 2022:</b> NASA stated they will be removing everything 0.5 mg/kg to the building, and inquired with FDEP how the PCB coordinated removal would work. FDEP has not participated in one of those yet, so this will be a mutual learning experience. NASA will forward the Notification Letter sent previously to Bruce.	Closed	2/7/2023	Deda will look for this letter and send out to FDEP. Deda provided to FDEP on 09/27/2022; this will be closed out.
2210-A04	2210-M04	NASA	<b>Fire Station #3 PFAS Site Assessment Update, October 2022:</b> First flush rain evaluations and Nalgene samplers are planned to be used. Once the monitoring well installation locations are determined, does FDEP want to know where those are? FDEP responded that they would like to know for information purposes. NASA will provide these locations to FDEP prior to installation.	Closed	2/7/2023	Sent to FDEP on 01/24/2023; this will be closed out
2210-A07	2210-M09	NASA	<b>Meeting Minutes and Miscellaneous Updates:</b> Annual Update on Launch Complex 34 at a prior meeting provided an overview of the hydraulic containment system (HCS). FDEP requested groundwater flow maps at the time that present the depth to groundwater and groundwater flow within the capture zone. NASA provided this information by email to FDEP on August 2, 2022. As a result, FDEP noted that the information provided was capture modeling and FDEP would like to see water level measurements to support the capture zone. NASA and Tetra Tech will provide that data to FDEP.	Closed	2/7/2023	The additional information was provided to FDEP and will be closed out.
2210-A08	2210-M10	NASA	<b>Base Support Building (SWMU 014) and KARS Park II (SWMU #118) PFAS Site Assessment Report:</b> The half white half back circle represents surface water. NASA requested to add a note to the Slide 35 to clarify what the symbol means for the ADP and the report.	Closed	2/7/2023	Standardization for symbols was provided by NASA to the A&E firms (January 11, 2023); this will be closed out.
2210-A09	2210-M10	NASA	<b>Base Support Building (SWMU 014) and KARS Park II (SWMU #118) PFAS Site Assessment Report:</b> NASA would like to maintain consistency throughout all the PFAS presentations (e.g., triangle symbol for surface water, etc.). The NASA RPMs will get together and issue guidance to the A&E firms on the use of identifiers in presentations for consistency.	Closed	2/7/2023	Standardization for symbols was provided by NASA to the A&E firms (January 11, 2023); this will be closed out.
2210-A12	2210-M12	NASA	<b>SWMU 067 POL and SWMU #088 SW3 ADP:</b> Tetra Tech will create a figure of the proposed monitoring well locations and give to Deda with NASA.	Closed	2/7/2023	Figure created and provided to FDEP. This will be closed.
2210-A02	2210-M02	NASA	<b>C-5 Electrical Substation (SWMU #066) Groundwater Monitoring Report and Long-Term Monitoring Work Plan:</b> FDEP requested the team construct an east/west cross-section of the plume to show vertical delineation of the site and put data points on the figure. A figure like this already exists and was developed during the site characterization. NASA will send this figure to FDEP.	Closed	4/5/2023	The figure was included in the C-5 Electrical Substation Groundwater Monitoring Report that was sent to FDEP on January 23, 2023.



KSCRT Closed Action Items

Action Item No.	Minutes Reference	Responsible Team Member	Action item	Status	Date Closed	Closure Comments
2210-A06	2210-M08	NASA	<b><u>Fire Station #1 (SWMU #116), Sewage Treatment Plant #1 and Sludge Disposal Area (SWMU #117) PFAS Sites Assessment Update:</u></b> The image on Slide 35 displays surface water PFOS results. Future sampling will be focused on influent into the Gator Pond, effluent from the gator pond, associated borrow pits that are part of the stormwater management system, tributaries into Buck Creek, locations within Buck Creek, junction of Buck Creek and Banana River with offsets north and south, isolated borrow pits northeast of gator pond to determine impacts, and four locations along Banana River that will correspond to DPT locations. Tetra Tech will email FDEP the locations of the proposed monitoring well locations.	Closed	4/5/2023	Locations provided to FDEP on February 22, 2023.
2210-A11	2210-M11	NASA	<b><u>Fire Station #2, Former Sewage Treatment Plant #17, and Towway Area (SWMU 114):</u></b> Space Florida sampled their effluent as they dewatered (referencing slide 25). Didn't see PFOS until last week or two and discharged to the east along Astronaut Rd and will keep in mind in future sampling efforts (in the hundreds). (Jan/Feb) DPTs along astronaut road predate the discharge. Will have to investigate south of the new road. We didn't have connectivity to the SLF with that dewatering effluent. We will go back to those areas to see what might have been spread within the SWMU boundary. Make a figure to show where all the effluent sample locations are.	Closed	4/5/2023	Maps have been drafted and will be submitted with the Land Use Control Annual Report; estimated February 2023.
2302-A01	2302-M12	NASA	<b><u>Launch Complex 39A (SWMU #008) and Launch Complex 39B (SWMU #009) Performance Monitoring, February 2023:</u></b> Action item for NASA to provide a list of wells that will be sampled for PFAS at LC39A to FDEP prior to conducting the sampling	Closed	6/28/2023	The list of wells were provided to FDEP.
2302-A02	2302-M12	NASA	<b><u>Launch Complex 39A (SWMU #008) and Launch Complex 39B (SWMU #009) Performance Monitoring, February 2023:</u></b> Action item for NASA to provide a list of wells that will be sampled for PFAS at LC39B to FDEP prior to conducting the sampling	Closed	6/28/2023	The list of wells were provided to FDEP.
2304-A01	2304-M03	NASA	<b><u>GSA Reclamation Yard (GSRY) 2022 Groundwater Monitoring Results:</u></b> NASA to provide FDEP approval emails or correspondence regarding lack of pre-injection data at the site and the selection of MW0002IS as a site-specific background well.	Closed	6/28/2023	Emails sent by NASA to FDEP on June 7, 2023.

**APPENDIX C**  
**Soil Boring Logs**

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CLIENT NASA PROJECT NAME Kennedy Space Center  
 PROJECT NUMBER KSC SITE NAME A3RB  
 DATE STARTED 01/14/2022 COMPLETED N/A SURVEYING BY \_\_\_\_\_  
 DRILLING CONTRACTOR EDS ON \_\_\_\_\_ GROUND ELEVATION N/A  
 DRILLING EQUIPMENT Geoprobe 7822DT EASTING N/A NORTHING N/A  
 DRILLING METHOD Direct-push HOLE DIAMETER long by wide  
 LOGGED BY Chris Marshall CHECKED BY N/A CASING TYPE N/A

DEPTH (ft)	SAMPLE	RECOVERY %	FID (ppm)	GRAPHIC LOG	MATERIAL DESCRIPTION
0					
0.00	HA	100	89		0.00 Silty sand (SM), fine, poorly graded, subangular, 25-35% silt, Organics throughout [NATIVE] - 10YR 2/1 (black), wet - no odour, no staining - non-cohesive, loose
			94		
			465		
5.00	DP	100	269		5.00 Poorly graded gravel with sand (GP), medium to coarse, subangular, 30-40% subangular, fine sand, Shell (hash) with sand [NATIVE] - 10YR 7/2 (light gray), wet - no odour, no staining - non-cohesive
			152		
			120		
10.00	DP	60	127		
			119		
			110		
18.00	DP	80	116		18.00 Poorly graded gravel (GP), very coarse, angular, <5% shell, very hard silicified layer. [NATIVE] - 10YR 5/1 (gray), moist - hydrocarbon odour, no staining - cohesive
20.00	DP	80	130		
22.50			140		
24.00	DP	80	89		24.00 Clayey sand (SC), poorly graded, subangular, 30-40% clay, Sampled at 21 for lab analyses [NATIVE] - 10BG 5/1 (greenish gray), wet - hydrocarbon odour, no staining - non-cohesive, loose
31.00	DP	80	63		
			122		
31.00	DP	80	144		31.00 Lean clay (CL) [NATIVE] - 10BG 5/1 (greenish gray), wet - hydrocarbon odour, no staining - cohesive, very soft
			118		
			106		
40.00	DP	50	94		40.00 Clayey sand (SC), poorly graded, subangular, 30-40% clay, Sampled at 21 for lab analyses [NATIVE] - 10BG 5/1 (greenish gray), wet - hydrocarbon odour, no staining - non-cohesive, loose
			25		
			16		
40.00	DP	50	11		40.00 Poorly graded sand (SP), fine, subangular, <10% subangular, medium gravel, There is a band of 15% shell within this unit at 36.5-37'. [NATIVE] - 10YR 5/1 (gray), wet - no odour, no staining - non-cohesive, loose
			16		
			17		
50.00	DP	50	12		50.00 Poorly graded sand (SP), very fine, subrounded [NATIVE] - 10YR 6/1 (gray), wet - no odour, no staining - non-cohesive, medium dense
			10		
			12		
55.00	DP	90	3		55.00 Clayey sand (SC), very fine, poorly graded, subrounded, 25-35% clay, Samples collected at 58' for lab analyses [NATIVE] - 10BG 5/1 (greenish gray), wet - no odour, no staining - non-cohesive, loose
			3		
			5		
59.00	DP	100	5		59.00 Lean clay (CL), Interbedded shell layers within interval. End of boring at 64' (refusal). [NATIVE] - 10BG 5/1 (greenish gray), wet - no odour, no staining - cohesive, medium stiff
			5		

Bottom of borehole at 64 feet.

AECOM SMART LOG 8X11 - NANAIMO LOGS\_DC.GPJ - 1/14/22 16:22 - C:\USERS\CHASTAIN\DOCUMENTS\SMY EQUIS WORK\INASA\KENNEDY SPACE CENTER\B LOGS\A3RB SB47A\A3RB SB47.GPJ



# BORING NUMBER A3RB-SB0048

TOTAL DEPTH 65 FT BGS  
PAGE 1 OF 1

CLIENT NASA PROJECT NAME Kennedy Space Center  
 PROJECT NUMBER KSC SITE NAME \_\_\_\_\_  
 DATE STARTED 06/13/2022 COMPLETED 06/13/2022 SURVEYING BY N/A  
 DRILLING CONTRACTOR Environmental Drilling Service ON N/A GROUND ELEVATION N/A  
 DRILLING EQUIPMENT Geoprobe 7822DT EASTING N/A NORTHING N/A  
 DRILLING METHOD Direct Push HOLE DIAMETER 2 in  
 LOGGED BY Brittany Follett CHECKED BY N/A CASING TYPE N/A

AECOM SMART LOG 8X11 NO WL - NANAIMO LOGS\_DC.GPJ - 6/14/22 10:51 - C:\USERS\CHASTAIN\DOCUMENTS\MY EQUIS WORK\KSC\KENNEDY SPACE CENTER\SB LOGS\A3RB SB48.GPJ

DEPTH (ft)	SAMPLE	RECOVERY %	PID (ppm)	GRAPHIC LOG	MATERIAL DESCRIPTION
0					
0.00	HA	100	0		0.00 Poorly graded sand (SP), fine, subangular [NATIVE] - 10YR 3/2 (very dark grayish brown), wet - no odor, no staining - non-cohesive, loose
0.6					
1.1					
10	DP	80	0.2		
0.3					
9.50	DP	54	0.6		9.50 Poorly graded gravel with sand (GP), subangular, 10-20% subangular, medium to coarse sand, Shell Hash [NATIVE] - 10YR 8/1 (white), wet - no odor, no staining - non-cohesive, medium dense to very dense
0.1					
0.2					
20	DP	56	0.2		
0.4					
24.00	DP	60	0.4		
0.2					
27.00	DP	68	0.4		24.00 Poorly graded gravel with sand (GP), subangular, 10-20% subangular, fine sand, Shell Hash with 5% clay [NATIVE] - 10YR 6/1 (gray), wet - no odor, no staining - non-cohesive, dense 27.00 Clayey sand (SC), fine, poorly graded, subangular, 15-25% clay [NATIVE] - 10YR 4/1 (dark gray), wet - no odor, no staining
0.3					
0.3					
30.00	DP	40	0.4		30.00 Poorly graded gravel with sand (GP), subangular, 10-20% subangular, medium to coarse sand, Shell Hash [NATIVE] - 10YR 8/1 (white), wet - no odor, no staining - non-cohesive, medium dense to very dense
0.3					
0.7					
40	DP	58	0.5		
0.9					
42.00	DP	56	0.1		42.00 Poorly graded sand (SP), fine, subangular, <10% clay, Few Shell Fragments, <5% [NATIVE] - 5Y 6/1 (gray / light olive gray), moist - no odor, no staining - non-cohesive, medium dense to dense
0.3					
0.1					
50	DP	68	0.3		
0.6					
53.00	DP	100	0.1		53.00 Clayey sand (SC), fine, poorly graded, subangular, 15-25% clay, Few Shell Fragments, <5% [NATIVE] - 5Y 5/1 (gray), wet - no odor, no staining - non-cohesive, dense
0.2					
0.1					
60	DP	78	0.3		
0.1					
61.50	DP	70	0.2		61.50 Lean clay with sand (CL), 15-25% fine sand, <10% subangular, medium to coarse gravel, Few shell fragments; <5% [NATIVE] - 10GY 5/1 (greenish gray), wet - no odor, no staining - cohesive, medium stiff
0.2					
0.4					
					Bottom of borehole at 65 feet.



# BORING NUMBER A3RB-SB0061

TOTAL DEPTH 60 FT BGS  
PAGE 1 OF 2

CLIENT NASA PROJECT NAME Kennedy Space Center  
 PROJECT NUMBER KSC SITE NAME \_\_\_\_\_  
 DATE STARTED 03/08/2023 COMPLETED 03/08/2023 SURVEYING BY \_\_\_\_\_  
 DRILLING CONTRACTOR EDS ON \_\_\_\_\_ Ground Elevation N/A  
 DRILLING EQUIPMENT Geoprobe 7822DT EASTING N/A NORTHING N/A  
 DRILLING METHOD Direct push HOLE DIAMETER \_\_\_\_\_ in  
 LOGGED BY Brittany Follett CHECKED BY N/A CASING TYPE N/A

AECOM SMART LOG 8X11 NO WL - BLANK GINT PROJECT FOR COLLECT.GPJ - 3/8/23 12:05 - C:\USERS\CHASTAINJ\DOCUMENTS\MY EQUIS WORK\NASA\KENNEDY SPACE CENTERS\SB LOGS\A3RBA3RB SB61.GPJ

DEPTH (ft)	SAMPLE TYPE	RECOVERY %	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0					
0.00 - 0.50			SP		Poorly graded sand (SP), medium, subangular [NATIVE] - 2.5Y 7/1 (light gray), dry - no odor, no staining - non-cohesive, very loose
0.50 - 7.50			SP		Poorly graded sand (SP), fine to medium, 5-15% roots, Organic throughout [NATIVE] - 2.5Y 2.5/1 (black), moist - no odor, trace black staining - non-cohesive, very loose
7.50 - 10.00			GP		Poorly graded gravel with sand (GP), fine to medium, subangular, <10% subangular, medium to coarse gravel, 5% shell fragments [NATIVE] - 10YR 4/6 (dark yellowish brown), wet - no odor, no staining - non-cohesive, very loose
10.00 - 20.00			GP		Poorly graded gravel with sand (GP), fine to medium, subangular, 25-35% fine sand, 30% shell hash [NATIVE] - 2.5Y 7/1 (light gray), wet - no odor, no staining - non-cohesive, very loose
20.00 - 28.00			SM		Silty sand (SM), fine, poorly graded, 25-35% silt [NATIVE] - 10YR 5/1 (gray), wet - no odor, no staining - non-cohesive, loose
28.00 - 30.00			SC		Clayey sand (SC), fine, poorly graded, subangular, 25-35% clay, <5% shell fragments [NATIVE] - 10YR 5/1 (gray), wet
30.00 - 38.00			GP		Poorly graded gravel with sand (GP), medium to coarse, subangular, 35-45% subangular, fine sand, 40% shell hash [NATIVE] - 10YR 7/1 (light gray), wet - no odor, no staining - non-cohesive, very loose
38.00 - 49.00			SP		Poorly graded sand (SP), fine, subangular, <10% subangular, medium to coarse gravel, <5% shell fragments [NATIVE] - 10YR 7/1 (light gray), moist - no odor, no staining - cohesive, soft
49.00 - 50.00			SM		Silty sand (SM), very fine, poorly graded, subangular, 15-25% silt, <10% subangular, medium to coarse gravel, <5% shell fragments [NATIVE] - 10YR 6/1 (gray), wet - no odor, no staining - non-cohesive, loose
50.00 - 55.00			SM		Silty sand (SM), very fine, poorly graded, subangular, 15-25% silt, <10% subangular, medium to coarse gravel, <5% shell fragments [NATIVE] - 10YR 6/1 (gray), wet - no odor, no staining - non-cohesive, loose
55.00 - 60.00			CL		Sandy lean clay (CL), 25-35% subangular, fine sand, 5-15% medium to coarse gravel, 10% shell hash [NATIVE] - 10GY 7/1 (light greenish gray), wet - no odor, no staining

(Continued Next Page)



# BORING NUMBER A3RB-SB0061

TOTAL DEPTH 60 FT BGS  
PAGE 2 OF 2

CLIENT NASA PROJECT NAME Kennedy Space Center  
PROJECT NUMBER KSC SITE NAME \_\_\_\_\_

AECOM SMART LOG\_8X11 NO WL - BLANK GINT PROJECT FOR COLLECT.GPJ - 3/8/23 12:05 - C:\USERS\CHASTAIN\DOCUMENTS\MY EQUIS WORK\NASA\KENNEDY SPACE CENTERS\SB LOGS\A3RBA3RB SB61A3RB SB61.GPJ

DEPTH (ft)	SAMPLE TYPE	RECOVERY %	U.S.C.S. GRAPHIC LOG	MATERIAL DESCRIPTION
---------------	-------------	------------	----------------------------	----------------------

- cohesive, medium stiff

Bottom of borehole at 60 feet.

**APPENDIX D**  
**Laboratory Analytical Report – Grain Size Analysis**



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National Aeronautics and  
Space Administration

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Caitlin Brice, M.S.  
Signature

12/27/18  
Date

Company Name: SGS North America Inc.  
Company Representative Name: Caitlin Brice  
Company Representative Title: General Manager  
Company Address: 4405 Vineland Rd., Ste C15, Orlando, FL 32811  
Company Representative Phone: 407-425-6700  
Company Representative E-Mail: caitlin.brice@sgs.com



The results set forth herein are provided by SGS North America Inc.

*e-Hardcopy 2.0*  
*Automated Report*

## Technical Report for

**AECOM, Inc**

**NASA KSC, PFAS SA & Mitigation**

**60667657.4**

**SGS Job Number: FC3375**

**Sampling Date: 03/08/23**



### Report to:

**AECOM**  
**150 N Orange Ave Suite 200**  
**Orlando, FL 32801**  
**gloria.richie@aecom.com; linnea.king@aecom.com;**  
**megan.garcia@aecom.com; jennifer.chastain@aecom.com;**  
**ATTN: Jennifer Joyal**

**Total number of pages in report: 21**



Test results contained within this data package meet the requirements of the National Environmental Laboratory Accreditation Program and/or state specific certification programs as applicable.

**Norm Farmer**  
**Technical Director**

**Client Service contact: Andrea Colby 407-425-6700**

Certifications: FL(E83510), LA(03051), KS(E-10327), NC(573), NJ(FL002), NY(12022), SC(96038001)  
DoD ELAP(ANAB L2229), AZ(AZ0806), CA(2937), TX(T104704404), PA(68-03573), VA(460177),  
AL, AK, AR, CT, IA, KY, MA, MI, MS, ND, NH, NV, OK, OR, IL, UT, VT, WA, WI, WV

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Test results relate only to samples analyzed.

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## Sample Summary

AECOM, Inc

Job No: FC3375

NASA KSC, PFAS SA & Mitigation  
Project No: 60667657.4

Sample Number	Collected		Received	Matrix		Client Sample ID
	Date	Time By		Code	Type	
FC3375-1	03/08/23	08:58 DS	03/09/23	SO	Soil	A3RB-SB0061-010.0-20230308
FC3375-2	03/08/23	10:15 DS	03/09/23	SO	Soil	A3RB-SB0061-035.0-20230308

---

Soil samples reported on a dry weight basis unless otherwise indicated on result page.

# SAMPLE DELIVERY GROUP CASE NARRATIVE

**Client:** AECOM, Inc

**Job No:** FC3375

**Site:** NASA KSC, PFAS SA & Mitigation

**Report Date** 3/31/2023 11:45:19 AM

On 03/09/2023, 2 Sample(s), 0 Trip Blank(s) and 0 Field Blank(s) were received at SGS North America Inc - Orlando. at a maximum corrected temperature of 5.2 C. Samples were intact and chemically preserved, unless noted below. A SGS North America Inc. - Orlando Job Number of FC3375 was assigned to the project.

Laboratory sample ID, client sample ID and dates of sample collection are detailed in the report's Results Summary Section. Specified quality control criteria were achieved for this job except as noted below. For more information, please refer to the analytical results and QC summary pages.

## General Chemistry By Method ASTM D422-63

**Matrix:** SO

**Batch ID:** N:GP45498

- FC3375-1 for 3 Inch Sieve: Analysis performed at SGS Dayton, NJ.
- FC3375-1 for 1.5 Inch Sieve: Analysis performed at SGS Dayton, NJ.
- FC3375-1 for % Silt, Clay, Colloids: Analysis performed at SGS Dayton, NJ.
- FC3375-1 for 0.0015 mm (Hydrometer): Analysis performed at SGS Dayton, NJ.
- FC3375-1 for 0.005 mm (Hydrometer): Analysis performed at SGS Dayton, NJ.
- FC3375-1 for 0.030 mm (Hydrometer): Analysis performed at SGS Dayton, NJ.
- FC3375-1 for 0.375 Inch Sieve: Analysis performed at SGS Dayton, NJ.
- FC3375-1 for No.10 Sieve (2.00 mm): Analysis performed at SGS Dayton, NJ.
- FC3375-2 for % Gravel: Analysis performed at SGS Dayton, NJ.
- FC3375-2 for 1.5 Inch Sieve: Analysis performed at SGS Dayton, NJ.
- FC3375-1 for No.8 Sieve (2.36 mm): Analysis performed at SGS Dayton, NJ.
- FC3375-1 for No.100 Sieve (0.15 mm): Analysis performed at SGS Dayton, NJ.
- FC3375-1 for No.16 Sieve (1.18 mm): Analysis performed at SGS Dayton, NJ.
- FC3375-1 for No.200 Sieve (0.075 mm): Analysis performed at SGS Dayton, NJ.
- FC3375-1 for No.30 Sieve (0.60 mm): Analysis performed at SGS Dayton, NJ.
- FC3375-1 for No.4 Sieve (4.75 mm): Analysis performed at SGS Dayton, NJ.
- FC3375-1 for % Gravel: Analysis performed at SGS Dayton, NJ.
- FC3375-1 for 0.75 Inch Sieve: Analysis performed at SGS Dayton, NJ.
- FC3375-2 for 3 Inch Sieve: Analysis performed at SGS Dayton, NJ.
- FC3375-2 for % Sand: Analysis performed at SGS Dayton, NJ.
- FC3375-2 for % Silt, Clay, Colloids: Analysis performed at SGS Dayton, NJ.
- FC3375-2 for 0.0015 mm (Hydrometer): Analysis performed at SGS Dayton, NJ.
- FC3375-2 for 0.005 mm (Hydrometer): Analysis performed at SGS Dayton, NJ.
- FC3375-2 for 0.030 mm (Hydrometer): Analysis performed at SGS Dayton, NJ.
- FC3375-2 for 0.375 Inch Sieve: Analysis performed at SGS Dayton, NJ.
- FC3375-1 for % Sand: Analysis performed at SGS Dayton, NJ.
- FC3375-2 for No.8 Sieve (2.36 mm): Analysis performed at SGS Dayton, NJ.
- FC3375-2 for No.10 Sieve (2.00 mm): Analysis performed at SGS Dayton, NJ.
- FC3375-1 for No.50 Sieve (0.30 mm): Analysis performed at SGS Dayton, NJ.
- FC3375-2 for No.100 Sieve (0.15 mm): Analysis performed at SGS Dayton, NJ.

**Friday, March 31, 2023**

**Page 1 of 2**

## General Chemistry By Method ASTM D422-63

**Matrix:** SO

**Batch ID:** N:GP45498

FC3375-2 for No.16 Sieve (1.18 mm): Analysis performed at SGS Dayton, NJ.  
FC3375-2 for No.200 Sieve (0.075 mm): Analysis performed at SGS Dayton, NJ.  
FC3375-2 for No.30 Sieve (0.60 mm): Analysis performed at SGS Dayton, NJ.  
FC3375-2 for No.4 Sieve (4.75 mm): Analysis performed at SGS Dayton, NJ.  
FC3375-2 for No.50 Sieve (0.30 mm): Analysis performed at SGS Dayton, NJ.  
FC3375-2 for 0.75 Inch Sieve: Analysis performed at SGS Dayton, NJ.

SGS North America Inc. - Orlando certifies that data reported for samples received, listed on the associated custody chain or analytical task order, were produced to specifications meeting the Quality System precision, accuracy and completeness objectives except as noted.

Estimated non-standard method measurement uncertainty data is available on request, based on quality control bias and implicit for standard methods. Acceptable uncertainty requires tested parameter quality control data to meet method criteria. SGS North America Inc.- Orlando is not responsible for data quality assumptions if partial reports are used and recommends that this report be used in its entirety.

Narrative prepared by:

Andrea Colby, Project Manager







National Aeronautics and  
Space Administration

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Caitlin Brice, M.S.  
Signature

12/27/18  
Date

Company Name: SGS North America Inc.  
Company Representative Name: Caitlin Brice  
Company Representative Title: General Manager  
Company Address: 4405 Vineland Rd., Ste C15, Orlando, FL 32811  
Company Representative Phone: 407-425-6700  
Company Representative E-Mail: caitlin.brice@sgs.com



## CASE NARRATIVE / CONFORMANCE SUMMARY

**Client:** SGS Orlando, FL

**Job No:** FC3375

**Site:** MEFLOR: NASA KSC, PFAS SA & Mitigation

**Report Date** 3/24/2023 9:03:27 AM

On 03/15/2023, 2 sample(s), 0 Trip Blank(s), and 0 Field Blank(s) were received at SGS North America Inc. (SGS) at a temperature of 2.4 °C. The samples were intact and properly preserved, unless noted below. An SGS Job Number of FC3375 was assigned to the project. The lab sample ID, client sample ID, and date of sample collection are detailed in the report’s Results Summary.

Specified quality control criteria were achieved for this job except as noted below. For more information, please refer to the analytical results and QC summary pages.

### General Chemistry By Method ASTM D422-63

<b>Matrix:</b> SO	<b>Batch ID:</b> GP45498
-------------------	--------------------------

- Sample(s) JD61296-7DUP were used as the QC samples for the % Gravel, % Sand, % Silt, Clay, Colloids, 0.0015 mm (Hydrometer), 0.005 mm (Hydrometer), 0.030 mm (Hydrometer), 0.375 Inch Sieve, 0.75 inch sieve, 1.5 Inch Sieve, 3 inch sieve, No.10 Sieve (2.00 mm), No.100 Sieve (0.15 mm), No.16 Sieve (1.18 mm), No.200 Sieve (0.075 mm), No.30 Sieve (0.60 mm), No.4 Sieve (4.75 mm), No.50 Sieve (0.30 mm), No.8 Sieve (2.36 mm) analysis.

SGS certifies that data reported for samples received, listed on the associated custody chain or analytical task order, were produced to specifications meeting SGS's Quality System precision, accuracy and completeness objectives except as noted.

Estimated non-standard method measurement uncertainty data is available on request, based on quality control bias and implicit for standard methods. Acceptable uncertainty requires tested parameter quality control data to meet method criteria.

SGS is not responsible for data quality assumptions if partial reports are used and recommends that this report be used in its entirety. This report is authorized by SGS indicated via signature on the report cover.

## Summary of Hits

**Job Number:** FC3375  
**Account:** AECOM, Inc  
**Project:** NASA KSC, PFAS SA & Mitigation  
**Collected:** 03/08/23



Lab Sample ID	Client Sample ID	Result/ Qual	LOQ	LOD	Units	Method
---------------	------------------	-----------------	-----	-----	-------	--------

**FC3375-1      A3RB-SB0061-010.0-20230308**

3 Inch Sieve <sup>a</sup>	100	b	%	ASTM D422-63
1.5 Inch Sieve <sup>a</sup>	100	b	%	ASTM D422-63
0.75 Inch Sieve <sup>a</sup>	100	b	%	ASTM D422-63
0.375 Inch Sieve <sup>a</sup>	99.6	b	%	ASTM D422-63
No.4 Sieve (4.75 mm) <sup>a</sup>	95.5	b	%	ASTM D422-63
No.8 Sieve (2.36 mm) <sup>a</sup>	89.9	b	%	ASTM D422-63
No.10 Sieve (2.00 mm) <sup>a</sup>	88.6	b	%	ASTM D422-63
No.16 Sieve (1.18 mm) <sup>a</sup>	82.5	b	%	ASTM D422-63
No.30 Sieve (0.60 mm) <sup>a</sup>	73.8	b	%	ASTM D422-63
No.50 Sieve (0.30 mm) <sup>a</sup>	50.2	b	%	ASTM D422-63
No.100 Sieve (0.15 mm) <sup>a</sup>	9.9	b	%	ASTM D422-63
No.200 Sieve (0.075 mm) <sup>a</sup>	4.3	b	%	ASTM D422-63
0.030 mm (Hydrometer) <sup>a</sup>	3.7	b	%	ASTM D422-63
0.005 mm (Hydrometer) <sup>a</sup>	3.7	b	%	ASTM D422-63
0.0015 mm (Hydrometer) <sup>a</sup>	2.2	b	%	ASTM D422-63
% Gravel <sup>a</sup>	4.5	b	%	ASTM D422-63
% Sand <sup>a</sup>	91.2	b	%	ASTM D422-63
% Silt, Clay, Colloids <sup>a</sup>	4.3	b	%	ASTM D422-63

**FC3375-2      A3RB-SB0061-035.0-20230308**

3 Inch Sieve <sup>a</sup>	100	b	%	ASTM D422-63
1.5 Inch Sieve <sup>a</sup>	100	b	%	ASTM D422-63
0.75 Inch Sieve <sup>a</sup>	100	b	%	ASTM D422-63
0.375 Inch Sieve <sup>a</sup>	99.1	b	%	ASTM D422-63
No.4 Sieve (4.75 mm) <sup>a</sup>	98.6	b	%	ASTM D422-63
No.8 Sieve (2.36 mm) <sup>a</sup>	93.9	b	%	ASTM D422-63
No.10 Sieve (2.00 mm) <sup>a</sup>	91.9	b	%	ASTM D422-63
No.16 Sieve (1.18 mm) <sup>a</sup>	71.8	b	%	ASTM D422-63
No.30 Sieve (0.60 mm) <sup>a</sup>	55.7	b	%	ASTM D422-63
No.50 Sieve (0.30 mm) <sup>a</sup>	35.1	b	%	ASTM D422-63
No.100 Sieve (0.15 mm) <sup>a</sup>	8.4	b	%	ASTM D422-63
No.200 Sieve (0.075 mm) <sup>a</sup>	4.6	b	%	ASTM D422-63
0.030 mm (Hydrometer) <sup>a</sup>	4.5	b	%	ASTM D422-63
0.005 mm (Hydrometer) <sup>a</sup>	4.5	b	%	ASTM D422-63
0.0015 mm (Hydrometer) <sup>a</sup>	2.7	b	%	ASTM D422-63
% Gravel <sup>a</sup>	1.4	b	%	ASTM D422-63
% Sand <sup>a</sup>	94.0	b	%	ASTM D422-63
% Silt, Clay, Colloids <sup>a</sup>	4.6	b	%	ASTM D422-63

(a) Analysis performed at SGS Dayton, NJ.

(b) Value reported is laboratory DL (MDL).

Sample Results

---

Report of Analysis

---

# Report of Analysis

<b>Client Sample ID:</b> A3RB-SB0061-010.0-20230308	<b>Date Sampled:</b> 03/08/23
<b>Lab Sample ID:</b> FC3375-1	<b>Date Received:</b> 03/09/23
<b>Matrix:</b> SO - Soil	<b>Percent Solids:</b> n/a
<b>Project:</b> NASA KSC, PFAS SA & Mitigation	

## General Chemistry

Analyte	Result	RL	Units	DF	Analyzed	By	Method
<b>Particle Size Analysis (Sieve and Hydrometer Testing)</b>							
3 Inch Sieve <sup>a</sup>	100		%	1	03/23/23 01:32	ANJ	ASTM D422-63
1.5 Inch Sieve <sup>a</sup>	100		%	1	03/23/23 01:32	ANJ	ASTM D422-63
0.75 Inch Sieve <sup>a</sup>	100		%	1	03/23/23 01:32	ANJ	ASTM D422-63
0.375 Inch Sieve <sup>a</sup>	99.6		%	1	03/23/23 01:32	ANJ	ASTM D422-63
No.4 Sieve (4.75 mm) <sup>a</sup>	95.5		%	1	03/23/23 01:32	ANJ	ASTM D422-63
No.8 Sieve (2.36 mm) <sup>a</sup>	89.9		%	1	03/23/23 01:32	ANJ	ASTM D422-63
No.10 Sieve (2.00 mm) <sup>a</sup>	88.6		%	1	03/23/23 01:32	ANJ	ASTM D422-63
No.16 Sieve (1.18 mm) <sup>a</sup>	82.5		%	1	03/23/23 01:32	ANJ	ASTM D422-63
No.30 Sieve (0.60 mm) <sup>a</sup>	73.8		%	1	03/23/23 01:32	ANJ	ASTM D422-63
No.50 Sieve (0.30 mm) <sup>a</sup>	50.2		%	1	03/23/23 01:32	ANJ	ASTM D422-63
No.100 Sieve (0.15 mm) <sup>a</sup>	9.9		%	1	03/23/23 01:32	ANJ	ASTM D422-63
No.200 Sieve (0.075 mm) <sup>a</sup>	4.3		%	1	03/23/23 01:32	ANJ	ASTM D422-63
0.030 mm (Hydrometer) <sup>a</sup>	3.7		%	1	03/23/23 01:32	ANJ	ASTM D422-63
0.005 mm (Hydrometer) <sup>a</sup>	3.7		%	1	03/23/23 01:32	ANJ	ASTM D422-63
0.0015 mm (Hydrometer) <sup>a</sup>	2.2		%	1	03/23/23 01:32	ANJ	ASTM D422-63
% Gravel <sup>a</sup>	4.5		%	1	03/23/23 01:32	ANJ	ASTM D422-63
% Sand <sup>a</sup>	91.2		%	1	03/23/23 01:32	ANJ	ASTM D422-63
% Silt, Clay, Colloids <sup>a</sup>	4.3		%	1	03/23/23 01:32	ANJ	ASTM D422-63

(a) Analysis performed at SGS Dayton, NJ.

RL = Reporting Limit

# Report of Analysis

<b>Client Sample ID:</b> A3RB-SB0061-035.0-20230308	<b>Date Sampled:</b> 03/08/23
<b>Lab Sample ID:</b> FC3375-2	<b>Date Received:</b> 03/09/23
<b>Matrix:</b> SO - Soil	<b>Percent Solids:</b> n/a
<b>Project:</b> NASA KSC, PFAS SA & Mitigation	

## General Chemistry

Analyte	Result	RL	Units	DF	Analyzed	By	Method
<b>Particle Size Analysis (Sieve and Hydrometer Testing)</b>							
3 Inch Sieve <sup>a</sup>	100		%	1	03/23/23 01:32	ANJ	ASTM D422-63
1.5 Inch Sieve <sup>a</sup>	100		%	1	03/23/23 01:32	ANJ	ASTM D422-63
0.75 Inch Sieve <sup>a</sup>	100		%	1	03/23/23 01:32	ANJ	ASTM D422-63
0.375 Inch Sieve <sup>a</sup>	99.1		%	1	03/23/23 01:32	ANJ	ASTM D422-63
No.4 Sieve (4.75 mm) <sup>a</sup>	98.6		%	1	03/23/23 01:32	ANJ	ASTM D422-63
No.8 Sieve (2.36 mm) <sup>a</sup>	93.9		%	1	03/23/23 01:32	ANJ	ASTM D422-63
No.10 Sieve (2.00 mm) <sup>a</sup>	91.9		%	1	03/23/23 01:32	ANJ	ASTM D422-63
No.16 Sieve (1.18 mm) <sup>a</sup>	71.8		%	1	03/23/23 01:32	ANJ	ASTM D422-63
No.30 Sieve (0.60 mm) <sup>a</sup>	55.7		%	1	03/23/23 01:32	ANJ	ASTM D422-63
No.50 Sieve (0.30 mm) <sup>a</sup>	35.1		%	1	03/23/23 01:32	ANJ	ASTM D422-63
No.100 Sieve (0.15 mm) <sup>a</sup>	8.4		%	1	03/23/23 01:32	ANJ	ASTM D422-63
No.200 Sieve (0.075 mm) <sup>a</sup>	4.6		%	1	03/23/23 01:32	ANJ	ASTM D422-63
0.030 mm (Hydrometer) <sup>a</sup>	4.5		%	1	03/23/23 01:32	ANJ	ASTM D422-63
0.005 mm (Hydrometer) <sup>a</sup>	4.5		%	1	03/23/23 01:32	ANJ	ASTM D422-63
0.0015 mm (Hydrometer) <sup>a</sup>	2.7		%	1	03/23/23 01:32	ANJ	ASTM D422-63
% Gravel <sup>a</sup>	1.4		%	1	03/23/23 01:32	ANJ	ASTM D422-63
% Sand <sup>a</sup>	94.0		%	1	03/23/23 01:32	ANJ	ASTM D422-63
% Silt, Clay, Colloids <sup>a</sup>	4.6		%	1	03/23/23 01:32	ANJ	ASTM D422-63

(a) Analysis performed at SGS Dayton, NJ.

RL = Reporting Limit

4.2  
4

Misc. Forms

Custody Documents and Other Forms

---

Includes the following where applicable:

- Chain of Custody
- QC Evaluation: DOD QSM5.x Limits





## SGS Sample Receipt Summary

Job Number: FC3375

Client: AECOM

Project: NASA KSC

Date / Time Received: 3/9/2023 5:12:00 PM

Delivery Method: COURIER

Airbill #s: \_\_\_\_\_

Therm ID: IR 1;

Therm CF: 0.2;

# of Coolers: 1

Cooler Temps (Raw Measured) °C: Cooler 1: (5.0);

Cooler Temps (Corrected) °C: Cooler 1: (5.2);

**Cooler Information**

Y or N

- |                             |                                     |                          |
|-----------------------------|-------------------------------------|--------------------------|
| 1. Custody Seals Present    | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| 2. Custody Seals Intact     | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| 3. Temp criteria achieved   | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| 4. Cooler temp verification | <u>IR Gun</u>                       |                          |
| 5. Cooler media             | <u>Ice (Bag)</u>                    |                          |

**Sample Information**

Y or N N/A

- |   |                                     |                                     |                                     |
|---|-------------------------------------|-------------------------------------|-------------------------------------|
| 1. Sample labels present on bottles                 | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |                                     |
| 2. Samples preserved properly                       | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |                                     |
| 3. Sufficient volume/containers recvd for analysis: | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |                                     |
| 4. Condition of sample                              | <u>Intact</u>                       |                                     |                                     |
| 5. Sample recvd within HT                           | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |                                     |
| 6. Dates/Times/IDs on COC match Sample Label        | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |                                     |
| 7. VOCs have headspace                              | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| 8. Bottles received for unspecified tests           | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |                                     |
| 9. Compositing instructions clear                   | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| 10. Voa Soil Kits/Jars received past 48hrs?         | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| 11. % Solids Jar received?                          | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| 12. Residual Chlorine Present?                      | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |

**Trip Blank Information**

Y or N N/A

- |                                |                          |                          |                                     |
|--------------------------------|--------------------------|--------------------------|-------------------------------------|
| 1. Trip Blank present / cooler | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| 2. Trip Blank listed on COC    | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |

W or S N/A

- |                        |                          |                          |                                     |
|------------------------|--------------------------|--------------------------|-------------------------------------|
| 3. Type Of TB Received | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
|------------------------|--------------------------|--------------------------|-------------------------------------|

**Misc. Information**

Number of Encores: 25-Gram \_\_\_\_\_ 5-Gram \_\_\_\_\_

Number of 5035 Field Kits: \_\_\_\_\_

Number of Lab Filtered Metals: \_\_\_\_\_

Test Strip Lot #s: pH 0-3 230315

pH 10-12 219813A

Other: (Specify) \_\_\_\_\_

Residual Chlorine Test Strip Lot #: \_\_\_\_\_

Comments

SM001  
Rev. Date 05/24/17

Technician: NATHANS

Date: 3/9/2023 5:12:00 PM

Reviewer: \_\_\_\_\_

Date: \_\_\_\_\_

**FC3375: Chain of Custody**

**Page 2 of 2**

# QC Evaluation: DOD QSM5.x Limits

**Job Number:** FC3375  
**Account:** AECOM, Inc  
**Project:** NASA KSC, PFAS SA & Mitigation  
**Collected:** 03/08/23

QC Sample ID	CAS#	Analyte	Sample Result Type	Result Type	Units	Limits
--------------	------	---------	--------------------	-------------	-------	--------

No DOD QSM5.x Limits found for methods in this job.

---

\* Sample used for QC is not from job FC3375

5.2  
5

Misc. Forms

Custody Documents and Other Forms

(SGS Dayton, NJ)

Includes the following where applicable:

- Chain of Custody
- QC Evaluation: DOD QSM5.x Limits





# QC Evaluation: DOD QSM5.x Limits

**Job Number:** FC3375  
**Account:** SGS Orlando, FL  
**Project:** MEFLOR: NASA KSC, PFAS SA & Mitigation  
**Collected:** 03/08/23

QC Sample ID	CAS#	Analyte	Sample Result Type	Result Type	Units	Limits
--------------	------	---------	--------------------	-------------	-------	--------

No DOD QSM5.x Limits found for methods in this job.

---

\* Sample used for QC is not from job FC3375

6.2  
6

## General Chemistry

---

### QC Data Summaries

(SGS Dayton, NJ)

---

Includes the following where applicable:

- Method Blank and Blank Spike Summaries
- Duplicate Summaries
- Matrix Spike Summaries

DUPLICATE RESULTS SUMMARY  
GENERAL CHEMISTRY

Login Number: FC3375  
Account: ALSE - SGS Orlando, FL  
Project: MEFLOR: NASA KSC, PFAS SA & Mitigation

Analyte	Batch ID	QC Sample	Units	Original Result	DUP Result	RPD	QC Limits
% Gravel	GP45498/GN39575	JD61296-7	%	27.4	26.6	3.1	0-41%
% Sand	GP45498/GN39575	JD61296-7	%	39.7	39.1	1.6	0-16%
% Silt, Clay, Colloids	GP45498/GN39575	JD61296-7	%	32.9	34.4	-4.3	0-40%
0.0015 mm (Hydrometer)	GP45498/GN39575	JD61296-7	%	5.4	5.6	-4.2	0-45%
0.005 mm (Hydrometer)	GP45498/GN39575	JD61296-7	%	10.1	10.6	-4.1	0-48%
0.030 mm (Hydrometer)	GP45498/GN39575	JD61296-7	%	20.9	23.0	-9.6	0-36%
0.375 Inch Sieve	GP45498/GN39575	JD61296-7	%	80.2	83.2	-3.6	0-14%
0.75 Inch Sieve	GP45498/GN39575	JD61296-7	%	90.2	94.3	-4.4	0-9%
1.5 Inch Sieve	GP45498/GN39575	JD61296-7	%	100	100	0.0	0-20%
3 Inch Sieve	GP45498/GN39575	JD61296-7	%	100	100	0.0	0-20%
No.10 Sieve (2.00 mm)	GP45498/GN39575	JD61296-7	%	64.7	65.8	-1.7	0-14%
No.100 Sieve (0.15 mm)	GP45498/GN39575	JD61296-7	%	40.4	42.7	-5.6	0-31%
No.16 Sieve (1.18 mm)	GP45498/GN39575	JD61296-7	%	62.0	62.9	-1.4	0-17%
No.200 Sieve (0.075 mm)	GP45498/GN39575	JD61296-7	%	32.9	34.4	-4.3	0-40%
No.30 Sieve (0.60 mm)	GP45498/GN39575	JD61296-7	%	58.8	59.9	-1.9	0-21%
No.4 Sieve (4.75 mm)	GP45498/GN39575	JD61296-7	%	72.6	73.4	-1.1	0-13%
No.50 Sieve (0.30 mm)	GP45498/GN39575	JD61296-7	%	53.8	55.2	-2.7	0-30%
No.8 Sieve (2.36 mm)	GP45498/GN39575	JD61296-7	%	65.6	66.8	-1.8	0-14%

Associated Samples:  
Batch GP45498: FC3375-1, FC3375-2  
(\* ) Outside of QC limits

7.1  
7



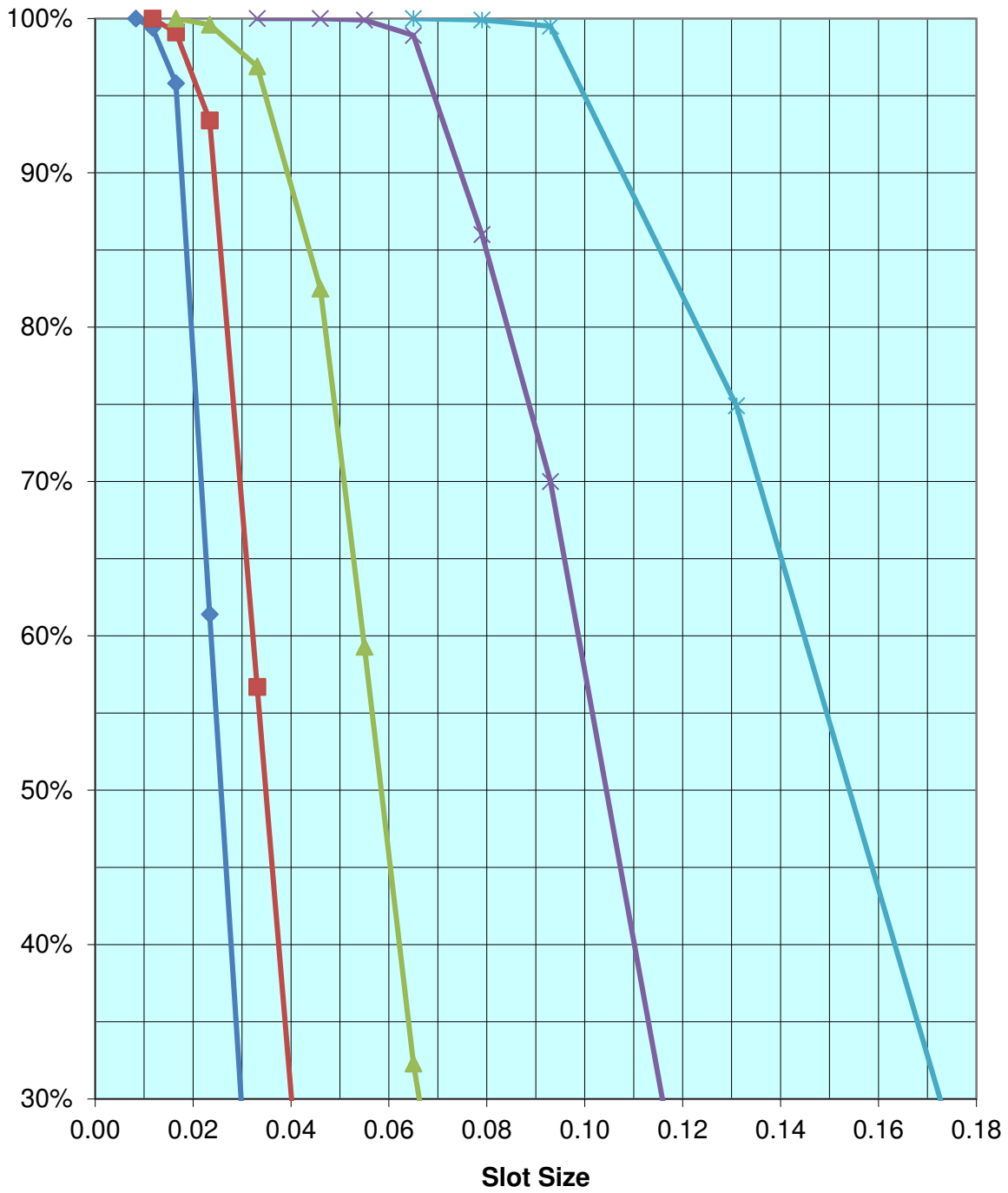
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**APPENDIX E**  
**Well Screen and Filter Pack Specifications**



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# Southern Products



GP #1 GP #1A GP #2 GP #3 GP #4



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**APPENDIX F**  
**Piping Calculations**



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## Hazen-Williams Equation

$$\frac{P_d}{L} = \frac{4.52 Q^{1.852}}{C^{1.852} d^{4.8704}}$$

Where:

$P_d$  – pressure drop over length of pipe (pounds per square inch - gauge)

$L$  – length of pipe (feet)

$Q$  – flow (gallons per minute)

$C$  – pipe roughness coefficient (150 for polyvinyl chloride)

$D$  – inside pipe diameter (inches)

Assume:

250 feet of flexible PVC piping

10 gallons per minute max flow

2 inch piping

Headloss = 0.257 psig

Grundfos 15 SQ05-70 rated at 29 psig output; pressure loss less than 1% of total

Source: [https://en.wikipedia.org/wiki/Hazen-Williams\\_equation](https://en.wikipedia.org/wiki/Hazen-Williams_equation)



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**APPENDIX G**  
**Pump and Transducer Specifications**



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# Environmental Pumps

## Grundfos Redi-Flo4™ Environmental Submersible Pumps

Grundfos Redi-Flo4™ submersible pumps are constructed of virgin PTFE and stainless steel to handle the rigors of contaminated groundwater pumping. Ideal for sampling and continuous operation in remediation applications. Grundfos Redi-Flo4™ Environmental submersibles meet EPA guidelines for environmental equipment and have been proven through extensive use in the field to be the industry choice.

### FEATURES

- For applications in 4 inch (10 cm) diameter and larger wells.
- Efficient purging/remediation to depths of 524 feet (160 m).
- Flow rates of up to 45 GPM (170 LPM) for purging and remediation.
- Stainless steel and PTFE are the only materials used in the Redi-Flo4 submersible pump ends.
- Features built-in check valve to prevent back-flow into the well once the pump is shut down.
- User friendly cable guard aids in the installation of motor lead.
- Variable speed pump applications available.
- Variable speed controller can run both Redi-Flo2® and Redi-Flo4™ pumps.

### OPERATION

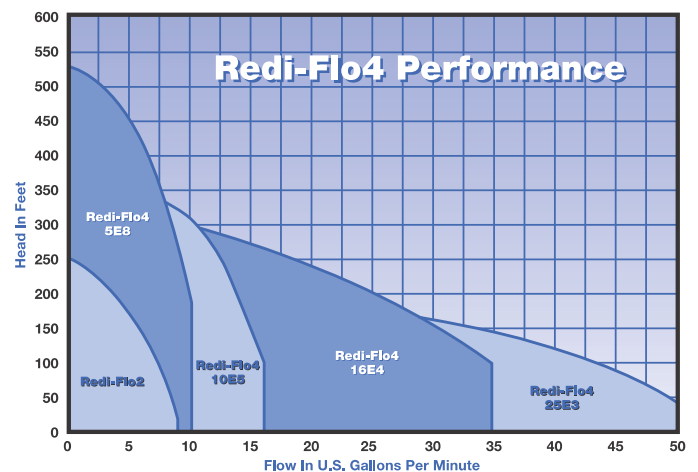
Typical clean-up operations include groundwater sampling and water table depression techniques to concentrate and remove floating contaminants. With correct placement of the recovery well and proper sizing of the depression pump, the water table is depressed to stop and reverse the movement of the contamination plume. Once isolated, the contaminant is removed for treatment, re-use, or proper disposal. Redi-Flo4 pumps are designed for reliable operation in toxic environments.



Geotech is a Certified Grundfos Master Distributor



Redi-Flo4™ Submersible Pump



Redi-Flo4™ Performance Curves

**CALL GEOTECH TODAY (800) 833-7958**

Geotech Environmental Equipment, Inc.

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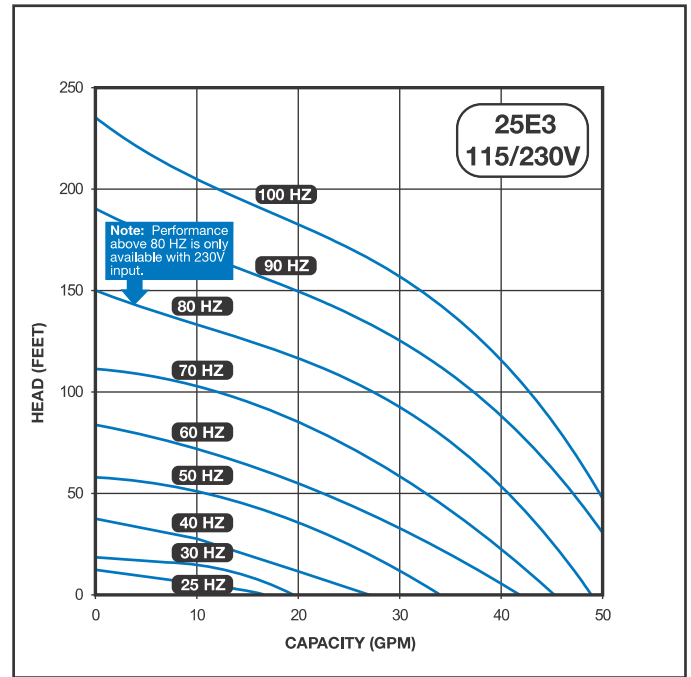
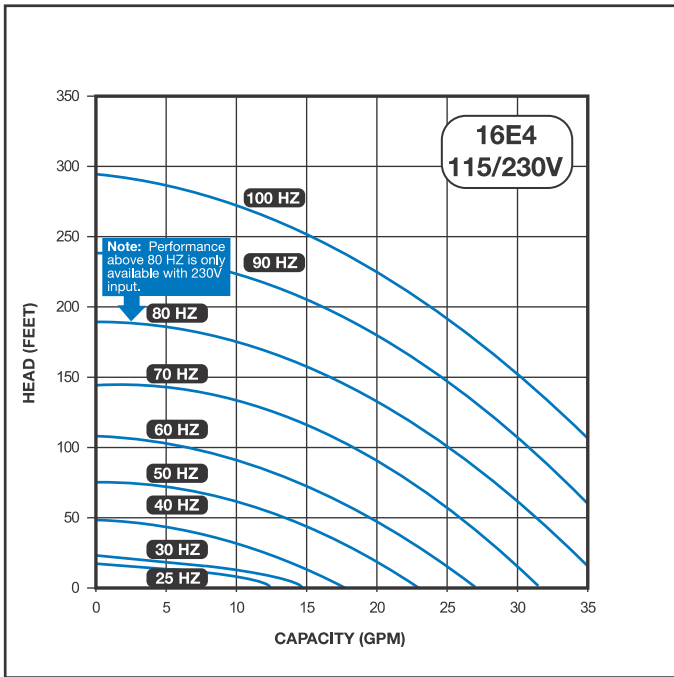
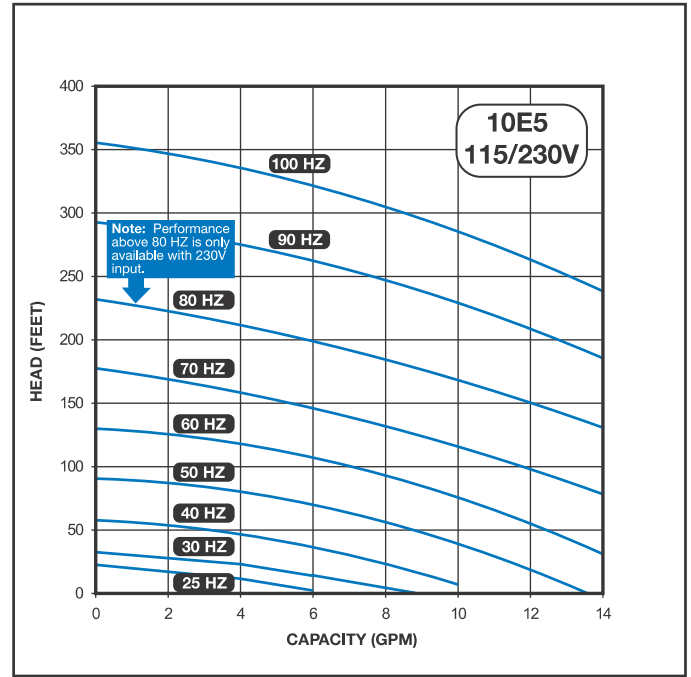
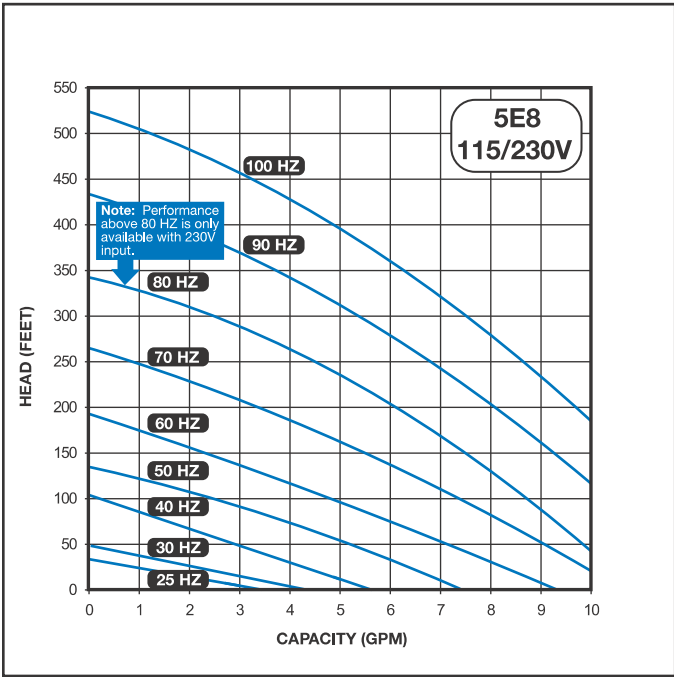
email: sales@geotechenv.com website: www.geotechenv.com



# Environmental Pumps

## Grundfos Redi-Flo4™ Environmental Submersible Pumps

### SPECIFICATIONS FOR VARIABLE SPEED PUMPS\*



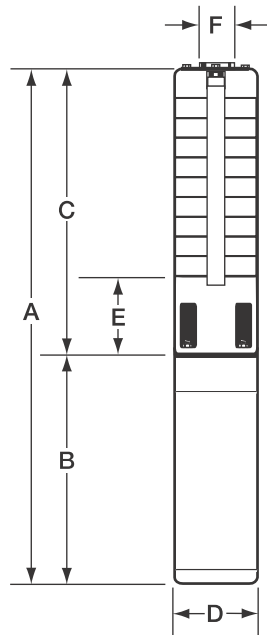
\* Requires Variable Speed Frequency Drive (VFD) and motor.

## Grundfos Redi-Flo4™ 5E Technical Data

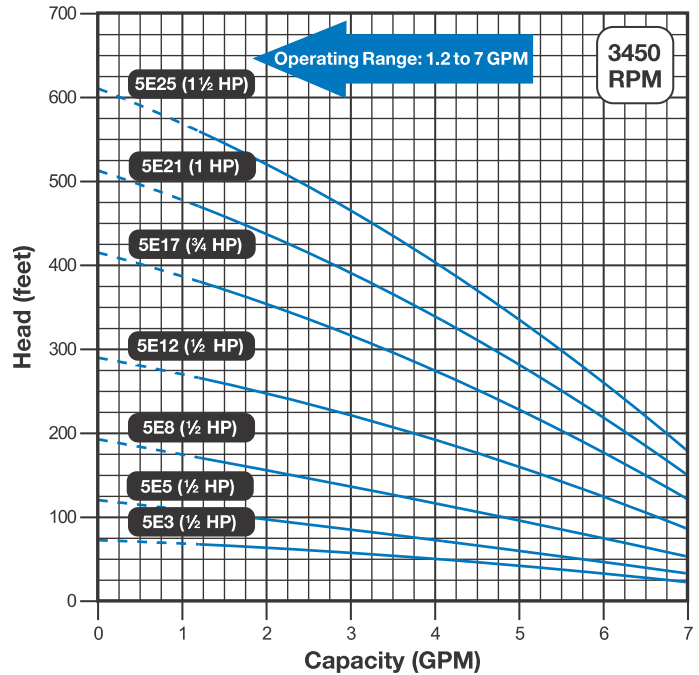
### MATERIALS OF CONSTRUCTION

Description	Material
<b>Redi-Flo4 Pump End</b>	
Check Valve Housing, Check Valve, Diffuser Chamber, Impeller, Suction Interconnector, Inlet Screen, Pump Shaft, Straps, Cable Guard, Priming Inducer	304 SS
Check Valve Seat	304 SS & PTFE
Impeller Seal Ring	PTFE
Coupling	316/431 SS
Intermediate Bearings	PTFE
<b>Grundfos Environmental Motor</b>	
NEMA Top, Studs & Fasteners, Stator Housing, Fill Plug Screw	304 SS
Nuts	316 SS
Sand Slinger	FPM
Shaft Extension	431 SS
Diaphragm	FPM
Fill Plug Washer	PTFE
<b>Grundfos Environmental Motor Leads</b>	
Connector Sleeve	304 SS
Connector Potting	Scotch Cast #4® Epoxy w/FPM Cap
Connector Plug	FPM
Lead Insulation	PTFE
Conductor	Stranded Copper, 12 AWG

**NOTES:** Specifications are subject to change without notice. Scotch Cast #4® is a registered trademark of 3M Company.



### PERFORMANCE CURVES



### TECHNICAL SPECIFICATIONS

<b>Flow Range:</b>	1.2 to 7 U.S. GPM (4.5 to 26.5 LPM)
<b>Motors:</b>	Grundfos MS402E Environmental Submersible Motor (Standard)
Maximum Operating Temperature	104°F (40°C)
Maximum Submergence Pressure	220 psi (15.2 bar)
Maximum Number of Starts Per Hour	100
Minimum Recommended Flow Past Motor	0.25 ft./sec. (7.6 cm/sec.)
<b>NOTE:</b> Franklin Pollution Recovery Motor is optional.	
<b>Discharge Size:</b>	1" NPT
<b>Installation:</b>	Unit to be installed vertically for submerged operation.

### ELECTRICAL DATA, DIMENSIONS, AND WEIGHTS\*

Pump Type	HP	Motors SF	PH	Volts	Overall Length A	Motor Length B	Pump End Length C	Maximum Diameter D	Inlet E	Disch. Pipe Size (NPT) F	Net Weight Lbs. (kg)†	Shipping Weight Lbs. (kg)†
5E3	1/2	1.60	1	230	19 3/8" (49.2cm)	10 13/16" (27.5cm)	8 9/16" (21.7cm)	3 3/32" (10cm)	3 1/4"	1"	24 (10.8)	26 (11.8)
5E5	1/2	1.60	1	230	21 1/8" (53.7cm)	10 13/16" (27.5cm)	10 5/16" (26.2cm)	3 3/32" (10cm)	3 1/4"	1"	25 (11.3)	27 (12.2)
5E8	1/2	1.60	1	230	23 9/16" (59.8cm)	10 13/16" (27.5cm)	12 3/4" (32.4cm)	3 3/32" (10cm)	3 1/4"	1"	27 (12.2)	28 (12.7)
5E12	1/2	1.60	1	230	26 13/16" (68.1cm)	10 13/16" (27.5cm)	16" (40.6cm)	3 3/32" (10cm)	3 1/4"	1"	28 (12.7)	29 (13.1)
5E17	3/4	1.50	1	230	31 7/16" (79.8cm)	11 3/8" (28.9cm)	20 3/16" (51.3cm)	3 3/32" (10cm)	3 1/4"	1"	31 (14)	32 (14.5)
5E21	1	1.40	1	230	35 7/16" (90cm)	12" (30.5cm)	23 7/16" (59.5cm)	3 3/32" (10cm)	3 1/4"	1"	33 (15)	35 (15.9)
5E25	1 1/2	1.30	1	230	40 5/16" (102.4cm)	13 9/16" (34.4cm)	26 3/4" (67.9cm)	3 3/32" (10cm)	3 1/4"	1"	35 (15.9)	37 (16.8)

\*Data for Grundfos MS402E motors.  
†Does not include motor leads.

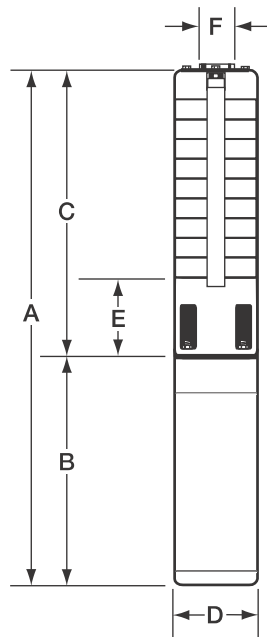


## Grundfos Redi-Flo4™ 10E Technical Data

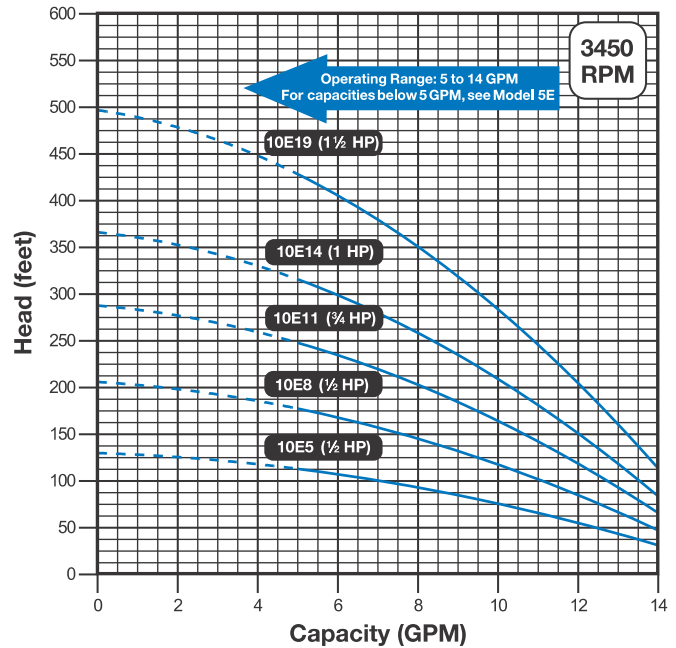
### MATERIALS OF CONSTRUCTION

Description	Material
<b>Redi-Flo4 Pump End</b>	
Check Valve Housing, Check Valve, Diffuser Chamber, Impeller, Suction Interconnector, Inlet Screen, Pump Shaft, Straps, Cable Guard, Priming Inducer	304 SS
Check Valve Seat	304 SS & PTFE
Impeller Seal Ring	PTFE
Coupling	316/431 SS
Intermediate Bearings	PTFE
<b>Grundfos Environmental Motor</b>	
NEMA Top, Studs & Fasteners, Stator Housing, Fill Plug Screw	304 SS
Nuts	316 SS
Sand Slinger	FPM
Shaft Extension	431 SS
Diaphragm	FPM
Fill Plug Washer	PTFE
<b>Grundfos Environmental Motor Leads</b>	
Connector Sleeve	304 SS
Connector Potting	Scotch Cast #4 <sup>®</sup> Epoxy w/FPM Cap
Connector Plug	FPM
Lead Insulation	PTFE
Conductor	Stranded Copper, 12 AWG

**NOTES:** Specifications are subject to change without notice. Scotch Cast #4<sup>®</sup> is a registered trademark of 3M Company.



### PERFORMANCE CURVES



### TECHNICAL SPECIFICATIONS

- Flow Range:** 5 to 14 U.S. GPM (19 to 53 LPM)
- Motors:** Grundfos MS402E Environmental Submersible Motor (Standard)
  - Maximum Operating Temperature: 104°F (40°C)
  - Maximum Submergence Pressure: 220 psi (15.2 bar)
  - Maximum Number of Starts Per Hour: 100
  - Minimum Recommended Flow Past Motor: 0.25 ft./sec. (7.6 cm/sec.)
- NOTE:** Franklin Pollution Recovery Motor is optional.
- Discharge Size:** 1¼" NPT
- Installation:** Unit to be installed vertically for submerged operation.

### ELECTRICAL DATA, DIMENSIONS, AND WEIGHTS\*

Pump Type	Motors				Overall Length A	Motor Length B	Pump End Length C	Maximum Diameter D	Inlet E	Disch. Pipe Size (NPT) F	Net Weight Lbs. (kg)†	Shipping Weight Lbs. (kg)†
	HP	SF	PH	Volts								
10E5	½	1.60	1	230	21 ½" (53.7cm)	10 ⅜" (27.5cm)	10 ⅝" (26.2cm)	3 ⅜" (10cm)	3 ¼"	1 ¼"	25 (11.3)	26 (11.8)
10E8	½	1.60	1	230	23 ⅞" (59.8cm)	10 ⅜" (27.5cm)	12 ¾" (32.4cm)	3 ⅜" (10cm)	3 ¼"	1 ¼"	26 (11.8)	28 (12.7)
10E11	¾	1.50	1	230	26 ⅞" (67.5cm)	11 ⅜" (28.9cm)	15 ⅜" (38.6cm)	3 ⅜" (10cm)	3 ¼"	1 ¼"	28 (12.7)	30 (13.6)
10E14	1	1.40	1	230	29 ⅞" (75.4cm)	12" (30.5cm)	17 ⅞" (45cm)	3 ⅜" (10cm)	3 ¼"	1 ¼"	31 (14)	32 (14.5)
10E19	1½	1.30	1	230	35 ⅜" (89.8cm)	13 ⅞" (34.4cm)	21 ⅜" (55.4cm)	3 ⅜" (10cm)	3 ¼"	1 ¼"	35 (15.9)	37 (16.8)

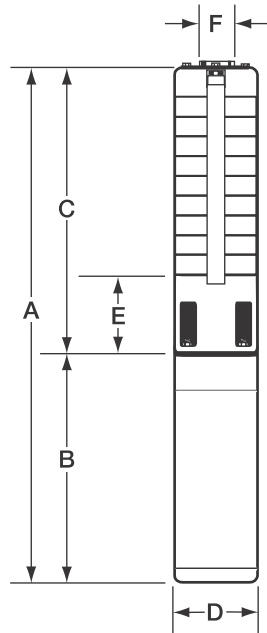
\*Data for Grundfos MS402E motors.  
†Does not include motor leads.

## Grundfos Redi-Flo4™ 16E Technical Data

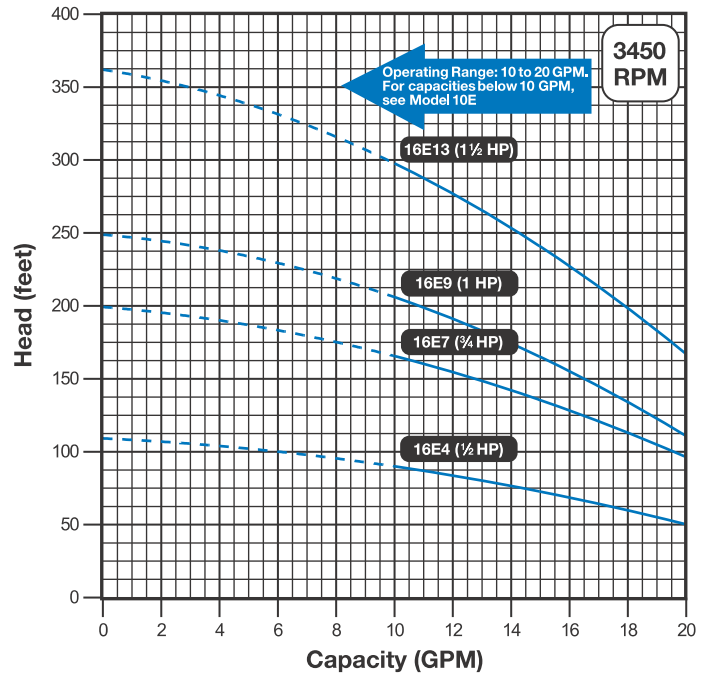
### MATERIALS OF CONSTRUCTION

Description	Material
<b>Redi-Flo4 Pump End</b>	
Check Valve Housing, Check Valve, Diffuser Chamber, Impeller, Suction Interconnector, Inlet Screen, Pump Shaft, Straps, Cable Guard, Priming Inducer	304 SS
Check Valve Seat	304 SS & PTFE
Impeller Seal Ring	PTFE
Coupling	316/431 SS
Intermediate Bearings	PTFE
<b>Grundfos Environmental Motor</b>	
NEMA Top, Studs & Fasteners, Stator Housing, Fill Plug Screw	304 SS
Nuts	316 SS
Sand Slinger	FPM
Shaft Extension	431 SS
Diaphragm	FPM
Fill Plug Washer	PTFE
<b>Grundfos Environmental Motor Leads</b>	
Connector Sleeve	304 SS
Connector Potting	Scotch Cast #4® Epoxy w/FPM Cap
Connector Plug	FPM
Lead Insulation	PTFE
Conductor	Stranded Copper, 12 AWG

**NOTES:** Specifications are subject to change without notice. Scotch Cast #4® is a registered trademark of 3M Company.



### PERFORMANCE CURVES



### TECHNICAL SPECIFICATIONS

<b>Flow Range:</b>	10 to 20 U.S. GPM (38 to 75 LPM)
<b>Motors:</b>	Grundfos MS402E Environmental Submersible Motor (Standard)
	Maximum Operating Temperature 104°F (40°C)
	Maximum Submergence Pressure 220 psi (15.2 bar)
	Maximum Number of Starts Per Hour 100
	Minimum Recommended Flow Past Motor 0.25 ft./sec. (7.6 cm/sec.)
<b>NOTE:</b>	Franklin Pollution Recovery Motor is optional.
<b>Discharge Size:</b>	1¼" NPT
<b>Installation:</b>	Unit to be installed vertically for submerged operation.

### ELECTRICAL DATA, DIMENSIONS, AND WEIGHTS\*

Pump Type	HP	Motors SF	PH	Volts	Overall Length A	Motor Length B	Pump End Length C	Maximum Diameter D	Inlet E	Disch. Pipe Size (NPT) F	Net Weight Lbs. (kg)†	Shipping Weight Lbs. (kg)†
16E4	½	1.60	1	230	20 ¼" (51.4cm)	10 13/16" (27.5cm)	9 7/16" (24cm)	3 3/32" (10cm)	3 ¼"	1 ¼"	25 (11.3)	27 (12.2)
16E7	¾	1.50	1	230	23 ¼" (59cm)	11 3/8" (28.9cm)	11 7/8" (30.2cm)	3 3/32" (10cm)	3 ¼"	1 ¼"	27 (12.2)	28 (12.7)
16E9	1	1.40	1	230	25 9/16" (65cm)	12" (30.5cm)	13 3/16" (34.4cm)	3 3/32" (10cm)	3 ¼"	1 ¼"	28 (12.7)	30 (13.6)
16E13	1½	1.30	1	230	30 7/16" (77.3cm)	13 3/16" (34.4cm)	16 7/8" (42.9cm)	3 3/32" (10cm)	3 ¼"	1 ¼"	33 (15)	34 (15.4)

\*Data for Grundfos MS402E motors.  
†Does not include motor leads.

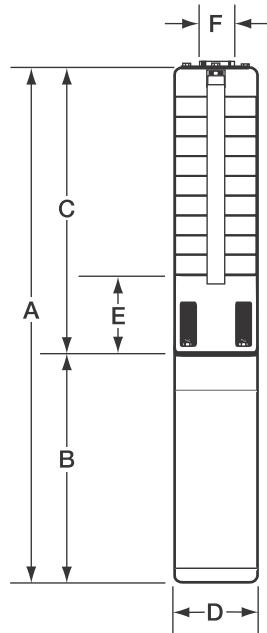


## Grundfos Redi-Flo4™ 25E Technical Data

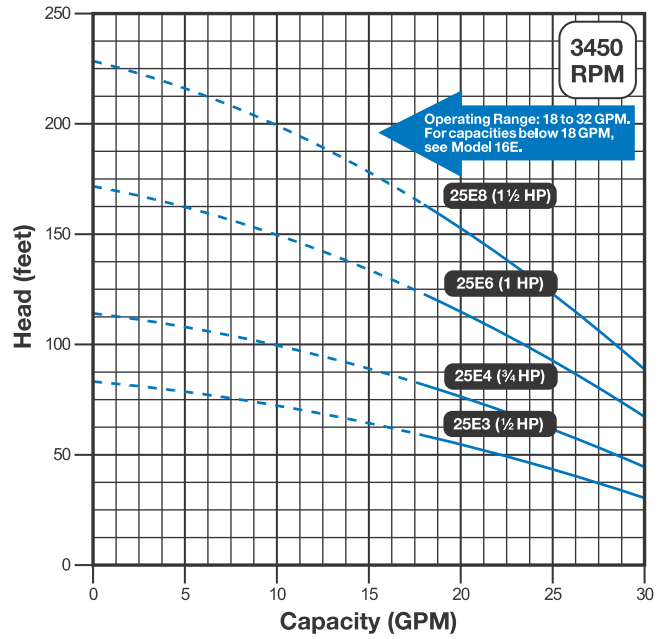
### MATERIALS OF CONSTRUCTION

Description	Material
<b>Redi-Flo4 Pump End</b>	
Check Valve Housing, Check Valve, Diffuser Chamber, Impeller, Suction Interconnector, Inlet Screen, Pump Shaft, Straps, Cable Guard, Priming Inducer	304 SS
Check Valve Seat	304 SS & PTFE
Impeller Seal Ring	PTFE
Coupling	316/431 SS
Intermediate Bearings	PTFE
<b>Grundfos Environmental Motor</b>	
NEMA Top, Studs & Fasteners, Stator Housing, Fill Plug Screw	304 SS
Nuts	316 SS
Sand Slinger	FPM
Shaft Extension	431 SS
Diaphragm	FPM
Fill Plug Washer	PTFE
<b>Grundfos Environmental Motor Leads</b>	
Connector Sleeve	304 SS
Connector Potting	Scotch Cast #4® Epoxy w/FPM Cap
Connector Plug	FPM
Lead Insulation	PTFE
Conductor	Stranded Copper, 12 AWG

**NOTES:** Specifications are subject to change without notice. Scotch Cast #4® is a registered trademark of 3M Company.



### PERFORMANCE CURVES



### TECHNICAL SPECIFICATIONS

- Flow Range:** 18 to 32 U.S. GPM (68 to 121 LPM)
- Motors:** Grundfos MS402E Environmental Submersible Motor (Standard)
  - Maximum Operating Temperature: 104°F (40°C)
  - Maximum Submergence Pressure: 220 psi (15.2 bar)
  - Maximum Number of Starts Per Hour: 100
  - Minimum Recommended Flow Past Motor: 0.25 ft./sec. (7.6 cm/sec.)
- NOTE:** Franklin Pollution Recovery Motor is optional.
- Discharge Size:** 1 1/2" NPT
- Installation:** Unit to be installed vertically for submerged operation.

### ELECTRICAL DATA, DIMENSIONS, AND WEIGHTS\*

Pump Type	HP	Motors			Overall Length A	Motor Length B	Pump End Length C	Maximum Diameter D	Inlet E	Disch. Pipe Size (NPT) F	Net Weight Lbs. (kg)†	Shipping Weight Lbs. (kg)†
		SF	PH	Volts								
25E3	1/2	1.60	1	230	19 3/8" (49.2cm)	10 13/16" (27.5cm)	8 9/16" (21.7cm)	3 3/32" (10cm)	3 1/4"	1 1/2"	24 (10.8)	25 (11.3)
25E4	3/4	1.50	1	230	20 13/16" (52.9cm)	11 3/8" (28.9cm)	9 7/16" (23.9cm)	3 3/32" (10cm)	3 1/4"	1 1/2"	25 (11.3)	27 (12.2)
25E6	1	1.40	1	230	23 1/16" (58.6cm)	12" (30.5cm)	11 1/16" (28.1cm)	3 3/32" (10cm)	3 1/4"	1 1/2"	27 (12.2)	29 (13.1)
25E8	1 1/2	1.30	1	230	26 3/16" (66.8cm)	13 3/16" (34.4cm)	12 3/4" (32.4cm)	3 3/32" (10cm)	3 1/4"	1 1/2"	28 (12.7)	30 (13.6)

\*Data for Grundfos MS402E motors.  
†Does not include motor leads.



## Aqua TROLL® CTD Data Loggers

CONDUCTIVITY, TEMPERATURE,  
PLUS WATER LEVEL LOGGING

**MEASURE AND RECORD WATER LEVEL, WATER PRESSURE, CONDUCTIVITY, AND TEMPERATURE WITH THE AQUA TROLL 200, OR ONLY CONDUCTIVITY AND TEMPERATURE WITH THE AQUA TROLL 100. UNIQUE CONDUCTIVITY CELL ALLOWS FOR A WIDE, ACCURATE MEASUREMENT RANGE IN A NARROW DIAMETER INSTRUMENT (SUB-1 INCH).**

### ACCURATE RESULTS

- Use **dynamic density compensation** to collect accurate water level data in environments where salinity values may vary.
- Receive **3D factory calibrated instruments** that are validated with NIST®-traceable standards.
- **Deploy for long-term monitoring.** Instruments operate with very low drift.

### FLEXIBLE COMMUNICATIONS

- **Streamline data management:** Use the VuSitu Mobile App to consolidate all site information on your smartphone, and tag data with site photos and GPS coordinates. Simply connect the instrument to a Wireless TROLL Com or power pack, launch the mobile app, and start reading results. Simplify instrument setup, reduce log errors and get the most out of your data with Log Setup Assistant and Panoramic Live Data. Log data to your smartphone and download results in a Universal Data File.

- Integrate into telemetry and SCADA systems and HydroVu™ Data Services for real-time data and automatic event alerts. Outputs include standard Modbus/RS485, SDI-12, and 4-20 mA.
- **Streamline data collection and analysis.** Simplify instrument setup, automate site management, and generate reports with user-friendly VuSitu Mobile and Win-Situ® PC Software.

### RUGGED, COMPACT DESIGN

- **Use in harsh environments** such as coastal, remediation, and mine water monitoring projects. Titanium construction resists fouling and is chemical- and corrosion-resistant.
- **Sub-1 inch design** fits narrow diameter, 1-inch wells.
- **Use RuggedCable® Systems** with titanium twist-lock connectors for quick, reliable connections. Integrate with the Rugged Cable Splitter to attach multiple In-Situ Shared Ecosystem instruments in a single water column with a single connector, allowing you to measure multiple parameters at various depths and simultaneously.

### TOTAL FIELD SUPPORT

- **One-stop-shop for purchasing and support.**
- **Total Field Support**
- **24/7/365 technical support is just a phone call away.**
- **Guaranteed 7-day service for maintenance (U.S.A. only).**

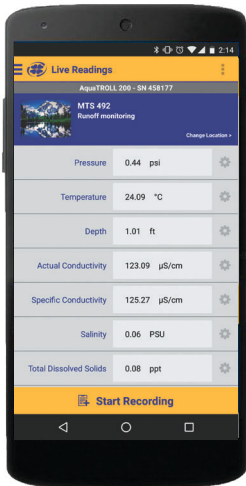
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### Applications:

- **AQUIFER STORAGE AND RECOVERY SYSTEMS**
- **COASTAL DEPLOYMENTS—SALTWATER INTRUSION MONITORING, STORM SURGE ANALYSIS, AND ESTUARY/WETLAND RESEARCH**
- **REMEDIATION SITE AND MINE WATER MONITORING**
- **STORMWATER MONITORING PROGRAMS**





## VUSITU MOBILE APP

Use the VuSitu Mobile App to access and manage data on your Android™ smartphone or tablet. Intuitive, free mobile app is an all-in-one software package that provides auto-configuration, simplified calibration, guided log setup, directed data analysis, automated report creation, Panoramic Live Data, Calibration Assistant and Log Setup Assistant. Tag data with site photos and GPS coordinates. View results in the field and email data on the spot. Download through the Google Play Store.

## HYDROVU DATA SERVICES

Get decision-quality data anywhere, anytime, with cloud-based HydroVu Data Services. Integrate with In-Situ instruments and telemetry systems for real-time feedback on all your remote water monitoring sites.



- <sup>1</sup> Temperature range for non-freezing liquids
  - <sup>2</sup> Typical battery life when used within the factory-calibrated temperature range, dependent on site conditions
  - <sup>3</sup> 1 reading = date/time plus all available parameters polled or logged from device
  - <sup>4</sup> 1 data record = date/time plus 3 parameters logged (no wrapping) from device
  - <sup>5</sup> External power or battery pack is recommended when using Linear Average or Event logging modes.
  - <sup>6</sup> Parameters derived from temperature at 25° C and actual conductivity range of 0 to 100,000 µS/cm with a ±0.5% + 1 µS/cm accuracy
  - <sup>7</sup> Derived from Standard Methods 2510B
  - <sup>8</sup> Defined by the Practical Salinity Scale 1978; Standard Methods 2520B
  - <sup>9</sup> Real-time level compensation based on water density
  - <sup>10</sup> Accuracy with 4-20 mA output option: ±0.25% FS
  - <sup>11</sup> Includes linearity and hysteresis over 1 year.
  - <sup>12</sup> Temperature response varies by temperature change and environmental conditions. Under typical field conditions, T95 < 5 min.
- Specifications are subject to change without notice. Delrin is a registered trademark of E. I. du Pont de Nemours and Company. NIST is a registered trademark of the National Institute of Standards and Technology. Android is a trademark of Google Inc.



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## AQUA TROLL 100 AND 200 INSTRUMENTS

TEMPERATURE RANGES <sup>1</sup>	Operational: -5 to 50° C (23 to 122° F) Storage: -40 to 65° C (-40 to 149° F) Calibrated: 0 to 50° C (32 to 122° F)	
DIMENSIONS & WEIGHT	Diameter (OD): 1.83 cm (0.72 in.) Length: 31.5 cm (12.4 in.) Weight: 188 g (0.41 lb)	
MATERIALS	Titanium body and sensors, Delrin® nose cone, and PVC conductivity cell	
OUTPUT OPTIONS	Modbus/RS485, SDI-12, and 4-20 mA	
BATTERY TYPE & LIFE <sup>2</sup>	3.6V lithium. 5 years or 200,000 readings <sup>3</sup>	
EXTERNAL POWER	8-36 VDC; Measurement current: 15 mA; Sleep current: 40 µA	
MEMORY Data records <sup>4</sup> Data logs	4.0 MB 190,000 50	
LOG TYPES <sup>5</sup>	Linear, Linear Average, and Event	
FASTEST LOGGING RATE	Linear: 1 per minute. Linear Average: 1 per minute. Event: 1 per second	
FASTEST OUTPUT RATE	1 per second	
ENVIRONMENTAL RATING	IP 68 with cable attached IP 67 without cable attached	
<b>CONDUCTIVITY SENSOR - TYPE: Balanced 4-electrode cell</b>		
METHODS	EPA Method 120.1; Standard Methods 2510	
RANGE, ACCURACY, & RESOLUTION	Range: 0 to 100,000 µS/cm Accuracy: ± 0.5% of reading + 1 µS/cm when reading less than 80,000 µS/cm ± 1.0% of reading when reading above 80,000 µS/cm Resolution: 0.1 µS/cm	
PARAMETERS SUPPORTED <sup>6</sup>	Range	Units
Actual conductivity	0 to 100,000 µS/cm	µS/cm, mS/cm
Specific conductivity <sup>7</sup>	0 to 100,000 µS/cm	µS/cm, mS/cm
Salinity <sup>8</sup>	0 to 42 PSU	PSU
Total dissolved solids	0 to 82 ppt	ppt, ppm
Resistivity	10 to 200,000 Ohms-cm	Ohms-cm
Density (water salinity)	0.98 to 1.14 g/cm <sup>3</sup>	g/cm <sup>3</sup>
<b>PRESSURE/LEVEL/SENSOR<sup>9</sup> - TYPE: Piezoresistive. Pressure/level are available only on the Aqua TROLL 200 Instrument.</b>		
RANGE	Absolute (non-vented) 30 psia: 11 m (35 ft) 100 psia: 60 m (197 ft) 300 psia: 200 m (658 ft)	Gauged (vented) 5 psig: 3.5 m (11.5 ft) 15 psig: 11 m (35 ft) 30 psig: 21 m (69 ft) 100 psig: 70 m (231 ft) 300 psig: 210 m (692 ft)
BURST PRESSURE	Maximum 2x range; burst > 3x range	
MAX PRESSURE FOR AQUA TROLL 100	300 psi (692 ft)	
ACCURACY & RESOLUTION <sup>10</sup>	Accuracy: ±0.05%FS or better; Resolution: ±0.01%FS or better	
LONG-TERM STABILITY <sup>12</sup>	<0.1% FS	
UNITS OF MEASURE	Pressure: psi, kPa, bar, mbar, mmHg, inHg, cmH <sub>2</sub> O, inH <sub>2</sub> O. Level: in, ft, mm, cm, m	
<b>TEMPERATURE SENSOR<sup>13</sup></b>		
METHOD	EPA Method 170.1	
ACCURACY & RESOLUTION	Accuracy: ±0.1° C. Resolution: 0.01° C or better	
UNITS OF MEASURE	Celsius or Fahrenheit	
WARRANTY	2 years. Up to 5-year (total) extended warranties available.	