PRE-DESIGN INVESTIGATION
ROD AND WIRE MILL AREA
CHARACTERIZATION REPORT

AREA A: PARCEL A3
TRADEPOINT ATLANTIC
SPARROWS POINT, MARYLAND

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1.0 INTRODUCTION

ARM Group Inc. (ARM), on behalf of EnviroAnalytics Group (EAG), has completed a Pre-Design Investigation (PDI) within a portion of Parcel A3 of the Tradepoint Atlantic property (formerly Sparrows Point Terminal, LLC). Parcel A3 is comprised of 64 acres of the approximately 3,100-acre former steel making facility (**Figure 1**). The portion that is the focus of this PDI includes the northernmost 15 acres that is currently undergoing groundwater interim remedial measures (Site). The Site is bounded to the west by Riverside Drive and Bear Creek, to the north by Bethlehem Boulevard and Interstate 695, and to the east by a BGE substation and the former Pipe Mill Area (which is currently designated as Parcel A1).

The PDI was performed in accordance with procedures outlined in the Phase II and Pre-Design Investigation Work Plan – Parcel A3. This Work Plan (dated September 17, 2015) was approved by the Maryland Department of the Environment and the United States Environmental Protection Agency in compliance with requirements pursuant to the following:

- Administrative Consent Order (ACO) between Tradepoint Atlantic (formerly Sparrows Point Terminal, LLC) and the Maryland Department of the Environment (effective September 12, 2014); and

- Settlement Agreement and Covenant Not to Sue (SA) between Tradepoint Atlantic (formerly Sparrows Point Terminal, LLC) and the United States Environmental Protection Agency (effective November 25, 2014).

An application to enter the Tradepoint Atlantic property into the Maryland Department of the Environment Voluntary Cleanup Program (MDE-VCP) was submitted to MDE on September 10, 2014. The property's current and anticipated future use is Tier 3 (Industrial), and plans for the property include demolition and redevelopment over the next several years. Parcel A3 is also part of the acreage that remains subject to the requirements of the Multimedia Consent Decree between Bethlehem Steel Corporation, the United States Environmental Protection Agency (EPA), and the Maryland Department of the Environment (MDE) (effective October 8, 1997) as documented in correspondence received from EPA on September 12, 2014.

1.1. SITE HISTORY

From the late 1800s until 2012, the production and manufacturing of steel was conducted at Sparrows Point. Iron and steel production operations and processes at Sparrows Point included raw material handling, coke production, sinter production, iron production, steel production, and semi-finished and finished product preparation. In 1970, Sparrows Point was the largest steel facility in the United States, producing hot and cold rolled sheets, coated materials, pipes, plates, and rod and wire. The steel making operations at Sparrows Point ceased in fall 2012.

The Rod and Wire Mill area is located in the northwestern portion of the Site, and is the location of the former mills that produced rods and wire products from the 1940's to the early 1980's. All manufacturing activities at the Rod and Wire Mill area ceased operation in the early 1980's with subsequent demolition of all structures between 1994 and 2000, based on historical aerial photos. Current ground cover includes slag aggregate that was placed in conjunction with the demolition program.

Manufacturing activities at the Rod and Wire Mill included leaching of zinc ore and a subsequent treatment process to remove cadmium impurities. The leaching process was implemented in large tanks located inside the north end of the former Rod and Wire Mill building. In the 1950's through the early 1970's, the acidic leach residue was stored in the Northwest Pond until about 1959 when filters were installed to dewater the residues. Dewatered sludge generated from this process was temporarily stored on the ground outside the north end of the mill in the former Sludge Bin Storage Area. Filtrate from the dewatering process was recycled to the wire plating process. Excess filtrate was discharged to the East Pond until 1971, after which it was sent to the Humphrey Creek Wastewater Treatment Plant (HCWWTP) for treatment. These operations ended in the early 1980's when the Rod and Wire Mill was shut down. The referenced historical potentially impacted areas are shown in **Figure 2**.

1.2. ROD AND WIRE MILL GROUNDWATER INTERIM MEASURE

Historical operations in the Rod and Wire Mill Area resulted in releases of cadmium and zinc to soil and groundwater. In 1986, a soil and groundwater remediation program was initiated to address groundwater exhibiting elevated levels of cadmium and zinc, and residual soil contamination in the Sludge Bin Storage Area. Remediation initially consisted of a soil flushing program and associated pumping and treatment of groundwater from shallow and intermediate wells. The groundwater pumping was discontinued and the treatment plant dismantled in 1999 to support a demolition project at the Rod and Wire Mill allowing for reassessment of the interim measure. A Work Plan to re-establish Interim Measures was submitted in July 2000; the Work Plan was approved by the Agencies in November 2000. Re-establishment of the Interim Measure included an institutional control for soil, upgrades to the monitoring well network, construction of two recovery wells, installation of a transmission pipeline to the HCWWTP, and evaluation of pump test data, groundwater flow characteristics, and review of the system's effectiveness.

The pumping and treatment of groundwater resumed in September 2001 and currently continues. At present, known dissolved cadmium and zinc plumes exist in the sandy subsurface from approximately 20 to 30 feet below ground surface (bgs). The average depth to water is approximately 3 to 5 feet bgs, and the sandy substrate exists down to approximately 50 to 60 feet bgs. There is currently no indication that significant dissolved phase concentrations are deeper than 30 ft. bgs.

Interim Measures (IMs) are currently underway at the former Rod and Wire Mill Area as described below:

- Institutional controls for soils have been established to provide a "Restricted Work Area" to control the exposure of onsite workers to soils in the Former Sludge Bin Storage Area.
- A groundwater monitoring network has been installed including the use of 31 wells for monitoring the performance of the groundwater pump and treat system. This monitoring network is used to collect water level and groundwater quality data.
- A groundwater pump and treat system is operated and maintained consisting of two intermediate depth zone recovery wells (RW10-PZM020 and RW15-PZM020) that operate at a rate of between 5.0 and 12.0 gallons per minute (gpm). The expected normal operating rate for the treatment plant was set at a combined rate of 8.0 to 12.0 gpm with a maximum design flow of 25 gpm. Recovered groundwater is transported via a pipeline to the HCWWTP for subsequent treatment and discharge in accordance with the NPDES permit requirements for the Facility.

A total of 4,487,659 gallons of water were extracted from the Former Rod and Wire Mill Area pumping wells and treated at the HCWWTP during 2015. The average pumping rate for the pump and treat system was 12,295 gpd, or 8.5 gpm. Average annual pumping rates of approximately 3.84 gpm were achieved in recovery well RW15-PZM020 and 4.69 gpm in RW10-PZM020. These pumping rates appear to effectively capture the most impacted groundwater beneath the Former Sludge Bin Storage Area. A total of 210 pounds (lbs) of cadmium and 10,630 pounds (lbs) of zinc were removed and treated during 2015.

- Average Cadmium and Zinc Concentrations:
    - RW10-PZM020:

	2015	2014	2013	2012
Cadmium (ppm)	9.55	9.83	11.75	12
Zinc (ppm)	487	526	373	470

    - RW15-PZM020:

	2015	2014	2013	2012
Cadmium (ppm)	0.78	1.08	1.0	3.3
Zinc (ppm)	35.8	34.9	44	51

- <u>Treated mass (lbs)</u>:
    - RW10-PZM020:

	2015	2014	2013	2012
Cadmium	197	193	99	142
Zinc	10,027	10,334	3,073	5,805

    - RW15-PZM020:

	2015	2014	2013	2012
Cadmium	13	23	12	41
Zinc	603	756	573	637

1.3. OBJECTIVES

The objective of this investigation was to characterize the impacted subsurface area currently undergoing interim remedial action for the future implementation of a remedial strategy. This scope included characterization of the nature and extent of current soil and groundwater contamination in this area. A summary of the soil boring and groundwater well identification numbers and the analyses performed has been provided as **Appendix A**. The PDI work scope also included characterization of the hydrologic properties of the aquifer in the Rod and Wire Mill area. The purpose of the aquifer analysis was to develop a groundwater model which could be used to screen and evaluate potential options for the final remedial approach, assist in developing the remedial design, and identify any additional data requirements.

2.0 SITE GEOLOGY/HYDROGEOLOGY

The encountered subsurface geology included slag fill materials overlying natural soils, which included fine-grained sediments (clays and silts) and coarse grained sediments (sands). Groundwater was observed within the soil cores at depths ranging from 4 to 18 feet below the ground surface (bgs) across the Site. Soil boring logs are provided in **Appendix B**.

Groundwater occurrence at the Site has been segregated into three horizons identified as shallow, intermediate and deep zones. The shallow water bearing zone (water table) includes piezometers screened to depths of approximately 15-feet below ground surface. The intermediate water bearing zone includes piezometers screened from approximately 20- to 30-foot depths. The intermediate water bearing zone is the focus of the interim pump and treat measure and is therefore also referred to as the intermediate pumping zone. The deep water bearing zone is defined as those piezometers screened from approximately 50- to 75-feet below ground surface.

Temporary groundwater sample collection points were installed in the intermediate zone at four locations during the Pre-Design Investigation to investigate groundwater conditions beneath the former Rod and Wire Mill area. In addition to the temporary groundwater sample collection points, several existing intermediate wells were sampled during the PDI. These existing wells included RW02-PZM020, RW07-PZM017, RW10-PZM020, RW19-PZM020, and RW20-PZM020. The locations of the groundwater sampling points are indicated on **Figure 3**. The temporary groundwater sample collection points and existing wells were surveyed by a Maryland-licensed surveyor, and supporting documentation from the surveys is included as **Appendix C**.

A synoptic round of groundwater level measurements was collected on January 28, 2016 from each of the groundwater points included in the PDI sampling plan. Several site-wide wells which were not included in the sampling plan were included in the potentiometric survey to provide better resolution of the groundwater potentiometric surface. Surveyed top of casing (TOC) and ground surface elevations for all applicable locations can be found in **Table 1**, along with the depth to water (DTW) measurements from this date.

Based on the field measurements, a groundwater potentiometric map was constructed for the intermediate hydrogeologic zone. The intermediate contour map is included on **Figure 4**. In this zone, groundwater flow appears to flow from the north and east toward the recovery system pumping wells. The western half of the Site is affected by the recovery system as well as elevations below 0 feet amsl were reported in several wells

3.0 SITE INVESTIGATION

A total of 192 soil samples (112 with Geoprobe, 80 with hollow stem augers) and nine intermediate groundwater samples were collected for analysis between October 1 and November 17, 2015 during the PDI. The PDI also included slug tests and an aquifer pumping test, which aided in the development of the preliminary groundwater model. Methods and protocols were utilized that followed the procedures included in the Quality Assurance Project Plan (QAPP) dated October 2, 2015 approved by the agencies to support the investigation and remediation of the Tradepoint Atlantic property. Information regarding the project organization, field activities and sampling methods, sampling equipment, sample handling and management procedures, the selected laboratory and analytical methods, quality control and quality assurance procedures, investigation-derived waste (IDW) management methods, and reporting requirements are described in detail in the approved Parcel A3 Work Plan dated September 17, 2015, and the QAPP.

All site characterization activities were conducted under the site-specific health and safety plan (HASP) provided as Appendix A of the approved Work Plan.

3.1. SOIL INVESTIGATION

A total of 18 borings were completed during the Pre-Design Investigation (**Figure 5**). Of these 18 boring locations, 14 were completed to a total depth of 35 feet for the purpose of investigating the current extents of metals contamination. The former East Pond and former Sludge Bin Storage Area were the primary focus of the Pre-Design Investigation based upon historical groundwater data and investigations. The remaining four locations were geotechnical borings completed to a minimum of 50 feet for the purpose of characterizing soils for the possible alignment of a permeable-reactive barrier (PRB) wall for the treatment of groundwater.

A summary of the areas that were investigated for the PDI, along with the boring identification number and the analyses performed, has been provided as **Appendix A**. During the completion of fieldwork, it was necessary to shift three borings from the proposed locations given in the Work Plan, two in the Former East Pond due to standing water and one of the geotechnical borings due to refusal. **Table 2** provides the identification numbers of the field adjusted borings, the rationale for field adjustment, the coordinates of the proposed and final locations, and the distance/direction of the field shifts.

3.1.1. Geoprobe Borings

Continuous core soil borings were advanced at 14 locations across the Site to assess the presence or absence of soil contamination, and to assess the vertical distribution of any encountered contamination (**Figure 5**). Using the Geoprobe® MC-7 Macrocore soil sampler, the continuous core soil borings were advanced to 35 feet deep. At each location, each soil core was visually inspected and screened with a hand-held X-ray fluorescence spectrometer (XRF) for cadmium and zinc prior to logging soil types. Soil boring logs have been included in **Appendix B**, and the XRF calibration logs as **Appendix D**. Please note that unless otherwise indicated, all Unified Soil Classification System (USCS) group symbols provided on the attached boring logs are from visual observations, and not from laboratory testing.

One shallow sample was collected from the 0- to 1-foot depth interval, and deeper samples were collected at approximate 5-foot intervals down to the total boring depth of 35 feet. If the XRF or other field observations indicated zinc/cadmium contamination to exist at a specific depth within the 5-foot interval, the sampling location was shifted to the alternate depth interval indicated by the XRF response. Soil sampling activities were conducted in accordance with the procedures and methods referenced in **Field SOPs Number 009, Number 012, and Number 013** provided in Appendix A of the QAPP.

Down-hole soil sampling equipment was decontaminated after soil sampling had been concluded at a location, according to the procedures and methods referenced in **Field SOP Number 016** provided in Appendix A of the QAPP.

Soil samples collected for contaminant delineation were submitted to Pace Analytical Services, Inc. (PACE), and analyzed for COPI List (RCRA) metals. Following the receipt of initial data, PACE provided additional (estimated) data for the remaining Target Analyte List (TAL) metals not specified in the RCRA list. A grain size analysis and soil typing procedure were also performed by the subcontracted laboratory Geotechnics, Inc. Based on the specific sampling targets, select locations associated with the East Pond were also analyzed for fraction organic carbon (FOC). Analytical methods, sample containers, preservatives, and holding times for the sample analyses are listed in the QAPP Worksheet 19 & 30 – Sample Containers, Preservation, and Holding Times.

3.1.2. Hollow Stem Auger Borings

A total of four hollow stem auger borings were completed to the west of the remedial investigation area in order to characterize the stratigraphy and geotechnical characteristics of the subsurface (**Figure 5**). These geotechnical borings were installed to provide data for the possible design of a PRB wall for groundwater treatment. Using 8-inch diameter hollow-stem augers and a Dietrich B-120 drill rig, the continuous soil borings were advanced to 50 feet deep. Soil samples were recovered at various intervals as further described below. Blow counts were recorded and recovered soil samples were visually inspected and screened with a hand-held Photo Ionization Detector (PID) prior to logging soil types. Soil boring logs have been included in **Appendix B**, and the PID calibration log as **Appendix E**. Please note that unless otherwise indicated, all USCS group symbols provided on the attached boring logs are from visual observations, and not from laboratory testing.

From each soil boring, one shallow sample (shelby tube or split-spoon) was collected from the 0 to 1-foot depth interval, and deeper samples were collected periodically down to the total boring depth of at least 50 feet. Thicknesses ranged from 1 to 2.5 feet for each individual sample. Shelby tube and split-spoon samples were alternated by field personnel, based on observations in the field. Intermittent periods of augering were completed between sample intervals. Soil sampling activities were conducted in accordance with the procedures and methods referenced in **Field SOPs Number 009, Number 012, and Number 013** provided in Appendix A of the QAPP.

Bulk soil samples were also collected from each of the geotechnical boreholes. Samples weighing approximately 12.5 lbs, 14.8 lbs, 15.8 lbs, and 13.0 lbs were collected from RW-001-GB, RW-002-GB, RW-003-GB, and RW-004-GB, respectively. These bulk samples were pooled to create one composite soil sample weighing approximately 56 lbs. The large composite sample was delivered to PeroxyChem for bench-scale testing related to the possible future design of a groundwater treatment PRB wall.

After soil sampling had been concluded at a location, down-hole soil sampling equipment was decontaminated according to the procedures and methods referenced in **Field SOP Number 016** provided in Appendix A of the QAPP.

Soil samples collected for the geotechnical investigation were submitted to PACE, and analyzed by Geotechnics, Inc. Not all parameters were analyzed for every sample. Generally, the samples collected using split-spoons were analyzed for FOC, while those collected with shelby tubes were analyzed for bulk density, total porosity, grain size analysis (and soil typing), and permeability.

3.2. GROUNDWATER INVESTIGATION

A total of five existing site-wide wells in the intermediate hydrogeologic zone were sampled for inclusion in the PDI. Four temporary groundwater sample collection points were also installed in the intermediate hydrogeologic zone to facilitate the gathering of groundwater samples and to support the definition of the potentiometric surface. The soil boring locations where the intermediate temporary groundwater sample collection points were installed during the PDI included RW-057-SB, RW-063-SB, RW-067-SB, and RW-070-SB (**Figure 3**). The temporary groundwater sample collection point construction logs have been included as **Appendix F**.

At each location the Geoprobe® DT22 Dual Tube sampling system was advanced to a target depth of approximately 30 to 35 feet bgs, the 1.25-inch inner rod string was removed, and the temporary, 1-inch PVC groundwater sample collection point was installed through the outer casing. Following its installation, the 0-hour depth to water was documented and the collection point was checked for the presence of Non-Aqueous Phase Liquid (NAPL) using an oil-water interface probe in accordance with the methods referenced in **Field SOP Number 019** provided in Appendix A of the QAPP. The existing groundwater wells were also checked for the presence of NAPL prior to sampling.

After the installation of each temporary groundwater sample collection point, down-hole equipment was decontaminated according to the procedures and methods referenced in **Field SOP Number 016** provided in Appendix A of the QAPP.

Groundwater samples were collected in accordance with methods referenced in **Field SOP Number 006** provided in Appendix A of the QAPP, which employed the use of laboratory-supplied sample containers and preservatives, a peristaltic pump, dedicated polyethylene tubing, and a YSI water quality meter with a flow-through cell. Groundwater samples submitted for TAL metals were filtered in the field with an in-line 0.45 micron filter. The sampling and purge logs have been included in **Appendix G**. YSI meter calibrations were performed before the start of the day of each sampling event, and a calibration post-check was completed at the end of the day. Appropriate documentation of the YSI calibration has also been included in **Appendix G**.

Groundwater samples were submitted to PACE, and analyzed for total organic carbon (TOC), total dissolved solids (TDS), biological oxygen demand (BOD), chemical oxygen demand (COD), total metals, sulfide, sulfate, ferrous iron, nitrate-N, and alkalinity. The additional parameters listed in the Parcel A3 Work Plan of dissolved oxygen (DO), oxidation-reduction potential (ORP), and pH were collected in the field during groundwater purging. Analytical methods, sample containers, preservatives, and holding times for the sample analyses are listed in the QAPP Worksheet 19 & 30 – Sample Containers, Preservation, and Holding Times.

3.3. AQUIFER INVESTIGATION

The aquifer investigation involved three phases including slug testing, an aquifer pumping test, and numerical groundwater model as described below.

3.3.1. Slug Testing

Hydraulic conductivity was measured at thirty-eight (38) wells within Parcel A3 via slug testing. The slug test method entails instantaneously adding (for a falling-head test) or removing (for a rising-head test) a known volume of water to or from each well and recording the resulting water level response as the hydraulic head recovers to static equilibrium. Hydraulic conductivity is then calculated from the head response using an appropriate analytical method based on several site-specific factors including the type of well construction, degree of aquifer penetration, and confined or unconfined nature of the aquifer.

Of the thirty-eight wells that were slug tested, four (4) were screened in the deep hydrogeologic zone, twelve (12) were screened in the intermediate hydrogeologic zone, and twenty-two (22) were screened in the shallow hydrogeologic zone. Both falling-head and rising-head slug tests were performed in each of these wells, except for RW17-PZM019, in which only a falling-head test was performed due to excessively rapid and turbulent recovery during the rising-head test.

During the falling-head tests fresh potable water obtained from the onsite wastewater treatment plant (HCWWTP) was quickly poured into each well until the water level reached the top of the casing. During the rising-head tests a bailer was used to remove between 1.5 and 3 gallons from each well. The water removed from each well was containerized in 55-gallon drums and disposed of according to **Field SOP Number 005** provided in Appendix A of the QAPP. An electronic pressure transducer recorded the water levels during all slug tests in 5-second intervals.

3.3.2. Aquifer Pumping Test

A long-term operational aquifer pumping test was performed on wells RW10-PZM020 and RW15-PZM020 from November 4 – December 8, 2015. Water levels in the pumping wells and fourteen (14) existing observation wells in the intermediate hydrogeologic zone were recorded using electronic pressure transducers/dataloggers (1-minute intervals) and/or manual water level measurements. In addition, water levels in twenty one (21) existing observation wells in the shallow hydrogeologic zone were also recorded via manual water level measurements. The shallow well RW22-PZM was also measured with an electronic datalogger to measure tidal effects. Precipitation measurements from the Fort Howard weather station located 3 miles southwest of the Rod and Wire Mill area (Weather Station ID: KMDEDGEM3, Edgemere, MD) were utilized in this report. Pumping rates in RW10-PZM020 and RW15-PZM020 were recorded hourly using a totalizing flow meter. The pumping schedule listed in the aquifer testing operations summary is given below:

Aquifer Testing Operations Summary

Date	Event
11/04/15	Pumping test plan initiated. Both wells are pumping.
11/12/15	Both wells off. Recovery and static monitoring.
11/17/15	RW15-PZM020 begins pumping.
11/20/15	RW10-PZM020 begins pumping.
11/30/15	Both wells off. Recovery monitoring.
12/01/15	RW10-PZM020 begins pumping.
12/02/15	RW15-PZM020 begins pumping.
12/04/15	RW15-PZM020 off. RW10-PZM020 off temporarily and restarted.
12/06/15	Both wells off. Recovery monitoring.
12/08/15	Pumping test operations ceased.

Following completion of the pumping tests, all dataloggers were removed from the wells and RW10-PZM020 and RW15-PZM020 resumed normal pumping operations.

3.3.3. Numerical Groundwater Modeling

A numerical groundwater model was developed for the Rod and Wire Mill area intermediate aquifer zone. This model may be used along with the results from the aquifer pumping test to screen and evaluate potential options for the final remedial approach, assist in developing the remedial design, and identify any additional data requirements during the design process. The groundwater model was developed using results from the slug testing and aquifer pumping tests, as well as additional hydrogeologic and geologic information, including historic groundwater levels, local tidal influences, and field data (well logs) from the shallow, intermediate, and lower hydrogeologic zones. To improve the resolution of the model in the Rod and Wire Mill area, three additional permanent groundwater wells were installed in the intermediate aquifer zone at final depths of approximately 30 to 40 feet bgs. The well construction logs for these additional wells (RW22, RW23, and RW24) have been included in **Appendix F**.

3.4. MANAGEMENT OF INVESTIGATION-DERIVED WASTE (IDW)

In accordance with **Field SOP Number 005** provided in Appendix A of the QAPP, potentially impacted materials, or IDW, generated during this Phase II Investigation was containerized in 55-gallon (DOT-UN1A2) drums. The types of IDW that was generated during this Phase II Investigation included the following:

- soil cuttings generated from soil borings or the installation of the temporary groundwater sampling points;
- purged groundwater;
- decontamination fluids; and
- used personal protective equipment

Following the completion of field activities, a composite sample was gathered from the designated Parcel A3 PDI IDW soil drums for TCLP analysis. Following this analysis, the waste soil was characterized as non-hazardous. A list of all detections from the TCLP analysis of the soil cuttings can be found in **Table 3**, which indicates no exceedances of TCLP criteria.

IDW drums containing aqueous materials were characterized by preparing composite samples from randomly selected drums. Each composite sample included aliquots from three individual drums that were chosen from a set of 30 drums being stored on-site at the date of collection. A total of eight aqueous composite samples were collected for TCLP analysis. A list of all detections from the TCLP analysis of the aqueous waste can be found in **Table 4**, which indicates no exceedances of TCLP criteria. Although there were no TCLP exceedances, one aqueous drum was designated as hazardous waste because it contained purge water from one piezometer which had an elevated detection of cadmium (44.5 mg/L) in its analytical sample. This drum was segregated based on this preliminary analytical result and was not included in the composite samples.

The parcel-specific IDW drum log from the Site investigation is included as **Appendix H**. All IDW procedures were carried out in accordance with methods referenced in the QAPP Worksheet 21 – Field SOPs and Appendix A of the QAPP.

4.0 RESULTS AND DISCUSSION

4.1. SOIL ANALYTICAL RECORDS

The laboratory soil Certificates of Analysis (including Chains of Custody) are included as **Appendix I**, and the supplemental reports from Geotechnics, Inc. have been included at the close of each certificate. Data Validation Reports (completed only for the initial list of RCRA metals) have been included as **Appendix J**. The laboratory and data validation reports contain a qualifiers key for the final flags assigned to individual results in the attached summary tables.

4.2. SOIL METALS

Table 5 provides the analytical metals data for the soil samples collected during the Pre-Design Investigation. The main contaminants of concern in the former Rod and Wire Mill area are zinc and cadmium based on the previous historical uses in the target area.

Contour maps were developed that show the zinc and cadmium concentrations at specific depth intervals from 0 to 35 feet bgs. Contour data was pooled based on the target depth intervals indicated in the approved Work Plan. Where applicable, individual borings from the separate Phase II Investigation were included for the development of the isoconcentration contours. Specifically, RW-008-SB, RW-036-S, RW-037-SB, and RW-039-SB provided relevant zinc and cadmium concentration data for soils between 0 and 10 feet bgs, which improved the resolution of the isoconcentration contours within this interval.

Figures S-1 through S-8 display soil cadmium contours for the depth ranges of 0 to 1, 2 to 5, 6 to 10, 11 to 15, 16 to 20, 21 to 25, 26 to 30, and 31 to 35 feet, respectively. The lowest contour interval ranges from 0 mg/kg (non-detect) to 0.38 mg/kg, the maximum contaminant level (MCL) based screening level for the protection of groundwater specified in the EPA Regional Screening Level (RSL) Summary Table published November 2015. The highest contour interval extends up to 3,600 mg/kg, with a maximum detection (RW-069-SB-3) of 3,530 mg/kg. While not directly applicable to the Pre-Design Investigation, exceedances of the project action limit (PAL) for cadmium (980 mg/kg) are indicated on all relevant figures.

Figures S-9 through S-16 display soil zinc contours for the depth ranges of 0 to 1, 2 to 5, 6 to 10, 11 to 15, 16 to 20, 21 to 25, 26 to 30, and 31 to 35 feet, respectively. The lowest contour interval ranges from 0 mg/kg (non-detect) to 370 mg/kg, the risk based screening level (with a target hazard quotient of 1.0) for the protection of groundwater specified in the EPA Regional Screening Level (RSL) Summary Table published November 2015. The highest contour interval extends up to 118,000 mg/kg, with a maximum detection (RW-064-SB-12) of 117,000 mg/kg. There were no exceedances of the PAL for zinc (350,000 mg/kg) in any of the soil samples.

Following the development of the zinc and cadmium contours, three dimensional (3D) representations were developed for these two contaminants. The 3D visuals for the cadmium and zinc contours have been included as **Figure 6** and **Figure 7**, respectively.

4.3. SOIL GEOTECHNICAL TESTING

All geotechnical parameters and FOC were reported by the subcontracted laboratory Geotechnics, Inc. The certificates of analysis from these supplemental analyses have been included at the close of each of the PACE laboratory reports for the same sample group (**Appendix I**). The details of the geotechnical analysis are summarized in **Table 6**, and supporting data may be viewed in the laboratory reports. The summary table includes a sample key indicating the sample IDs used by EAG, PACE, and Geotechnics, Inc. Relevant soils data included FOC, percent moisture/solids, Unified Soil Classification System (USCS) symbol and classification, grain size distribution (% greater than #4 sieve, % between #4 and #200 sieve, and % finer than #200 sieve), specific gravity, permeability, bulk density (unit wet/dry weight), and porosity. Not all geotechnical parameters were applicable for every sample.

Cross sections have been developed to describe the lithology of the subsurface in the area of the Pre-Design Investigation. These cross sections were constructed using field-identified soil types. **Figure 8** indicates the locations of the PDI and geotechnical borings, and highlights the three cross sections prepared for the study area. The cross sections include information from the geotechnical borings as well as the shallower borings (35 feet bgs) completed for the purpose of contaminant delineation. **Cross Section A-A'** extends from the center of RW-003-GB to the northeast across the former Sludge Bin Storage Area and the former East Pond. **Cross Section B-B'** extends from the north end of the RW-001-GB to the southeast across the former Sludge Bin Storage Area and the former East Pond. **Cross Section C-C'** extends along the line investigated by borings RW-001-GB to RW-004-GB from the north to the south. The cross sections generally show overlying slag/gravel fill in select locations, followed by intermittent striation of sand and clay layers down to the full boring depth.

4.4. GROUNDWATER ANALYTICAL RECORDS

The laboratory groundwater Certificates of Analysis (including Chains of Custody) are included as **Appendix K**. Data Validation Reports have been included as **Appendix L**. The laboratory and data validation reports contain a qualifiers key for the final flags assigned to individual results in the attached summary tables.

4.5. GROUNDWATER PARAMETERS

Table 7 provides the analytical total metals data for the groundwater samples collected during the Pre-Design Investigation. The main contaminants of concern in the former Rod and Wire Mill area are zinc and cadmium based on the previous historical uses in the target area. Contour maps have been developed showing the zinc and cadmium concentrations in the intermediate hydrogeologic zone. The contour maps for cadmium and zinc have been included as **Figure 9** and **Figure 10**, respectively. Additional water quality parameters (TOC, TDS, BOD, COD, sulfide, sulfate, ferrous iron, nitrate-N, and alkalinity) are also included in **Table 7**. Other parameters included in the table (DO, ORP, and pH) were used to indicate stabilization of groundwater prior to sampling. These parameters were extracted from the field groundwater purge logs (**Appendix G**), and the last recorded field value was used in each case. Hydraulic Conductivity Results

The Bouwer-Rice Method (Bouwer and Rice, 1976) was used to calculate the hydraulic conductivities following each slug test because of its wide range of applicability. This method is valid for wells in confined or unconfined aquifers, wells that fully or partially penetrate an aquifer, and wells that are screened or open to the surrounding formation.

The average hydraulic conductivities for the shallow, intermediate, and deep hydrogeologic zones were calculated to be 8.33, 15.81, and 3.51 ft/day, respectively. **Table M1** in **Appendix M** summarizes the calculated hydraulic conductivities for each test. The falling-head and rising-head conductivities were pooled for each well, yielding an average hydraulic conductivity for the location. The conductivity value only applies to the aquifer in the immediate vicinity of each well at the screened depth intervals. The hydrographs and calculated results for each individual test are included in **Appendix M**.

4.6. AQUIFER PUMPING TEST RESULTS

Measurements from the pumping test are included in **Appendix N** (hydrographs for the pumping wells and all monitoring wells including graphs of precipitation and pump ON and OFF events). The instantaneous pumping rates for RW10-PZM020 and RW15-PZM020 in gallons per minute (GPM) varied between 2 GPM to 7 GPM and 3 GPM to 5 GPM, respectively, throughout the test. Water level measurements were taken from 22 monitoring wells in the shallow hydrogeologic zone and 15 monitoring wells in the intermediate hydrogeologic zone. Measurements from RW22-PZM were impacted by the presence of floating hydrocarbon product (NAPL) in the well and were not included in the water level maps or the groundwater modeling.

Hydraulic conductivity and storage were calculated using the Cooper-Jacob Straight Line Approximation (Cooper and Jacob, 1946) for both pumping wells based on water level data from periods when only the well of interest was pumping. Storage was calculated for RW15-PZM020 only. The storage value for RW10-PZM020 could not be determined due to a precipitation event on November 19, 2015 that obscured the drawdown response in the existing observation wells. The hydraulic conductivity values for the pumping wells are included in **Appendix M**. The conductivity and storage calculations are also included (following the slug testing hydrographs).

Average stabilized water levels for the pumping wells and each monitoring well were determined during the times when (1) both wells were pumping, (2) only one well was pumping, and (3) no wells were pumping. These water levels were incorporated into the numerical groundwater model for calibration purposes.

4.7. INITIAL GROUNDWATER MODEL

4.7.1. Model Construction and Calibration

The numerical groundwater model for the intermediate aquifer zone was created using the United States Geological Survey (USGS) MODFLOW computer software. The model used in this project is steady-state and three-dimensional with 11,772 rectangular cells and six layers representing the shallow, intermediate, and deep aquifers (hydrogeologic zones) and three aquitard units. Ambient (non-pumping) conditions were established using the static water level measurements in the monitoring and pumping wells prior to the aquifer tests. General head boundaries around portions of the outer edge of the model domain were adjusted to approximate ambient conditions. Preliminary hydraulic conductivity zones in the model were estimated using computed hydraulic conductivities from the slug test and aquifer pumping test results. The model was calibrated to steady-state pumping conditions (i.e., RW10-PZM020 and RW15-PZM020 pumping) as measured during the aquifer pumping test by modifying the hydraulic conductivity zones and general head boundary conditions until the model-computed heads were within 0.25 feet of the measured heads in the monitoring wells. A detailed report documenting the development of the numerical groundwater model has been included as **Appendix O**. The final calibrated model hydraulic conductivity values are shown in **Figure 11**.

4.7.2. Model Results

4.7.2.1. RW10 and RW15 Pumping

The modeled groundwater contours for the condition when both pumping wells are operating (pump on) in the intermediate aquifer zone are shown in **Figure 12**. All abbreviated well designations refer to the existing observation wells in the intermediate hydrogeologic zone. Modeled groundwater elevation contours matched measured water level measurements in all intermediate aquifer monitoring wells within 0.25 feet. Measureable drawdowns of 1.49 feet or more associated with the pumping of RW10 and RW15 were observed in all monitoring wells including RW19, RW20, and RW21 located on the west and southwest sides of the Rod and Wire Mill area. Modeled groundwater elevation contours indicate that RW10 and RW15 pumping wells provide sufficient drawdown to capture flows from the northern and eastern portions of the Rod and Wire Mill area. Areas located south and west of the RWM do not have sufficient control points beyond the existing monitoring wells to verify complete capture.

4.7.2.2. RW10 and RW15 Not Pumping

The measured groundwater contours for the condition when both pumping wells are not operating (pump off) in the intermediate aquifer zone are shown in **Figure 13** and **Figure 14**. Two figures are shown for the pump off condition due to the different recovery responses measured in RW10 and RW15. Groundwater mounding in the vicinity of RW10 and RW15 was noted for the period November 12 to 17, 2015 (both pumps OFF; **Figure 13**), and a depression in the groundwater surface was noted in the vicinity of RW15 for the period December 6 to 9, 2015 (both pumps OFF, **Figure 14**).

The groundwater mounding shown in **Figure 13** indicates that groundwater is moving from shallow aquifer zones vertically downward in close proximity to the RW10 and RW15 well bores and into the intermediate aquifer when both pumps are off. The groundwater depression in the vicinity of RW15 (**Figure 14**) indicates that recovery was incomplete in this well bore area possibly due to localized blockage to return flow after the pump was turned off. The variability in the recovery response of the two pumping wells indicates one or more of the following:

a) Vertical communication between shallow and intermediate aquifer zones in the vicinity of RW10 and RW15.
b) Temporary blockage of the well screen/sand pack in RW15 during the pump off condition.
c) Changes in the vertical hydraulic gradient between shallow aquifers and the intermediate aquifer associated with the regular pumping of RW10 and RW15, precipitation events, or other factors associated with heterogeneous aquifer parameters at the Site. The vertical hydraulic gradient at the Rod and Wire Mill area may be positive or negative depending on the conditions mentioned above coupled with the similarity in hydraulic heads between aquifers at this site.
d) The other monitoring wells in the intermediate aquifer consistently recovered to within 0.5 feet during the two pump off conditions supporting a) and b) above.

4.7.2.3. Scenarios from Modeled Results

Modeled pumping scenarios with RW15 pumping and RW10 off, RW15 off and RW10 pumping, and both RW15 and RW10 off are illustrated in **Figures 15, 16, and 17** respectively. Pump on scenarios for both RW10 and RW15 indicate capture from the north and east portions of the site; however, areas located south and west have very small hydraulic gradients and limited control points to assure 100% capture of fluids migrating from the west. The scenario with both RW10 and RW15 pumps off indicates southerly and westward migration of fluids away from the Rod and Wire Mill area.

5.0 FINDINGS AND RECOMMENDATIONS

The objectives of this Pre-Design Investigation were to identify the presence/extent of any existing soil and groundwater contamination, and to describe the stratigraphy and lithology of the subsurface in the potential location of a PRB wall. During the investigation, nine groundwater samples and 192 soil samples (112 with Geoprobe, 80 with hollow stem augers) were collected and analyzed. A large composite soil sample was also submitted to PeroxyChem for batch testing related to the PRB wall. Slug tests and aquifer pumping tests were completed to support the development of a groundwater flow model. This flow model may assist in the selection and design of the final remedial approach.

Groundwater samples were analyzed for total metals, TOC, TDS, BOD, COD, sulfide, sulfate, ferrous iron, nitrate-N, and alkalinity. Additional parameters collected in the field during groundwater purging (pH, ORP, DO) were also reported. The resulting groundwater data indicates that zinc contamination may be more widespread than cadmium in the intermediate hydrogeologic zone. RW-057-PZ (Sludge Bin Storage Area) and RW-067-PZ (East Pond) both exhibited elevated levels of zinc in groundwater, while levels of cadmium were negligible in RW-067-PZ. Furthermore, the cadmium mass appears to be concentrated in the vicinity of the former Sludge Bin Storage Area, with greater than 90% of the mass detected within three sample locations (RW07-PZM017, RW10-PZM020, and RW-057-PZ). Zinc contamination appears to be more widespread, with detections exceeding 10 mg/L in all locations except for one (RW19-PZM020). Based on the established potentiometric surface, natural groundwater flow is towards the west along a slight gradient before intersecting with Bear Creek.

The existing recovery well system utilizing RW10-PZM020 and RW15-PZM020 appears to capture groundwater from the eastern and northern portions of the site when both pumps are operating. Groundwater capture in the western and southern portions of the site is less certain due to low hydraulic gradients and lack of control points in those areas. Measured groundwater levels and modeled scenarios with only one pump operating also indicate uncertain capture of groundwater west and south of the site. The measured groundwater levels and modeled scenario with both pumps off indicates that groundwater will generally flow from east to west and off-site.

Soil samples collected with the Geoprobe were analyzed for metals, and a grain size analysis was performed along with a USCS soil classification. Soil samples associated with the former East Pond were also analyzed for FOC. The geotechnical borings completed with hollow stem augers were analyzed for their grain size distribution and soil classification, along with FOC, bulk density, permeability and total porosity. These parameters are relevant for determining the anticipated effectiveness of treatment in the remedial zone, as well as the necessary vertical extent of a PRB wall. The bulk soil sample collected from the geotechnical borings was delivered to PeroxyChem for bench-scale modeling. Following the completion of batch tests, PeroxyChem prepared a completion report documenting their work. This soil testing report is included as **Appendix P**.

Based on the 14 PDI borings completed within the boundaries of the former East Pond and former Sludge Bin Storage Area, the zinc and cadmium contamination appears to be highly co-located. The most elevated detections for both metals were observed in the location of borings RW-064-SB (11 to 15 feet bgs) and RW-069-SB (2 to 5 feet bgs), both of which targeted the former East Pond area. Notably, the elevated levels at location RW-069-SB appear to extend vertically downward into the next sampling interval (6 to 10 feet bgs), but appear to be more significant at the adjacent boring RW-068-SB, located roughly 90 feet to the southeast. This may be indicative of a continuous zone of contamination within the specified depth range. The severe impacts observed at RW-064-SB do not appear extensive, as the zinc and cadmium detections above and below the contaminated sample (11 to 15 feet bgs) were negligible. Slight elevations of zinc and cadmium were observed in the surficial soil samples from RW-067-SB (East Pond) and RW-057-SB (Sludge Storage Bins). At RW-067-SB, the concentrations of the target metals appeared to dissipate rapidly with depth, while remaining more persistent in the former Sludge Bin Storage Area from 2 to 5 feet bgs.

Field logged soil types were used in the construction of cross sections below the Former East Pond and Sludge Bin Storage Area. Slag fill was observed overlying several boring locations, with striated clay and sandy layers extending through the remainder of the borehole depths. **Cross Section C-C'** is particularly beneficial for describing potential confining layers in the vicinity of the potential PRB wall. This cross section demonstrates the extent of a 5 to 15 foot thick clay layer overlying the intermediate hydrogeologic zone where the highest levels of groundwater contamination have been consistently documented. A second main clay layer is located 5 to 35 feet beneath the first layer, indicating the presence of a sandy water bearing unit with this approximate thickness. The full thickness of the deeper clay layer is undefined, but RW-001-GB extended approximately 25 feet into the clay without breakthrough. In the event that a PRB wall is installed, the lowest extent of the reactive zone must extend to within this deeper clay unit to prevent circumvention below the wall.

The PDI provided relevant chemical data to support the delineation of contaminated soil and groundwater. The distribution of contaminant mass in the soil and groundwater has been defined using zinc and cadmium isoconcentration contours. The groundwater flow model developed using the results of the slug testing and aquifer pumping test has characterized existing hydrologic conditions in the aquifer, and may aid in the selection and design of the final remedial strategy. Soil geotechnical conditions have been characterized to support the evaluation of future remedial options, and may also be useful to support future development planning.

6.0 REFERENCES

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Cooper, H.H. and Jacob, C.E. (1946). A generalized graphical method for evaluating formation constants and summarizing well-field history. *Transactions, American Geophysical Union,* vol. 27, p. 526-534.

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Weaver Boos Consultants (2014). *Phase I Environmental Site Assessment: Former RG Steel Facility*. Final Draft. May 19, 2014.

FIGURES

ARM Group Inc.
Earth Resource Engineers and Consultants

0 375 750 1,500
Feet

🟩 Site Boundary
▨ Private Property
☐ Area A Boundaries
☐ Area B Boundaries

Tradepoint Atlantic
Area A and Area B Parcels

May 31, 2016

EnviroAnalytics Group

Area A: Project 150298M
Area B: Project 150300M

Tradepoint Atlantic

Baltimore County, MD

Figure
1

Parcel A3 (Rod & Wire Mill)
Location of Historical Activities
June 10, 2016

Figure
2

EnviroAnalytics Group	Tradepoint Atlantic
ARM Project 150298M	Baltimore County, MD

ARM Group Inc.
Earth Resource Engineers and Consultants

▨ Former Northwest Pond
▨ Former East Pond
▨ Former Sludge Bin Storage Area
□ Approximate Boundary of Remedial Design Area
□ Parcel A3 (RWM) boundary

Parcel A3 (Rod & Wire Mill)
Groundwater Sample Locations (intermediate)

April 4, 2016

Figure
3

EnviroAnalytics Group

Sparrows Point Terminal

ARM Project 150298M

Baltimore County, MD

⌖	Existing Site-wide Well (Intermediate)	☐	Area of Interest
⌖	Remedial Design Piezometer (Intermediate)	☐	Parcel A3 (RWM) boundary

Groundater Measurements
Collected January 28, 2016

Pump System Active:
RW10-PZM020
RW15-PZM020

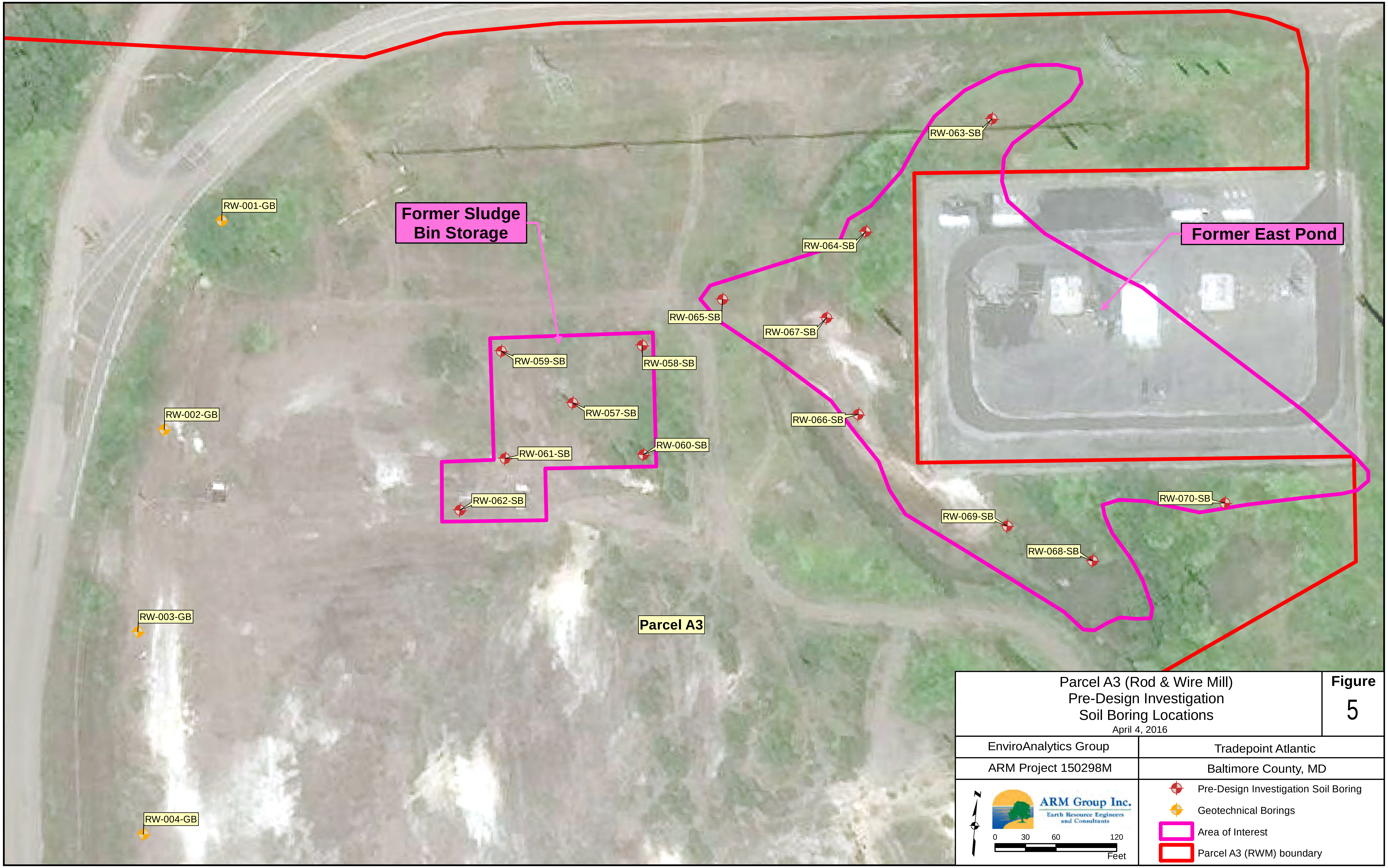
Parcel A3 (Rod & Wire Mill) - Intermediate Zone Groundwater Contour Map

April 8, 2016

Figure
4

EnviroAnalytics Group	Tradepoint Atlantic
ARM Project 150298M	Baltimore County, MD

ARM Group Inc.
Earth Resource Engineers and Consultants



Parcel A3 (Rod & Wire Mill)
Pre-Design Investigation
Soil Boring Locations
April 4, 2016

Figure
5

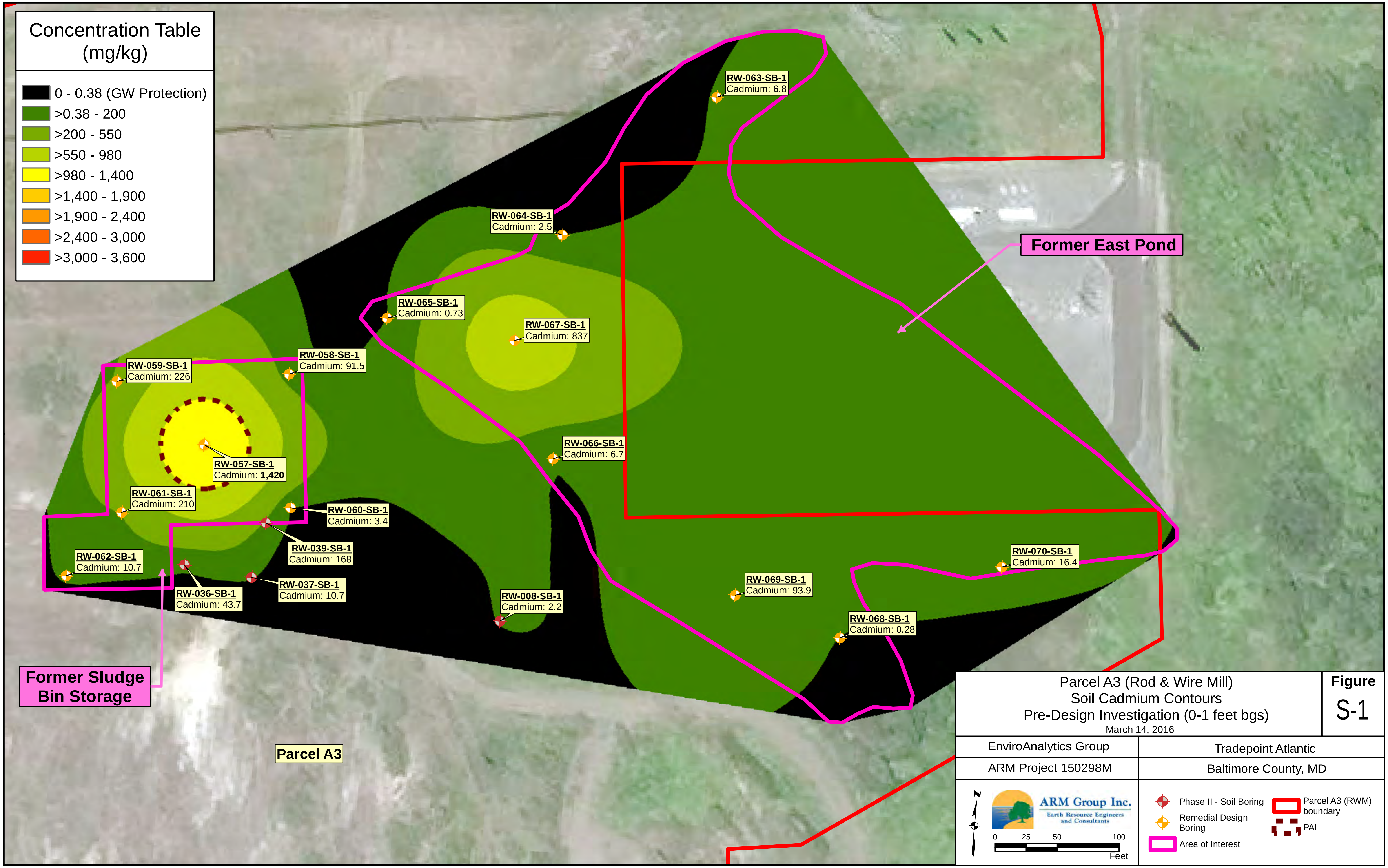
EnviroAnalytics Group
ARM Project 150298M

Tradepoint Atlantic
Baltimore County, MD

⊕	Pre-Design Investigation Soil Boring
⊕	Geotechnical Borings
▭	Area of Interest
▭	Parcel A3 (RWM) boundary

Concentration Table (mg/kg)

⬛	0 - 0.38 (GW Protection)
🟩	>0.38 - 200
🟩	>200 - 550
🟨	>550 - 980
🟨	>980 - 1,400
🟧	>1,400 - 1,900
🟧	>1,900 - 2,400
🟧	>2,400 - 3,000
🟥	>3,000 - 3,600



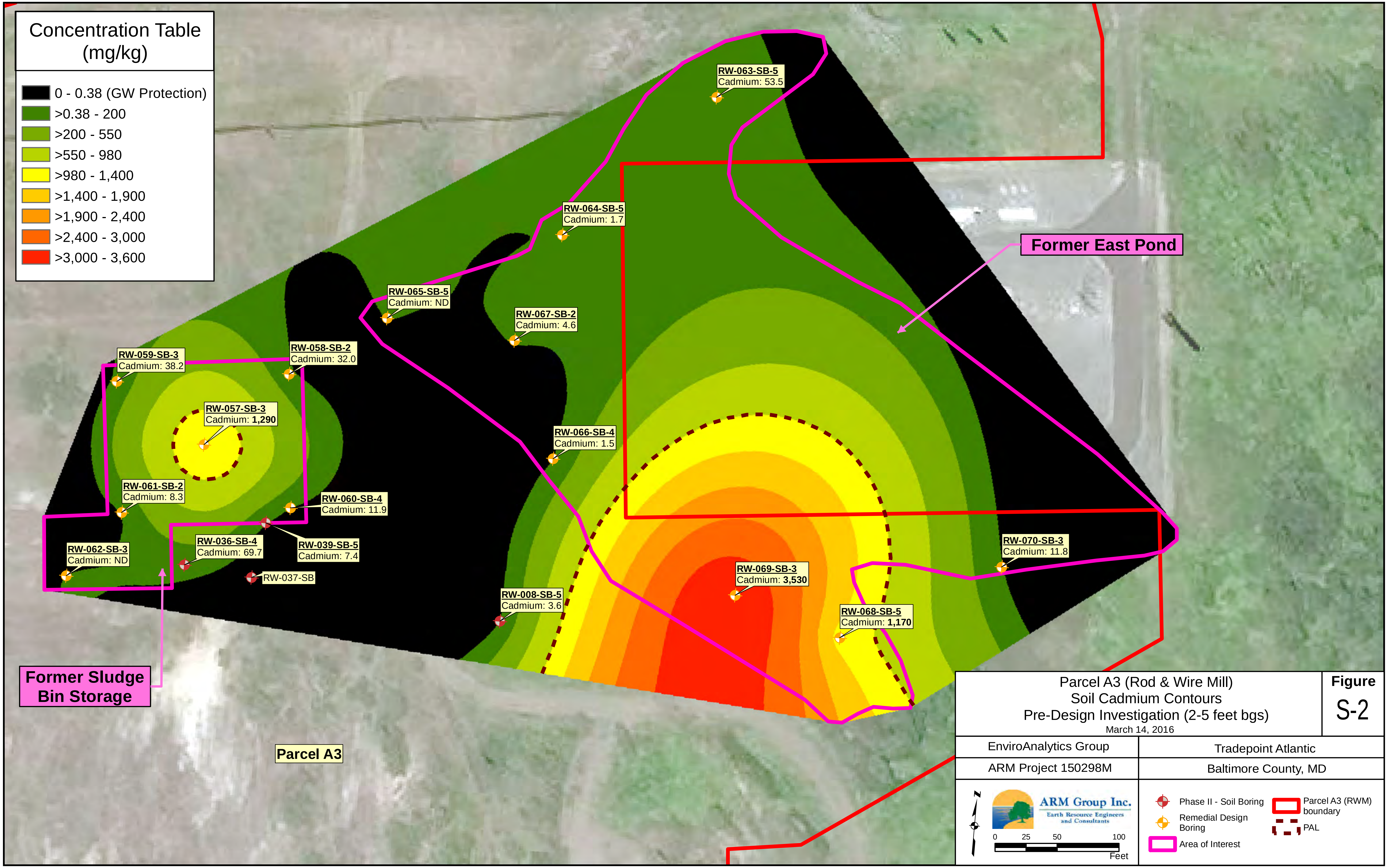
Parcel A3 (Rod & Wire Mill)
Soil Cadmium Contours
Pre-Design Investigation (0-1 feet bgs)
March 14, 2016

Figure
S-1

EnviroAnalytics Group	Tradepoint Atlantic
ARM Project 150298M	Baltimore County, MD

ARM Group Inc.
Earth Resource Engineers and Consultants

⊕	Phase II - Soil Boring
⊕	Remedial Design Boring
▭	Area of Interest
▭	Parcel A3 (RWM) boundary
⬚	PAL

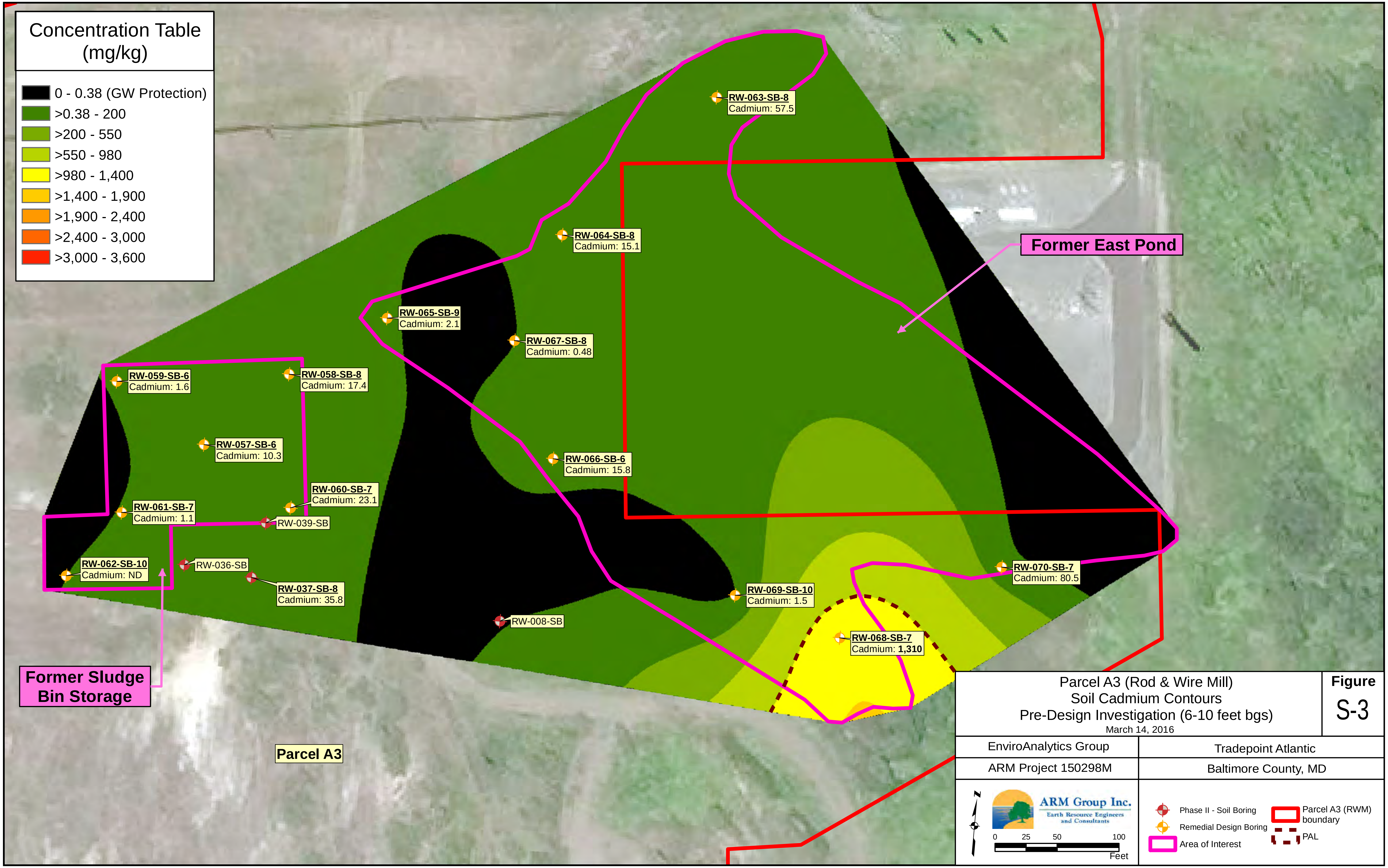


Parcel A3 (Rod & Wire Mill)
Soil Cadmium Contours
Pre-Design Investigation (2-5 feet bgs)
March 14, 2016

Figure
S-2

EnviroAnalytics Group	Tradepoint Atlantic
ARM Project 150298M	Baltimore County, MD

ARM Group Inc.
Earth Resource Engineers and Consultants

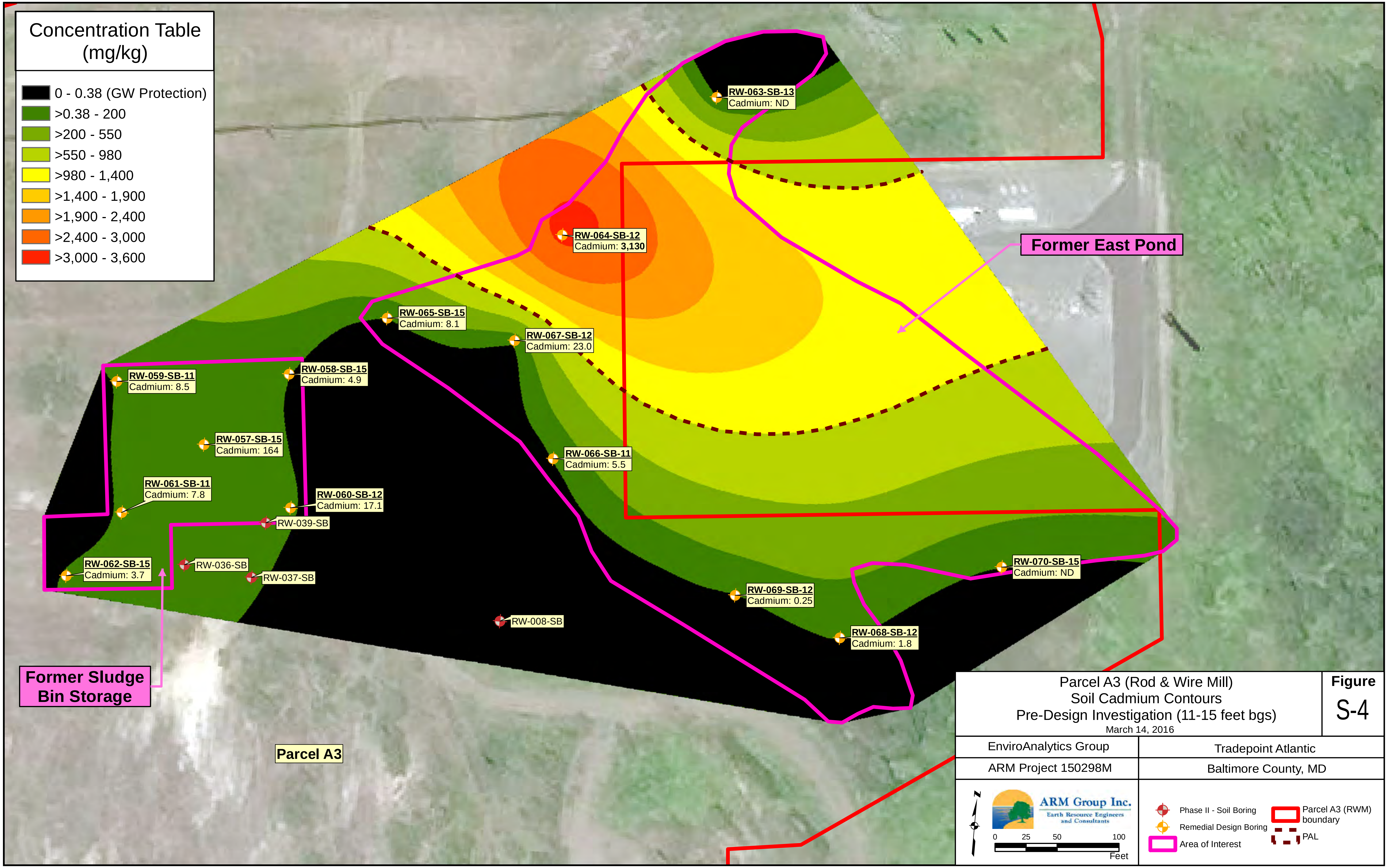


Parcel A3 (Rod & Wire Mill)
Soil Cadmium Contours
Pre-Design Investigation (6-10 feet bgs)
March 14, 2016

Figure
S-3

EnviroAnalytics Group	Tradepoint Atlantic
ARM Project 150298M	Baltimore County, MD

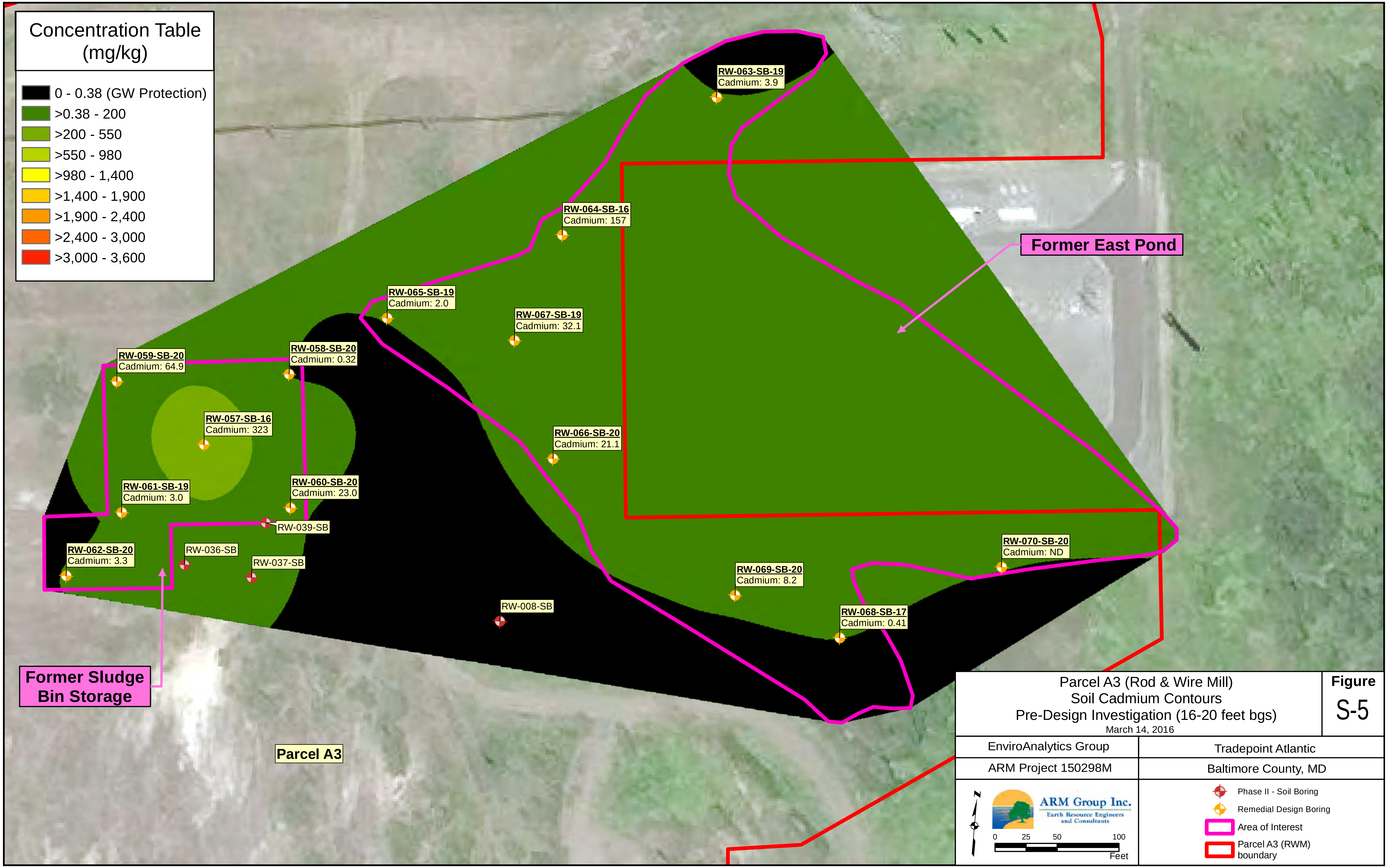
ARM Group Inc.
Earth Resource Engineers and Consultants



Parcel A3 (Rod & Wire Mill)
Soil Cadmium Contours
Pre-Design Investigation (11-15 feet bgs)
March 14, 2016

Figure
S-4

EnviroAnalytics Group
Tradepoint Atlantic
ARM Project 150298M
Baltimore County, MD

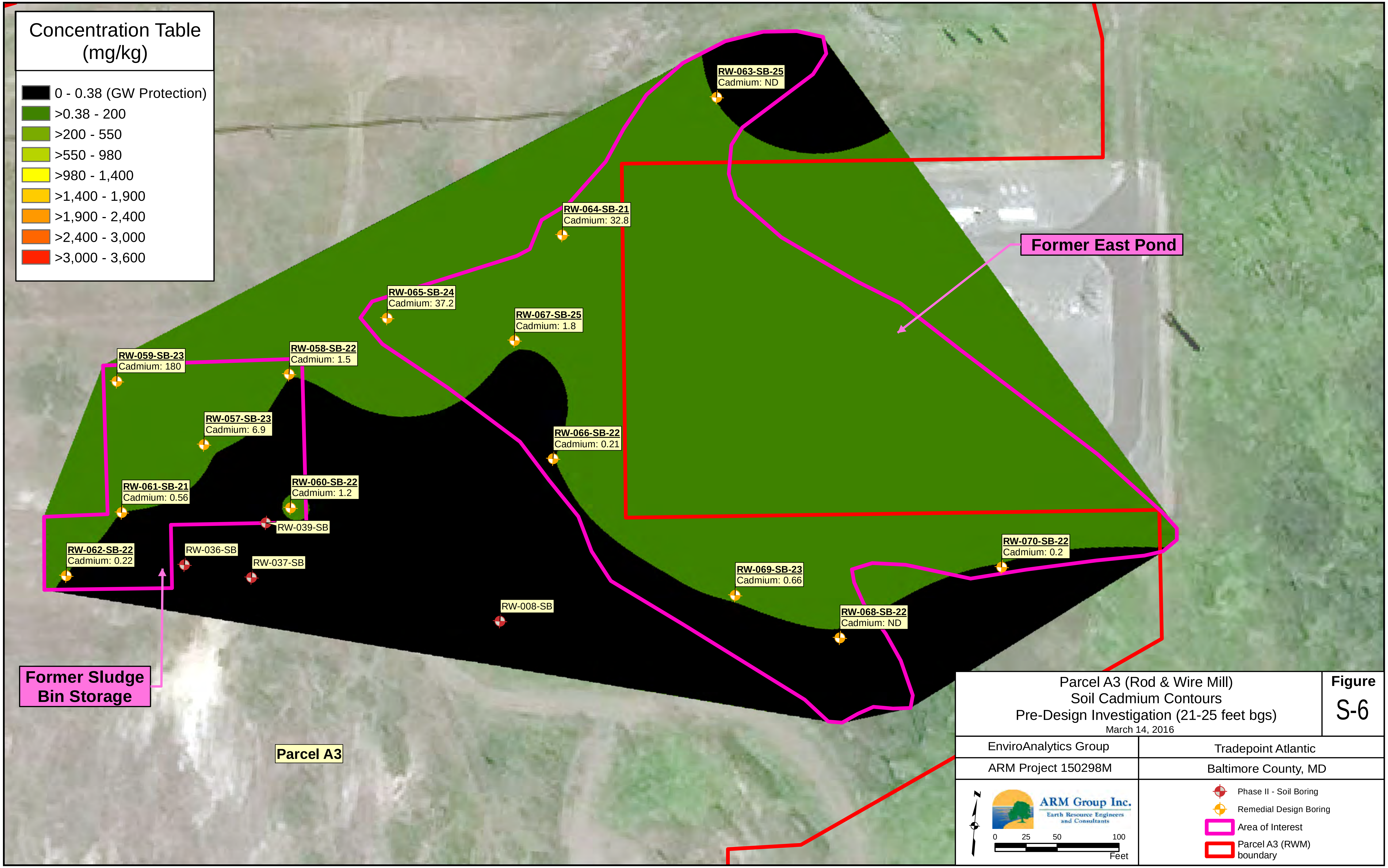


Parcel A3 (Rod & Wire Mill)
Soil Cadmium Contours
Pre-Design Investigation (16-20 feet bgs)
March 14, 2016

Figure
S-5

EnviroAnalytics Group
ARM Project 150298M
Tradepoint Atlantic
Baltimore County, MD

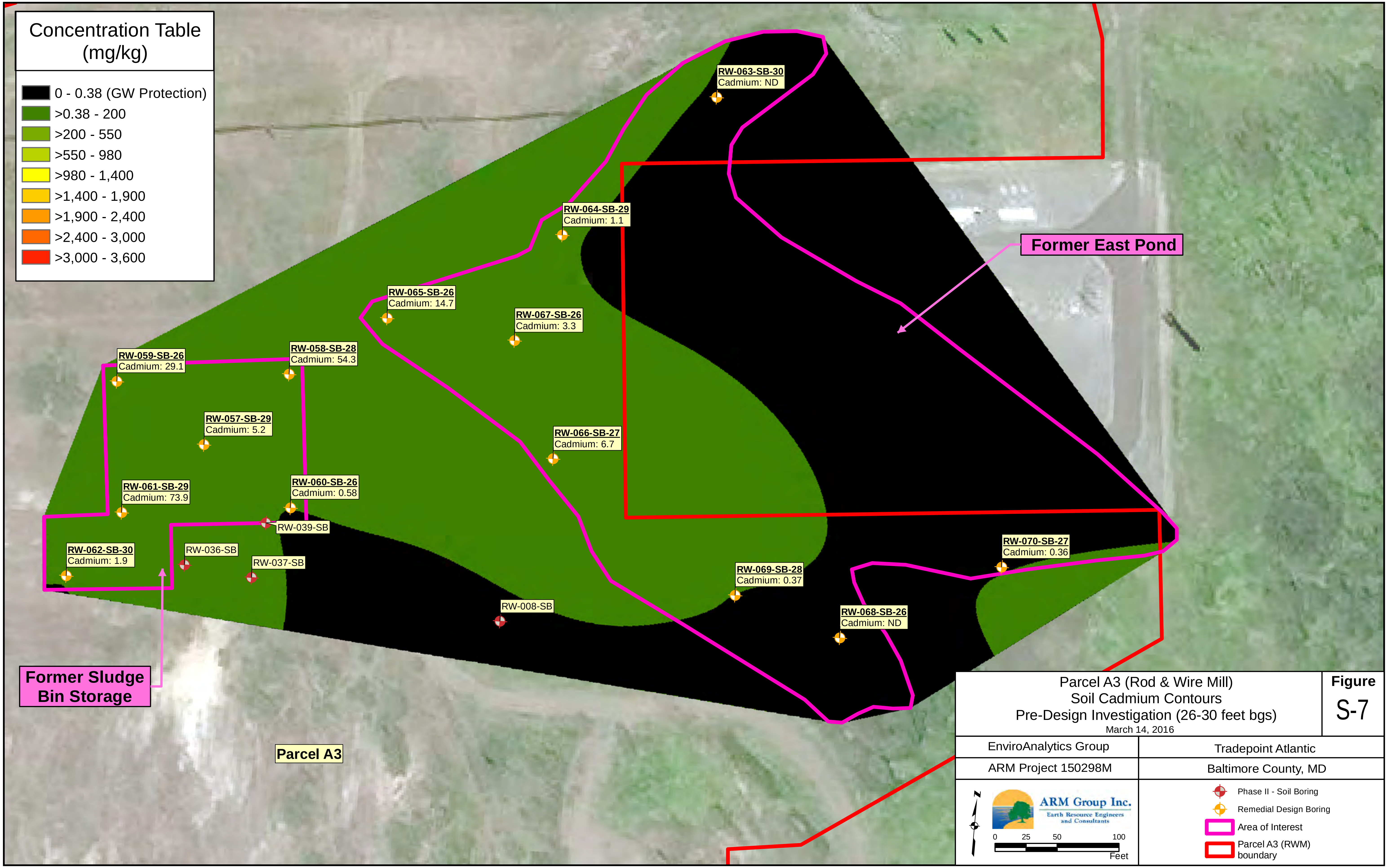
ARM Group Inc.
Earth Resource Engineers and Consultants



Parcel A3 (Rod & Wire Mill)
Soil Cadmium Contours
Pre-Design Investigation (21-25 feet bgs)
March 14, 2016

Figure
S-6

EnviroAnalytics Group	Tradepoint Atlantic
ARM Project 150298M	Baltimore County, MD



Parcel A3 (Rod & Wire Mill)
Soil Cadmium Contours
Pre-Design Investigation (26-30 feet bgs)
March 14, 2016

Figure
S-7

EnviroAnalytics Group	Tradepoint Atlantic
ARM Project 150298M	Baltimore County, MD

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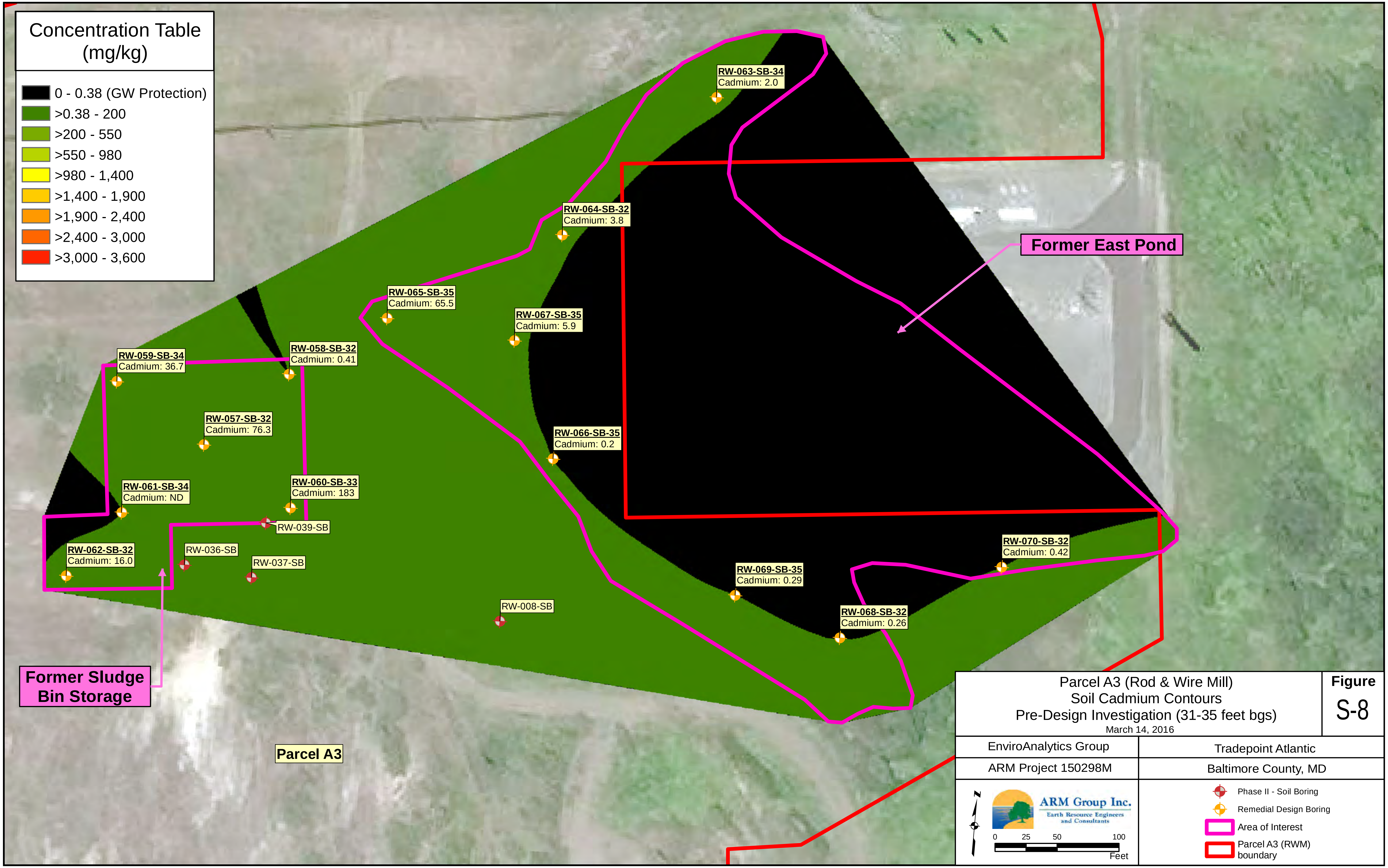


Concentration Table (mg/kg)

⬛	0 - 0.38 (GW Protection)
🟩	>0.38 - 200
🟩	>200 - 550
🟩	>550 - 980
🟨	>980 - 1,400
🟨	>1,400 - 1,900
🟧	>1,900 - 2,400
🟧	>2,400 - 3,000
🟥	>3,000 - 3,600

Parcel A3 (Rod & Wire Mill)
Soil Cadmium Contours
Pre-Design Investigation (31-35 feet bgs)

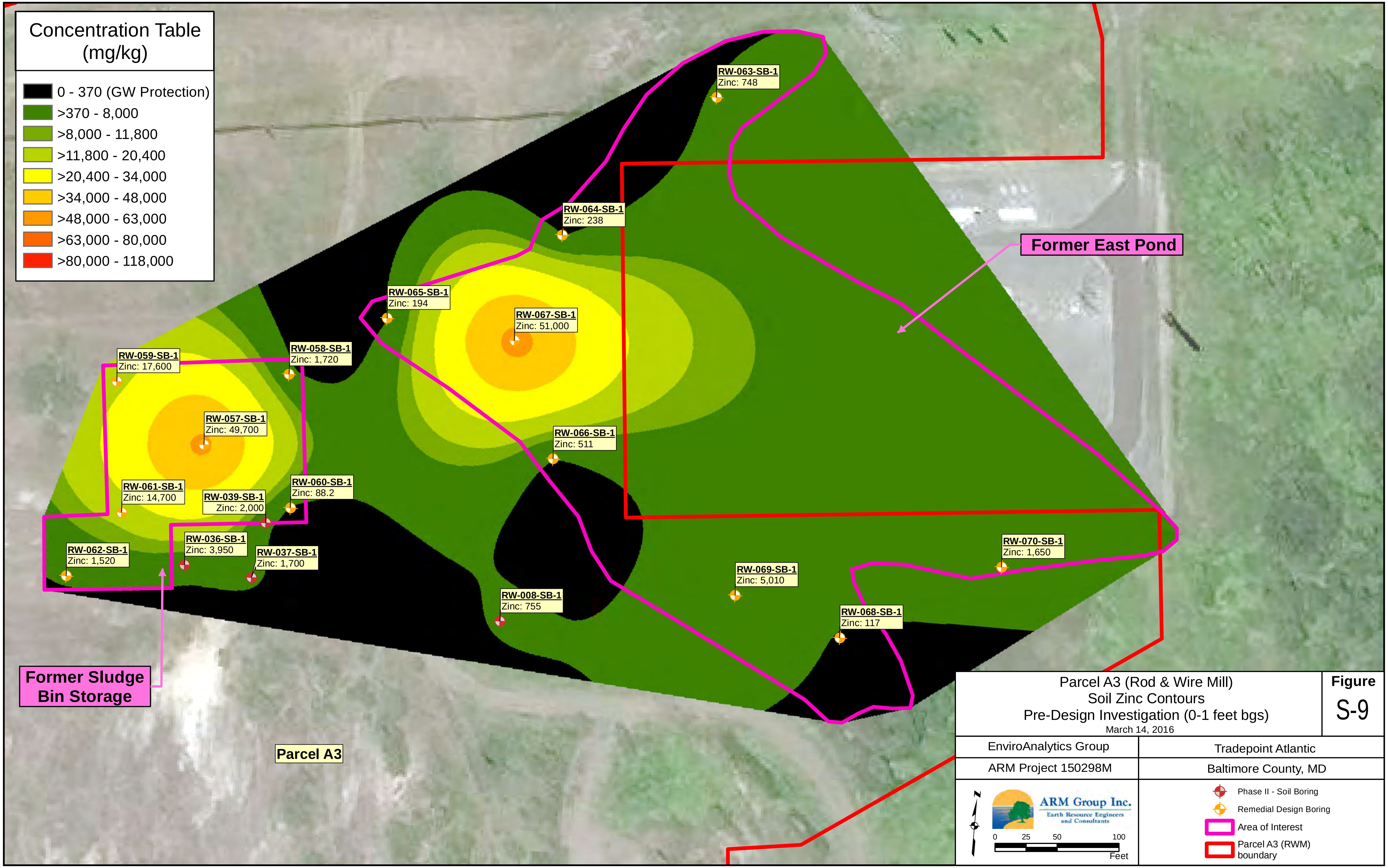
March 14, 2016

Figure
S-8

EnviroAnalytics Group	Tradepoint Atlantic
ARM Project 150298M	Baltimore County, MD

ARM Group Inc.
Earth Resource Engineers and Consultants

⊕ Phase II - Soil Boring
⊕ Remedial Design Boring
▭ Area of Interest
▭ Parcel A3 (RWM) boundary

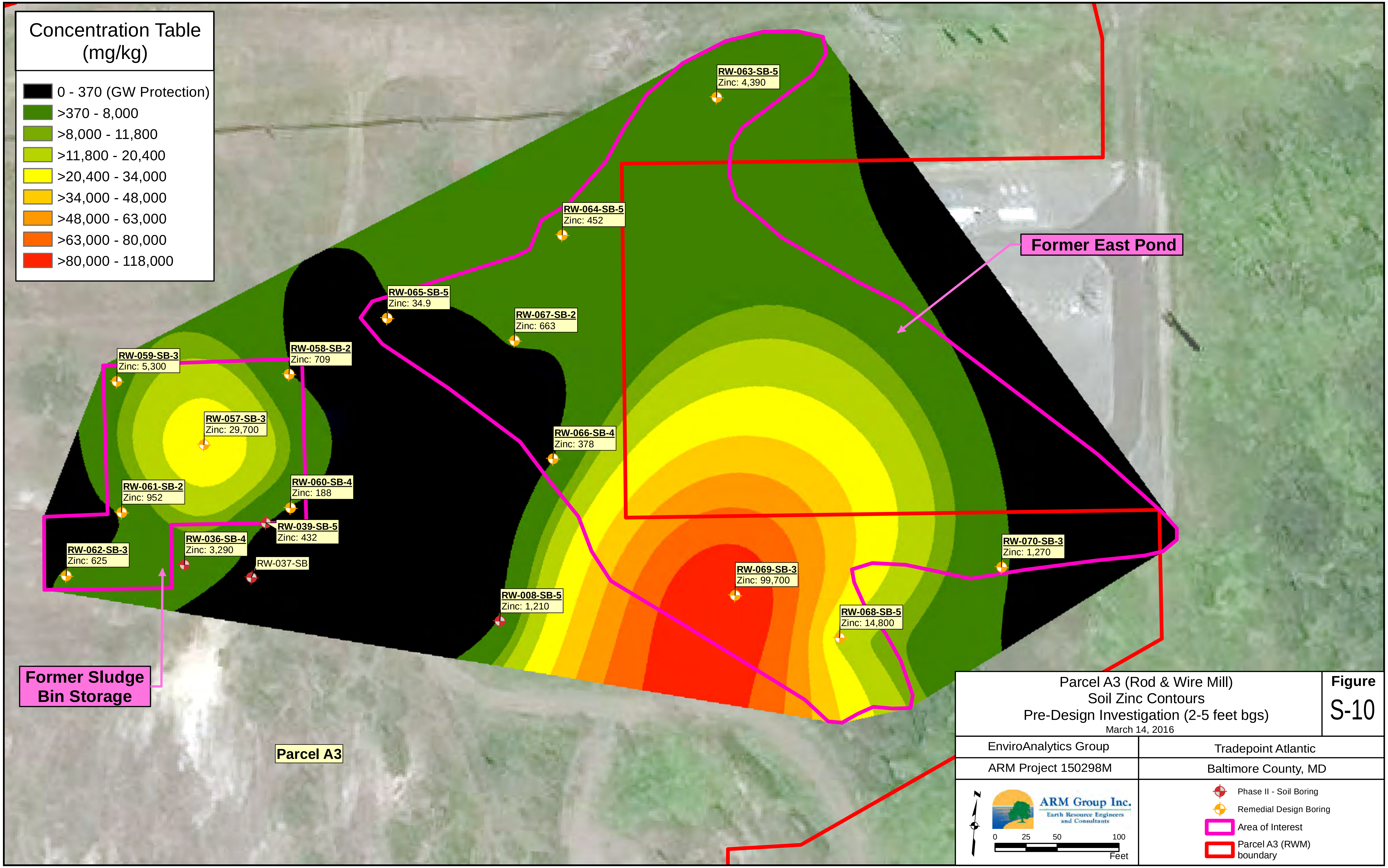


Parcel A3 (Rod & Wire Mill)
Soil Zinc Contours
Pre-Design Investigation (0-1 feet bgs)
March 14, 2016

Figure
S-9

EnviroAnalytics Group	Tradepoint Atlantic
ARM Project 150298M	Baltimore County, MD

ARM Group Inc.
Earth Resource Engineers and Consultants



Parcel A3 (Rod & Wire Mill)
Soil Zinc Contours
Pre-Design Investigation (2-5 feet bgs)
March 14, 2016

Figure
S-10

EnviroAnalytics Group
ARM Project 150298M

Tradepoint Atlantic
Baltimore County, MD

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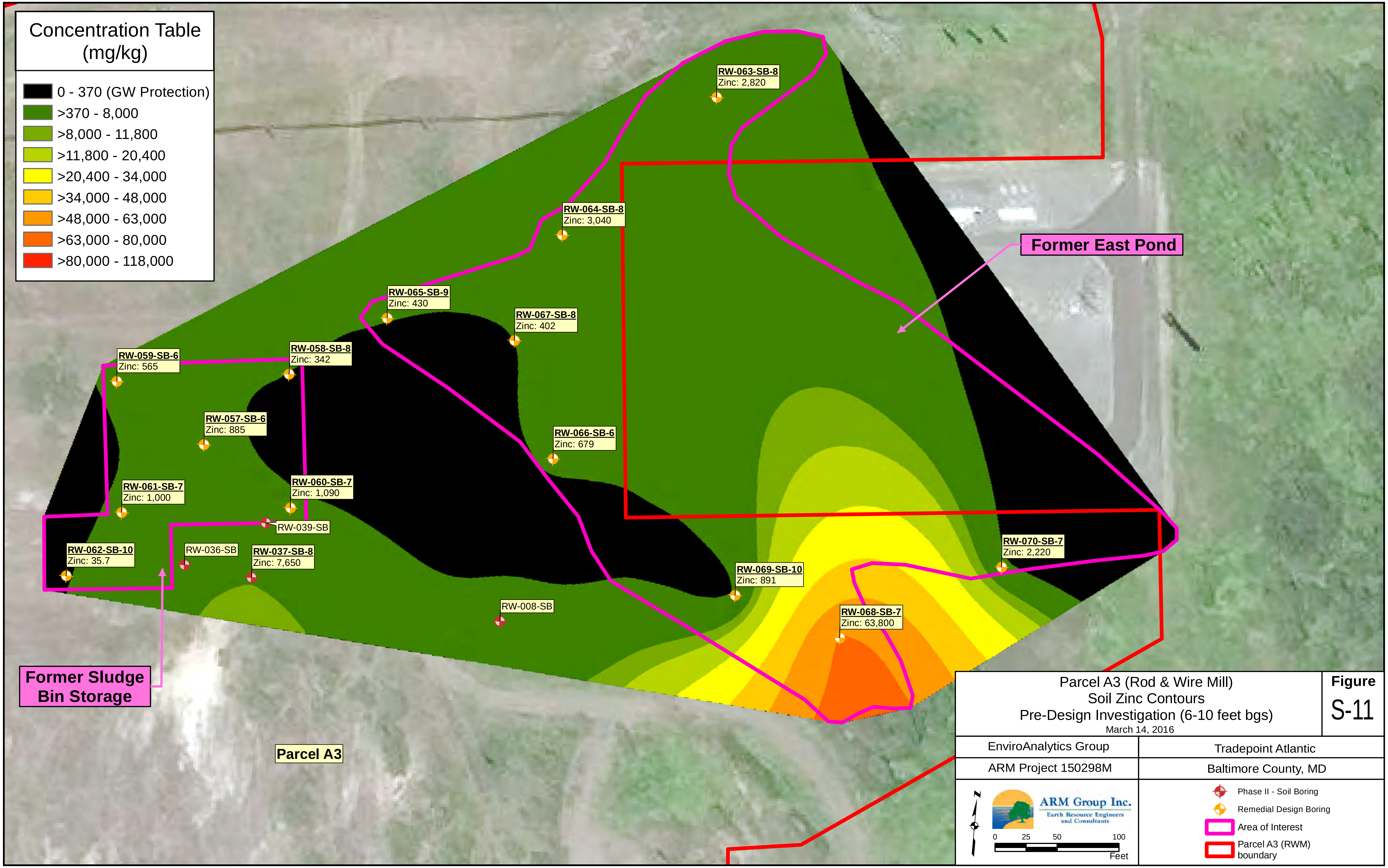
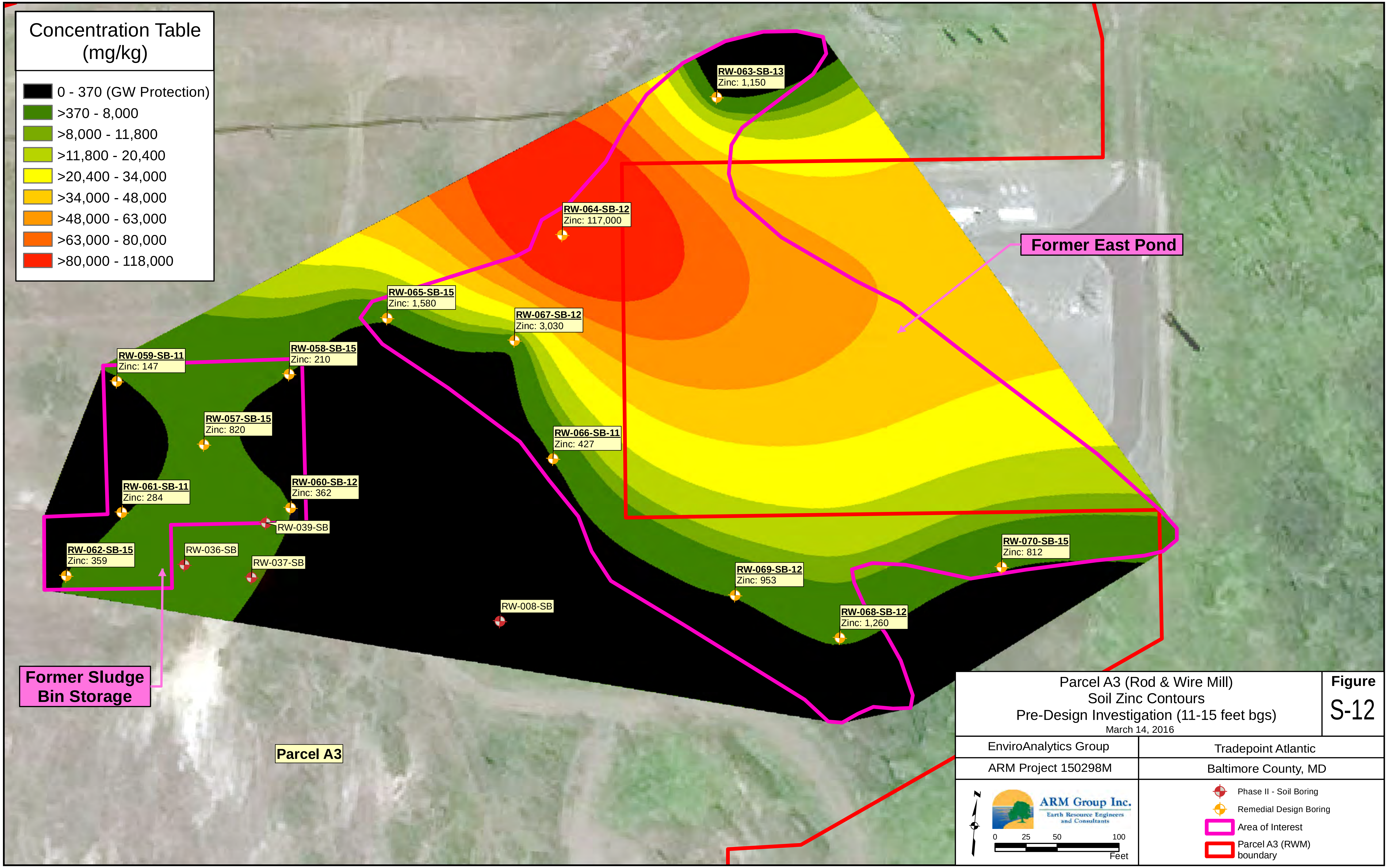


Parcel A3 (Rod & Wire Mill)
Soil Zinc Contours
Pre-Design Investigation (6-10 feet bgs)
March 14, 2016

Figure
S-11

EnviroAnalytics Group	Tradepoint Atlantic
ARM Project 150298M	Baltimore County, MD

ARM Group Inc.
Earth Resource Engineers and Consultants



Parcel A3 (Rod & Wire Mill)
Soil Zinc Contours
Pre-Design Investigation (11-15 feet bgs)
March 14, 2016

Figure
S-12

EnviroAnalytics Group	Tradepoint Atlantic
ARM Project 150298M	Baltimore County, MD

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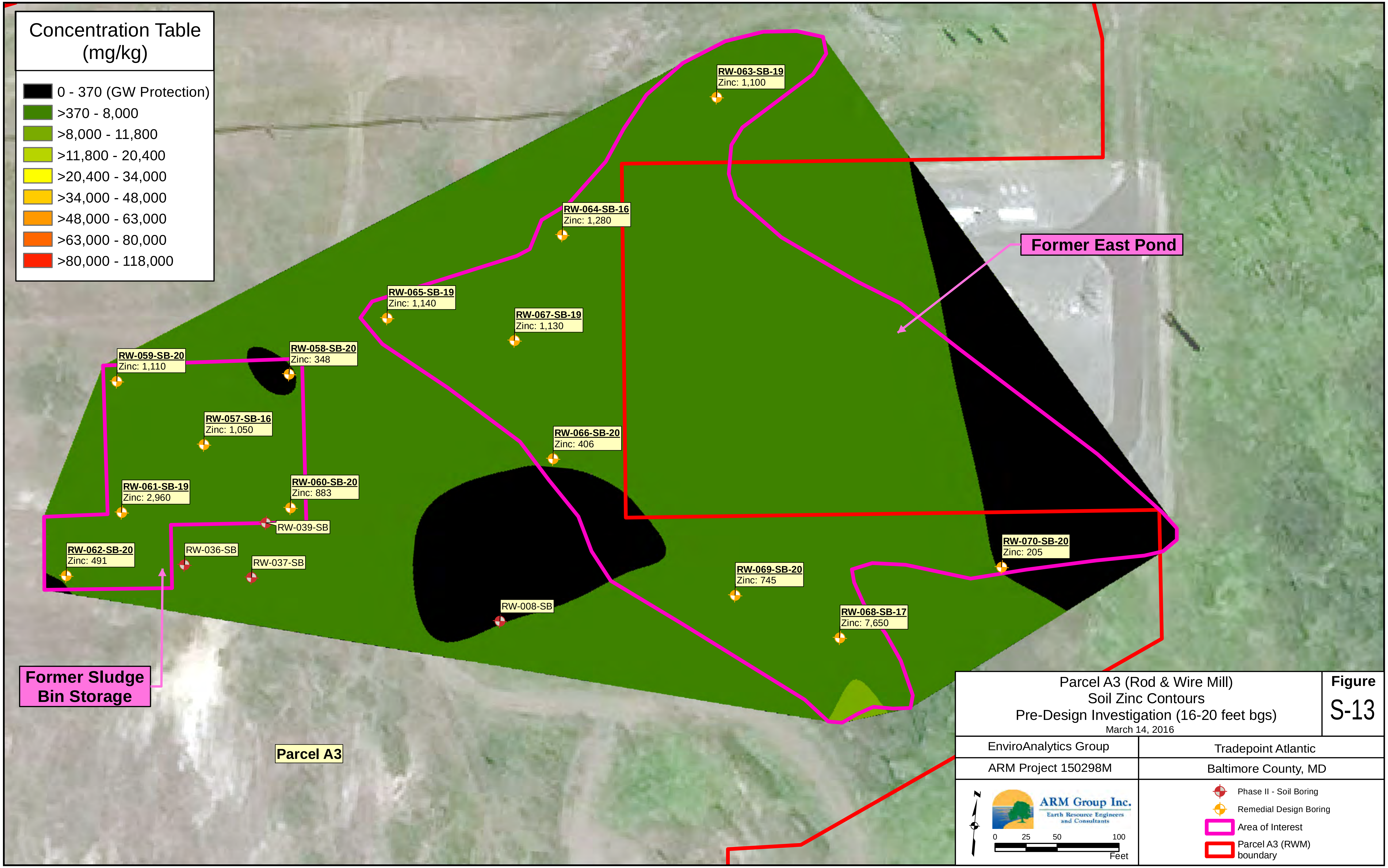
Earth Resource Engineers and Consultants



Concentration Table (mg/kg)

■	0 - 370 (GW Protection)
🟩	>370 - 8,000
🟩	>8,000 - 11,800
🟨	>11,800 - 20,400
🟨	>20,400 - 34,000
🟧	>34,000 - 48,000
🟧	>48,000 - 63,000
🟧	>63,000 - 80,000
🟥	>80,000 - 118,000

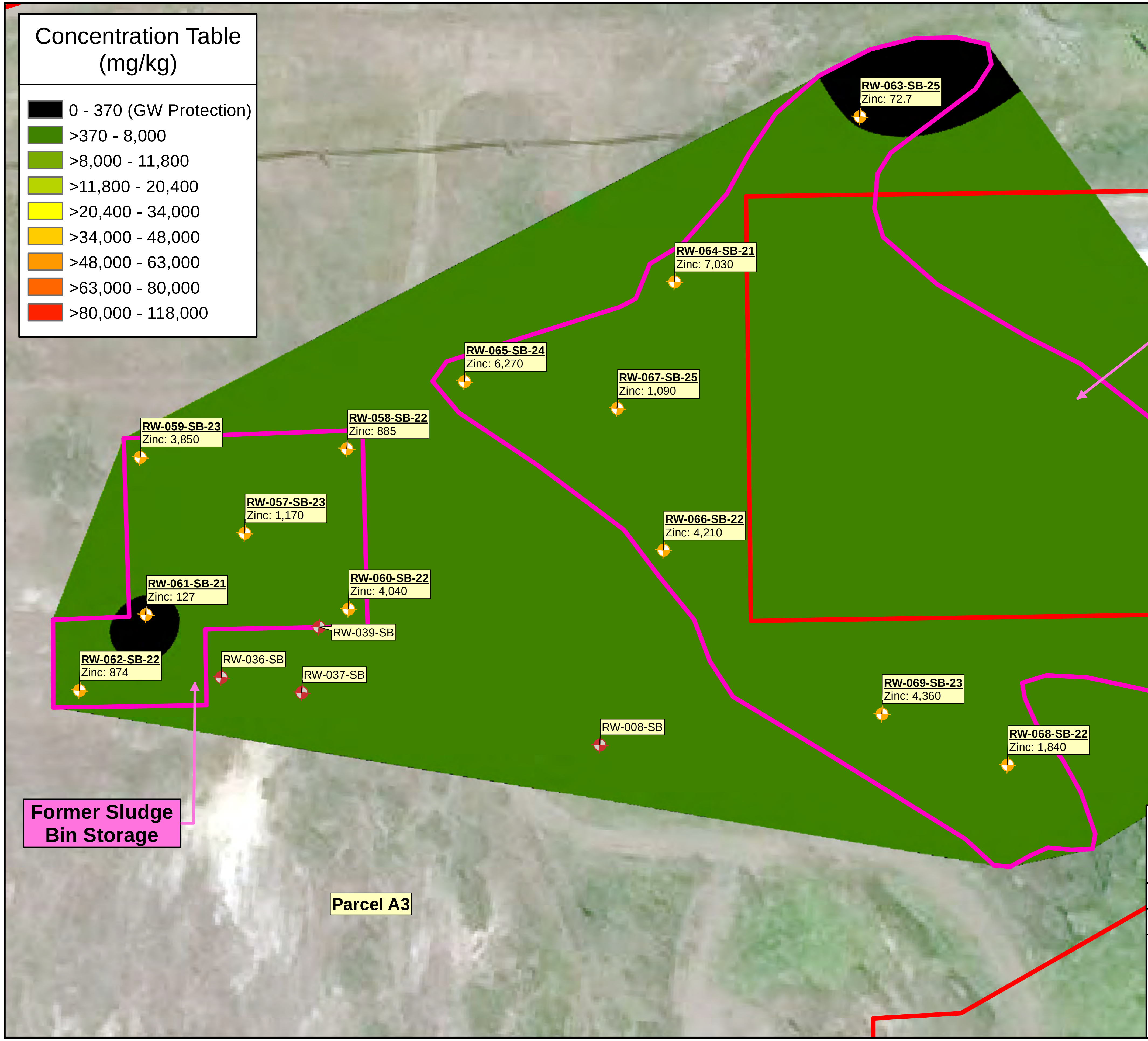
Parcel A3 (Rod & Wire Mill)
Soil Zinc Contours
Pre-Design Investigation (16-20 feet bgs)
March 14, 2016

Figure
S-13

EnviroAnalytics Group	Tradepoint Atlantic
ARM Project 150298M	Baltimore County, MD

ARM Group Inc.
Earth Resource Engineers and Consultants

⊕ Phase II - Soil Boring
⊕ Remedial Design Boring
▭ Area of Interest
▭ Parcel A3 (RWM) boundary



Parcel A3 (Rod & Wire Mill)
Soil Zinc Contours
Pre-Design Investigation (21-25 feet bgs)
March 14, 2016

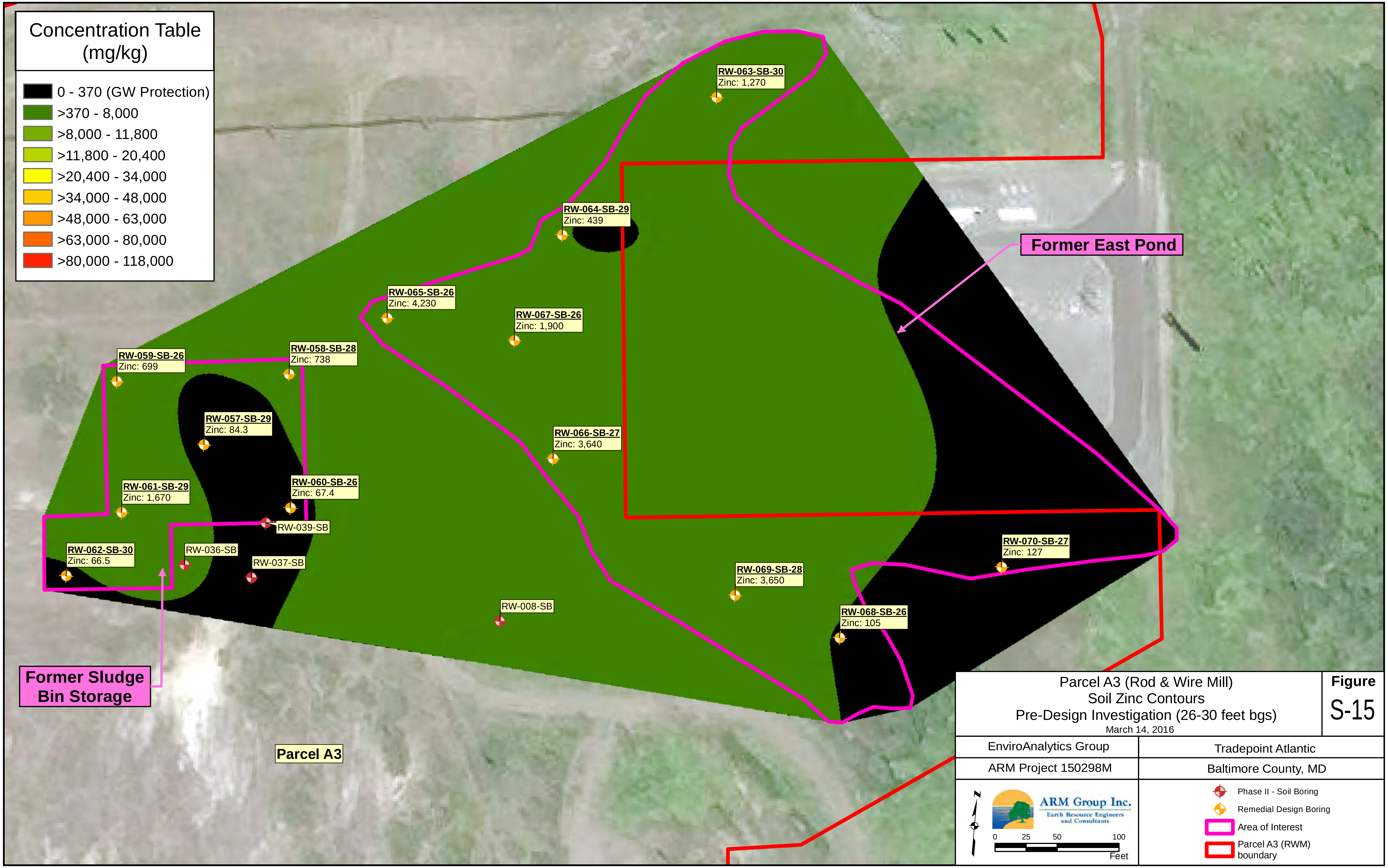
Figure
S-14

EnviroAnalytics Group
ARM Project 150298M

Tradepoint Atlantic
Baltimore County, MD

ARM Group Inc.
Earth Resource Engineers and Consultants

Phase II - Soil Boring
Remedial Design Boring
Area of Interest
Parcel A3 (RWM) boundary



Concentration Table (mg/kg)

⬛	0 - 370 (GW Protection)
🟩	>370 - 8,000
🟩	>8,000 - 11,800
🟨	>11,800 - 20,400
🟨	>20,400 - 34,000
🟧	>34,000 - 48,000
🟧	>48,000 - 63,000
🟧	>63,000 - 80,000
🟥	>80,000 - 118,000

Parcel A3 (Rod & Wire Mill)
Soil Zinc Contours
Pre-Design Investigation (26-30 feet bgs)

March 14, 2016

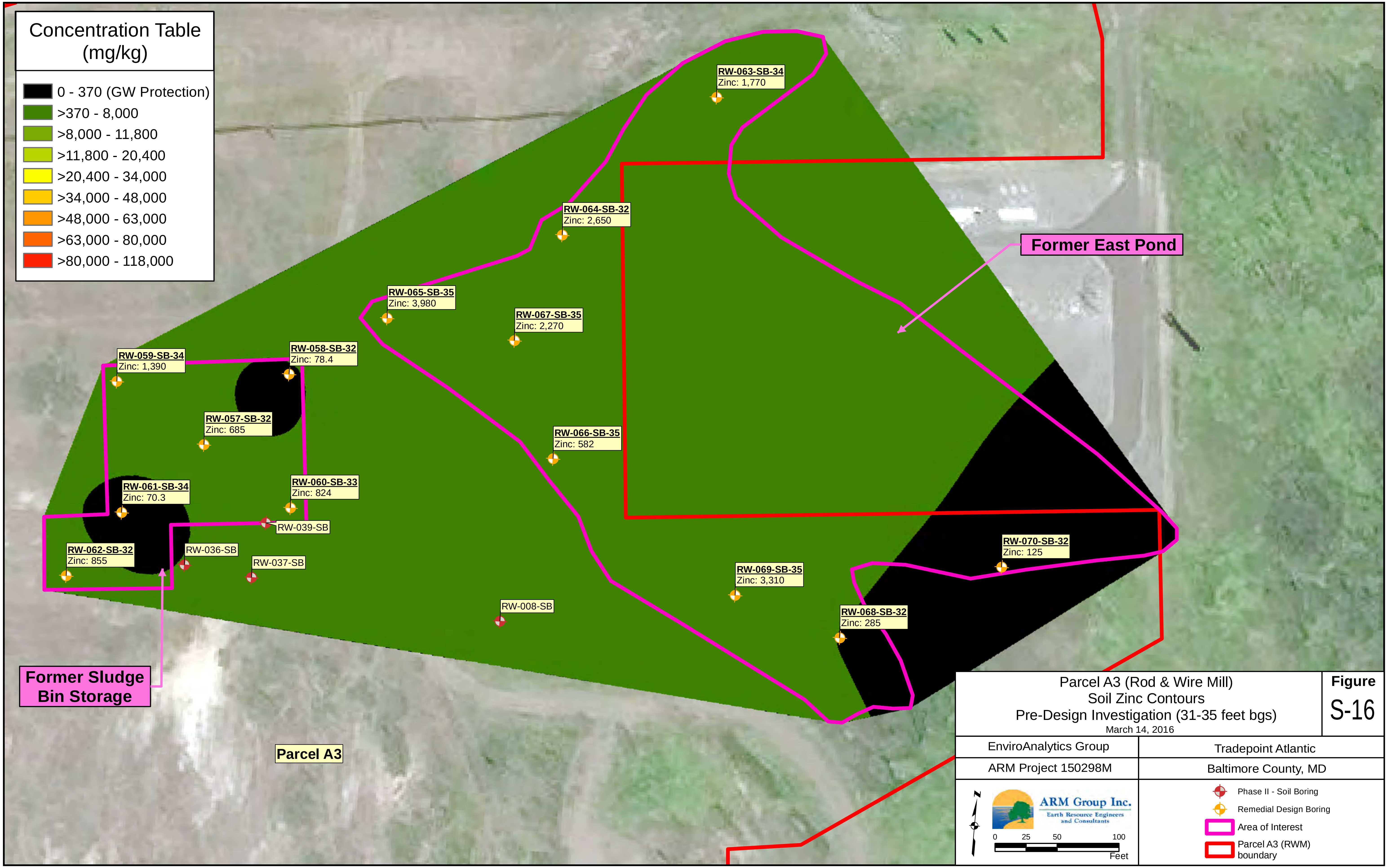
Figure

S-15

EnviroAnalytics Group	Tradepoint Atlantic
ARM Project 150298M	Baltimore County, MD

ARM Group Inc.
Earth Resource Engineers and Consultants

- Phase II - Soil Boring
- Remedial Design Boring
- Area of Interest
- Parcel A3 (RWM) boundary



Concentration Table (mg/kg)

⬛	0 - 370 (GW Protection)
🟩	>370 - 8,000
🟩	>8,000 - 11,800
🟨	>11,800 - 20,400
🟨	>20,400 - 34,000
🟧	>34,000 - 48,000
🟧	>48,000 - 63,000
🟧	>63,000 - 80,000
🟥	>80,000 - 118,000

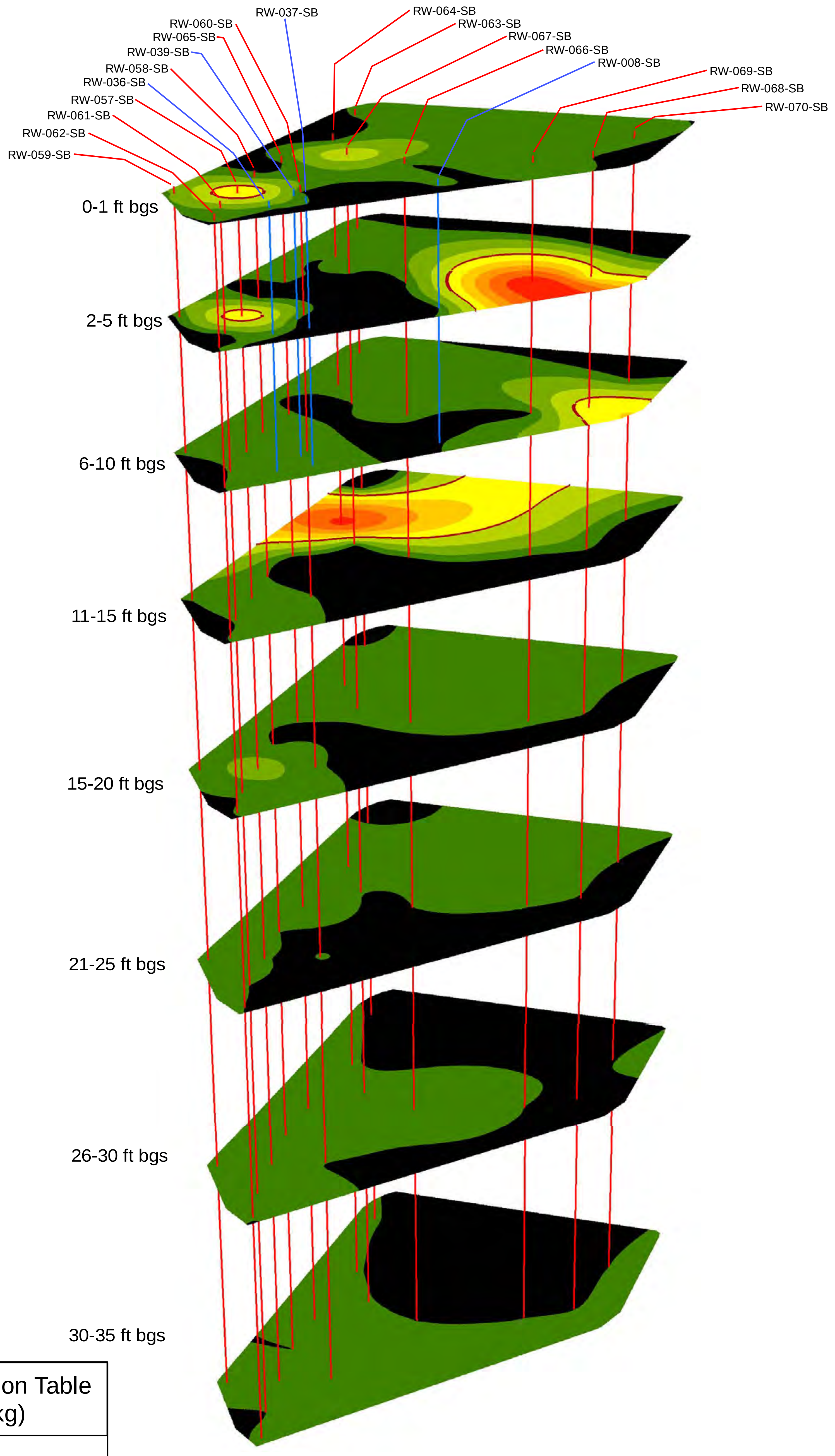
Parcel A3 (Rod & Wire Mill)
Soil Zinc Contours
Pre-Design Investigation (31-35 feet bgs)
March 14, 2016

Figure
S-16

EnviroAnalytics Group	Tradepoint Atlantic
ARM Project 150298M	Baltimore County, MD

ARM Group Inc.
Earth Resource Engineers and Consultants

- Phase II - Soil Boring
- Remedial Design Boring
- Area of Interest
- Parcel A3 (RWM) boundary



Concentration Table (mg/kg)

⬛	ND - 0.38 (GW Protection)
🟩	>0.38 - 200
🟩	>200 - 550
🟩	>550 - 980 (PAL)
🟨	>980 - 1,400
🟨	>1,400 - 1,900
🟧	>1,900 - 2,400
🟧	>2,400 - 3,000
🟥	>3,000 - 3,600

Parcel A3 (Rod & Wire Mill)
Soil Cadmium Contours (mg/kg)
Pre-Design Investigation (All Depths)
March 15, 2016

Figure
6

EnviroAnalytics Group	Tradepoint Atlantic
ARM Project 150298M	Baltimore County, MD

N

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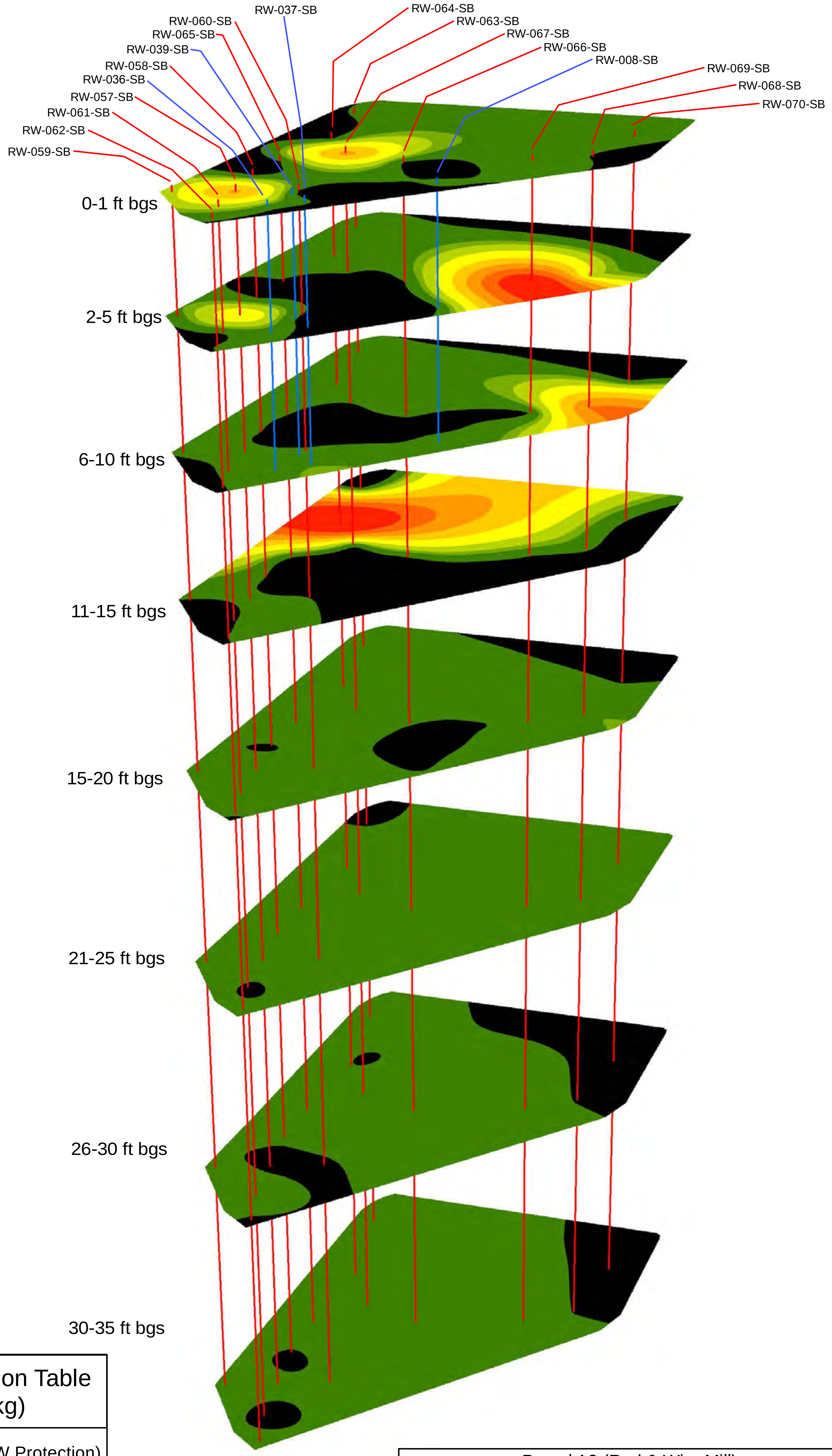
● Phase II - Soil Boring
● Remedial Design Boring
▭ PAL Indicator Line



Concentration Table (mg/kg)

⬛	0 - 370 (GW Protection)
🟩	>370 - 8,000
🟩	>8,000 - 11,800
🟩	>11,800 - 20,400
🟨	>20,400 - 34,000
🟨	>34,000 - 48,000
🟧	>48,000 - 63,000
🟧	>63,000 - 80,000
🟥	>80,000 - 118,000

Parcel A3 (Rod & Wire Mill)
Soil Zinc Contours (mg/kg)
Pre-Design Investigation (All Depths)
March 15, 2016

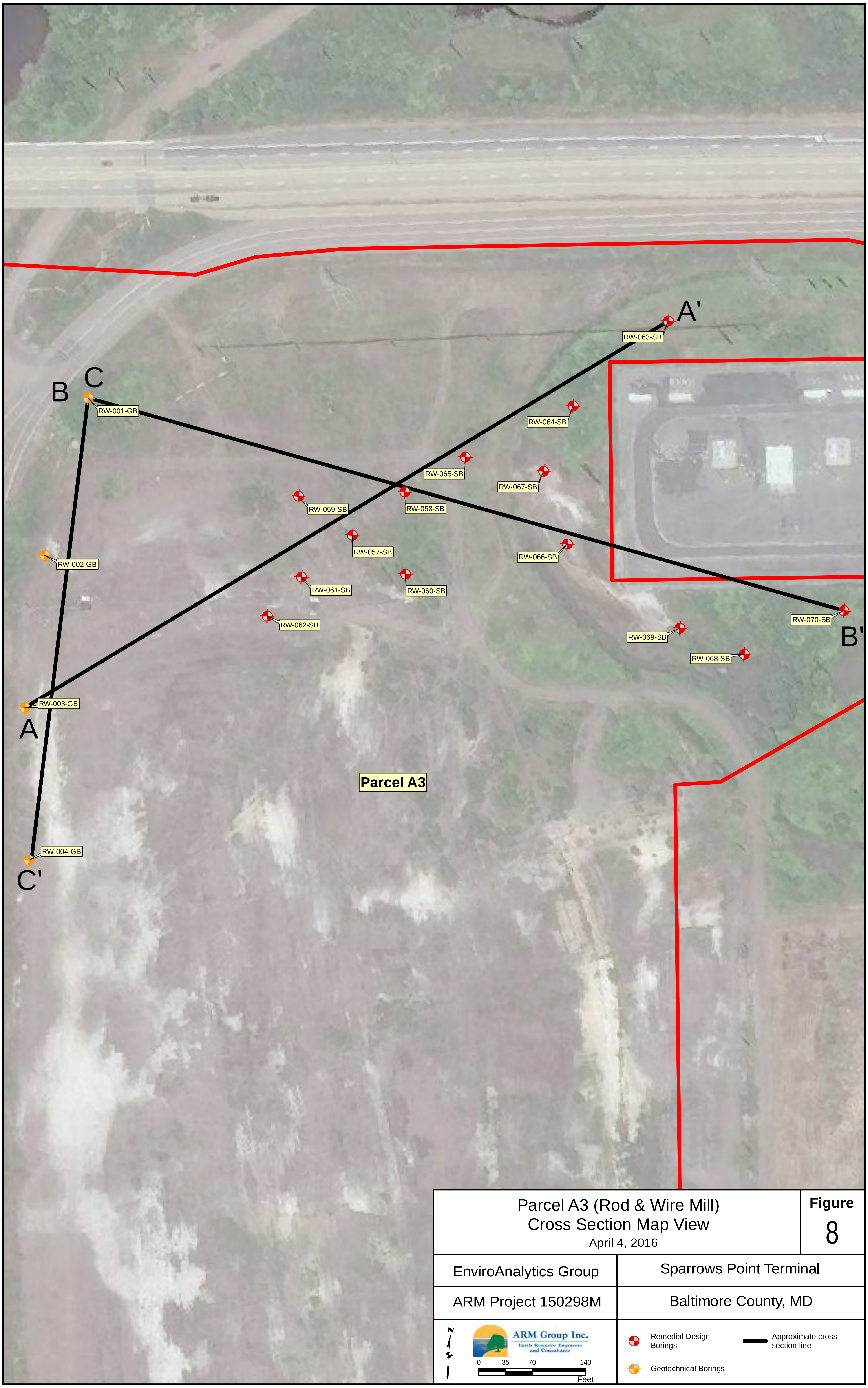
Figure
7

EnviroAnalytics Group	Tradepoint Atlantic
ARM Project 150298M	Baltimore County, MD

N

ARM Group Inc.
Earth Resource Engineers and Consultants

● Phase II - Soil Boring
● Remedial Design Boring



Parcel A3 (Rod & Wire Mill)
Cross Section Map View

April 4, 2016

Figure

8

EnviroAnalytics Group

Sparrows Point Terminal

ARM Project 150298M

Baltimore County, MD

ARM Group Inc.
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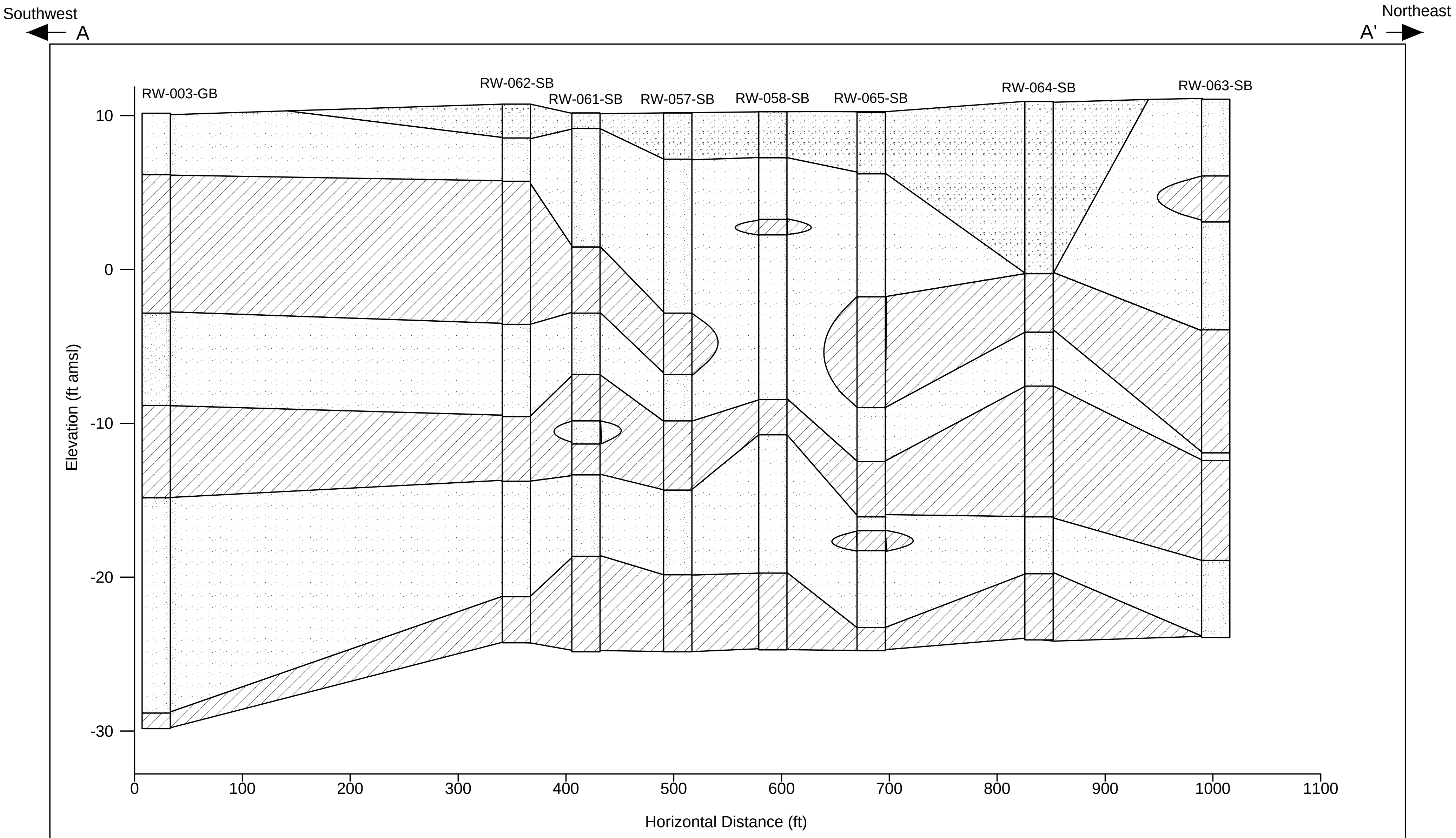
🞧 Remedial Design Borings	▬ Approximate cross-section line
🞧 Geotechnical Borings	



Parcel A3 (Rod & Wire Mill)
Cross Section

Tradepoint Atlantic
Baltimore County, MD

ARM Group Inc.
Earth Resource Engineers
and Consultants

Cross Section A-A'

EnviroAnalytics Group

ARM Project 150298M
March 2016

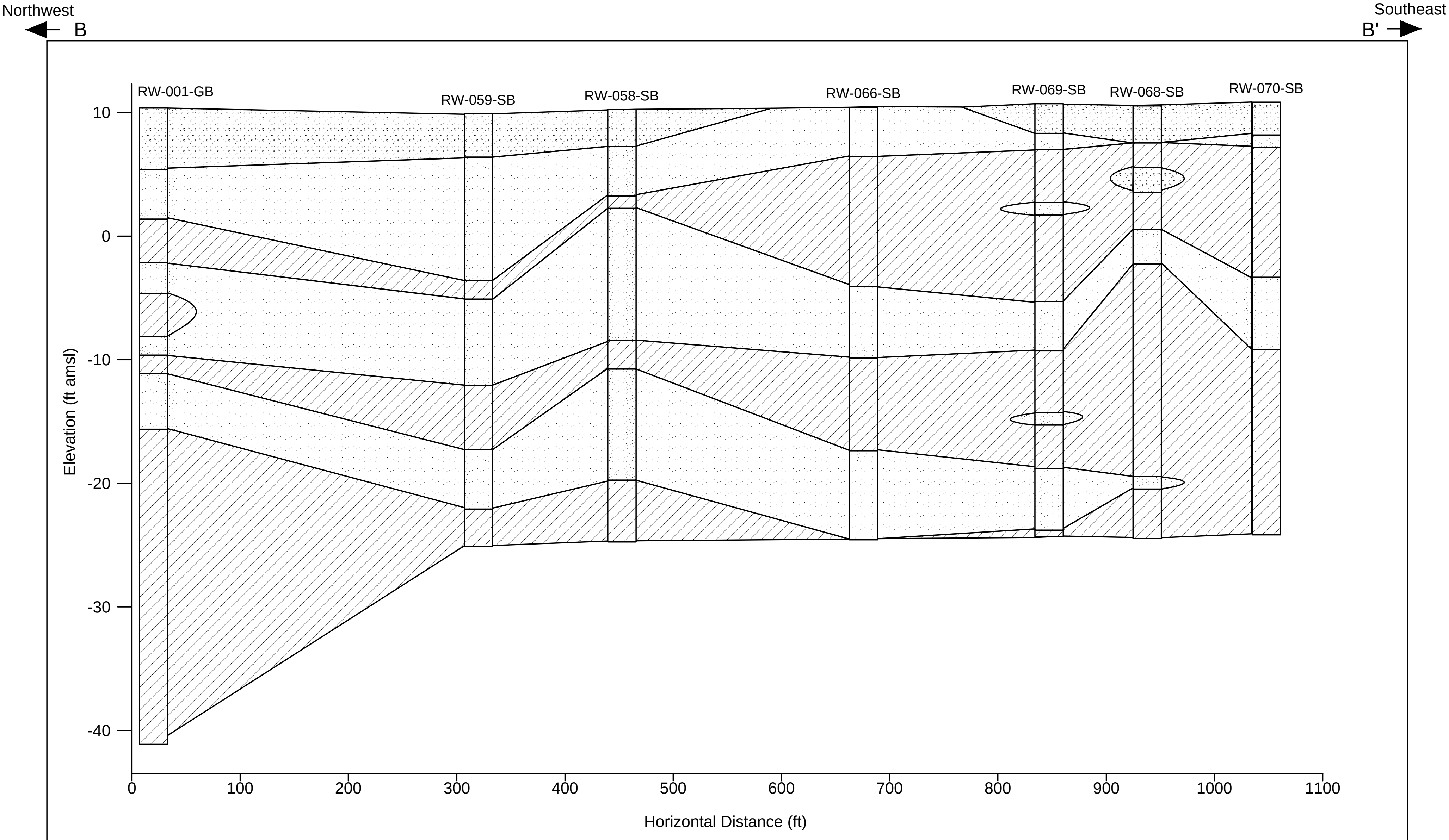
LEGEND

▩ Gravel/Slag

░ Sand

▨ Clay

Note: amsl = above mean sea level
Cross-section is vertically exaggerated approximately 14:1



Parcel A3 (Rod & Wire Mill)
Cross Section

Tradepoint Atlantic
Baltimore County, MD

ARM Group Inc.
Earth Resource Engineers
and Consultants

Cross Section B-B'

EnviroAnalytics Group

ARM Project 150298M
March 2016

LEGEND

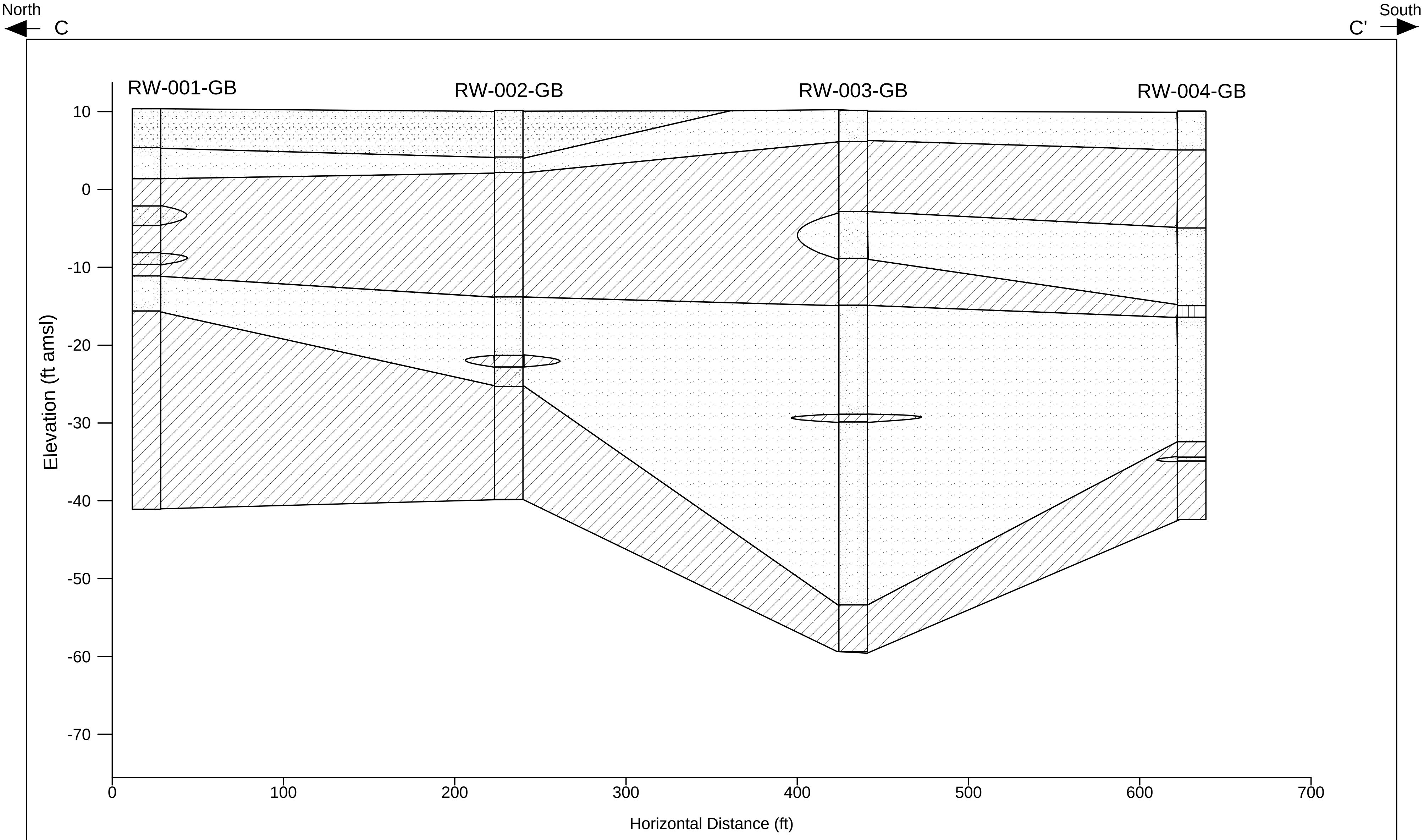
▩ Gravel/Slag

░ Sand

▨ Clay

Note: amsl = above mean sea level
Cross-section is vertically exaggerated approximately 11:1

P:\EnviroAnalytics Group\150298M EAG_Sparrows Point Area A\Documents\Parcel A3 (RWM)\Boring Logs\B-B'.cro



Parcel A3 (Rod & Wire Mill)
Cross Section

Tradepoint Atlantic
Baltimore County, MD

ARM Group Inc.
Earth Resource Engineers
and Consultants

Cross Section C-C'

EnviroAnalytics Group

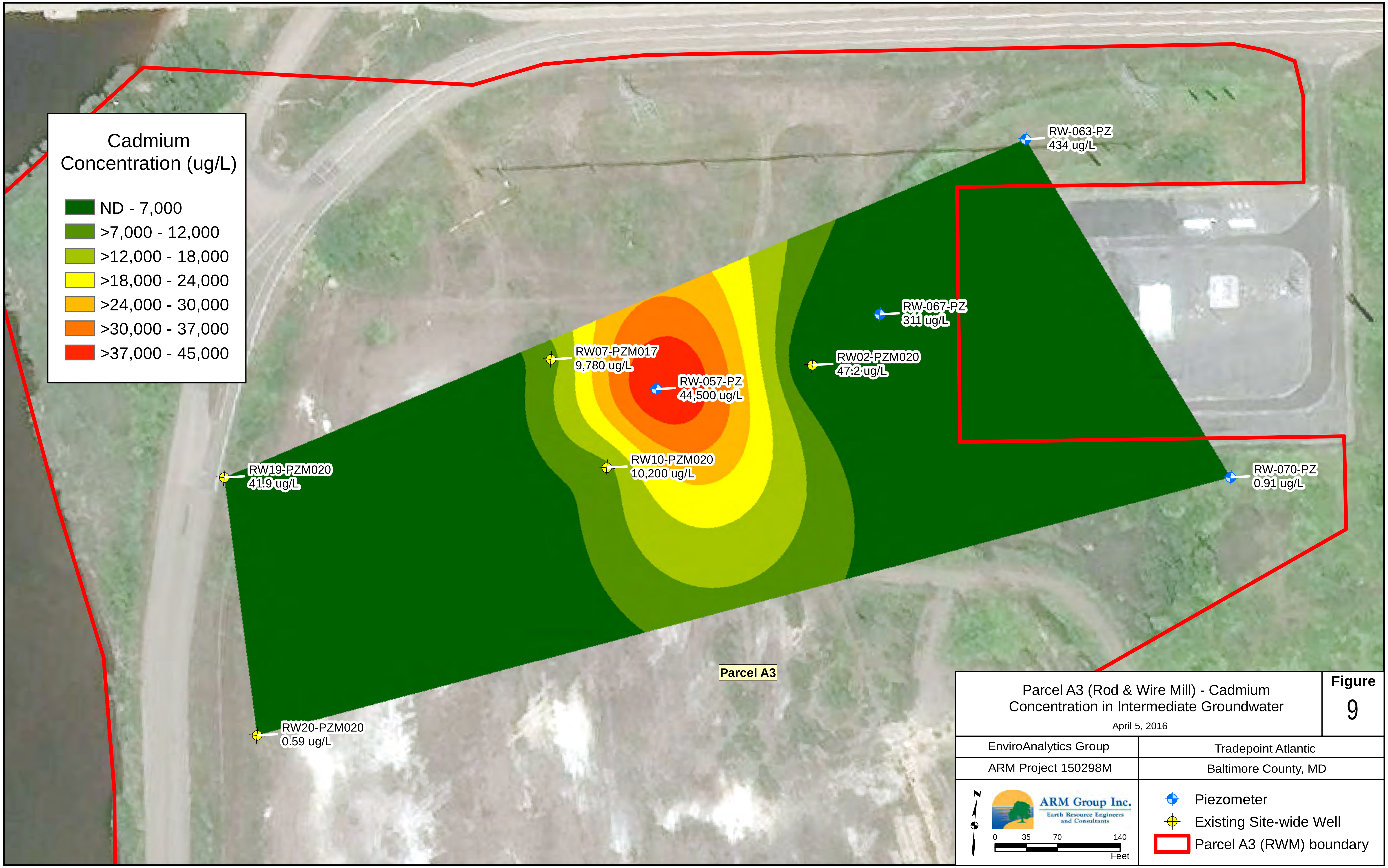
ARM Project 150298M
March 2016

LEGEND

▒	Gravel/Slag
░	Sand
▨	Clay

amsl = above mean sea level
Cross-section is vertically exaggerated

P:\EnviroAnalytics Group\150298M EAG_Sparrows Point Area A\Documents\Parcel A3 (RWM)\Boring Logs\C-C'.cro



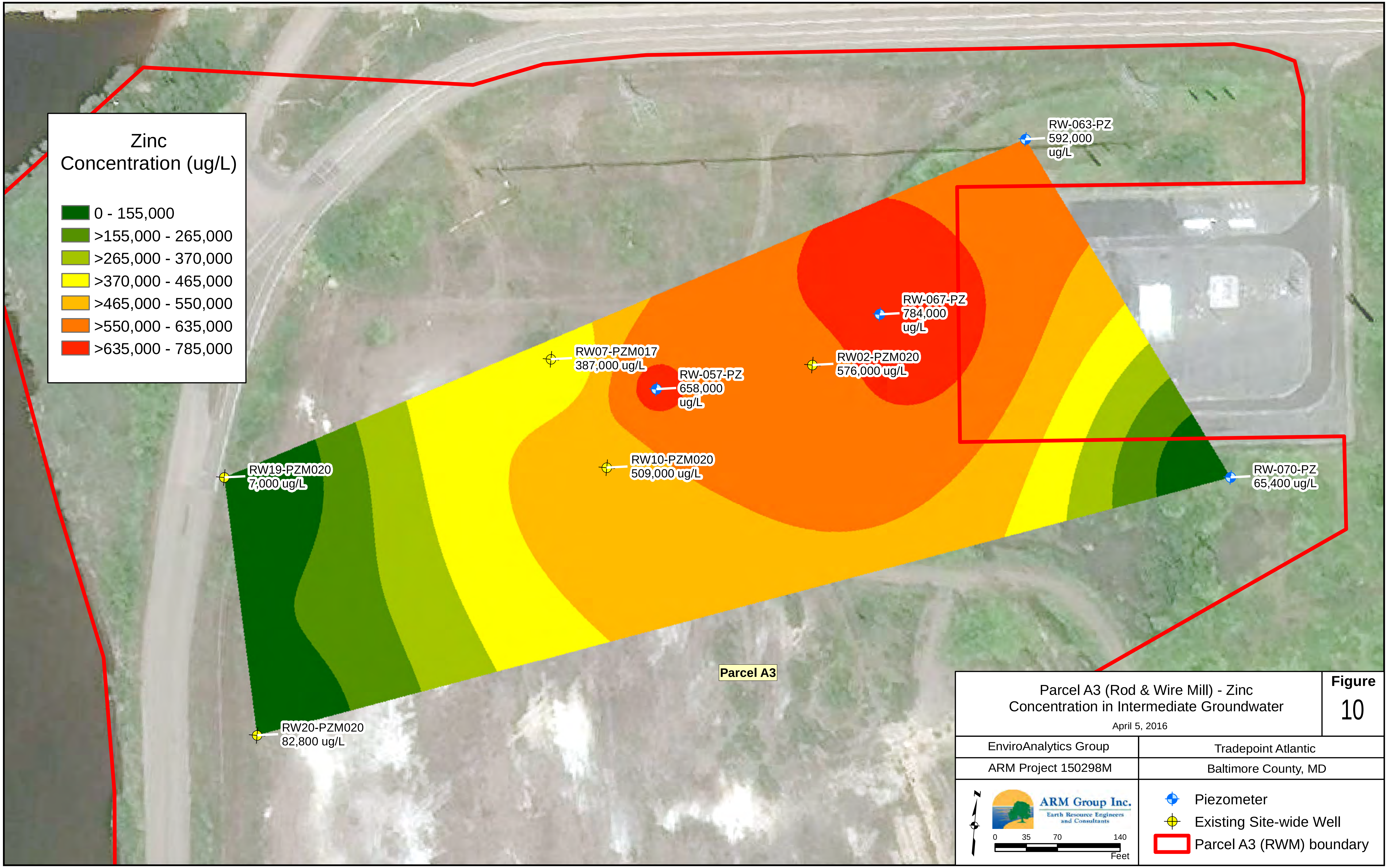
Parcel A3 (Rod & Wire Mill) - Cadmium Concentration in Intermediate Groundwater

April 5, 2016

Figure

9

EnviroAnalytics Group	Tradepoint Atlantic
ARM Project 150298M	Baltimore County, MD



Parcel A3 (Rod & Wire Mill) - Zinc
Concentration in Intermediate Groundwater

April 5, 2016

Figure
10

EnviroAnalytics Group	Tradepoint Atlantic
ARM Project 150298M	Baltimore County, MD

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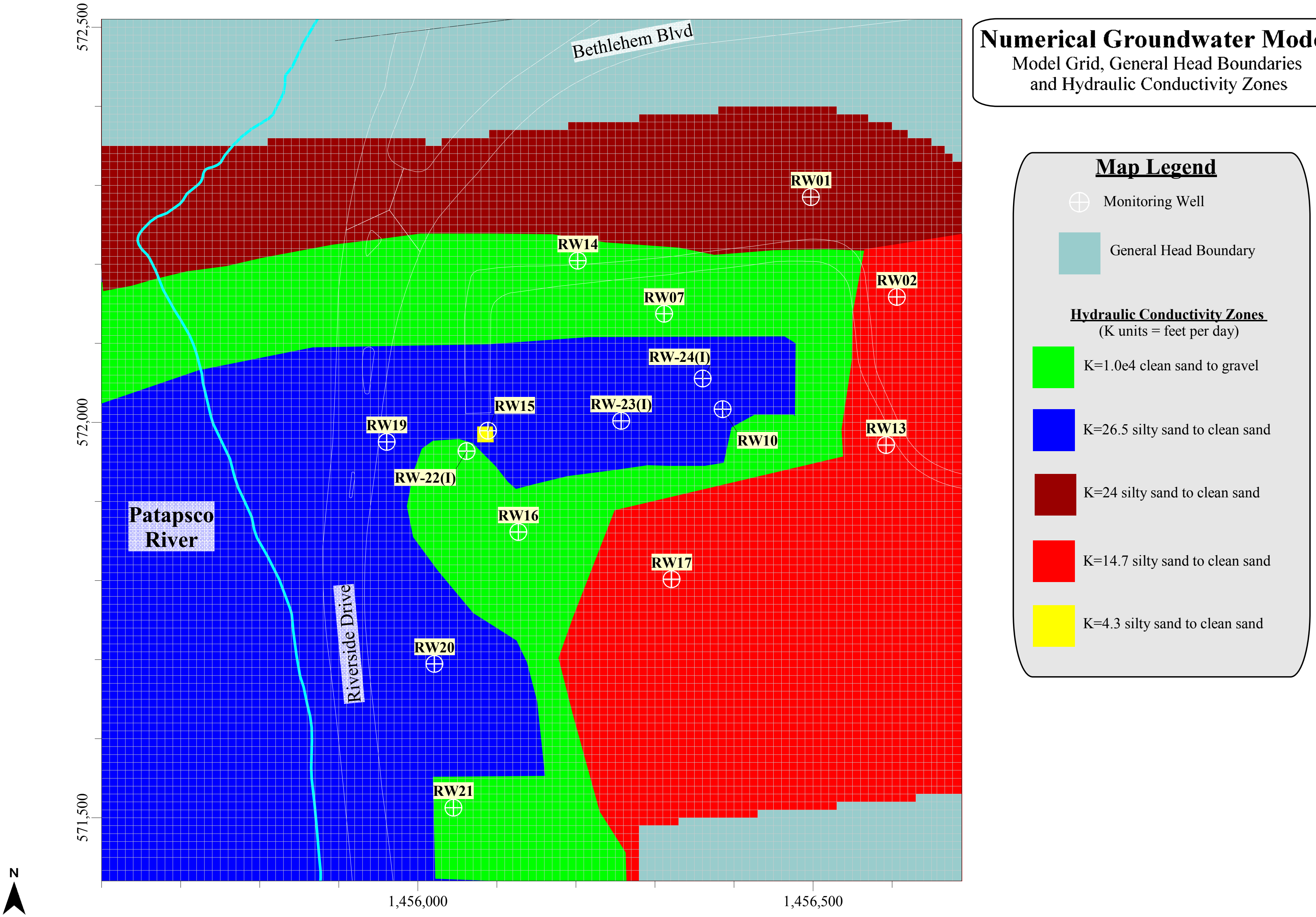
Numerical Groundwater Model

Model Grid, General Head Boundaries
and Hydraulic Conductivity Zones



0 200 400
Feet
MD State Plane Coordinates
NAD 1983

ARM Group Inc.
Earth Resource Engineers
and Consultants

Numerical Groundwater Model

Pre-Design Investigation
Rod and Wire Mill Source Area
Characterization Report

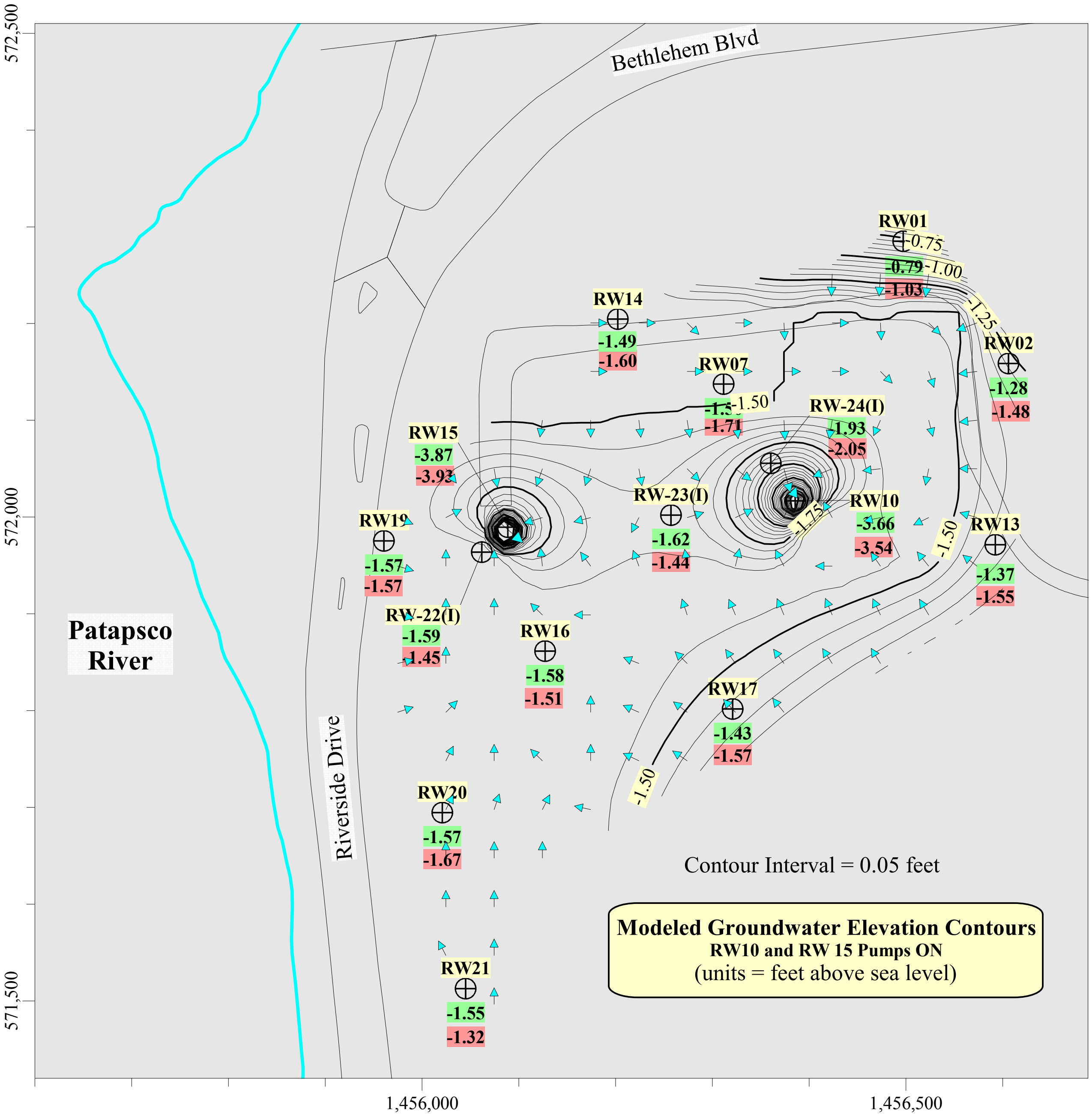
April 2016

150298

Figure
11

Numerical Groundwater Model
RW10 and RW15 ON
Calibrated Results

Groundwater Elevation Contours
Posted Measured and Calibrated Water Elevations



Map Legend

RW01

-0.79 ← modeled groundwater elevation

-1.03 ← measured groundwater elevation

Monitoring Well
with posted modeled and measured groundwater elevations*

Groundwater Flow Vector
Flow direction indicated by arrow orientation
Flow magnitude indicated by arrow length

*All modeled groundwater elevations were within 0.25 feet of the measured values.

N

0 200 400
Feet
MD State Plane Coordinates
NAD 1983

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Numerical Groundwater Model

Pre-Design Investigation
Rod and Wire Mill Source Area
Characterization Report

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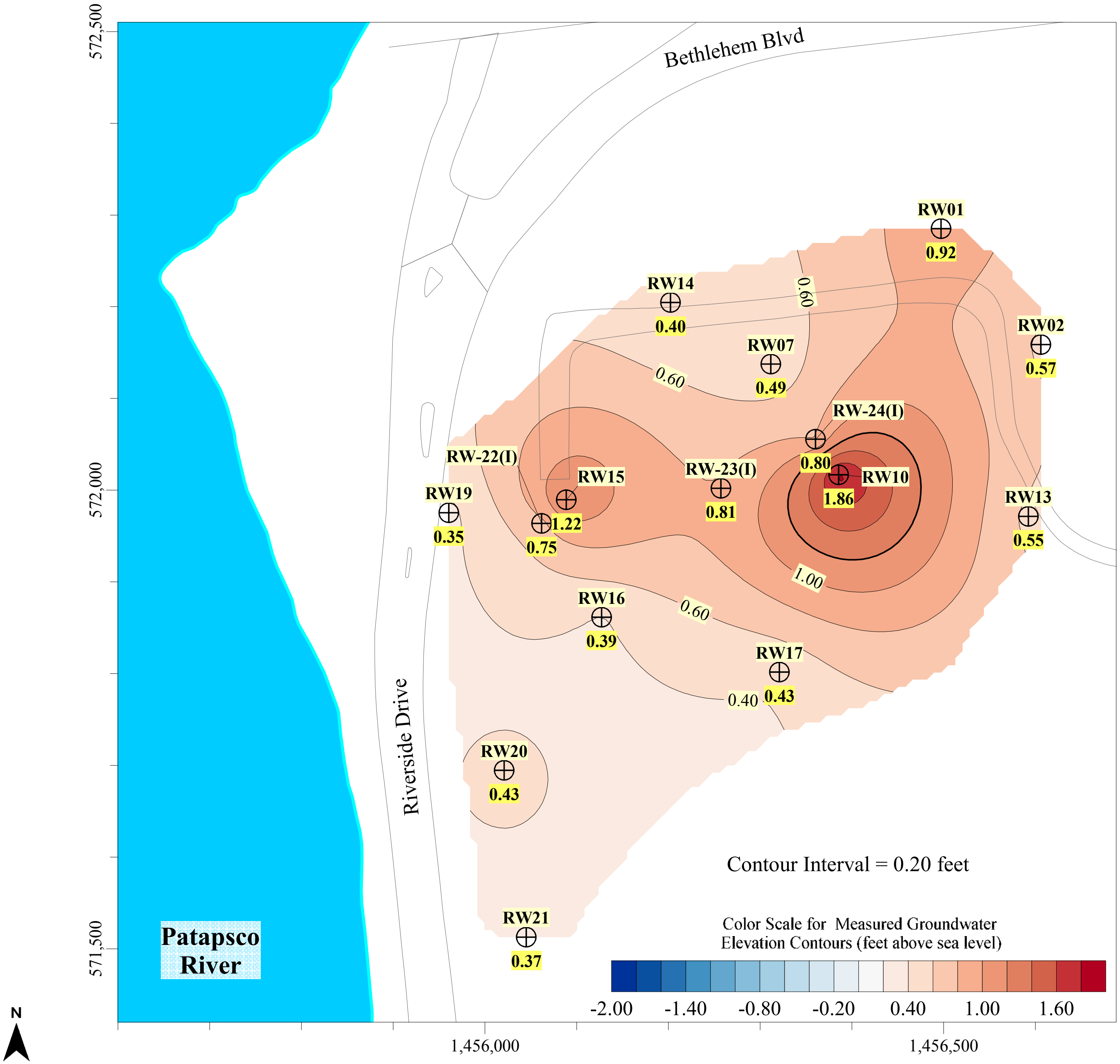
Figure
12

Measured Groundwater Elevation Contours

RW10 and RW15 Pump OFF
November 12 -17, 2015



Map Legend

Monitoring Well
with measured
groundwater elevation

RW01
⊕
2.06

measured groundwater elevation

Measured groundwater elevations taken during November 12 - 17, 2015 indicate groundwater mounding in the vicinity of RW10 and RW15 (both pumps OFF).

For the period November 12-17, 2015
Note groundwater mounding
in the vicinity of RW10 and RW15
(both pumps OFF).

0 200 400
Feet
MD State Plane Coordinates
NAD 1983

ARM Group Inc.
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Measured Groundwater Elevation Contours

Pre-Design Investigation
Rod and Wire Mill Source Area
Characterization Report

April 2016

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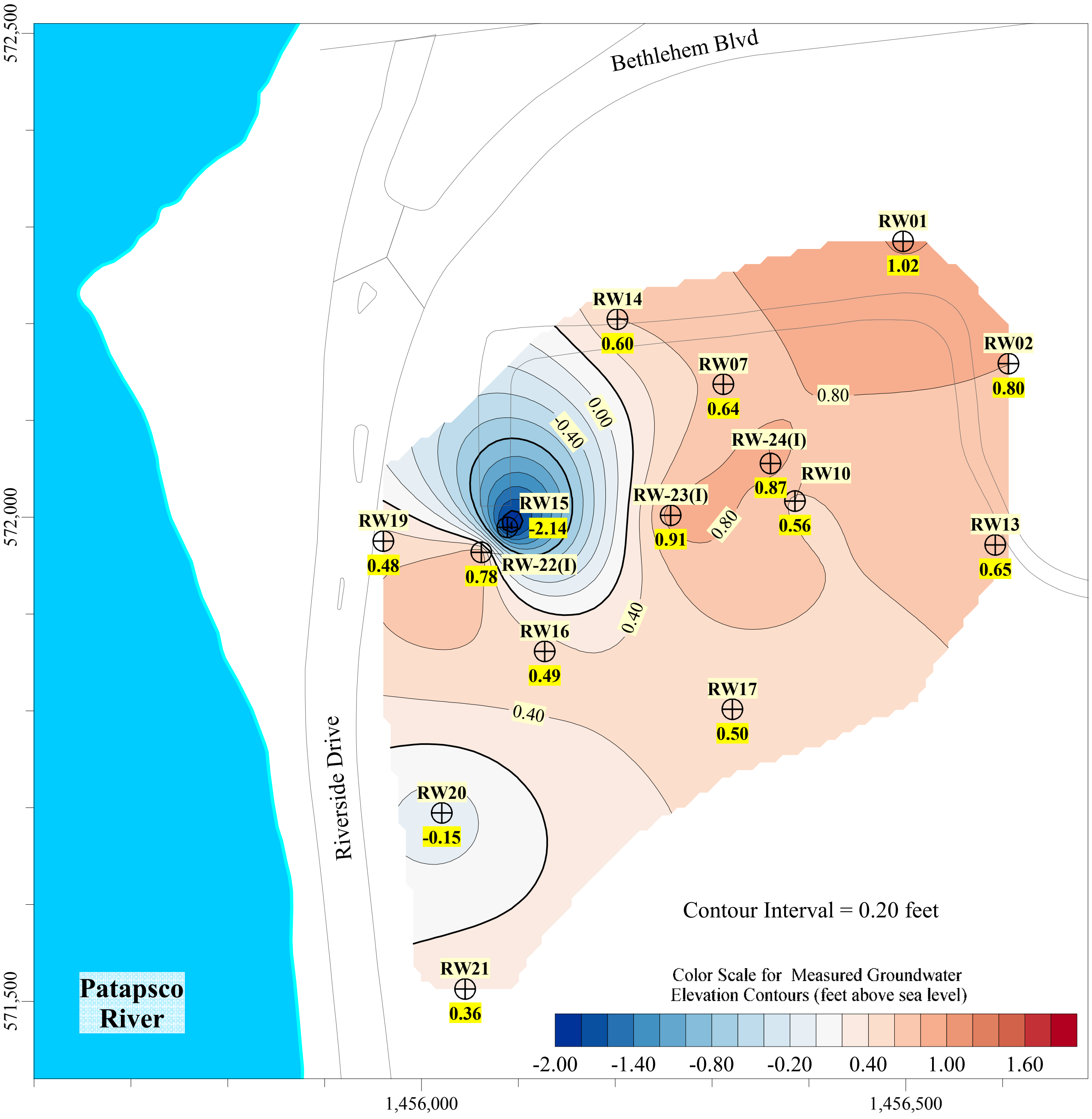
Figure
13

Measured Groundwater Elevation Contours

RW10 and RW15 Pump OFF
December 6 -9, 2015



Map Legend

Monitoring Well
with measured
groundwater elevation

RW01
⊕
2.06

measured groundwater elevation

Measured groundwater elevations taken during December 6 -9, 2015 indicate a groundwater depression in the vicinity of RW15 (both pumps OFF).

For the period December 6 -9, 2015, 2015

Note groundwater depression
in the vicinity of RW15 (both pumps OFF).

N

0 200 400
Feet
MD State Plane Coordinates
NAD 1983

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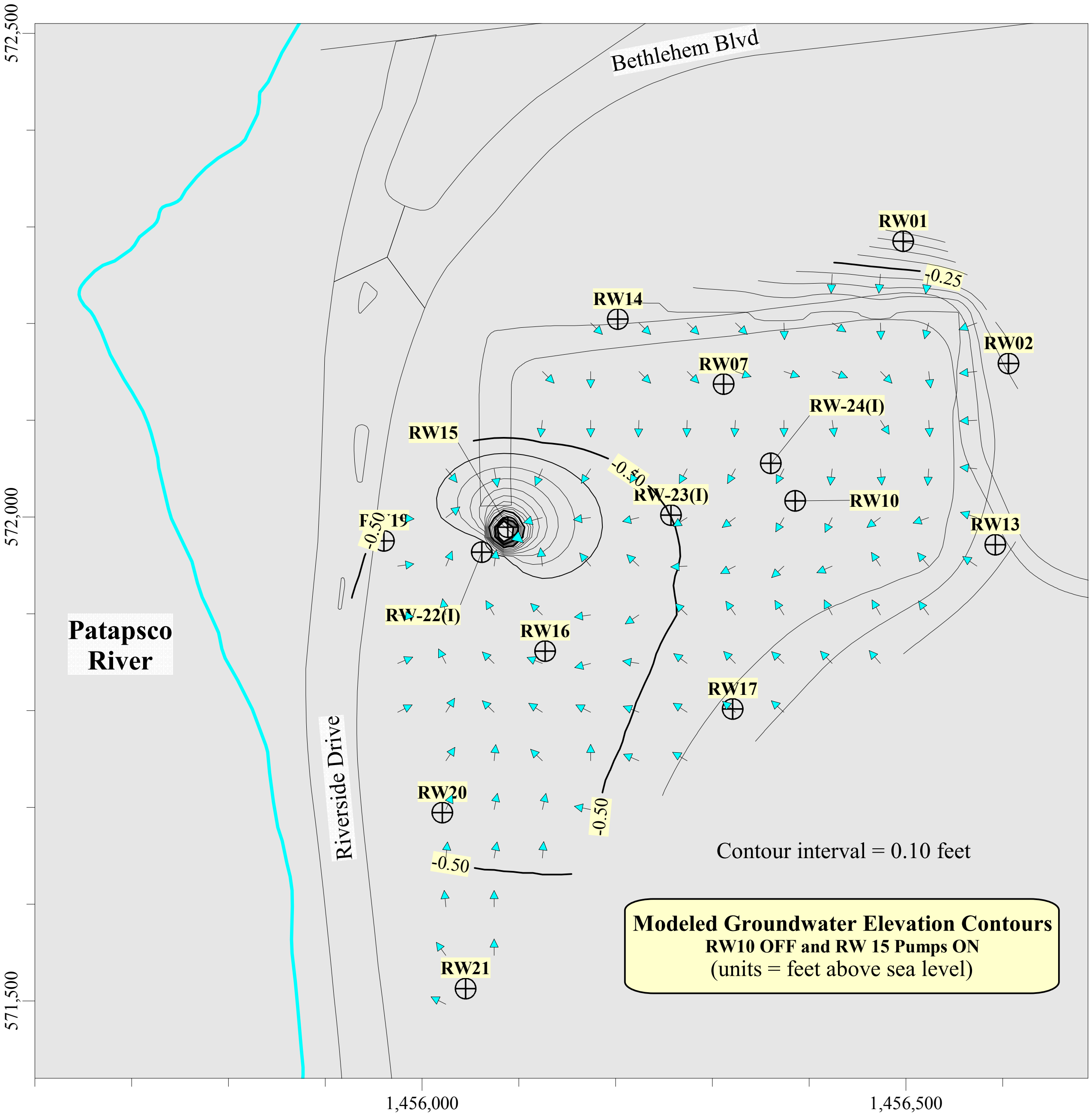
Measured Groundwater Elevation Contours

Pre-Design Investigation
Rod and Wire Mill Source Area
Characterization Report

April 2016

150298

Figure
14



Modeled Groundwater Elevation Contours
RW10 OFF and RW 15 Pumps ON
(units = feet above sea level)

Numerical Groundwater Model

RW10 OFF and RW15 ON

Modeled Groundwater Elevation Contours

Map Legend

RW01
Monitoring Well Location

Groundwater Flow Vector
Flow direction indicated by arrow orientation
Flow magnitude indicated by arrow length

N

0 200 400
Feet
MD State Plane Coordinates
NAD 1983

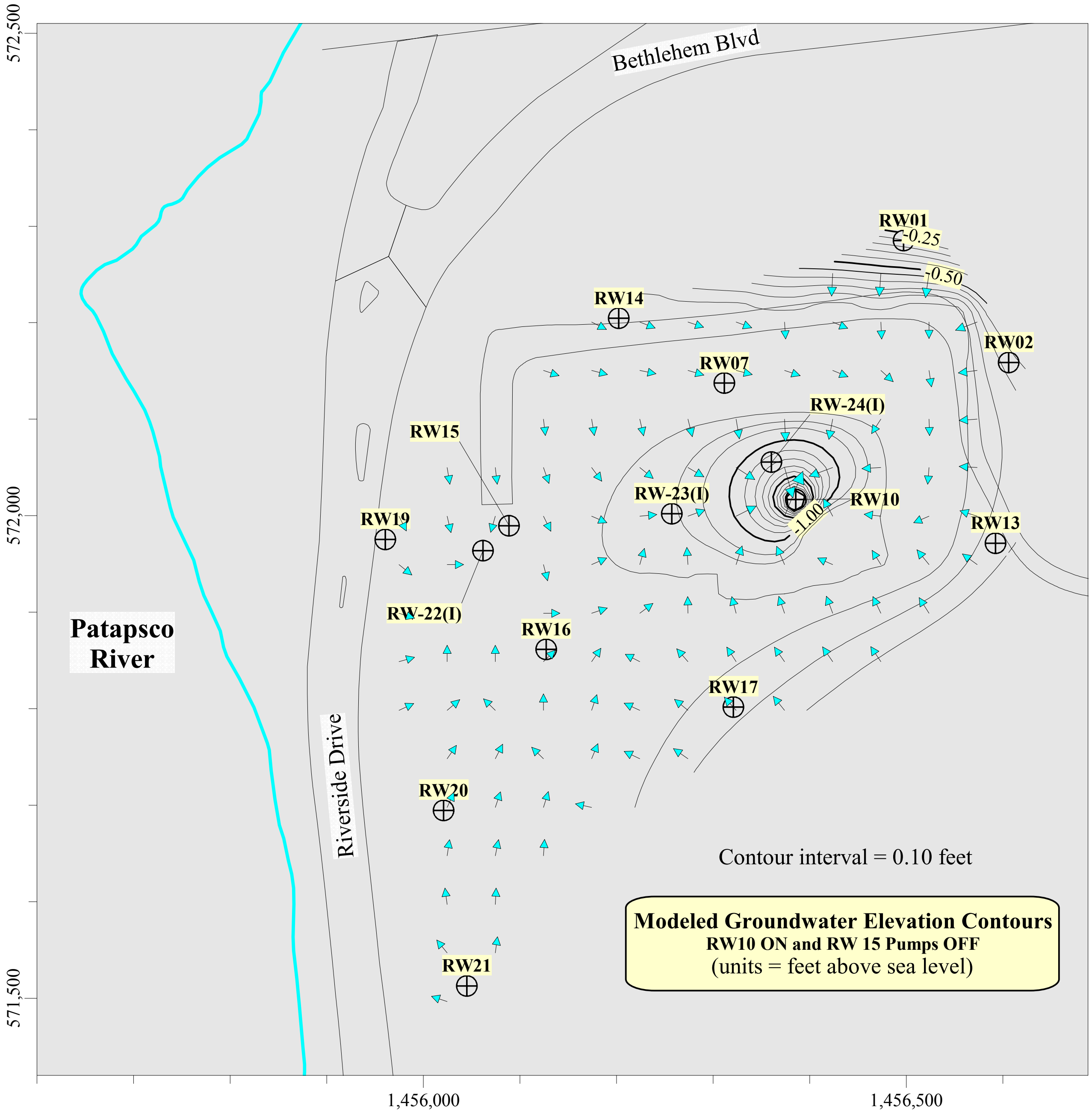
ARM Group Inc.
Earth Resource Engineers and Consultants

Numerical Groundwater Model Pre-Design Investigation Rod and Wire Mill Source Area Characterization Report	April 2016 150298	Figure 15

Numerical Groundwater Model

RW10 ON and RW15 OFF

Modeled Groundwater Elevation Contours



Map Legend

RW01
⊕
Monitoring Well Location

↑
Groundwater Flow Vector
Flow direction indicated by arrow orientation
Flow magnitude indicated by arrow length

N

0 200 400
Feet
MD State Plane Coordinates
NAD 1983

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Numerical Groundwater Model

Pre-Design Investigation
Rod and Wire Mill Source Area
Characterization Report

April 2016

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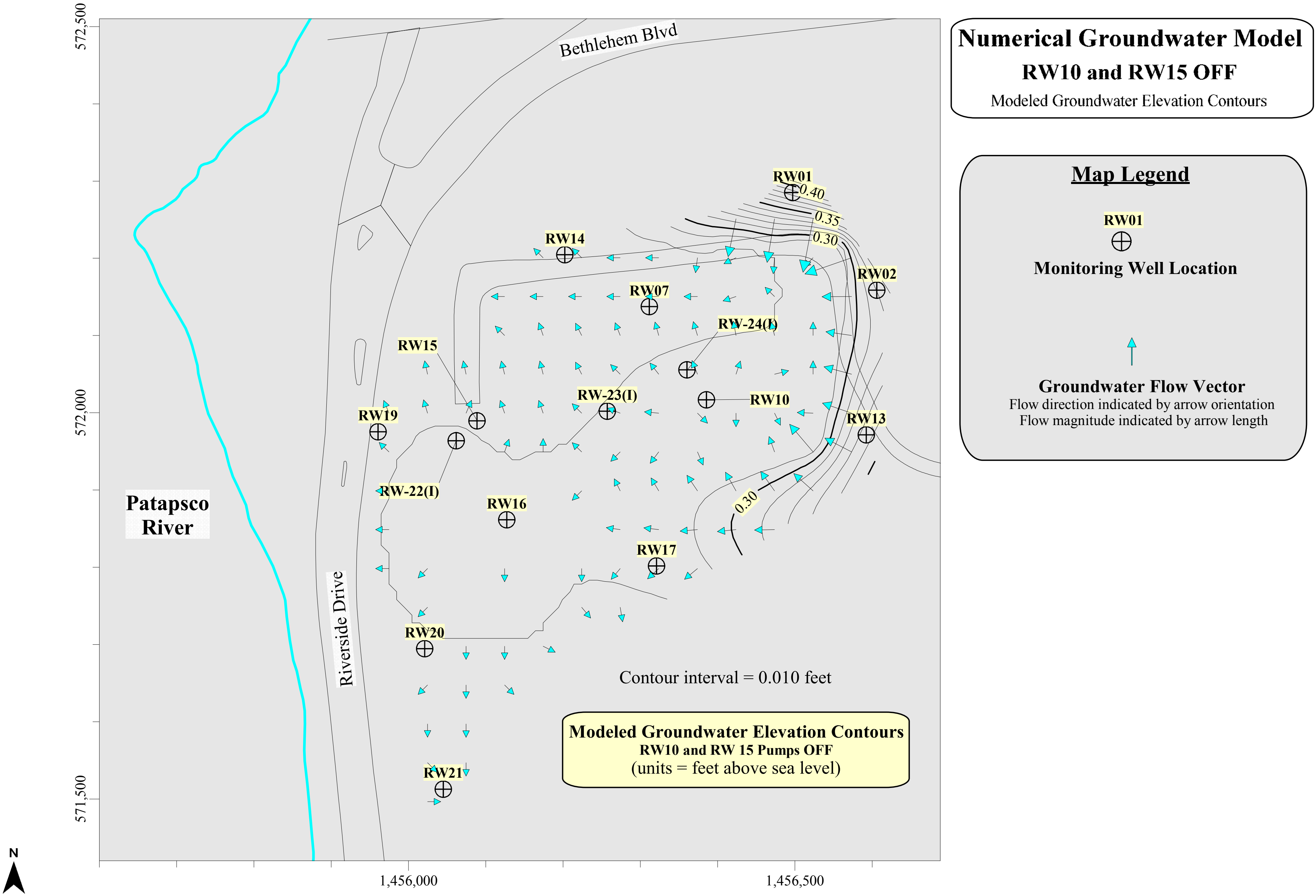
Figure
16

Numerical Groundwater Model

RW10 and RW15 OFF

Modeled Groundwater Elevation Contours



0 200 400
Feet
MD State Plane Coordinates
NAD 1983

ARM Group Inc.
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Numerical Groundwater Model

Pre-Design Investigation
Rod and Wire Mill Source Area
Characterization Report

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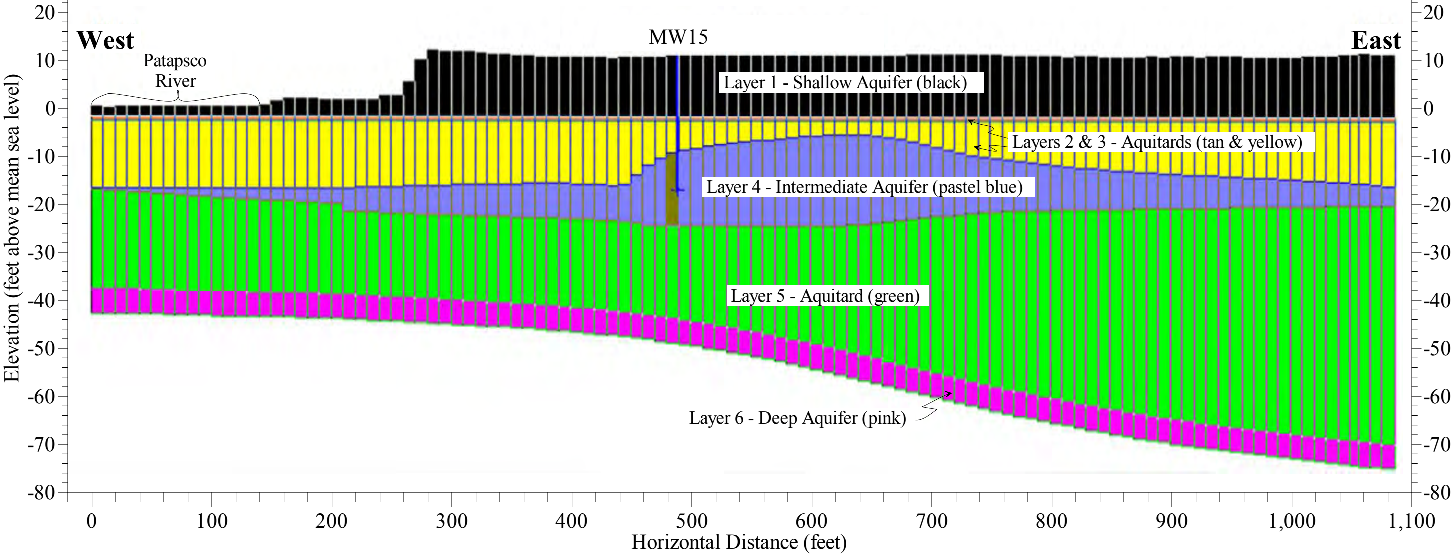
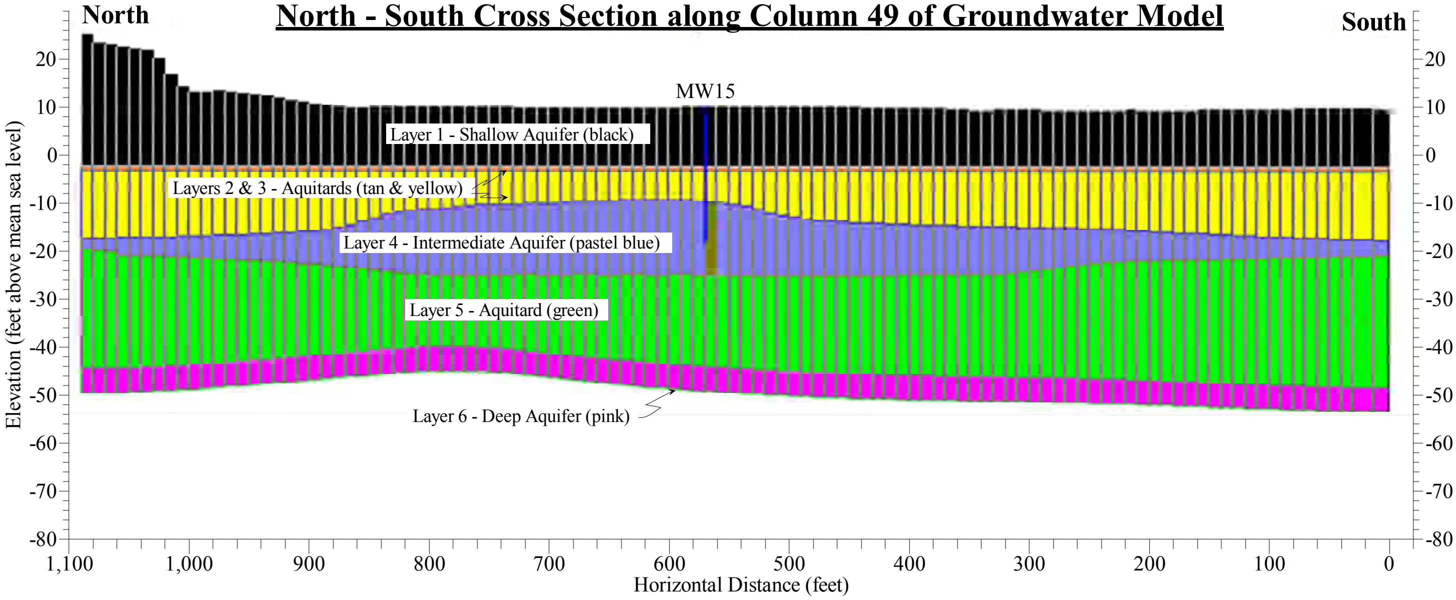
Figure
17

West - East Cross Section along Row 53 of Groundwater Model

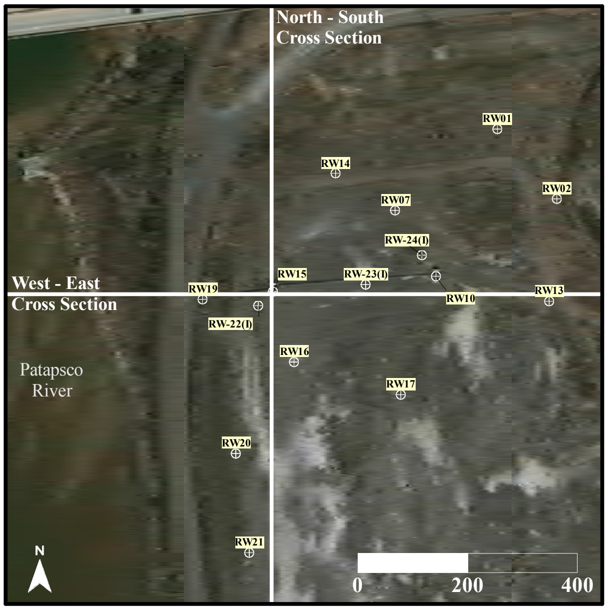


North - South Cross Section along Column 49 of Groundwater Model



0 100 200

Cross Section Horizontal Scale in Feet
Vertical Exaggeration x 4



Locator Map for Cross Sections

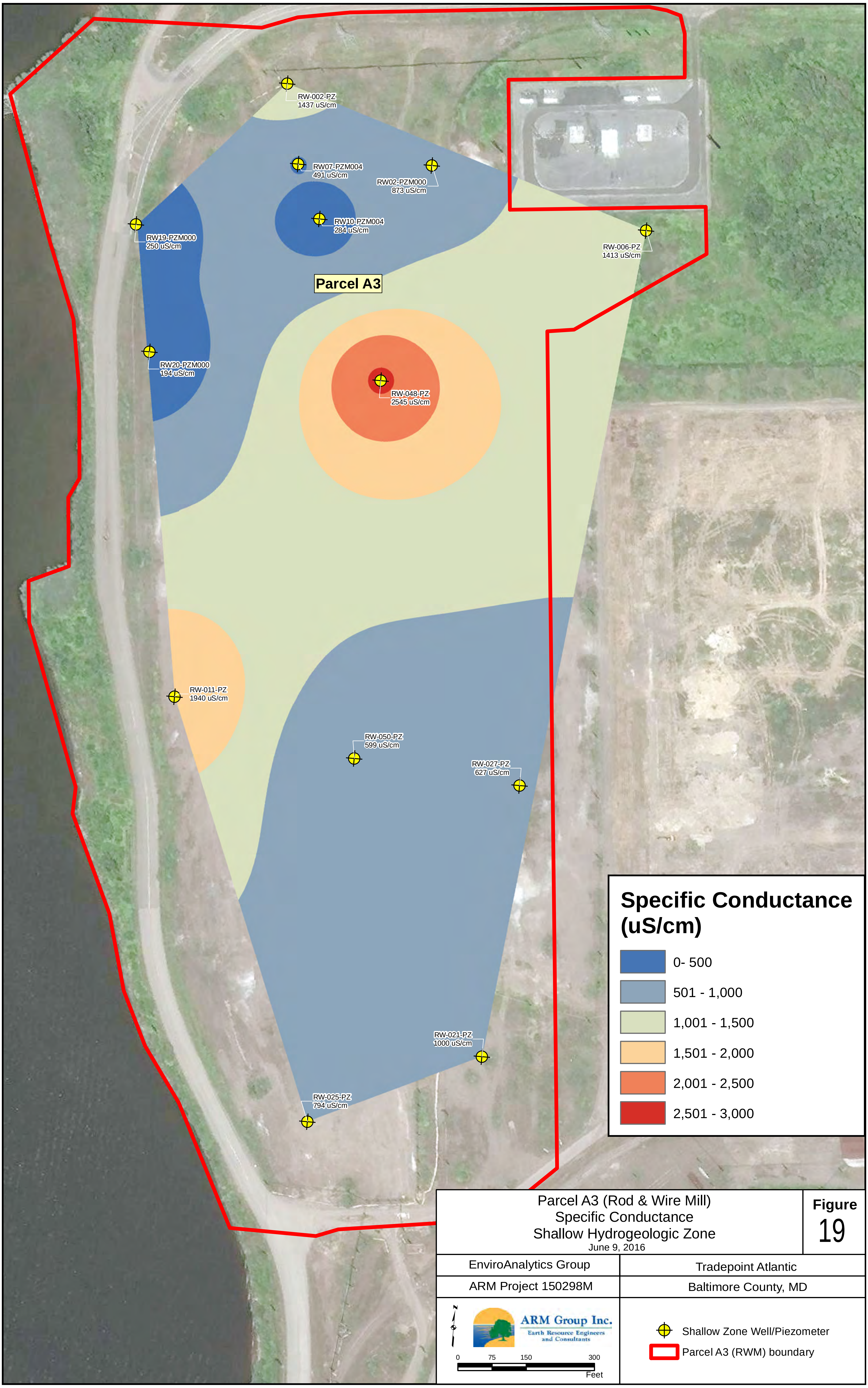
Groundwater Model Layers

Pre-Design Investigation
Rod and Wire Mill Source Area
Characterization Report

May 2016	ARM Project 150298

ARM Group Inc.
Earth Resource Engineers and Consultants

Figure
18



Parcel A3 (Rod & Wire Mill)
Specific Conductance
Shallow Hydrogeologic Zone
June 9, 2016

Figure
19

EnviroAnalytics Group	Tradepoint Atlantic
ARM Project 150298M	Baltimore County, MD

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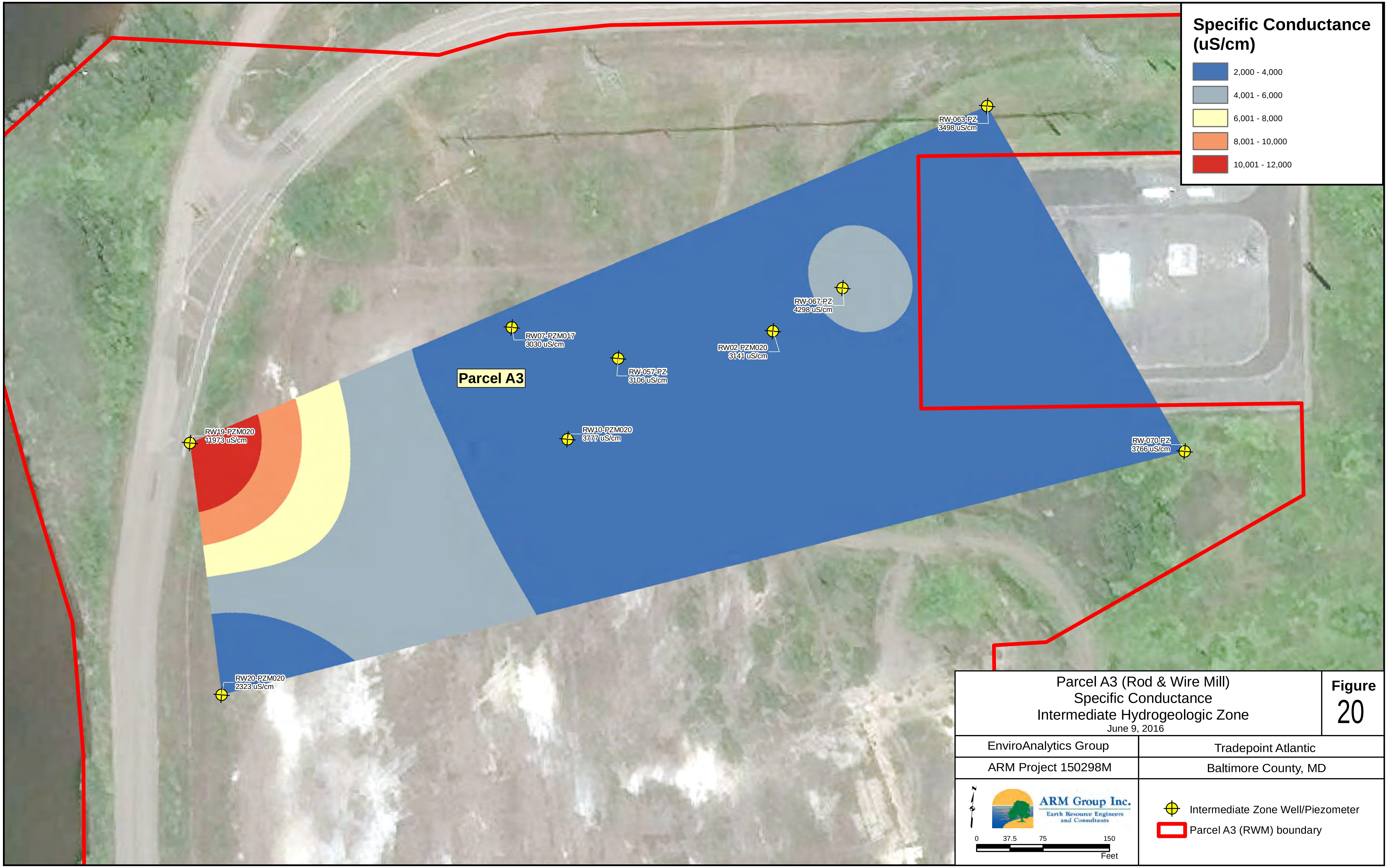

Parcel A3 (Rod & Wire Mill)
Specific Conductance
Intermediate Hydrogeologic Zone
June 9, 2016

Figure
20

EnviroAnalytics Group	Tradepoint Atlantic
ARM Project 150298M	Baltimore County, MD

Pumping Test Measured Water Levels
(feet below top of casing (toc)

Well Name	TOC	Ground Elevation	Period 1 10 ON 15 ON	Period 2 10 OFF 15 OFF	Period 3 10 OFF 15 ON	Period 4 10 ON 15 ON	Period 5 10 OFF 15 OFF	Period 6 10 ON 15 OFF	Period 7 10 ON 15 ON	Period 8 10 ON 15 OFF	Period 9 10 OFF 15 OFF
RW01	12.72	10.15	13.8	11.8	11.75	13.25	11.75	11.75	13.3	12.7	11.7
RW02	13.02	10.27	14.5	12.45	12.3	13.75	12.15	12.35	13.95	13.32	12.22
RW07	12.94	10.71	14.8	12.45	12.4	14	12.2	12.4	14.3	13.4	12.3
RW10	11.86	11.47	15.4	10	9.8	15.07	12.75	12.86	15.05	14.8	11.3
RW13	13.05	11.17	14.6	12.5	12.4	13.95	12.3	12.4	14.22	13.43	12.4
RW14	13.6	11.24	15.2	13.2	13.22	14.55	12.88	12.99	14.89	13.93	13
RW15	12.17	11.84	16.1	10.95	17.04	18.35	14.32	14.34	17.88	15.28	14.31
RW16	13.89	11.65	15.4	13.5	13.45	14.91	13.2	13.21	15.26	14.24	13.4
RW17	13.73	11.43	15.3	13.3	13.25	14.73	13.05	13.05	15.13	14.1	13.23
RW19	13.53	11.28	15.1	13.18	13.1	14.6	12.89	12.9	14.91	13.86	13.05
RW20	13.03	11.14	14.9	12.6	12.6	14.5	n/a	n/a	14.8	n/a	13.18
RW21	12.93	10.86	14.05	12.56	12.5	13.8	12.29	12.3	14.18	13.31	12.57
RW-22(I)	11.25	11.25	12.6	10.5	10.6	12.01	10.24	10.29	12.34	11.28	10.47
RW-23(I)	11.46	11.46	12.9	10.65	10.6	12.23	10.41	10.55	12.55	11.6	10.55
RW-24(I)	11.05	11.05	12.93	10.25	10.27	12	10.05	10.43	12.31	11.5	10.18
red = estimated value											
RW10	Ave Pumping Rate (gpm)		6.4	0	0	3	0	3.6	3.6	5	0
RW15			4.2	0	3.7	3.8	0	0	3.4	0	0

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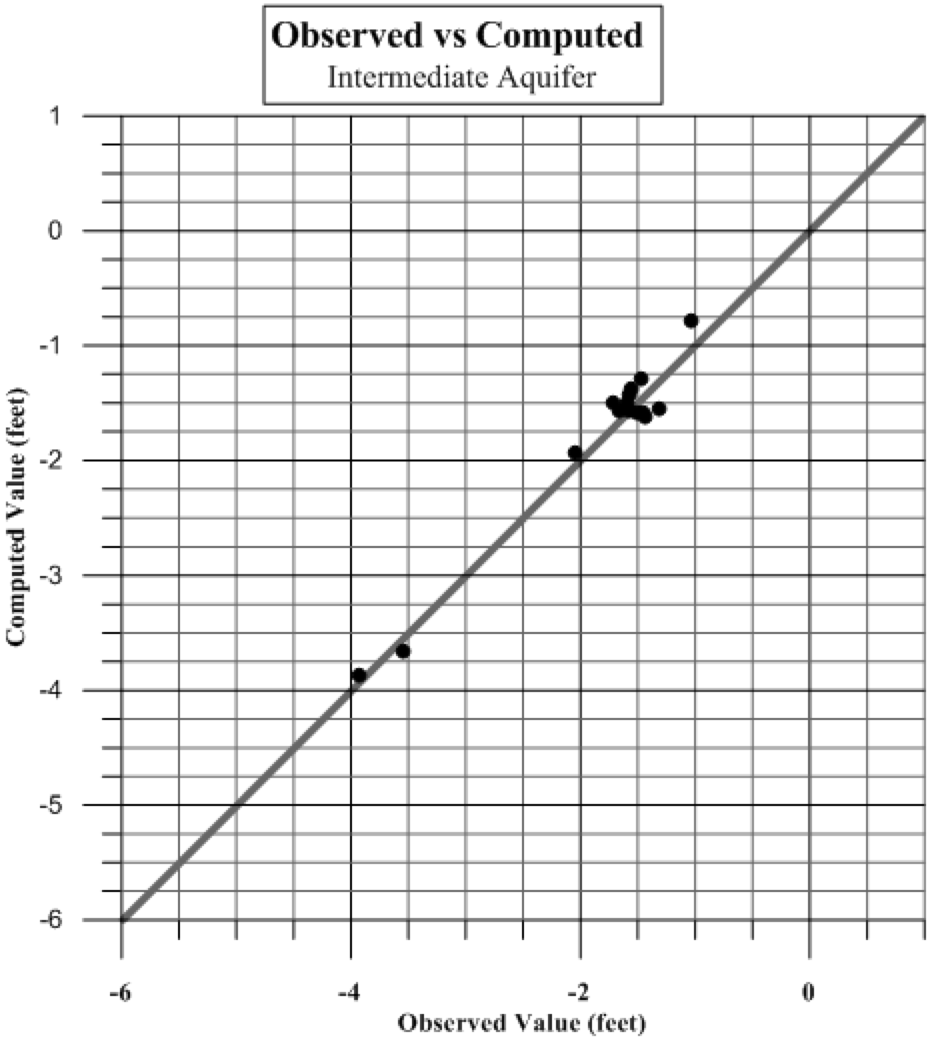
Earth Resource Engineers
and Consultants

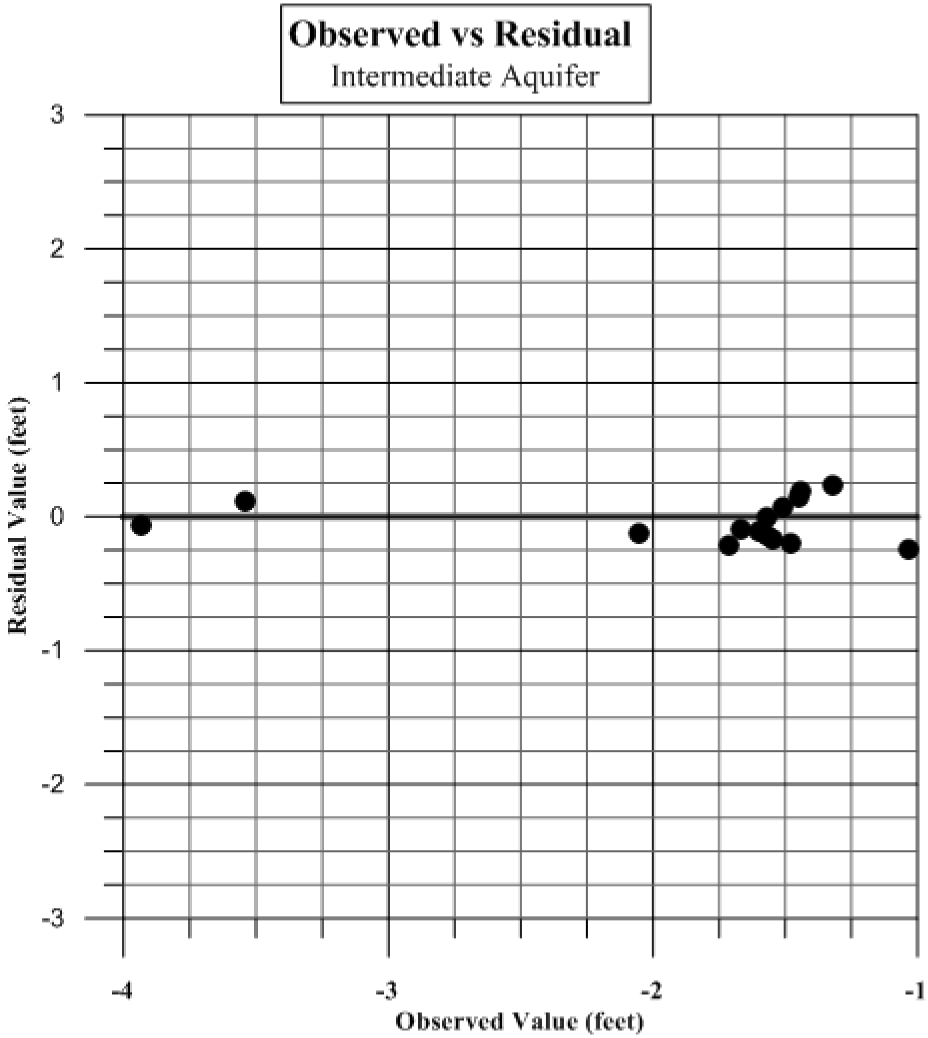
Pumping Test
Measured Water Levels
Pre-Design Investigation
Rod and Wire Mill Source Area
Characterization Report

May 2016

150298

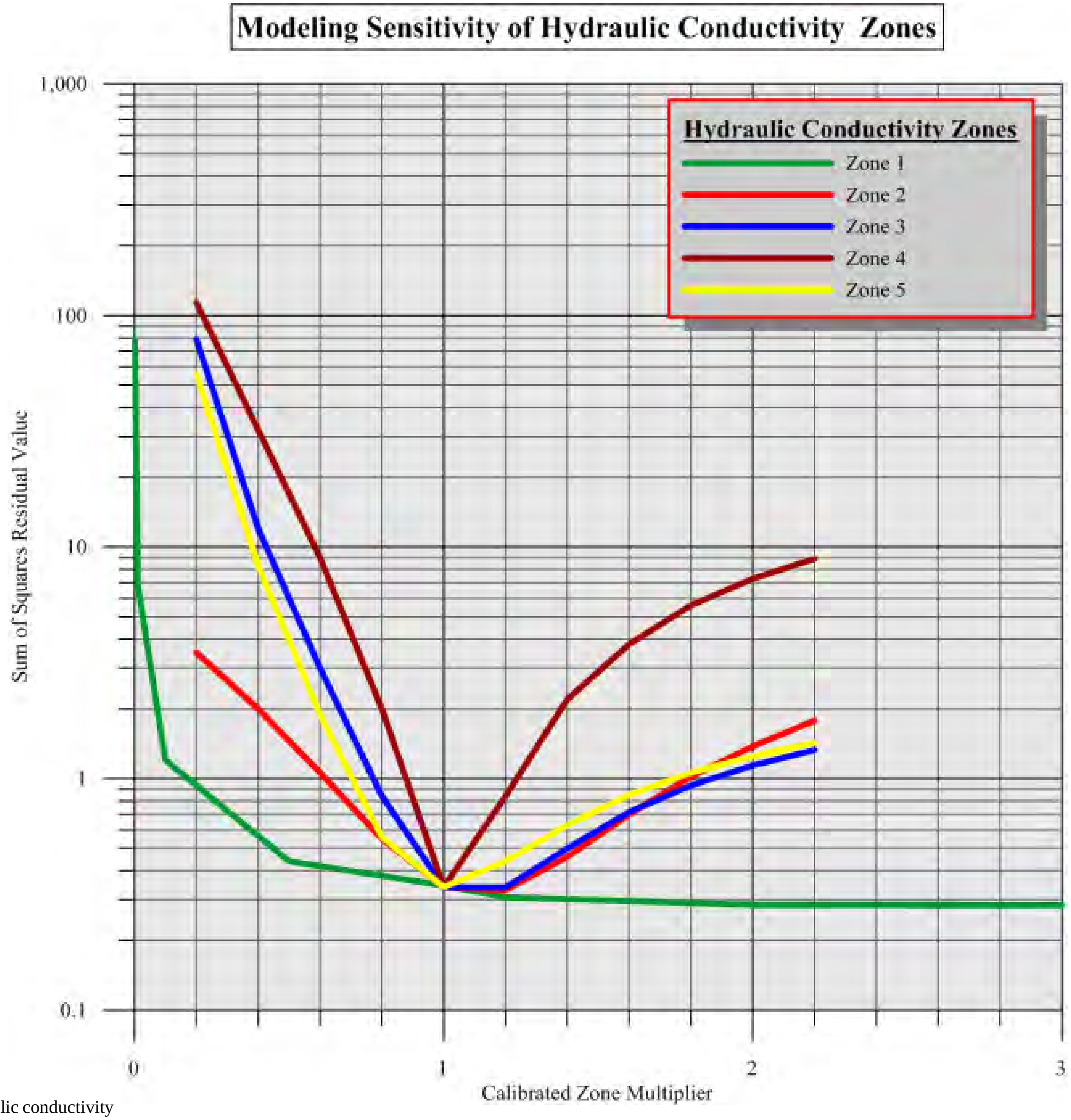
Figure
21





Residual Value = Observed Value – Computed Value

ARM Group Inc. Earth Resource Engineers and Consultants	**Calibration Statistics** Pre-Design Investigation Rod and Wire Mill Source Area Characterization Report	May 2016 150298	Figure 22



The sum of squares residual values for hydraulic conductivity are at a minimum when the calibrated zone multiplier values are near 1.

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Model Sensitivity

Pre-Design Investigation
Rod and Wire Mill Source Area
Characterization Report

May 2016

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Figure
23

TABLES

TABLE 1
GROUNDWATER ELEVATION DATA

Location Name	TOC Elevation (feet AMSL)	Ground Elevation (feet AMSL)	Measured DTW (ft)	Groundwater Elevation (feet AMSL)
RW-057-PZ	13.14	10.17	13.42	-0.28
RW-063-PZ	14.19	11.07	12.45	1.74
RW-067-PZ	13.37	10.68	13.57	-0.20
RW-070-PZ	14.14	10.84	9.27	4.87
RW22 50ft	11.25	11.25*	11.60	-0.35
RW23 50ft	11.46	11.46*	11.85	-0.39
RW24 50ft	11.05	11.05*	11.55	-0.50
RW01-PZM020	12.72	10.15	12.81	-0.09
RW02-PZM020	13.02	10.27	13.34	-0.32
RW07-PZM017	12.94	10.71	13.58	-0.64
RW13-PZM020	13.05	11.17	13.50	-0.45
RW14-PZM020	13.60	11.24	14.13	-0.53
RW15-PZM020	12.17	11.84	13.87	-1.70
RW16-PZM020	13.89	11.65	14.41	-0.52
RW17-PZM019	13.73	11.43	14.26	-0.53
RW19-PZM020	13.53	11.28	14.11	-0.58
RW20-PZM020	13.03	11.14	14.09	-1.06
RW21-PZM023	12.93	10.68	13.43	-0.50
RW-RWBW-21	15.11	14.75	14.96	0.15

DTW = Depth to water
TOC = Top of casing
AMSL = Above mean sea level
* = Identical ground and TOC elevations may be due to survey error.

TABLE 2
FIELD SHIFTED BORING LOCATIONS

Location ID	Sample Target	Proposed Location[¥]		Final Location[¥]		Relocation Distance & Direction		Rationale
		Northing	Easting	Northing	Easting			
RW-001-GB	None (geotechnical boring)	572,249	1,456,071	572,264	1,456,076	16 ft	NE	Shifted due to slag/refusal
RW-068-SB	Former East Pond	571,966	1,456,972	572,004	1,456,961	39 ft	N	Standing water
RW-069-SB	Former East Pond	572,021	1,456,896	572,031	1,456,874	24 ft	NW	Standing water*

[¥] Reported northings and eastings are not survey accurate. Coordinates are reported in NAD 1983 Maryland State Plane (US feet).

*RW-069-SB was shifted to allow for good spatial distribution after RW-068-SB was adjusted due to standing water/flooding.

TABLE 3
TCLP DETECTIONS FOR SOLID IDW

Parameter	Result (mg/L)	TCLP Limit (mg/L)	TCLP Exceedance	Laboratory Flag	Laboratory LOQ (mg/L)
2-Butanone (MEK)	0.0069	200	No	JB	5
Arsenic	0.0045	5	No	J	0.05
Barium	0.15	100	No	J	1
Cadmium	0.06	1	No		0.05
Chromium	0.0046	5	No	J	0.05
Lead	0.021	5	No	J	0.25

J = The positive result reported for this analyte is a quantitative estimate below the laboratory PQL.
JB = The positive result reported for this analyte is an estimate with evidence of blank contamination.
TCLP = Toxicity characteristic leaching procedure
LOQ = Limit of Quantitation

TABLE 4
TCLP DETECTIONS FOR LIQUID IDW

Location ID	Parameter	Result (mg/L)	TCLP Limit (mg/L)	TCLP Exceedance	Laboratory Flag	Laboratory LOQ (mg/L)
Water Disposal 1	Barium	0.0338	100	No		0.01
Water Disposal 1	Cadmium	0.0006	1	No	J	0.003
Water Disposal 1	Chromium	0.0016	5	No	J	0.005
Water Disposal 2	Barium	0.0811	100	No		0.01
Water Disposal 2	Chloroform	0.0029	6	No		0.001
Water Disposal 2	Chromium	0.0012	5	No	J	0.005
Water Disposal 3	Barium	0.0051	100	No	J	0.01
Water Disposal 3	Chloroform	0.0016	6	No		0.001
Water Disposal 3	Chromium	0.00085	5	No	J	0.005
Water Disposal 4	Arsenic	0.0094	5	No		0.005
Water Disposal 4	Barium	0.101	100	No		0.01
Water Disposal 4	Chloroform	0.0024	6	No		0.001
Water Disposal 4	Chromium	0.0012	5	No	J	0.005
Water Disposal 5	Barium	0.398	100	No		0.01
Water Disposal 5	Cadmium	0.00058	1	No	J	0.003
Water Disposal 5	Chloroform	0.0039	6	No		0.001
Water Disposal 5	Chromium	0.0012	5	No	J	0.005
Water Disposal 6	Barium	2.14	100	No		0.01
Water Disposal 6	Cadmium	0.001	1	No	J	0.003
Water Disposal 6	Chloroform	0.00058	6	No	J	0.001
Water Disposal 7	Barium	0.0889	100	No		0.01
Water Disposal 7	Cadmium	0.00067	1	No	J	0.003
Water Disposal 7	Chloroform	0.00075	6	No	J	0.001
Water Disposal 7	Trichloroethene	0.00065	0.5	No	J	0.001
Water Disposal 8	Barium	0.01	100	No	J	0.01

J = The positive result reported for this analyte is a quantitative estimate below the laboratory PQL.
TCLP = Toxicity characteristic leaching procedure
LOQ = Limit of Quantitation

Table 5
Summary of Metals Detected in Soil
Parcel A3
Tradepoint Atlantic
Sparrows Point, Maryland

Parameter	Units	RW-057-SB-1		RW-057-SB-3		RW-057-SB-6		RW-057-SB-15		RW-057-SB-16		RW-057-SB-23		RW-057-SB-29		RW-057-SB-32	
		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil	
		10/1/2015		10/1/2015		10/1/2015		10/1/2015		10/1/2015		10/1/2015		10/1/2015		10/1/2015	
Validated Metals																	
Arsenic	mg/kg	**31.8**		**6.4**		**3.2**		**9.3**		**1.9**	J	**1.8**	J	2.2	U	1.9	U
Barium	mg/kg	**1,670**	J	**454**	J	**13.6**	J	**20.7**	J	**24.2**	J	**62.2**	J	**1.7**	B	**29.4**	J
Cadmium	mg/kg	**1,420**	J	**1,290**	J	**10.3**	J	**164**	J	**323**	J	**6.9**	J	**5.2**	J	**76.3**	J
Chromium	mg/kg	**16.3**	J	**22.9**	J	**6.9**	J	**10.5**	J	**13.3**	J	**38.3**	J	**1.1**	J	**27.1**	J
Lead	mg/kg	**1,730**		**743**		**4.5**		**5**		**6.3**		**13**		2.2	U	**6.3**	
Mercury	mg/kg	0.12	U	**0.085**	J	**0.0089**	J	**0.0087**	J	**0.017**	J	**0.03**	J	0.11	U	**0.0064**	J
Selenium	mg/kg	4.3	U	**2.5**	B	3.2	U	4.6	U	3.8	U	3.5	U	3.5	U	3	U
Silver	mg/kg	**4.5**		**1.7**	J	2.4	U	3.5	U	2.8	U	2.6	U	2.6	U	2.3	U
Non-Validated Metals																	
Aluminum	mg/kg	**32,300**	E	**17,700**		**4,740**		**5,700**		**6,380**		**14,900**		**417**		**5,820**	
Antimony	mg/kg	**2.6**	J	3.2	U	2.4	U	3.5	U	2.8	U	2.6	U	2.6	U	2.3	U
Beryllium	mg/kg	**2.3**		**0.85**	J	**0.17**	J	**0.27**	J	**0.31**	J	**0.81**	J	0.87	U	**0.38**	J
Cobalt	mg/kg	**3.3**	J	**5.8**		**1.6**	J	**6.7**		**2.3**	J	**11.1**		4.4	U	**6.2**	
Copper	mg/kg	**237**		**90.1**		**4.8**		**5.9**		**7.8**		**17.7**		4.4	U	**12.8**	
Iron	mg/kg	**31,400**	E	**18,200**		**7,340**		**6,460**		**4,520**		**22,800**	E	**899**		**3,800**	
Manganese	mg/kg	**6,840**	E	**3,150**	E	**38.9**		**39**		**41.4**		**151**		**4.7**		**36.3**	
Nickel	mg/kg	**14.3**		**13**		**3.2**	J	**7.4**	J	**5.7**	J	**30.6**		8.7	U	**19.9**	
Thallium	mg/kg	10.8	U1c	10.7	U1c	8	U1c	11.5	U1c	9.5	U1c	8.8	U1c	8.7	U1c	7.6	U1c
Vanadium	mg/kg	**607**		**107**		**12.6**		**12.9**		**16.8**		**48.1**		**1.5**	J	**21.1**	
Zinc	mg/kg	**49,700**	E	**29,700**	E	**885**		**820**		**1,050**		**1,170**		**84.3**		**685**	

Detections in bold

NA: This parameter was not analyzed for this sample

Qualifier Keys can be viewed in the attached laboratory
and validation reports

Table 5
Summary of Metals Detected in Soil
Parcel A3
Tradepoint Atlantic
Sparrows Point, Maryland

Parameter	Units	RW-058-SB-1		RW-058-SB-2		RW-058-SB-8		RW-058-SB-15		RW-058-SB-20		RW-058-SB-22		RW-058-SB-28		RW-058-SB-32	
		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil	
		10/5/2015		10/5/2015		10/5/2015		10/5/2015		10/5/2015		10/5/2015		10/5/2015		10/5/2015	
Validated Metals																	
Arsenic	mg/kg	**80.6**	J	**8.9**	J	**2.5**		**4.9**	J	2.2	U	**6.2**	J	**1.6**	B	**5.8**	J
Barium	mg/kg	**216**		**53.7**		**27**		**16.2**		**11.5**		**36.3**		**33**		**107**	
Cadmium	mg/kg	**91.5**	J	**32**	J	**17.4**		**4.9**	J	**0.32**	B	**1.5**	J	**54.3**	J	**0.41**	B
Chromium	mg/kg	**37.5**	J	**15.9**	J	**11.9**		**10.6**	J	**7.7**	J	**24.5**	J	**23.1**	J	**46**	J
Lead	mg/kg	**29.8**	J	**10.7**	J	**4.6**		**3.4**	J	**3.6**	J	**9.6**	J	**6.6**	J	**8.9**	J
Mercury	mg/kg	**0.19**		**0.062**	J	**0.0047**	J	**0.016**	J	**0.0029**	J	**0.026**	J	**0.0062**	J	**0.045**	J
Selenium	mg/kg	3.3	U	3	U	3.5	U	4.7	U	3.5	U	3.3	U	2.9	U	5.1	U
Silver	mg/kg	2.5	U	2.3	U	2.6	U	3.5	U	2.6	U	2.5	U	2.2	U	3.8	U
Non-Validated Metals																	
Aluminum	mg/kg	**21,500**	E	**11,100**		**9,230**		**6,770**		**4,510**		**9,140**		**9,420**		**11,200**	
Antimony	mg/kg	2.5	U	2.3	U	2.6	U	3.5	U	2.6	U	2.5	U	2.2	U	3.8	U
Beryllium	mg/kg	**1.7**		**0.42**	J	**0.35**	J	**0.21**	J	0.88	U	**0.37**	J	**0.42**	J	**2**	
Cobalt	mg/kg	**10.8**		**5.3**		**2.4**	J	**1.5**	J	**1.1**	J	**2.8**	J	**4.2**		**38**	
Copper	mg/kg	**34.9**		**7.4**		**9.4**		**11.6**		**4.7**		**12.7**		**7.4**		**33.4**	
Iron	mg/kg	**30,200**	E	**15,400**	E	**6,890**		**10,100**		**4,630**		**28,800**	E	**16,100**	E	**11,900**	
Manganese	mg/kg	**569**		**246**		**48.1**		**28**		**35.1**		**106**		**79.1**		**49.6**	
Nickel	mg/kg	**20.8**		**7.6**		**9**		**4.2**	J	**3.2**	J	**10.6**		**10.8**		**35.6**	
Thallium	mg/kg	8.3	U	7.6	U	8.7	U	11.7	U	8.8	U	8.2	U	7.4	U	12.7	U
Vanadium	mg/kg	NA		NA		NA		NA		NA		NA		NA		NA	
Zinc	mg/kg	**1,720**	E	**709**		**342**		**210**		**348**		**885**		**738**		**78.4**	

Detections in bold

NA: This parameter was not analyzed for this sample

Qualifier Keys can be viewed in the attached laboratory
and validation reports

Table 5
Summary of Metals Detected in Soil
Parcel A3
Tradepoint Atlantic
Sparrows Point, Maryland

Parameter	Units	RW-059-SB-1		RW-059-SB-3		RW-059-SB-6		RW-059-SB-11		RW-059-SB-20		RW-059-SB-23		RW-059-SB-26		RW-059-SB-34	
		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil	
		10/1/2015		10/1/2015		10/1/2015		10/1/2015		10/1/2015		10/1/2015		10/1/2015		10/1/2015	
Validated Metals																	
Arsenic	mg/kg	**235**		**6.4**		**4.3**		**2.2**		2.9	U	**24.3**		3.3	U	**2.7**	B
Barium	mg/kg	**946**		**166**	J	**16.3**	J	**10.8**	J	**8.8**	J	**78.3**	J	**130**	J	**67.2**	J
Cadmium	mg/kg	**226**		**38.2**	J	**1.6**	J	**8.5**	J	**64.9**	J	**180**	J	**29.1**	J	**36.7**	J
Chromium	mg/kg	**115**	J	**16.2**	J	**9.9**	J	**5**	J	**6.9**	J	**67.1**	J	**35.6**	J	**50.2**	J
Lead	mg/kg	**3,130**	J	**363**		**4.8**		**2.7**		2.9	U	**27.8**		**21.7**		**13.1**	
Mercury	mg/kg	**0.12**		**0.75**		**0.015**	J	**0.0045**	J	**0.0087**	J	**0.044**	J	**0.021**	J	**0.047**	J
Selenium	mg/kg	**3**	J	3.5	U	4.4	U	2.6	U	4.6	U	5.1	U	5.2	U	**2.6**	B
Silver	mg/kg	2.4	U	**2**	J	3.3	U	2	U	3.4	U	3.8	U	3.9	U	3.4	U
Non-Validated Metals																	
Aluminum	mg/kg	**34,800**	E	**7,030**		**6,630**		**2,810**		**2,040**		**17,300**		**19,100**		**12,300**	
Antimony	mg/kg	2.4	U	2.6	U	3.3	U	2	U	3.4	U	3.8	U	3.9	U	3.4	U
Beryllium	mg/kg	**2.6**		**0.59**	J	1.1	U	**0.15**	J	1.1	U	**0.79**	J	**2.4**		**2.2**	
Cobalt	mg/kg	**3.3**	J	**2.2**	J	**1.2**	J	**0.61**	J	**1.2**	J	**11.8**		**18.9**		**36.8**	
Copper	mg/kg	**228**		**105**		**7.1**		**7.3**		5.7	U	**345**		**22.2**		**28.4**	
Iron	mg/kg	**20,500**	E	**10,500**		**8,950**		**2,380**		**1,180**		**17,700**		**17,500**		**16,400**	
Manganese	mg/kg	**9,550**	E	**294**		**104**		**22.4**		**26.9**		**148**		**162**		**79.6**	
Nickel	mg/kg	**18.6**		**8.1**	J	**3.2**	J	**1.9**	J	**1.9**	J	**22.5**		**44.8**		**40.7**	
Thallium	mg/kg	8	U	8.7	U1c	11.1	U1c	6.5	U1c	11.5	U1c	12.7	U1c	13.1	U1c	11.4	U1c
Vanadium	mg/kg	**645**		**17.2**		**15.4**		**9.8**		**6.8**		**36.9**		**52.6**		**67**	
Zinc	mg/kg	**17,600**	E	**5,300**	E	**565**		**147**		**1,110**		**3,850**	E	**699**		**1,390**	

Detections in bold

NA: This parameter was not analyzed for this sample

Qualifier Keys can be viewed in the attached laboratory
and validation reports

Table 5
Summary of Metals Detected in Soil
Parcel A3
Tradepoint Atlantic
Sparrows Point, Maryland

Parameter	**Units**	RW-060-SB-1		RW-060-SB-4		RW-060-SB-7		RW-060-SB-12		RW-060-SB-20		RW-060-SB-22		RW-060-SB-26		RW-060-SB-33	
		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil	
		10/5/2015		10/5/2015		10/5/2015		10/5/2015		10/5/2015		10/5/2015		10/5/2015		10/5/2015	
Validated Metals																	
Arsenic	mg/kg	**2.3**	J	**4.7**		**5**		**2.1**	J	**8**		**3**		**3.3**		**4.6**	
Barium	mg/kg	**49.2**		**26**		**1,590**		**38.4**		**18.5**		**67**		**6.4**	J	**58.4**	
Cadmium	mg/kg	**3.4**		**11.9**		**23.1**		**17.1**		**23**		**1.2**	B	**0.58**	B	**183**	
Chromium	mg/kg	**3**	B	**10.7**		**27.1**		**16.1**		**10.5**		**40**		**5.1**		**36.7**	
Lead	mg/kg	**150**		**243**		**23.8**		**8**		**2.7**		**14.9**		2.6	U	**7.8**	
Mercury	mg/kg	**0.14**		**0.02**	J	**0.0037**	J	**0.039**	J	**0.0095**	J	**0.026**	J	0.11	U	**0.03**	J
Selenium	mg/kg	4	U	3.6	U	3.8	U	4.1	U	3.6	U	3.4	U	4.2	U	3	U
Silver	mg/kg	3	U	2.7	U	2.9	U	3	U	2.7	U	2.6	U	3.2	U	2.3	U
Non-Validated Metals																	
Aluminum	mg/kg	**1,060**		**5,880**		**16,100**		**10,400**		**3,860**		**14,400**		**1,130**		**9,600**	
Antimony	mg/kg	3	U	2.7	U	2.9	U	**2.2**	J	2.7	U	2.6	U	3.2	U	2.3	U
Beryllium	mg/kg	1	U	**0.15**	J	**0.54**	J	**0.39**	J	**0.47**	J	**2**		1.1	U	**0.52**	J
Cobalt	mg/kg	5	U	**1.7**	J	**4.5**	J	**7.2**		**9.1**		**19**		5.3	U	**8.8**	
Copper	mg/kg	**9.2**		**17.2**		**12.5**		**11.3**		**5.9**		**21.8**		**2.4**	J	**19.3**	
Iron	mg/kg	**2,200**		**12,700**		**14,800**		**7,920**		**4,950**		**19,700**	E	**10,200**		**9,260**	
Manganese	mg/kg	**17.3**		**37**		**88.5**		**75.3**		**34.4**		**194**		**28.3**		**47.8**	
Nickel	mg/kg	10	U	**5**	J	**11.5**		**17.4**		**10.4**		**35.1**		**1**	J	**16.7**	
Thallium	mg/kg	10	U	9.1	U	9.5	U	10.2	U	8.9	U	8.5	U	10.6	U	7.6	U
Vanadium	mg/kg	NA		NA		NA		NA		NA		NA		NA		NA	
Zinc	mg/kg	**88.2**		**188**		**1,090**		**362**		**883**		**4,040**	E	**67.4**		**824**	

Detections in bold

NA: This parameter was not analyzed for this sample

Qualifier Keys can be viewed in the attached laboratory
and validation reports

Table 5
Summary of Metals Detected in Soil
Parcel A3
Tradepoint Atlantic
Sparrows Point, Maryland

Parameter	Units	RW-061-SB-1		RW-061-SB-2		RW-061-SB-7		RW-061-SB-11		RW-061-SB-19		RW-061-SB-21		RW-061-SB-29		RW-061-SB-34	
		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil	
		10/5/2015		10/5/2015		10/5/2015		10/5/2015		10/5/2015		10/5/2015		10/5/2015		10/5/2015	
Validated Metals																	
Arsenic	mg/kg	**5.6**	J	**3.9**		**11.3**		2.2	U	**2.3**	J	**5**		**6.8**		3.4	U
Barium	mg/kg	**676**		**75.1**		**35.3**		**39.6**		**76.6**		**66.5**		**54.4**		**43**	
Cadmium	mg/kg	**210**	J	**8.3**		**1.1**	B	**7.8**		**3**		**0.56**	B	**73.9**		2	U
Chromium	mg/kg	**57.5**	J	**12.5**		**25.1**		**18.2**		**43.1**		**36.8**		**43.6**		**37.9**	J
Lead	mg/kg	**677**	J	**102**		**12.7**		**16.6**		**13.8**		**13.4**		**12.5**		**8.5**	J
Mercury	mg/kg	0.12	U	**0.48**		**0.029**	J	**0.02**	J	**0.02**	J	**0.026**	J	**0.028**	J	**0.021**	J
Selenium	mg/kg	**2**	B	3.1	U	3.9	U	3.5	U	4.3	U	5.2	U	3.8	U	5.4	U
Silver	mg/kg	2.4	U	2.3	U	3	U	2.6	U	3.2	U	3.9	U	2.9	U	4.1	U
Non-Validated Metals																	
Aluminum	mg/kg	**39,100**	E	**6,810**		**13,100**		**10,200**		**13,700**		**13,800**		**12,000**		**9,110**	
Antimony	mg/kg	2.4	U	2.3	U	3	U	2.6	U	3.2	U	3.9	U	2.9	U	4.1	U
Beryllium	mg/kg	**2.8**		**0.53**	J	**0.52**	J	**0.39**	J	**0.79**	J	**1.6**		**0.61**	J	**1.3**	J
Cobalt	mg/kg	**3.5**	J	**7.4**		**3.1**	J	**3.9**	J	**6.5**		**15.3**		**43**		**9.3**	
Copper	mg/kg	**179**		**89.4**		**15.2**		**14.2**		**23.8**		**20**		**30**		**19.4**	
Iron	mg/kg	**17,500**	E	**8,060**		**19,900**	E	**6,160**		**30,300**	E	**24,100**		**7,510**		**56,700**	E
Manganese	mg/kg	**7,310**	E	**191**		**61.1**		**50.2**		**170**		**156**		**68.1**		**379**	
Nickel	mg/kg	**13.7**		**10.7**		**10.9**		**11.1**		**18.8**		**29**		**31**		**18.1**	
Thallium	mg/kg	8	U	7.7	U	9.8	U	8.7	U	10.7	U	12.9	U	9.5	U	13.5	U
Vanadium	mg/kg	NA		NA		NA		NA		NA		NA		NA		NA	
Zinc	mg/kg	**14,700**	E	**952**		**1,000**		**284**		**2,960**	E	**127**		**1,670**		**70.3**	

Detections in bold

NA: This parameter was not analyzed for this sample

Qualifier Keys can be viewed in the attached laboratory
and validation reports

Table 5
Summary of Metals Detected in Soil
Parcel A3
Tradepoint Atlantic
Sparrows Point, Maryland

Parameter	Units	RW-062-SB-1		RW-062-SB-3		RW-062-SB-10		RW-062-SB-15		RW-062-SB-20		RW-062-SB-22		RW-062-SB-30		RW-062-SB-32	
		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil	
		10/5/2015		10/5/2015		10/5/2015		10/5/2015		10/5/2015		10/5/2015		10/5/2015		10/5/2015	
Validated Metals																	
Arsenic	mg/kg	**15.1**	J	**4.3**	J	**8.6**	J	**5.9**	J	**2.2**	J	3	U	**4.2**		**3.5**	
Barium	mg/kg	**1,180**		**32.8**		**59.7**		**38**		**8.9**		**64.6**		**4.3**	J	**73.8**	
Cadmium	mg/kg	**10.7**	J	1.4	U	1.4	U	**3.7**	J	**3.3**	J	**0.22**	B	**1.9**		**16**	
Chromium	mg/kg	**165**	J	**14.9**	J	**23.8**	J	**17**	J	**7.9**	J	**35.3**	J	**9.2**		**50**	
Lead	mg/kg	**901**	J	**16.3**	J	**13.3**	J	**9.6**	J	**1.5**	J	**12**	J	2.4	U	**9.7**	
Mercury	mg/kg	**0.37**		**0.079**	J	**0.016**	J	**0.022**	J	**0.007**	J	**0.022**	J	0.1	U	**0.034**	J
Selenium	mg/kg	4.4	U	3.7	U	3.7	U	3.4	U	3.1	U	4.8	U	3.8	U	4.2	U
Silver	mg/kg	**1**	B	2.8	U	2.8	U	2.5	U	2.3	U	3.6	U	2.9	U	3.2	U
Non-Validated Metals																	
Aluminum	mg/kg	**12,400**		**9,110**		**14,100**		**9,760**		**2,330**		**12,800**		**611**		**12,600**	
Antimony	mg/kg	3.3	U	2.8	U	2.8	U	**1.3**	J	2.3	U	3.6	U	2.9	U	3.2	U
Beryllium	mg/kg	**1.1**	J	**0.3**	J	**0.52**	J	**0.46**	J	**0.25**	J	**2**		0.96	U	**2.2**	
Cobalt	mg/kg	**6.3**		**7.6**		**4.4**	J	**5.5**		**0.98**	J	**16.3**		4.8	U	**8.8**	
Copper	mg/kg	**304**		**7.3**		**11.5**		**11.5**		**3.9**		**19.5**		4.8	U	**19.3**	
Iron	mg/kg	**45,100**	E	**13,500**		**15,600**		**9,490**		**4,610**		**41,800**	E	**4,450**		**16,200**	
Manganese	mg/kg	**2,320**	E	**148**		**35**		**61.2**		**27.2**		**578**		**6**		**89**	
Nickel	mg/kg	**41.5**		**6.7**	J	**10.8**		**14**		**2.6**	J	**35**		9.6	U	**20.4**	
Thallium	mg/kg	11.1	U	9.3	U	9.3	U	8.4	U	7.7	U	12.1	U	9.6	U	10.6	U
Vanadium	mg/kg	NA		NA		NA		NA		NA		NA		NA		NA	
Zinc	mg/kg	**1,520**		**625**		**35.7**		**359**		**491**		**874**		**66.5**		**855**	

Detections in bold

NA: This parameter was not analyzed for this sample

Qualifier Keys can be viewed in the attached laboratory
and validation reports

Table 5
Summary of Metals Detected in Soil
Parcel A3
Tradepoint Atlantic
Sparrows Point, Maryland

Parameter	Units	RW-063-SB-1		RW-063-SB-5		RW-063-SB-8		RW-063-SB-13		RW-063-SB-19		RW-063-SB-25		RW-063-SB-30		RW-063-SB-34	
		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil	
		10/6/2015		10/6/2015		10/6/2015		10/6/2015		10/6/2015		10/6/2015		10/6/2015		10/6/2015	
Validated Metals																	
Arsenic	mg/kg	**4.4**		**8.5**		**2.8**	B	**2.6**	B	3.3	U	**3.6**		**15.4**		**3.5**	
Barium	mg/kg	**71.2**		**129**		**30.4**		**38**		**31.1**		**64.6**		**82**		**18.4**	
Cadmium	mg/kg	**6.8**		**53.5**	J	**57.5**	J	1.7	UJ	**3.9**	J	1.6	UJ	1.8	UJ	**2**	J
Chromium	mg/kg	**19.6**		**55.8**		**7.6**		**16.5**		**14.7**		**36.8**		**38.7**		**20.3**	
Lead	mg/kg	**75.4**	J	**297**	J	**15.3**	J	**7.6**	J	**7.3**	J	**12.3**	J	**20.6**	J	**6.5**	J
Mercury	mg/kg	**0.39**		**0.25**		**1.5**		**0.0053**	J	**0.011**	J	**0.036**	J	**0.021**	J	**0.0089**	J
Selenium	mg/kg	3.6	U	3.6	U	4.6	U	4.4	U	5.3	U	4.2	U	4.9	U	3.3	U
Silver	mg/kg	2.7	U	**0.91**	J	3.5	U	3.3	U	4	U	3.2	U	3.7	U	2.4	U
Non-Validated Metals																	
Aluminum	mg/kg	**8,130**		**10,800**		**3,550**		**10,700**		**7,490**		**16,300**		**20,500**		**6,300**	
Antimony	mg/kg	2.7	U	2.7	U	3.5	U	3.3	U	4	U	3.2	U	3.7	U	2.4	U
Beryllium	mg/kg	**0.48**	J	**0.57**	J	1.2	U	**0.31**	J	**0.25**	J	**0.8**	J	**1.5**		**0.33**	J
Cobalt	mg/kg	**4.6**		**6.3**		**1.9**	J	**4.5**	J	**3.2**	J	**18.5**		**22.4**		**2.2**	J
Copper	mg/kg	**21.6**		**112**		**10.1**		**10.8**		**6.9**		**20.2**		**23**		**4**	J
Iron	mg/kg	**13,400**		**36,400**	E	**3,080**		**10,100**		**12,000**		**32,200**	E	**47,100**	E	**6,960**	
Manganese	mg/kg	**405**		**1,240**		**30.9**		**67.1**		**45.8**		**133**		**755**		**36.2**	
Nickel	mg/kg	**8.8**	J	**15.1**		**4.6**	J	**12.4**		**8.2**	J	**15.4**		**40.1**		**5.5**	J
Thallium	mg/kg	8.9	U	9	U	11.6	U	11	U	13.2	U	10.6	U	12.3	U	8.2	U
Vanadium	mg/kg	**34.4**		**172**		**7.8**		**18.5**		**16**		**56.9**		**38.2**		**27.2**	
Zinc	mg/kg	**748**		**4,390**	E	**2,820**	E	**1,150**		**1,100**		**72.7**		**1,270**		**1,770**	E

Detections in bold

NA: This parameter was not analyzed for this sample

Qualifier Keys can be viewed in the attached laboratory
and validation reports

Table 5
Summary of Metals Detected in Soil
Parcel A3
Tradepoint Atlantic
Sparrows Point, Maryland

Parameter	Units	RW-064-SB-1		RW-064-SB-5		RW-064-SB-8		RW-064-SB-12		RW-064-SB-16		RW-064-SB-21		RW-064-SB-29		RW-064-SB-32	
		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil	
		10/6/2015		10/6/2015		10/6/2015		10/6/2015		10/6/2015		10/6/2015		10/6/2015		10/6/2015	
Validated Metals																	
Arsenic	mg/kg	**9.6**		**17.9**		**5.7**		**53.6**		2.7	U	**16.6**		**3**		**17**	
Barium	mg/kg	**243**		**4,070**		**93.6**		**989**		**11**		**66.2**		**5**	J	**16.7**	
Cadmium	mg/kg	**2.5**	J	**1.7**	J	**15.1**	J	**3,130**	J	**157**	J	**32.8**	J	**1.1**	J	**3.8**	
Chromium	mg/kg	**332**		**576**		**637**		**49.8**		**10.1**		**36.7**		**4.9**		**13.1**	
Lead	mg/kg	**56.8**	J	**102**	J	**34.9**	J	**2,880**	J	**13.9**	J	**16.5**	J	**1.7**	J	**7.4**	
Mercury	mg/kg	**0.014**	J	**0.028**	J	**0.0095**	J	**0.11**	J	**0.0083**	J	**0.018**	J	0.1	U	**0.021**	J
Selenium	mg/kg	3.8	U	3.2	U	2.7	U	12.7	U	4.3	U	**2.1**	J	3.1	U	3.2	U
Silver	mg/kg	2.9	U	2.4	U	2	U	**58.4**		3.2	U	**0.41**	J	2.3	U	2.4	U
Non-Validated Metals																	
Aluminum	mg/kg	**11,100**		**13,400**		**4,620**		**15,600**		**1,490**	M1	**14,600**		**1,340**		**4,420**	
Antimony	mg/kg	2.9	U	2.4	U	2	U	9.5	U	3.2	UM	2.6	U	2.3	U	2.4	U
Beryllium	mg/kg	**0.4**	J	**0.37**	J	**0.31**	J	**0.62**	J	**0.21**	J	**2.1**		0.77	U	**0.33**	J
Cobalt	mg/kg	**6.9**		**9.8**		**6.3**		**14**	J	**3.9**	J	**25.7**		**0.53**	J	**2.6**	J
Copper	mg/kg	**80.9**		**197**		**45.3**		**1,350**		**16.8**		**22.7**		3.9	U	**9.9**	
Iron	mg/kg	**156,000**	E	**173,000**	E	**138,000**	E	**126,000**	E	**3,020**	M1	**80,900**	E	**1,480**		**7,430**	
Manganese	mg/kg	**27,400**	E	**18,600**	E	**9,910**	E	**12,900**	E	**173**	M1	**1,070**		**20.8**		**70.3**	
Nickel	mg/kg	**60.8**		**69.3**		**33.6**		**79.3**		**3.6**	J	**31.2**		**1.3**	J	**4**	J
Thallium	mg/kg	9.5	U	7.9	U	6.8	U	31.7	U	10.8	U	8.7	U	7.7	U	7.9	U
Vanadium	mg/kg	**492**		**601**		**532**		**28.3**		**9.9**		**47.9**		**2.6**	J	**17**	
Zinc	mg/kg	**238**		**452**		**3,040**	E	**117,000**	E	**1,280**	M1	**7,030**	E	**439**		**2,650**	E

Detections in bold

NA: This parameter was not analyzed for this sample

Qualifier Keys can be viewed in the attached laboratory
and validation reports

Table 5
Summary of Metals Detected in Soil
Parcel A3
Tradepoint Atlantic
Sparrows Point, Maryland

Parameter	Units	RW-065-SB-1		RW-065-SB-5		RW-065-SB-9		RW-065-SB-15		RW-065-SB-19		RW-065-SB-24		RW-065-SB-26		RW-065-SB-35	
		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil	
		9/18/2015		9/18/2015		10/8/2015		10/8/2015		10/8/2015		10/8/2015		10/8/2015		10/8/2015	
Validated Metals																	
Arsenic	mg/kg	**7.9**		**6.6**		**3.1**		**5.2**		**2.1**		**8.4**		**3.3**		**14.7**	J
Barium	mg/kg	**256**		**58.7**		**9.9**		**54.7**		**54.6**		**71.8**		**60.3**		**37.5**	J
Cadmium	mg/kg	**0.73**	B	1.3	U	**2.1**		**8.1**		**2**		**37.2**		**14.7**		**65.5**	J
Chromium	mg/kg	**197**		**10.5**		**7.3**		**24.9**		**29.3**		**38**		**34.3**		**20.7**	
Lead	mg/kg	**175**		**64.9**		**1.9**	B	**8.1**		**17**		**12.6**		**13**		**7.4**	
Mercury	mg/kg	**0.39**		**1.6**		**0.013**	J	**0.019**	J	**0.034**	J	**0.0073**	J	**0.031**	J	0.12	UJ
Selenium	mg/kg	**2.9**	B	3.5	U	3.5	U	4	U	2.7	U	3.4	U	3.6	U	3.7	U
Silver	mg/kg	2.4	U	2.7	U	2.6	U	3	U	2	U	2.6	U	2.7	U	2.8	U
Non-Validated Metals																	
Aluminum	mg/kg	**24,600**	E	**5,720**		**3,250**		**12,000**		**14,400**	E	**17,700**	E	**14,900**		**9,150**	M1
Antimony	mg/kg	2.4	U	2.7	U	2.6	U	3	U	2	U	2.6	U	2.7	U	2.8	UM
Beryllium	mg/kg	**1.2**		**0.33**	J	0.87	U	**0.62**	J	**0.65**	J	**2.8**		**2.4**		**1.4**	
Cobalt	mg/kg	**4.7**		**2.9**	J	**1.4**	J	**4.3**	J	**4.4**		**37.3**		**18.6**		**18.9**	
Copper	mg/kg	**45.2**		**13.5**		**3.2**	J	**12.3**		**16.5**		**21.4**		**20.1**		**13**	
Iron	mg/kg	**27,200**	E	**7,320**		**5,600**		**12,000**		**9,280**		**16,800**		**29,000**	E	**11,900**	M1
Manganese	mg/kg	**5,150**	E	**159**		**53.6**		**60.5**		**66**		**160**		**298**		**100**	
Nickel	mg/kg	**19.8**		**5.7**	J	**2.9**	J	**10.1**		**11.6**		**81.4**		**41.2**		**36.2**	M1
Thallium	mg/kg	7.9	U	8.8	U	8.7	U	9.9	U	6.7	U	8.6	U	8.9	U	9.4	U
Vanadium	mg/kg	**878**		**14**		**40.1**		**31.1**		**36.9**		**49.5**		**45**		**27.5**	
Zinc	mg/kg	**194**		**34.9**		**430**		**1,580**		**1,140**		**6,270**	E	**4,230**	E	**3,980**	M1

Detections in bold

NA: This parameter was not analyzed for this sample

Qualifier Keys can be viewed in the attached laboratory
and validation reports

Table 5
Summary of Metals Detected in Soil
Parcel A3
Tradepoint Atlantic
Sparrows Point, Maryland

Parameter	Units	RW-066-SB-1		RW-066-SB-4		RW-066-SB-6		RW-066-SB-11		RW-066-SB-20		RW-066-SB-22		RW-066-SB-27		RW-066-SB-35	
		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil	
		10/7/2015		10/7/2015		10/7/2015		10/7/2015		10/7/2015		10/7/2015		10/7/2015		10/7/2015	
Validated Metals																	
Arsenic	mg/kg	2.3	U	**4.4**		**1.6**	B	**5.1**		**5.9**		**4.6**		**11.7**		**4.1**	
Barium	mg/kg	**26.8**	J	**21.6**	J	**27.9**	J	**35.3**	J	**9.7**	J	**68.9**	J	**60.3**	J	**2.6**	J
Cadmium	mg/kg	**6.7**		**1.5**	B	**15.8**		**5.5**		**21.1**		**0.21**	J	**6.7**		**0.2**	JB
Chromium	mg/kg	**4.7**		**10.9**		**15.8**		**18.2**		**8**		**40.1**		**31.1**		**3.8**	
Lead	mg/kg	**5.5**		**5.3**		**20.2**		**13**		**2.7**		**15.6**		**20.2**		2.3	U
Mercury	mg/kg	**0.0081**	J	**0.013**	J	**0.011**	J	**0.009**	J	**0.0083**	J	**0.015**	J	**0.01**	J	0.11	U
Selenium	mg/kg	3.7	U	3.2	U	3.1	U	4.5	U	2.8	U	4.5	U	3.7	U	3.7	U
Silver	mg/kg	2.8	U	2.4	U	2.3	U	3.4	U	2.1	U	3.4	U	2.8	U	2.8	U
Non-Validated Metals																	
Aluminum	mg/kg	**3,530**		**8,200**		**9,750**		**11,500**		**2,720**		**15,800**		**15,600**		**646**	
Antimony	mg/kg	2.8	U	2.4	U	2.3	U	3.4	U	2.1	U	3.4	U	2.8	U	2.8	U
Beryllium	mg/kg	**0.2**	J	**0.38**	J	**0.32**	J	**0.46**	J	**0.23**	J	**1.4**		**1.4**		0.94	U
Cobalt	mg/kg	**3.3**	J	**2.2**	J	**2.1**	J	**4.3**	J	**24.9**		**18.7**		**22.4**		4.7	U
Copper	mg/kg	**5**		**5.7**		**9.6**		**15.5**		**3.4**	J	**22.1**		**21.6**		**2**	J
Iron	mg/kg	**3,680**		**12,200**		**8,140**		**9,870**		**2,220**		**24,000**	E	**46,800**	E	**1,470**	
Manganese	mg/kg	**71.7**		**42.7**		**42.9**		**52.6**		**26.9**		**338**		**657**		**21.7**	
Nickel	mg/kg	**4.3**	J	**6.3**	J	**4.3**	J	**10.2**	J	**34.2**		**36.1**		**37**		9.4	U
Thallium	mg/kg	9.3	U	8	U	**1.2**	J	11.2	U	7.1	U	11.2	U	9.3	U	9.4	U
Vanadium	mg/kg	**6.6**		**20.8**		**30.4**		**18.1**		**9.4**		**49.2**		**30.3**		**1.9**	J
Zinc	mg/kg	**511**		**378**		**679**		**427**		**406**		**4,210**	E	**3,640**	E	**582**	

Detections in bold

NA: This parameter was not analyzed for this sample

Qualifier Keys can be viewed in the attached laboratory
and validation reports

Table 5
Summary of Metals Detected in Soil
Parcel A3
Tradepoint Atlantic
Sparrows Point, Maryland

Parameter	Units	RW-067-SB-1		RW-067-SB-2		RW-067-SB-8		RW-067-SB-12		RW-067-SB-19		RW-067-SB-25		RW-067-SB-26		RW-067-SB-35	
		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil	
		10/7/2015		10/7/2015		10/7/2015		10/7/2015		10/7/2015		10/7/2015		10/7/2015		10/7/2015	
Validated Metals																	
Arsenic	mg/kg	**5.2**		**8.7**		**2.3**	J	**4.1**		**7.2**		**9.3**		**5.6**		**3.3**	
Barium	mg/kg	**77**	J	**75**	J	**12**	J	**36.7**	J	**21.5**	J	**13.1**	J	**29.8**	J	**19.5**	J
Cadmium	mg/kg	**837**		**4.6**		**0.48**	J	**23**		**32.1**		**1.8**		**3.3**		**5.9**	
Chromium	mg/kg	**11.6**		**15.8**		**7.2**		**27.1**		**13.1**		**7.8**		**14.6**		**14.9**	
Lead	mg/kg	**107**		**137**		**3.6**		**12.4**		**3.9**		**3.7**		**3.3**		**5.3**	
Mercury	mg/kg	**0.0062**	J	**2.6**		**0.0028**	J	**0.018**	J	**0.0032**	J	**0.0083**	J	**0.0065**	J	**0.003**	J
Selenium	mg/kg	3.7	U	4.4	U	4.1	U	4.1	U	3.1	U	2.7	U	5	U	2.8	U
Silver	mg/kg	**4.3**		3.3	U	3.1	U	3.1	U	2.3	U	2.1	U	3.7	U	2.1	U
Non-Validated Metals																	
Aluminum	mg/kg	**7,150**		**5,750**		**4,220**		**14,300**		**4,310**		**2,860**		**4,520**		**6,550**	
Antimony	mg/kg	**1.7**	J	3.3	U	3.1	U	3.1	U	2.3	U	2.1	U	3.7	U	2.1	U
Beryllium	mg/kg	**0.35**	J	**0.33**	J	**0.19**	J	**0.66**	J	**0.41**	J	**0.25**	J	**0.22**	J	**0.23**	J
Cobalt	mg/kg	**3.1**	J	**3.7**	J	**0.82**	J	**4.4**	J	**8.2**		**11.3**		**1.1**	J	**2.4**	J
Copper	mg/kg	**227**		**35.3**		**3.1**	J	**7.4**		**5.5**		**4.7**		**4.8**	J	**5.8**	
Iron	mg/kg	**12,300**		**11,200**		**5,740**		**14,100**		**7,960**		**6,670**		**49,600**	E	**6,110**	
Manganese	mg/kg	**531**		**223**		**20.9**		**70.5**		**53.2**		**51.9**		**69.3**		**80.3**	
Nickel	mg/kg	**8.6**	J	**8.5**	J	**2.7**	J	**12**		**17.5**		**8.9**		**3.9**	J	**6.6**	J
Thallium	mg/kg	9.2	U	10.9	U	10.2	U	10.2	U	7.7	U	6.8	U	12.4	U	7	U
Vanadium	mg/kg	**21.3**		**13.7**		**12.1**		**28.8**		**12.4**		**8.5**		**21.4**		**23.6**	
Zinc	mg/kg	**51,000**	E	**663**		**402**		**3,030**	E	**1,130**		**1,090**		**1,900**		**2,270**	E

Detections in bold

NA: This parameter was not analyzed for this sample

Qualifier Keys can be viewed in the attached laboratory
and validation reports

Table 5
Summary of Metals Detected in Soil
Parcel A3
Tradepoint Atlantic
Sparrows Point, Maryland

Parameter	Units	RW-068-SB-1		RW-068-SB-5		RW-068-SB-7		RW-068-SB-12		RW-068-SB-17		RW-068-SB-22		RW-068-SB-26		RW-068-SB-32	
		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil	
		10/7/2015		10/7/2015		10/7/2015		10/7/2015		10/7/2015		10/7/2015		10/7/2015		10/7/2015	
Validated Metals																	
Arsenic	mg/kg	**4.1**		**32.8**		**46.9**		**3.2**		**4.2**		**1.8**	J	**10.5**		**10.8**	
Barium	mg/kg	**83**		**168**		**403**		**28.2**		**38.4**		**56.4**		**74.1**		**87.4**	
Cadmium	mg/kg	**0.28**	B	**1,170**		**1,310**		**1.8**		**0.41**	B	1.2	UB	2.2	U	**0.26**	B
Chromium	mg/kg	**16.2**		**294**		**146**		**61.6**		**10.6**		**30.4**		**34.5**		**40**	
Lead	mg/kg	**69.8**		**597**		**448**		**12.1**		**5.8**		**12.2**		**18.5**		**21.4**	
Mercury	mg/kg	**0.14**		**0.34**		**0.49**		**0.1**	J	0.21	U	**0.017**	J	**0.017**	J	**0.0072**	J
Selenium	mg/kg	3.3	U	5.5	U	5.2	U	4.7	U	6.6	U	3.1	U	6	U	5.6	U
Silver	mg/kg	2.5	U	**6.5**		3.9	U	3.6	U	4.9	U	2.3	U	**0.49**	B	4.2	U
Non-Validated Metals																	
Aluminum	mg/kg	**10,500**		**8,870**		**8,680**		**3,640**		**7,200**		**10,500**		**18,700**		**21,800**	
Antimony	mg/kg	2.5	U	4.2	U	3.9	U	3.6	U	4.9	U	2.3	U	4.5	U	4.2	U
Beryllium	mg/kg	**0.7**	J	**0.79**	J	**0.99**	J	**0.25**	J	**0.77**	J	**0.91**		**1.4**	J	**1.6**	
Cobalt	mg/kg	**5.1**		**5.8**	J	**18**		**3.1**	J	**10.2**		**6.1**		**17.3**		**21.5**	
Copper	mg/kg	**19.6**		**329**		**265**		**12.9**		**7.8**	J	**9.8**		**22.5**		**26.4**	
Iron	mg/kg	**14,100**		**29,100**	E	**78,200**	E	**12,200**		**13,500**		**9,380**		**57,800**	E	**51,100**	E
Manganese	mg/kg	**460**		**838**		**1,310**		**1,240**		**84.2**		**84.2**		**1,660**		**1,050**	
Nickel	mg/kg	**11.5**		**15.3**		**678**		**8.8**	J	**11.9**	J	**17.2**		**36.4**		**44.2**	
Thallium	mg/kg	8.2	U	13.8	U	13.1	U	11.8	U	16.4	U	7.7	U	14.9	U	14	U
Vanadium	mg/kg	**24**		**63.9**		**142**		**102**		**12.7**		**35.5**		**35.2**		**39.7**	
Zinc	mg/kg	**117**		**14,800**	E	**63,800**	E	**1,260**		**7,650**	E	**1,840**	E	**105**		**285**	

Detections in bold

NA: This parameter was not analyzed for this sample

Qualifier Keys can be viewed in the attached laboratory
and validation reports

Table 5
Summary of Metals Detected in Soil
Parcel A3
Tradepoint Atlantic
Sparrows Point, Maryland

Parameter	Units	RW-069-SB-1		RW-069-SB-3		RW-069-SB-10		RW-069-SB-12		RW-069-SB-20		RW-069-SB-23		RW-069-SB-28		RW-069-SB-35	
		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil	
		10/7/2015		10/7/2015		10/7/2015		10/7/2015		10/7/2015		10/7/2015		10/7/2015		10/7/2015	
Validated Metals																	
Arsenic	mg/kg	**199**		**6.9**		**3.1**	D6	3	U	**1.6**	J	**2.2**		**10.2**		**11.9**	
Barium	mg/kg	**560**	J	**66.4**	J	**18.3**		**64**		**17.2**		**61.7**		**68.5**		**30.8**	
Cadmium	mg/kg	**93.9**		**3,530**		**1.5**		**0.25**	J	**8.2**		**0.66**	JB	**0.37**	B	**0.29**	B
Chromium	mg/kg	**52.3**		**12.5**		**10**		**25.6**		**8.8**		**36.5**		**33.1**		**19.3**	
Lead	mg/kg	**353**		**400**		**4.5**	D6	**13.6**		**2.9**		**14.4**		**17.5**		**9.9**	
Mercury	mg/kg	**0.31**		**0.028**	J	**0.02**	J	**0.025**	J	**0.004**	J	**0.018**	J	0.14	U	0.11	U
Selenium	mg/kg	3.4	U	4.2	U	3.9	U	4.8	U	2.9	U	3	U	4.2	U	4.7	U
Silver	mg/kg	2.6	U	**18.5**		2.9	U	3.6	U	2.2	U	2.2	U	**0.95**	B	3.5	U
Non-Validated Metals																	
Aluminum	mg/kg	**19,000**	E	**2,410**		**6,880**		**13,100**		**3,240**		**13,700**		**17,500**		**9,500**	
Antimony	mg/kg	2.6	U	**6.3**		2.9	U	3.6	U	2.2	U	2.2	U	3.2	U	3.5	U
Beryllium	mg/kg	**2**		1.1	U	**0.38**	J	**0.52**	J	**0.5**	J	**1.4**		**1.7**		**0.96**	J
Cobalt	mg/kg	**7.3**		**5.4**		**1.5**	J	**4.7**	J	**3.3**	J	**17.2**		**18.2**		**23.5**	
Copper	mg/kg	**73**		**672**		**4.8**	J	**11**		**5**		**20.2**		**20.8**		**11.5**	
Iron	mg/kg	**26,100**	E	**28,100**	E	**8,950**		**9,640**		**1,740**		**20,500**	E	**65,400**	E	**18,200**	
Manganese	mg/kg	**4,290**	E	**1,420**		**26.1**		**58.1**		**22.5**		**216**		**1,560**		**312**	
Nickel	mg/kg	**15.5**		**16.4**		**4.6**	J	**13.7**		**6.2**	J	**30.7**		**36.9**		**41**	
Thallium	mg/kg	8.5	U	10.6	U	9.8	U	12	U	7.2	U	7.4	U	10.6	U	11.7	U
Vanadium	mg/kg	**142**		**9**		**15.9**		**26.1**		**11.9**		**47.2**		**33.7**		**20.3**	
Zinc	mg/kg	**5,010**	E	**99,700**	E	**891**		**953**		**745**		**4,360**	E	**3,650**	E	**3,310**	E

Detections in bold

NA: This parameter was not analyzed for this sample

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and validation reports

Table 5
Summary of Metals Detected in Soil
Parcel A3
Tradepoint Atlantic
Sparrows Point, Maryland

Parameter	Units	RW-070-SB-1		RW-070-SB-3		RW-070-SB-7		RW-070-SB-15		RW-070-SB-20		RW-070-SB-22		RW-070-SB-27		RW-070-SB-32	
		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil	
		10/8/2015		10/8/2015		10/8/2015		10/8/2015		10/8/2015		10/8/2015		10/8/2015		10/8/2015	
Validated Metals																	
Arsenic	mg/kg	**14.3**		**184**		**12.2**		2.6	U	2.7	U	**22.8**		**8.6**		**8.9**	
Barium	mg/kg	**219**		**107**		**74.3**		**74**		**5.6**	J	**72.5**		**70.6**		**76.3**	
Cadmium	mg/kg	**16.4**		**11.8**		**80.5**		1.5	U	1.6	U	**0.2**	B	**0.36**	B	**0.42**	B
Chromium	mg/kg	**272**		**121**		**36**		**18.3**		**7.4**		**40.3**		**33.7**		**34.7**	
Lead	mg/kg	**97**		**481**		**86.7**		**7.9**		2.7	U	**17.7**		**16.1**		**17.5**	
Mercury	mg/kg	**0.08**	J	**0.26**		**0.13**		**0.0064**	J	**0.0092**	J	**0.028**	J	**0.011**	J	**0.013**	J
Selenium	mg/kg	3.7	U	**7**		4.1	U	4.1	U	4.3	U	3.8	U	4.9	U	4.9	U
Silver	mg/kg	**1.8**	B	**8**		3.1	U	3.1	U	3.2	U	2.8	U	3.7	U	**0.41**	B
Non-Validated Metals																	
Aluminum	mg/kg	**15,000**		**13,200**		**11,800**		**11,700**		**1,430**		**16,800**		**17,900**		**18,700**	
Antimony	mg/kg	2.8	U	2.4	U	3.1	U	3.1	U	3.2	U	2.8	U	3.7	U	3.7	U
Beryllium	mg/kg	**1**		**0.8**	J	**0.61**	J	**0.76**	J	**0.35**	J	**1.6**		**1.3**		**1.4**	
Cobalt	mg/kg	**7.2**		**37.9**		**3.7**	J	**3.7**	J	5.4	U	**17.9**		**17.4**		**17.5**	
Copper	mg/kg	**59**		**233**		**48.4**		**9.2**		**3.3**	J	**24.3**		**22.1**		**22.6**	
Iron	mg/kg	**94,700**	E	**201,000**	E	**20,600**	E	**7,120**		**10,200**		**24,000**	E	**47,300**	E	**51,300**	E
Manganese	mg/kg	**17,200**	E	**5,040**	E	**355**		**40.8**		**15.3**		**210**		**897**		**1,280**	
Nickel	mg/kg	**23.6**		**29.4**		**10.1**	J	**10.3**		**1.3**	J	**32.6**		**35.8**		**36.3**	
Thallium	mg/kg	9.2	U	**3.3**	J	10.3	U	10.2	U	10.8	U	9.4	U	12.3	U	12.2	U
Vanadium	mg/kg	**352**		**219**		**78.8**		**20.1**		**3.2**	J	**48.5**		**33.5**		**34.1**	
Zinc	mg/kg	**1,650**		**1,270**		**2,220**	E	**812**		**205**		**3,280**	E	**127**		**125**	

Detections in bold

NA: This parameter was not analyzed for this sample

Qualifier Keys can be viewed in the attached laboratory
and validation reports

TABLE 6
SOIL CLASSIFICATION AND GEOTECHNICAL DATA

Date Collected	ARM/EAG Sample ID	PACE/Geotechnics Sample ID	TOC (mg/kg)	Qual.	Percent Moisture	Percent Solids	USCS Symbol	USCS Classification	% greater than #4 sieve	% between #4 and #200 sieve	% finer than #200 sieve	Avg. Specific Gravity @ 20C	Avg. Permeability (cm/sec) @ 20C	Unit Wet Wt. (g/cm3)	Unit Dry Wt. (g/cm3)	Porosity
10/1/2015	RW-057-SB-1	30160869001					gm	silty gravel with sand	47.37	39.82	12.81					
10/1/2015	RW-057-SB-3	30160869002					gm	silty gravel with sand	42.03	35.61	22.36					
10/1/2015	RW-057-SB-6	30160869003					sm	silty sand	0.27	75.92	23.81					
10/1/2015	RW-057-SB-15	30160869004					cl	sandy lean clay	0.00	31.42	68.57					
10/1/2015	RW-057-SB-16	30160869005					cl	sandy lean clay	0.00	37.73	62.27					
10/1/2015	RW-057-SB-23	30160869006					cl	lean clay	0.00	5.61	94.39					
10/1/2015	RW-057-SB-29	30160869007					sp	poorly graded sand	1.17	97.11	1.72					
10/1/2015	RW-057-SB-32	30160869008					sm	silty sand	0.43	50.35	49.21					
10/5/2015	RW-058-SB-1	30161133025					sw-sm	well-graded sand with silt and gravel	29.17	61.72	9.11					
10/5/2015	RW-058-SB-2	30161133026					sc	clayey sand	0.12	68.66	31.22					
10/5/2015	RW-058-SB-8	30161133027					cl	sandy lean clay	0.02	44.96	55.02					
10/5/2015	RW-058-SB-15	30161133030					sc	clayey sand	0.38	74.65	24.97					
10/5/2015	RW-058-SB-20	30161133031					cl	sandy lean clay	0.00	41.39	58.61					
10/5/2015	RW-058-SB-22	30161133032					sc	clayey sand	1.91	80.74	17.35					
10/5/2015	RW-058-SB-28	30161133033					cl	lean clay with sand	0.06	18.49	81.45					
10/5/2015	RW-058-SB-32	30161133034					cl	lean clay with sand	1.66	26.36	71.97					
10/1/2015	RW-059-SB-1	30160869009					gp-gm	poorly graded gravel with silt and sand	47.80	42.86	9.33					
10/1/2015	RW-059-SB-3	30160869010					cl	sandy lean clay	2.00	42.53	55.46					
10/1/2015	RW-059-SB-6	30160869011					sm	silty sand	0.00	63.57	36.43					
10/1/2015	RW-059-SB-11	30160869012					sm	silty sand	0.00	73.03	26.97					
10/1/2015	RW-059-SB-20	30160869013					sm	silty sand	2.56	79.67	17.76					
10/1/2015	RW-059-SB-23	30160869014					ml	silt	0.00	5.78	94.22					
10/1/2015	RW-059-SB-26	30160869015					cl	lean clay	0.25	12.88	86.86					
10/1/2015	RW-059-SB-34	30160869016					sm	silty sand	0.91	50.39	48.70					
10/5/2015	RW-060-SB-1	30161133003					sc	clayey sand	3.77	59.89	36.34					
10/5/2015	RW-060-SB-4	30161133004					cl	sandy lean clay	0.00	44.71	55.29					
10/5/2015	RW-060-SB-7	30161133005					cl	lean clay	0.15	6.07	93.78					
10/5/2015	RW-060-SB-12	30161133006					cl	lean clay	0.00	9.09	90.91					
10/5/2015	RW-060-SB-20	30161133007					cl	sandy lean clay	0.35	48.06	51.60					
10/5/2015	RW-060-SB-22	30161133008					cl	lean clay	0.07	8.99	90.94					
10/5/2015	RW-060-SB-26	30161133009					sc	clayey sand	2.23	61.46	36.31					
10/5/2015	RW-060-SB-33	30161133010					sc	clayey sand	0.70	66.33	32.97					
10/5/2015	RW-061-SB-1	30161133035					sw-sm	well-graded sand with silt and gravel	25.42	62.99	11.59					
10/5/2015	RW-061-SB-2	30161133011					sc	clayey sand	10.89	60.35	28.76					
10/5/2015	RW-061-SB-7	30161133012					cl	lean clay with sand	0.28	18.88	80.84					
10/5/2015	RW-061-SB-11	30161133013					cl	lean clay	0.00	8.01	91.99					
10/5/2015	RW-061-SB-19	30161133014					cl	lean clay	0.00	7.45	92.55					
10/5/2015	RW-061-SB-21	30161133015					cl	sandy lean clay	0.00	44.34	55.66					
10/5/2015	RW-061-SB-29	30161133017					sc	clayey sand	1.51	61.52	36.97					
10/5/2015	RW-061-SB-34	30161133018					cl	lean clay with sand	0.06	19.72	80.22					
10/5/2015	RW-062-SB-1	30161133019					sw	well-graded sand with gravel	46.96	50.56	2.48					
10/5/2015	RW-062-SB-3	30161133020					sc	clayey sand	2.13	54.68	43.19					
10/5/2015	RW-062-SB-10	30161133021					cl	lean clay	0.17	10.65	89.18					
10/5/2015	RW-062-SB-15	30161133022					cl	sandy lean clay	0.06	41.75	58.19					
10/5/2015	RW-062-SB-20	30161133023					sc	clayey sand	1.43	53.53	45.05					
10/5/2015	RW-062-SB-22	30161133024					cl	lean clay	0.00	10.81	89.19					
10/5/2015	RW-062-SB-30	30161133001					sw-sm	well-graded sand with silt	6.61	84.31	9.08					
10/5/2015	RW-062-SB-32	30161133002					cl	lean clay	0.03	4.29	95.68					
10/6/2015	RW-063-SB-1	30161228009	12000		1.8	98	sc	clayey sand	12.95	42.03	45.02					
10/6/2015	RW-063-SB-5	30161228010	15000		3.6	96	sc	clayey sand	11.48	47.27	41.25					
10/6/2015	RW-063-SB-8	30161228011	8800		5.9	94	sm	silty sand	0.29	62.67	37.03					
10/6/2015	RW-063-SB-13	30161228012	270		2.2	98	ml	silt with sand	0.03	21.93	78.04					
10/6/2015	RW-063-SB-19	30161228013	340		3.2	97	sm	silty sand	1.17	76.17	22.66					
10/6/2015	RW-063-SB-25	30161228014	3800		2.5	97	ml	sandy silt	0.42	38.42	61.16					
10/6/2015	RW-063-SB-30	30161228015	30000		8.3	92	cl	lean clay	0.00	3.20	96.80					
10/6/2015	RW-063-SB-34	30161228016	270		3.4	97	cl	sandy lean clay	1.77	33.33	64.90					

TABLE 6
SOIL CLASSIFICATION AND GEOTECHNICAL DATA

Date Collected	ARM/EAG Sample ID	PACE/Geotechnics Sample ID	TOC (mg/kg)	Qual.	Percent Moisture	Percent Solids	USCS Symbol	USCS Classification	% greater than #4 sieve	% between #4 and #200 sieve	% finer than #200 sieve	Avg. Specific Gravity @ 20C	Avg. Permeability (cm/sec) @ 20C	Unit Wet Wt. (g/cm3)	Unit Dry Wt. (g/cm3)	Porosity
10/6/2015	RW-064-SB-1	30161228018	15000		2.2	98	sc	clayey sand with gravel	25.13	38.50	36.37					
10/6/2015	RW-064-SB-5	30161228019	9200		4	96	sw-sc	well-graded sand with clay and gravel	40.55	50.47	8.98					
10/6/2015	RW-064-SB-8	30161228020	3500		2.9	97	sw-sm	well-graded sand with silt and gravel	42.70	48.97	8.33					
10/6/2015	RW-064-SB-12	30161228021	23000		32	68	ml	sandy silt	4.26	38.44	57.30					
10/6/2015	RW-064-SB-16	30161228022	1200		4.4	96	sm	silty sand	0.93	72.72	26.35					
10/6/2015	RW-064-SB-21	30161228023	11000		5.6	94	cl	lean clay	0.00	7.59	92.41					
10/6/2015	RW-064-SB-29	30161228024	250	U	1.6	98	sp	poorly graded sand	1.65	95.37	2.98					
10/6/2015	RW-064-SB-32	30161228025	260	U	3	97	ml	sandy silt	0.00	37.84	62.16					
10/8/2015	RW-065-SB-1	30161487009	7500		6.2	94	gw-gc	well-graded gravel with clay and sand	45.17	44.06	10.77					
10/8/2015	RW-065-SB-5	30161487010	390	J	0.92	99	sc	clayey sand	0.01	67.21	32.78					
10/8/2015	RW-065-SB-9	30161487011	580	J	0.25	100	sm	silty sand	0.02	85.82	14.16					
10/8/2015	RW-065-SB-15	30161487013	710	J	1.2	99	cl	lean clay with sand	0.00	24.52	75.48					
10/8/2015	RW-065-SB-19	30161487014	3000		0.94	99	cl	sandy lean clay	0.00	33.13	66.87					
10/8/2015	RW-065-SB-24	30161487015	7700		2.6	97	cl	lean clay	0.00	7.82	92.18					
10/8/2015	RW-065-SB-26	30161487016	12000		2.7	97	cl	lean clay	0.00	7.11	92.89					
10/8/2015	RW-065-SB-35	30161487017	32000		3.7	96	cl	sandy lean clay	0.00	30.07	69.93					
10/7/2015	RW-066-SB-1	30161351010	7800		3.3	97	sm	silty sand	2.14	66.62	31.24					
10/7/2015	RW-066-SB-4	30161351012	340		2.1	98	cl	sandy lean clay	0.00	39.92	60.08					
10/7/2015	RW-066-SB-6	30161351011	2600		2.1	98	cl	sandy lean clay	0.75	35.13	64.12					
10/7/2015	RW-066-SB-11	30161351014	1300		2.3	98	cl	lean clay	0.00	6.24	93.76					
10/7/2015	RW-066-SB-20	30161351015	3500		2	98	sm	silty sand	2.16	79.35	18.49					
10/7/2015	RW-066-SB-22	30161351013	6800		3.4	97	cl	lean clay	0.00	6.79	93.21					
10/7/2015	RW-066-SB-27	30161351016	28000		4.7	95	cl	lean clay	0.00	5.38	94.62					
10/7/2015	RW-066-SB-35	30161351017	1100		3	97	sm	silty sand	2.08	85.36	12.55					
10/7/2015	RW-067-SB-1	30161351002	12000		6.8	93	sm	silty sand with gravel	26.72	47.33	25.95					
10/7/2015	RW-067-SB-2	30161351003	15000		1.9	98	sc	clayey sand	1.14	53.90	44.96					
10/7/2015	RW-067-SB-8	30161351004	280		3	97	sm	silty sand	0.00	83.70	16.30					
10/7/2015	RW-067-SB-12	30161351005	1200		2.4	98	cl	lean clay	0.06	10.85	89.09					
10/7/2015	RW-067-SB-19	30161351006	9500		3.6	96	cl	lean clay with sand	0.08	24.29	75.64					
10/7/2015	RW-067-SB-25	30161351007	12000		2.6	97	cl	sandy lean clay	1.59	34.80	63.61					
10/7/2015	RW-067-SB-26	30161351008	22000		4.7	95	cl	lean clay with sand	2.19	15.50	82.31					
10/7/2015	RW-067-SB-35	30161351009	260	U	3.1	97	cl	lean clay with sand	0.00	24.47	75.53					
10/7/2015	RW-068-SB-1	30161351025	11000		2.1	98	sc	clayey sand with gravel	34.42	49.29	16.30					
10/7/2015	RW-068-SB-5	30161351026	16000		1.3	99	sc	clayey sand	10.79	45.90	43.32					
10/7/2015	RW-068-SB-7	30161351027	24000		2.1	98	cl	sandy lean clay	5.49	43.99	50.52					
10/7/2015	RW-068-SB-12	30161351028	5300		0.68	99	sc	clayey sand	0.10	50.26	49.64					
10/7/2015	RW-068-SB-17	30161351029	130000		6.8	93	sm	silty sand	0.95	57.26	41.79					
10/7/2015	RW-068-SB-22	30161351030	1700		2	98	cl	lean clay	0.14	13.79	86.08					
10/7/2015	RW-068-SB-26	30161351031	26000		2.2	98	cl	lean clay	0.05	5.94	94.01					
10/7/2015	RW-068-SB-32	30161351032	30000		2.5	98	cl	lean clay	0.00	2.44	97.56					
10/7/2015	RW-069-SB-1	30161351018	14000		2.5	98	sm	silty sand with gravel	17.66	59.75	22.58					
10/7/2015	RW-069-SB-3	30161351019	11000		2.2	98	sm	silty sand	3.73	73.34	22.93					
10/7/2015	RW-069-SB-10	30161351020	250	U	1.4	99	cl	sandy lean clay	0.00	38.28	61.72					
10/7/2015	RW-069-SB-12	30161351021	810		1.4	99	cl	lean clay	0.00	12.81	87.19					
10/7/2015	RW-069-SB-20	30161351022	2900		0.82	99	sm	silty sand	3.53	82.38	14.09					
10/7/2015	RW-069-SB-23	30161351023	6500		2.5	98	cl	lean clay	0.00	5.73	94.27					
10/7/2015	RW-069-SB-28	30161351024	31000		3.2	97	cl	lean clay	0.00	3.85	96.15					
10/7/2015	RW-069-SB-35	30161351033	6800		1.1	99	sm	silty sand	0.32	62.58	37.09					
10/8/2015	RW-070-SB-1	30161487001	12000		9	91	sc	clayey sand with gravel	24.71	50.63	24.66					
10/8/2015	RW-070-SB-3	30161487002	3400		2.3	98	sc	clayey sand	11.09	54.73	34.18					
10/8/2015	RW-070-SB-7	30161487003	25000		4.6	95	sc	clayey sand	0.82	57.60	41.58					
10/8/2015	RW-070-SB-15	30161487004	1500		1.6	98	cl	sandy lean clay	0.00	39.60	60.40					
10/8/2015	RW-070-SB-20	30161487005	270	J	0.41	100	sp-sm	poorly graded sand with silt	1.71	89.21	9.08					
10/8/2015	RW-070-SB-22	30161487006	8500		2.2	98	cl	lean clay	0.00	4.57	95.43					
10/8/2015	RW-070-SB-27	30161487007	4700		1.3	99	sc	clayey sand	4.33	59.34	36.33					
10/8/2015	RW-070-SB-32	30161487008	20000		2.7	97	cl	lean clay	0.05	3.40	96.55					

TABLE 6
SOIL CLASSIFICATION AND GEOTECHNICAL DATA

Date Collected	ARM/EAG Sample ID	PACE/Geotechnics Sample ID	TOC (mg/kg)	Qual.	Percent Moisture	Percent Solids	USCS Symbol	USCS Classification	% greater than #4 sieve	% between #4 and #200 sieve	% finer than #200 sieve	Avg. Specific Gravity @ 20C	Avg. Permeability (cm/sec) @ 20C	Unit Wet Wt. (g/cm3)	Unit Dry Wt. (g/cm3)	Porosity
10/21/2015	RW-01-GB-SS-1 (1-3)	30163058022	4600		1.4	99										
10/21/2015	RW-01-GB-SS-2 (5-7)	30163058023	4700		7.6	92										
10/21/2015	RW-01-GB-SS-3 (10-12)	30163058024	1000	J	12	88										
10/21/2015	RW-01-GB-SS-4 (16-18)	30163058001	930	J	17	83										
10/22/2015	RW-01-GB-SS-6 (20.5-22.5)	30163058002	1200		19	81										
10/22/2015	RW-01-GB-SS-7 (25-27)	30163058003	1400		14	86										
10/22/2015	RW-01-GB-SS-8 (29.5-31.5)	30163058004	1200		29	71										
10/22/2015	RW-01-GB-SS-9 (34.5-36.5)	30163058005	18000		33	67										
10/22/2015	RW-01-GB-SS-10 (39.5-41.5)	30163058006	41000		48	52										
10/22/2015	RW-01-GB-SS-11 (44.5-46.5)	30163058007	19000		38	62										
10/21/2015	RW-01-GB-ST-1 (0-1.1)	30163058013					gw	well-graded gravel with sand	19.74	76.57	3.69	2.22	8.10E-04	1.60	1.42	0.36
10/21/2015	RW-01-GB-ST-2 (12-13.2)	30163058014					cl	lean clay with sand	0.33	21.83	77.84	2.69	1.80E-07	2.09	1.73	0.36
10/21/2015	RW-01-GB-ST-3 (15-16)	30163058015					cl	lean clay	1.15	8.17	90.68	2.67	1.30E-07	2.07	1.73	0.35
10/22/2015	RW-01-GB-ST-4 (22.5-25)	30163058016					sc	clayey sand	0.34	55.99	43.67	2.67	2.60E-04	2.03	1.69	0.37
10/22/2015	RW-01-GB-ST-5 (27-29.5)	30163058017					cl	lean clay	0.23	4.22	95.55	2.73	1.60E-07	1.76	1.18	0.56
10/22/2015	RW-01-GB-ST-6 (32-34.5)	30163058018					cl	lean clay with sand	0.19	16.12	83.69	2.58	6.00E-07	1.80	1.30	0.50
10/22/2015	RW-01-GB-ST-7 (37-39.5)	30163058019					cl	lean clay	0.30	8.20	91.50	2.39	2.50E-07	1.43	0.72	0.70
10/22/2015	RW-01-GB-ST-8 (42-44.5)	30163058020					cl	lean clay	0.00	7.04	92.96	2.47	1.70E-06	1.49	0.81	0.67
10/22/2015	RW-01-GB-ST-9 (47-49.5)	30163058021					cl	lean clay	0.00	2.52	97.48	2.6	4.00E-07	1.60	0.96	0.63
10/23/2015	RW-02-GB-SS-2 (3-5)	30163058008	24000		19	81										
10/23/2015	RW-02-GB-SS-4 (8-10)	30163058025	310	J	12	88										
10/23/2015	RW-02-GB-SS-5 (12.5-14.5)	30163058009	970	J	16	84										
10/23/2015	RW-02-GB-SS-6 (17.5-19.5)	30163058010	5200		13	87										
10/23/2015	RW-02-GB-SS-7 (22.5-24.5)	30163058027	15000		23	77										
10/23/2015	RW-02-GB-SS-8 (26-28)	30163058028	1100	U	13	87										
10/26/2015	RW-02-GB-SS-9 (30'-32')	30163718001	1800		22	78										
10/26/2015	RW-02-GB-SS-10 (37.5'-39.5')	30163718002	51000		46	54										
10/26/2015	RW-02-GB-SS-11 (42.5-44.5')	30163718003	38000		48	52										
10/26/2015	RW-02-GB-SS-12 (48'-50')	30163718004	19000		36	64										
10/23/2015	RW-02-GB-ST-1 (10-12.5)	30163058011					cl	lean clay	0.00	5.30	94.70	2.68	3.90E-08	2.06	1.71	0.36
10/23/2015	RW-02-GB-ST-2 (15-17.5)	30163058012					cl	lean clay with sand	0.18	25.09	74.73	2.64	2.20E-07	2.02	1.72	0.35
10/23/2015	RW-02-GB-ST-3 (20-22.5)	30163058026					cl	lean clay	0.00	5.19	94.81	2.67	5.50E-08	1.94	1.47	0.45
10/26/2015	RW-02-GB-ST-4 (35'-37.5')	30163718005					cl	lean clay	0.00	2.67	97.33	2.54	6.30E-07	1.48	0.80	0.68
10/26/2015	RW-02-GB-ST-5 (40'-42.5')	30163718006					cl	lean clay	0.11	8.91	90.98	2.39	6.00E-07	1.39	0.69	0.71
10/26/2015	RW-02-GB-ST-6 (45'-47.5')	30163718007					cl	lean clay	0.03	2.91	97.05	2.56	3.50E-07	1.60	1.00	0.61

TABLE 6
SOIL CLASSIFICATION AND GEOTECHNICAL DATA

Date Collected	ARM/EAG Sample ID	PACE/Geotechnics Sample ID	TOC (mg/kg)	Qual.	Percent Moisture	Percent Solids	USCS Symbol	USCS Classification	% greater than #4 sieve	% between #4 and #200 sieve	% finer than #200 sieve	Avg. Specific Gravity @ 20C	Avg. Permeability (cm/sec) @ 20C	Unit Wet Wt. (g/cm3)	Unit Dry Wt. (g/cm3)	Porosity
10/26/2015	RW-03-GB-SS-1 (1-3')	30163718028	11000		13	87										
10/26/2015	RW-03-GB-SS-2 (5-7')	30163718029	1800		14	86										
10/26/2015	RW-03-GB-SS-3 (10-12')	30163718030	1700		16	84										
10/27/2015	RW-03-GB-SS-4 (16-18')	30163718031	900	J	17	83										
10/27/2015	RW-03-GB-SS-5 (22.5-24.5')	30163718032	7700		25	75										
10/27/2015	RW-03-GB-SS-6 (27-29)	30163718033	540	J	11	89										
10/27/2015	RW-03-GB-SS-6 (27-29)	30163718048					sw-sm	well-graded sand with silt	11.06	83.63	5.31					
10/27/2015	RW-03-GB-SS-7 (30-32)	30163718049					sp	poorly graded sand with gravel	11.37	85.74	2.89					
10/27/2015	RW-03-GB-SS-8 (35-36)	30163718050					sp	poorly graded sand with gravel	26.56	71.58	1.86					
10/27/2015	RW-03-GB-SS-8 (35-37)	30163718035	830	J	8.9	91										
10/27/2015	RW-03-GB-SS-10 (40-42)	30163718036	730	J	13	87										
10/27/2015	RW-03-GB-SS-11 (44-45)	30163718051					sm	silty sand	0.00	60.95	39.05					
10/27/2015	RW-03-GB-SS-12 (45-47)	30163718037	1400		14	86										
10/27/2015	RW-03-GB-SS-13 (48-50)	30163718052					ml	sandy silt	0.00	33.91	66.09					
10/27/2015	RW-03-GB-SS-14 (52.5-54.5)	30163718038	1600		12	88										
10/27/2015	RW-03-GB-SS-15 (57.5-59.5)	30163718039	1800		13	87										
10/28/2015	RW-03-GB-SS-16 (62.5-64.5)	30163718040	17000		32	68										
10/28/2015	RW-03-GB-SS-16 (62.5-64.5)	30163718053					ml	sandy silt	0.71	35.71	63.58					
10/28/2015	RW-03-GB-SS-17 (67.5-69.5)	30163718041	15000		25	75										
10/27/2015	RW-03-GB-ST-1 (12-14.5)	30163718042					cl	lean clay	0.00	9.87	90.13	2.63	3.30E-07	2.08	1.77	0.33
10/27/2015	RW-03-GB-ST-2 (15-16)	30163718043					sp-sm	poorly graded sand with silt	0.05	92.02	7.93	2.58	2.60E-04	1.92	1.58	0.39
10/27/2015	RW-03-GB-ST-3 (20-22.5)	30163718044					cl	lean clay	0.00	4.02	95.98	2.62	1.60E-07	1.87	1.39	0.47
10/27/2015	RW-03-GB-ST-5 (50-52.5)	30163718045					sc	clayey sand	0.00	50.34	49.66	2.63	4.00E-07	2.12	1.84	0.30
10/27/2015	RW-03-GB-ST-6 (55-57.5)	30163718046					sc	clayey sand	1.70	67.88	30.42	2.62	4.90E-06	2.17	1.89	0.28
10/28/2015	RW-03-GB-ST-7 (65-67.5)	30163718047					cl	sandy lean clay	1.77	46.49	51.74	2.64	2.10E-07	1.83	1.35	0.49
10/29/2015	RW-04-GB-SS-1 (1'-3')	30163718008	10000		11	89										
10/29/2015	RW-04-GB-SS-2 (5'-7')	30163718009	1400		13	87										
10/29/2015	RW-04-GB-SS-3 (8'-10')	30163718010	1400		18	82										
10/29/2015	RW-04-GB-SS-4 (12.5'-14.5')	30163718011	4800		20	80										
10/29/2015	RW-04-GB-SS-5 (16.5'-18.5')	30163718012	2700		18	82										
10/29/2015	RW-04-GB-SS-6 (22.8'-24.5')	30163718013	11000		27	73										
10/29/2015	RW-04-GB-SS-7 (26.5'-28.5')	30163718014	1100		9.4	91										
10/29/2015	RW-04-GB-SS-8 (32.5'-34.5')	30163718015	1100		11	89										
10/29/2015	RW-04-GB-SS-9 (36.1-38.1)	30163718016	940	J	11	89										
10/29/2015	RW-04-GB-SS-10 (41.5-43.5)	30163718017	2400		17	83										
10/29/2015	RW-04-GB-SS-11 (46.8-48.8)	30163718018	5600		12	88										
10/29/2015	RW-04-GB-ST-1 (10-12.5)	30163718019					cl	lean clay	0.08	5.10	94.83	2.65	3.00E-08	2.03	1.66	0.38
10/29/2015	RW-04-GB-ST-2 (15-16.5)	30163718020					sp-sm	poorly graded sand with silt	0.25	89.46	10.29	2.6	6.70E-04	1.95	1.57	0.40
10/29/2015	RW-04-GB-ST-3 (20-22.5)	30163718021					sc	clayey sand	0.11	58.50	41.40	2.62	1.30E-07	1.89	1.37	0.48
10/29/2015	RW-04-GB-ST-4 (25-26.5)	30163718022					ml	silt with sand	6.58	16.25	77.17	2.57	1.20E-07	1.84	1.31	0.49
10/29/2015	RW-04-GB-ST-5 (30-31.3)	30163718023					sc	clayey sand	1.48	68.73	29.78	2.64	3.10E-05	1.93	1.54	0.42
10/29/2015	RW-04-GB-ST-6 (35-36.1)	30163718024					sc	clayey sand	0.46	69.09	30.46	2.6	1.10E-06	2.16	1.85	0.29
10/29/2015	RW-04-GB-ST-7 (40-41.5)	30163718025					sc	clayey sand	0.00	60.99	39.01	2.6	9.20E-06	2.07	1.77	0.32
10/29/2015	RW-04-GB-ST-8 (45-46.8)	30163718026					cl	sandy lean clay	0.00	40.65	59.35	2.61	1.00E-05	2.06	1.65	0.37
10/29/2015	RW-04-GB-ST-9 (50-52.5)	30163718027					cl	lean clay	0.00	2.89	97.11	2.6	8.50E-08	1.75	1.19	0.54

▨ = Parameter not requested for this sample ID.

Table 7
Summary of Parameters Detected in Groundwater
Parcel A3
Tradepoint Atlantic
Sparrows Point, Maryland

Parameter	**Units**	RW-057-PZ		RW-063-PZ		RW-067-PZ		RW-070-PZ		RW02-PZM020		RW07-PZM017		RW10-PZM020		RW19-PZM020		RW20-PZM020	
		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater	
		11/9/2015		11/9/2015		11/9/2015		11/9/2015		11/13/2015		11/13/2015		11/12/2015		11/12/2015		11/17/2015	
Total Metals																			
Aluminum	μg/L	**230**		**22.8**	J	50	U	50	U	**32.5**	B	**38.1**	B	**206**		**35.5**	B	**24.1**	B
Antimony	μg/L	**17.9**		**8.6**		**16.3**		6	U	**11**		**7.3**		**7.9**		6	U	6	U
Arsenic	μg/L	**12**		**60.2**		**4.5**	B	5	U	**6.9**		5	U	**3.3**	J	5	U	**3.7**	J
Barium	μg/L	**13**		**13.7**		**16.3**		**16.6**		**8.1**	B	**9.9**	B	**13.7**		**34.3**		**28.7**	
Beryllium	μg/L	**0.42**	B	1	U	1	U	**0.45**	B	**0.39**	B	1	U	1	U	1	U	1	U
Cadmium	μg/L	**44,500**		**434**		**311**		**0.91**	J	**47.2**		**9,780**		**10,200**		**41.9**		**0.59**	J
Chromium	μg/L	5	U	5	U	5	U	5	U	5	U	5	U	5	U	**0.89**	J	5	U
Cobalt	μg/L	**238**		**76.3**		**142**		**13**		**113**		**144**		**114**		**38.5**		**53.1**	
Copper	μg/L	5	U	**2.5**	B	5	U	5	U	5	U	**1.5**	J	**7.8**		**12**		**6**	
Iron	μg/L	**134,000**	J	**159,000**	J	**400,000**	J	**713,000**	J	**443,000**		**283,000**		**202,000**		**37,000**		**226,000**	
Lead	μg/L	5	U	5	U	5	U	5	U	5	U	5	U	5	U	25	U	5	U
Manganese	μg/L	**16,400**		**26,600**		**28,200**		**33,300**		**19,000**		**17,500**		**18,000**		**2,580**		**9,210**	
Mercury	μg/L	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
Nickel	μg/L	**287**		**42.2**		**94**		**11.5**		**63.2**		**109**		**92.8**		**12.6**		**40**	
Selenium	μg/L	8	U	8	U	8	U	8	U	8	U	8	U	8	U	8	U	8	U
Silver	μg/L	**2.4**	J	**4.3**	J	**7.3**		**11.5**		**7.6**		**5.2**	B	**4.1**	B	**0.62**	B	**4.5**	J
Thallium	μg/L	10	U	10	U	10	U	10	U	10	U	10	U	10	U	50	U	10	U
Vanadium	μg/L	5	U	5	U	5	U	5	U	**7.5**		**5.9**		**5.6**		**1.5**	B	**4**	B
Zinc	μg/L	**658,000**	J	**592,000**	J	**784,000**	J	**65,400**	J	**576,000**		**387,000**		**509,000**		**7,000**		**82,800**	
Additional Water Quality Parameters																			
Alkalinity, Total as CaCO3	μg/L	**32**		**98**		**24**		**142**		**19**	J-	**22**	J-	**10**		**40**		**12**	
BOD, 5 day	μg/L	10	U	10	U	**15.2**		**23.9**		**31.9**		20	U	10	U	**10**		**17.5**	
Chemical Oxygen Demand	μg/L	**61**		**86.5**		**114**		**170**		**106**		**78**		**86.5**		**38.5**	J	**86.5**	
Dissolved Oxygen	μg/L	**0.21**		**0.18**		**0.22**		**0.04**		**0.17**		**0.25**		**0.82**		**0.30**		**0.18**	
Iron, Ferrous	μg/L	**0.14**	J-	**0.13**	J-	**0.17**	J-	**727**	J-	**0.33**	J-	**0.48**	J-	**0.26**	J-	**40.5**	J-	NS	
Nitrate as N	μg/L	**0.04**	J	**0.033**	J	**0.044**	J	**0.037**	J	**0.044**	J	**0.036**	J	**0.032**	J	0.1	U	0.1	U
Nitrite as N	μg/L	**0.0044**	J	**0.0031**	J	**0.0028**	J	**0.0074**	J	0.01	U	0.01	U	**0.0052**	J	0.01	U	**0.0058**	J
Oxidation-Reduction Potential	μg/L	**-49.3**		**-59.4**		**-10.3**		**-28.4**		**-107.0**		**-64.1**		**-85.3**		**-71.3**		**-167.7**	
pH	μg/L	**4.33**		**4.90**		**4.47**		**5.10**		**4.17**		**4.1**		**6.74**		**5.65**		**3.06**	
Sulfate	μg/L	**2,270**	B	**2,590**	B	**3,350**		**2,580**	B	**3,420**		**2,380**	B	**2,000**	B	**742**	B	NS	
Sulfide	μg/L	1	U	**0.4**	J	1	U	1	U	**0.4**	J-	**0.6**	J-	1	U	1	U	1	U
Total Dissolved Solids	μg/L	**4,240**		**4,680**		**5,780**		**4,280**		**5,840**		**3,930**		**4,190**		**8,250**		**1,990**	
Total Organic Carbon	μg/L	**3.3**		**5.8**		**4.2**		**6.6**		**3.7**	J-	**3.3**	J-	**2.9**		**1.2**	B	**2.6**	B

Detections in bold

Qualifier Keys can be viewed in the attached
validation reports

APPENDIX A

Table 2
Pre-Design Investigation Borings

Sample Location	REC or Source Area	Boring Depth	Sample Depth	Analytical Parameters		Rationale
				Soil	Groundwater	
RW-001-GB	Possible PRB Wall Alignment	50 feet	0-1' Every 5' to 50'	FOC, Bulk Density, Total Porosity and Grain Size Analysis		Characterize soil to evaluate viability of possible PRB wall for groundwater treatment
RW-002-GB	Possible PRB Wall Alignment	50 feet	0-1' Every 5' to 50'	FOC, Bulk Density, Total Porosity and Grain Size Analysis		Characterize soil to evaluate viability of possible PRB wall for groundwater treatment
RW-003-GB	Possible PRB Wall Alignment	50 feet	0-1' Every 5' to 50'	FOC, Bulk Density, Total Porosity and Grain Size Analysis		Characterize soil to evaluate viability of possible PRB wall for groundwater treatment
RW-004-GB	Possible PRB Wall Alignment	50 feet	0-1' Every 5' to 50'	FOC, Bulk Density, Total Porosity and Grain Size Analysis		Characterize soil to evaluate viability of possible PRB wall for groundwater treatment
RW-057-SB	SMWU 27 (REC 6A) Sludge Bin Storage Area	35 feet	0-1' Every 5' to 35'	COPI List (RCRA) Metals and Grain Size Analysis	TOC, TDS, BOD, COD, Total Metals, pH, ORP, Sulfide, Ferrous Iron, DO, Sulfate, Nitrate (as N) and Alkalinity (CaCO3)	Characterize soil and groundwater to define nature and extent of suspected source area
RW-058-SB	SMWU 27 (REC 6A) Sludge Bin Storage Area	35 feet	0-1' Every 5' to 35'	COPI List (RCRA) Metals and Grain Size Analysis		Characterize soil to define nature and extent of suspected source area
RW-059-SB	SMWU 27 (REC 6A) Sludge Bin Storage Area	35 feet	0-1' Every 5' to 35'	COPI List (RCRA) Metals and Grain Size Analysis		Characterize soil to define nature and extent of suspected source area
RW-060-SB	SMWU 27 (REC 6A) Sludge Bin Storage Area	35 feet	0-1' Every 5' to 35'	COPI List (RCRA) Metals and Grain Size Analysis		Characterize soil to define nature and extent of suspected source area
RW-061-SB	SMWU 27 (REC 6A) Sludge Bin Storage Area	35 feet	0-1' Every 5' to 35'	COPI List (RCRA) Metals and Grain Size Analysis		Characterize soil to define nature and extent of suspected source area
RW-062-SB	SMWU 27 (REC 6A) Sludge Bin Storage Area	35 feet	0-1' Every 5' to 35'	COPI List (RCRA) Metals and Grain Size Analysis		Characterize soil to define nature and extent of suspected source area
RW-063-SB	SWMU 29 (REC 6C) East Pond	35 feet	0-1' Every 5' to 35'	COPI List (RCRA) Metals, FOC and Grain Size Analysis	TOC, TDS, BOD, COD, Total Metals, pH, ORP, Sulfide, Ferrous Iron, DO, Sulfate, Nitrate (as N) and Alkalinity (CaCO3)	Characterize soil and groundwater to define nature and extent of suspected source area
RW-064-SB	SWMU 29 (REC 6C) East Pond	35 feet	0-1' Every 5' to 35'	COPI List (RCRA) Metals, FOC and Grain Size Analysis		Characterize soil to define nature and extent of suspected source area
RW-065-SB	SWMU 29 (REC 6C) East Pond	35 feet	0-1' Every 5' to 35'	COPI List (RCRA) Metals, FOC and Grain Size Analysis		Characterize soil to define nature and extent of suspected source area
RW-066-SB	SWMU 29 (REC 6C) East Pond	35 feet	0-1' Every 5' to 35'	COPI List (RCRA) Metals, FOC and Grain Size Analysis		Characterize soil to define nature and extent of suspected source area
RW-067-SB	SWMU 29 (REC 6C) East Pond	35 feet	0-1' Every 5' to 35'	COPI List (RCRA) Metals, FOC and Grain Size Analysis	TOC, TDS, BOD, COD, Total Metals, pH, ORP, Sulfide, Ferrous Iron, DO, Sulfate, Nitrate (as N) and Alkalinity (CaCO3)	Characterize soil and groundwater to define nature and extent of suspected source area
RW-068-SB	SWMU 29 (REC 6C) East Pond	35 feet	0-1' Every 5' to 35'	COPI List (RCRA) Metals, FOC and Grain Size Analysis		Characterize soil to define nature and extent of suspected source area
RW-069-SB	SWMU 29 (REC 6C) East Pond	35 feet	0-1' Every 5' to 35'	COPI List (RCRA) Metals, FOC and Grain Size Analysis		Characterize soil to define nature and extent of suspected source area
RW-070-SB	SWMU 29 (REC 6C) East Pond	35 feet	0-1' Every 5' to 35'	COPI List (RCRA) Metals, FOC and Grain Size Analysis	TOC, TDS, BOD, COD, Total Metals, pH, ORP, Sulfide, Ferrous Iron, DO, Sulfate, Nitrate (as N) and Alkalinity (CaCO3)	Characterize soil and groundwater to define nature and extent of suspected source area
RW02-PZM020	Existing Monitoring Well		25 feet		TOC, TDS, BOD, COD, Total Metals, pH, ORP, Sulfide, Ferrous Iron, DO, Sulfate, Nitrate (as N) and Alkalinity (CaCO3)	Characterize groundwater to evaluate possible remedial technologies
RW07-PZM017	Existing Monitoring Well		25 feet		TOC, TDS, BOD, COD, Total Metals, pH, ORP, Sulfide, Ferrous Iron, DO, Sulfate, Nitrate (as N) and Alkalinity (CaCO3)	Characterize groundwater to evaluate possible remedial technologies
RW10-PZM020	Existing Monitoring Well		25 feet		TOC, TDS, BOD, COD, Total Metals, pH, ORP, Sulfide, Ferrous Iron, DO, Sulfate, Nitrate (as N) and Alkalinity (CaCO3)	Characterize groundwater to evaluate possible remedial technologies
RW19-PZM020	Existing Monitoring Well		25 feet		TOC, TDS, BOD, COD, Total Metals, pH, ORP, Sulfide, Ferrous Iron, DO, Sulfate, Nitrate (as N) and Alkalinity (CaCO3)	Characterize groundwater to evaluate possible remedial technologies
RW20-PZM020	Existing Monitoring Well		25 feet		TOC, TDS, BOD, COD, Total Metals, pH, ORP, Sulfide, Ferrous Iron, DO, Sulfate, Nitrate (as N) and Alkalinity (CaCO3)	Characterize groundwater to evaluate possible remedial technologies

Soil Borings Sampling Density Requirements (from **Worksheet 17 - Sampling Design and Rationale**)

See Table 1 Footnotes

APPENDIX B

Boring ID: RW-001-GB

(page 1 of 2)

Project Name : Sparrows Point
ARM Project No. : 150298M
Client : EnviroAnalytics Group
Site : Sparrows Point - Area A
Borehole Location : Parcel A3
Weather : Clear, 65 F

Date/Time Started : 10/21/2015 - 10:45
Date/ Time Completed : 10/22/2015 - 15:00
Logged By : PNV
Checked By : ESM
Driller : Mike Waller - Allied
Drill Rig Type/Method : Dietrich B-120
Bit/Auger Size : 8" (4.25" ID) HSA

Northing (US ft) : 572,264.00
Easting (US ft) : 1,456,076.19
Surface Elevation (ft) : 10.37
Depth to Refusal (ft) : NA
Total Depth (ft bgs) : 51.5
Depth to Water (ft bgs) : 9

Depth (ft.)	Sample No:	Recovery (%)	PID (PPM):	Blow Count	DESCRIPTION	USCS	REMARKS
0	ST-1	100	-	-	0-5' SAND with gravel slag, dark gray to black, dry to moist	SW-GW	ST-1 @ 0-1.1'
2	SS-1	74	0.6	6-4-5-5			SS-1 @ 1-3'
4							
6	SS-2	70	0.9	3-5-6-25	5-9' SAND with gravel, dark gray to black, some yellow gravel and white crystalline material	SW	SS-2 @ 5-7'
8							
					9-11.5' CLAY, light brown to gray, with fine sand and gravel	CL	
10	SS-3	80	0.0	3-1-2-1			SS-3 @ 10-12'
12	ST-2	100	-	-	11.5-12.5' CLAY, lean with sand, gray to brown	CL	ST-2 @ 12-13.2'
					12.5-15' Clayey SAND, gray, fine-grained, mottled	SC	
14							
	ST-3	100	-	-	15-18.5' CLAY, lean, gray	CL	ST-3 @ 15-16'
16	SS-4	80	0.0	4-7-8-10			SS-4 @ 16-18'
18	SS-5	100	-	2-3-3-5	18.5-20' Clayey SAND, light brown to gray, fine to coarse grained sand with gravels	SC	SS-5 @ 18-20'
20					20-21.5' Silty CLAY, gray	ML/CL	
	SS-6	80	-	-			
22					21.5-24' Clayey SAND, gray, fine grained	SC	ST-4 @ 22.5-25'
	ST-4	100	-	-			
24					24-26' SAND, tan, fine grained with trace gravel	SW	
26	SS-7	100	0.0	3-2-1-2	26-34.5' CLAY, lean	CL	SS-7 @ 25-27'
							ST-5 @ 27-29.5'
28	ST-5	92	-	-			
30	SS-8	100	0.0	3-2-3-3			SS-8 @ 29.5-31.5'

Boring ID: RW-001-GB

(page 2 of 2)

Project Name : Sparrows Point
ARM Project No. : 150298M
Client : EnviroAnalytics Group
Site : Sparrows Point - Area A
Borehole Location : Parcel A3
Weather : Clear, 65 F

Date/Time Started : 10/21/2015 - 10:45
Date/ Time Completed : 10/22/2015 - 15:00
Logged By : PNV
Checked By : ESM
Driller : Mike Waller - Allied
Drill Rig Type/Method : Dietrich B-120
Bit/Auger Size : 8" (4.25" ID) HSA

Northing (US ft) : 572,264.00
Easting (US ft) : 1,456,076.19
Surface Elevation (ft) : 10.37
Depth to Refusal (ft) : NA
Total Depth (ft bgs) : 51.5
Depth to Water (ft bgs) : 9

Depth (ft.)	Sample No:	Recovery (%)	PID (PPM):	Blow Count	DESCRIPTION	USCS	REMARKS
30	SS-8	100	0.0	3-2-3-3			
32	ST-6	92	-	-		CL	ST-6 @ 32-34.5'
34							
	SS-9	100	0.0	2-2-3-4	34.5-44.5' CLAY, lean, dark gray 0.5' sand lens at 36.2' bgs		SS-9 @ 34.5-36.5'
36							
	ST-7	92	-	-			ST-7 @ 37-39.5'
38							
40	SS-10	100	0.0	2-2-2-3		CL	SS-10 @ 39.5-41.5'
42	ST-8	94	-	-			ST-8 @ 42-44.5'
44							
	SS-11	100	0.0	1-2-3-4	44.5-51.5' CLAY, lean, dark gray		SS-11 @ 44.5-46.5'
46							
							Terminated auger use at 47'
48	ST-9	92	-	-		CL	ST-9 @ 47-49.5'
50	SS-10	100	0.0	3-3-3-3			SS-10 @ 49.5-51.5' no sample collected
52					End of Boring at 51.5' bgs		
54							
56							
58							
60							

Boring ID: RW-002-GB

(page 1 of 2)

Project Name : Sparrows Point
ARM Project No. : 150298M
Client : EnviroAnalytics Group
Site : Sparrows Point - Area A
Borehole Location : Parcel A3
Weather : Clear, 60s F

Date/Time Started : 10/23/2015 - 10:45
Date/ Time Completed : 10/26/2015
Logged By : PNV
Checked By : ESM
Driller : Mike Waller - Allied
Drill Rig Type/Method : Dietrich B-120
Bit/Auger Size : 8" (4.25" ID) HSA

Northing (US ft) : 572,053.70
Easting (US ft) : 1,456,037.53
Surface Elevation (ft) : 10.17
Depth to Refusal (ft) : NA
Total Depth (ft bgs) : 30
Depth to Water (ft bgs) : -

Depth (ft.)	Sample No:	Recovery (%)	PID (PPM):	Blow Count	DESCRIPTION	USCS	REMARKS
0					0-6' SAND and GRAVEL, dark gray to black, fine to medium grained sand (slag fill)	SW-GW	
2	SS-1	60	0.1	36-18-8-5			SS-1 @ 0.5-2.5'
4	SS-2	40	2.9	3-6-6-2			SS-2 @ 3-5'
6	SS-3	40	0.3	1-2-2-2	6-8' SAND, tan, fine grained	SP	
8	SS-4	70	0.1	4-7-8-4	8-12' CLAY, lean, brown to gray	CL	SS-4 @ 8-10'
10 12	ST-1	92	-	-			ST-1 @ 10-12.5'
14	SS-5	-	0.1	4-6-8-10	12-24' CLAY, lean with sand, gray, hard concretions at base of spoon sample	CL	SS-5 @ 12.5-14.5'
							ST-2 @ 15-17'
16	ST-2	92	-	-			
18	SS-6	75	-	2-2-3-5			SS-6 @ 17.5-19.5'
20 22	ST-3	90	-	-			ST-3 @ 20-20.5'
24	SS-7	65	-	1-3-4-7			
					24-30' SAND, tan, fine to coarse sand with rounded gravel	SW	Attempt ST from 25-27.5'; advanced 1' with no recovery
26	SS-8	75	-	6-12-18-18			SS-8 @ 26-28'
28 30	HSA	-	-	-			Attempt ST from 28-30'; advanced 0.8' with no recovery

Boring ID: RW-002-GB

(page 2 of 2)

Project Name : Sparrows Point
ARM Project No. : 150298M
Client : EnviroAnalytics Group
Site : Sparrows Point - Area A
Borehole Location : Parcel A3
Weather : Clear, 60s F

Date/Time Started : 10/23/2015 - 10:45
Date/ Time Completed : 10/26/2015
Logged By : PNV
Checked By : ESM
Driller : Mike Waller - Allied
Drill Rig Type/Method : Dietrich B-120
Bit/Auger Size : 8" (4.25" ID) HSA

Northing (US ft) : 572,053.70
Easting (US ft) : 1,456,037.53
Surface Elevation (ft) : 10.17
Depth to Refusal (ft) : NA
Total Depth (ft bgs) : 30
Depth to Water (ft bgs) : -

Depth (ft.)	Sample No:	Recovery (%)	PID (PPM):	Blow Count	DESCRIPTION	USCS	REMARKS
30	SS-9	100	0.0	1-2-3-4	30-31.5' SAND, tan, fine to medium grained with trace clay and gravel, some iron concretions near bottom of sand layer	SW	Attempt ST from 30-32'; no recovery Took SS sample 30-32'
32					31.5-33' Silty CLAY, gray, with trace sand at bottom of spoon	ML/CL	
34					33-35.5' Clayey SAND, gray	SC	ST-4 @ 35-37.5'
36	ST-4	100	-	-	35.5-39.5' Clayey SILT, gray, with some thin fine sand stringers	CL/ML	
38	SS-10	100	0.0	1-2-3-3			SS-10 @ 37.5-39.5'
40					39.5-42.5' Silty CLAY, gray	ML/CL	ST-5 @ 40-42.5'
42	ST-5	100	-	-			
44	SS-11	100	0.0	1-1-2-2	42.5-44' Clayey SILT, gray	CL/ML	SS-11 @ 42.5-44.5
46	ST-6	92	-	-	44-50' Silty CLAY, gray	ML/CL	ST-6 @ 45-47.5'
48							Augers to 48'
	SS-12	100	-	1-1-2-2			SS-12 @ 48-50'
50					End of Boring at 50' bgs		
52							
54							
56							
58							
60							

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Boring ID: RW-003-GB

(page 1 of 2)

Project Name	: Sparrows Point
ARM Project No.	: 150298M
Client	: EnviroAnalytics Group
Site	: Sparrows Point - Area A
Borehole Location	: Parcel A3
Weather	: Clear, 60 F

Date/Time Started	: 10/26/2015 - 15:15
Date/ Time Completed	: 10/28/2015 - 11:30
Logged By	: PNV
Checked By	: ESM
Driller	: Mike Waller - Allied
Drill Rig Type/Method	: Dietrich B-120
Bit/Auger Size	: 8" (4.25" ID) HSA

Northing (US ft)	: 571,852.74
Easting (US ft)	: 1,456,029.15
Surface Elevation (ft)	: 10.16
Depth to Refusal (ft)	: NA
Total Depth (ft bgs)	: 69.5
Depth to Water (ft)	: 13.5

Depth (ft.)	Sample No:	Recovery (%)	PID (PPM):	Blow Count	DESCRIPTION	USCS	REMARKS
0					0-4' SAND, dark gray to black, fine to coarse grained with some gravel (slag fill)	SW	SS-1 @ 1-3'
2	SS-1	100	0.1	12-20-16-10			
4					4-13' CLAY, lean, light gray with trace amounts of light brown Clayey SILT	CL	SS-2 @ 5-7'
6	SS-2	80	0.1	2-4-6-11			
8							
10	SS-3	100	0.1	3-5-8-12			SS-3 @ 10-12'
12	ST-1	90	-	-			ST-1 @ 12-14'
					13-19' CLAY, lean, gray to brown, with fine grained sand, trace clay, wet	CL-SP	
14							
	ST-2	100	-	-			ST-2 @15-16'
16	SS-4	87.5	0.2	2-3-4-3			SS-4 @16-18'
18							
					19-25' CLAY, lean, grayish brown	CL	
20	ST-3	92	-	-			ST-3 @ 20-22.5'
22	SS-5	80	0.1	2-3-4-10			SS-5 @ 22.5-24.5'
24							
					25-26' Clayey SAND, dark brown, fine grained sand	SC	ST-4 at 25-27' (0.25" R)
26	ST-4	12.5	-	-	26-28' SAND with SILT, tan, well graded, fine to coarse grained, trace fine gravel and silt	SW/SM	SS-6 @ 27-29'
28	SS-6	90	0.5	4-6-6-8	28-36.5' SAND, tan to light brown, fine to coarse grained, with some fine gravel and silt	SW	
30	SS-7	100	0.4	6-10-40-30			SS-7 @ 30-32'
32							
34							SS-8 @ 35-37'
36	SS-8	85	0.0	3-5-9-13			
					36.5-37.5' Silty SAND, gray, fine grained, trace clay	ML/SW	SS-9 @ 37.5-39.5'
38	SS-9	88	0.0	4-5-4-5	37.5-39' SAND, tan, fine to coarse grained with some fine gravel	SW	
					39-40' Clayey SILT, gray	CL/ML	
40							

Boring ID: RW-003-GB

(page 2 of 2)

Project Name	: Sparrows Point
ARM Project No.	: 150298M
Client	: EnviroAnalytics Group
Site	: Sparrows Point - Area A
Borehole Location	: Parcel A3
Weather	: Clear, 60 F

Date/Time Started	: 10/26/2015 - 15:15
Date/ Time Completed	: 10/28/2015 - 11:30
Logged By	: PNV
Checked By	: ESM
Driller	: Mike Waller - Allied
Drill Rig Type/Method	: Dietrich B-120
Bit/Auger Size	: 8" (4.25" ID) HSA

Northing (US ft)	: 571,852.74
Easting (US ft)	: 1,456,029.15
Surface Elevation (ft)	: 10.16
Depth to Refusal (ft)	: NA
Total Depth (ft bgs)	: 69.5
Depth to Water (ft)	: 13.5

Depth (ft.)	Sample No:	Recovery (%)	PID (PPM):	Blow Count	DESCRIPTION	USCS	REMARKS
40	SS-10	82	-	2-2-7-8	40-44' SAND, tan, fine to coarse grained with some fine gravel	SW	SS-10 @ 40-42'
42							SS-11 @ 43-45'
44	SS-11	80	-	2-4-7-12	44-45' Silty SAND, gray, fine grained	SM	
	SS-12	40	0.0	2-1-1-1	45-46' SAND, tan, fine to medium grained	SP	SS-12 @ 45-47'
46					46-47.5' Sandy SILT, gray, fine grained sand with trace clay	ML	
48	SS-13	75	0.0	4-6-4-2	47.5-49' Sandy SILT, fine to coarse grained, gray	ML	SS-13 @ 48-50'
					49-50' Clayey SAND, gray, fine grained	SC	
50	ST-5	92	-	-	50-51 SAND, gray, fine grained	SP	ST-5 @ 50-52.5
52					51-59.5' Clayey SAND, gray, fine grained	SC	
54	SS-14	65	0.0	4-4-6-6			SS-14 @ 52.5-54.5'
56	ST-6	92	-	-			ST-6 @ 55-57.5'
58	SS-15	-	0.0	4-4-4-4			SS-15 @ 57.5-59.5'
60					59.5-63.5' Clayey SAND, gray	SC	
62	SS-16	90	0.0	4-5-4-5			SS-16 @ 62.5-64.5'
64					63.5-69.5' Sandy SILT, gray	SW/ML	
66	ST-7	92	-	-			ST-7 @ 65-67.5'
68	SS-17	90	0.0	4-4-4-5			SS-17 @ 67.5-69.5'
70					End of Boring at 69.5' bgs		
72							
74							
76							
78							
80							

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Boring ID: RW-004-GB

(page 1 of 2)

Project Name : Sparrows Point
ARM Project No. : 150298M
Client : EnviroAnalytics Group
Site : Sparrows Point - Area A
Borehole Location : Parcel A3
Weather :

Date/Time Started : 10/29/2015 - 8:00
Date/ Time Completed : 10/29/2015 - 15:00
Logged By : PNV
Checked By : ESM
Driller : Mike Waller - Allied
Drill Rig Type/Method : Dietrich B-120
Bit/Auger Size : 8" (4.25" ID) HSA

Northing (ft) : 571,654.30
Easting (ft) : 1,456,051.90
Surface Elevation (ft) : 10.06
Depth to Refusal (ft) : NA
Total Depth (ft bgs) : 52.5
Depth to Water (ft) : -

Depth (ft.)	Sample No:	Recovery (%)	PID (PPM):	Blow Count	DESCRIPTION	USCS	REMARKS
0					0-2' Gravelly SAND, dark brown to black, trace clay	GW-SW	SS-1 @ 1-3'
2	SS-1	100	0.1	42-25-18-20	2-5' Clayey SAND, light gray	SC	
4							
6	SS-2	100	0.2	4-6-6-7	5-11' Clayey SILT, light gray to brown with some mottling	CL/ML	SS-2 @ 5-7'
8	SS-3	100	0.3	2-6-7-7			SS-3 @ 8-10'
10	ST-1	92	-	-			ST-1 @10-12.3'
					11-15' CLAY, light gray	CL	
12	SS-4	100	0.4	2-2-2-2			SS-4 @ 12.5-14.5'
14							
16	ST-2	100	-	-	15-16.5' SAND with SILT, poorly graded	SP/SM	ST-2 @ 15-16.5'
	SS-5	80	5.9	2-2-4-5	16.5-17' SAND, light brown, fine grained	SP	SS-5 @ 16.5-18.5'
18					17-19' SAND, light gray, fine grained	SP	
					19-21' Clayey SAND, dark gray, fine grained	SC	
20	ST-3	92	-	-			ST-3 @ 20-22.3'
					21-25' Clayey SAND, brown to dark gray	SC	
22	SS-6	100	0.2	2-5-6-5			SS-6 @ 22.5-24.5'
24							
26	ST-4	80	-	-	25-26.5' SILT, dark brown, with sand	ML	ST-4 @ 25-26.5'
28	SS-7	75	0.6	4-4-9-6	26.5-30' SAND, tan to gray, fine grained	SP	SS-7 @ 26.5-28.5'
30							ST-5 @ 30-31.3'

Boring ID: RW-004-GB

(page 2 of 2)

Project Name : Sparrows Point
ARM Project No. : 150298M
Client : EnviroAnalytics Group
Site : Sparrows Point - Area A
Borehole Location : Parcel A3
Weather :

Date/Time Started : 10/29/2015 - 8:00
Date/ Time Completed : 10/29/2015 - 15:00
Logged By : PNV
Checked By : ESM
Driller : Mike Waller - Allied
Drill Rig Type/Method : Dietrich B-120
Bit/Auger Size : 8" (4.25" ID) HSA

Northing (ft) : 571,654.30
Easting (ft) : 1,456,051.90
Surface Elevation (ft) : 10.06
Depth to Refusal (ft) : NA
Total Depth (ft bgs) : 52.5
Depth to Water (ft) : -

Depth (ft.)	Sample No:	Recovery (%)	PID (PPM):	Blow Count	DESCRIPTION	USCS	REMARKS
30	ST-5	24	-	-	30-32.5' Clayey SAND, gray, with some fine sand	SC	ST-5 @ 30-31.3'
32							
34	SS-8	70	0.3	4-4-4-4	32.5-33.5' SAND, fine to coarse grained, trace fine gravel 33.5-36' Clayey SAND, gray, with some fine sand	SW SC	SS-8 @ 32.5-34.5'
36	ST-6	86	-	-			ST-6 @ 35-36.1'
38	SS-9	100	0.8	7-10-10-12	36-39' SAND, light gray, fine grained	SP	SS-9 @ 36.1-38.1'
					39-42.5' Clayey SAND, gray	SC	
40	ST-7	100	-	-			ST-7 @ 40-41.5'
42	SS-10	100	0.0	3-4-5-6	42.5-44.5' Silty CLAY, gray	ML/CL	SS-10 @ 41.5-43.5'
44					44.5-45' SAND, gray, fine grained	SP	
46	ST-8	100	-	-	45-51' Sandy CLAY, lean, gray	CL	ST-8 @ 45-46.8'
48	SS-11	50	-	3-6-9-5			SS-11 @ 46.8-48.8'
50							ST-9 @ 50-52.5'
52	ST-9	100	-	-	51-52.5' CLAY, lean, dark gray	CL	
54					End of boring at 52.5' bgs		
56							
58							
60							

ARM Group Inc.
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Boring ID: RW-057-SB

(page 1 of 1)

Client	: EnviroAnalytics Group
ARM Project No.	: 150298M-11-3
Project Description	: Sparrows Point - Parcel A3
Site Location	: Sparrows Point, MD
ARM Representative	: L. Perrin
Checked by	: W. Mader P.G., CPSS
Drilling Company	: Green Services, Inc
Driller	: Don Marchese
Drilling Equipment	: Geoprobe 7822DT

Date	: 10/1/2015
Weather	: Rainy
Northing (US ft)	: 572,115.07
Easting (US ft)	: 1,456,436.55

Depth (ft.)	% Recovery	PID Reading (PPM)	Sample No/Interval	XRF - Zn (PPM)	XRF - Cd (PPM)	DESCRIPTION	USCS	REMARKS
0		-	RW-057-SB-1	55,100	725	(0-3') Slag, clayey to gravel sized, dark brown, moist, loose, no plasticity	GM	
		-		80,204	1.990			
	80	-	RW-057-SB-3	57,886	2,767			
		-		13,847	123	(3-4') Sandy SILT, dark tan, moist, firm, no cohesion, no plasticity	SM	
		-		4,452	181	(4-10') SAND, orangish tan, moist, no cohesion, no plasticity	SM-SW	
5		-	RW-057-SB-6	2,845	ND<57			
		-		2,397	ND<55			
	70	-		814	ND<54			
		-		212	ND<53			
		-		596	ND<54			
10		-		202	ND<51	(10-13') SAND, beige, wet, soft, no cohesion, no plasticity	SM	Wet at 10' bgs
		-		163	ND<51			
	100	-		166	ND<51			
		-		382	ND<51	(13-17') Sandy CLAY, gray to dark gray, moist to wet, firm, high cohesion, high plasticity	SC	
		-	RW-057-SB-15	1,019	262			
15		-	RW-057-SB-16	791	399			
		-		292	901			
	100	-		315	132	(17-20') SAND, medium to coarse grained, dark gray, wet, very soft, no cohesion, no plasticity	SM	
		-		502	ND<51			
		-		901	ND<53			
20		-		1,737	ND<60	(20-24.5') CLAY, brown, wet, soft, high cohesion, high plasticity	CH	
		-		1,539	ND<55			
	100	-	RW-057-SB-23	1,707	108			
		-		1,307	82			
		-		1,310	67	(24.5-25') SAND, brown, wet, soft, no cohesion, no plasticity	SM	
25		-		52	ND<55	(25-30') Gravelly SAND, light tan, wet, loose, no plasticity	SW	
		-		64	ND<55			
	100	-		69	ND<54			
		-	RW-057-SB-29	131	ND<43			
		-		63	ND<54			
30		-		1,024	168	(30-33') Sandy CLAY, gray, wet, firm, high cohesion, medium plasticity	SC	
		-	RW-057-SB-32	1,235	196			
	100	-		584	88			
		-		580	67	(33-35') CLAY, dark gray, firm, high cohesion, high plasticity	CH	Boring terminated at 35' bgs
		-		218	67			
35								

Total Borehole Depth: 35' bgs.

ARM Group Inc.
Earth Resource Engineers and Consultants

Boring ID: RW-058-SB

(page 1 of 1)

Client : EnviroAnalytics Group
ARM Project No. : 150298M-11-3
Project Description : Sparrows Point - Parcel A3
Site Location : Sparrows Point, MD
ARM Representative : L. Perrin
Checked by : W. Mader P.G., CPSS
Drilling Company : Green Services, Inc
Driller : Kevin Pumphrey
Drilling Equipment : Geoprobe 7822DT

Date : 10/5/2015
Weather : Sunny

Northing (US ft) : 572,177.57
Easting (US ft) : 1,456,500.09

Depth (ft.)	% Recovery	PID Reading (PPM)	Sample No/Interval	XRF Zn (PPM)	XRF Cd (PPM)	DESCRIPTION	USCS
0		-	RW-058-SB-1	12192 ± 113	378 ± 20	(0-3') Slag, sand sized, black, moist, loose, no plasticity	SM
		-	RW-058-SB-2	1747 ± 25	95 ± 16		
	60	0.0		1289 ± 19	107 ± 15		
		0.0		416 ± 10	ND <41	(3-4') Sandy CLAY, orangish tan, moist, soft, low cohesion, medium plasticity	SC
		0.0		NA	NA	(4-7') SAND, orange, moist to wet, soft, no cohesion, no plasticity, wet at 5' bgs	SW
5		0.0		47 ± 4	ND <38		
		0.0		62 ± 4	ND <39		
	100	0.0	RW-058-SB-8	576 ± 12	56 ± 14	(7-8') CLAY, light gray, wet, high cohesion, medium plasticity	CL
		0.0		351 ± 9	47 ± 14	(8-9.3') SAND, orange, wet, soft, no cohesion, no plasticity	SW
		0.0		461 ± 11	71 ± 14	(9.3-10') Sandy CLAY, orange, wet, firm, medium cohesion, low plasticity	SC
10		-		268 ± 8	54 ± 13	(10-12') SAND, fine to medium grained with trace clay, orange, wet, soft, no cohesion, no plasticity	SM
		-		267 ± 7	52 ± 13		
	100	-		194 ± 7	61 ± 14	(12-15') SAND, fine to medium grained, orange, wet, soft, no cohesion, no plasticity	SW
		-		221 ± 7	ND <38		
		-	RW-058-SB-15	324 ± 8	61 ± 13		
15		-		124 ± 6	ND <43	(15-18.7') SAND, fine to medium grained, orange, wet, slightly firm, no cohesion, no plasticity	SW
		-		83 ± 5	41 ± 13		
	90	-		121 ± 5	ND <38		
		-		251 ± 8	ND <42	(18.7-21') CLAY, grayish beige, wet, very soft, high cohesion, high plasticity	CH
		-		1118 ± 16	59 ± 14		
20		-		288 ± 8	ND <41		
		-	RW-058-SB-22	478 ± 11	ND <43	(21-23') SAND, fine to medium grained, orange, wet, soft, no cohesion, no plasticity	SW
	60	-		133 ± 5	55 ± 13		
		-		59 ± 4	ND <39	(23-30') SAND, orange, coarse grained with gravels, finer grained and light orange with depth, wet, soft, no cohesion, no plasticity	SW
		-		NA	NA		
25		-		36 ± 3	38 ± 12		
		-		82 ± 5	ND <43		
	80	-	RW-058-SB-28	661 ± 13	90 ± 15		
		-		555 ± 12	56 ± 14		
		-		NA	NA		
30		-		193 ± 7	ND <42	(30-35') CLAY, brown, firm, high cohesion, very high plasticity	CH
		-	RW-058-SB-32	258 ± 8	ND <41		
	100	-		163 ± 7	ND <44		
		-		105 ± 6	ND <49		
		-		98 ± 5	ND <42		
35							

Total Borehole Depth: 35' bgs.

ARM Group Inc.
Earth Resource Engineers
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Boring ID: RW-059-SB

(page 1 of 1)

Client : EnviroAnalytics Group
ARM Project No. : 150298M-11-3
Project Description : Sparrows Point - Parcel A3
Site Location : Sparrows Point, MD
ARM Representative : L. Perrin
Checked by : W. Mader P.G., CPSS
Drilling Company : Green Services, Inc
Driller : Don Marchese
Drilling Equipment : Geoprobe 7822DT

Date : 10/1/2015
Weather : Rainy

Northing (US ft) : 572,159.86
Easting (US ft) : 1,456,362.07

Depth (ft.)	% Recovery	PID Reading (PPM)	Sample No/Interval	XRF Zn (PPM)	ZRF Cd (PPM)	DESCRIPTION	USCS
0		0.3	RW-059-SB-1	8005	98	(0-3.5') Slag, coarse grained to gravel sized, black, loose, no cohesion, no plasticity	GM
		9.7		13221	128		
	80	117.5	RW-059-SB-3	>10% ± 0%	987		
		1.1		7824 ± 85	< 60	(3.5-4.5') SAND, with trace clay, brownish red, moist, soft, no cohesion, no plasticity	SM
		0		3599 ± 46	70 ± 19	(4.5-5') SAND, orange, wet, soft, no cohesion, no plasticity	SW
5		-	RW-059-SB-6	416 ± 12	51 ± 17	(5-13.5') SAND, orange to orangish brown, wet, soft, no cohesion, no plasticity	SW
		-		548 ± 14	ND <50		
	80	-		507 ± 15	ND <56		
		-		404 ± 13	ND <54		
		-		188 ± 9	ND <54		
10		-	RW-059-SB-11	502 ± 14	ND <53		
		-		236 ± 10	ND <53		
	100	-		121 ± 7	ND <51		
		-		203 ± 9	ND <55	(13.5-15') CLAY, reddish brown, high cohesion, high plasticity	CH
		-		333 ± 12	ND <54		
15		-		1171 ± 22	ND <52	(15-17.5') SAND, fine to medium grained, beige, wet, soft, no cohesion, no plasticity	SW
		-		493 ± 12	ND <47		
	100	-		797 ± 15	79 ± 15	(17.5-20') SAND, fine to medium grained, gray, wet, soft, no cohesion, no plasticity	SM
		-		889 ± 15	81 ± 14		
		-	RW-059-SB-20	955 ± 15	108 ± 14		
20		-		1802 ± 21	107 ± 13	(20-22') Silty SAND, gray, wet, soft, no cohesion, no plasticity	SM
		-		1408 ± 20	150 ± 15		
	90	-	RW-059-SB-23	2490 ± 30	60 ± 16	(22-25') CLAY, brown, wet, sticky, soft, high cohesion, high plasticity	CH
		-		1692 ± 20	78 ± 13		
		-		487 ± 11	ND <43		
25		-	RW-059-SB-26	1105 ± 17	ND <42	(25-27.2') CLAY, dark gray, wet, firm, high cohesion, high plasticity	CH
		-		1064 ± 18	ND <45		
	90	-		177 ± 7	74 45 ± 13 14	(27.2-32') SAND, fine to coarse grained with depth, reddish orange, wet, slightly firm, coarse to medium grained at 30'	SW
		-		167 ± 6	ND <40		
		-		326 ± 9	ND <41		
30		-		132 ± 6	ND <42		
		-		300 ± 8	45 ± 13		
	100	-		251 ± 8	ND <41	(32-33') CLAY, orange, wet, hard, high cohesion, high plasticity	CH
		-	RW-059-SB-34	775 ± 14	63 ± 14	(33-35') CLAY, gray, wet, hard, high cohesion, high plasticity	CH
		-		813 ± 14	ND <41		
35							

Total Borehole Depth: 35' bgs.

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ARM Group Inc.
Earth Resource Engineers
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Boring ID: RW-060-SB

(page 1 of 2)

Client	: EnviroAnalytics Group
ARM Project No.	: 150298M-11-3
Project Description	: Sparrows Point - Parcel A3
Site Location	: Sparrows Point, MD
ARM Representative	: L. Perrin
Checked by	: W. Mader P.G., CPSS
Drilling Company	: Green Services, Inc
Driller	: Kevin Pumphrey
Drilling Equipment	: Geoprobe 7822DT

Date	: 10/5/2015
Weather	: 60s F, sunny
Northing (US ft)	: 572,070.27
Easting (US ft)	: 1,456,510.50

Depth (ft.)	% Recovery	PID Reading (PPM)	Sample No/Interval	XRF Zn (PPM)	XRF Cd (PPM)	DESCRIPTION	USCS
0		-	RW-060-SB-1	1092 ± 20	ND <48	(0-0.5') Topsoil, with organic matter and trace clay, dark brown, moist, soft, slight cohesion, no plasticity	ML
		0.0		888 ± 14	ND <40	(0.5-2.5') Silty SAND, light beige, slightly firm, no cohesion, no plasticity	SM
	76	0.1		619 ± 12	ND <40	(2.5-4.3') SAND, light beige, slightly firm, no cohesion, no plasticity	SW
		0.0	RW-060-SB-4	1204 ± 18	ND <44		
		0.0		496 ± 11	ND <44	(4.3-5') Sandy SILT, beige, dry, hard, no cohesion, no plasticity	SM
5		0.0		1203 ± 19	ND <46	(5-10') CLAY, brown with red streaks, dry, very firm, high cohesion, high plasticity	CH
		0.0	RW-060-SB-7	1464 ± 22	ND <47		
	100	0.0		1129 ± 17	46 ± 14		
		0.0		898 ± 15	ND <42		
		0.0		877 ± 14	ND <41		
10		0.0		771 ± 14	ND <42	(10-14.3') CLAY, grayish brown, moist, firm, high cohesion, high plasticity, wet at 14.2' bgs	CH
		0.0	RW-060-SB-12	777 ± 14	66 ± 14		
	100	0.0		488 ± 11	60 ± 14		
		0.0		397 ± 9	71 ± 13		
		0.0		276 ± 8	ND <40	(14.3-15.8') SAND, with trace clay, orange, wet, soft, no cohesion, no plasticity	SM
15		-		133 ± 6	ND <39		
		-		160 ± 6	ND <41	(15.8-19') SAND, orange, wet, soft, no cohesion, no plasticity	SW
	83	-		347 ± 9	ND <41		
		-		1613 ± 20	ND <41		
		-	RW-060-SB-20	3763 ± 36	73 ± 14	(19-20') CLAY, with trace clay, dark gray, wet, firm, high cohesion, high plasticity	CH
20							

Total Borehole Depth: 35' bgs.

ARM Group Inc.
Earth Resource Engineers
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Boring ID: RW-060-SB

(page 2 of 2)

Client	: EnviroAnalytics Group
ARM Project No.	: 150298M-11-3
Project Description	: Sparrows Point - Parcel A3
Site Location	: Sparrows Point, MD
ARM Representative	: L. Perrin
Checked by	: W. Mader P.G., CPSS
Drilling Company	: Green Services, Inc
Driller	: Kevin Pumphrey
Drilling Equipment	: Geoprobe 7822DT

Date	: 10/5/2015
Weather	: 60s F, sunny
Northing (US ft)	: 572,070.27
Easting (US ft)	: 1,456,510.50

Depth (ft.)	% Recovery	PID Reading (PPM)	Sample No/Interval	XRF Zn (PPM)	XRF Cd (PPM)	DESCRIPTION	USCS
20		-		1667 ± 21	42 ± 14	(20-24.9') CLAY, gray, wet, soft, high cohesion, high plasticity, firm at 24.5'	CH
		-	RW-060-SB-22	2110 ± 24	61 ±14		
	93	-		2596 ± 29	ND <43		
		-		1291 ± 23	ND <54		
		-		294 ± 9	ND <44		
25		-		897 ± 15	ND <42	(24.9-26') SAND, gray, wet, soft, no cohesion, no plasticity	SW
		-		86 ± 5	76 ± 13	(26-27') SAND, fine to coarse grained, well graded, gray, wet, soft, no cohesion, no plasticity	SW
	80	-		140 ± 6	ND <40	(27-29.5') SAND, fine to coarse grained, orange to dark orange, wet, soft, no cohesion, no plasticity	SW
		-		59 ± 4	ND <40		
		-		114 ± 5	ND <40	(29.5-31.3') SAND, poorly graded, orange with reddish tint, no cohesion, no plasticity	SP
30		-		304 ± 8	44 ± 13		
		-		499 ± 10	89 ± 13	(31.3-32.8') SAND, fine to coarse grained with some gravels, wet, soft, no cohesion, no plasticity	SW
	73	-		773 ± 14	181 ± 15		
		-	RW-059-SB-34	485 ± 11	153 ± 14	(32.8-35') CLAY, gray, wet, hard, high cohesion, high plasticity	CH
		-		181 ± 7	75 ± 14		
35						End of Boring	
40							

Total Borehole Depth: 35' bgs.

ARM Group Inc.
Earth Resource Engineers and Consultants

Boring ID: RW-061-SB

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Client : EnviroAnalytics Group
ARM Project No. : 150298M-11-3
Project Description : Sparrows Point - Parcel A3
Site Location : Sparrows Point, MD
ARM Representative : L. Perrin
Checked by : W. Mader P.G., CPSS
Drilling Company : Green Services, Inc
Driller : Kevin Pumphrey
Drilling Equipment : Geoprobe 7822DT

Date : 10/5/2015
Weather : 60s F, sunny
Northing (US ft) : 572,054.65
Easting (US ft) : 1,456,375.09

Depth (ft.)	% Recovery	PID Reading (PPM)	Sample No/Interval	XRF Zn (PPM)	XRF Cd (PPM)	DESCRIPTION	USCS
0		0.5	RW-061-SB-1	1026 ± 21	ND <56	(0-1') Slag, coarse grained, black, dry, loose, no plasticity	SM/GM
		17.5	RW-061-SB-2	>10% ± 1%	334 ± 49	(1-1.5') SILT, with very fine sand, light brown, dry, hard, no cohesion, no plasticity	ML
	100	1.7		6834 ± 55	59 ± 14	(1.5-5') SAND, fine grained with trace silt, black, oily, moist to very moist, plasticity increasing with depth, petroleum odor	SM
		35.2		794 ± 14	47 ± 14		
		8.7		100 ± 5	58 ± 14		
5		-		796 ± 12	120 ± 13	(5-7') SAND, light brown, wet, loose, soft, no plasticity	SW
		-	RW-061-SB-7	1410 ± 19	ND < 42		
	90	-		944 ± 16	ND <42	(7-8.7') Sandy CLAY, light brown, dry, firm, low cohesion, low plasticity	SC
		0.0		261 ± 8	ND <44	(8.7-10.5') CLAY, light brown, moist, high cohesion, medium plasticity	CL
		0.0		71 ± 5	ND <43		
10		-	RW-061-SB-11	1725 ± 22	42 ± 14	(10.5-13') CLAY, with trace sand, light grayish brown, moist, firm, high cohesion, high plasticity	CH
		-		793 ± 14	ND < 42		
	90	-		267 ± 7	46 ± 13		
		-		213 ± 7	87 ± 14	(13-15') SAND, beige, wet at 13' bgs, slightly firm, no cohesion, no plasticity	SW
		-		246 ± 7	ND <40		
15		-		474 ± 10	ND <38	(15-17') SAND, fine to coarse grained, orangish brown, wet, loose, soft, no plasticity	SW
		-		638 ± 12	ND <42		
	80	-		2045 ± 23	53 ± 14	(17-18') Sandy CLAY, orangish brown, moist, soft, medium cohesion, high plasticity	SC
		-	RW-061-SB-19	2279 ± 25	48 ± 14	(18-20') CLAY, brown, moist, sticky, soft, high cohesion, high plasticity	CH
		-		1832 ± 23	ND <42		
20		-	RW-061-SB-21	718 ± 15	ND <45	(20-21.5') SAND, fine to very coarse grained, orange, wet, firm, no cohesion, no plasticity	SW
		-		179 ± 7	ND <41	(21.5-23.5') CLAY, gray, wet, hard, high cohesion, high plasticity	CH
	80	-		292 ± 9	ND <42		
		-		47 ± 4	ND <46	(23.5-28.8') SAND, medium to coarse grained with gravels, with trace clay, beige, wet, soft, no cohesion, no plasticity	SM
		-		89 ± 4	ND <39		
25		-		78 ± 4	41 ± 13		
		-		188 ± 7	ND <42		
	80	-		334 ± 9	ND <41		
		-	RW-061-SB-29	1217 ± 19	ND <46	(28.8-35') CLAY, gray, wet, hard, high cohesion, high plasticity	CH
		-		917 ± 15	ND <43		
30		-		190 ± 7	ND <42		
		-		172 ± 7	70 ± 14		
	100	-		308 ± 9	ND <44		
		-	RW-061-SB-34	521 ± 12	ND <44		
		-		338 ± 9	ND <43		
35							

Total Borehole Depth: 35' bgs.

ARM Group Inc.
Earth Resource Engineers
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Boring ID: RW-062-SB

(page 1 of 1)

Client : EnviroAnalytics Group
ARM Project No. : 150298M-11-3
Project Description : Sparrows Point - Parcel A3
Site Location : Sparrows Point, MD
ARM Representative : L. Perrin
Checked by : W. Mader P.G., CPSS
Drilling Company : Green Services, Inc
Driller : Kevin Pumphrey
Drilling Equipment : Geoprobe 7822DT

Date : 10/5/2015
Weather : 60s F, sunny

Northing (US ft) : 571,999.96
Easting (US ft) : 1,456,334.98

Depth (ft.)	% Recovery	PID Reading (PPM)	Sample No/Interval	XRF Zn (PPM)	XRF Cd (PPM)	DESCRIPTION	USCS
0		6.8	RW-062-SB-1	871 ± 25	ND < 72	(0-1.5') Slag, sand sized, dark brown, moist, loose, no plasticity	SW
		0.0		702 ± 15	ND < 48	(1.5-2.2') SAND, with silt, gray to brown, moist, firm, loose, no cohesion, no plasticity	SM
	80	0.0	RW-062-SB-3	1762 ± 24	ND <45		
		0.0		477 ± 11	ND <42	(2.2-5') Sandy SILT, gray to brown, mottled, dry, very firm, no cohesion, no plasticity	SM
		0.1		123 ± 6	ND <42		
5		0.1		32 ± 4	ND <44	(5-7') Clayey SILT, beige, dry, hard, low cohesion, low plasticity	CL
		0.1		48 ± 4	ND <42		
	100	0.1		30 ± 4	ND < 44	(7-10') Silty CLAY, dark beige, gray streaked, dry, hard, high cohesion, low plasticity	CL
		0.0		48 ± 5	ND <46		
		0.0	RW-062-SB-10	43 ± 4	54 ± 15		
10		0.0		33 ± 4	ND <44	(10-14.3') CLAY, gray, orange streaked, dry, firm, medium cohesion, medium plasticity	CL
		0.0		44 ± 4	ND <41		
	100	0.0		45 ± 4	ND <41		
		0.0		196 ± 7	ND <42		
		0.1	RW-062-SB-15	364 ± 9	ND <41	(14.3-15') Clayey SAND, dark gray, wet	SC
15		-		85 ± 5	ND <41	(15-19.3') SAND, beige, wet at 15' bgs, soft, no cohesion, no plasticity	SM
		-		84 ± 4	39 ± 13		
	100	-		149 ± 6	ND <37		
		-		436 ± 8	ND <39		
		-	RW-062-SB-20	1107 ± 17	85 ± 14	(19.3-20.3') Clayey SAND, dark gray, wet, low cohesion, low plasticity	SC
20		-		313 ± 8	ND <39		
		-	RW-062-SB-22	816 ± 13	ND <40	(20.3-22.3') Sandy CLAY, gray, wet, soft, high cohesion, high plasticity	CH
	95	-		484 ± 11	ND <41		
		-		59 ± 4	ND <41	(22.3-24.5') CLAY, dark gray, wet, sticky, high cohesion, high plasticity	CH
		-		82 ± 5	ND <45	(24-26') SAND, gray, wet, soft, no cohesion, no plasticity	SM
25		-		22 ± 3	ND <40		
		-		13 ± 3	43 ± 13	(26-28.5') SAND, fine to very coarse grained, beige, wet, soft, no cohesion, no plasticity	SW
	80	-		30 ± 3	ND <39		
		-		42 ± 6	ND <40	(28.5-30') SAND, fine to very coarse grained, beige with red staining, loose, no cohesion, no plasticity	SW
		-	RW-062-SB-30	198 ± 7	ND <44		
30		-		309 ± 8	ND <41	(30-32') SAND, fine to medium grained, grayish beige, wet, soft, no cohesion, no plasticity	SW
		-	RW-062-SB-32	937 ± 15	50 ±14		
	80	-		792 ± 15	ND <45	(32-35') CLAY, dark gray, wet, very hard, high cohesion, high plasticity	CH
		-		351 ± 9	ND <42		
		-		50 ± 5	ND <50		
35							

Total Borehole Depth: 35' bgs.

ARM Group Inc.
Earth Resource Engineers and Consultants

Boring ID: RW-063-SB

(page 1 of 2)

Client : EnviroAnalytics Group
ARM Project No. : 150298M-10-3
Project Description : Sparrows Point - Parcel A3
Site Location : Sparrows Point, MD
ARM Representative : L. Perrin
Checked by : W. Mader P.G., CPSS
Drilling Company : Green Services, Inc
Driller : Don Marchese
Drilling Equipment : Geoprobe 7822DT

Date : 10/6/2015
Weather : 70s F, sunny

Northing (US ft) : 572,430.34
Easting (US ft) : 1,456,824.20

Depth (ft.)	% Recovery	PID Reading (PPM)	Sample No/Interval	XRF Zn (PPM)	ZRF Cd (PPM)	DESCRIPTION	USCS
0		-	RW-063-SB-1	2352 ± 30	133 ± 16	(0-0.25') Topsoil, with clay and roots, dark brown, dry firm (0.25-2.75') Clayey SAND, brown, dry, firm, no cohesion, no plasticity	ML SM/ SC
		0.0		1052 ± 18	ND <45		
	90	1.2		1599 ± 26	120 ± 17		
		5.5		4748 ± 51	63 ± 17	(2.75-5') Sandy CLAY, black, dry, firm, low cohesion, low plasticity, petroleum odor	CL
		10.3	RW-063-SB-5	5251 ± 55	155 ± 18		
5		-		NA	NA	(5-6.5') CLAY, with trace sand, black, dry, firm, medium cohesion, medium plasticity	CL
		-		3626 ± 38	846 ± 19	(6.5-8') CLAY, with trace sand, black, moist, very soft, medium cohesion, high plasticity, wet at 7.83' bgs	CH
	60	0.1	RW-063-SB-8	8240 ± 67	767 ± 18		
		-		3059 ± 33	127 ± 15	(8-10') SAND, beige, wet, soft, no cohesion, no plasticity	SM
		-		1562 ± 21	ND <41		
10		-		1890 ± 27	ND <49	(10-10.5') SAND, orange, gray streaked, wet, soft, no cohesion, no plasticity (10.5-11.2') CLAY, gray, wet, soft, medium cohesion, medium plasticity	SW CL
		-		986 ± 17	ND <46	(11.2-14') Sandy CLAY, gray with orange streaks, wet, soft, low cohesion, low plasticity	CL
	100	-	RW-063-SB-13	1940 ± 25	ND <44		
		-		1351 ± 20	62 ± 15		
		-		732 ± 15	ND <48	(14-15') SAND, fine to medium grained, orange, wet, soft, no cohesion, no plasticity	SW
15		-		NA	NA	(15-16') CLAY, light gray, moist, soft, high cohesion, high plasticity	CH
		-		NA	NA	(16-20') SILT, beige, with iron staining, soft, no cohesion, no plasticity	ML
	40	-		NA	NA		
		-	RW-063-SB-19	864 ± 17	ND <48		
		-		304 ± 9	ND <44		
20							

Total Borehole Depth: 35' bgs.

ARM Group Inc.
Earth Resource Engineers
and Consultants

Boring ID: RW-063-SB

(page 2 of 2)

Client : EnviroAnalytics Group
ARM Project No. : 150298M-10-3
Project Description : Sparrows Point - Parcel A3
Site Location : Sparrows Point, MD
ARM Representative : L. Perrin
Checked by : W. Mader P.G., CPSS
Drilling Company : Green Services, Inc
Driller : Don Marchese
Drilling Equipment : Geoprobe 7822DT

Date : 10/6/2015
Weather : 70s F, sunny

Northing (US ft) : 572,430.34
Easting (US ft) : 1,456,824.20

Depth (ft.)	% Recovery	PID Reading (PPM)	Sample No/Interval	XRF Zn (PPM)	ZRF Cd (PPM)	DESCRIPTION	USCS
20		-		NA	NA	(20-23') CLAY, light brownish red, wet, very sticky, soft, high cohesion, high plasticity	CH
		-		319 ± 9	54 ± 15		
	60	-		326 ± 9	53 ± 15		
		-		242 ± 7	59 ± 13	(23-23.5') SAND, fine to medium grained, gray, wet, soft, no cohesion, no plasticity	SW
		-	RW-063-SB-25	729 ± 13	55 ± 13	(23.5-30') CLAY, gray, wet, soft, sticky, high cohesion, high plasticity	CH
25		-		NA	NA		
		-		NA	NA		
	40	-		NA	NA		
		-		417 ± 11	ND <46		
		-	RW-063-SB-30	861 ± 17	58 ± 16		
30		-		1362 ± 20	71 ± 15	(30-34.5') Clayey SAND, light gray, wet, soft, slight cohesion, no plasticity, orange streaks at 32.5'	SC
		-		1794 ± 23	ND <44		
	100	-		1121 ± 17	ND <44		
		-	RW-063-SB-34	2238 ± 27	49 ± 15		
		-		1708 ± 24	ND <47	(34.5-35') Sandy CLAY, light gray, wet, soft, medium cohesion, low plasticity	CL
35						End of Borehole	
40							

Total Borehole Depth: 35' bgs.

ARM Group Inc.

Earth Resource Engineers and Consultants

Boring ID: RW-064-SB

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Client : EnviroAnalytics Group
ARM Project No. : 150298M-11-3
Project Description : Sparrows Point - Parcel A3
Site Location : Sparrows Point, MD
ARM Representative : L. Perrin
Checked by : W. Mader P.G.,CPSS
Drilling Company : Green Services, Inc
Driller : Don Marchese
Drilling Equipment : Geoprobe 7822DT

Date : 10/6/2015
Weather : 70s F, sunny

Northing (US ft) : 572,308.69
Easting (US ft) : 1,456,709.82

Depth (ft.)	% Recovery	PID Reading (PPM)	Sample No/Interval	XRF Zn (PPM)	XRF Cd (PPM)	DESCRIPTION	USCS
0		-	RW-064-SB-1	NA	NA	(0-0.5') CLAY, brown, dry, soft, medium cohesion, medium plasticity	CL
		1.3		350 ± 22	ND <103	(0.5-6') Slag, fine grained to gravel size with pieces of metal, black, loose, no cohesion, no plasticity, slight petroleum odor	GM
	80	0.8		128 ± 13	ND <88		
		0.8		79 ± 7	ND <57		
		2.2	RW-064-SB-5	775 ± 19	ND <56		
5		-		NA	NA		
		-		1633 ± 28	ND <55	(6-10') Slag, medium grained to gravel sized, black, moist, loose, hard, no cohesion, no plasticity	GM
	60	0.0	RW-064-SB-8	15808 ± 197	ND <74		
		0.1		2875 ± 62	ND <87		
		0.2		1915 ± 26	73 ± 16		
10		-		23047 ± 206	529 ± 21	(10-11.2') Slag, sand to gravel sized, brown to black, moist, wet at 11' bgs	GM
		0.0	RW-064-SB-12	55397 ± 534	1087 ± 28	(11.2-15') CLAY, with trace sand and silt, black to dark brown, wet, very soft, medium cohesion, high plasticity	CH
	96	0.0		49559 ± 434	882 ± 24		
		-		55426 ± 526	859 ± 26		
		-		41217 ± 327	845 ± 21		
15		-	RW-064-SB-16	2095 ± 25	601 ± 17	(15-18.5') SAND, light gray, wet, loose, no cohesion, no plasticity	SM
		-		446 ± 10	74 ± 13		
	90	-		131 ± 7	113 ± 16		
		-		651 ± 14	80 ± 16	(18.5-19.5') Sandy CLAY, gray, wet, soft, low cohesion, low plasticity	CL
		-		2059 ± 35	88 ± 21	(19.5-20') CLAY, brown, wet, soft, high cohesion, high plasticity	CH
20		-	RW-064-SB-21	9281 ± 92	482 ± 20	(20-27') CLAY, gray, wet, hard, high cohesion, high plasticity, soft at 24'	CH
		-		9729 ± 82	ND <48		
	100	-		9510 ± 78	83 ± 16		
		-		7647 ± 73	129 ± 17		
		-		6221 ± 59	55 ± 16		
25		-		NA	NA		
		-		852 ± 15	ND <44		
	60	-		814 ± 15	ND <45	(27-28.5') SAND, medium grained with some coarse, gray, wet, no cohesion, no plasticity	SP
		-	RW-064-SB-29	1533 ± 17	ND <41	(28.5-30') SAND, coarse to medium grained with depth, beige, wet, soft	SW
		-		812 ± 14	ND <40		
30		-		3717 ± 40	ND <48	(30-30.7') SAND, medium grained, brown, wet, soft, no cohesion, no plasticity	SW
		-	RW-064-SB-32	5359 ± 51	ND <48	(30.7-35') Sandy CLAY, light beige, wet, soft, medium cohesion, medium plasticity	CL
	100	-		4514 ± 42	ND <43		
		-		3193 ± 34	47 ± 15		
		-		3864 ± 40	ND <47		
35							

Total Borehole Depth: 35' bgs.

ARM Group Inc.
Earth Resource Engineers
and Consultants

Boring ID: RW-065-SB

(page 1 of 2)

Client : EnviroAnalytics Group
ARM Project No. : 150298M-11-3
Project Description : Sparrows Point - Parcel A3
Site Location : Sparrows Point, MD
ARM Representative : L. Perrin
Checked by : W. Mader P.G., CPSS
Drilling Company : Green Services, Inc
Driller : Kevin Pumphrey
Drilling Equipment : Geoprobe 7822DT

Date : 10/8/2015
Weather : 70s F, sunny

Northing (US ft) : 572,229.64
Easting (US ft) : 1,456,574.89

Depth (ft.)	% Recovery	PID Reading (PPM)	Sample No/Interval	XRF Zn (PPM)	XRF Cd (PPM)	DESCRIPTION	USCS
0		-	RW-065-SB-1	NA	NA	(0-3.9') Slag, silt to gravel sized, dark brown, dry, loose, no cohesion, no plasticity, gray at 3.5'	
		-		NA	NA		
	60	1.4		131 ± 8	ND <58		GM
		0.0		22 ± 4	ND <56		
		0.0	RW-065-SB-5	63 ± 5	ND <52	(3.9-6') Silty SAND, orange, moist, soft, low cohesion, no plasticity, slight petroleum odor	
5		-		NA	NA		SM
		-		NA	NA	(6-10') SAND, orangish beige, wet, loose, no cohesion, no plasticity	
	40	-		NA	NA		
		-	RW-065-SB-9	175 ± 8	ND <51		SP
		-		122 ± 6	ND <45		
10		-		NA	NA	(10-12') Silty SAND, orange, wet at 11' bgs, soft, no cohesion, no plasticity	
		-		394 ± 12	ND <59		SM
	80	-		716 ± 19	ND <66	(12-15') Silty CLAY, gray, with orange mottling, wet, hard, medium cohesion, medium plasticity	
		-		937 ± 20	ND <62		CL
		-	RW-065-SB-15	1175 ± 23	ND <60		
15		-		NA	NA	(15-17.5') Clayey SILT, orangish brown, wet, hard, low cohesion, no plasticity	
		-		716 ± 18	ND <62		ML
	70	-		647 ± 16	ND <60	(17.5-19.2') Silty CLAY, orangish brown, wet, hard, medium cohesion, medium plasticity	
		-	RW-065-SB-19	839 ± 19	ND <62		CL
		-		452 ± 14	ND <62	(19.2-20') SAND, coarse grained, orange, wet, soft, no cohesion, no plasticity	SP
20							

Total Borehole Depth: 35' bgs.

ARM Group Inc.
Earth Resource Engineers
and Consultants

Boring ID: RW-065-SB

(page 2 of 2)

Client	: EnviroAnalytics Group
ARM Project No.	: 150298M-11-3
Project Description	: Sparrows Point - Parcel A3
Site Location	: Sparrows Point, MD
ARM Representative	: L. Perrin
Checked by	: W. Mader P.G., CPSS
Drilling Company	: Green Services, Inc
Driller	: Kevin Pumphrey
Drilling Equipment	: Geoprobe 7822DT

Date	: 10/8/2015
Weather	: 70s F, sunny
Northing (US ft)	: 572,229.64
Easting (US ft)	: 1,456,574.89

Depth (ft.)	% Recovery	PID Reading (PPM)	Sample No/Interval	XRF Zn (PPM)	XRF Cd (PPM)	DESCRIPTION	USCS
20		-		644 ± 15	ND <55	(20-22') SAND, medium to coarse grained, orange, wet, loose, no cohesion, no plasticity	SW
		-		607 ± 15	ND <58		
	100	-		2338 ± 34	ND <64	(22-22.7') SAND, coarse grained, gray, wet, loose, no cohesion, no plasticity	SP
		-	RW-065-SB-24	6834 ± 74	ND <65	(22.7-26.3') CLAY, dark gray to gray, wet, sticky, firm, high cohesion, high plasticity	CH
		-		5872 ± 69	ND <67		
25		-	RW-065-SB-26	2929 ± 39	ND <59		
		-		1439 ± 24	ND <57	(26.3-27.2') SAND, coarse grained, dark gray, wet, loose, no cohesion, no plasticity	SP
	93	-		818 ± 19	ND <60	(27.2-28.5') CLAY, dark gray, wet, firm, high cohesion, high plasticity	CH
		-		312 ± 12	ND <62	(28.5-33.5') SAND, orange, medium to very coarse grained, wet, soft, no cohesion, no plasticity	SW
		-		366 ± 13	ND <61		
30		-		NA	NA		
		-		509 ± 14	ND <60		
	80	-		239 ± 8	ND <51		
		-		387 ± 13	ND <61	(33.5-35') SILT, with trace clay, gray, wet, hard, no cohesion, no plasticity	ML
		-	RW-065-SB-35	1295 ± 24	ND <60		
35						End of Boring	
40							

Total Borehole Depth: 35' bgs.

ARM Group Inc.
Earth Resource Engineers
and Consultants

Boring ID: RW-066-SB

(page 1 of 1)

Client : EnviroAnalytics Group
ARM Project No. : 150298M-11-3
Project Description : Sparrows Point - Parcel A3
Site Location : Sparrows Point, MD
ARM Representative : L. Perrin
Checked by : W. Mader P.G., CPSS
Drilling Company : Green Services, Inc
Driller : Don Marchese
Drilling Equipment : Geoprobe 7822DT

Date : 10/8/2015
Weather : 70s F, cloudy

Northing (US ft) : 572,128.13
Easting (US ft) : 1,456,718.15

Depth (ft.)	% Recovery	PID Reading (PPM)	Sample No/Interval	XRF Zn (PPM)	XRF Cd (PPM)	DESCRIPTION	USCS
0		-	RW-066-SB-1	63791 ± 562	632 ± 24	(0-2') SAND, organic material is fine to medium grained with silt and clay, dark brown, moist	SM
		0.0		155 ± 7	ND <46		
	80	0.0		1894 ± 28	ND <51	(2-4') SAND, orange, moist, firm, no cohesion, no plasticity	SP
		0.1		5912 ± 56	95 ± 16		
		0.0	RW-066-SB-5	2126 ± 29	60 ± 17	(4-5.5') Sandy CLAY, orange, moist, firm, medium cohesion, medium plasticity	CL
5		-	RW-066-SB-6	8937 ± 78	72 ± 17	(5.5-7.5') Sandy CLAY, light gray, moist, soft, high cohesion, high plasticity	CH
		0.0		992 ± 18	ND <48		
	80	0.0		1337 ± 20	ND <45	(7.5-10') CLAY, gray to light gray, moist, very firm, medium cohesion, medium plasticity	CL
		0.0		53 ± 4	ND <45		
		0.0		66 ± 6	ND <55		
10		-	RW-066-SB-11	16544 ± 133	99 ± 17	(10-14.5') CLAY, gray, moist, slightly firm, high cohesion, high plasticity	CH
		0.0		1264 ± 20	47 ± 15		
	100	0.0		151 ± 7	ND <44		
		0.0		311 ± 9	52 ± 15		
		0.0		150 ± 7	57 ± 15	(14.5-15') SAND, orange, moist, loose, no cohesion, no plasticity	SP
15		-		168 ± 6	ND <42	(15-18') SAND, fine to medium grained, orangish beige to beige, wet at 15' bgs, soft, no cohesion, no plasticity	SW
		-		150 ± 6	ND <43		
	100	-		53 ± 4	ND <43		
		-		374 ± 10	ND <44	(18-20') SAND, fine to coarse grained, dark gray, wet, soft, no cohesion, no plasticity	SW
		-	RW-066-SB-20	512 ± 11	57 ± 15		
20		-		1862 ± 25	ND <46	(20-20.3') SAND, beige, wet, soft, no cohesion, no plasticity	SW
		-	RW-066-SB-22	3667 ± 37	ND <45	(20.3-27.8') CLAY, with trace sand, dark gray, wet, firm, high cohesion, high plasticity	CH
	100	-		2015 ± 28	ND <50		
		-		1062 ± 20	67 ± 17		
		-		172 ± 7	60 ± 15		
25		-		977 ± 17	70 ± 15		
		-	RW-066-SB-27	3605 ± 40	61 ± 16		
	80	-		1642 ± 26	ND <41	(27.8-30') SAND, fine to coarse grained, beige, with gray streaks, wet, loose, no cohesion, no plasticity	SW
		-		1070 ± 18	92 ±16		
		-		96 ± 5	ND <45		
30		-		232 ± 8	80 ± 15	(30-35') SAND, fine to coarse grained, beige, wet, soft, no cohesion, no plasticity	SW
		-		284 ± 8	63 ±14		
	60	-		480 ± 10	ND <41		
		-		934 ± 16	ND <45		
		-	RW-066-SB-35	977 ± 17	70 ± 15		
35						End of Borehole	

Total Borehole Depth: 35' bgs.

ARM Group Inc.
Earth Resource Engineers
and Consultants

Boring ID: RW-067-SB

(page 1 of 1)

Client : EnviroAnalytics Group
ARM Project No. : 150298M-11-3
Project Description : Sparrows Point - Parcel A3
Site Location : Sparrows Point, MD
ARM Representative : L. Perrin
Checked by : W. Mader P.G., CPSS
Drilling Company : Green Services, Inc
Driller : Don Marchese
Drilling Equipment : Geoprobe 7822DT

Date : 10/7/2015
Weather : Cloudy

Northing (US ft) : 572,220.49
Easting (US ft) : 1,456,678.83

Depth (ft.)	% Recovery	PID Reading (PPM)	Sample No/Interval	XRF Zn (PPM)	XRF Cd (PPM)	DESCRIPTION	
0		-	RW-067-SB-1	>10% ± 0%	2680 ± 61	(0-0.3') Sandy CLAY, brown, moist, soft, medium cohesion, medium plasticity (0.3-2.3') Slag, medium sand to gravel sized, dark brown, dry, loose, no cohesion, no plasticity	CL GM
		0.1	RW-067-SB-2	14570 ± 121	146 ± 17		
	80	0.0		12964 ± 107	ND <49	(2.3-3.3') Clayey SAND, brown, dry, soft, no cohesion, no plasticity	SC
		0.0		1687 ± 23	ND <46	(3.3-7') Sandy CLAY, dark brown, moist, soft, high cohesion, high plasticity, wet at 5.5'	CH
		0.1		236 ± 8	64 ± 15		
5		-		NA	NA		
		-		356 ± 10	ND <45		
	100	-	RW-067-SB-8	303 ± 9	57 ± 15	7-10' SAND, orange, very wet, loose, no cohesion, no plasticity	SP
		-		237 ± 8	ND <42		
		-		290 ± 9	ND <45		
10		-		1859 ± 26	ND <48	(10-13') CLAY, gray, wet, hard, high cohesion, medium plasticity	CL
		-	RW-067-SB-12	2383 ± 30	ND <48		
	100	-		1996 ± 26	ND <46		
		-		987 ± 17	ND <46	(13-14') Sandy CLAY, orange and gray, mottled, wet, soft, medium cohesion, medium plasticity	CL
		-		120 ± 6	ND <44	(14-18') SAND, orange, wet, loose to medium dense, no cohesion, no plasticity	SP
15		-		1542 ± 21	ND <43		
		-		111 ± 6	ND <43		
	90	-		1064 ± 21	78 ± 18		
		-	RW-067-SB-19	4484 ± 46	49 ± 16	(18-20') CLAY, dark gray, wet, slightly firm, high cohesion, high plasticity	CH
		-		3975 ± 41	ND < 47		
20		-		2844 ± 33	ND <47	(20-22') Sandy CLAY, dark gray, wet, hard, high cohesion, high plasticity	CH
		-		2465 ± 31	62 ± 16		
	100	-		2263 ± 31	ND <49	(22-22.5') SAND, gray, wet, soft, no cohesion, no plasticity (22.5-27') CLAY, dark gray, wet, sticky, stiff to soft, high cohesion, high plasticity	SP CH/ CL
		-		3014 ± 36	ND <48		
		-	RW-067-SB-25	2901 ± 34	72 ± 16		
25		-	RW-067-SB-26	2585 ± 29	44 ± 15		
		-		1858 ± 28	54 ± 17		
	80	-		98 ± 6	ND <51	(27-30') SAND, medium to coarse grained, beige, wet, loose, no cohesion, no plasticity	SW
		-		88 ± 6	ND <48		
		-		189 ± 7	ND <41		
30		-		367 ± 10	ND <43	(30-31.3') SAND, orange, wet, firm, no cohesion, no plasticity	SP
		-		2016 ± 25	48 ± 15	(31.3-34') Sandy CLAY, dark beigish orange, wet, soft, low cohesion, medium plasticity	CL
	100	-		2332 ± 27	47 ± 15		
		-		2522 ± 30	ND <46		
		-	RW-067-SB-35	2545 ± 29	53 ± 15	(34-35') CLAY, gray, wet, soft, high cohesion, high plasticity	CH
35							

Total Borehole Depth: 35' bgs.

ARM Group Inc.
Earth Resource Engineers
and Consultants

Boring ID: RW-068-SB

(page 1 of 1)

Client : EnviroAnalytics Group
ARM Project No. : 150298M-11-3
Project Description : Sparrows Point - Parcel A3
Site Location : Sparrows Point, MD
ARM Representative : L. Perrin
Checked by : W. Mader P.G., CPSS
Drilling Company : Green Services, Inc
Driller : Don Marchese
Drilling Equipment : Geoprobe 7822DT

Date : 10/7/2015
Weather : Cloudy

Northing (US ft) : 572,004.42
Easting (US ft) : 1,456,961.18

Depth (ft.)	% Recovery	PID Reading (PPM)	Sample No:	XRF Zn (PPM)	XRF Cd (PPM)
0		-	RW-068-SB-1	NA	NA
		-		838 ± 34	ND <97
	60	46.9		217 ± 10	66 ± 20
		0.2		148 ± 7	63 ± 17
		0.2	RW-068-SB-5	6771 ± 63	127 ± 16
5		-		NA	NA
		-	RW-068-SB-7	38406 ± 298	753 ± 21
	80	-		2826 ± 34	135 ± 16
		-		3095 ± 32	106 ± 14
		-		11883 ± 91	119 ± 15
10		-		5382 ± 55	ND <50
		-	RW-068-SB-17	4064 ± 38	98 ± 14
	86	-		2094 ± 25	57 ± 14
		-		2093 ± 24	68 ± 14
		-		3352 ± 33	43 ± 14
15		-		4576 ± 32	ND <31
		-		4900 ± 36	ND <32
	100	-		3972 ± 34	53 ± 12
		-		2814 ± 25	61 ± 12
		-		3007 ± 30	45 ± 14
20		-		1904 ± 24	ND <44
		-	RW-068-SB-26	1776 ± 24	49 ± 15
	100	-		1838 ± 24	ND <44
		-		977 ± 17	69 ± 15
		-		1712 ± 23	ND <44
25		-		466 ± 11	51 ± 15
		-		75 ± 6	ND <49
	100	-		68 ± 5	62 ± 15
		-		60 ± 5	57 ± 14
		-		42 ± 4	57 ± 14
30		-		421 ± 11	ND <45
		-	RW-068-SB-32	1060 ± 19	ND <49
	100	-		252 ± 9	ND <49
		-		73 ± 6	ND <57
		-		63 ± 5	64 ± 16
35					

DESCRIPTION	USCS
(0-0.3') Topsoil, wth roots and bark, brown, moist, soft, loose, no cohesion, no plasticity	ML
(0.3-3') Slag, coarse grained to gravel sized, dark brown, loose, no cohesion, no plasticity	GM/ GW
(3-5') Sandy CLAY, black, moist, soft, sticky, high cohesion, high plasticity, petroleum odor, wet at 5' bgs	CH
(5-7') Slag, coarse grained to gravel sized, black, wet, loose, no cohesion, no plasticity	GM/ GW
(7-10') CLAY, with trace clay, brown, wet, soft, medium cohesion, medium plasticity	CL
(10-11.8') Silty SAND, medium grained, brown, wet, no cohesion, no plasticity	SM
(11.8-12.8') SAND, medium grained, brownish gray, wet, soft, no cohesion, no plasticity	SP
(12.8-15') CLAY, with trace sand, gray, wet, soft, medium cohesion, medium plasticity	CL
(15-20') CLAY, dark brown, wet, firm, medium cohesion, high plasticity	CH
(20-24') CLAY, light gray, wet, soft, high cohesion, high plasticity, with trace sand at 23'	CH
(24-25') CLAY, light grayish brown, wet, soft, high cohesion, high plasticity	CH
(25-30') CLAY, dark gray, wet, soft, high cohesion, high plasticity	CH
(30-31') SAND, gray, wet, loose, no cohesion, no plasticity	SP
(31-35') CLAY, dark gray, wet, soft, sticky, high cohesion, high plasticity	CH

Total Borehole Depth: 35' bgs.

ARM Group Inc.
Earth Resource Engineers
and Consultants

Boring ID: RW-069-SB

(page 1 of 2)

Client : EnviroAnalytics Group
ARM Project No. : 150298M-11-3
Project Description : Sparrows Point - Parcel A3
Site Location : Sparrows Point, MD
ARM Representative : L. Perrin
Checked by : W. Mader P.G., CPSS
Drilling Company : Green Services, Inc
Driller : Don Marchese
Drilling Equipment : Geoprobe 7822DT

Date : 10/7/2015
Weather : 70s F, cloudy

Northing (US ft) : 572,031.30
Easting (US ft) : 1,456,874.17

Depth (ft.)	% Recovery	PID Reading (PPM)	Sample No/Interval	XRF Zn (PPM)	XRF Cd (PPM)	DESCRIPTION	USCS
0		7.5	RW-069-SB-1	3986 ± 65	ND <90	(0-0.4') Topsoil, brown, with roots and some fines and gravel slag, dry, soft, low cohesion, no plasticity	ML
		5.5		4609 ± 52	73 ± 18	(0.4-2.4') Slag, sand to gravel sized with trace clay/silt, dark brown, dry, loose, no cohesion, no plasticity	GM
	100	0.2	RW-069-SB-3	>10% ± 1%	2553 ± 69	(2.4-3.7') Clayey SAND, brown, low cohesion, slight plasticity, wet at 3.5' bgs - perched	SC
		0.0		7410 ± 70	271 ± 18	(3.7-8') Sandy CLAY, light brown to beige, wet, soft, medium cohesion, medium plasticity	CL
		0.0		781 ± 15	ND <46		
5		-		NA	NA		
		-		647 ± 14	ND <47		
	80	-		431 ± 11	ND <45		
		-		329 ± 9	54 ± 14	(8-9') SAND, with trace clay, beige, wet, soft, no cohesion, no plasticity	SM
		-	RW-069-SB-10	743 ± 15	62 ± 16	(9-10.5') Sandy CLAY, gray, wet, firm, high cohesion, high plasticity	CH
10		-		833 ± 16	ND <47	(10.5-11.8') CLAY, light gray, dry, soft, high cohesion, high plasticity	CH
		-	RW-069-SB-12	1015 ± 18	ND <48		
	90	-		638 ± 14	ND <46	(11.8-16') Silty CLAY, light gray, dry, firm, medium cohesion, low plasticity, wet at 15' bgs	CL
		-		120 ± 6	ND <44		
		-		201 ± 8	ND <47		
15		-		220 ± 9	ND <50		
		-		285 ± 8	ND <40	(16-18.7') SAND, orange, wet, loose, no cohesion, no plasticity	SP
	80	-		476 ± 12	ND <46		
		-		408 ± 10	ND <44	(18.7-20') SAND, gray, wet, loose, no cohesion, no plasticity	SP
		-	RW-069-SB-20	867 ± 16	ND <45		
20							

Total Borehole Depth: 35' bgs.

ARM Group Inc.
Earth Resource Engineers
and Consultants

Boring ID: RW-069-SB

(page 2 of 2)

Client	: EnviroAnalytics Group
ARM Project No.	: 150298M-11-3
Project Description	: Sparrows Point - Parcel A3
Site Location	: Sparrows Point, MD
ARM Representative	: L. Perrin
Checked by	: W. Mader P.G., CPSS
Drilling Company	: Green Services, Inc
Driller	: Don Marchese
Drilling Equipment	: Geoprobe 7822DT

Date	: 10/7/2015
Weather	: 70s F, cloudy
Northing (US ft)	: 572,031.30
Easting (US ft)	: 1,456,874.17

Depth (ft.)	% Recovery	PID Reading (PPM)	Sample No/Interval	XRF Zn (PPM)	XRF Cd (PPM)	DESCRIPTION	USCS
20		-		1925 ± 23	75 ± 14	(20-22') Sandy CLAY, gray, wet, slightly firm, high cohesion, high plasticity	CH
		-		2553 ± 29	68 ± 15		
	90	-	RW-069-SB-23	3157 ± 33	46 ± 15	(22-25') CLAY, gray, wet, firm, high cohesion, high plasticity	CH
		-		2235 ± 27	49 ± 15		
		-		842 ± 18	ND <51		
25		-		1409 ± 19	ND <42	(25-26') SAND, with trace clay, grayish brown, wet, loose, no cohesion, no plasticity	SP
		-		2458 ± 30	49 ± 16	(26-29.5') CLAY, gray, wet, firm, high cohesion, high plasticity	CH
	100	-	RW-069-SB-28	2696 ± 33	69 ± 16		
		-		1501 ± 25	ND <53		
		-		771 ± 17	65 ± 18	(29.5-30') SAND, medium grained, gray, wet, soft, no cohesion, no plasticity	SP
30		-		345 ± 9	ND <40	(30-34.5') SAND, medium to coarse grained, beige to gray, wet, soft, no cohesion, no plasticity	SW
		-		1178 ± 17	47 ± 14		
	80	-		1117 ± 17	ND <42		
		-		2695 ± 31	ND <46		
		-	RW-069-SB-35	6150 ± 60	54 ± 17	(34.5-35') Sandy CLAY, gray, wet, soft, low cohesion, low plasticity	CL
35						End of Boring	
40							

Total Borehole Depth: 35' bgs.

ARM Group Inc.
Earth Resource Engineers
and Consultants

Boring ID: RW-006-SB
RW-070-SB
(page 1 of 2)

Client : EnviroAnalytics Group
ARM Project No. : 150298M-10-3
Project Description : Sparrows Point - Parcel A3
Site Location : Sparrows Point, MD
ARM Representative : L. Perrin
Checked by : W. Mader P.G., CPSS
Drilling Company : Green Services, Inc
Driller : Kevin Pumphrey
Drilling Equipment : Geoprobe 7822DT

Date : 10/8/2015
Weather : Sunny, 70s F

Northing (US ft) : 572,073.37; 572,072.73
Easting (US ft) : 1,457,082.23; 1,457,086.37

Depth (ft.)	% Recovery	PID Reading (PPM)	Sample No/Interval	XRF Zn (PPM)	XRF Cd (PPM)	DESCRIPTION	USCS
0		-	RW-070-SB-1	8775 ± 119	ND <75	(0-0.7') Topsoil, brown, with plant detritis, dry, loose, soft, no cohesion, no plasticity, few slag gravels at 0.33'	ML
		16.3		68 ± 6	ND <55	(0.7-2.16') Slag, coarse grained to gravel sized, brown, dry, loose, no cohesion, no plasticity	GW
	100	10.2	RW-070-SB-3	1198 ± 37	ND <91	(2.16-2.66') Slag, coarse grained to gravel sized, light gray, dry, loose, no cohesion, no plasticity	GM
		4.9		50 ± 5	ND <49	(2.66-3.66') SAND, fine grained with silt, brown, dry, soft, loose, no cohesion, no plasticity	SM
		5.8		691 ± 17	ND <55	(3.66-5') CLAY, with wood debris, brown, moist, soft, high cohesion, high plasticity, wet at 5' bgs	CH
5		-		1423 ± 20	100 ± 15	(5-7.5') Sandy CLAY, grayish brown, wet, firm, high cohesion, high plasticity	CH
		-	RW-070-SB-7	8228 ± 59	158 ± 13		
	90	-		1491 ± 20	65 ± 14	(7.5-11') CLAY, with trace sand, light gray, wet, soft, medium cohesion, medium plasticity	CL-CH
		-		1950 ± 23	ND <42		
		-		1537 ± 21	ND <44		
10		-		421 ± 11	ND <46		
		-		374 ± 10	ND <42	(11-14.16') CLAY, with trace sand, light gray, wet, firm, high cohesion, high plasticity, less firm at 13.16'	CH
	80	-		1085 ± 16	58 ± 13		
		-		553 ± 13	ND <47		
		-	RW-070-SB-15	1423 ± 20	100 ± 15	(14.16-17') SAND, coarse grained, light gray, soft, wet, no cohesion, no plasticity	SW
15		-		71 ± 5	ND <41		
		-		61 ± 4	62 ± 14		
	83	-		66 ± 4	ND <39	(17-20') SAND, medium to coarse grained, orange, wet, soft, no cohesion, no plasticity	SW
		-		231 ± 8	ND <42		
		-	RW-070-SB-20	291 ± 9	ND <44		
20							

Total Borehole Depth: 35' bgs

0-10ft. - based on RW-006-SB drilling
10-25ft. - based on RW-070-SB drilling

ARM Group Inc.
Earth Resource Engineers
and Consultants

Boring ID: RW-006-SB
RW-070-SB

(page 2 of 2)

Client : EnviroAnalytics Group
ARM Project No. : 150298M-10-3
Project Description : Sparrows Point - Parcel A3
Site Location : Sparrows Point, MD
ARM Representative : L. Perrin
Checked by : W. Mader P.G., CPSS
Drilling Company : Green Services, Inc
Driller : Kevin Pumphrey
Drilling Equipment : Geoprobe 7822DT

Date : 10/8/2015
Weather : Sunny, 70s F

Northing (US ft) : 572,073.37; 572,072.73
Easting (US ft) : 1,457,082.23; 1,457,086.37

Depth (ft.)	% Recovery	PID Reading (PPM)	Sample No/Interval	XRF Zn (PPM)	XRF Cd (PPM)	DESCRIPTION	USCS
20		-		1472 ± 20	ND <43	(20-25') CLAY, with trace sand, gray, wet, soft, high cohesion, high plasticity	
		-	RW-070-SB-22	1497 ± 20	54 ± 14		
	100	-		210 ± 8	57 ± 15		CH
		-		100 ± 6	56 ± 15		
		-		61 ± 6	61 ± 18		
25		-		NA	NA	(25-28') CLAY, gray, wet, very soft, high cohesion, high plasticity	
		-	RW-070-SB-27	180 ± 7	ND <41		CH
	60	-		64 ± 5	ND <44		
		-		48 ± 5	ND <48	(28-29') SAND, coarse grained, light gray, wet, soft, no cohesion, no plasticity	SW
		-		131 ± 7	ND <47	(29-35') CLAY, gray, wet, soft, high cohesion, high plasticity	
30		-		106 ± 5	ND <42		
		-	RW-070-SB-32	104 ± 6	74 ± 15		CH
	100	-		73 ± 5	ND <46		
		-		74 ± 5	62 ± 16		
		-		52 ± 5	64 ± 16		
35						End of Boring	
40							

Total Borehole Depth: 35' bgs

0-10ft. - based on RW-006-SB drilling
10-25ft. - based on RW-070-SB drilling

APPENDIX C

TRIAD ENGINEERING, INC.
MD | OH | PA | VA | WV
TRIAD Listens, Designs & Delivers

December 4, 2015

Mr. James Calenda
EnviroAnalytis Group, LLC
1650 Des Peres Road, Suite 303
St. Louis, MO 63131

Re: Sparrows Point Piezometer Survey
Sparrows Point, MD
Triad Engineering Job No. 03-15-0343

Mr. Calenda:

Below are the specified surveyed piezometers, date of last field work completed on November 24, 2015. The coordinate values shown were derived from G.P.S. observations based on National Geodetic Surveys stations “GIS 1”, PID AC7684 and “GIS 2”, PID AC7685 which purport to be on NAD83(2011) Maryland Grid coordinate system and NAVD88 elevations.

DESCRIPTION	NORTHING	EASTING	TOP CASING ELEVATION	GROUND AT PIEZOMETER ELEVATION
A2-013-PZ	574018.74	1463788.08	16.17	12.38
A2-022-PZ	572911.38	1463476.53	12.58	9.68
A2-025-PZ	573614.75	1464570.56	11.23	8.51
A2-031-PZ	574485.04	1464939.09	22.88	20.78
A4-001-PZ	571114.57	1458067.91	14.71	12.71
A4-005-PZ	571746.11	1458066.66	15.95	12.94
A4-005a-PZ	571748.15	1458062.51	15.55	12.99
A4-007-PZ	572370.58	1457965.85	15.41	12.88
A4-010-PZ	572631.43	1458703.03	14.67	12.79
A4-012-PZ	570367.73	1458232.61	15.90	12.24
A4-013-PZ	570657.51	1458543.60	12.00	9.76
A4-014-PZ	571109.86	1459218.50	15.39	11.49
A4-019-PZ	571962.55	1458881.91	16.34	12.65
A8-002-PZ	573593.69	1461765.45	16.14	13.21
A8-004-PZ	573652.14	1462090.63	16.73	12.85
A8-007-PZ	573458.80	1462039.43	15.86	12.60
A8-009-PZ	573912.57	1461846.67	16.73	12.81
A8-013-PZ	574444.07	1462162.14	20.01	16.10
A8-015-PZ	574293.04	1461458.35	16.18	11.91
A8-017-PZ	572956.53	1461959.46	16.59	13.26
A8-017a-PZ	572957.82	1461960.12	15.44	13.26

B8-009-PZ	569732.21	1456540.64	13.99	11.76
B8-010-PZ	569657.78	1456741.04	12.73	10.52
B8-013-PZ	569957.71	1457081.01	13.56	9.80
B8-016-PZ	570091.95	1457637.26	13.99	10.54
B8-017-PZ	570261.64	1457914.69	12.00	9.81
B8-018-PZ	570304.18	1458366.07	11.79	9.21
B8-019-PZ	570052.18	1458026.66	13.60	9.97
B8-020-PZ	570151.96	1458265.97	12.50	9.88
RW-002-PZ	572319.86	1456268.80	12.62	9.56
RW-006-PZ	572066.50	1457083.26	14.28	10.87
RW-011-PZ	570954.75	1456139.80	15.15	11.34
RW-021-PZ	570224.93	1456882.30	13.88	10.25
RW-025-PZ	570048.83	1456512.07	15.28	11.61
RW-027-PZ	570825.85	1456912.97	14.77	11.17
RW-048-PZ	571686.96	1456530.55	14.28	11.56
RW-050-PZ	570853.87	1456545.21	15.47	11.40
RW-057-PZ	572112.71	1456434.62	13.14	10.17
RW-063-PZ	572433.51	1456825.40	14.19	11.07
RW-067-PZ	572214.11	1456680.41	13.37	10.68
RW-070-PZ	572063.81	1457082.09	14.14	10.84
RW22 50FT	571963.73	1456061.85	11.25	11.25
RW23 50FT	572002.55	1456257.38	11.46	11.46
RW24 50FT	572055.46	1456360.62	11.05	11.05

TRIAD ENGINEERING, INC.
MD | OH | PA | VA | WV
TRIAD Listens, Designs & Delivers

April 1, 2016

Mr. James Calenda
EnviroAnalytis Group, LLC
1650 Des Peres Road, Suite 303
St. Louis, MO 63131

Re: Sparrows Point Well Survey
Sparrows Point, MD
Triad Engineering Job No. 03-15-0343

Mr. Calenda:
Below are the specified surveyed wells, date of last field work completed on March 31, 2016. The coordinate values shown were derived from G.P.S. observations based on National Geodetic Surveys stations “GIS 1”, PID AC7684 and “GIS 2”, PID AC7685 which purport to be on NAD83(2011) Maryland Grid coordinate system with NAVD88 (AMSL) elevations.

DESCRIPTION	NORTHING	EASTING	TOP CASING ELEVATION	GROUND AT WELL ELEVATION
RW01-PZM020	572285.02	1456497.40	12.72	10.15
RW02-PZM000	572167.62	1456601.84	12.39	10.05
RW02-PZM020	572158.64	1456606.28	13.02	10.27
RW03-PZM003	572259.59	1456590.24	10.87	10.31
RW04-PZM003	572273.38	1456415.50	11.11	10.27
RW05-PZP001	572192.49	1456509.88	13.03	10.76
RW06-PZM001	572173.11	1456427.80	12.17	10.20
RW07-PZM004	572145.46	1456308.46	13.70	10.61
RW07-PZM017	572137.29	1456311.82	12.94	10.71
RW08-PZM003	572100.62	1456449.49	11.38	10.76
RW09-PZM004	572065.65	1456324.72	13.67	10.76
RW10-PZM004	572028.98	1456365.53	10.92	11.22
RW10-PZM020	572016.81	1456385.68	11.86	11.47
RW10-PZM065	572031.12	1456376.20	10.75	10.98
RW11-PZM004	572016.05	1456486.05	13.79	11.11
RW12-PZM004	572051.83	1456593.90	13.88	11.16
RW13-PZM020	571971.43	1456592.59	13.05	11.17
RW14-PZM020	572204.47	1456202.53	13.60	11.24
RW15-PZM020	571989.55	1456088.94	12.17	11.84
RW16-PZM020	571861.44	1456127.25	13.89	11.65
RW17-PZM019	571801.70	1456321.19	13.73	11.43
RW18-PZM047	572418.32	1456080.56	15.69	13.70

RW19-PZM020	571975.38	1455960.61	13.53	11.28
RW19-PZM050	571973.56	1455966.33	12.95	11.17
RW19-PZP003	571981.70	1455964.46	13.49	11.16
RW20-PZM020	571694.60	1456021.05	13.03	11.14
RW20-PZM050	571704.36	1456022.96	11.87	11.09
RW20-PZP000	571705.48	1456018.60	13.54	11.06
RW21-PZM023	571512.69	1456045.20	12.93	10.86
RW-RW89	572109.51	1456513.71	11.35	10.97
RW-RW90	572154.39	1456467.19	11.08	10.55
RW-RW93	NOT INSTALLED			
RW-RW95	572243.17	1456479.97	12.62	10.81
RW-RW97	572070.55	1456523.86	13.08	10.93
RW-RWBW-20	WELL CASING DAMAGED, COULD NOT SURVEY (SEE FIGURE 1.0)			14.04
RW-RWBW-21	572425.20	1456092.04	15.11	14.75
SW03-PZM003	571205.39	1456735.24	14.54	10.93
SW03-PZM060	571201.38	1456738.70	14.93	10.92
TS04-PDM004	571781.18	1456010.86	13.69	11.10
TS04-PPM007	571713.99	1455885.63	10.20	10.24
TS04-PZM023	571723.19	1455884.69	10.05	10.30
SW-061-MWS	567005.21	1457693.91	15.83	13.65
SW-059-MWS	567199.64	1458459.63	15.99	13.64
SW-060-MWS	567889.61	1457693.79	14.12	12.20
SW-051-MWS	565671.75	1462655.02	13.40	10.99
SW-049-MWS	566666.92	1463263.78	11.55	11.89
SW-050-MWS	565719.62	1463489.52	10.62	8.04
SW-066-MWS	564235.89	1458826.45	13.02	10.77
SW-071-MWS	564957.19	1460809.42	16.63	14.25
SW-072-MWS	564563.01	1460661.22	14.60	12.02
SW-073-MWS	564422.72	1461025.48	14.76	12.43
SW-065-MWS	564008.99	1457839.54	12.27	12.57
SW-057-MWS	567666.75	1460456.19	12.31	12.62
SW-058-MWS	568148.01	1459749.57	11.45	11.75
SW-056-MWS	566048.47	1460677.32	11.52	8.72
SW-054-MWS	566520.20	1461893.20	13.35	10.89
SW-055-MWS	565946.68	1461317.07	11.87	9.28
SW-053-MWS	567410.98	1461986.20	13.84	14.06
SW-037-MWS	563571.81	1461007.95	13.28	10.96
SW-035-MWS	563772.91	1460297.91	13.43	11.06
SW-034-MWS	563668.32	1459941.32	12.62	10.16
SW-032-MWS	563537.58	1458639.17	12.64	10.49
SW-027-MWS	564973.53	1456177.11	16.98	14.33
SW-028-MWS	564518.61	1456324.45	15.59	13.20

SW-021-MWS	568534.52	1457422.96	12.83	10.42
SW-022-MWS	568222.29	1457122.05	14.31	12.20
SW-023-MWS	568116.87	1456637.37	14.66	12.79
SW-024-MWS	568021.88	1456157.41	14.03	11.62
SW-025-MWS	566943.92	1456126.02	13.16	11.03
SW-026-MWS	566649.66	1455514.08	11.51	8.61
SW-040-MWS	564306.40	1463005.67	13.01	11.16
SW-041-MWS	564416.60	1463773.99	13.47	11.80
SW-042-MWS	564740.08	1464633.24	7.40	7.78
SW-043-MWS	565729.24	1464430.00	10.26	8.53
SW-044-MWS	566398.36	1464363.35	8.61	8.99
SW-048-MWS	568760.44	1463140.98	16.73	14.27
SW-046-MWS	569504.23	1464948.41	9.80	10.13
SW-047-MWS	570242.63	1464394.66	20.24	20.56
SW-038-MWS	563432.87	1461357.62	16.28	13.76
SW-039-MWS	563507.65	1462484.16	19.91	17.91
SW-031-MWS	563598.44	1458394.82	13.41	10.93
SW-070-MWS	565612.92	1459619.82	11.17	9.10
SW-052-MWS	565095.06	1462682.05	13.88	11.49
SW-045-MWS	568357.88	1463927.89	13.10	11.17
SW-043-MWI	565719.77	1464429.47	10.43	8.56
SW-045-MWI	568344.09	1463932.84	12.86	10.92
SW-074-MWI	567047.75	1464301.55	10.20	8.20
SW-036-MWS	563678.17	1460774.35	13.38	10.82
SW-033-MWS	563597.45	1459274.61	10.28	10.59
SW-030-MWS	563547.95	1458146.61	14.72	12.32
SW-074-MWS	567038.13	1464298.66	11.32	8.79
SW-062-MWS	567420.73	1456909.57	16.81	14.39
SW-063-MWS	565322.90	1456892.20	19.98	17.54
SW-067-MWS	564917.48	1458453.61	14.85	12.66
SW-068-MWS	565823.84	1458036.16	16.87	14.55
SW-069-MWS	566309.02	1458770.00	16.56	14.23
SW-029-MWS	563980.59	1456323.19	15.75	13.15
SW-064-MWS	564322.36	1457393.54	17.39	15.15
FM01-PZM003	568251.65	1460279.28	10.08	10.37
FM01-PZM041	568251.76	1460275.61	9.91	10.24
FM05-PZM004	568565.69	1462040.51	14.48	11.73
FM05-PZM024	568578.67	1462043.77	14.47	12.04
SG07-PZM007	NOT INSTALLED			
SW06-PZM001	569184.69	1463625.88	17.29	14.92
SW06-PZM053	569188.45	1463637.32	16.75	14.59
SW07-PZM004	567658.52	1456050.21	14.52	12.02

SW07-PZM108	567665.11	1456048.67	15.76	11.56
SW08-PZM003	568091.75	1458990.33	11.75	9.37
SW08-PZM053	568090.03	1458982.75	12.02	9.67
SW09-PZM004	566974.91	1460293.50	13.16	10.34
SW09-PZM028	566965.08	1460295.30	12.70	10.48
SW09-PZM068	566970.72	1460290.93	13.31	10.32
NO DESC.	566975.78	1460287.86	13.03	10.17
SW10-PZM012	567312.59	1463288.23	7.91	4.82
SW10-PZM085	567286.63	1463311.33	7.83	4.88
SW11-PZM005	565794.79	1456073.98	13.54	11.35
SW12-PZP001	565989.17	1457438.18	17.66	15.57
SW13-PZM003	563493.91	1456407.34	16.26	14.01
SW13-PZM025	563498.66	1456410.45	15.59	13.56
SW13-PZM111	563502.75	1456409.98	15.37	13.66
SW14-PZM004	563392.23	1457680.38	15.85	13.80
SW15-PZM005	564367.29	1459534.16	14.83	12.17
SW15-PZM031	564371.72	1459531.84	14.90	12.02
SW15-PZM085	564367.22	1459539.25	14.23	12.15
NO DESC.	564374.63	1459537.53	14.50	12.19
SW16-PZM003	564524.42	1462434.76	14.94	12.80
SW16-PZM067	564528.56	1462441.95	15.33	13.06
TM03-PZM004	568852.92	1457628.81	12.66	10.34
TM03-PZM037	568849.30	1457622.17	12.08	10.38
TM05-PZM005	568837.40	1458595.64	12.76	10.62
TM05-PZM040	568830.24	1458596.23	12.83	10.70
TS10-PDM008	567529.89	1464010.26	6.74	3.88
SG07 PD	564025.39	1463980.66	17.93	15.19

Figure 1.0: RW-RWBW-20 Photographs

APPENDIX D

XRF CALIBRATION LOG

PROJECT NAME: Area A Parcel A3 PDI

SAMPLER NAME: N. Kurtz

PROJECT NUMBER: 150298M-11-3

DATE: April 1, 2016

PAGE__1__of__1__

DATE/TIME	NIST 2710a		NIST 2711a		Blank SiO2		COMMENTS
	Zn	Cd	Zn	Cd	Zn	Cd	
Certified Value (mg/kg)	0.418±0.015	12.3±0.3	414±11	54.1±0.5	±	±	-
10/1/2015 0840	0.4084*	ND<74	NA	NA	ND	ND	-
10/5/2015 0748	NA	NA	385±13	66±16	ND<11	ND<60	-
10/5/2015 1003	NA	NA	357±11	60±16	ND<9	ND<50	-
10/5/2015 1141	NA	NA	360±11	49±15	ND<9	ND<62	-
10/5/2015 1600	NA	NA	361±12	47±16	ND<9	ND<50	-
10/6/2015 0920	NA	NA	357±11	48±15	ND<9	ND<48	-
10/6/2015 1145	NA	NA	361±11	36±16	ND<8	ND<52	-
10/7/2015 0755	NA	NA	363±11	52±16	ND<10	ND<53	-
10/7/2015 1000	NA	NA	357±11	77±16	ND<9	ND<57	-
10/7/2015 1110	NA	NA	360±11	69±13	ND<10	ND<52	-
10/7/2015 1335	NA	NA	354±11	59±16	ND<11	ND<59	-
10/7/2015 1505	NA	NA	349±11	60±16	ND<9	ND<53	-
10/8/2015 0805	NA	NA	363±11	67±16	ND<10	ND<53	-
10/8/2015 1000	NA	NA	372±11	65±15	ND<10	ND<56	-
10/8/2015 1205	NA	NA	405±11	60±14	ND<11	ND<60	-

ND= Non-detect

* Result converted from % to mg/kg

APPENDIX E

PID CALIBRATION LOG

PROJECT NAME: Area A Parcel A3

SAMPLER NAME: N. Kurtz, L. Perrin & P. Vogel

PROJECT NUMBER: 150298M-10/11-3

DATE: April 1, 2016

PAGE__1__of__1_

DATE/TIME	PID SERIAL #	FRESH AIR CAL	STANDARD	STANDARD CONCENTRATION	METER READING	COMMENTS
9/21/2015	592-913262	*	Isobutylene	100 ppm	100.1	LLP
9/22/2015	592-908581	*	Isobutylene	100 ppm	100.1	LLP
9/23/2015	592-908581	*	Isobutylene	100 ppm	100.1	LLP
9/24/2015	592-908581	*	Isobutylene	100 ppm	100.1	NSK
9/25/2015	592-908581	*	Isobutylene	100 ppm	100.1	LLP
9/28/2015	592-908581	*	Isobutylene	100 ppm	100.3	LLP
9/29/2015	592-908608	*	Isobutylene	100 ppm	100.0	NSK
9/30/2015	592-908608	*	Isobutylene	101 ppm	100.1	LLP
10/1/2015	592-908608	*	Isobutylene	100 ppm	100.1	NSK
10/5/2015	592-908608	0.0	Isobutylene	100 ppm	100.0	-
10/6/2015	592-908608	0.0	Isobutylene	100 ppm	99.6	-
10/7/2015	592-908608	0.0	Isobutylene	100 ppm	100.0	-
10/8/2015	592-908608	0.0	Isobutylene	100 ppm	100.0	-
10/21/2015	592-908608	0.0	Isobutylene	100 ppm	100.1	PV
10/22/2015	592-908608	0.0	Isobutylene	100 ppm	100.1	PV
10/23/2015	592-908608	0.0	Isobutylene	100 ppm	100.0	PV
10/26/2015	592-908608	0.0	Isobutylene	100 ppm	100.0	PV
10/27/2015	592-908608	0.0	Isobutylene	100 ppm	100.1	PV
10/28/2015	592-908608	0.0	Isobutylene	100 ppm	100.1	PV
10/29/2015	592-908608	0.0	Isobutylene	100 ppm	100.0	PV
			Isobutylene	100 ppm		
			Isobutylene	100 ppm		
			Isobutylene	100 ppm		

* Fresh air calibrations were completed, but not recorded

APPENDIX F

LOG OF TEMPORARY GROUNDWATER SAMPLE COLLECTION POINT: RW-057-PZ

Client: EnviroAnalytics Group
Site: Sparrows Point - Area A Parcel A3
Sparrows Point, MD
ARM Project No.: 150298M-10-3
Page 1 of 1

Date Installed : 10-26-15
Casing/Riser Type : PVC
Borehole Diameter : 3.25"
Drilling Method : 7822DT Geoprobe
Driller : Kevin Pumphrey

Drilling Company : Green Services, Inc
TOC Elevation : 13.14
0-Hr DTW : 14.53' TOC
24-Hr DTW : 15.20' TOC
ARM Representative : L. Perrin

Depth in Feet	Surf. Elev. 10.17
0	10
1	9
2	8
3	7
4	6
5	5
6	4
7	3
8	2
9	1
10	0
11	-1
12	-2
13	-3
14	-4
15	-5
16	-6
17	-7
18	-8
19	-9
20	-10
21	-11
22	-12
23	-13
24	-14
25	-15
26	-16
27	-17
28	-18
29	-19
30	

DESCRIPTION

Riser Type: PVC
Riser Diameter: 1 inch
Riser Stickup: 32.75"

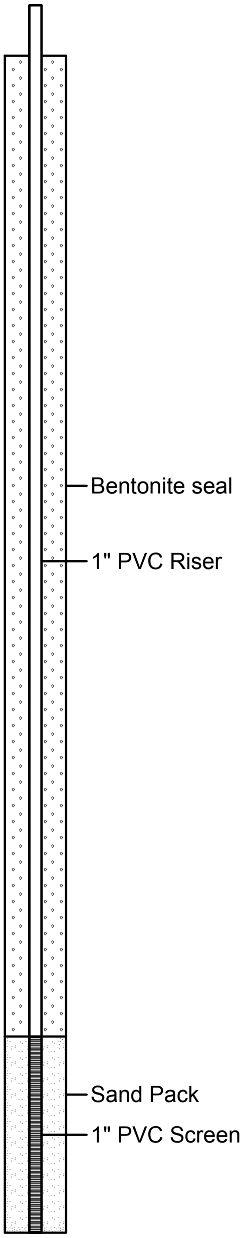
Screen Type: PVC
Screen Diameter: 1 inch
Screen Amount: 5 feet
Slot Size: 0.010"

Filter Pack:
Top: 20' bgs
Bottom: 25' bgs
Used filter pack

Bentonite Seal:
Top: 0 (surface)
Bottom: 25' bgs
Grain Size: 3/8" chips/ granular 30-50 mesh

End of Boring

PZM Name: RW-057-PZ



REMARKS

5' pre-packed well screen

Total Depth: 30' bgs

ARM Group Inc.

LOG OF TEMPORARY GROUNDWATER SAMPLE COLLECTION POINT: RW-063-PZ

Client: EnviroAnalytics Group
Site: Sparrows Point - Area A Parcel A3
Sparrows Point, MD
ARM Project No.: 150298M-10-3
Page 1 of 1

Date Installed	: 10-26-15	Drilling Company	: Green Services, Inc
Casing/Riser Type	: PVC	TOC Elevation	: 14.19
Borehole Diameter	: 3.25"	0-Hr DTW	: 13.52' TOC
Drilling Method	: 7822DT Geoprobe	24-Hr DTW	: 13.24' TOC
Driller	: Kevin Pumphrey	ARM Representative	: L. Perrin

Depth in Feet	Surf. Elev. 11.07
0	11
1	10
2	9
3	8
4	7
5	6
6	5
7	4
8	3
9	2
10	1
11	0
12	-1
13	-2
14	-3
15	-4
16	-5
17	-6
18	-7
19	-8
20	-9
21	-10
22	-11
23	-12
24	-13
25	-14
26	-15
27	-16
28	-17
29	-18
30	-19
31	-20
32	-21
33	-22
34	-23
35	

DESCRIPTION

Riser Type: PVC
Riser Diameter: 1 inch
Riser Stickup: 34.75"

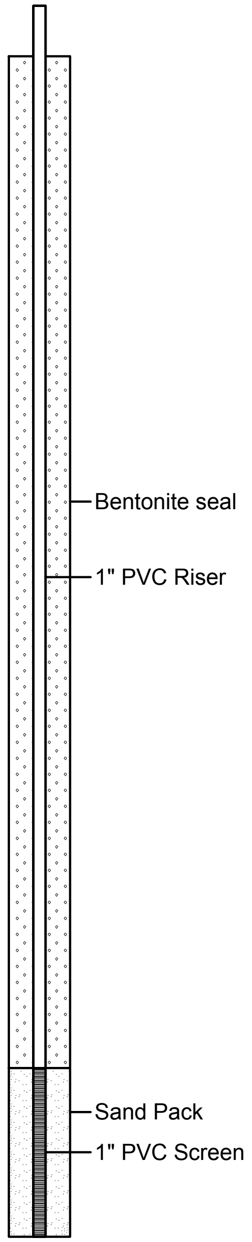
Screen Type: PVC
Screen Diameter: 1 inch
Screen Amount: 5 feet
Slot Size: 0.010"

Filter Pack:
Top: 30' bgs
Bottom: 35' bgs
Used filter pack

Bentonite Seal:
Top: 0 (surface)
Bottom: 30' bgs
Grain Size: 3/8" chips/ granular 30-50 mesh

End of Boring

PZM Name: RW-063-PZ



REMARKS

5' pre-packed well screen

Total Depth: 35' bgs

ARM Group Inc.

LOG OF TEMPORARY GROUNDWATER SAMPLE COLLECTION POINT: RW-067-PZ

Client: EnviroAnalytics Group
Site: Sparrows Point - Area A Parcel A3
Sparrows Point, MD
ARM Project No.: 150298M-10-3
Page 1 of 1

Date Installed	: 10-26-15	Drilling Company	: Green Services, Inc
Casing/Riser Type	: PVC	TOC Elevation	: 13.37
Borehole Diameter	: 3.25"	0-Hr DTW	: 15.17' TOC
Drilling Method	: 7822DT Geoprobe	24-Hr DTW	: 14.71' TOC
Driller	: Kevin Pumphrey	ARM Representative	: L. Perrin

PZM Name: RW-067-PZ

Depth in Feet	Surf. Elev. 10.68
0	
1	10
2	9
3	8
4	7
5	6
6	5
7	4
8	3
9	2
10	1
11	0
12	-1
13	-2
14	-3
15	-4
16	-5
17	-6
18	-7
19	-8
20	-9
21	-10
22	-11
23	-12
24	-13
25	-14
26	-15
27	-16
28	-17
29	-18
30	-19
31	-20
32	-21
33	-22
34	-23
35	-24

DESCRIPTION

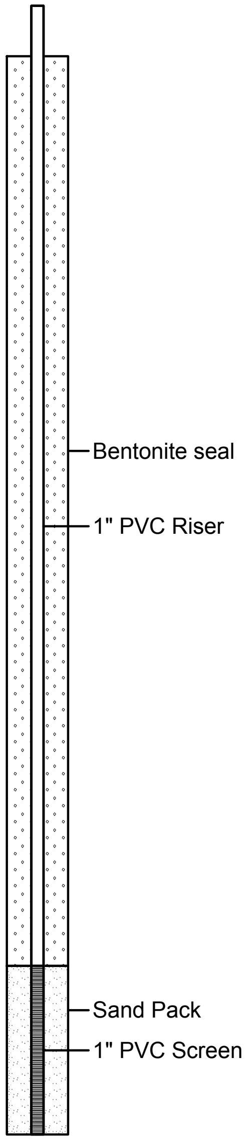
Riser Type: PVC
Riser Diameter: 1 inch
Riser Stickup: 28.5"

Screen Type: PVC
Screen Diameter: 1 inch
Screen Amount: 5 feet
Slot Size: 0.010"

Filter Pack:
Top: 27' bgs
Bottom: 32' bgs
Used filter pack

Bentonite Seal:
Top: 0 (surface)
Bottom: 27' bgs
Grain Size: 3/8" chips/ granular 30-50 mesh

End of Boring



REMARKS

5' pre-packed well screen

Total Depth: 32' bgs

ARM Group Inc.

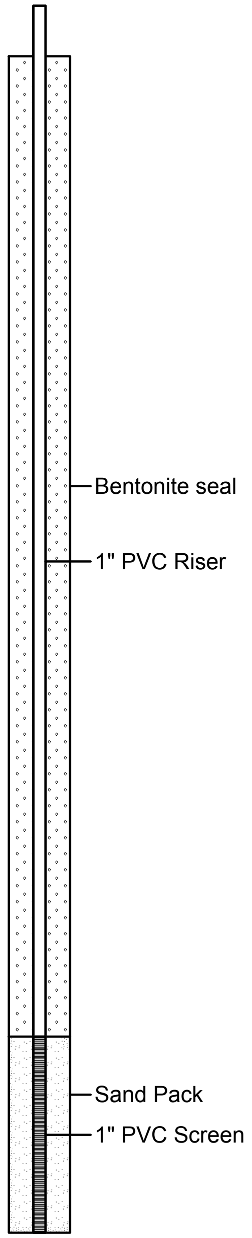
LOG OF TEMPORARY GROUNDWATER SAMPLE COLLECTION POINT: RW-070-PZ

Client: EnviroAnalytics Group
Site: Sparrows Point - Area A Parcel A3
Sparrows Point, MD
ARM Project No.: 150298M-10-3
Page 1 of 1

Date Installed	: 10-26-15	Drilling Company	: Green Services, Inc
Casing/Riser Type	: PVC	TOC Elevation	: 14.14
Borehole Diameter	: 3.25"	0-Hr DTW	: 10.60' TOC
Drilling Method	: 7822DT Geoprobe	24-Hr DTW	: 10.51' TOC
Driller	: Kevin Pumphrey	ARM Representative	: L. Perrin

Depth in Feet	Surf. Elev. 10.84	DESCRIPTION	REMARKS
0		Riser Type: PVC Riser Diameter: 1 inch Riser Stickup: 37.25"	
1	10		
2	9		
3	8		
4	7	Screen Type: PVC Screen Diameter: 1 inch Screen Amount: 5 feet Slot Size: 0.010"	
5	6		
6	5		
7	4		
8	3	Filter Pack: Top: 25' bgs Bottom: 30' bgs Used filter pack	
9	2		
10	1		
11	0		
12	-1	Bentonite Seal: Top: 0 (surface) Bottom: 25' bgs Grain Size: 3/8" chips/ granular 30-50 mesh	
13	-2		
14	-3		
15	-4		
16	-5		
17	-6		
18	-7		
19	-8		
20	-9		
21	-10		
22	-11		
23	-12		
24	-13		
25	-14		5' pre-packed well screen
26	-15		
27	-16		
28	-17		
29	-18		
30	-19		
		End of Boring	

PZM Name: RW-070-PZ



Total Depth: 30' bgs

ARM Group Inc.
Earth Resource Engineers
and Consultants

Boring ID: RW22-PZM(I)

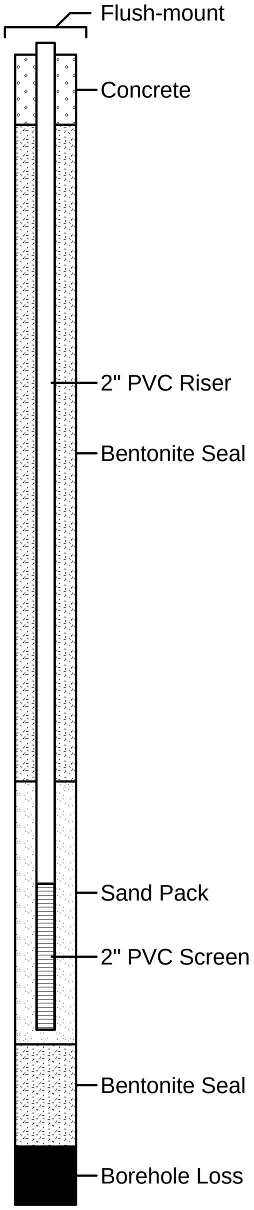
(page 1 of 1)

Client : EnviroAnalytics Group
ARM Project No. : 150298M-10-3
Project Description : Sparrows Point - Parcel A3
Site Location : Sparrows Point, MD
ARM Representative : P. Vogel
Checked by : E. Magdar
Drilling Company : Allied
Driller : Mike Waller
Drilling Equipment : Diedrich D 120
Bit/Auger Size: : 4.25" ID HSA

Date Started : 10/19/15 ~12:30
Weather : Clear to P. Cloudy, 55 F
0 Hr Depth to Water : NA
24 Hr Depth to Water : NA
TOC Elevation: : 11.25' amsl
Northing : 571963.73
Easting : 1456061.85

Depth (ft.)	Sample No:	Recovery (%)	PID (PPM)	Blow Count	DESCRIPTION	REMARKS
0	S1	50	0.5	13-13-6-38	0-2' Gravelly SAND, fine to coarse grained with some slag, dark gray to black	Concrete pad
	S2	70	0.1	7-5-6-5	2-6' SAND, fine grained, orange brown to gray, wet at 4' bgs	
4	S3	80	0.2	1-2-1-2		
	S4	85	0.1	3-5-6-8	6-14' Clayey SILT, gray and tan to brown, some mottling, moist throughout	bentonite chips
8	S5	80	0.2	7-5-6-7		
	S6	85	0.2	6-7-8-8		
12	S7	90	0.1	9-10-10-10		
	S8	65	0.1	4-8-7-8	SAND, fine-grained, tan to gray, wet	
16	S9	75	0.1	5-6-6-6		
	S10	75	0.1	7-8-8-6		
20	S11	75	0.0	3-2-4-4	20-21.5' SAND, fine to coarse grained with fine gravel, dark gray, wet	
	S12	50	0.0	3-4-4-5	21.5-26.5' CLAY, dark gray, stiff, moist	
24	S13	25	0.0	5-5-13-18		
	S14	100	0.2	8-14-16-19	26.5-34' SAND, fine to coarse grained with fine gravel, orange brown and tan to gray, wet	#2 sand
28	S15	100	0.2	25-33-40-50/5		
	S16	100	0.1	2-5-19-30		5' screen 29-34' bgs 0.020" slot
32	S17	100	0.5	12-31-31-35		
	S18	100	0.1	2-3-4-6	34-35.5' CLAY, light gray, stiff 35.5-36' SAND, fine grained, tan	
36	S19	85	0.1	7-7-7-14	36-37.5' CLAY, dark gray, stiff, with 1/2" thick fine grained clayey sand stringers	
	S20	75	0.1	2-6-10-12	37.5-39' Clayey SAND, dark gray	
40					39-40' Clayey SAND, light gray, wet	

Well ID: RW22-PZM(I)



Total Borehole Depth: 40' bgs.

ARM Group Inc.
Earth Resource Engineers
and Consultants

Boring ID: RW23-PZM(I)

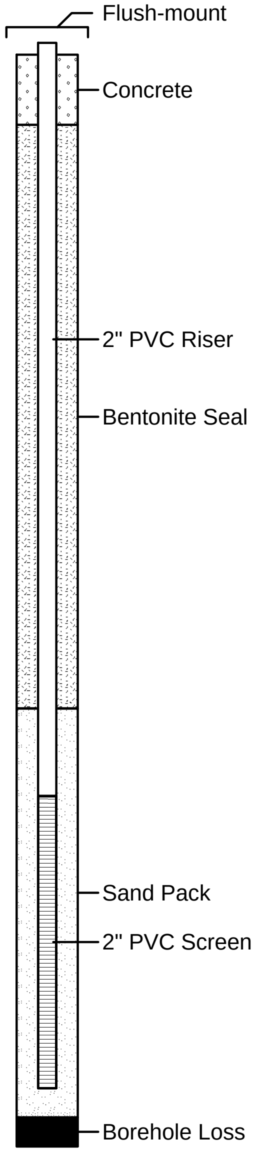
(page 1 of 1)

Client : EnviroAnalytics Group
ARM Project No. : 150298M-10-3
Project Description : Sparrows Point - Parcel A3
Site Location : Sparrows Point, MD
ARM Representative : P. Vogel
Checked by : E. Magdar
Drilling Company : Allied
Driller : Mike Waller
Drilling Equipment : Diedrich D 120
Bit/Auger Size: : 4.25" ID HSA

Date Started : 10/16/15 08:00
Weather : Clear to P. Cloudy, 55 F
0 Hr Depth to Water : NA
24 Hr Depth to Water : NA
TOC Elevation: : 11.46' amsl
Northing : 572002.55
Easting : 1456257.38

Depth (ft.)	Sample No:	Recovery (%)	PID (PPM)	Blow Count	DESCRIPTION	REMARKS
0	S1	50	0.0	6-28-50/2	0-3' SAND and GRAVEL, fine to coarse grained, dark gray to black, dry	Concrete pad
	S2	75	0.0	13-12-11-12	3-11.8' SAND, fine grained, orange to tan, wet at 6' bgs	
4	S3	100	0.0	7-8-9-9		
	S4	100	0.1	8-8-8-5		Bentonite chips
8	S5	75	0.0	1-5-4-5		
	S6	100	0.1	4-5-6-7	11.8-16' Sandy CLAY, gray	
12	S7	85	0.0	1-2-3-3		
	S8	100	0.0	4-4-4-4		
16	S9	25	0.0	1-7-4-6	16-31' SAND, tan to orange to gray, wet	
	S10	100	0.0	4-7-7-7		
20	S11	100	0.0	3-1-2-13		
	S12	100	0.0	4-7-13-14		
24	S13	100	0.0	3-1-2-13		
	S14	100	0.0	22-18-3-4		#2 sand
28	S15	100	0.2	4-7-10-14		
	S16	100	0.0	14-22-17-25	31-35.5' SAND, fine to coarse grained, with trace fine gravel, tan, wet	10' screen 26-36' bgs 0.020" slot
32	S17	100	0.0	3-5-10-17		
	S18	100	0.0	8-3-4-4	35.5-38' CLAY, with trace silt, gray, stiff	
36	S19	50	0.0	4-12-32-14		
					End of Boring	
40						

Well ID: RW23-PZM(I)



Total Borehole Depth: 38' bgs.

ARM Group Inc.
Earth Resource Engineers
and Consultants

Boring ID: RW24-PZM(I)

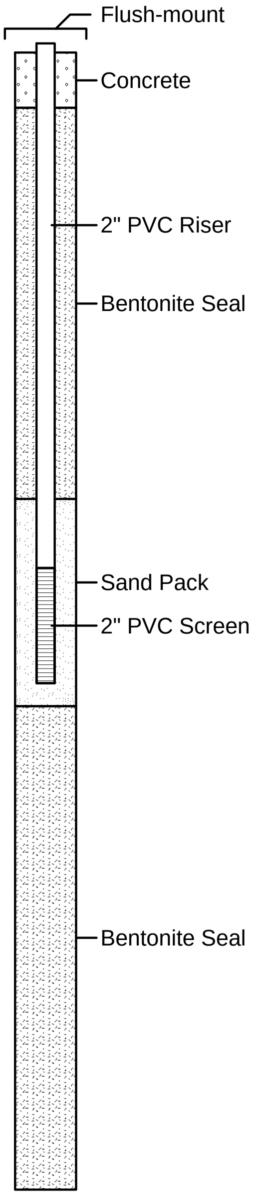
(page 1 of 1)

Client : EnviroAnalytics Group
ARM Project No. : 150298M-10-3
Project Description : Sparrows Point - Parcel A3
Site Location : Sparrows Point, MD
ARM Representative : P. Vogel
Checked by : E. Magdar
Drilling Company : Allied
Driller : Mike Waller
Drilling Equipment : Diedrich D 120
Bit/Auger Size: : 4.25" ID HSA

Date Started : 10/14/15 12:30
Weather : Clear to P. Cloudy, 55 F
0 Hr Depth to Water : NA
24 Hr Depth to Water : NA
TOC Elevation : 11.05' amsl
Northing : 572055.46
Easting : 1456360.62

Depth (ft.)	Sample No:	Recovery (%)	PID (PPM)	Blow Count	DESCRIPTION	REMARKS
0	S1	50	0.1	10-40-19-5	0-2' Silty SAND with gravel (slag), brown to orange/black	Concrete pad
	S2	75	0.2	8-9-5-5	2-3' Silty SAND, dark gray	
4	S3	90	0.4	5-7-13-6	3-4.5' Sandy CLAY, olive gray, wet at 4' bgs	
	S4	95	0.1	9-15-16-9	4.5-7' SAND, fine-grained, tan, wet	Bentonite chips
8	S5	85	0.1	4-7-7-6	7-10' SAND, fine-grained, light gray, trace clay at 8' bgs	
	S6	80	0.1	2-2-3-7	10-12' Clayey SAND, fine-grained, gray to orange, wet	
12	S7	85	0.0	1-3-3-4	12-16' SAND, fine-grained, tan to orange, wet	
	S8	-	-	4-5-5-4		
16	S9	50	0.1	3-1-1-1	16-18' SAND, gray, wet	
	S10	100	0.0	1-2-3-2	18-22' CLAY, with trace fine sand, dark gray, stiff, moist	
20	S11	55	0.0	2-2-4-8		
	S12	60	0.0	4-6-9-11	22-28' SAND, fine to coarse grained with some fine gravel, tan to orange, wet	#2 sand
24	S13	100	0.0	4-5-8-16		5' screen 23-28' bgs 0.020" slot
	S14	100	0.0	16-17-17-18	Trace fine gravel and 1" Clayey SAND layer at 27' bgs	
28	S15	-	-	1-4-4-4	28-36' CLAY, with trace sand, gray	
	S16	65	0.0	5-4-4-5	2" Gravelly medium grained SAND layer at 31' bgs 3" Clayey SAND medium/coarse grained layer at 33' bgs	
32	S17	70	0.0	4-5-5-6	Trace silt at 35' bgs	
	S18	100	0.0	3-3-4-5		
36	S19	100	0.0	4-3-4-6	36-38' Silty CLAY, dark gray, moist	
	S20	100	0.0	2-2-4-5	38-48' Clayey SILT, very clayey, dark gray, moist	
40	S21	100	0.0	4-3-4-6		
	S22	100	0.0	4-4-4-5		
44	S23	100	0.0	4-6-9-5		
	S24	100	0.0	5-4-4-4		
48	S25	100	0.0	3-4-4-4	48-50' Silty CLAY, dark gray, moist	
					End of Boring	
52						

Well ID: RW24-PZM(I)



Total Borehole Depth: 50' bgs.

APPENDIX G

GROUNDWATER SAMPLING RECORD SHEET

Sheet Number 1 of 1

Job Name: Area A, RWM PDI Job Location: SPT

Job Number: 150298M Phase: PDI Task: GW Sampling

Sample Location: RW-057-PZ Name(s) of Sampler(s): Lisa Perrin, Nick Kurtz

Description of Sample: Water X Soil ____ Other ____

PURGING

Time/Date Started: 1250 / 11-9-15

Air Temperature: 54 ([✓ °F]/°C)

Weather Conditions: Sunny ____ Rain ____ Overcast X Other ____

Depth to Water: 14.74 ft

Total Well Depth: 31.23 ft

Height of Water Column: 16.49 ft

Well Diameter: 1-inch X 4-inch ____ 2-inch ____ 6-inch ____

Well Volume Calculation:

16.49 ft x 0.041 gal/ft = 0.676 gal

Purge Volume = 3 x 0.676 = 2.03 gal

Purging Method: Pump X Bailed ___ Other ___

Gallons Removed: 3.60 gal

Length of Time Purged 26 min

Yield at End of Purging: 0.138 gpm

How was yield measured? Graduated Bucket

Color beige Odor None

Turbidity High

Was well cavitated? Yes ____ No ____

SAMPLING

Time/Date Started: 1321 / 11-9-15

Air Temperature: 54 ([✓ °F]/°C)

Weather Conditions: Sunny ____ Rain ____ Overcast X Other ____

Depth to Water: ____ ft

Sampling Method: Bailer ____ Submersible Pump ____ Peristaltic Pump X Other ____

Number of Bottles Filled: 5

Date Sent To Lab: 11-9-15

Laboratory Name: PACE

Parameters to Analyze: See COC

Chain of Custody Number: ____

Other: ____

FIELD DATA

Time	1302	1306	1311	1316				Remarks:
Volume of water purged	2.25	3.00	3.35	3.60			gal	
pH	4.73	4.42	4.36	4.33			s.u.	
Conductance	2.638	2.591	2.574	2.576			ms/cm	
Temperature	16.13	16.04	16.07	16.08			°C	
DO	1.51	0.43	0.28	0.21			mg/l	
Redox	-22.1	-40.4	-47.4	-49.3			mV	
Turbidity	3117 AU	2644 AU	1958 AU	1559 AU			NTU	
SpC	3175	3126	3104	3106			us/cm	

Pipe Volume:
1" I.D. = 0.041 gal/ft
2" I.D. = 0.163 gal/ft
4" I.D. = 0.653 gal/ft
6" I.D. = 1.47 gal/ft

GROUNDWATER SAMPLING RECORD SHEET

Sheet Number 1 of 1

Job Name: Area A, RWM PDI
Job Location: SPT
Job Number: 150298m
Phase: PDI
Task: GW Sampling
Sample Location: RW-063-PZ
Name(s) of Sampler(s): Lisa Perrin, Nick Kurtz
Description of Sample: Water X Soil ____ Other ____

PURGING

Time/Date Started: 1123 / 11-9-15
Air Temperature: 50 ([✓ °F]/°C)
Weather Conditions: Sunny ____ Rain ____ Overcast X Other ____
Depth to Water: 13.30 ft
Total Well Depth: 37.36 ft
Height of Water Column: 24.06 ft
Well Diameter: 1-inch X 4-inch ____ 2-inch ____ 6-inch ____
Well Volume Calculation:
24.06 ft x 0.041 gal/ft = 0.986 gal
Purge Volume = 3 x 0.986 = 2.958 gal
Purging Method: Pump X Bailed ____ Other ____
Gallons Removed: 4.25 gal
Length of Time Purged 30 min
Yield at End of Purging: 0.142 gpm
How was yield measured? Graduated Bucket
Color milky gray Odor None
Turbidity high
Was well cavitated? Yes ____ No ____

SAMPLING

Time/Date Started: 1158 / 11-9-15
Air Temperature: 50 ([✓ °F]/°C)
Weather Conditions: Sunny ____ Rain ____ Overcast X Other ____
Depth to Water: ____ ft
Sampling Method: Bailer ____
Submersible Pump ____
Peristaltic Pump X
Other ____
Number of Bottles Filled: 6
Date Sent To Lab: ~~Pace~~ 11-9-15
Laboratory Name: PACE
Parameters to Analyze: See COC
Chain of Custody Number: ____
Other: ____

FIELD DATA

Time	1138	1143	1148	1153			
Volume of water purged	3.00	3.60	3.75	4.25			gal
pH	4.90	4.89	4.89	4.90			s.u.
Conductance	2.790	2.768	2.781	2.790			ms/cm
Temperature	14.37	14.40	14.42	14.41			°C
DO	0.16	0.31	0.29	0.18			mg/l
Redox	-30.7	-46.8	-53.6	-59.4			mV
Turbidity	1182 AU	183	696 AU	662 AU			NTU
SpC	3497	3471	3484	3498			us/cm

Remarks: ____

Pipe Volume:
1" I.D. = 0.041 gal/ft
2" I.D. = 0.163 gal/ft
4" I.D. = 0.653 gal/ft
6" I.D. = 1.47 gal/ft

GROUNDWATER SAMPLING RECORD SHEET

Sheet Number 1 of 1

Job Name: Area A, RWM PDI
Job Location: SPT
Job Number: 150298M
Phase: PDI
Task: GW sampling
Sample Location: RW-067-PZ
Name(s) of Sampler(s): Lisa Perrin and Nick Kurtz
Description of Sample: Water X Soil ____ Other ____

PURGING

Time/Date Started: 1024 / 11-9-15
Air Temperature: 45 [✓ °F] °C
Weather Conditions: Sunny ____ Rain ____ Overcast X Other ____
Depth to Water: 14.61 ft
Total Well Depth: 34.01 ft
Height of Water Column: 19.40 ft
Well Diameter: 1-inch X 4-inch ____ 2-inch ____ 6-inch ____
Well Volume Calculation:
19.40 ft x 0.041 gal/ft = 0.795 gal
Purge Volume = 3 x 0.795 = 2.39 gal
Purging Method: Pump X Bailed ____ Other ____
Gallons Removed: 3.75 gal
Length of Time Purged 33 min
Yield at End of Purging: 0.114 gpm
How was yield measured? Graduated Bucket
Color Slightly cloudy yellow Odor None
Turbidity turbid at start
Was well cavitated? Yes ____ No ____

SAMPLING

Time/Date Started: 1102 / 11-9-15
Air Temperature: 45 [✓ °F] °C
Weather Conditions: Sunny ____ Rain ____ Overcast X Other ____
Depth to Water: ____ ft
Sampling Method: Bailer ____ Submersible Pump ____ Peristaltic Pump X Other ____
Number of Bottles Filled: 6
Date Sent To Lab: 11-9-15
Laboratory Name: PACE
Parameters to Analyze: See COC
Chain of Custody Number: ____
Other: ____

FIELD DATA

Time	1042	1047	1052	1057			
Volume of water purged	2.75	3.00	3.50	3.75			gal
pH	4.58	4.51	4.47	4.47			s.u.
Conductance	3.577	3.465	3.497	3.510			ms/cm
Temperature	15.38	15.43	15.38	15.39			°C
DO	0.33	0.28	0.24	0.22			mg/l
Redox	-0.7	-3.4	-6.1	-10.3			mV
Turbidity	92.0	85.6	44.1	35.8			NTU
SpC	4383	4246	4282	4298			us/cm

Remarks: ____

Pipe Volume:
1" I.D. = 0.041 gal/ft
2" I.D. = 0.163 gal/ft
4" I.D. = 0.653 gal/ft
6" I.D. = 1.47 gal/ft

GROUNDWATER SAMPLING RECORD SHEET

Sheet Number 1 of 1

Job Name: Area A, Parcel A3, PDI
Job Location: SPT
Job Number: 150298m
Phase: PDI
Task: GW Sampling
Sample Location: RW-070-PZ
Name(s) of Sampler(s): Lisa Perrotti, Nick Kurtz
Description of Sample: Water X Soil ___ Other ___

PURGING

Time/Date Started: 0915 / 11-9-15
Air Temperature: 34 ([✓ °F]/°C)
Weather Conditions: Sunny ___ Rain ___ Overcast X Other ___
Depth to Water: 10.55 ft
Total Well Depth: 32.50 ft
Height of Water Column: 22.05 ft
Well Diameter: 1-inch X 4-inch ___ 2-inch ___ 6-inch ___
Well Volume Calculation:
22.05 ft x 0.041 gal/ft = 0.904 gal
Purge Volume = 3 x 0.904 = 2.71 gal
Purging Method: Pump X Bailed ___ Other ___
Gallons Removed: 3.75 gal
Length of Time Purged 25 min
Yield at End of Purging: 0.15 gpm
How was yield measured? Graduated Bucket
Color Clear Odor None
Turbidity ___
Was well cavitated? Yes ___ No ___

SAMPLING

Time/Date Started: 0945 / 11-9-15
Air Temperature: 34 ([✓ °F]/°C)
Weather Conditions: Sunny ___ Rain ___ Overcast X Other ___
Depth to Water: ___ ft
Sampling Method: Bailer ___
Submersible Pump ___
Peristaltic Pump X
Other ___
Number of Bottles Filled: 6
Date Sent To Lab: 11-9-15
Laboratory Name: PACE
Parameters to Analyze: See COC
Chain of Custody Number: ___
Other: ___

FIELD DATA

Time	0925	0930	0935	0940			
Volume of water purged	3.0	3.25	3.5	3.75			gal
pH	6.35	5.41	5.19	5.10			s.u.
Conductance			3792	3766			ms/cm
Temperature	14.25	14.32	14.27	14.26			°C
DO	0.85	0.37	0.031	0.041			mg/l
Redox	1.8	-20.4	-26.6	-28.4			mV
Turbidity	6.17	4.00	2.94	2.32			NTU
SpC	3.088	3.047	3.013	2.993			us/cm

Remarks: ___

Pipe Volume:
1" I.D. = 0.041 gal/ft
2" I.D. = 0.163 gal/ft
4" I.D. = 0.653 gal/ft
6" I.D. = 1.47 gal/ft

GROUNDWATER SAMPLING RECORD SHEET

Sheet Number _____ of _____

Job Name: Area A Parcel A3

Job Location: SPT

Job Number: 150298m

Phase: PDI

Task: GW sampling

Sample Location: RW10-PZM020

Name(s) of Sampler(s): Lisa Petrun

Description of Sample: Water X Soil ____ Other ____

PURGING

Time/Date Started: 1203 / 11-12-15

Air Temperature: 61 ([✓ °F]/°C)

Weather Conditions: Sunny ____ Rain ____ Overcast X Other ____

Depth to Water: NA ft

Total Well Depth: NA ft

Height of Water Column: ____ ft

Well Diameter: 1-inch ____ 4-inch X 2-inch ____ 6-inch ____

Well Volume Calculation:

____ ft x ____ gal/ft = ____ gal

Purge Volume = ____ x ____ = ____ gal

Purging Method: Pump X Bailed ___ Other ___

Gallons Removed: 0 gal

Length of Time Purged NA min

Yield at End of Purging: NA gpm

How was yield measured? ____

Color Slightly Cloudy Odor none

Turbidity Low/mod

Was well cavitated? Yes ____ No ____

SAMPLING

Time/Date Started: 1220 / 11-12-15

Air Temperature: 61 ([✓ °F]/°C)

Weather Conditions: Sunny ____ Rain ____ Overcast X Other ____

Depth to Water: ____ ft

Sampling Method: Bailer ____

Submersible Pump ~~X~~

Peristaltic Pump X

Other ____

Number of Bottles Filled: 16

Date Sent To Lab: 11-12-15

Laboratory Name: PACE

Parameters to Analyze: See COC

Chain of Custody Number: ____

Other: ____

FIELD DATA

Time	1203						
Volume of water purged	0						gal
pH ± 0.1	6.74						s.u.
Conductance	3.213						ms/cm
Temperature [illegible]	17.20						°C
DO ~~±0.5~~ ~~10%~~ 0.3	0.82						mg/l
Redox ± 10 mV	-85.3						mV
Turbidity 75, 10%	12.32						NTU
SpC 3%	3777						us/cm

Remarks: Well is from pump test, has already been running

Pipe Volume:

1" I.D. = 0.041 gal/ft

2" I.D. = 0.163 gal/ft

4" I.D. = 0.653 gal/ft

6" I.D. = 1.47 gal/ft

GROUNDWATER SAMPLING RECORD SHEET

Sheet Number 1 of 1

Job Name: Area A Parcel A3
Job Location: SPT
Job Number: 150298M
Phase: PDI
Task: GW sampling
Sample Location: RW19-PZM020
Name(s) of Sampler(s): Lisa Perrin
Description of Sample: Water X Soil ______ Other ______

PURGING

Time/Date Started: 1330 / 11-12-15
Air Temperature: 61 ([✓ °F]/°C)
Weather Conditions: Sunny ______ Rain ______ Overcast X Other ______
Depth to Water: 14.08 ft
Total Well Depth: NA ft
Height of Water Column: NA ft
Well Diameter: 1-inch ______ 4-inch ______ 2-inch X 6-inch ______
Well Volume Calculation:
______ ft x ______ gal/ft = ______ gal
Purge Volume = ______ x ______ = ______ gal
Purging Method: Pump X Bailed ___ Other ___
Gallons Removed: ______ gal
Length of Time Purged ______ min
Yield at End of Purging: ______ gpm
How was yield measured? ______
Color gray Odor none
Turbidity mod
Was well cavitated? Yes ___ No ___

SAMPLING

Time/Date Started: 1355 / 11-12-15
Air Temperature: 61 ([✓ °F]/°C)
Weather Conditions: Sunny ______ Rain ______ Overcast X Other ______
Depth to Water: ______ ft
Sampling Method: Bailer ______
Submersible Pump X
Peristaltic Pump ______
Other ______
Number of Bottles Filled: 16
Date Sent To Lab: 11-12-15
Laboratory Name: PACE
Parameters to Analyze: See COC
Chain of Custody Number: ______
Other: ______

FIELD DATA

Time	1330	1335	1340	1345			
Volume of water purged	0.25	0.50	1.00	1.50			gal
pH ± 0.1	5.84	5.70	5.68	5.65			s.u.
Conductance	8.586	9.777	10.07	10.21			ms/cm
Temperature	16.92	17.20	17.39	17.34			°C
DO 0.3	1.00	0.45	0.43	0.30			mg/l
Redox ± 10 mV	-48.6	-62.8	-66.9	-71.3			mV
Turbidity >5, 10%	67.4	53.4	25.3	12.81			NTU
SpC 3%	9896	11458	11776	11973			us/cm

Remarks: ______

Pipe Volume:
1" I.D. = 0.041 gal/ft
2" I.D. = 0.163 gal/ft
4" I.D. = 0.653 gal/ft
6" I.D. = 1.47 gal/ft

3x purge volume was not completed b/c permanen well

GROUNDWATER SAMPLING RECORD SHEET

Sheet Number 1 of 1

Job Name: Area A Parcel A3
Job Location: SPT
Job Number: 150298m
Phase: PDF
Task: GW sampling
Sample Location: RW02-PZM020
Name(s) of Sampler(s): Lisa Perrin
Description of Sample: Water X Soil ____ Other ____

PURGING

Time/Date Started: 1210 / 11-13-15
Air Temperature: 59 ([✓ °F]/°C)
Weather Conditions: Sunny X Rain ____ Overcast ____ Other ____
Depth to Water: 12.03 ft
Total Well Depth: ____ ft
Height of Water Column: ____ ft
Well Diameter: 1-inch ____ 4-inch ____ 2-inch X 6-inch ____
Well Volume Calculation:
____ ft x ____ gal/ft = ____ gal
Purge Volume = ____ x ____ = ____ gal
Purging Method: Pump X Bailed ____ Other ____
Gallons Removed: 1.75 gal
Length of Time Purged 28 min
Yield at End of Purging: 0.0625 gpm
How was yield measured? [illegible]
Color clear Odor none
Turbidity low
Was well cavitated? Yes ____ No ____

SAMPLING

Time/Date Started: 1240 / 11-13-15
Air Temperature: 59 ([✓ °F]/°C)
Weather Conditions: Sunny X Rain ____ Overcast ____ Other ____
Depth to Water: ____ ft
Sampling Method: Bailer ____
Submersible Pump ____
Peristaltic Pump X
Other ____
Number of Bottles Filled: 16
Date Sent To Lab: 11-13-15
Laboratory Name: PACE
Parameters to Analyze: See COC
Chain of Custody Number: ____
Other: ____

FIELD DATA

Time	1213	1218	1223	1228	1233	1238	
Volume of water purged	0.25	0.50	1.00	1.25	1.50	1.75	gal
pH ± 0.1	4.91	4.49	4.40	4.25	4.19	4.17	s.u.
Conductance	2.822	3.263	3.369	3.292	3.224	3.134	ms/cm
Temperature [illegible]	16.63	16.25	16.37	16.46	16.43	16.45	°C
DO [illegible] , [illegible] 0.3	0.32	0.18	0.18	0.21	0.19	0.17	mg/l
Redox ± 10 mV	-108.8	-102.3	-102.1	-104.1	-104.8	-107.0	mV
Turbidity 75 , 10%	6.60	8.78	3.17	2.29	1.69	1.91	NTU
SpC 3%	3352	3959	4031	3939	3854	3741	us/cm

Remarks: [illegible] 3x
Volume was not calculated b/c permanent well.

Pipe Volume:
1" I.D. = 0.041 gal/ft
2" I.D. = 0.163 gal/ft
4" I.D. = 0.653 gal/ft
6" I.D. = 1.47 gal/ft

GROUNDWATER SAMPLING RECORD SHEET

Sheet Number 1 of 1

Job Name: Area A Parcel A3
Job Location: SPT
Job Number: 150298m Phase: PDI
Task: GW sampling
Sample Location: RW07-PZm017 Name(s) of Sampler(s): Lisa Perrin
Description of Sample: Water X Soil ____ Other ____

PURGING

Time/Date Started: 0941 / 11-13-15
Air Temperature: 55 [✓ °F] °C)
Weather Conditions: Sunny X Rain ____ Overcast ____ Other ____
Depth to Water: 11.91 ft
Total Well Depth: ~~[illegible]~~ ft
Height of Water Column: ____ ft
Well Diameter: 1-inch ____ 4-inch ____ 2-inch X 6-inch ____
Well Volume Calculation:
____ ft x ____ gal/ft = ____ gal
Purge Volume = ____ x ____ = ____ gal
Purging Method: Pump X Bailed ____ Other ____
Gallons Removed: 1.75 gal
Length of Time Purged 28 min
Yield at End of Purging: 0.0625 gpm
How was yield measured? ____
Color ~~tlo~~ clear Odor none
Turbidity low
Was well cavitated? Yes ____ No ____

SAMPLING

Time/Date Started: 1015 / 11-13-15
Air Temperature: 55 [✓ °F] °C)
Weather Conditions: Sunny X Rain ____ Overcast ____ Other ____
Depth to Water: ____ ft
Sampling Method: Bailer ____
Submersible Pump ____
Peristaltic Pump X
Other ____
Number of Bottles Filled: 16
Date Sent To Lab: 11-13-15
Laboratory Name: PACE
Parameters to Analyze: See COC
Chain of Custody Number: ____
Other: ____

FIELD DATA

Time	0944	0949	0954	0959	1004	1009	
Volume of water purged	0.25	0.50	1.00	1.25	1.50	1.75	gal
pH ± 0.1	5.24	4.49	4.30	4.19	4.14	4.10	s.u.
Conductance	2.666	2.641	2.610	2.597	2.592	2.577	ms/cm
Temperature ~~[illegible]~~	17.33	17.30	17.12	17.31	17.43	17.18	°C
DO ~~±0.2~~, ~~10%~~ 0.3	0.50	0.40	0.38	0.31	0.28	0.25	mg/l
Redox ± 10 mV	-38.6	-44.1	-48.6	-56.0	-60.9	-64.1	mV
Turbidity >5, 10%	1.73	1.47	1.82	0.61	0.83	0.68	NTU
SpC 3%	3123	3096	3072	3043	3027	3030	us/cm

Remarks: ____

Pipe Volume:
1" I.D. = 0.041 gal/ft
2" I.D. = 0.163 gal/ft
4" I.D. = 0.653 gal/ft
6" I.D. = 1.47 gal/ft

Low Flow Sampling

ARM Group Inc.
Earth Resource Engineers and Consultants

Project Name: Area A Parcel A3 PDI
Well Number: RW20-PZM020
Well Diameter (in): 4
Total Depth (ft):
Depth to Water (ft) 13.31
Height of Water Column (ft):

Project Number: 150298M
Date: 11-17-15
One Well Volume (gal):
QED Controller Settings:
Flow Rate ~~(mL/min)~~ (gal/min) 0.0530
Length of time Purged (min) 33

WELL PURGING RECORD

Start 0758

Time	Volume Purged (gallons)	Temp (°C)	pH (s.u.)	Specific Conductance (mS/cm)	Dissolved Oxygen (mg/L)	ORP (mV)	Turbidity (NTU)	Comments
0801	0.25	16.67	3.25	2.460	0.50	-33.8	14.3	cloudy
0806	0.50	16.35	2.92	2.414	0.35	-79.9	15.2	no odor
0811	0.75	16.21	2.82	2.374	0.26	-107.7	12.7	
0816	1.00	16.05	2.83	2.346	0.23	-125.1	12.19	
0821	1.25	16.09	2.91	2.329	0.21	-147.9	11.07	
0826	1.50	16.24	3.00	2.326	0.19	158.0	12.02	
0831	1.75	16.30	3.06	2.323	0.18	167.7	10.94	

MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter	Container	Perservative	Y/N
RW20-PZM020	0835	TCL-VOCs	3 - 40 mL VOA	HCL	Y
		TCL-SVOCs	2- 1 L Amber	none	Y
		TAL-Metals	1 - 250 mL Plastic	HNO3 ~~none~~	Y
		Oil and Grease	1-1L HCL		Y
		TPH-DRO	1 - 1 L Amber	none	N
		TPH-GRO	3 - 40 mL VOA	HCL	N
		Hexavalent Chromium	1 - 250 mL Plastic	none	Y
		Cyanide	1 - 250 mL Plastic	NaOH ~~none~~	Y
Matrix Spike present? N			~~2-16~~		
Duplicate assessed? N					

Sampled By: Lisa Perrin Comments: Extra Predesign paramaters taken

Casing Volume: **1" I.D.** = 0.041 gal/ft - **2" I.D.** = 0.163 gal/ft - **4" I.D.** = 0.653 gal/ft - **6" I.D.** = 1.47 gal/ft
______ft x ______gal/ft = ______(gal)

2-1L plastic unpreserved
1-500mL plastic sulfuric acid
2-40mL VOAS sulfuric acid
1-500mL plastic NaOH + Znacetate

TABLE 1
MULTIPARAMETER CALIBRATION LOG

Project Name Parcel A3 Date 11/9/15
Weather Partly Cloudy 50s-60s
Calibrated by N. Kurtz & L. Perrin Instrument YSI Meter
Serial Number NA

Parameters	Morning Calibration	Morning Temperature	End of Day Calibration Check	End of Day Temperature
Specific Conductance Standard #1	1.412	40℉ (est.)	NA[¥]	NA
Specific Conductance Standard #2	NA	NA	NA	NA
pH (7)	6.98	40℉ (est.)	NA[¥]	NA
pH (4)	3.97	40℉ (est.)	NA[¥]	NA
pH(10)	9.96	40℉ (est.)	NA[¥]	NA
ORP Zobel Solution	240.1	40℉ (est.)	NA[¥]	NA
Dissolved Oxygen 100% water saturated air mg/L	13.30	40℉ (est.)	NA[¥]	NA
Dissolved Oxygen Zero Dissolved Oxygen Solution mg/L	NA	40℉ (est.)	NA	NA
Barometric Pressure mm Hg	775.2	NA	NA	NA
Turbidity #1 (10 NTU)	9.24	NA	NA[¥]	NA
Turbidity #2 (0.0 NTU)	0.04	NA	NA[¥]	NA
Turbidity Standard #3	NA	NA	NA	NA

[¥] **The post-calibration check was not performed on this date. Values displayed on field purge logs may be inaccurate.**

TABLE 1
MULTIPARAMETER CALIBRATION LOG

Project Name Parcel A3 Date 11/12/15
Weather Cloudy 50s
Calibrated by N. Kurtz & L. Perrin Instrument YSI Meter
Serial Number NA

Parameters	Morning Calibration	Morning Temperature	End of Day Calibration Check	End of Day Temperature
Specific Conductance Standard #1	1.446	55℉ (est.)	1.078[¥]	60℉ (est.)
Specific Conductance Standard #2	NA	NA	NA	NA
pH (7)	7.00	55℉ (est.)	7.00	60℉ (est.)
pH (4)	4.00	55℉ (est.)	3.87	60℉ (est.)
pH(10)	10.00	55℉ (est.)	10.00	60℉ (est.)
ORP Zobel Solution	240	55℉ (est.)	240	60℉ (est.)
Dissolved Oxygen 100% water saturated air mg/L	99.9%	55℉ (est.)	99.5%	60℉ (est.)
Dissolved Oxygen Zero Dissolved Oxygen Solution mg/L	NA	55℉ (est.)	NA	60℉ (est.)
Barometric Pressure mm Hg	NA	NA	NA	NA
Turbidity #1 (10 NTU)	NA	NA	NA	NA
Turbidity #2 (0.0 NTU)	NA	NA	NA	NA
Turbidity Standard #3	NA	NA	NA	NA

[¥] **Specific conductance is outside of the post-calibration acceptance criteria. Values displayed on field purge logs may be biased low.**

TABLE 1
MULTIPARAMETER CALIBRATION LOG

Project Name Parcel A3 Date 11/13/15
Weather Sunny 60s
Calibrated by N. Kurtz & L. Perrin Instrument YSI Meter
Serial Number NA

Parameters	Morning Calibration	Morning Temperature	End of Day Calibration Check	End of Day Temperature
Specific Conductance Standard #1	1.410	55℉ (est.)	1.186[¥]	57℉ (est.)
Specific Conductance Standard #2	NA	NA	NA	NA
pH (7)	7.00	55℉ (est.)	NA[¥]	57℉ (est.)
pH (4)	3.87	55℉ (est.)	NA[¥]	57℉ (est.)
pH(10)	10.00	55℉ (est.)	9.87	57℉ (est.)
ORP Zobel Solution	240.0	55℉ (est.)	NA[¥]	57℉ (est.)
Dissolved Oxygen 100% water saturated air mg/L	99.5%	55℉ (est.)	NA[¥]	57℉ (est.)
Dissolved Oxygen Zero Dissolved Oxygen Solution mg/L	NA	55℉ (est.)	NA	57℉ (est.)
Barometric Pressure mm Hg	NA	NA	NA	NA
Turbidity #1 (10 NTU)	NA	NA	NA	NA
Turbidity #2 (0.0 NTU)	NA	NA	NA	NA
Turbidity Standard #3	NA	NA	NA	NA

[¥] Specific conductance is outside of the post-calibration acceptance criteria. Post-calibration checks were not performed for DO, ORP, or pH (4 & 7). Values displayed on field purge logs may be inaccurate.

TABLE 1
MULTIPARAMETER CALIBRATION LOG

Project Name Parcel A3 Date 11/17/15
Weather Sunny 40s
Calibrated by N. Kurtz & L. Perrin Instrument YSI Meter
Serial Number NA

Parameters	Morning Calibration	Morning Temperature	End of Day Calibration Check	End of Day Temperature
Specific Conductance Standard #1	0.985[¥]	52℉ (est.)	1.005[¥]	55℉ (est.)
Specific Conductance Standard #2	NA	NA	NA	NA
pH (7)	6.99	52℉ (est.)	5.27[¥]	55℉ (est.)
pH (4)	3.58	52℉ (est.)	-0.67[¥]	55℉ (est.)
pH(10)	10.08	52℉ (est.)	10.17	55℉ (est.)
ORP Zobel Solution	240.0	52℉ (est.)	235.4	55℉ (est.)
Dissolved Oxygen 100% water saturated air mg/L	99.9%	52℉ (est.)	100.8%	55℉ (est.)
Dissolved Oxygen Zero Dissolved Oxygen Solution mg/L	NA	52℉ (est.)	NA	55℉ (est.)
Barometric Pressure mm Hg	NA	NA	NA	NA
Turbidity #1 (10 NTU)	NA	NA	NA	NA
Turbidity #2 (0.0 NTU)	NA	NA	NA	NA
Turbidity Standard #3	NA	NA	NA	NA

[¥] Specific conductance and pH < 10 are outside of the post-calibration acceptance criteria. Values displayed on field purge logs may be biased low.

APPENDIX H

Parcel A3 - IDW Drum Log
Pre-Design Investigation

Drum ID	Designation	Activity/Phase	Contents	Open Date
5-N. Acid-9/15/15-A	Non-haz.	Area A	Nitric Acid	9/15/2015
6-Hexane-9/15/15-A	Hazardous	Area A	Hexane	9/15/2015
18-Liners-9/29/15-A3 (RWM)	Non-haz.	Parcel A3	Liners	9/29/2015
19-Decon Water-9/29/15-A3 (RWM)	Non-haz.	Parcel A3	Decon water	9/29/2015
20-PPE-9/30/15-A3 (RWM)	Non-haz.	Parcel A3	PPE	9/30/2015
21-Soil-10/8/15-A3 (RWM)	Non-haz.	Parcel A3	Soil	10/8/2015
22-Liners-10/8/15-A3 (RWM)	Non-haz.	Parcel A3	Liners	10/8/2015
29-Soil-10/1/15-A3 (RWM)	Non-haz.	Parcel A3	Soil	10/1/2015
RW-24-PZM(I) Soil	Non-haz.	Parcel A3	Soil	10/15/2015
31 RW 24-PZM(I) Soil	Non-haz.	Parcel A3	Soil	10/15/2015
32 RW 24-PZM(I) Soil	Non-haz.	Parcel A3	Soil	10/15/2015
33 RW 23-PZM(I) Soil	Non-haz.	Parcel A3	Soil	10/16/2015
34 RW 23-PZM(I) Soil	Non-haz.	Parcel A3	Soil	10/16/2015
RW22-PZM(I) Soil	Non-haz.	Parcel A3	Soil	10/21/2015
RW22-PZM(I) Soil	Non-haz.	Parcel A3	Soil	10/20/2015
RW-01-GB	Non-haz.	Parcel A3	Soil	10/22/2015
RW-01-GB	Non-haz.	Parcel A3	Soil	10/22/2015
RW-(22,23,24) PZM(I)	Non-haz.	Parcel A3	Purge water	10/22/2015
RW-02-GB	Non-haz.	Parcel A3	Soil	10/23/2015
RW-02-GB	Non-haz.	Parcel A3	Soil	10/23/2015
RW-03-GB	Non-haz.	Parcel A3	Soil	10/27/2015
RW-03-GB	Non-haz.	Parcel A3	Soil	10/27/2015
RW-03-GB	Non-haz.	Parcel A3	Soil	10/27/2015
RW-04-GB	Non-haz.	Parcel A3	Soil	10/29/2015

Drum ID	Designation	Activity/Phase	Contents	Open Date
RW-04-GB	Non-haz.	Parcel A3	Soil	10/29/2015
RW-04-GB	Non-haz.	Parcel A3	Soil	10/29/2015
61-Purge Water-11/4/15-A3	Hazardous	Parcel A3	Purge water	11/4/2015
66-DW-10/29/15-A	Non-haz.	Parcel A3	IDW Decon	10/29/2015
67-DW-10/29/15-A	Non-haz.	Parcel A3	IDW Decon	10/29/2015
68-DW-10/29/15-A	Non-haz.	Parcel A3	IDW Decon	10/29/2015
78-Purge water-11/16/15-A3	Non-haz.	Parcel A3	Purge water	11/16/2015
91-PPE-11/11/15-A3	Non-haz.	Parcel A3	PPE	11/11/2015
93-Dec Water-11/11/15-A3	Non-haz.	Parcel A3	Decon water	11/11/2015

APPENDIX I

(Electronic Attachment)

APPENDIX J

(Electronic Attachment)

APPENDIX K

(Electronic Attachment)

APPENDIX L

(Electronic Attachment)

APPENDIX M

Table M-1
EnviroAnalytics Group - Area A Parcel A3
ARM Project No: 150298-13-3
Aquifer Testing - Slug Tests

Well Name:	Field ID:	Zone	Total Depth (ft bgs)	Screened Interval (ft bgs)	Screen length (ft)	Well Casing Diameter (in)	Borehole Diameter (in)	Recovery In Screen Interval?	Conductivity (K)				
									Falling Head (ft/sec)	Falling Head (ft/day)	Rising Head (ft/sec)	Rising Head (ft/day)	Average K (ft/day)
RW01-PZM020	RW-1	Intermediate	29.51	24.51-29.51	5	2	10.25	No	4.86E-05	4.20	6.97E-05	6.02	5.11
RW02-PZM000	RW-2S	Shallow	9.75	4.75-9.75	5	2	10.25	No	7.06E-05	6.10	4.19E-05	3.62	4.86
RW02-PZM020	RW-2D	Intermediate	29.93	24.93-29.93	5	2	10.25	No	3.63E-04	31.38	3.23E-04	27.89	29.64
RW03-PZM003	RW-3	Shallow	13.87	8.87-13.87	5	2	10.25	No	3.22E-06	0.28	1.11E-06	0.10	0.19
RW04-PZM003	RW-4	Shallow	13.98	8.98-13.98	5	2	10.25	No	6.56E-06	0.57	5.21E-06	0.45	0.51
RW05-PZP001	RW-5	Shallow	9.67	4.67-9.67	5	2	10.25	No	4.12E-05	3.56	4.14E-05	3.58	3.57
RW06-PZM001	RW-6	Shallow	8.32	3.32-8.32	5	2	10.25	No	1.38E-04	11.91	1.13E-04	9.78	10.84
RW07-PZM004	RW-7S	Shallow	13.66	3.66-13.66	10	2	10.25	YES	2.98E-05	2.58	1.61E-05	1.39	1.99
RW07-PZM017	RW-7D	Intermediate	29.87	24.87-29.87	5	2	10.25	No	2.65E-04	22.90	2.90E-04	25.03	23.97
RW08-PZM003	RW-8	Shallow	14.28	9.28-14.28	5	2	10.25	No	1.55E-07	0.01	1.53E-07	0.01	0.01
RW09-PZM004	RW-9	Shallow	12.29	2.29-12.29	10	2	10.25	YES	1.73E-04	14.96	1.53E-04	13.18	14.07
RW10-PZM004	RW-10S	Shallow	13.84	3.84-13.84	10	2	10.25	No	2.86E-05	2.47	1.96E-05	1.69	2.08
RW10-PZM020	RW-10I	Intermediate	30.57	20.57-30.57	10	4	10.25	NA	*Cooper- Jacob Straight Line Method*				12.1
RW10-PZM065	RW-10D	Deep	74.97	69.97-74.97	5	2	10.25	No	1.50E-04	12.97	1.66E-04	14.37	13.67
RW11-PZM004	RW-11	Shallow	13.72	3.75-13.72	10	2	10.25	YES	9.61E-05	8.30	6.44E-05	5.57	6.93
RW12-PZM004	RW-12	Shallow	13.57	3.57-13.57	10	2	10.25	YES	9.04E-05	7.81	5.52E-05	4.77	6.29
RW13-PZM020	RW-13	Intermediate	30.05	25.05-30.05	5	2	10.25	No	3.63E-04	31.33	3.10E-04	26.76	29.05
RW14-PZM020	RW-14	Intermediate	29.58	24.58-29.58	5	2	10.25	No	2.50E-04	21.57	1.78E-04	15.34	18.45
RW15-PZM020	RW-15	Intermediate	29.21	19.21-29.21	10	4	10.25	NA	*Cooper- Jacob Straight Line Method*				7.11
RW16-PZM020	RW-16	Intermediate	29.64	24.64-29.64	5	2	10.25	No	1.91E-04	16.49	1.42E-04	12.25	14.37
RW17-PZM019	RW-17	Intermediate	29.65	24.65-29.65	5	2	10.25	No	4.38E-04	37.84	-		37.84
RW18-PZM047	RW-18D	Deep	60.55	55.55-60.55	5	2	10.25	No	3.40E-08	0.003	1.97E-07	0.017	0.003
RW19-PZM020	RW-19I	Shallow	29.21	24.21-29.21	5	4	10.25	No	9.10E-04	78.64	7.66E-04	66.17	72.41
RW19-PZM050	RW-19D	Deep	59.33	54.33-59.33	5	2	10.25	No	5.49E-07	0.05	1.84E-07	0.02	0.05
RW19-PZP003	RW-19S	Shallow	9.56	4.56-9.56	5	2	10.25	YES	5.03E-04	43.49	5.29E-04	45.73	44.61
RW20-PZP000	RW-20S	Shallow	10.62	5.62-10.62	5	2	10.25	YES	5.46E-05	4.71	3.35E-05	2.90	3.81
RW20-PZM020	RW-20I	Intermediate	32.86	22.86-32.86	10	2	10.25	No	1.31E-06	0.11	2.63E-06	0.23	0.17
RW20-PZM050	RW-20D	Deep	57.85	52.85-57.85	5	2	10.25	No	5.80E-06	0.50	1.35E-06	0.12	0.31
RW21-PZM023	RW-21	Intermediate	33.18	28.18-33.18	5	2	10.25	No	2.73E-05	2.36	1.02E-04	8.81	5.59
RW-22(I)	RW-22(I)	Intermediate	34.00	29.00-34.00	5	2	8.25	No	1.62E-04	14.04	2.6E-04	22.18	18.11
RW-22-PZM	RW-22-PZM	Shallow	19.50	9.50-19.50	10	2	8.25	NA	*Not tested - LNAPL in well*				
RW-23(I)	RW-23(I)	Intermediate	36.00	26.00-36.00	10	2	8.25	No	1.93E-04	16.64	1.27E-04	10.94	13.79
RW23-PZM	RW23-PZM	Shallow	20.00	10.00-20.00	10	2	8.25	No	5.53E-05	4.78	5.59E-05	4.83	4.80
RW-24(I)	RW-24(I)	Intermediate	28.00	23.00-28.00	5	2	8.25	No	1.53E-04	13.22	1.26E-04	10.93	12.08
RW24-PZM	RW24-PZM	Shallow	20.00	10.00-20.00	10	2	8.25	No	1.28E-05	1.11	1.41E-05	1.22	1.16
RW-RW89	RW-RW89	Shallow	14.40	9.40-14.40	5	2	10.25	No	1.46E-06	0.13	1.90E-06	0.16	0.15
RW-RW90	RW-RW90	Shallow	13.80	8.80-13.80	5	2	10.25	No	1.28E-06	0.11	5.24E-06	0.45	0.28
RW-RW93	RW-RW93	Shallow	9.43	4.43-9.43	5	2	10.25	No	1.28E-05	1.10	1.78E-05	1.54	1.32
RW-RW95	RW-RW95	Shallow	9.95	4.95-9.95	5	2	10.25	No	3.03E-05	2.62	3.67E-05	3.17	2.89
RW-RW97	RW-RW97	Shallow	14.67	9.67-14.67	5	2	10.25	No	1.09E-07	0.01	5.56E-07	0.05	0.03
TS04-PDM004	TS-04	Shallow	15.31	5.31-15.31	10	2	10.25	YES	2.79E-06	0.24	8.39E-06	0.73	0.48

"*" Cooper-Jacob Straight Line Method from pumping tests data used to calculate K

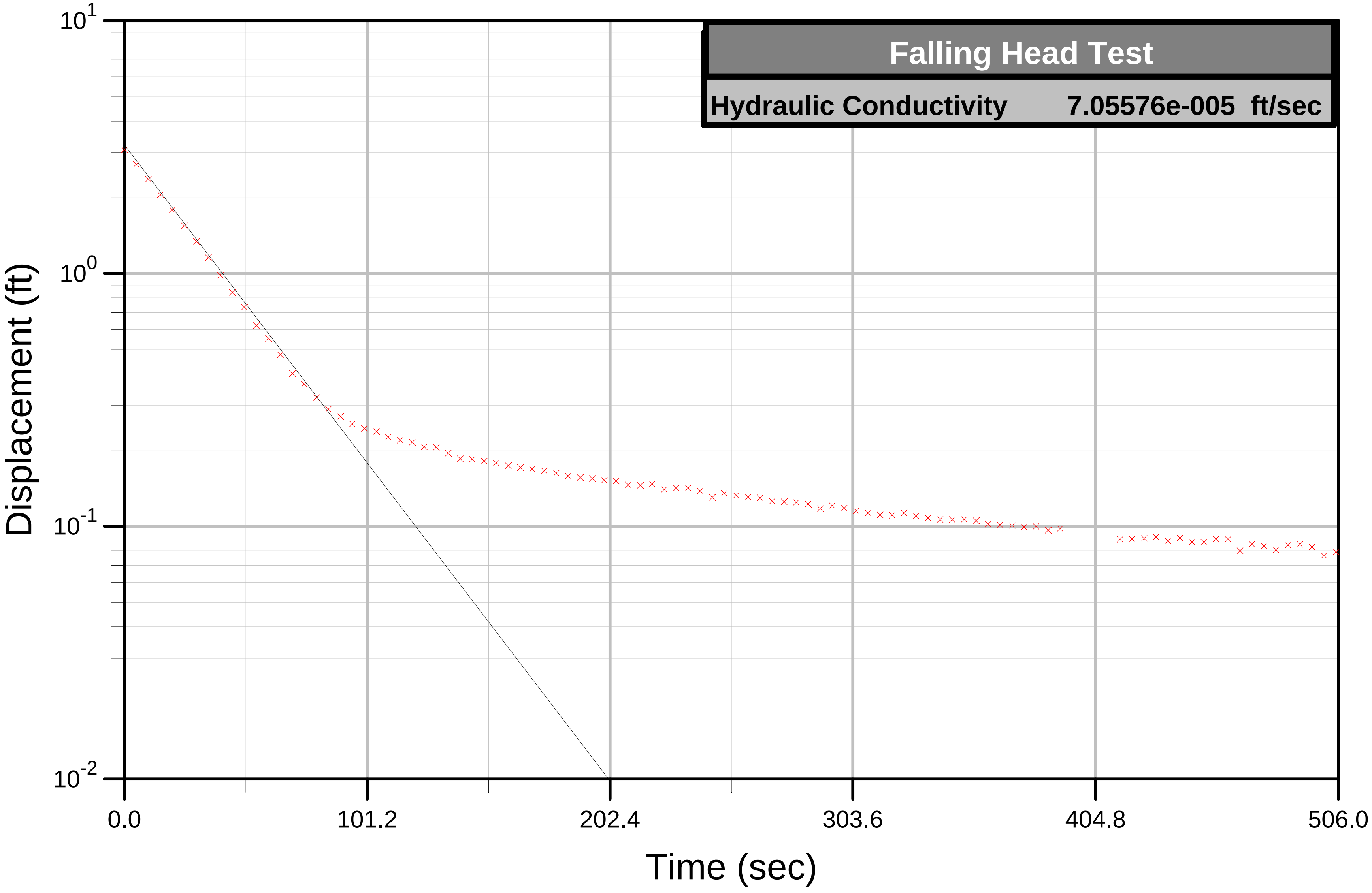
"-" data unusable - test proceeded too rapidly/turbulent

10.25" borehole diameter assumed - no well construction information available

NA - not applicable

SHALLOW MONITORING WELLS

RW02-PZM000


Falling Head Test
Hydraulic Conductivity 7.05576e-005 ft/sec
Displacement (ft)
10^1
10^0
10^{-1}
10^{-2}
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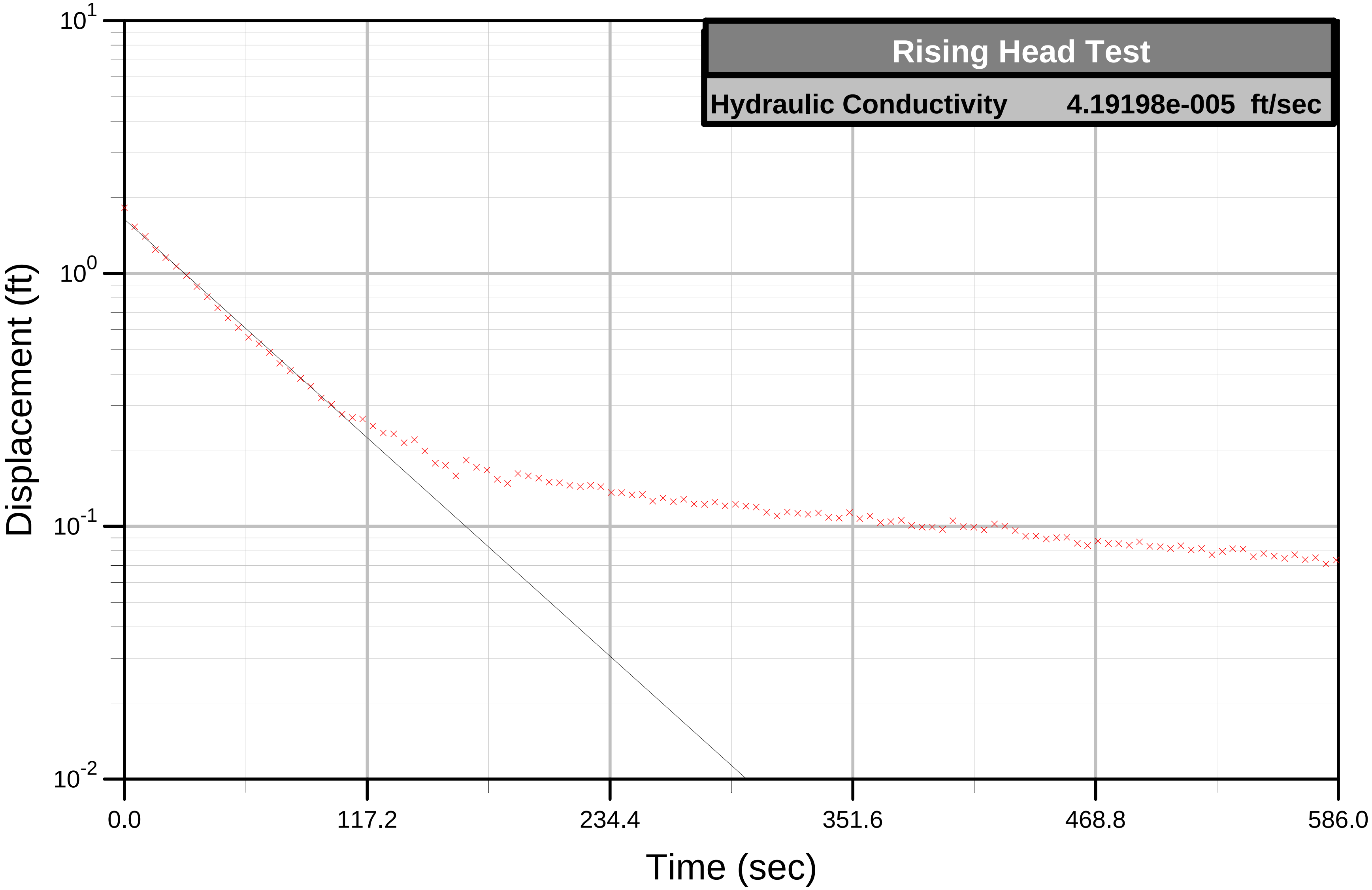
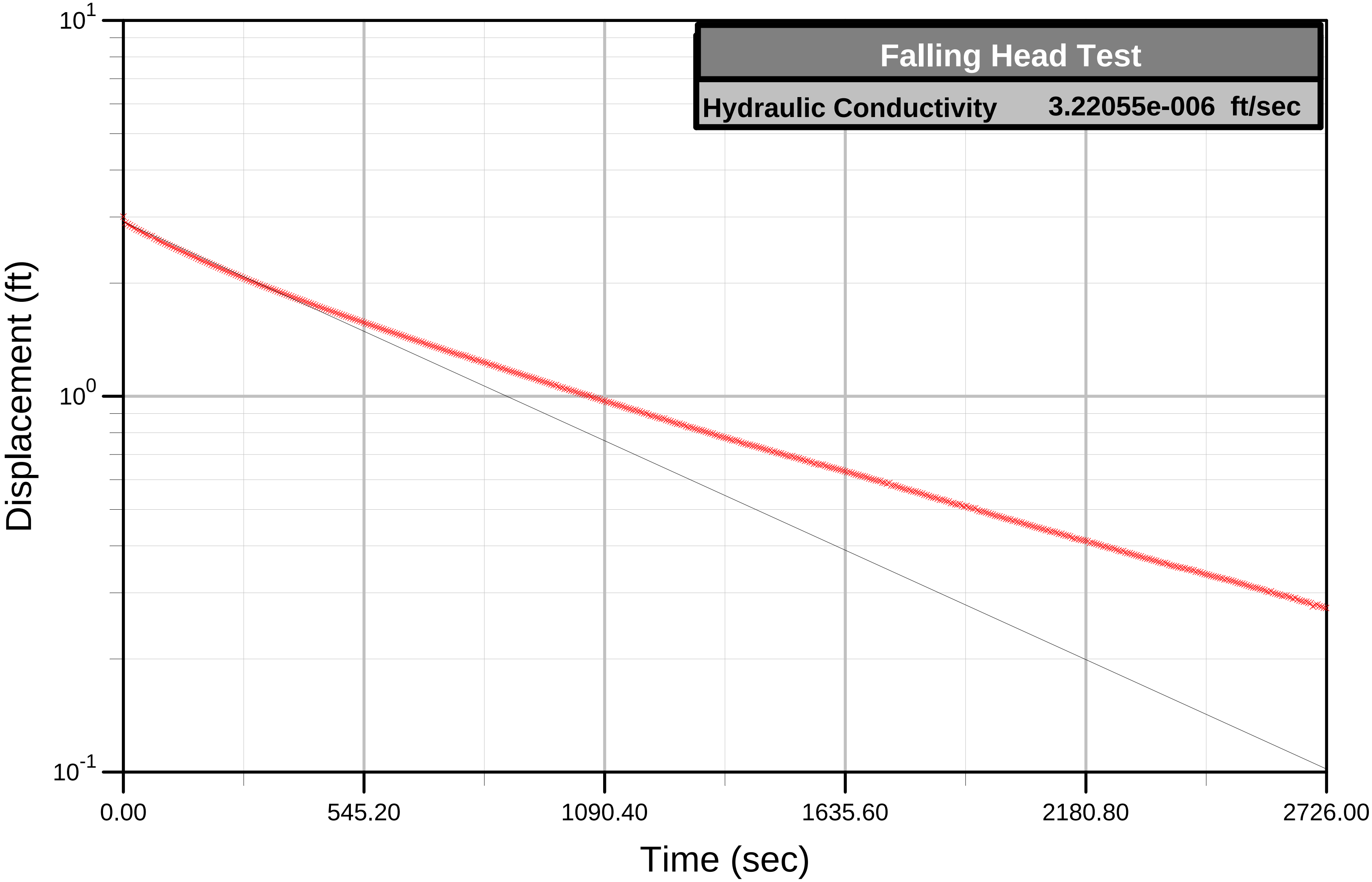
101.2
202.4
303.6
404.8
506.0
Time (sec)

RW02-PZM000


Rising Head Test
Hydraulic Conductivity 4.19198e-005 ft/sec
Displacement (ft)
10^{1}
10^{0}
10^{-1}
10^{-2}
0.0
117.2
234.4
351.6
468.8
586.0
Time (sec)

RW03-PZM003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Hydraulic Conductivity 3.22055e-006 ft/sec
Displacement (ft)
10^1
10^0
10^-1
Time (sec)
0.00
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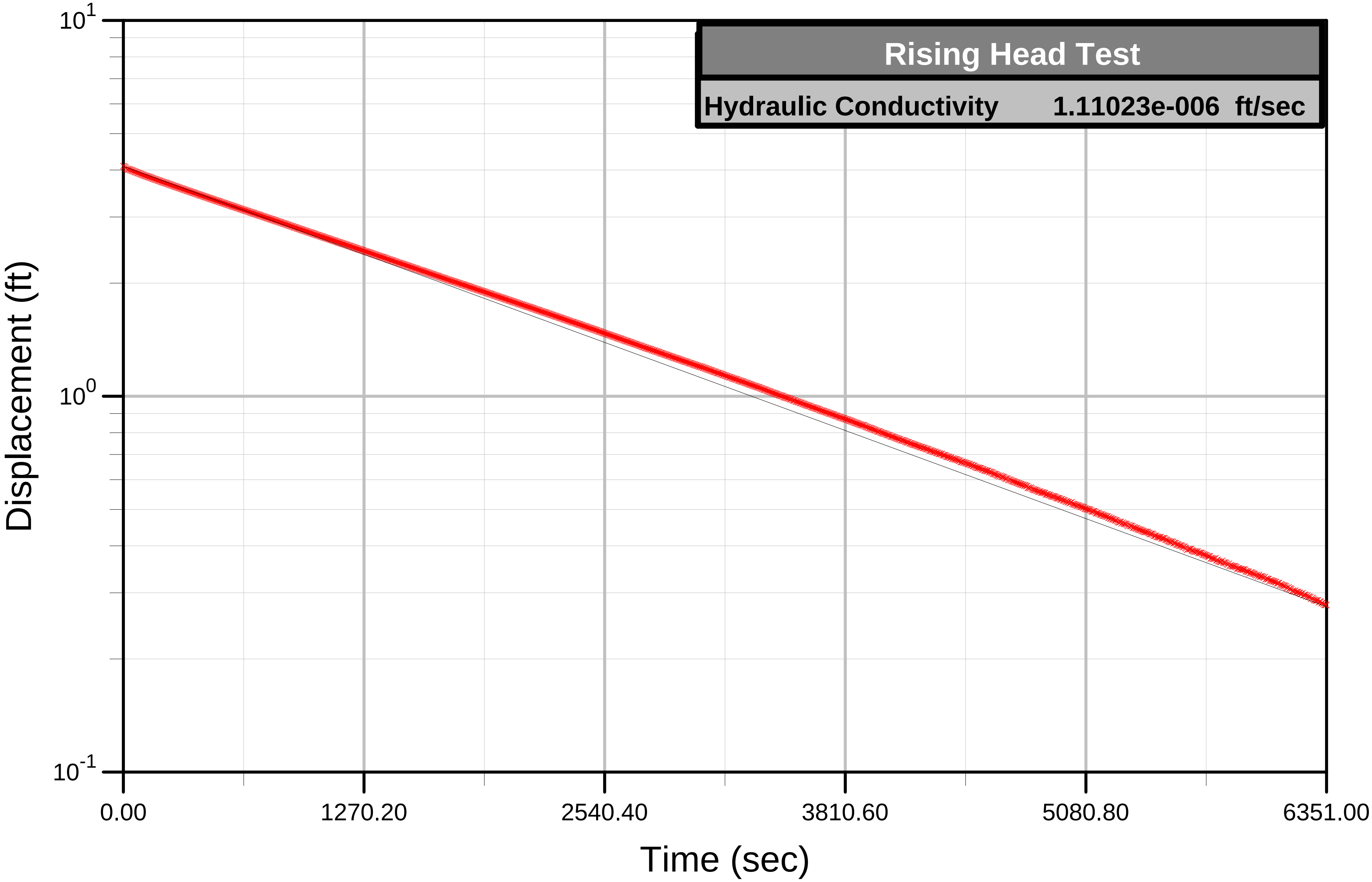
1090.40
1635.60
2180.80
2726.00

RW03-PZM003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Hydraulic Conductivity 1.11023e-006 ft/sec
10^1
10^0
10^{-1}
Displacement (ft)
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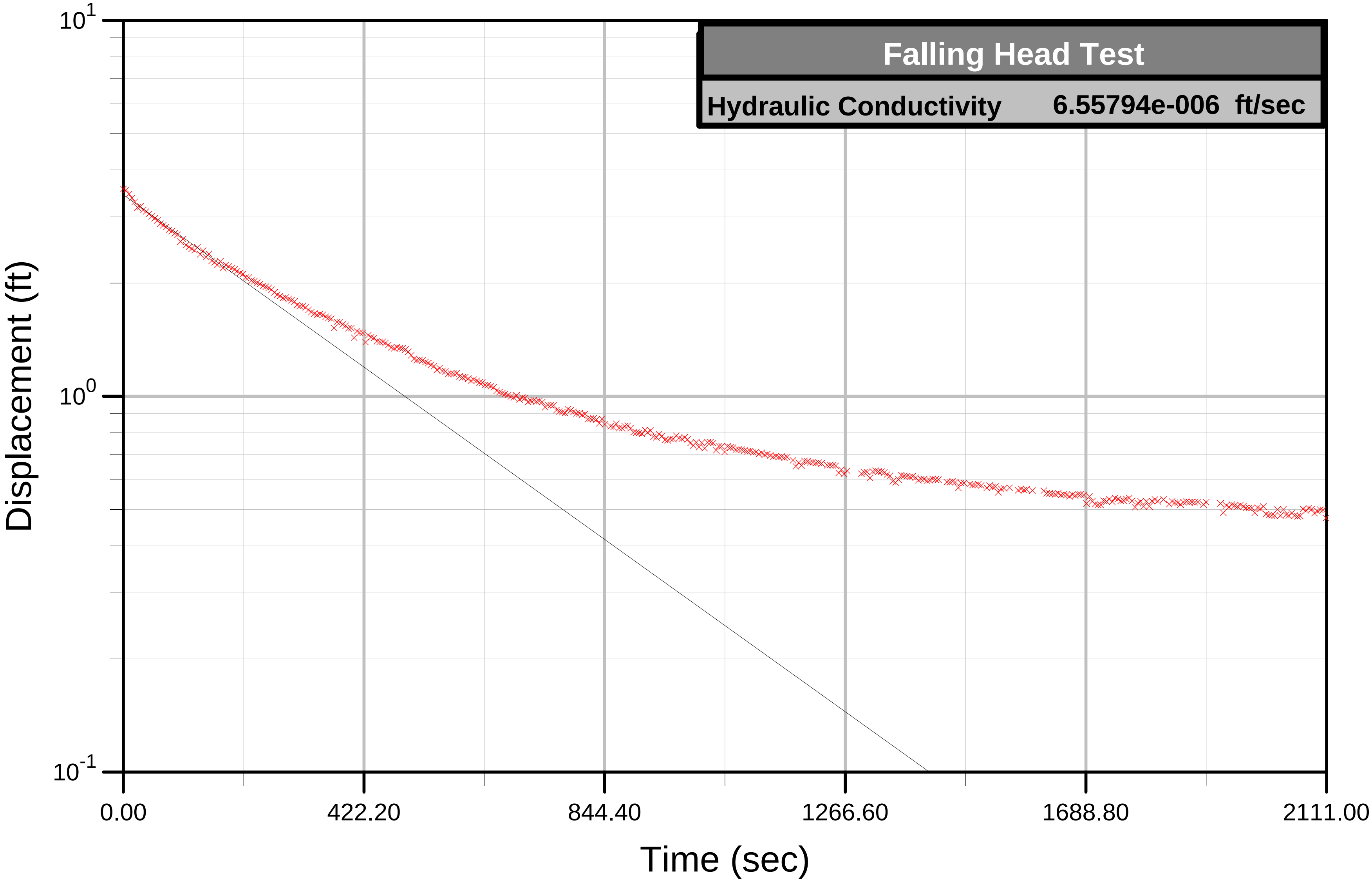
2540.40
3810.60
5080.80
6351.00
Time (sec)

RW04-PZM003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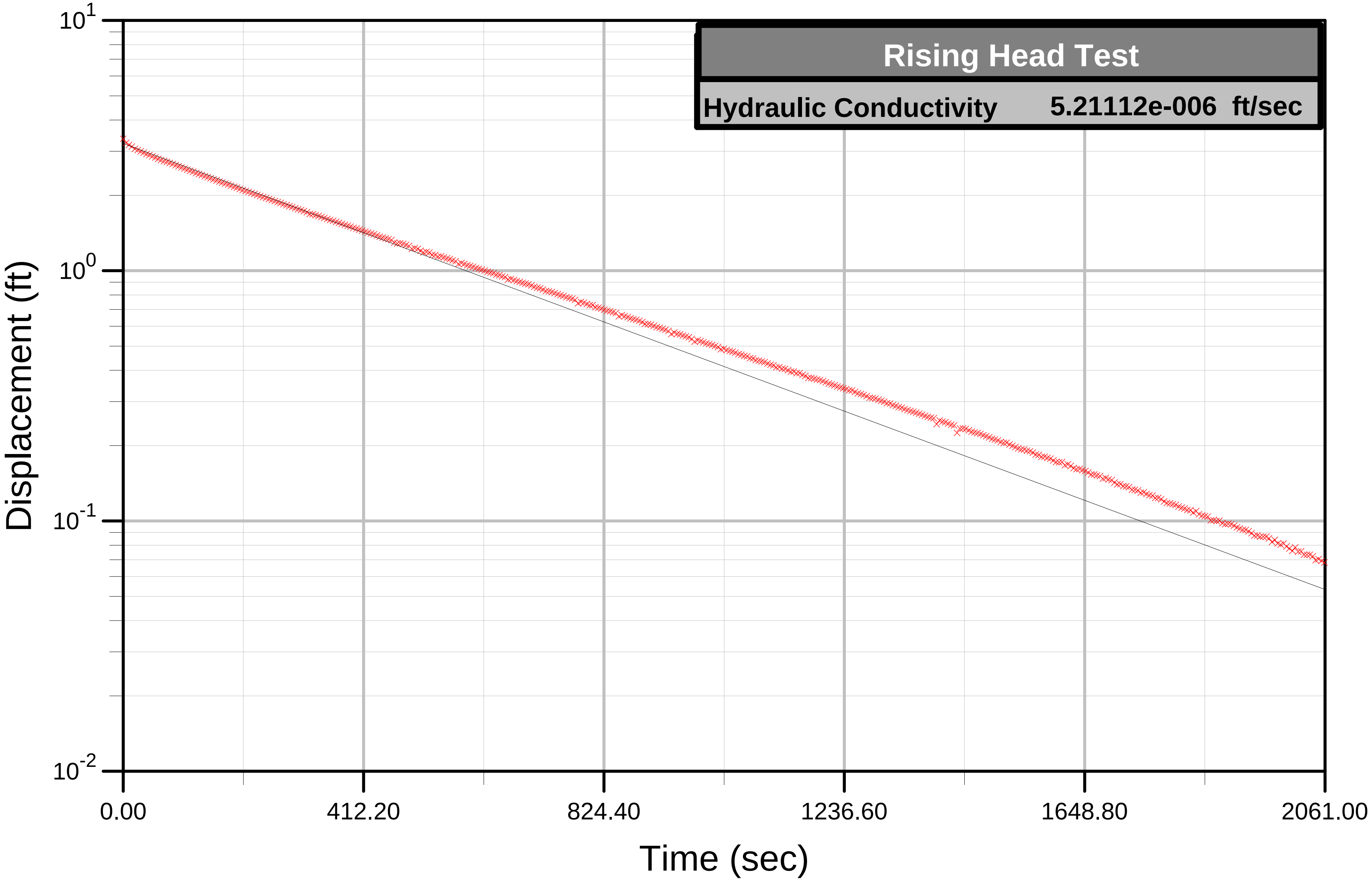
Hydraulic Conductivity 6.55794e-006 ft/sec
10^{1}
10^{0}
10^{-1}
Displacement (ft)
0.00
422.20
844.40
1266.60
1688.80
2111.00
Time (sec)

RW04-PZM003


Rising Head Test
Hydraulic Conductivity 5.21112e-006 ft/sec
Displacement (ft)
10^1
10^0
10^-1
10^-2
Time (sec)
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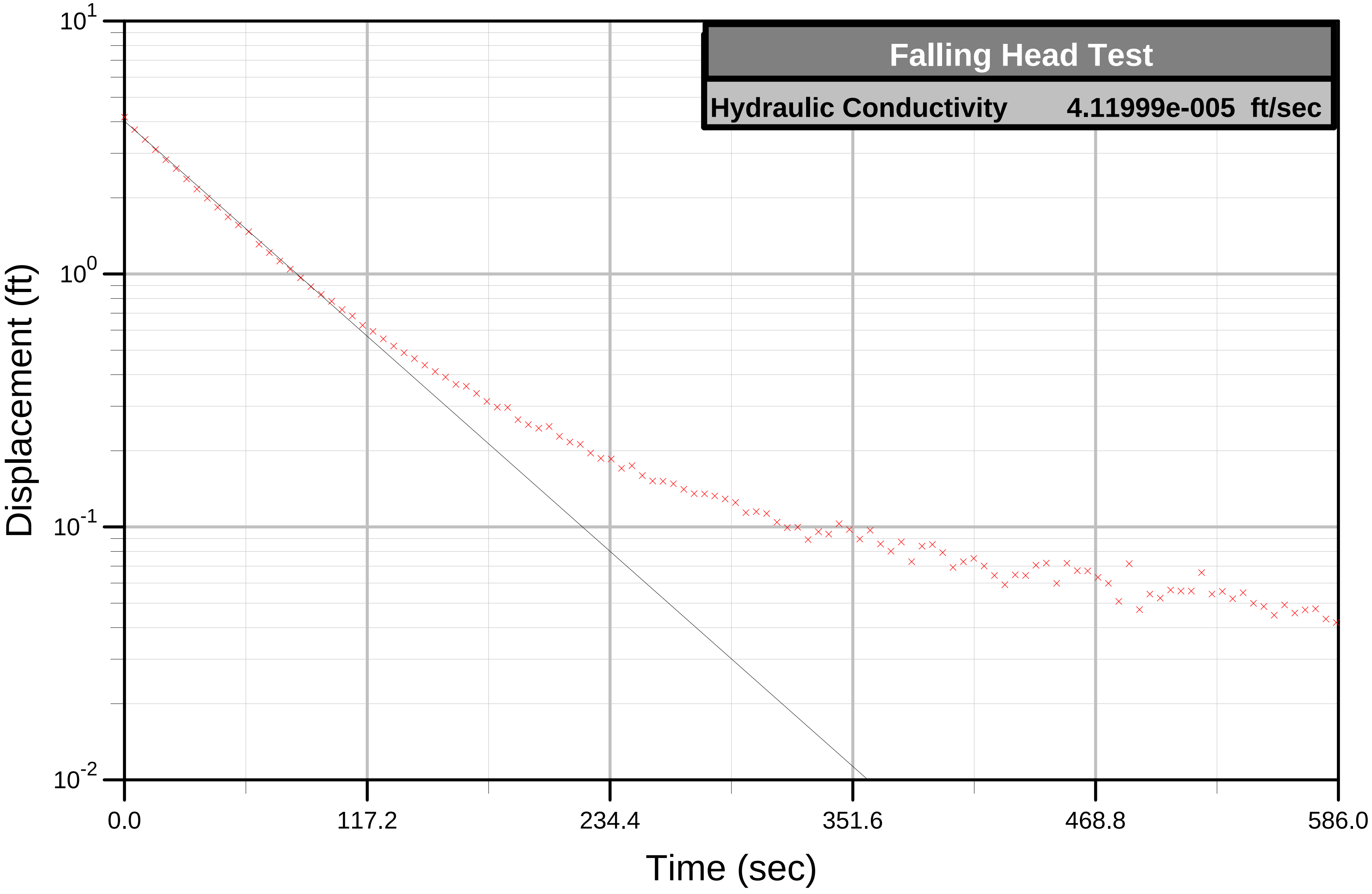
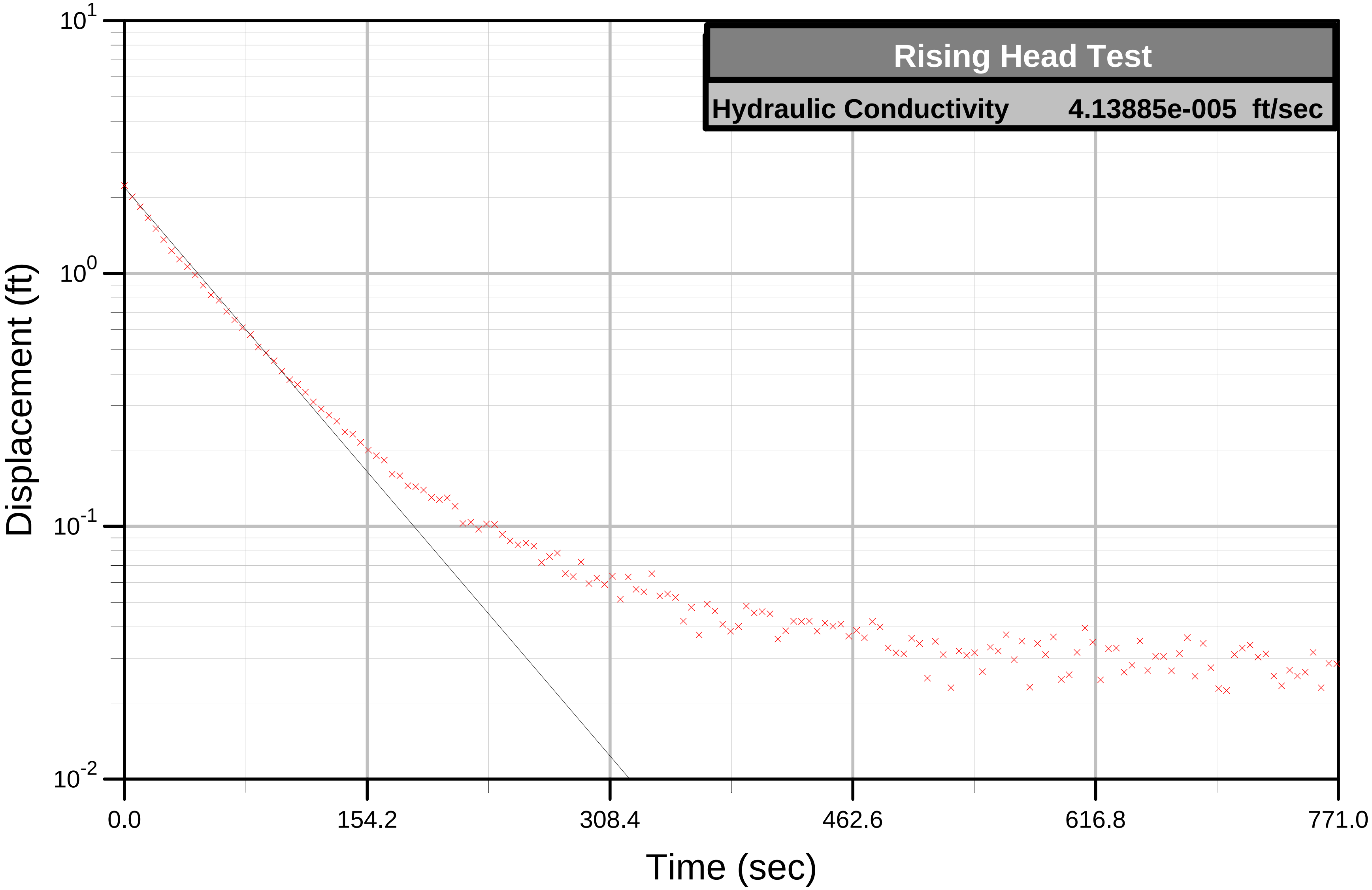
824.40
1236.60
1648.80
2061.00

RW05-PZP001

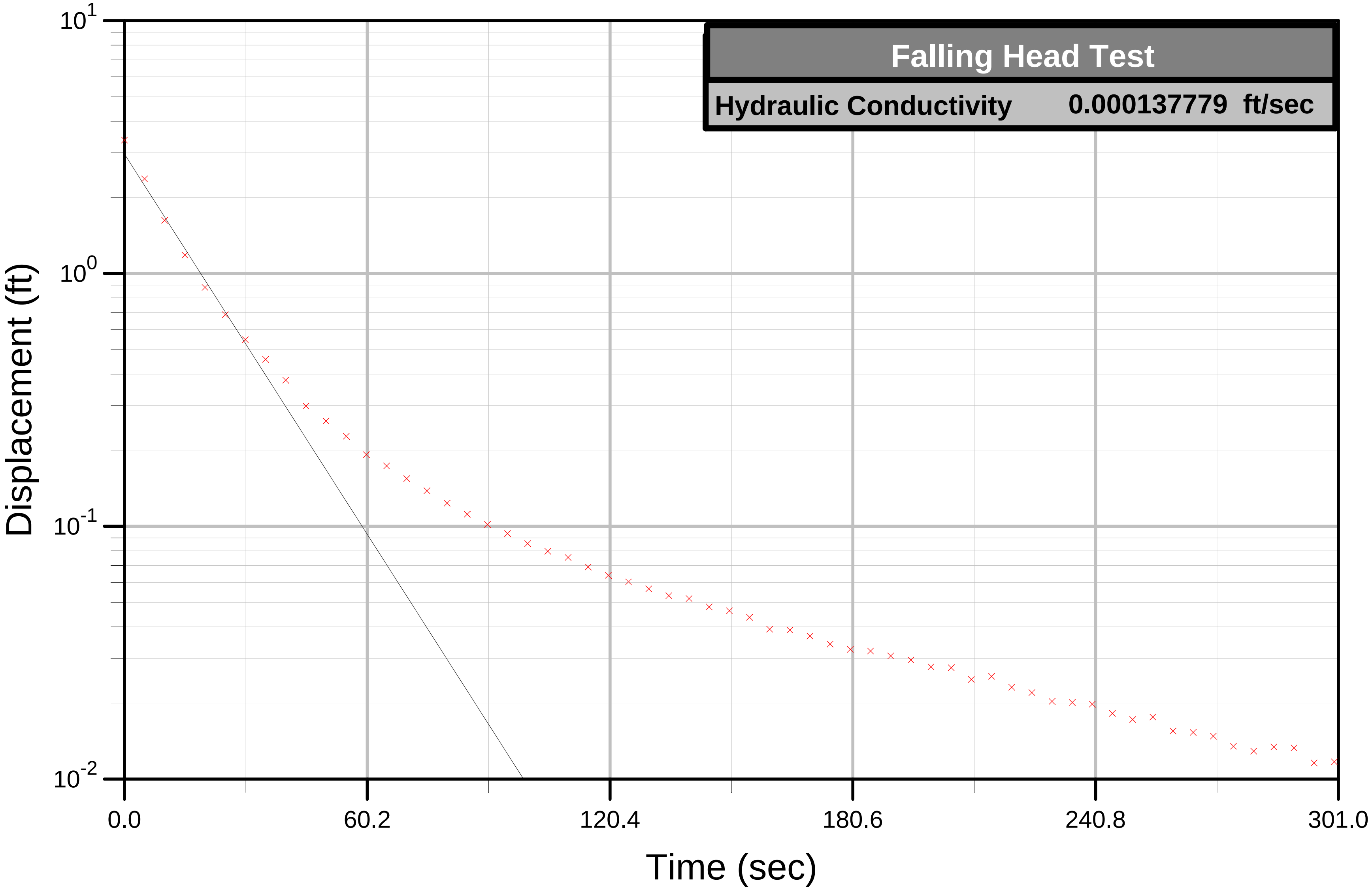


Falling Head Test
Hydraulic Conductivity 4.11999e-005 ft/sec
Displacement (ft)
10^1
10^0
10^{-1}
10^{-2}
0.0
117.2
234.4
351.6
468.8
586.0
Time (sec)

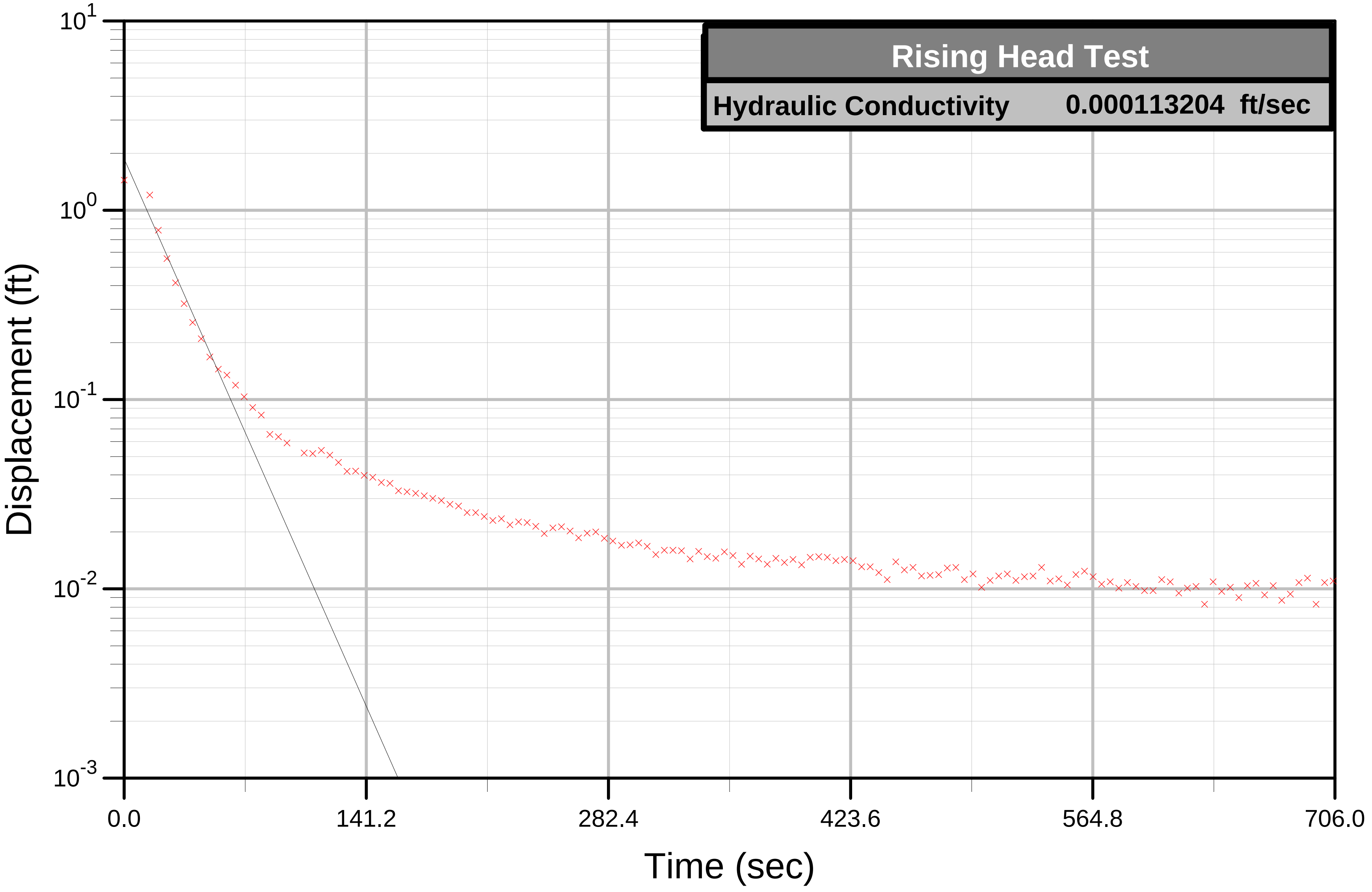
RW05-PZP001


Rising Head Test
Hydraulic Conductivity 4.13885e-005 ft/sec
Displacement (ft)
10^{1}
10^{0}
10^{-1}
10^{-2}
0.0
154.2
308.4
462.6
616.8
771.0
Time (sec)

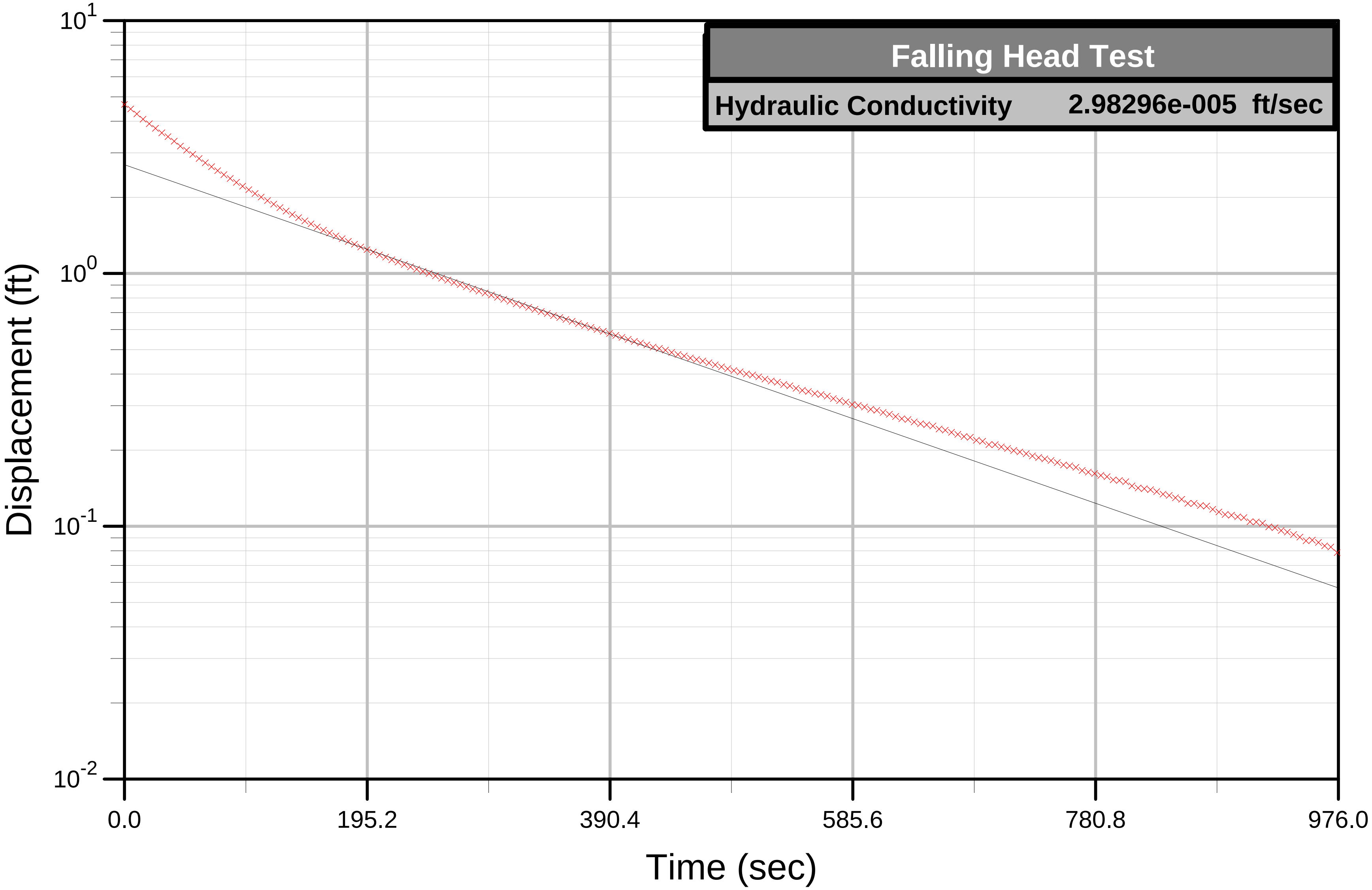
RW06-PZM001


Falling Head Test
Hydraulic Conductivity 0.000137779 ft/sec
Displacement (ft)
10^{1}
10^{0}
10^{-1}
10^{-2}
0.0
60.2
120.4
180.6
240.8
301.0
Time (sec)

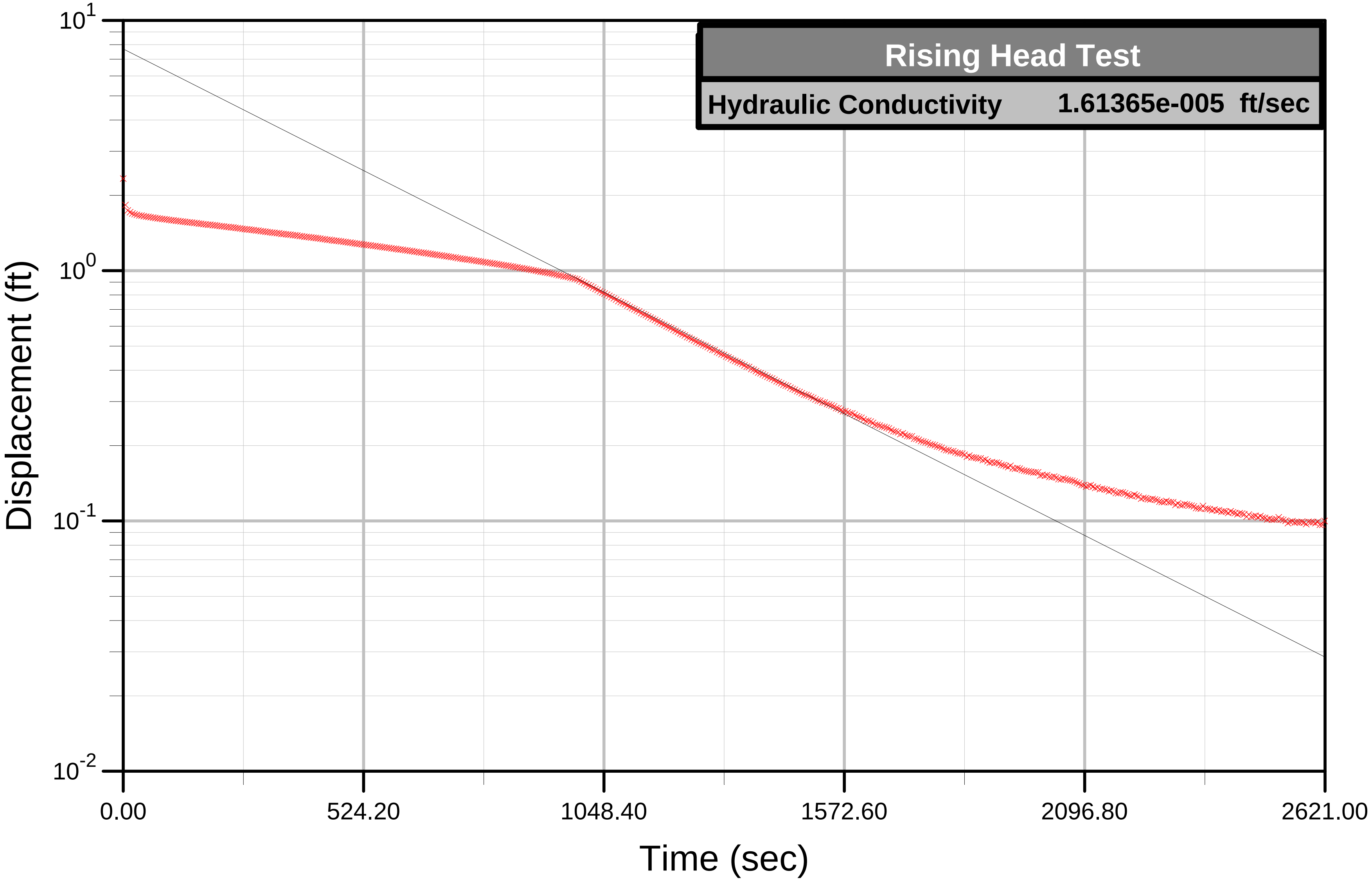
RW06-PZM001


Rising Head Test
Hydraulic Conductivity 0.000113204 ft/sec
Displacement (ft)
10^1
10^0
10^{-1}
10^{-2}
10^{-3}
Time (sec)
0.0
141.2
282.4
423.6
564.8
706.0

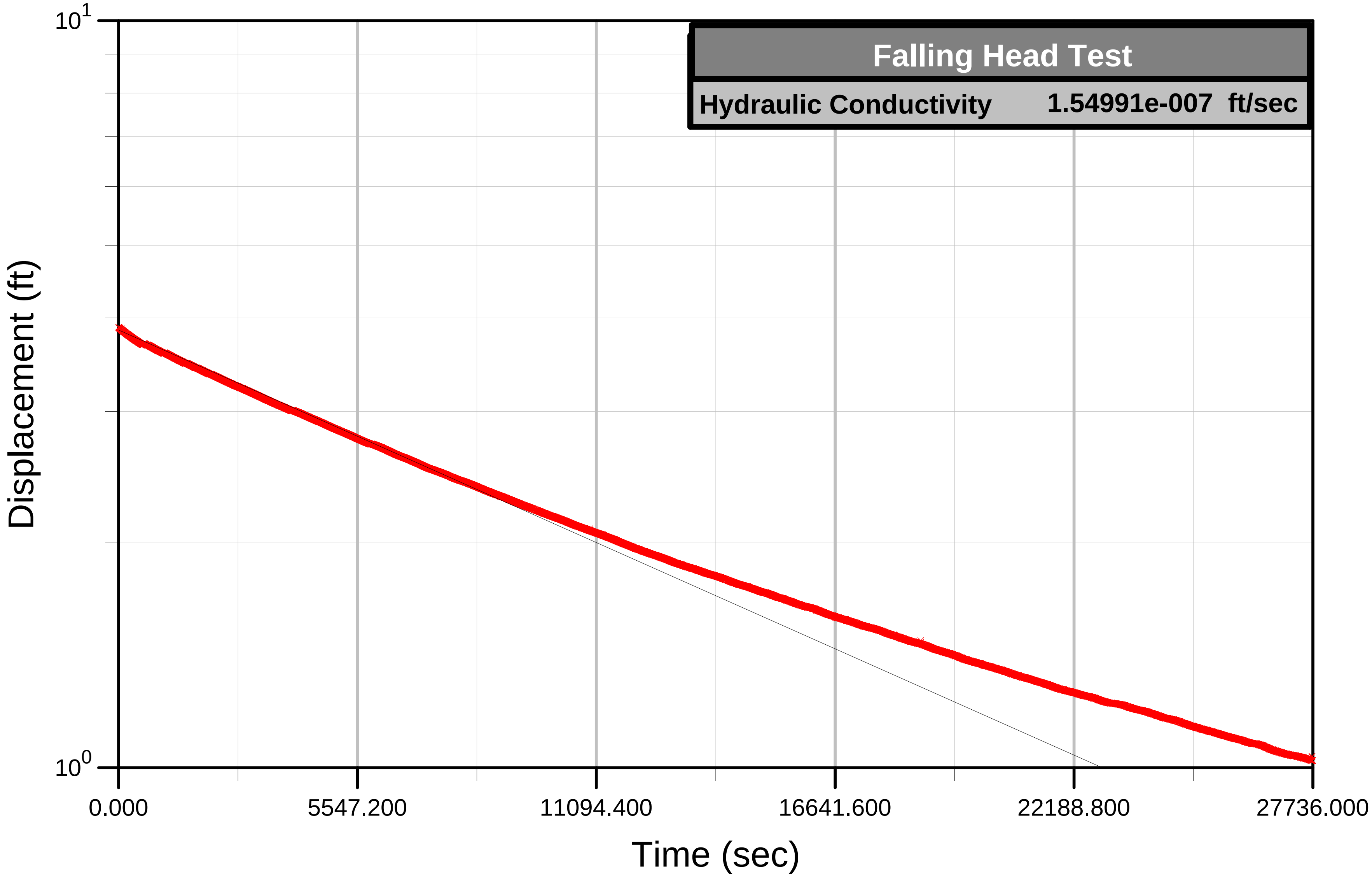
RW07-PZM004


Falling Head Test
Hydraulic Conductivity 2.98296e-005 ft/sec
10^1
10^0
10^{-1}
10^{-2}
Displacement (ft)
0.0
195.2
390.4
585.6
780.8
976.0
Time (sec)

RW07-PZM004

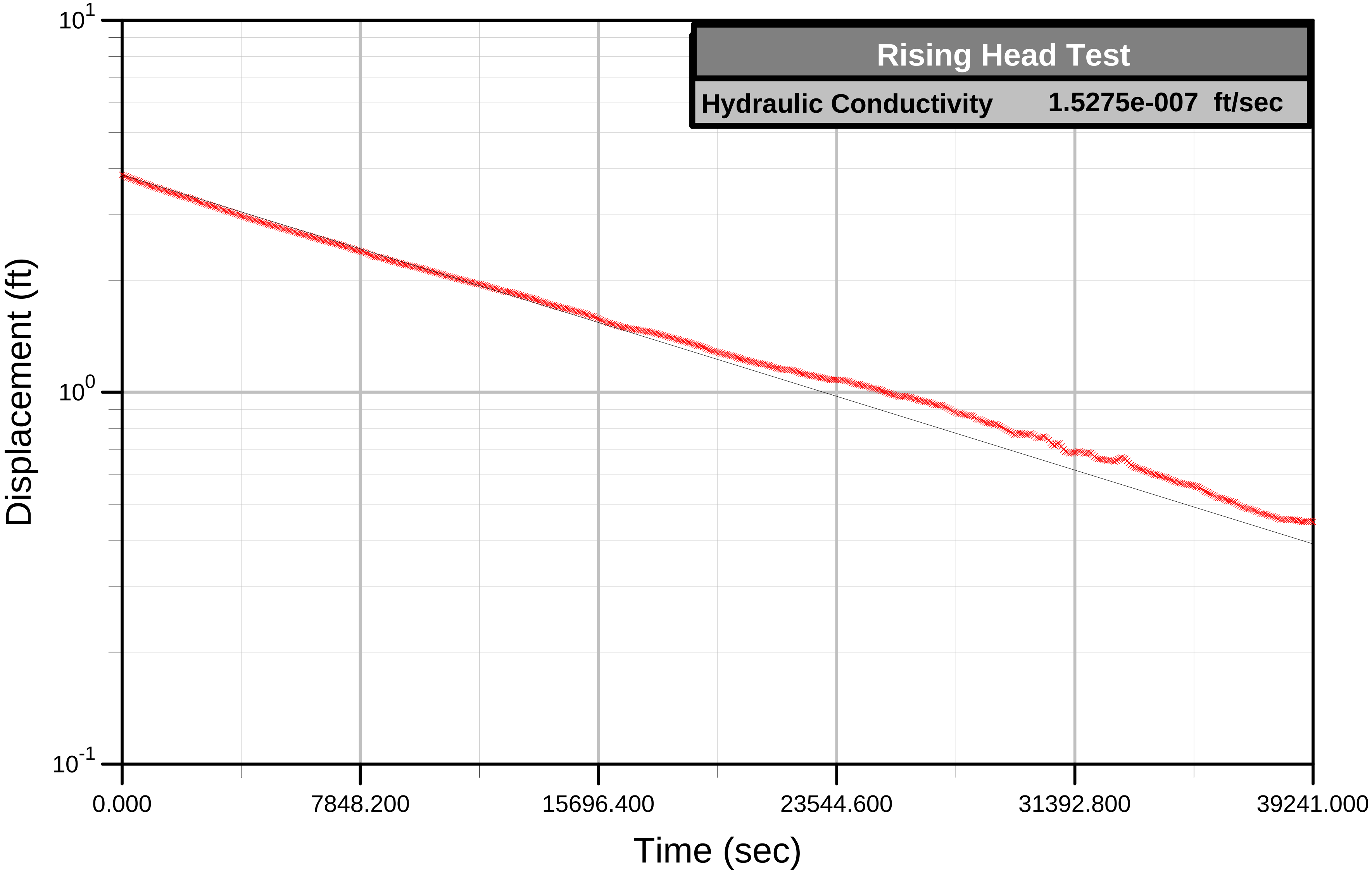

Rising Head Test
Hydraulic Conductivity 1.61365e-005 ft/sec
10^1
10^0
10^{-1}
10^{-2}
Displacement (ft)
0.00
524.20
1048.40
1572.60
2096.80
2621.00
Time (sec)

RW08-PZM003



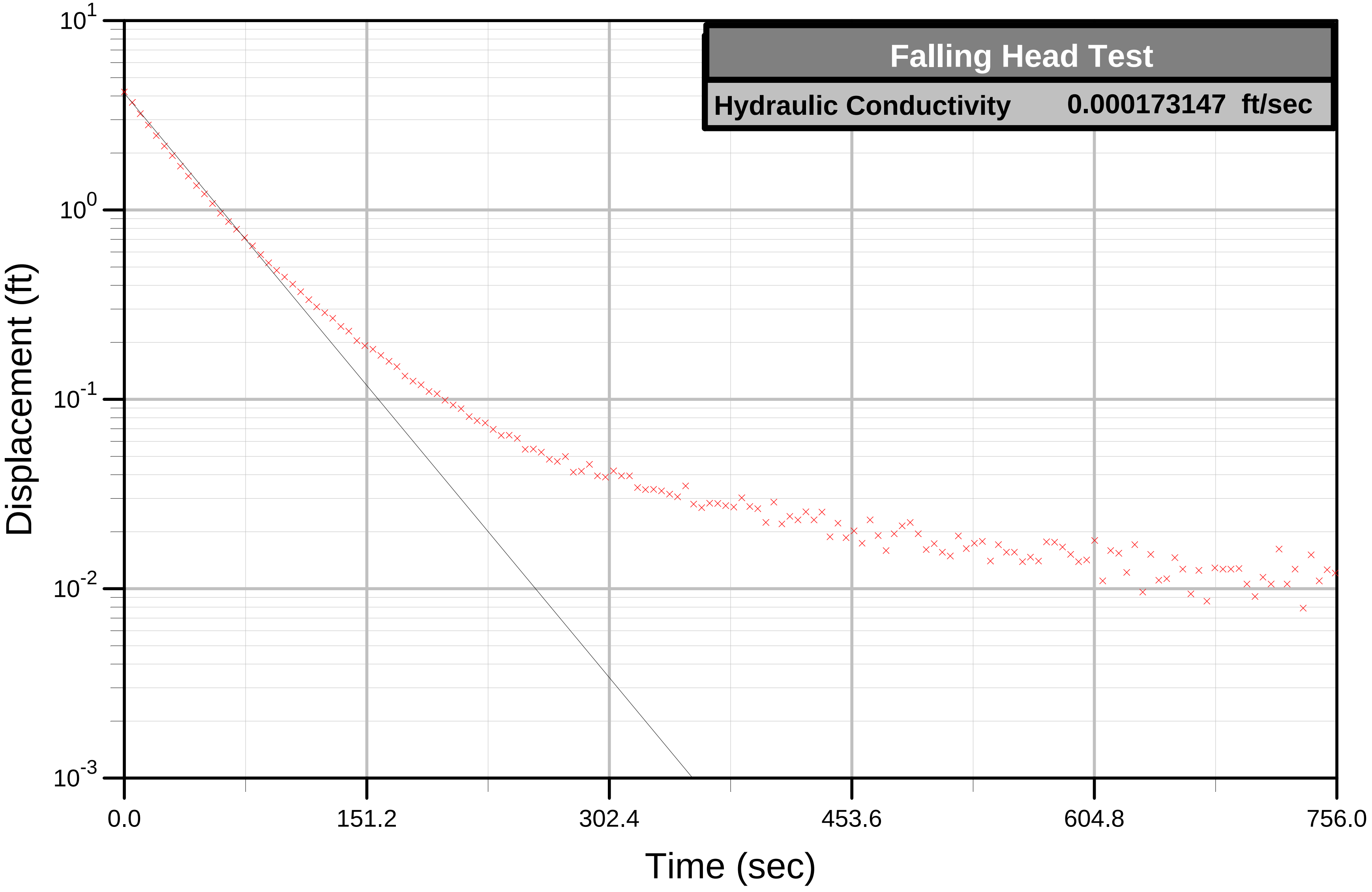
Falling Head Test
Hydraulic Conductivity 1.54991e-007 ft/sec
10^1
10^0
Displacement (ft)
0.000
5547.200
11094.400
16641.600
22188.800
27736.000
Time (sec)

RW08-PZM003

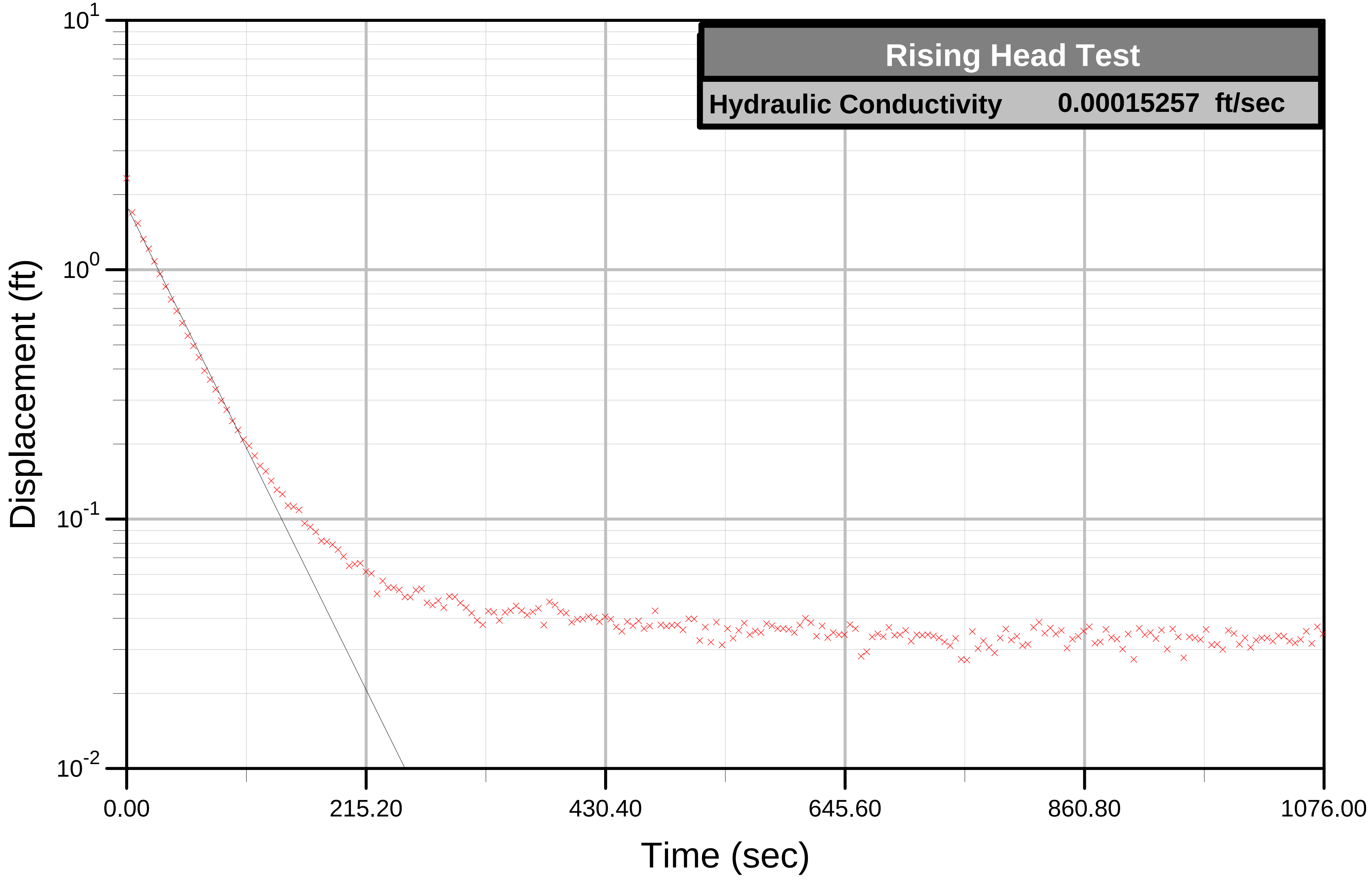


Rising Head Test
Hydraulic Conductivity 1.5275e-007 ft/sec
10^1
10^0
10^{-1}
Displacement (ft)
0.000
7848.200
15696.400
23544.600
31392.800
39241.000
Time (sec)

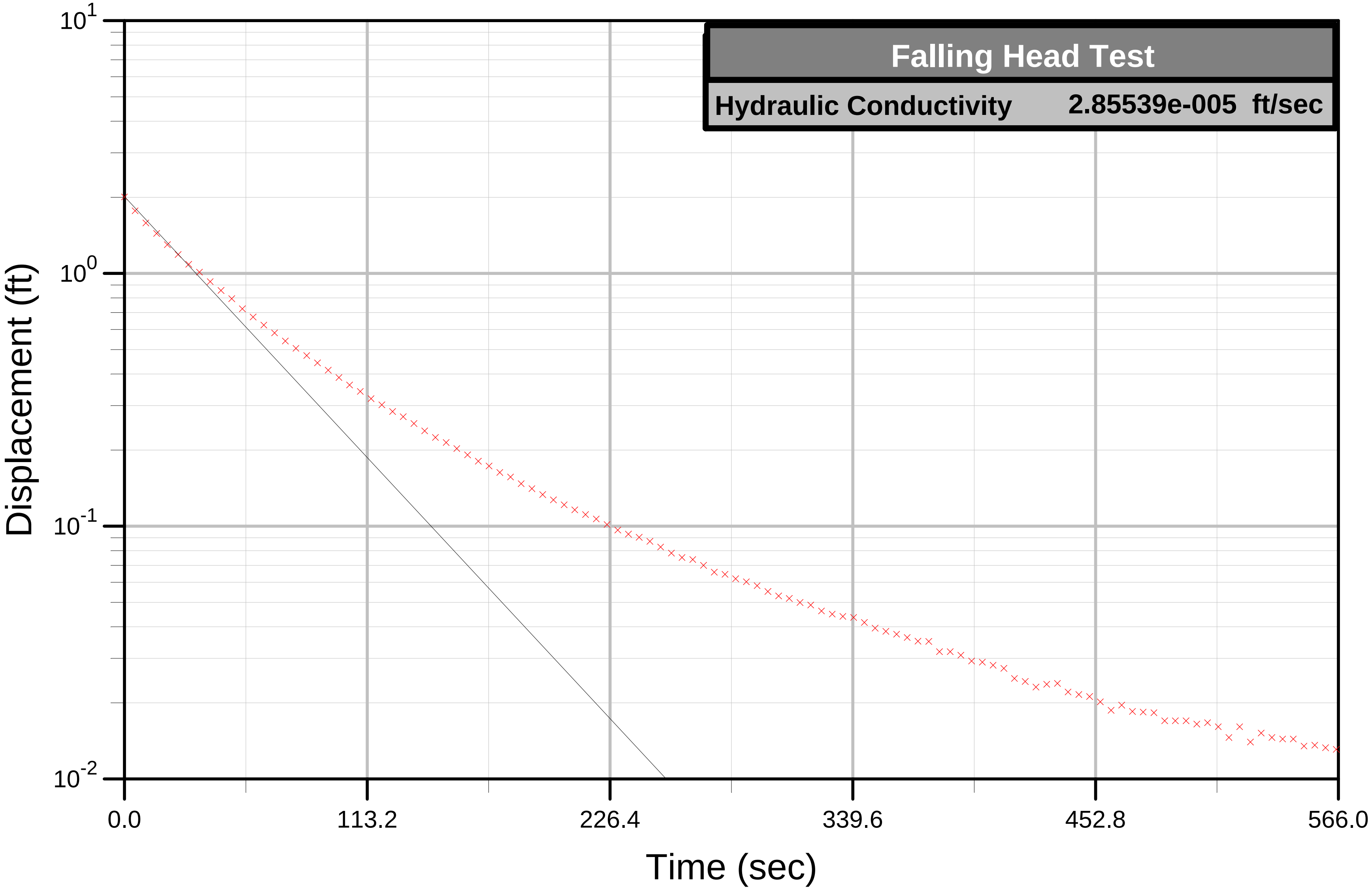
RW09-PZM004


Falling Head Test
Hydraulic Conductivity 0.000173147 ft/sec
Displacement (ft)
10^1
10^0
10^{-1}
10^{-2}
10^{-3}
0.0
151.2
302.4
453.6
604.8
756.0
Time (sec)

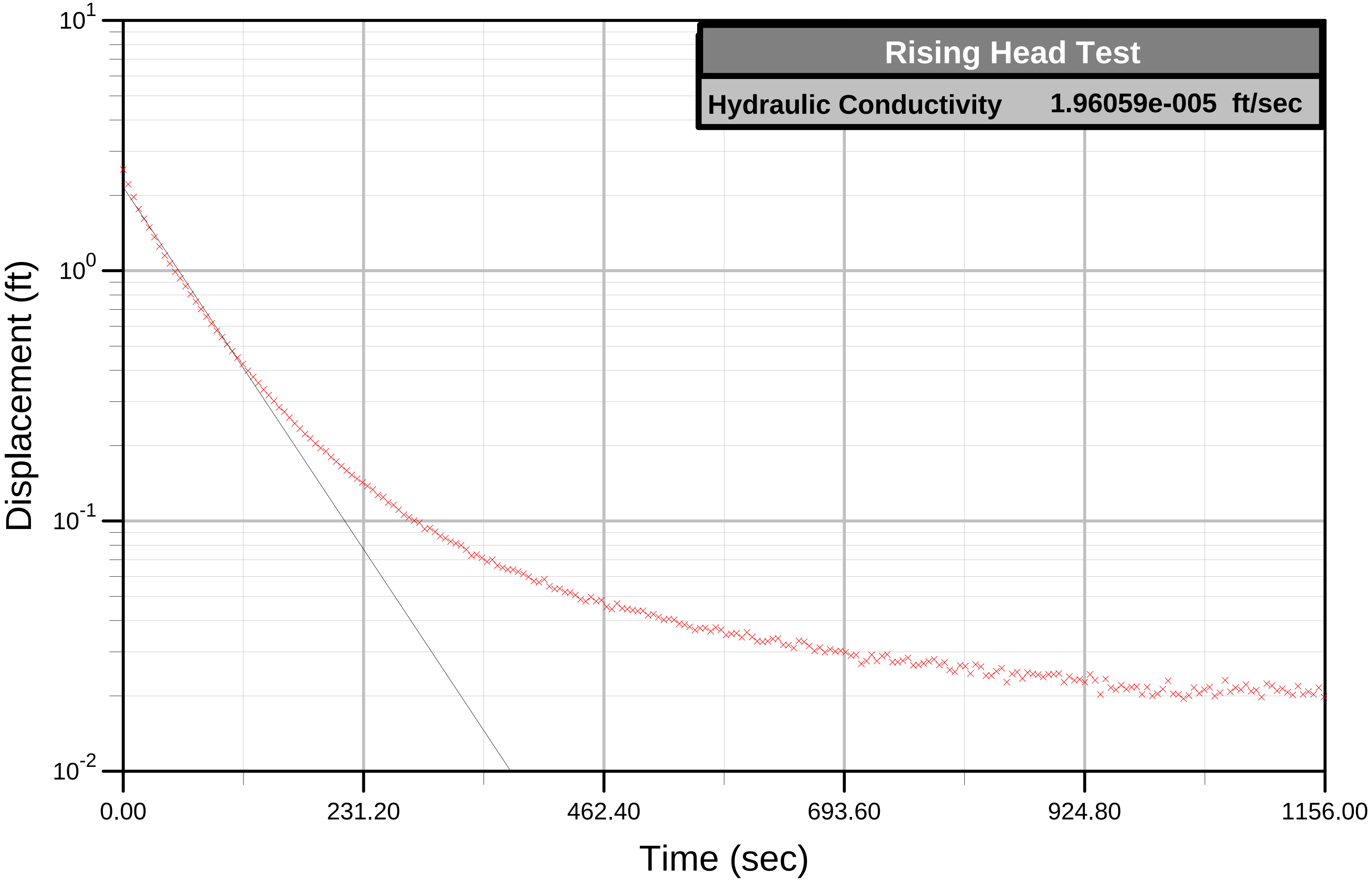
RW09-PZM004


Rising Head Test
Hydraulic Conductivity 0.00015257 ft/sec
Displacement (ft)
10^1
10^0
10^{-1}
10^{-2}
0.00
215.20
430.40
645.60
860.80
1076.00
Time (sec)

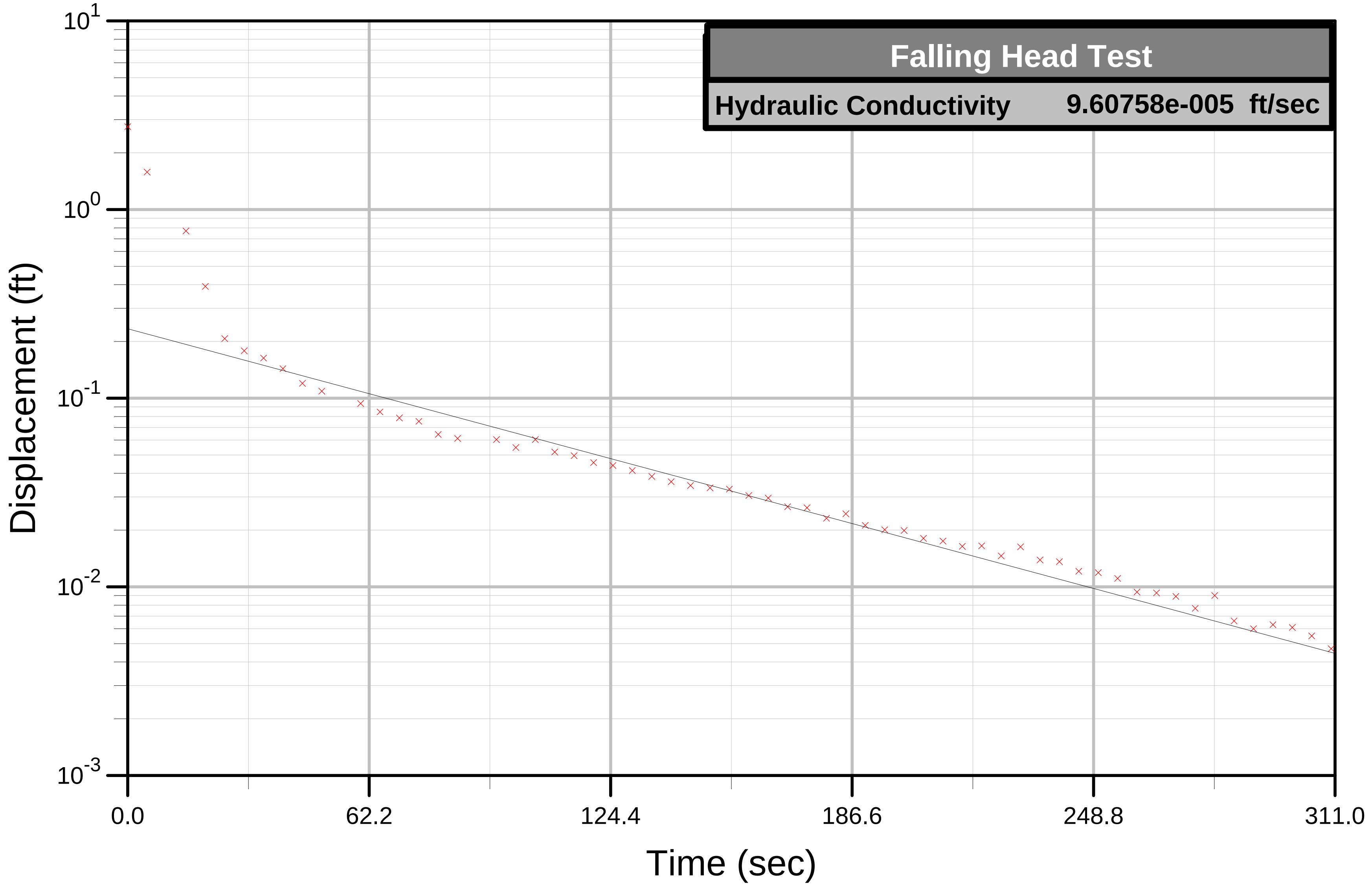
RW10-PZM004


Falling Head Test
Hydraulic Conductivity 2.85539e-005 ft/sec
10^{1}
10^{0}
10^{-1}
10^{-2}
Displacement (ft)
0.0
113.2
226.4
339.6
452.8
566.0
Time (sec)

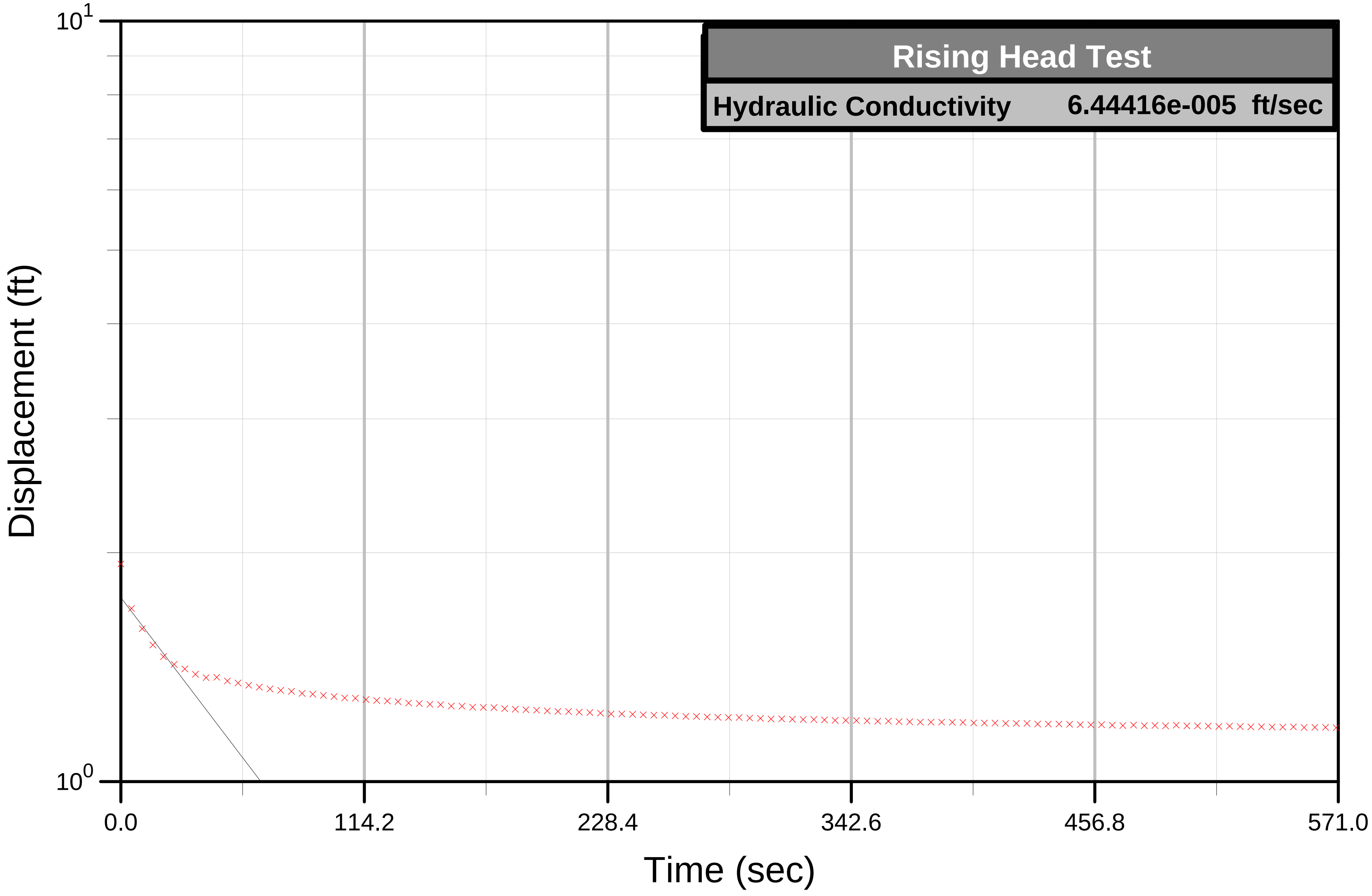
RW10-PZM004


Rising Head Test
Hydraulic Conductivity 1.96059e-005 ft/sec
Displacement (ft)
10^1
10^0
10^{-1}
10^{-2}
0.00
231.20
462.40
693.60
924.80
1156.00
Time (sec)

RW11-PZM004

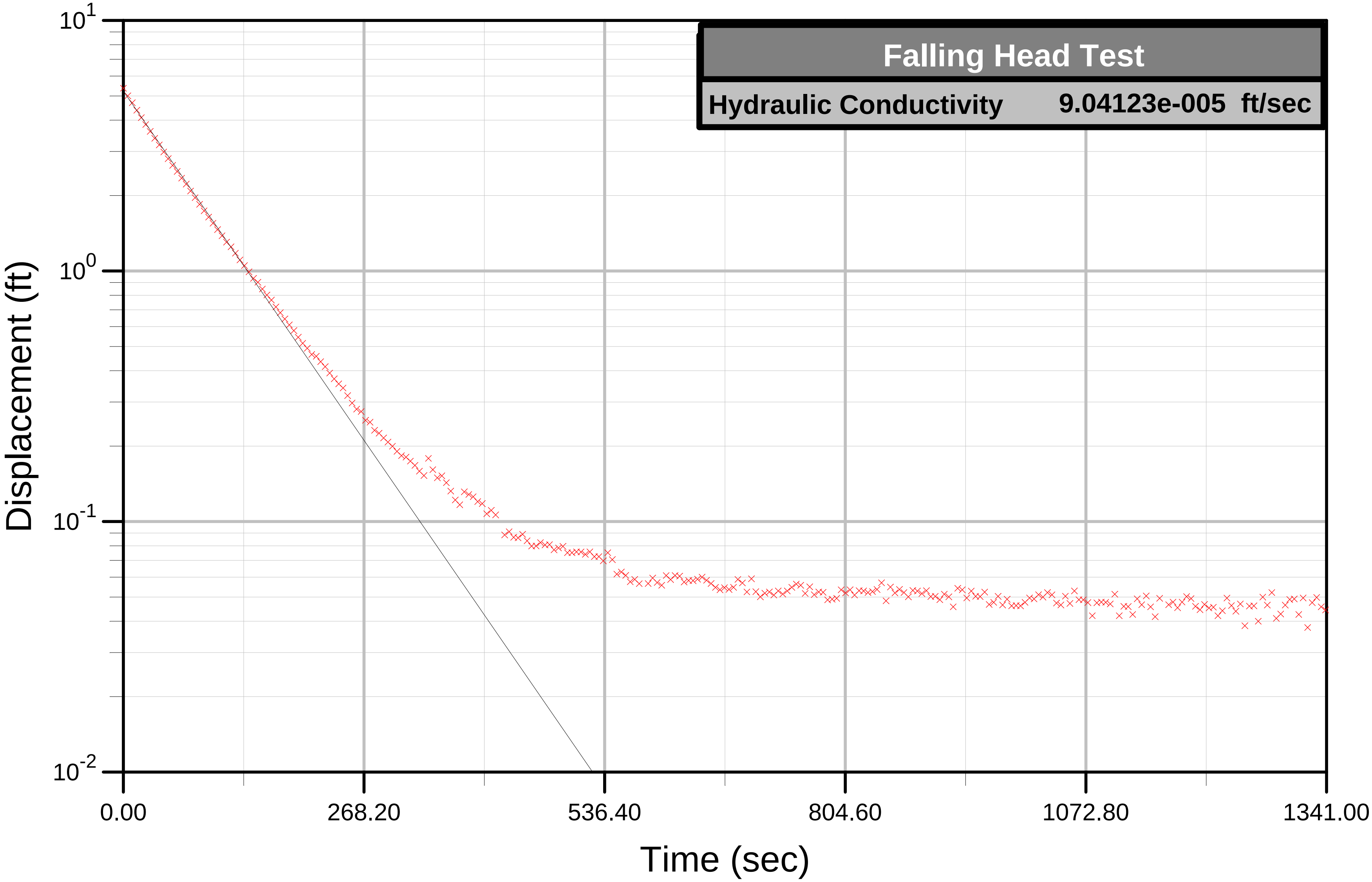

Falling Head Test
Hydraulic Conductivity
9.60758e-005 ft/sec
10^{1}
10^{0}
10^{-1}
10^{-2}
10^{-3}
Displacement (ft)
0.0
62.2
124.4
186.6
248.8
311.0
Time (sec)

RW11-PZM004



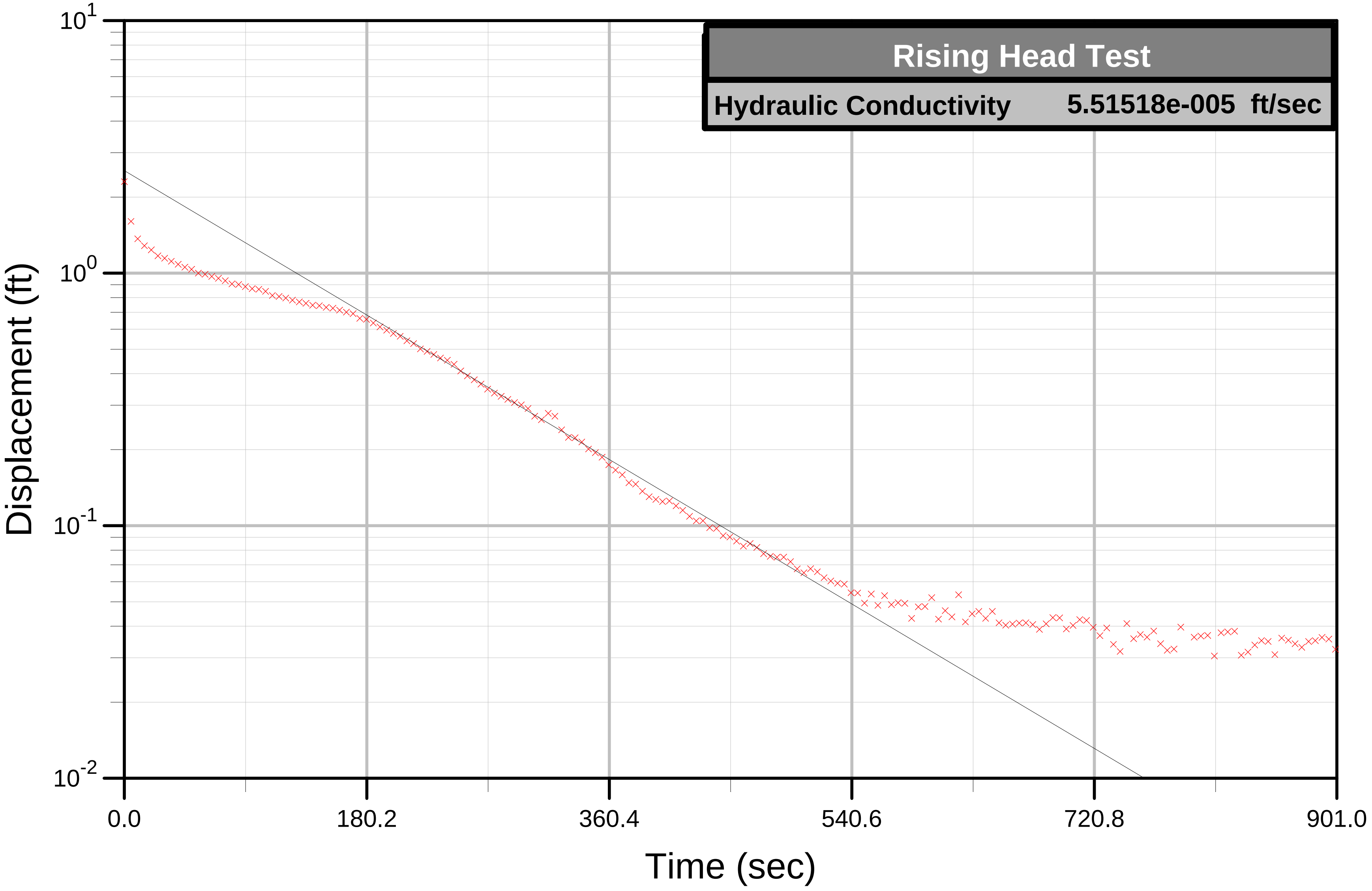
Rising Head Test
Hydraulic Conductivity 6.44416e-005 ft/sec
10^1
10^0
Displacement (ft)
0.0
114.2
228.4
342.6
456.8
571.0
Time (sec)

RW12-PZM004

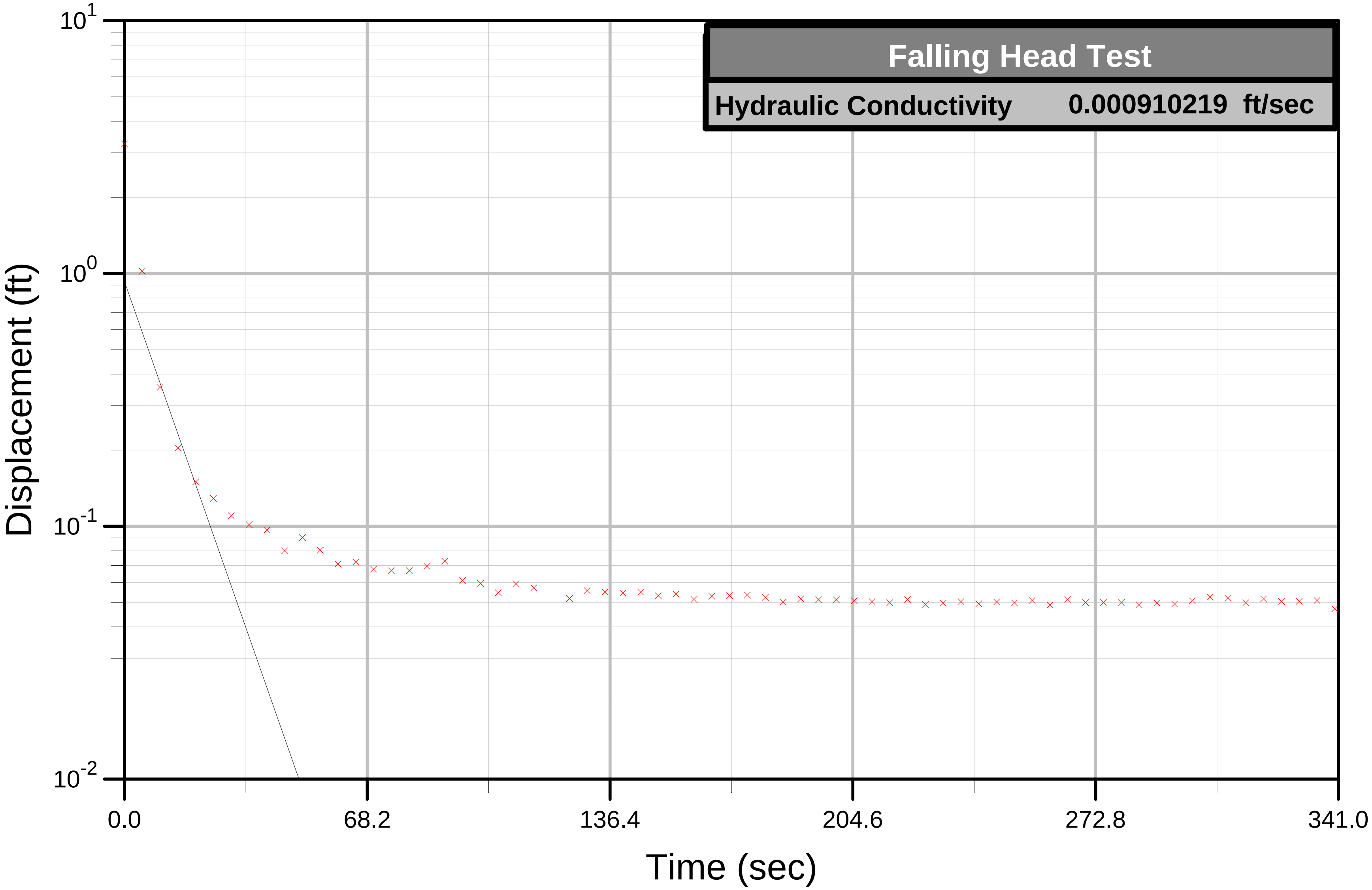


Falling Head Test
Hydraulic Conductivity 9.04123e-005 ft/sec
10^1
10^0
10^{-1}
10^{-2}
Displacement (ft)
0.00
268.20
536.40
804.60
1072.80
1341.00
Time (sec)

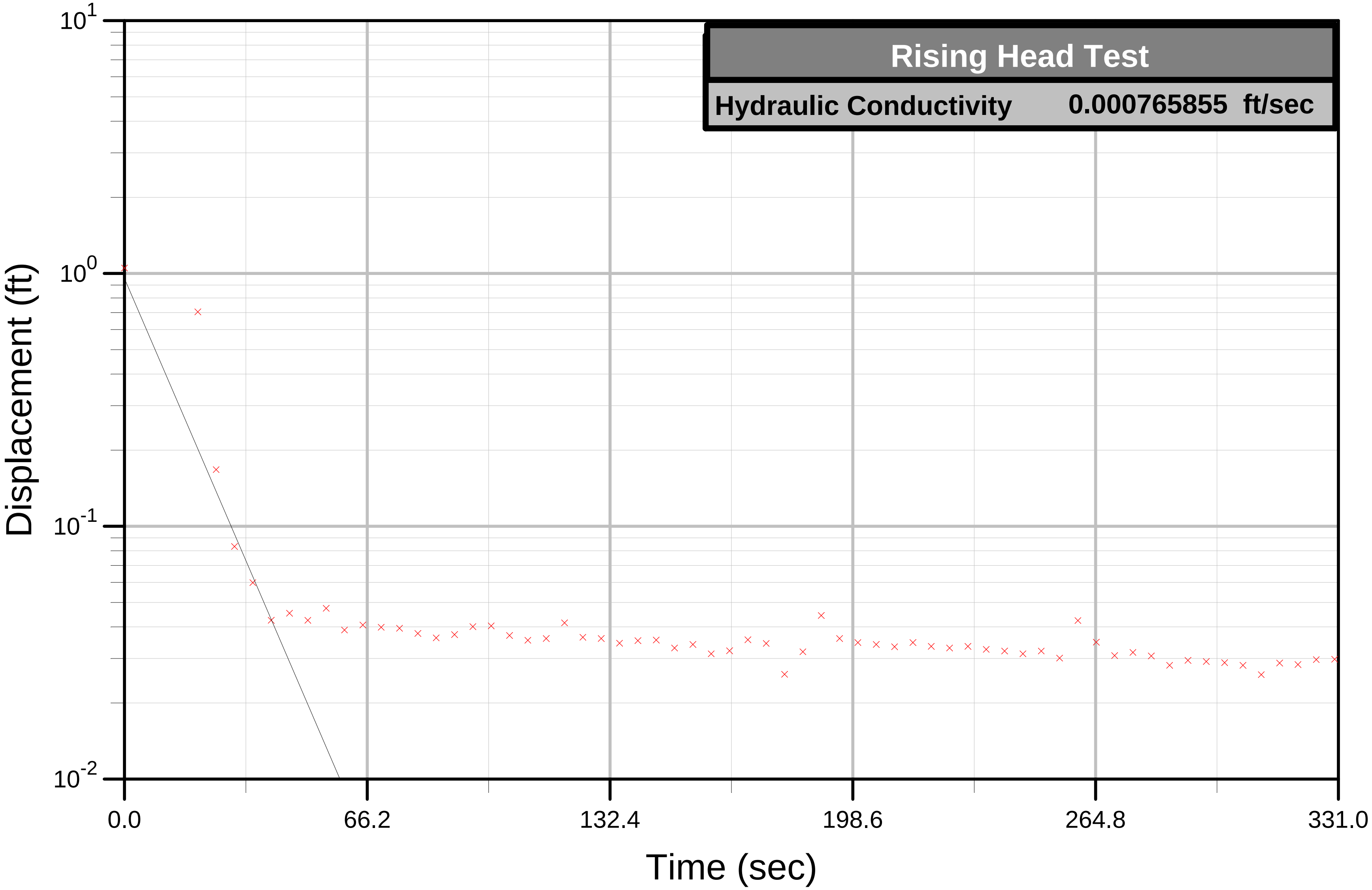
RW12-PZM004


Rising Head Test
Hydraulic Conductivity 5.51518e-005 ft/sec
10^1
10^0
10^{-1}
10^{-2}
Displacement (ft)
0.0
180.2
360.4
540.6
720.8
901.0
Time (sec)

RW19-PZM020

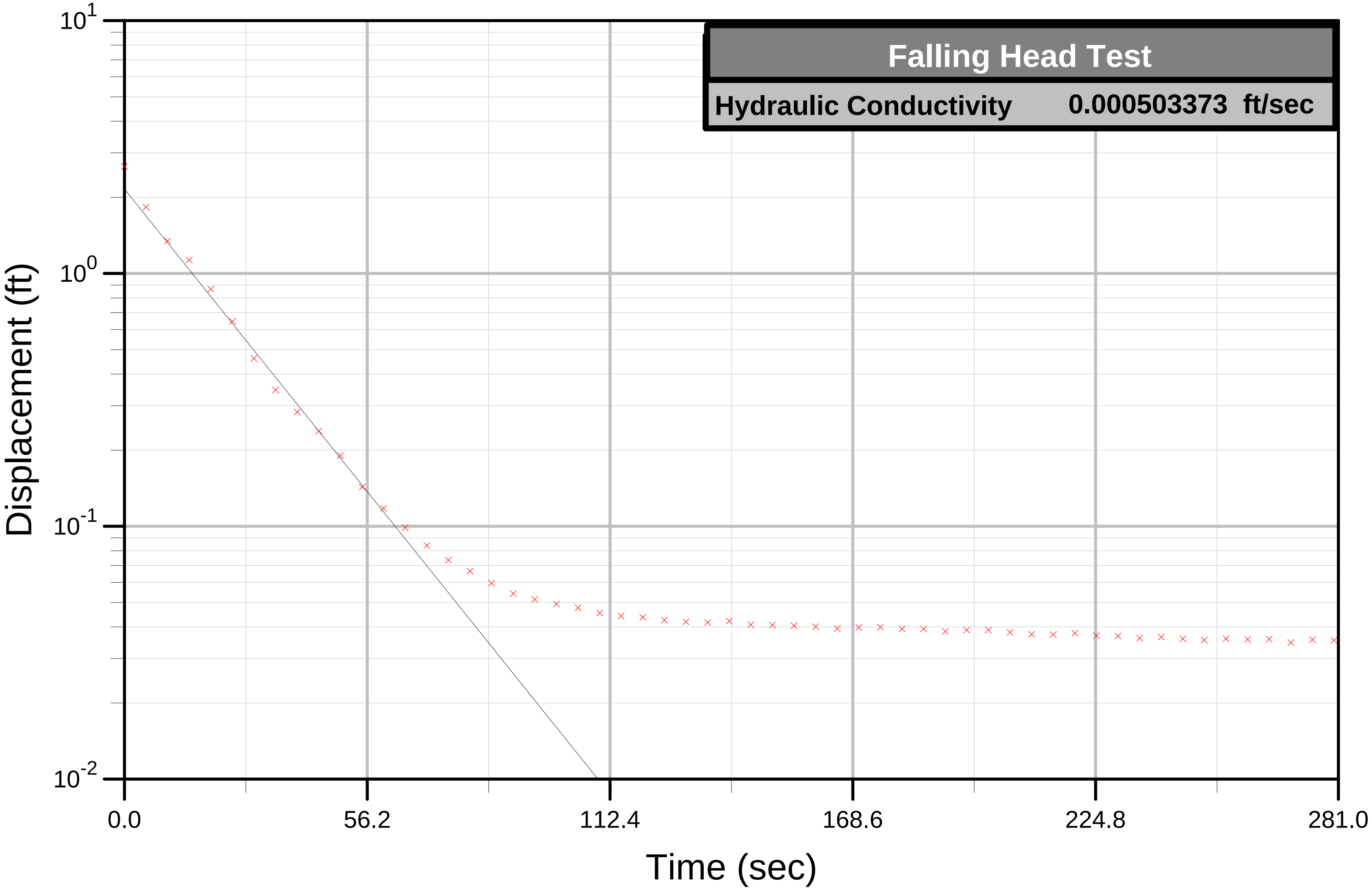

Falling Head Test
Hydraulic Conductivity
0.000910219 ft/sec
Displacement (ft)
10^1
10^0
10^{-1}
10^{-2}
0.0
68.2
136.4
204.6
272.8
341.0
Time (sec)

RW19-PZM020

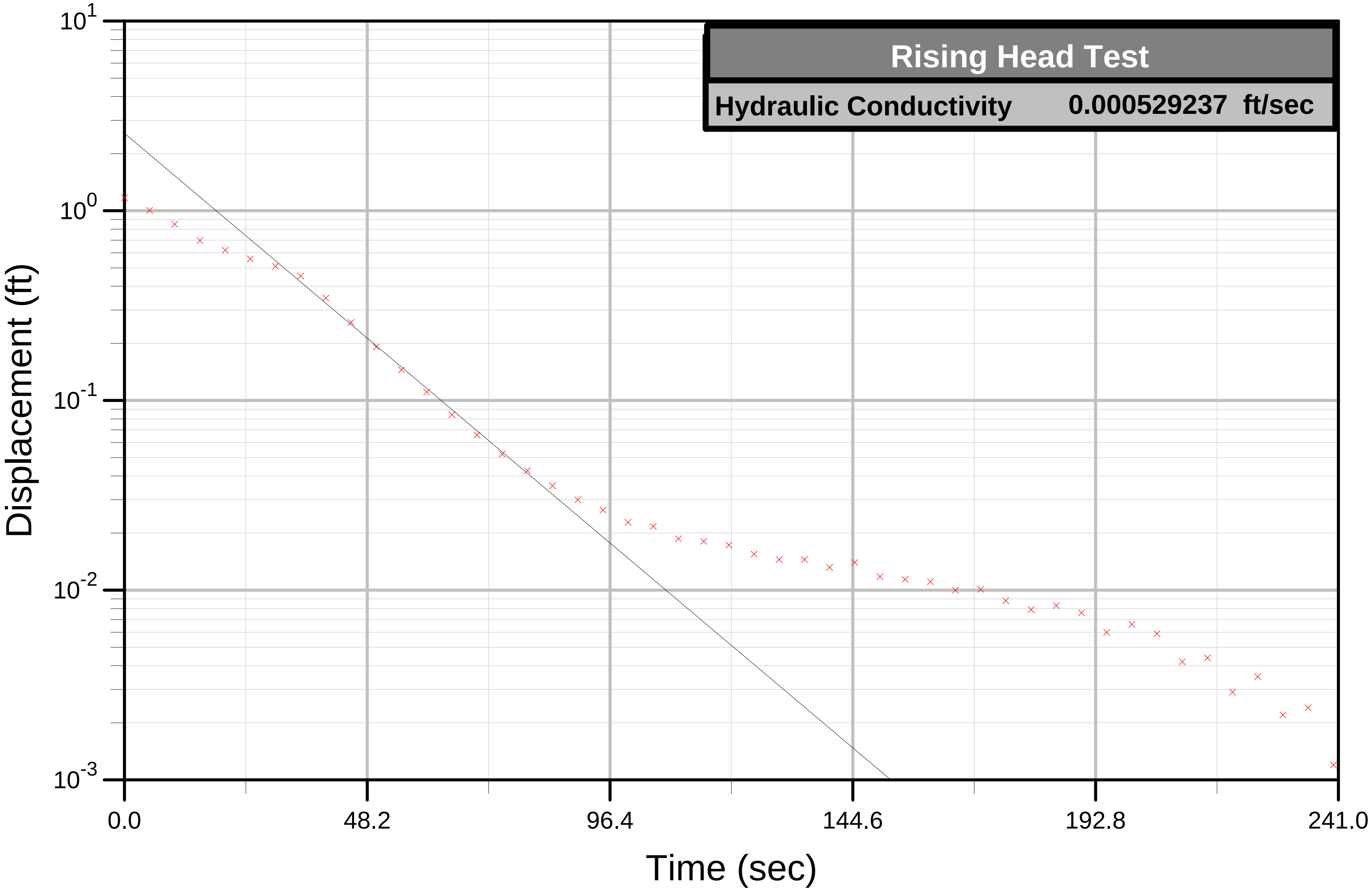


Rising Head Test
Hydraulic Conductivity 0.000765855 ft/sec
10^1
10^0
10^{-1}
10^{-2}
Displacement (ft)
0.0
66.2
132.4
198.6
264.8
331.0
Time (sec)

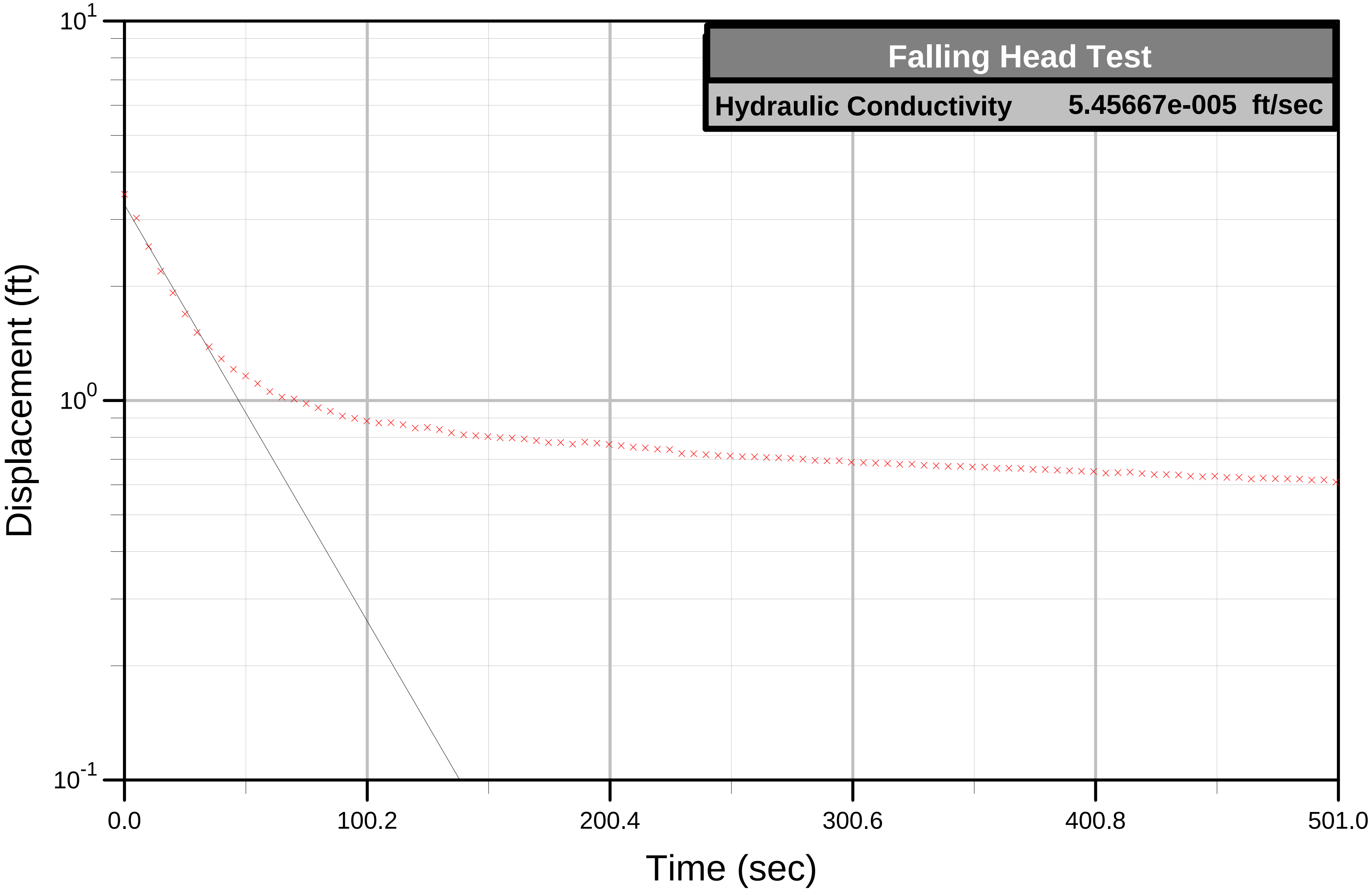
RW19-PZP003


Falling Head Test
Hydraulic Conductivity
0.000503373 ft/sec
10^{1}
10^{0}
10^{-1}
10^{-2}
Displacement (ft)
0.0
56.2
112.4
168.6
224.8
281.0
Time (sec)

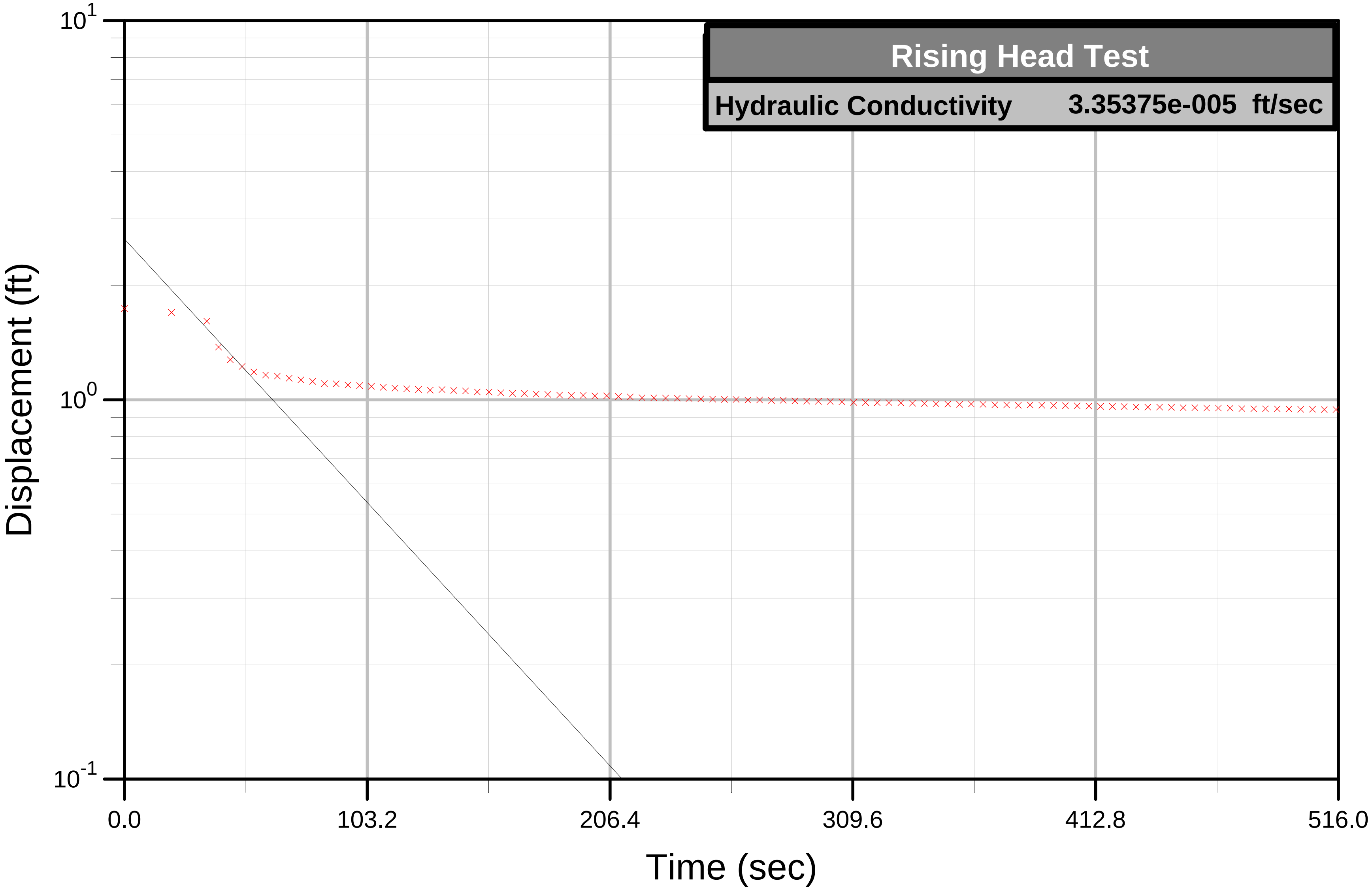
RW19-PZP003


Rising Head Test
Hydraulic Conductivity 0.000529237 ft/sec
10^{1}
10^{0}
10^{-1}
10^{-2}
10^{-3}
Displacement (ft)
0.0
48.2
96.4
144.6
192.8
241.0
Time (sec)

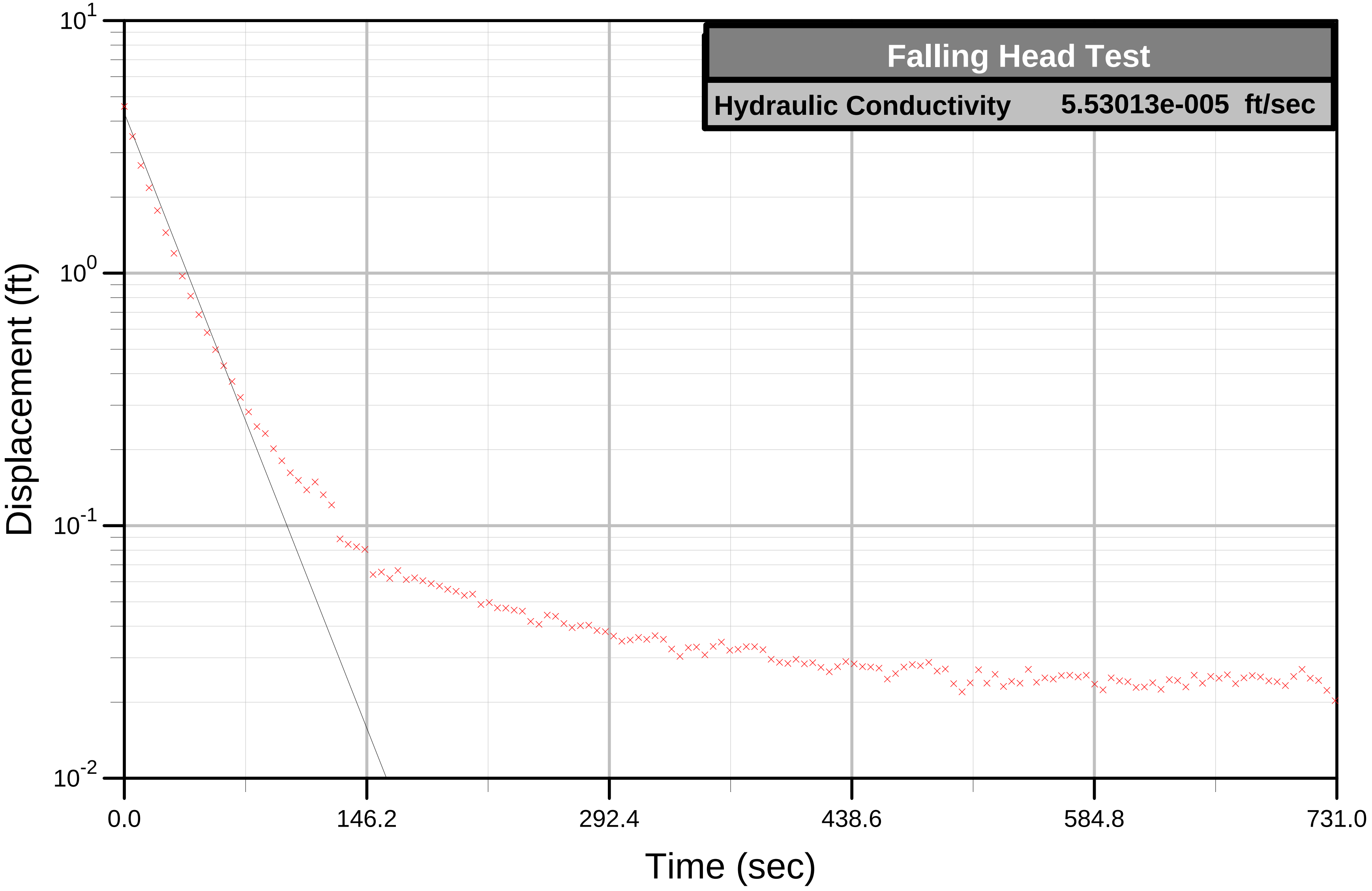
RW20-PZP000


Falling Head Test
Hydraulic Conductivity
5.45667e-005 ft/sec
Displacement (ft)
10^1
10^0
10^{-1}
0.0
100.2
200.4
300.6
400.8
501.0
Time (sec)

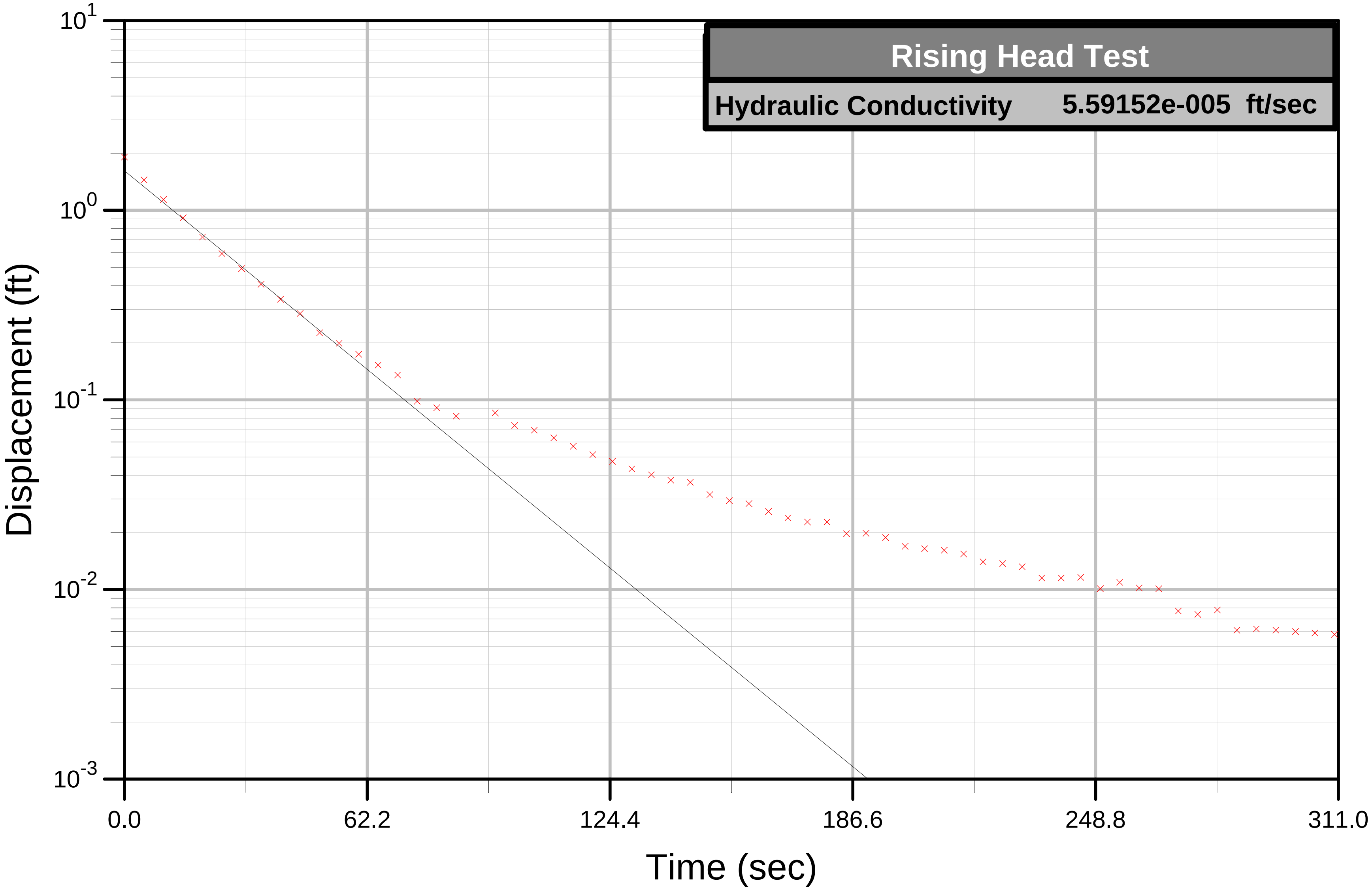
RW20-PZP000


Rising Head Test
Hydraulic Conductivity 3.35375e-005 ft/sec
10^1
10^0
10^{-1}
Displacement (ft)
0.0
103.2
206.4
309.6
412.8
516.0
Time (sec)

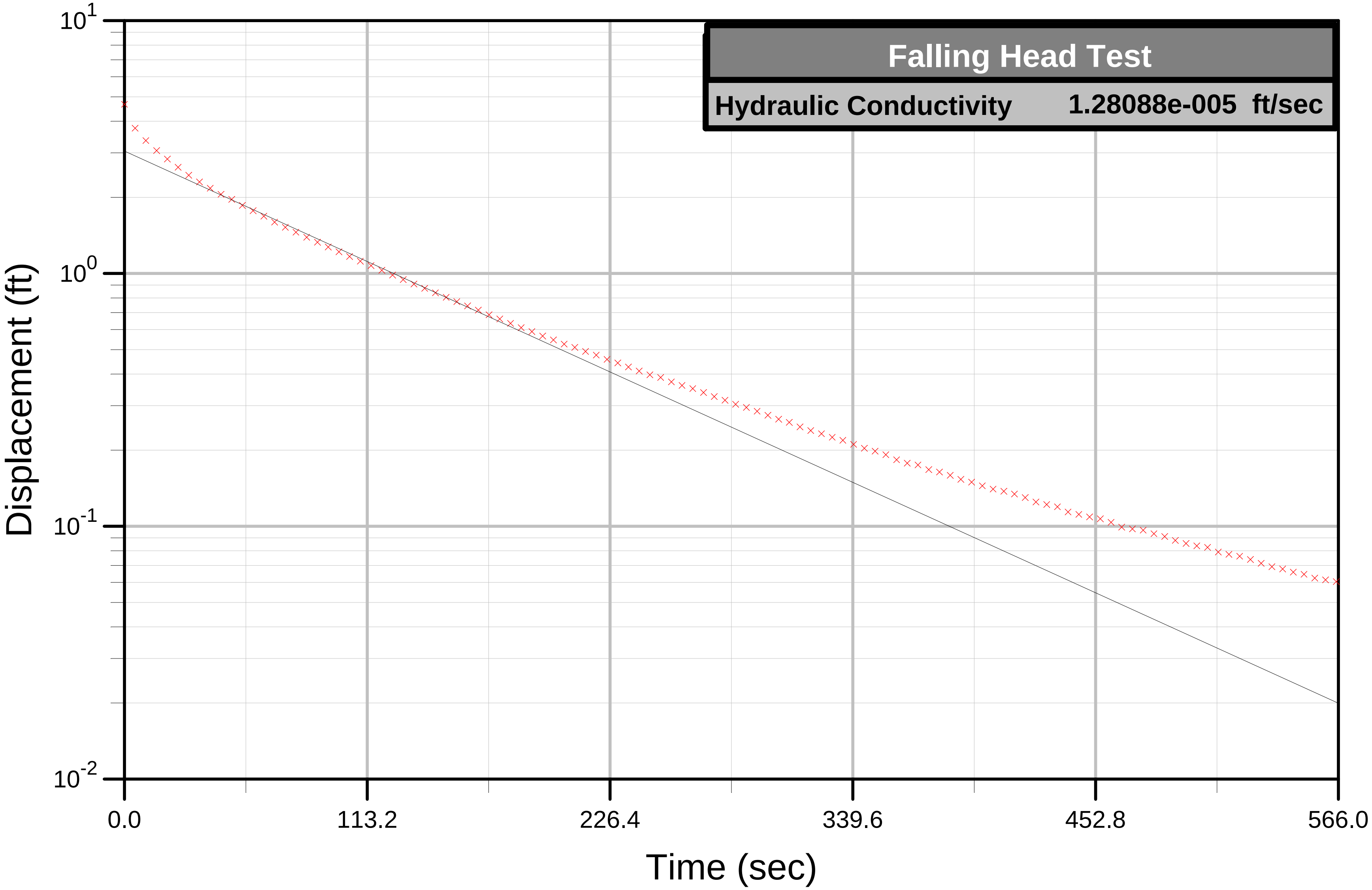
RW23-PZM


Falling Head Test
Hydraulic Conductivity 5.53013e-005 ft/sec
10^{1}
10^{0}
10^{-1}
10^{-2}
Displacement (ft)
0.0
146.2
292.4
438.6
584.8
731.0
Time (sec)

RW23-PZM

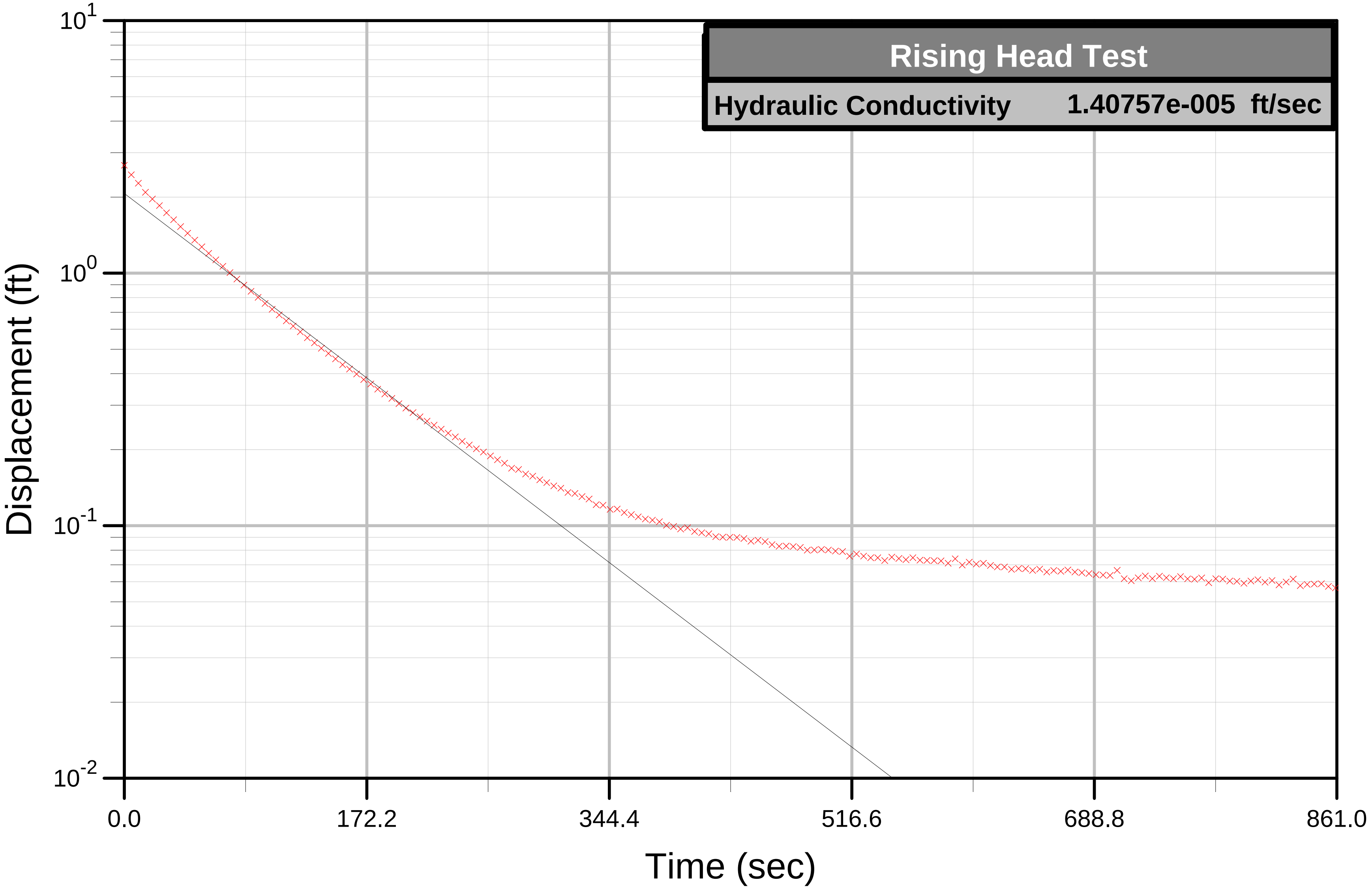

Rising Head Test
Hydraulic Conductivity 5.59152e-005 ft/sec
Displacement (ft)
10^1
10^0
10^{-1}
10^{-2}
10^{-3}
0.0
62.2
124.4
186.6
248.8
311.0
Time (sec)

RW24-PZM

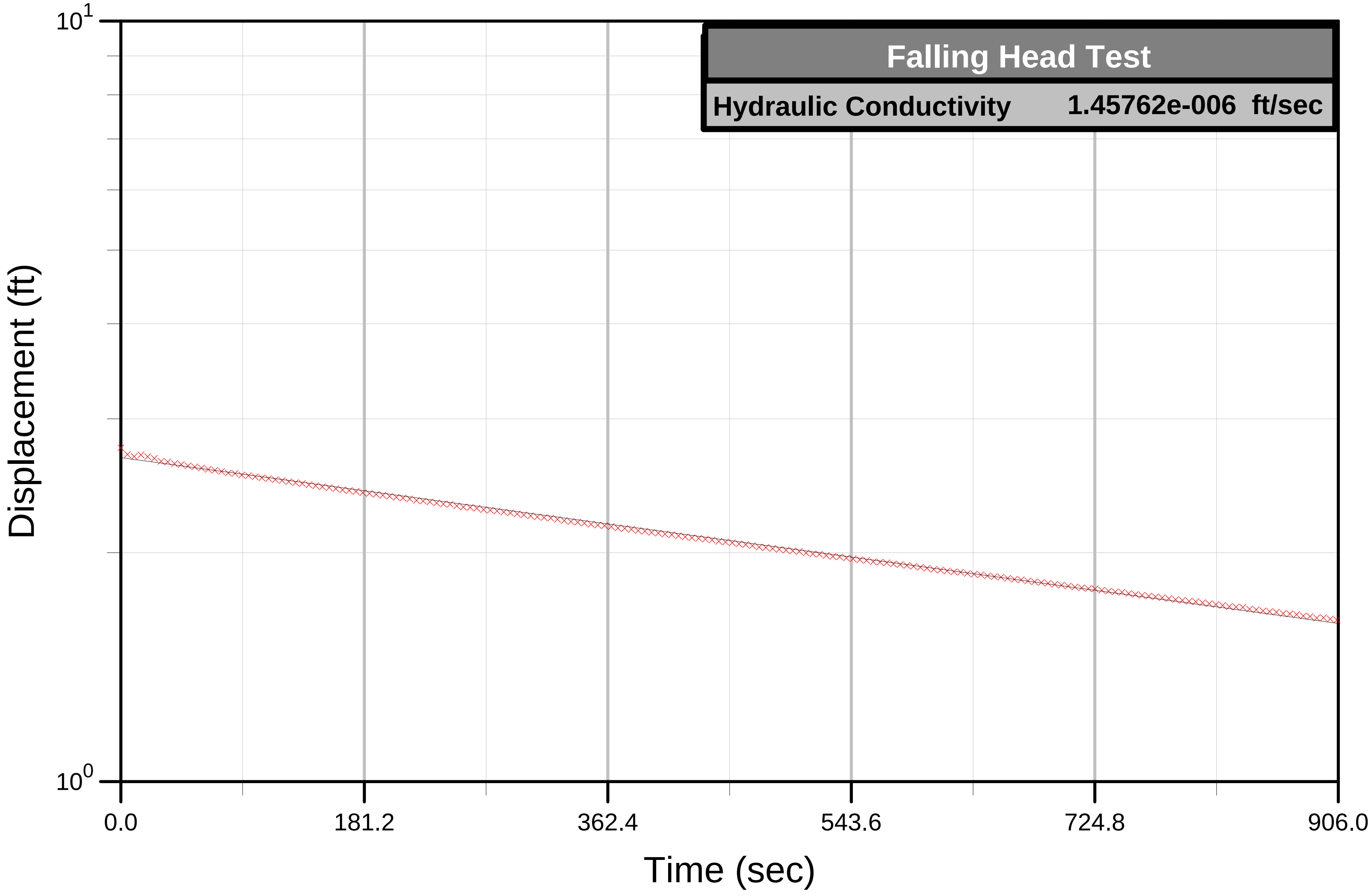


Falling Head Test
Hydraulic Conductivity 1.28088e-005 ft/sec
Displacement (ft)
10^{1}
10^{0}
10^{-1}
10^{-2}
0.0
113.2
226.4
339.6
452.8
566.0
Time (sec)

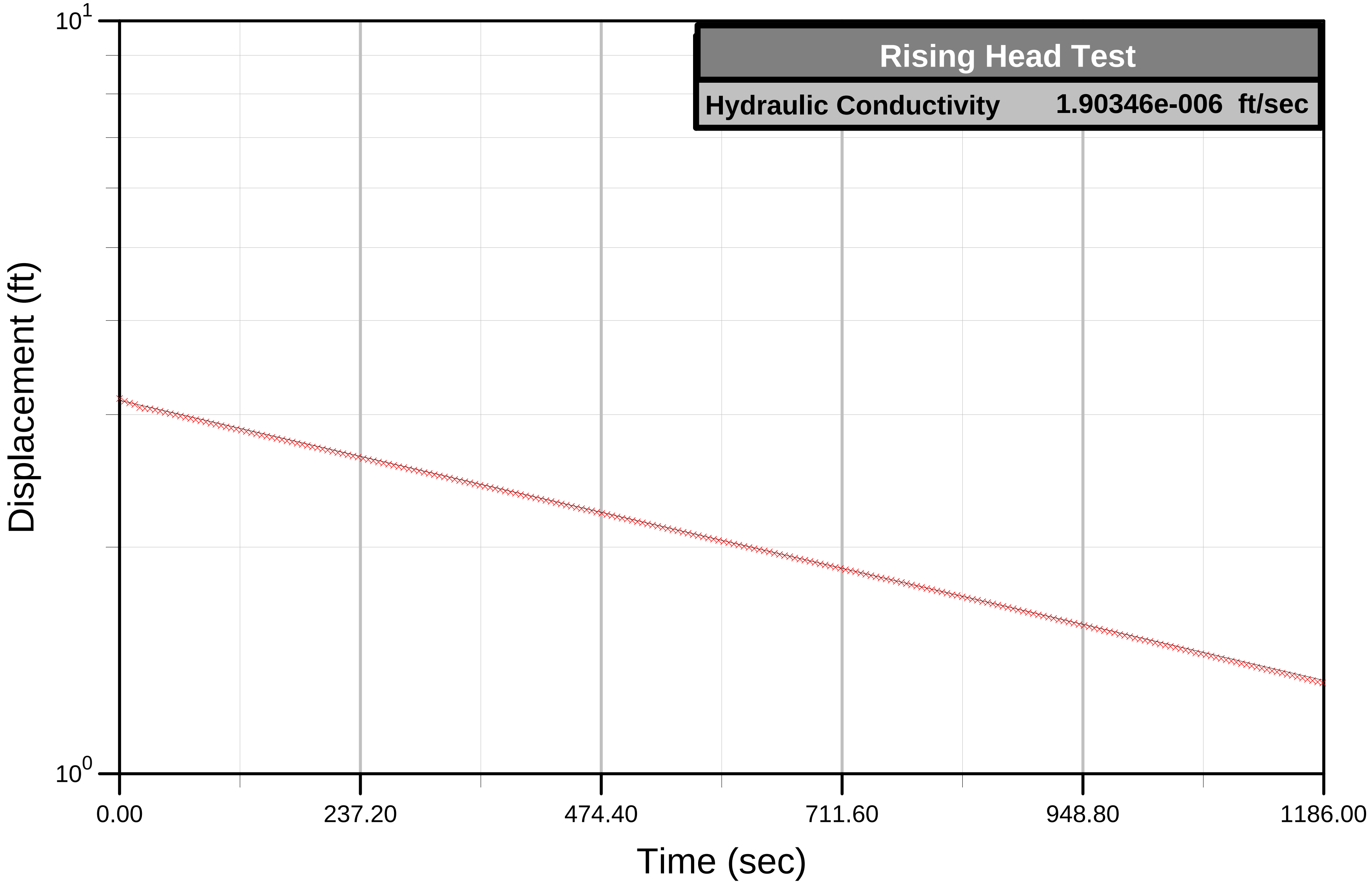
RW24-PZM

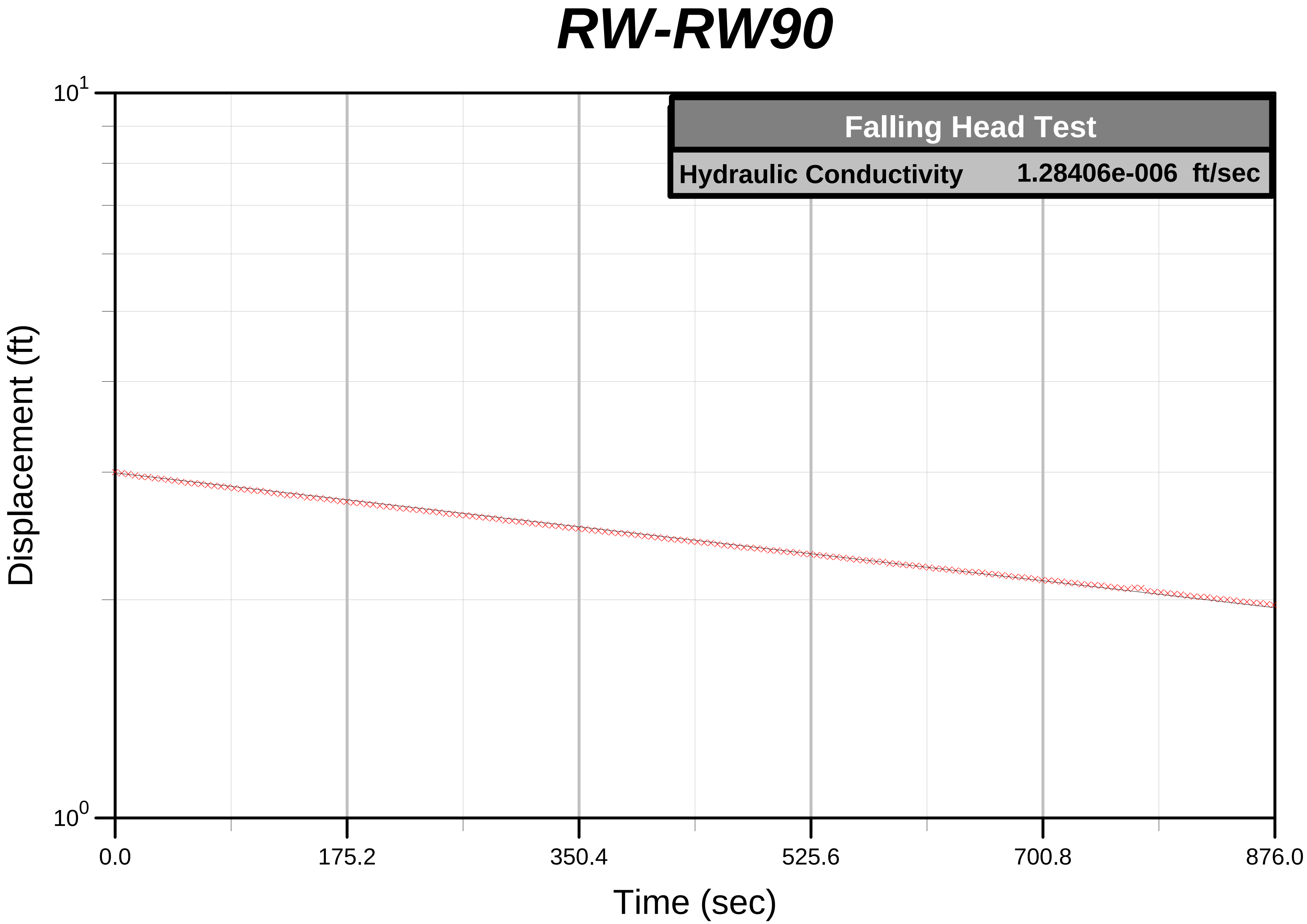

Rising Head Test
Hydraulic Conductivity
1.40757e-005 ft/sec
Displacement (ft)
10^1
10^0
10^{-1}
10^{-2}
0.0
172.2
344.4
516.6
688.8
861.0
Time (sec)

RW-RW89


Falling Head Test
Hydraulic Conductivity 1.45762e-006 ft/sec
10^1
10^0
Displacement (ft)
0.0
181.2
362.4
543.6
724.8
906.0
Time (sec)

RW-RW89

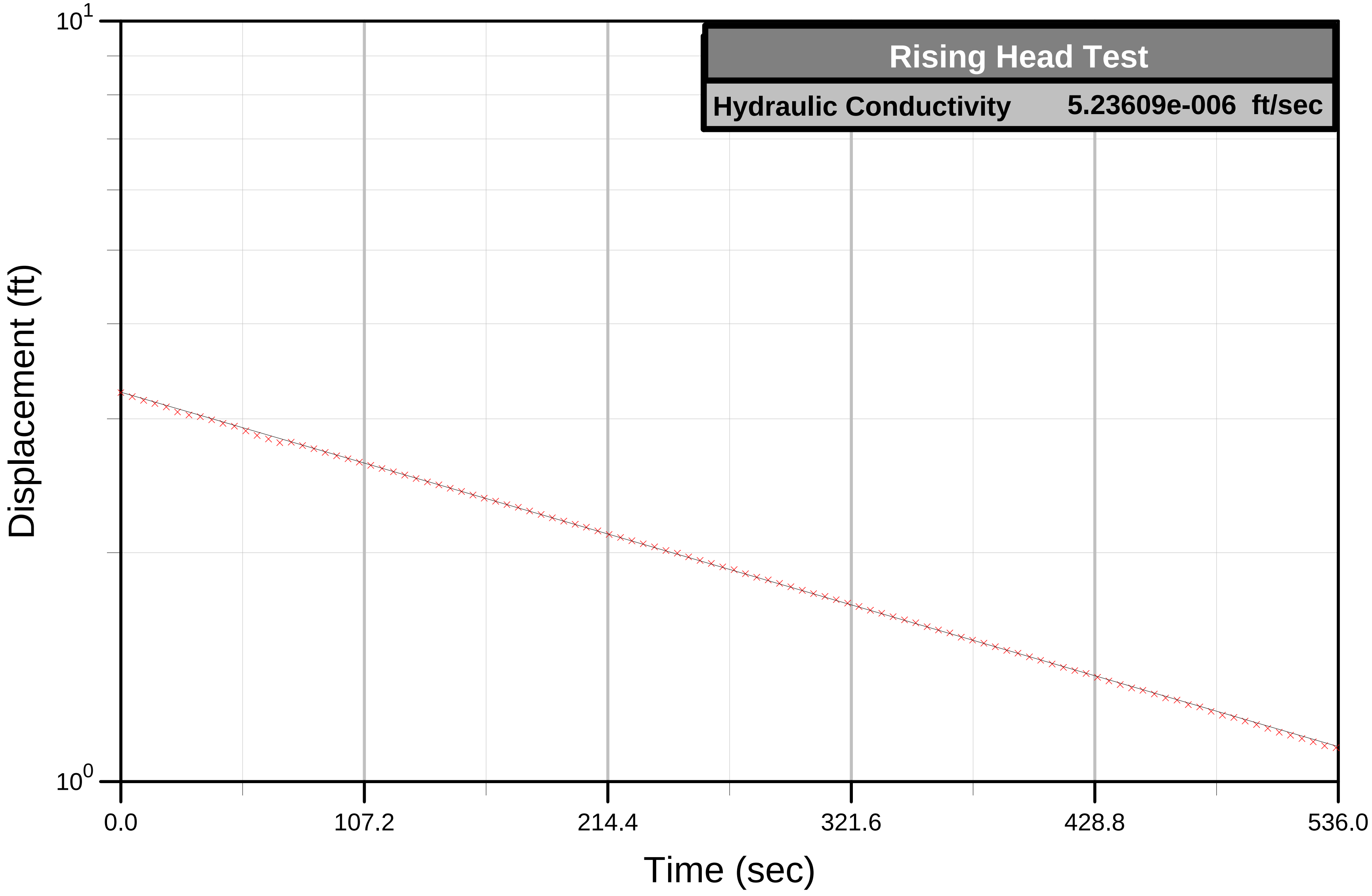

Rising Head Test
Hydraulic Conductivity 1.90346e-006 ft/sec
10^1
10^0
Displacement (ft)
0.00
237.20
474.40
711.60
948.80
1186.00
Time (sec)



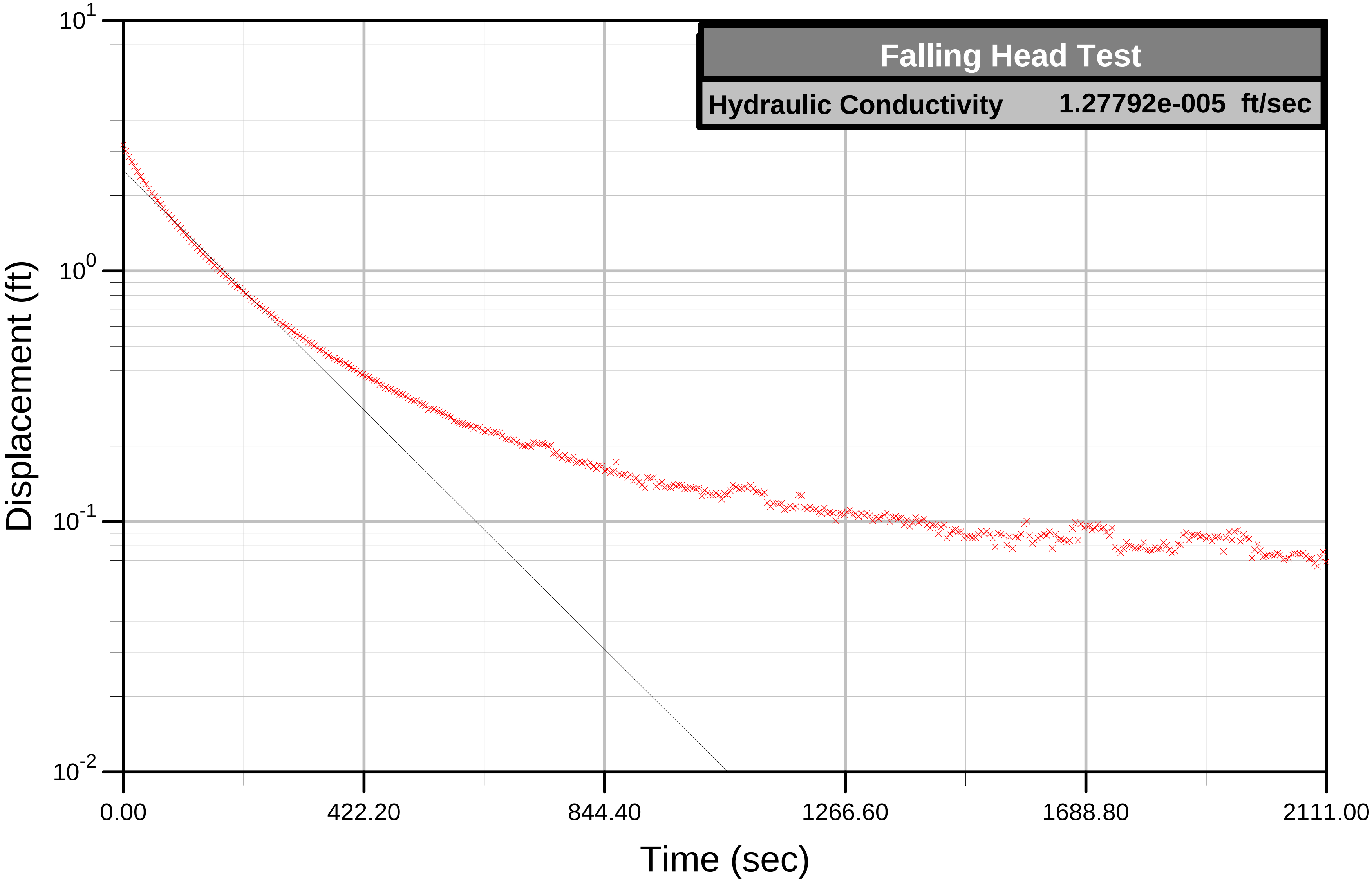
RW-RW90

Falling Head Test
Hydraulic Conductivity 1.28406e-006 ft/sec
Displacement (ft)
10^1
10^0
0.0
175.2
350.4
525.6
700.8
876.0
Time (sec)

RW-RW90

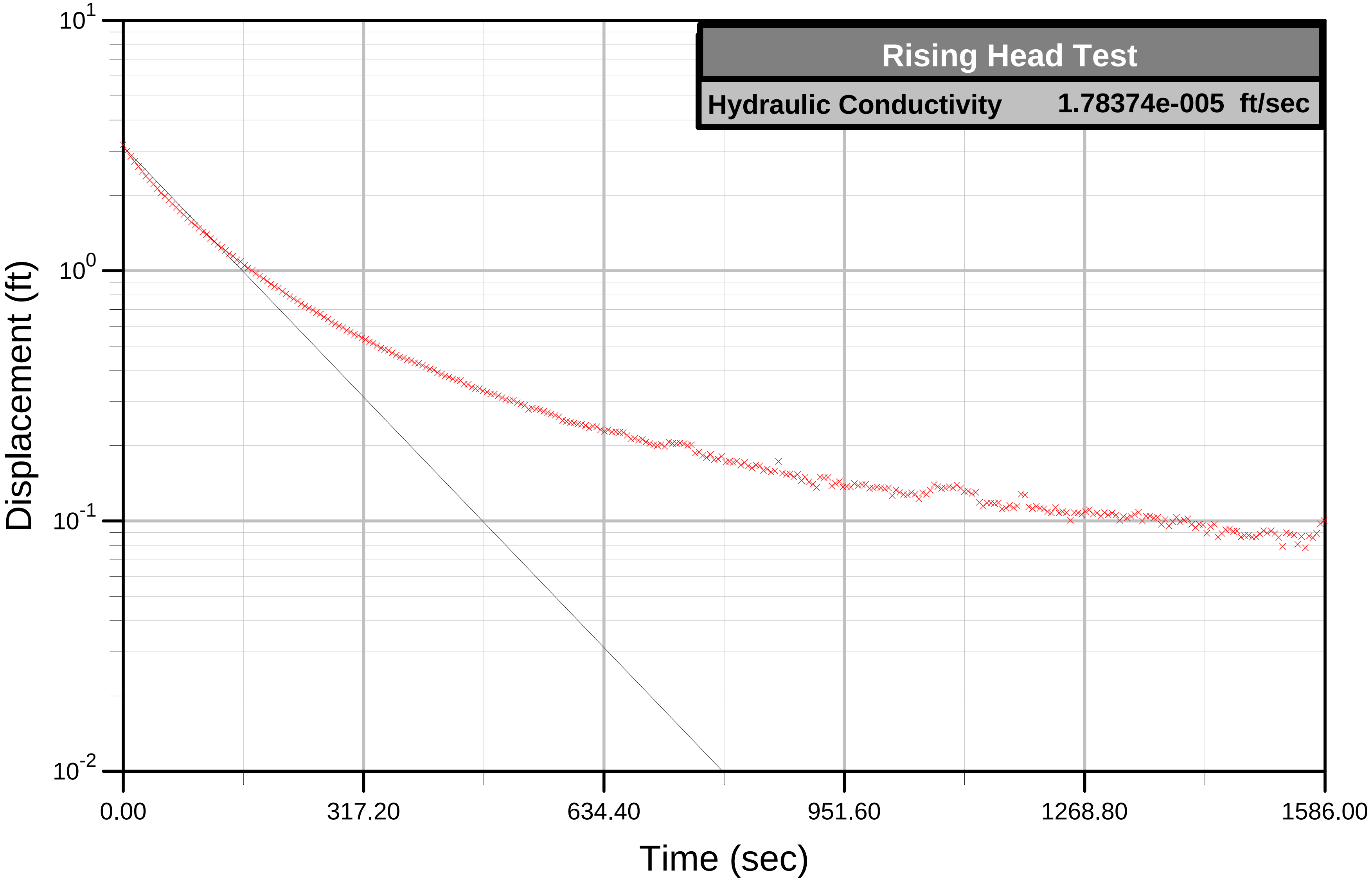

Rising Head Test
Hydraulic Conductivity 5.23609e-006 ft/sec
Displacement (ft)
10^1
10^0
0.0
107.2
214.4
321.6
428.8
536.0
Time (sec)

RW-RW93

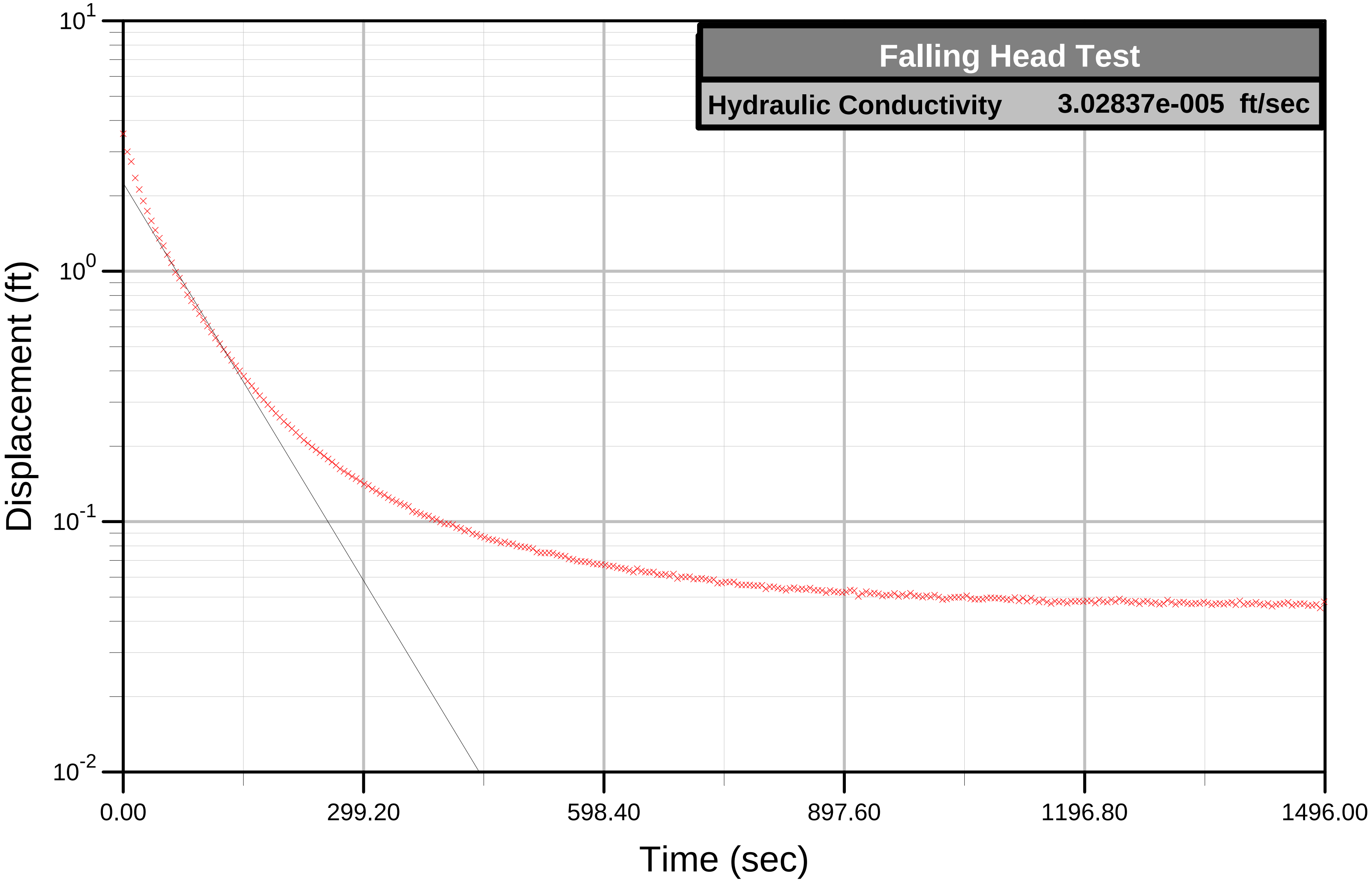


Falling Head Test
Hydraulic Conductivity 1.27792e-005 ft/sec
Displacement (ft)
10^1
10^0
10^-1
10^-2
Time (sec)
0.00
422.20
844.40
1266.60
1688.80
2111.00

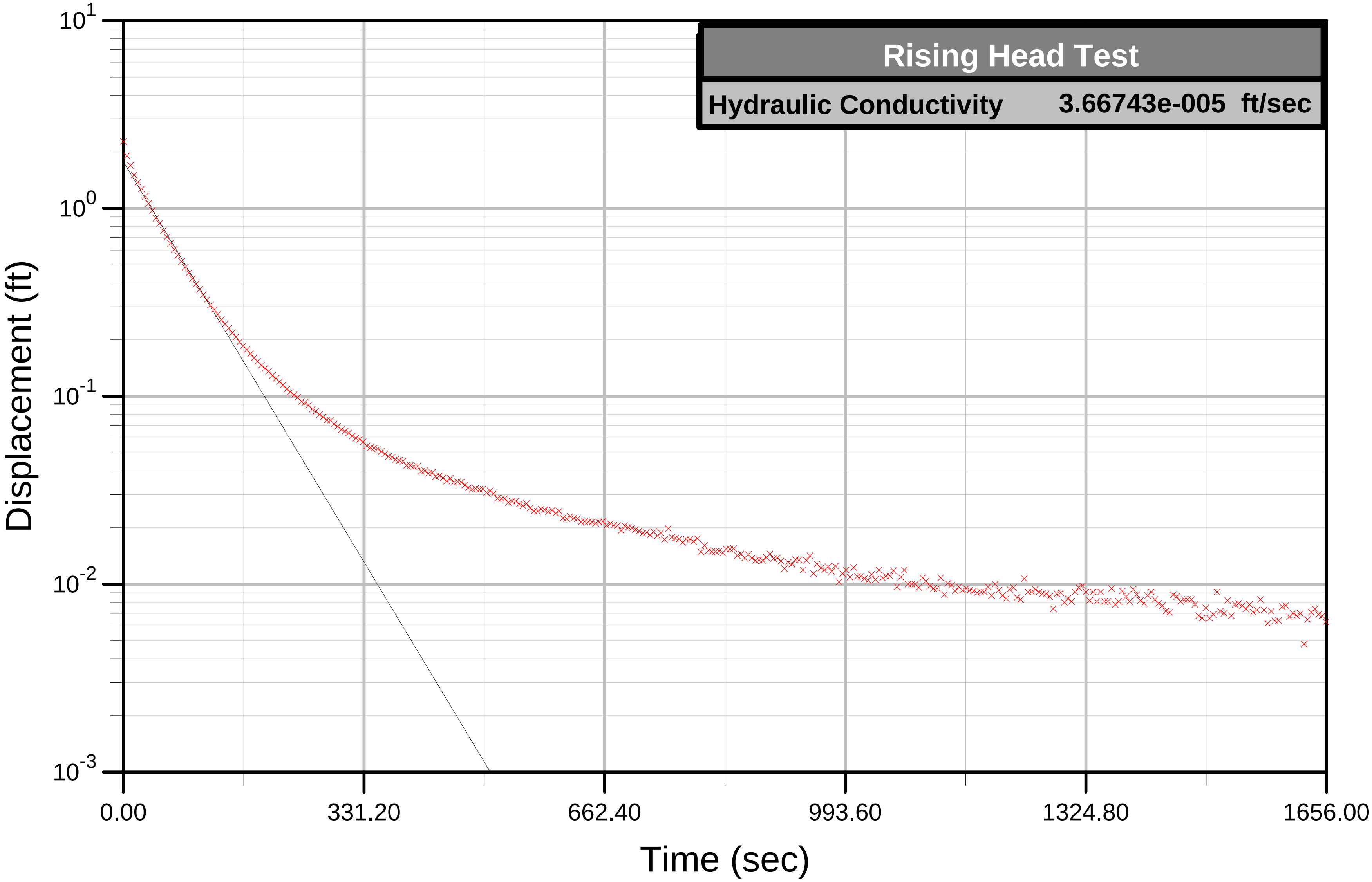
RW-RW93


Rising Head Test
Hydraulic Conductivity 1.78374e-005 ft/sec
Displacement (ft)
10^1
10^0
10^{-1}
10^{-2}
0.00
317.20
634.40
951.60
1268.80
1586.00
Time (sec)

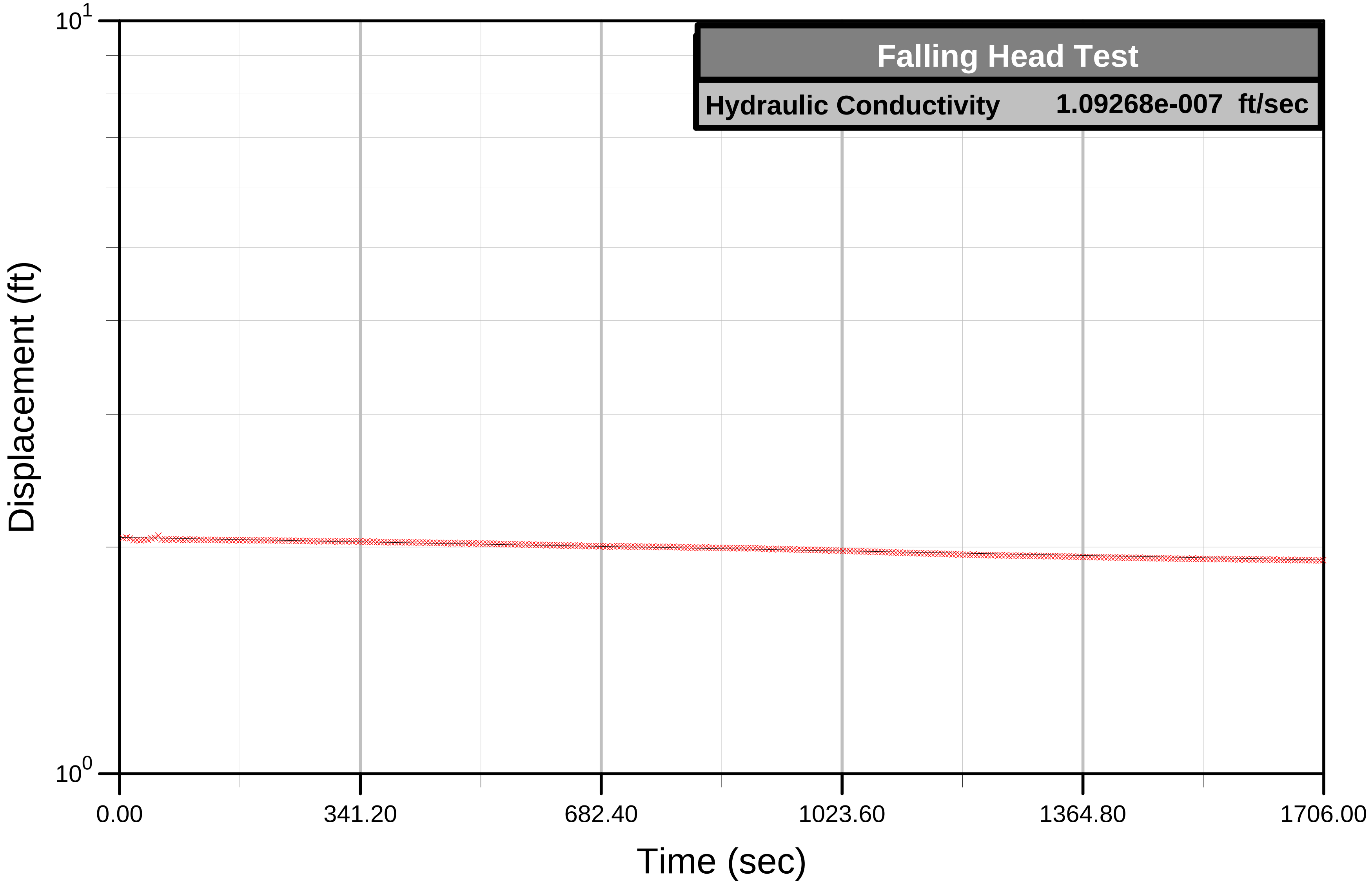
RW-RW95


Falling Head Test
Hydraulic Conductivity 3.02837e-005 ft/sec
10^{1}
10^{0}
10^{-1}
10^{-2}
Displacement (ft)
0.00
299.20
598.40
897.60
1196.80
1496.00
Time (sec)

RW-RW95

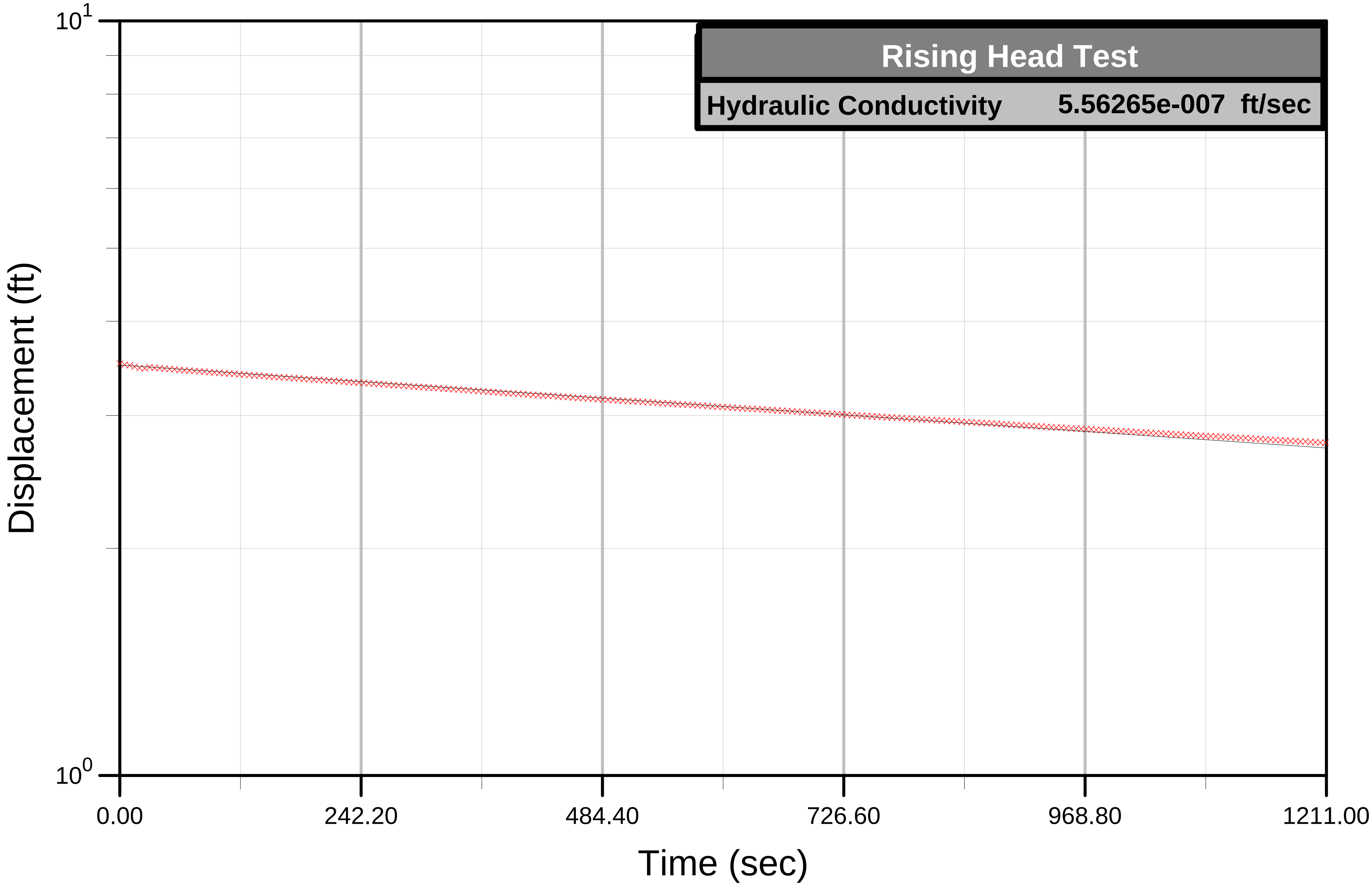

Rising Head Test
Hydraulic Conductivity 3.66743e-005 ft/sec
Displacement (ft)
10^{1}
10^{0}
10^{-1}
10^{-2}
10^{-3}
0.00
331.20
662.40
993.60
1324.80
1656.00
Time (sec)

RW-RW97



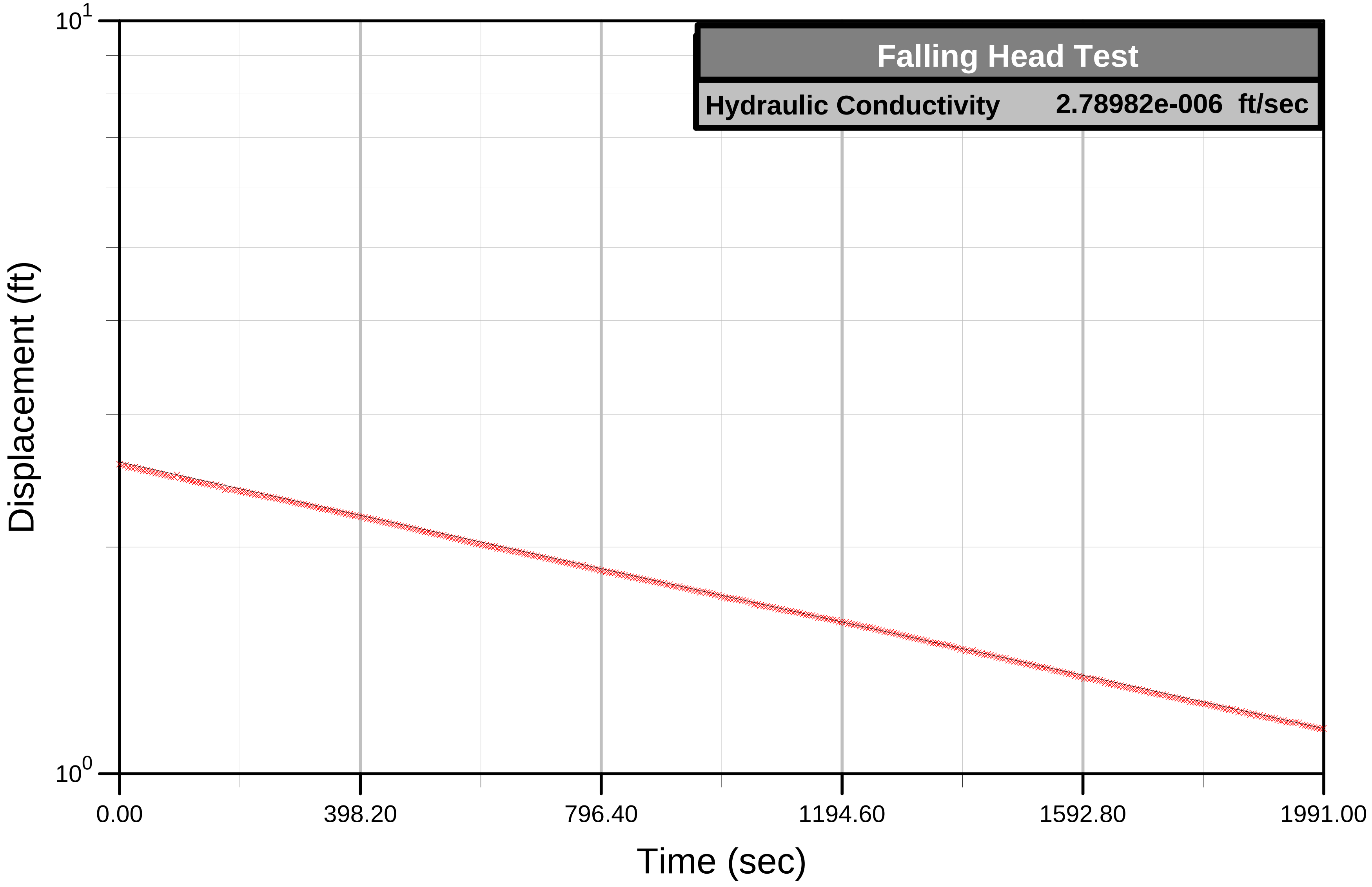
Falling Head Test
Hydraulic Conductivity 1.09268e-007 ft/sec
10^1
10^0
Displacement (ft)
0.00
341.20
682.40
1023.60
1364.80
1706.00
Time (sec)

RW-RW97

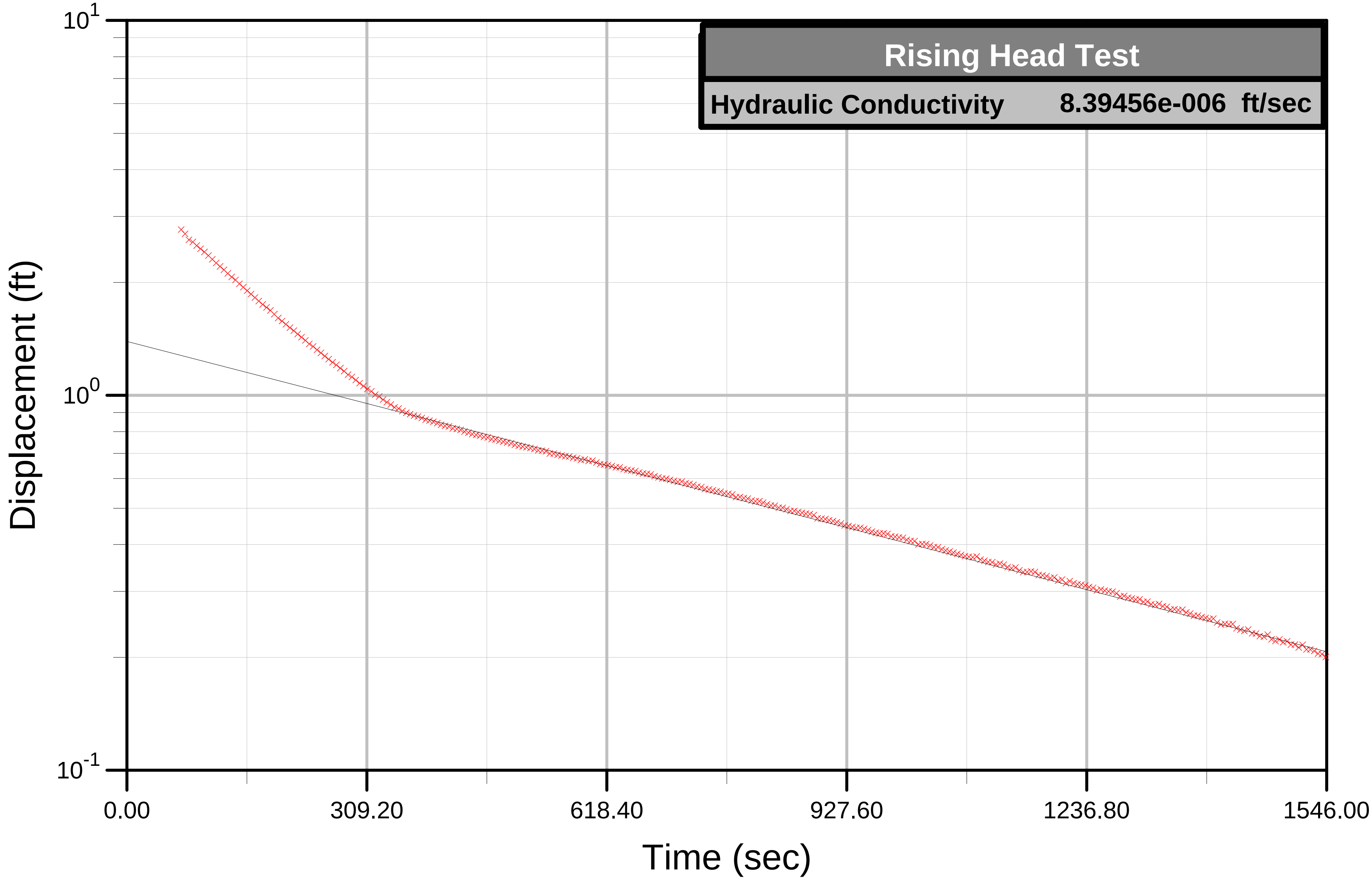


Rising Head Test
Hydraulic Conductivity 5.56265e-007 ft/sec
10^1
10^0
Displacement (ft)
0.00
242.20
484.40
726.60
968.80
1211.00
Time (sec)

TS04-PDM004

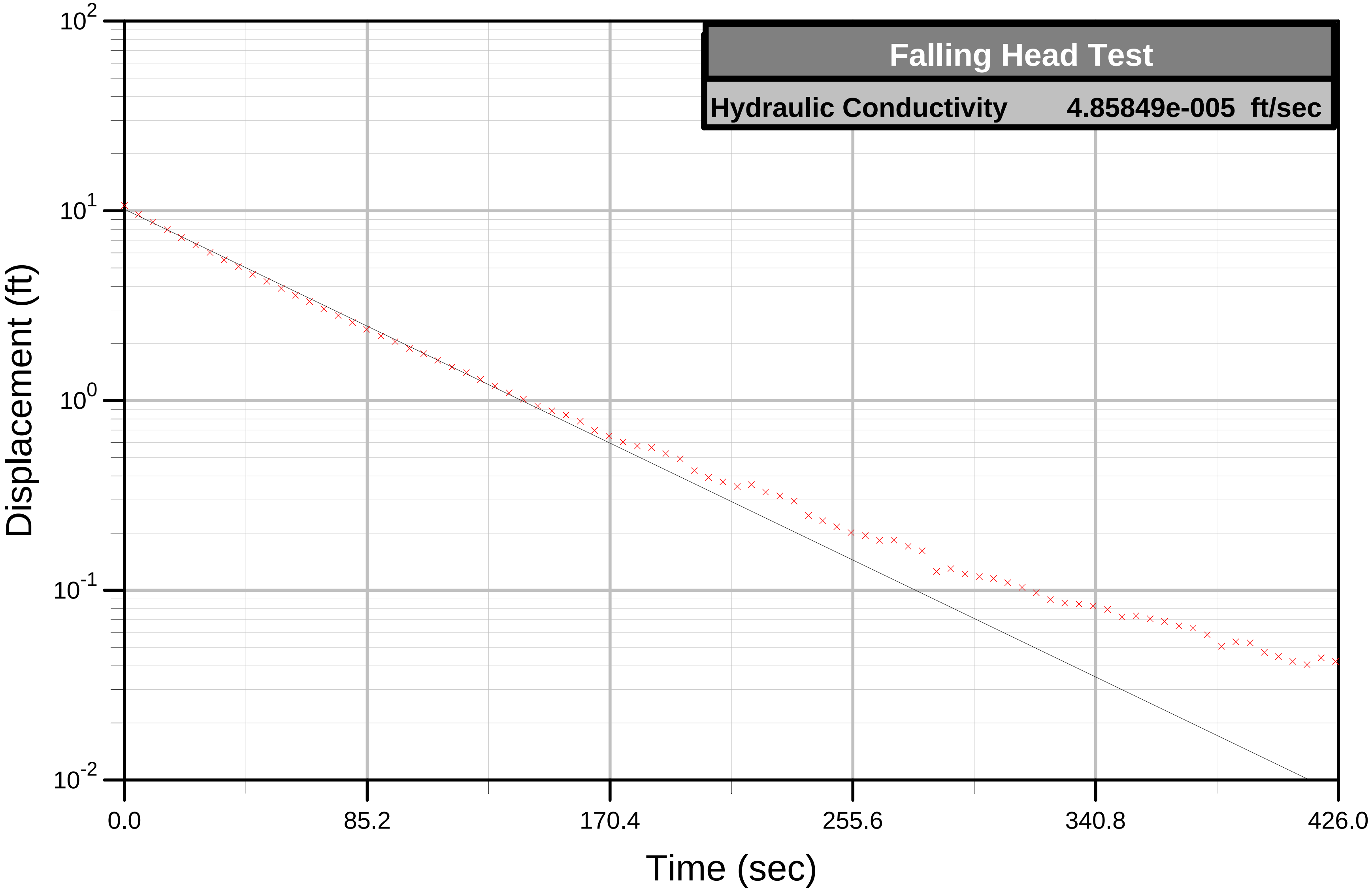

Falling Head Test
Hydraulic Conductivity 2.78982e-006 ft/sec
Displacement (ft)
10^1
10^0
0.00
398.20
796.40
1194.60
1592.80
1991.00
Time (sec)

TS04-PDM004


Rising Head Test
Hydraulic Conductivity 8.39456e-006 ft/sec
10^1
10^0
10^{-1}
Displacement (ft)
0.00
309.20
618.40
927.60
1236.80
1546.00
Time (sec)

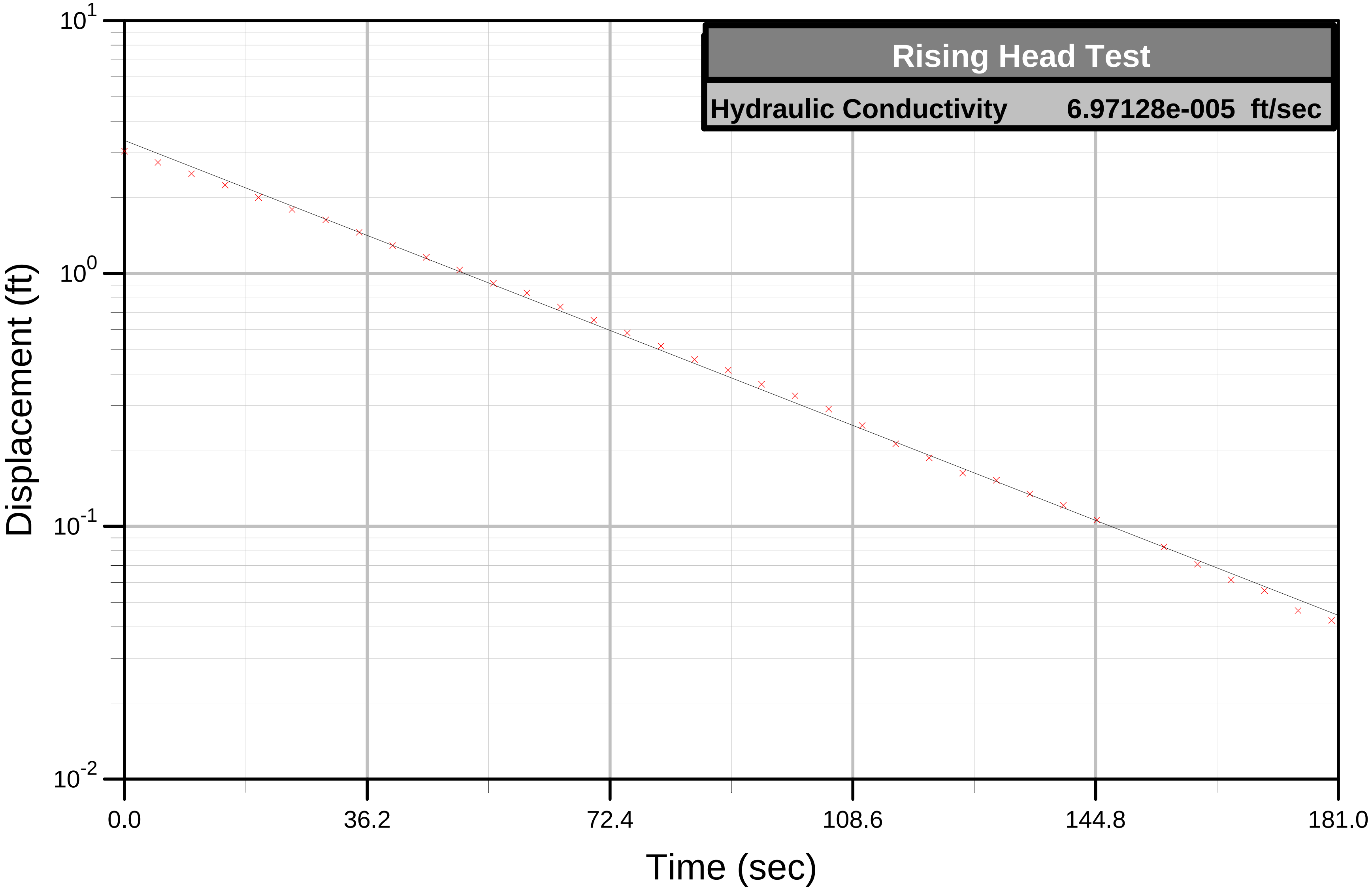
INTERMEDIATE MONITORING WELLS

RW01-PZM020

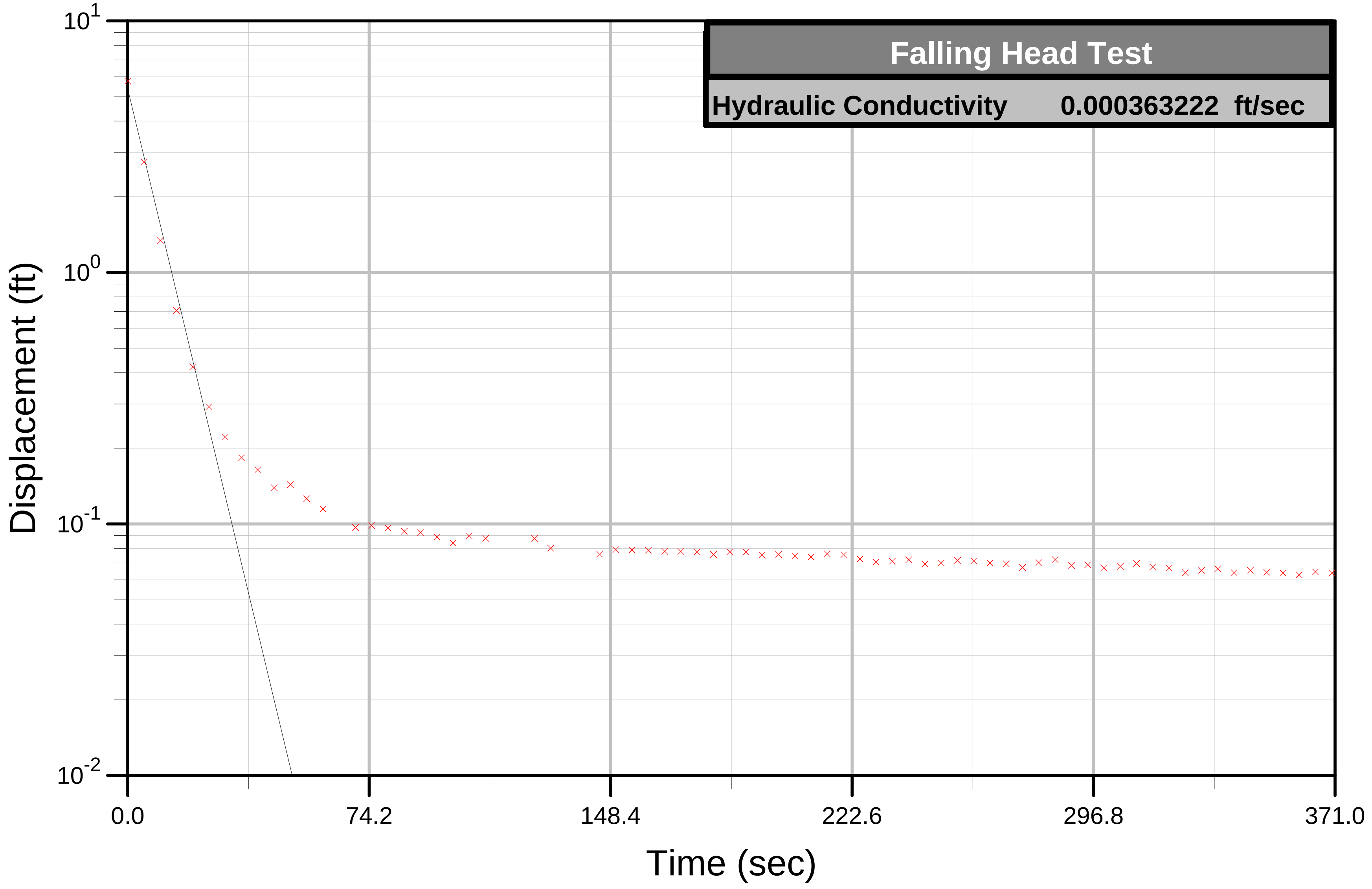


Falling Head Test
Hydraulic Conductivity 4.85849e-005 ft/sec
Displacement (ft)
Time (sec)
10^{2}
10^{1}
10^{0}
10^{-1}
10^{-2}
0.0
85.2
170.4
255.6
340.8
426.0

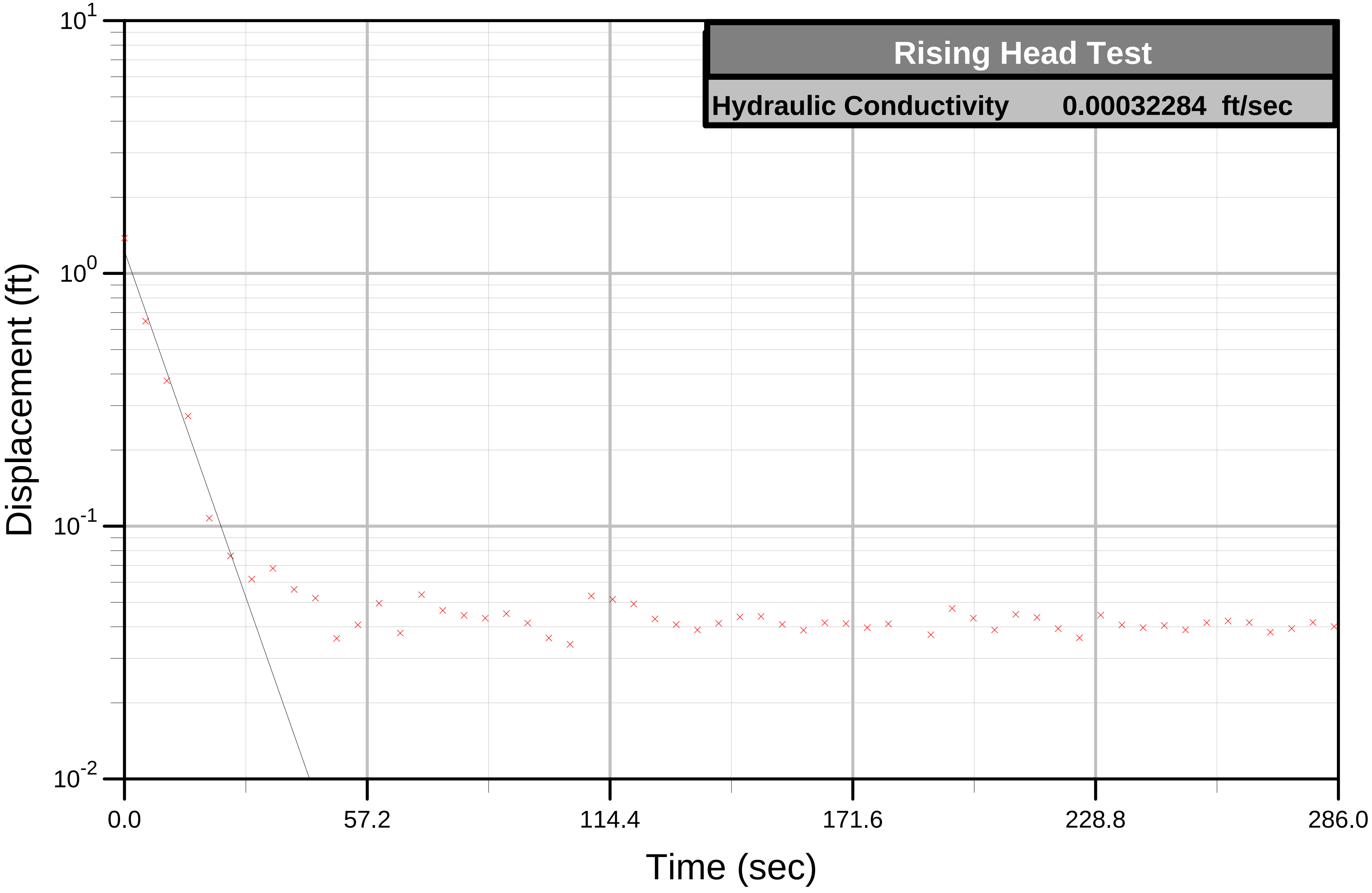
RW01-PZM020


Rising Head Test
Hydraulic Conductivity 6.97128e-005 ft/sec
Displacement (ft)
10^1
10^0
10^{-1}
10^{-2}
0.0
36.2
72.4
108.6
144.8
181.0
Time (sec)

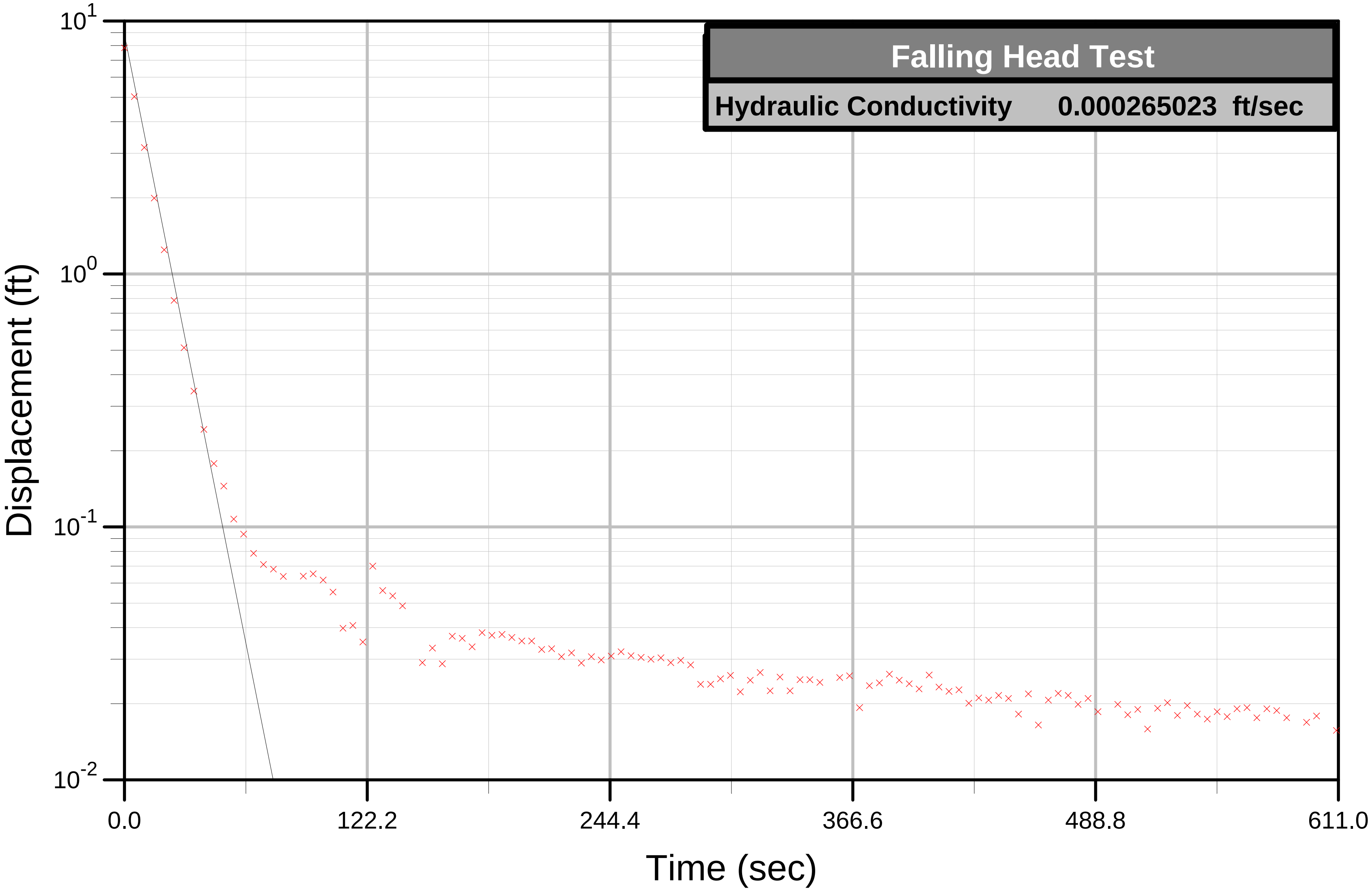
RW02-PZM020


Falling Head Test
Hydraulic Conductivity 0.000363222 ft/sec
Displacement (ft)
10^1
10^0
10^{-1}
10^{-2}
0.0
74.2
148.4
222.6
296.8
371.0
Time (sec)

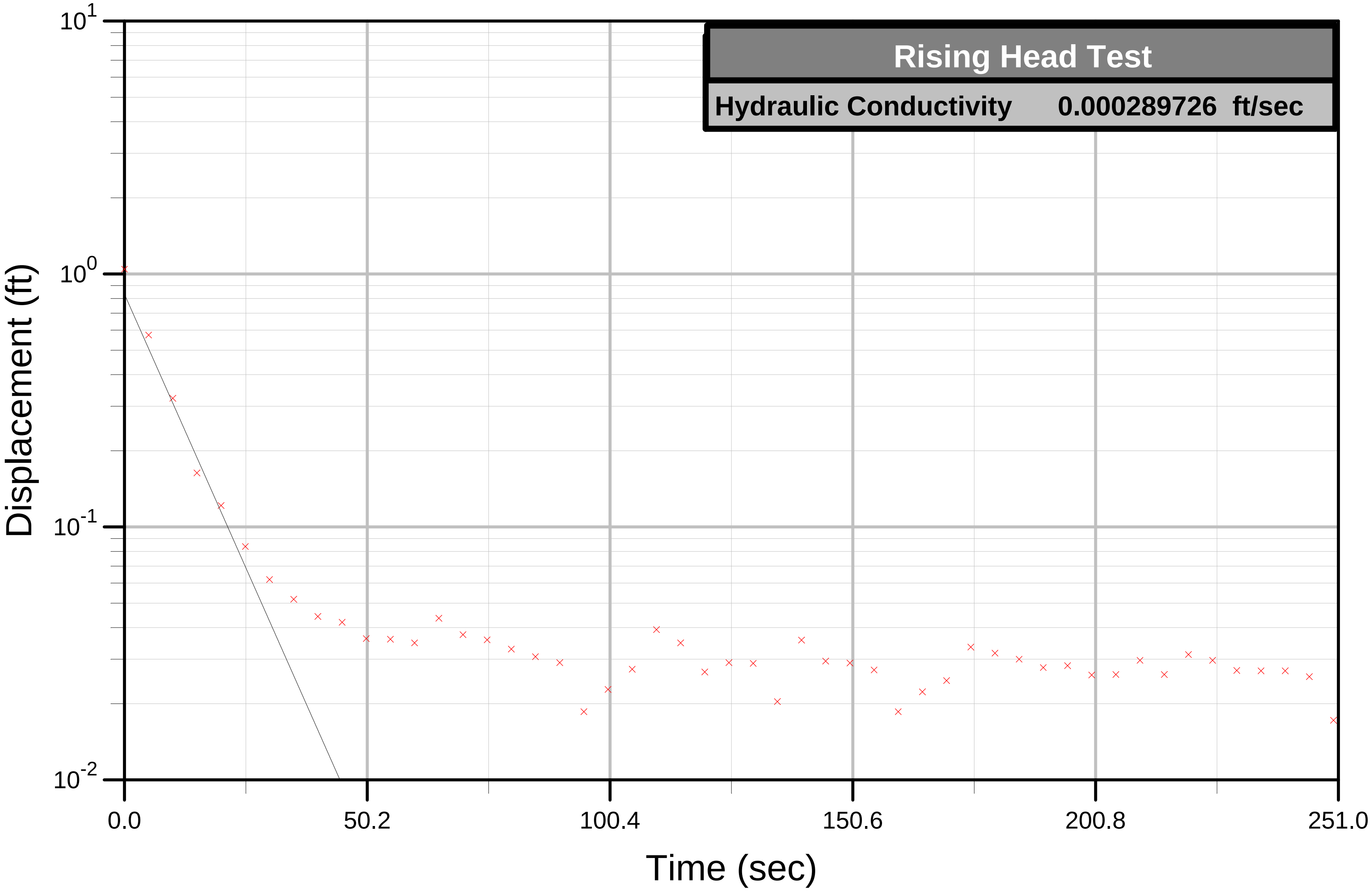
RW02-PZM020


Rising Head Test
Hydraulic Conductivity 0.00032284 ft/sec
Displacement (ft)
10^1
10^0
10^{-1}
10^{-2}
0.0
57.2
114.4
171.6
228.8
286.0
Time (sec)

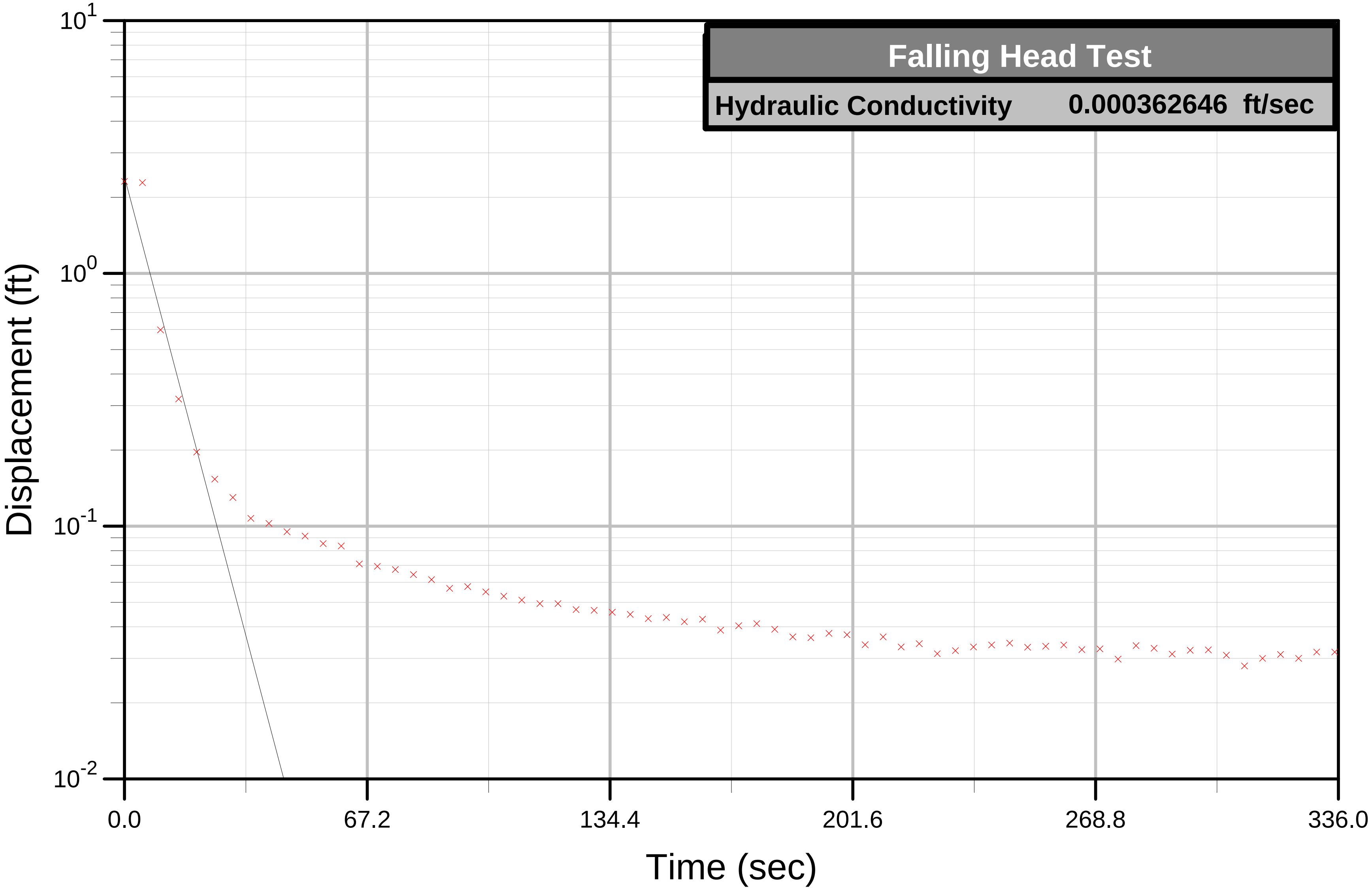
RW07-PZM017


Falling Head Test
Hydraulic Conductivity 0.000265023 ft/sec
Displacement (ft)
10^1
10^0
10^{-1}
10^{-2}
0.0
122.2
244.4
366.6
488.8
611.0
Time (sec)

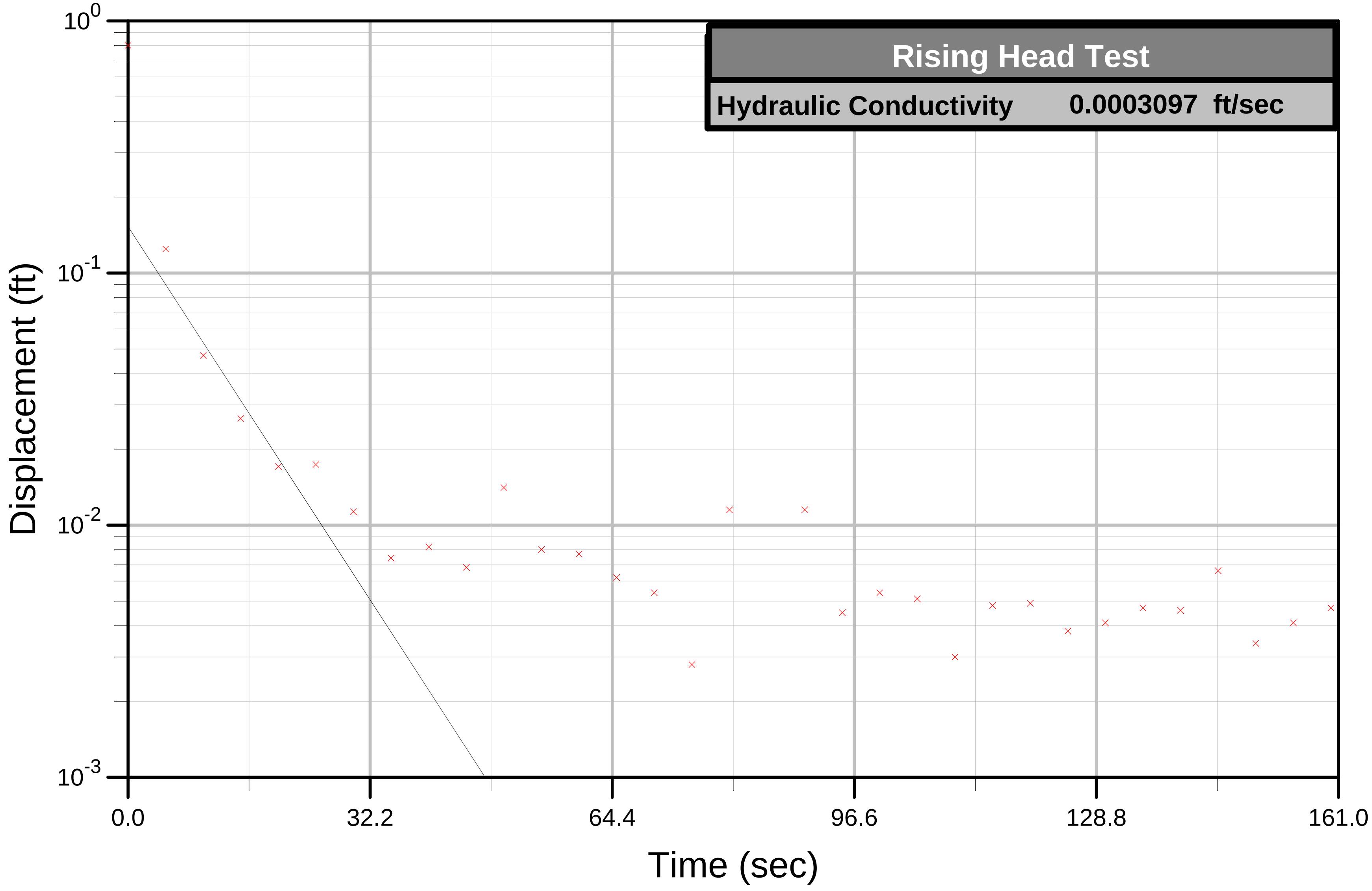
RW07-PZM017


Rising Head Test
Hydraulic Conductivity 0.000289726 ft/sec
Displacement (ft)
10^1
10^0
10^{-1}
10^{-2}
0.0
50.2
100.4
150.6
200.8
251.0
Time (sec)

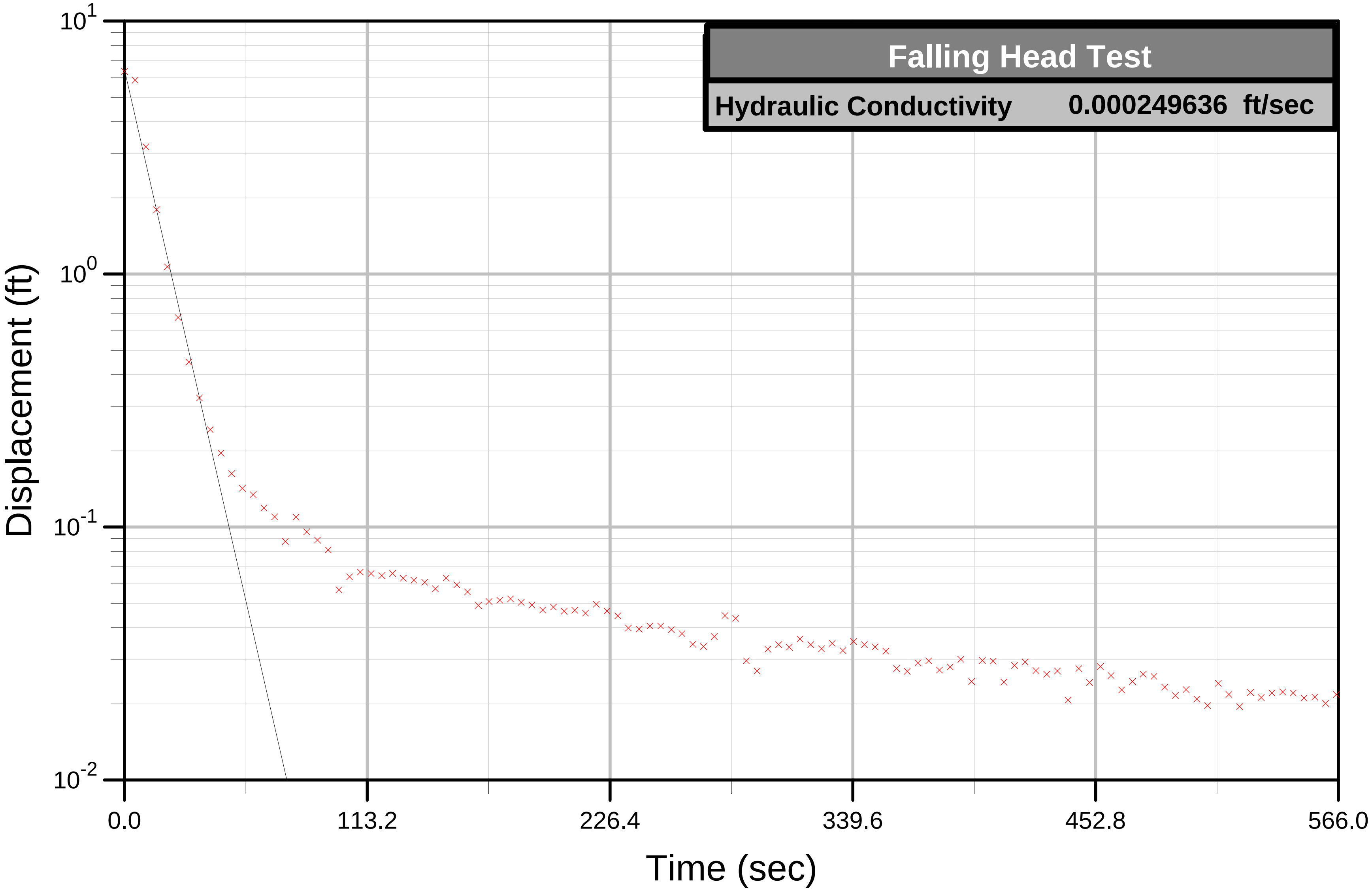
RW13-PZM020


Falling Head Test
Hydraulic Conductivity 0.000362646 ft/sec
Displacement (ft)
10^1
10^0
10^{-1}
10^{-2}
0.0
67.2
134.4
201.6
268.8
336.0
Time (sec)

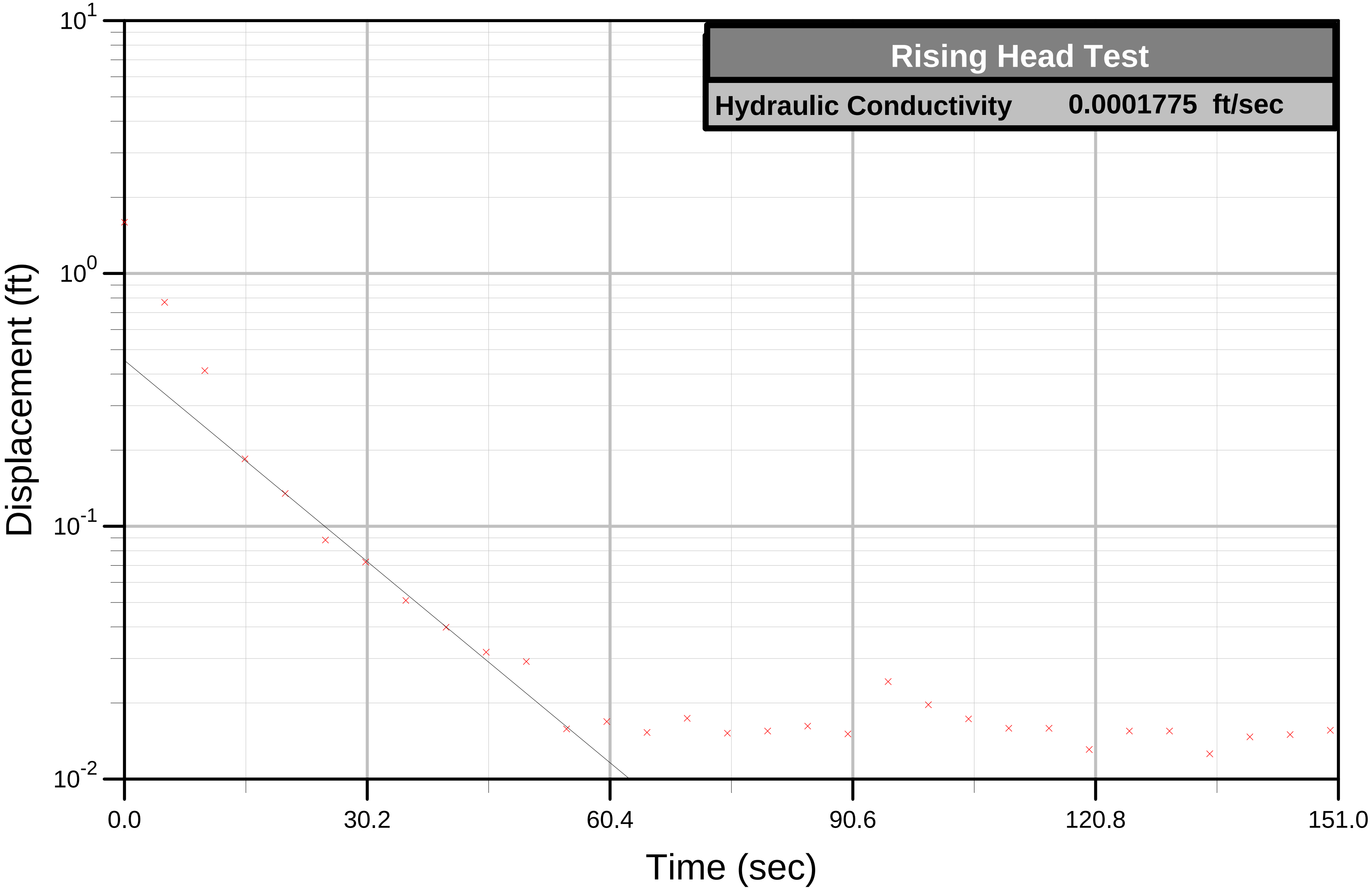
RW13-PZM020


Rising Head Test
Hydraulic Conductivity 0.0003097 ft/sec
Displacement (ft)
10^0
10^{-1}
10^{-2}
10^{-3}
0.0
32.2
64.4
96.6
128.8
161.0
Time (sec)

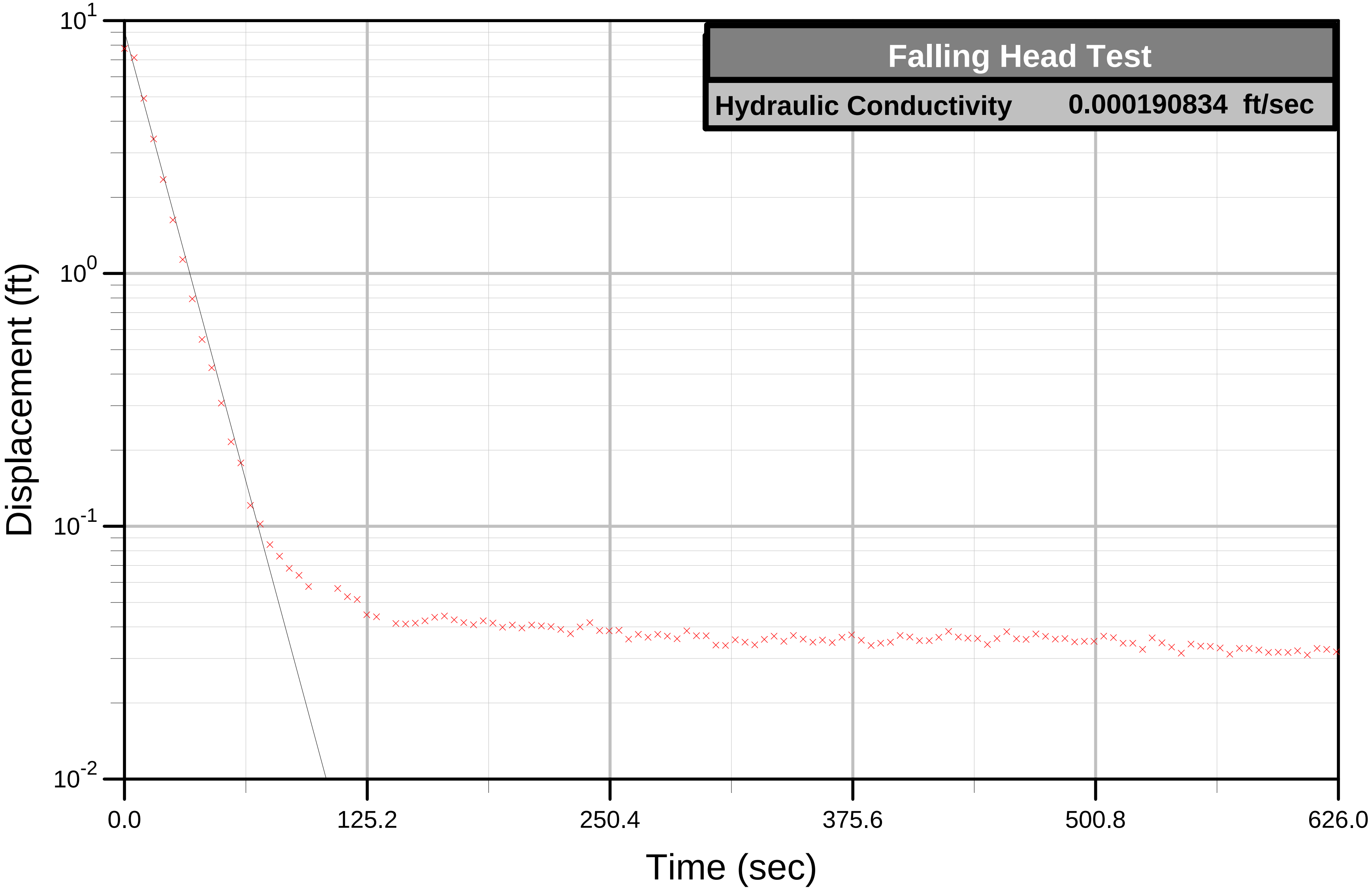
RW14-PZM020


Falling Head Test
Hydraulic Conductivity 0.000249636 ft/sec
Displacement (ft)
10^{1}
10^{0}
10^{-1}
10^{-2}
0.0
113.2
226.4
339.6
452.8
566.0
Time (sec)

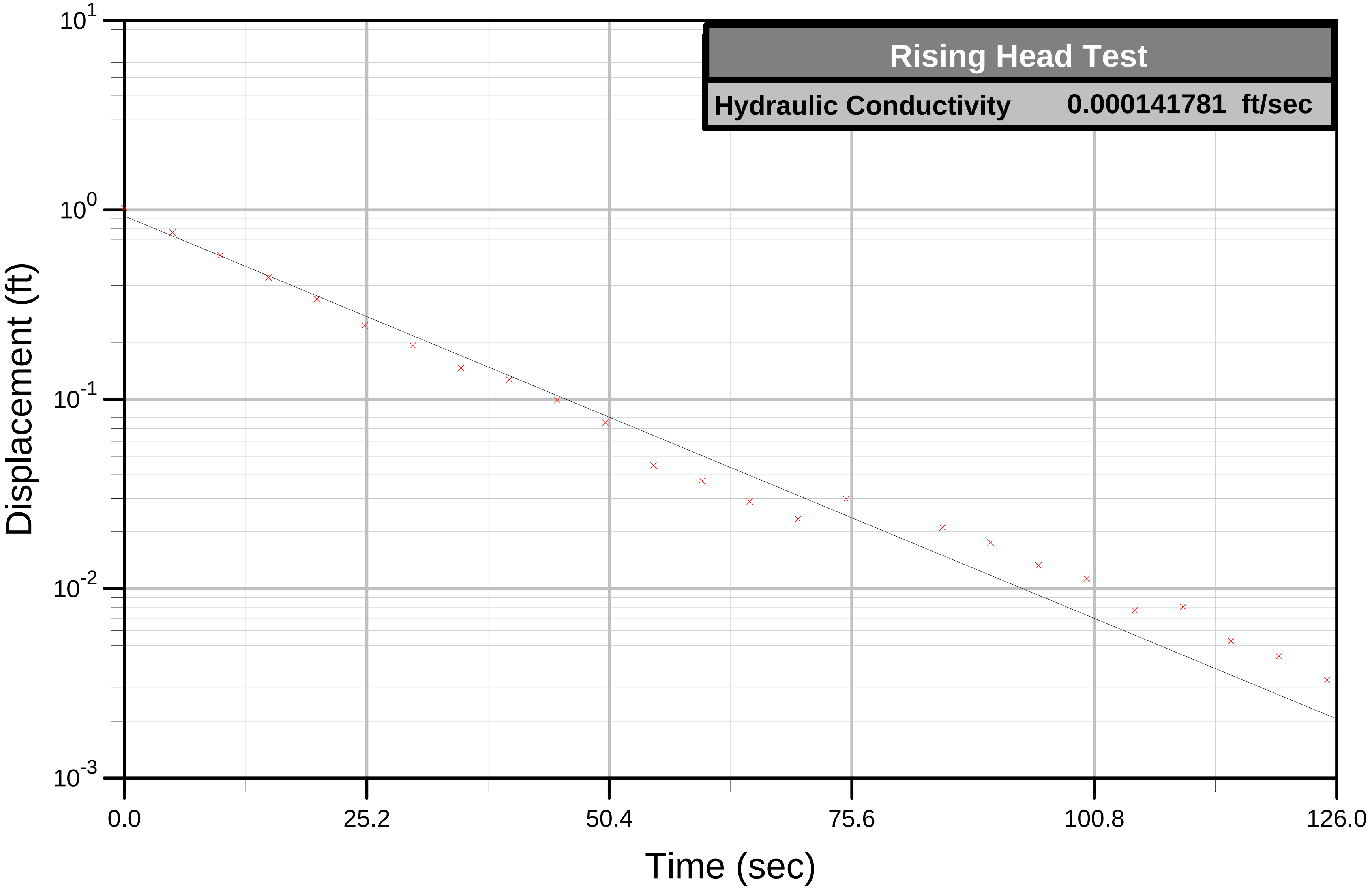
RW14-PZM020


Rising Head Test
Hydraulic Conductivity 0.0001775 ft/sec
Displacement (ft)
10^1
10^0
10^{-1}
10^{-2}
0.0
30.2
60.4
90.6
120.8
151.0
Time (sec)

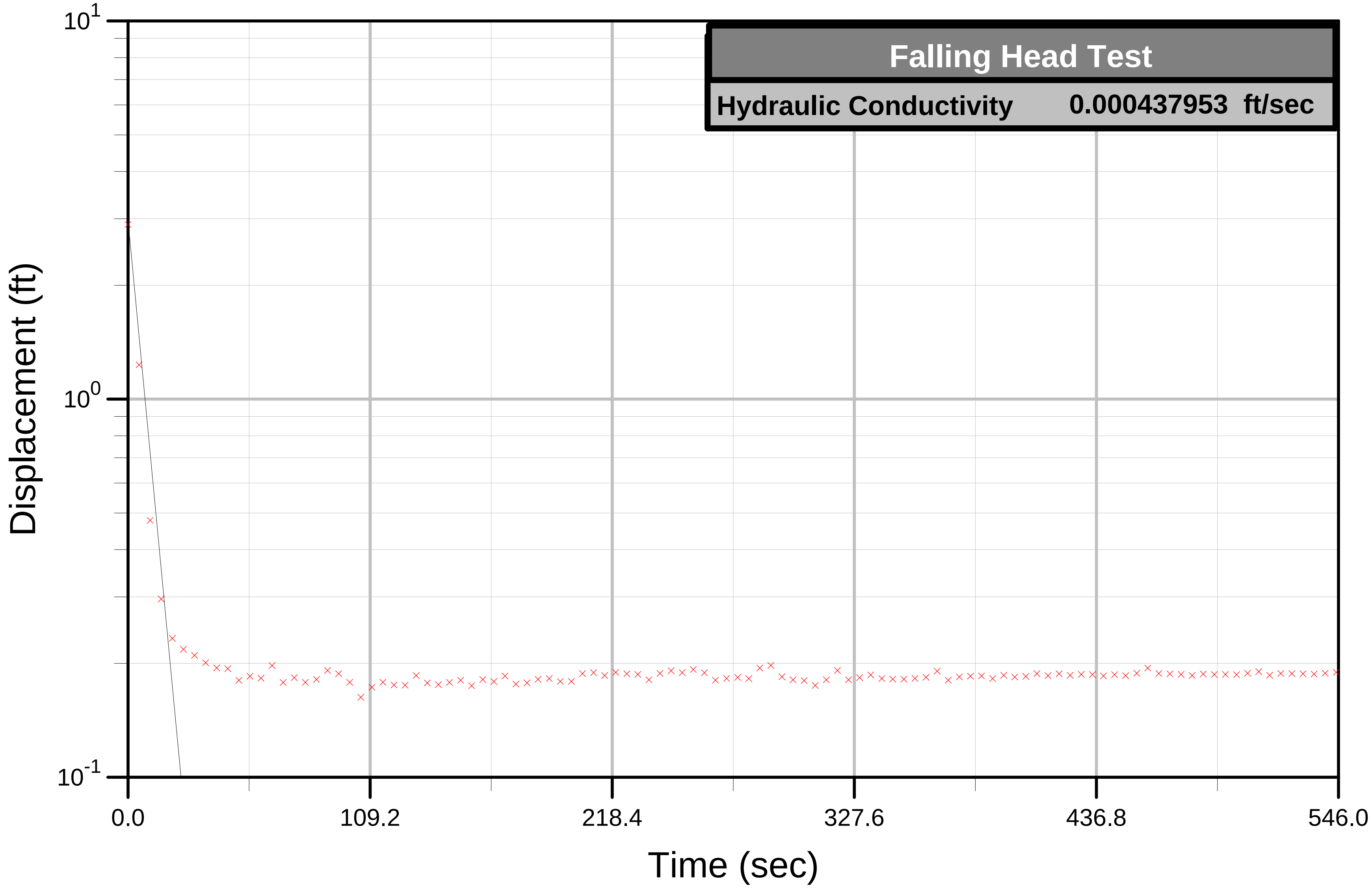
RW16-PZM020


Falling Head Test
Hydraulic Conductivity 0.000190834 ft/sec
Displacement (ft)
10^{1}
10^{0}
10^{-1}
10^{-2}
0.0
125.2
250.4
375.6
500.8
626.0
Time (sec)

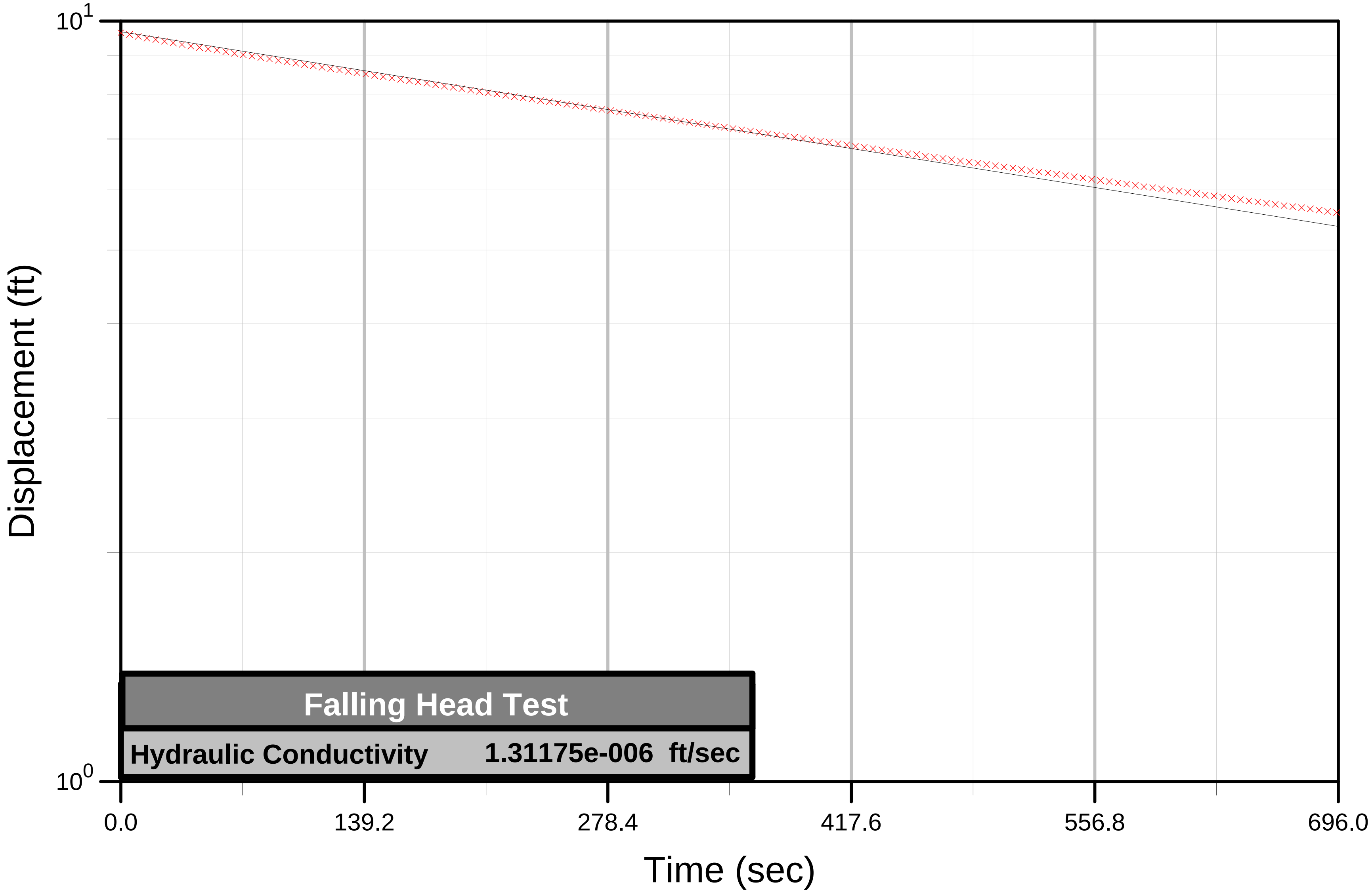
RW16-PZM020


Rising Head Test
Hydraulic Conductivity 0.000141781 ft/sec
Displacement (ft)
10^1
10^0
10^{-1}
10^{-2}
10^{-3}
0.0
25.2
50.4
75.6
100.8
126.0
Time (sec)

RW17-PZM019

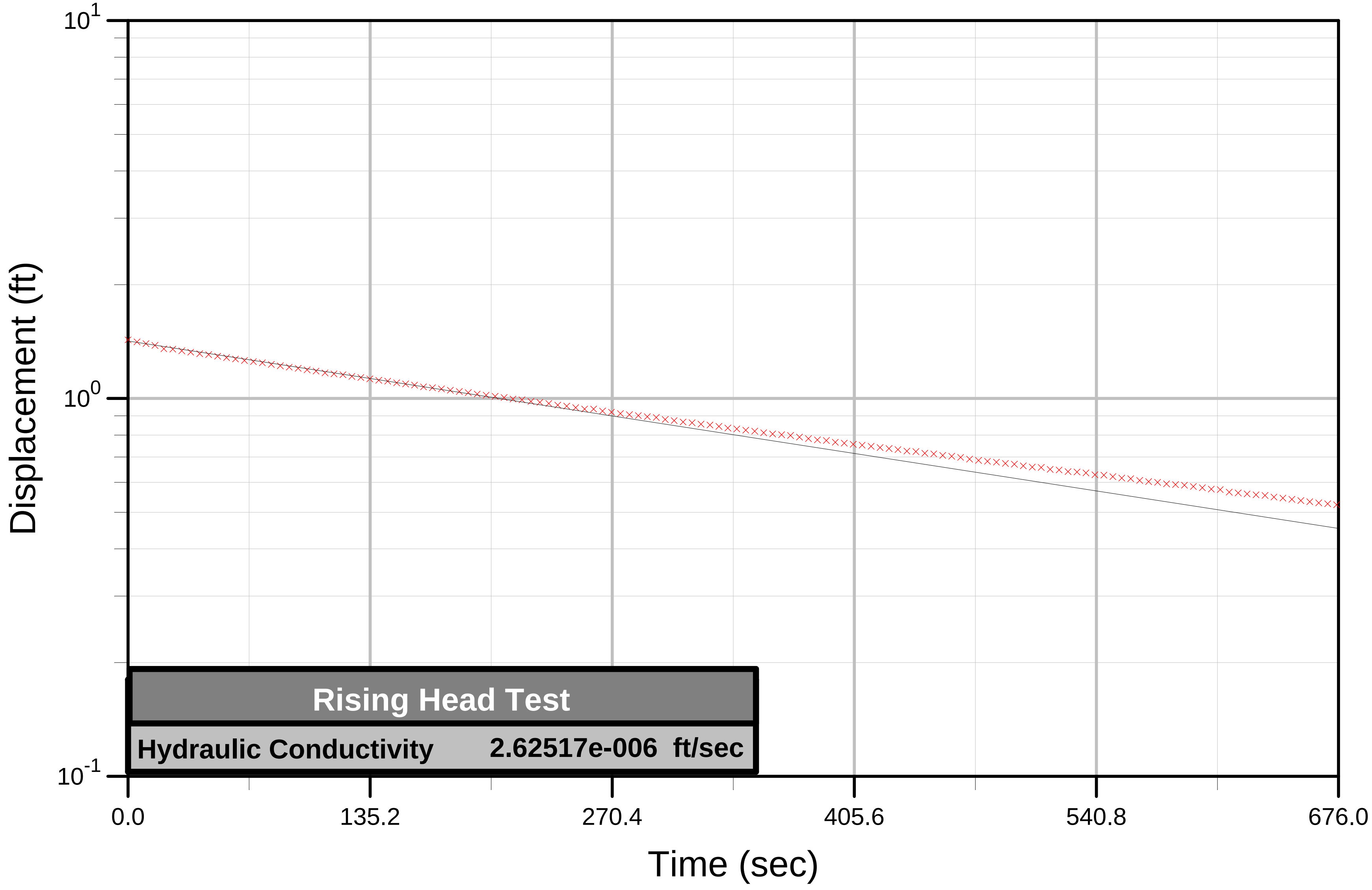

Falling Head Test
Hydraulic Conductivity 0.000437953 ft/sec
10^1
10^0
10^{-1}
Displacement (ft)
0.0
109.2
218.4
327.6
436.8
546.0
Time (sec)

RW20-PZM020

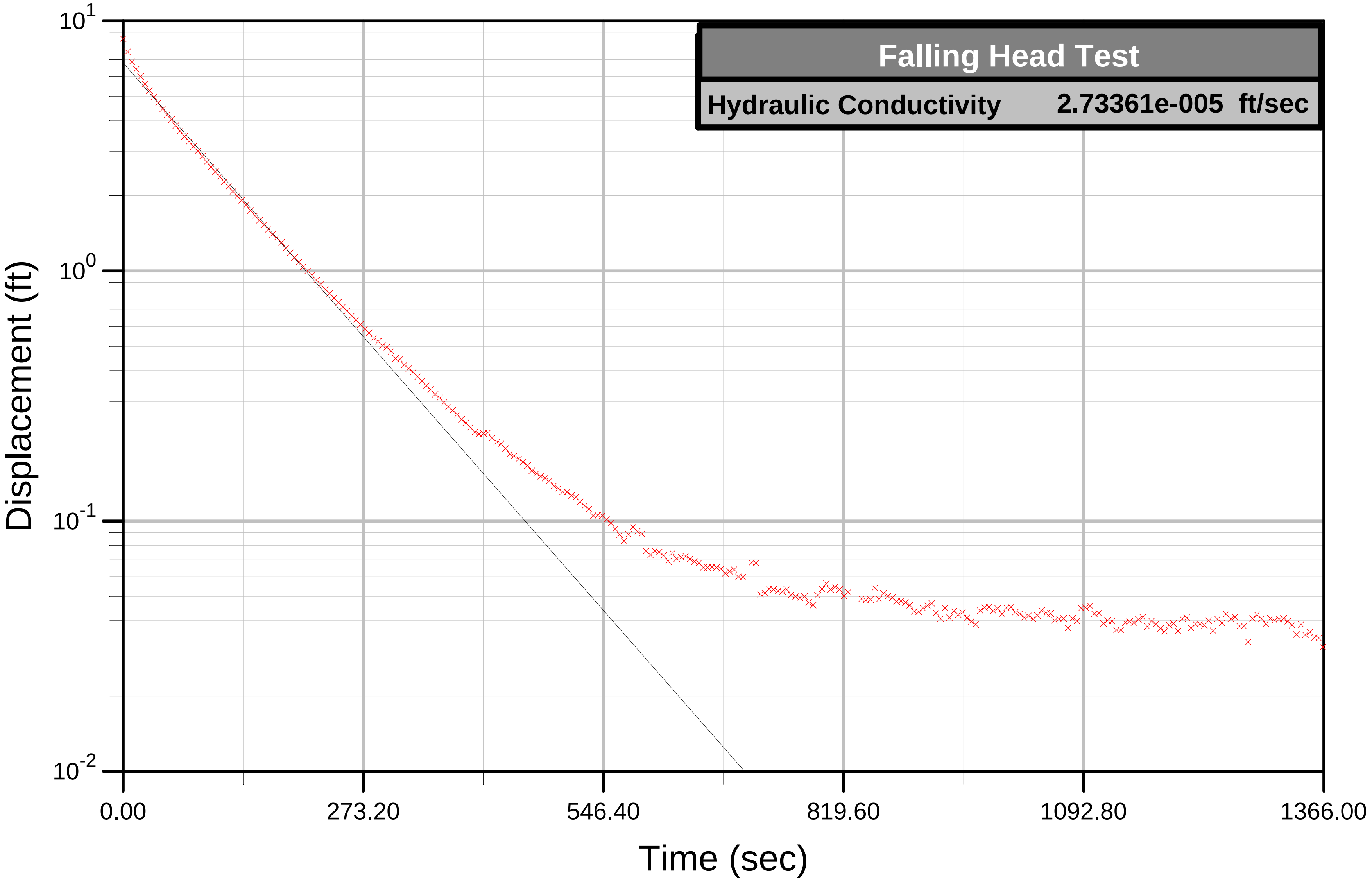


10^1
10^0
Displacement (ft)
0.0
139.2
278.4
417.6
556.8
696.0
Time (sec)
Falling Head Test
Hydraulic Conductivity
1.31175e-006 ft/sec

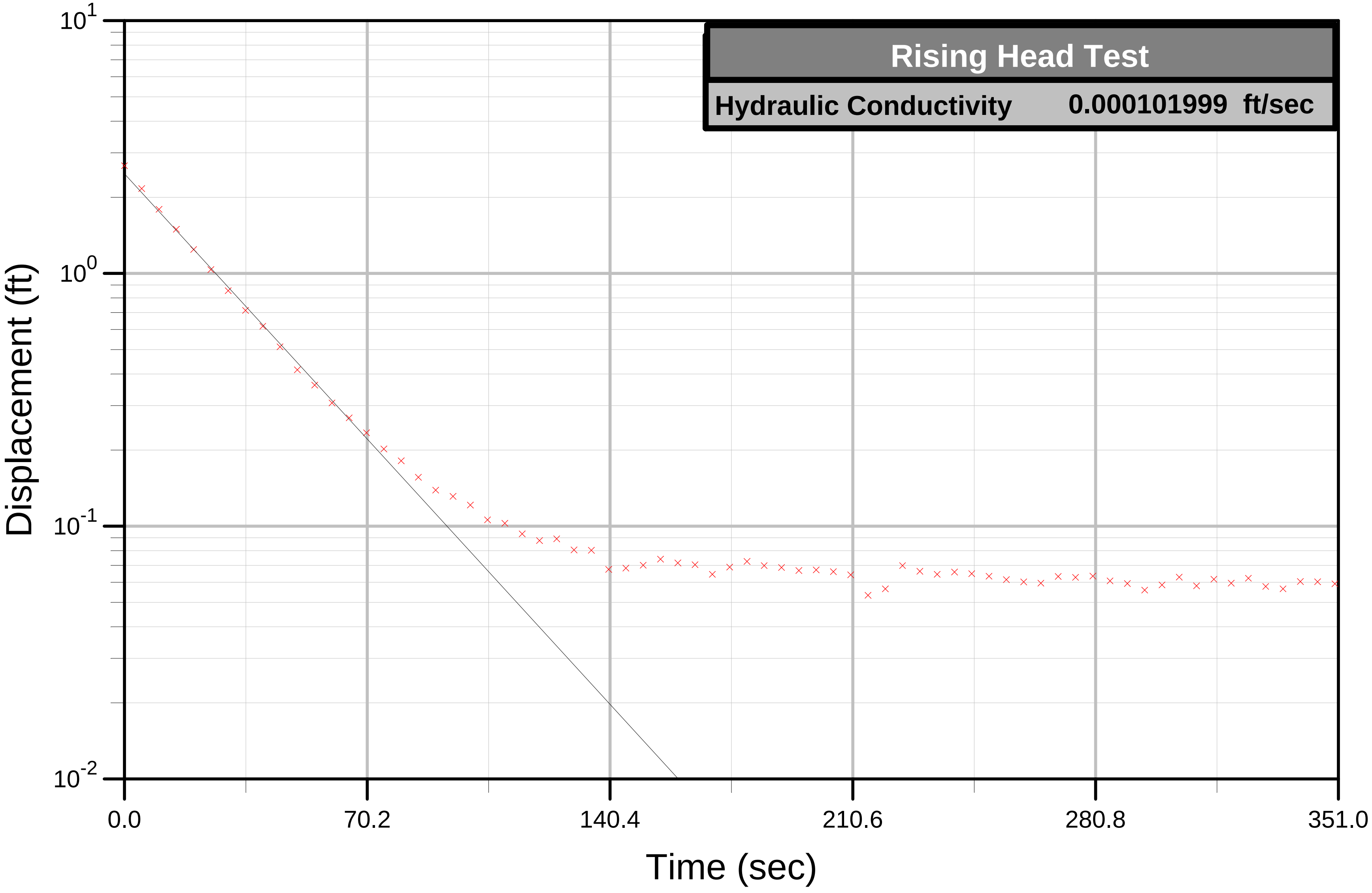
RW20-PZM020


10^1
10^0
10^{-1}
Displacement (ft)
0.0
135.2
270.4
405.6
540.8
676.0
Time (sec)
Rising Head Test
Hydraulic Conductivity 2.62517e-006 ft/sec

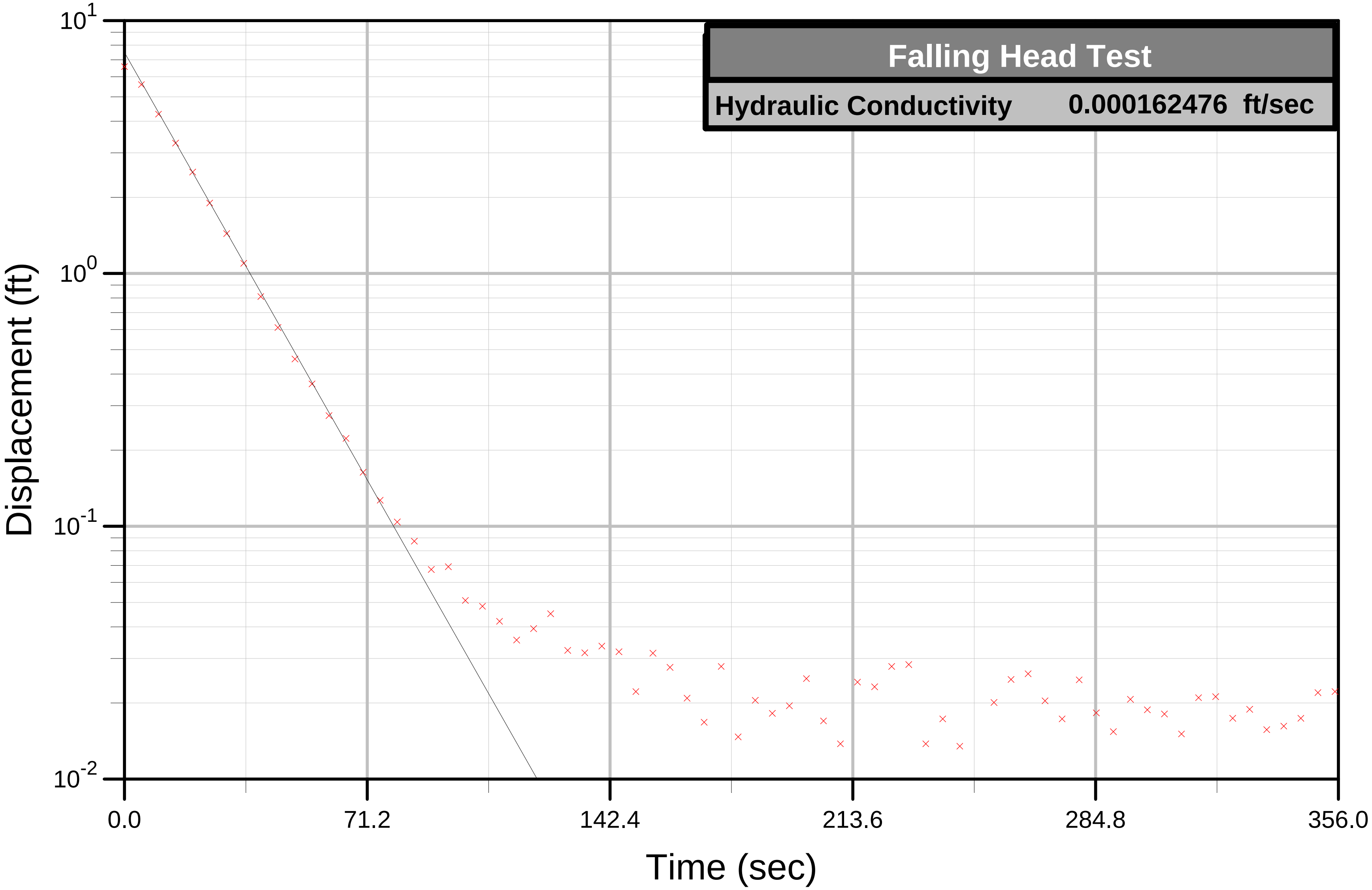
RW21-PZM023


Falling Head Test
Hydraulic Conductivity 2.73361e-005 ft/sec
10^1
10^0
10^{-1}
10^{-2}
Displacement (ft)
0.00
273.20
546.40
819.60
1092.80
1366.00
Time (sec)

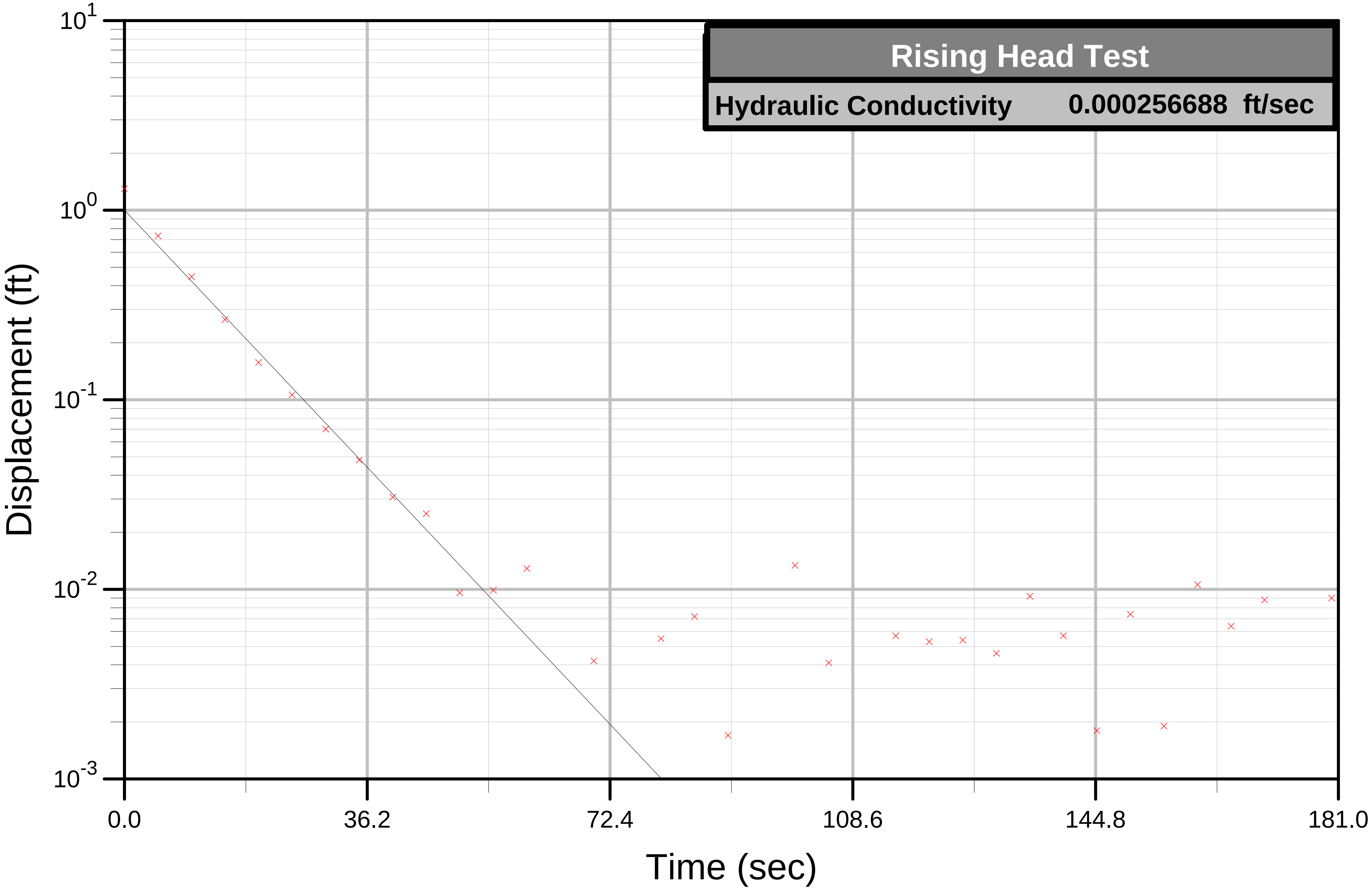
RW21-PZM023


Rising Head Test
Hydraulic Conductivity 0.000101999 ft/sec
Displacement (ft)
10^1
10^0
10^{-1}
10^{-2}
0.0
70.2
140.4
210.6
280.8
351.0
Time (sec)

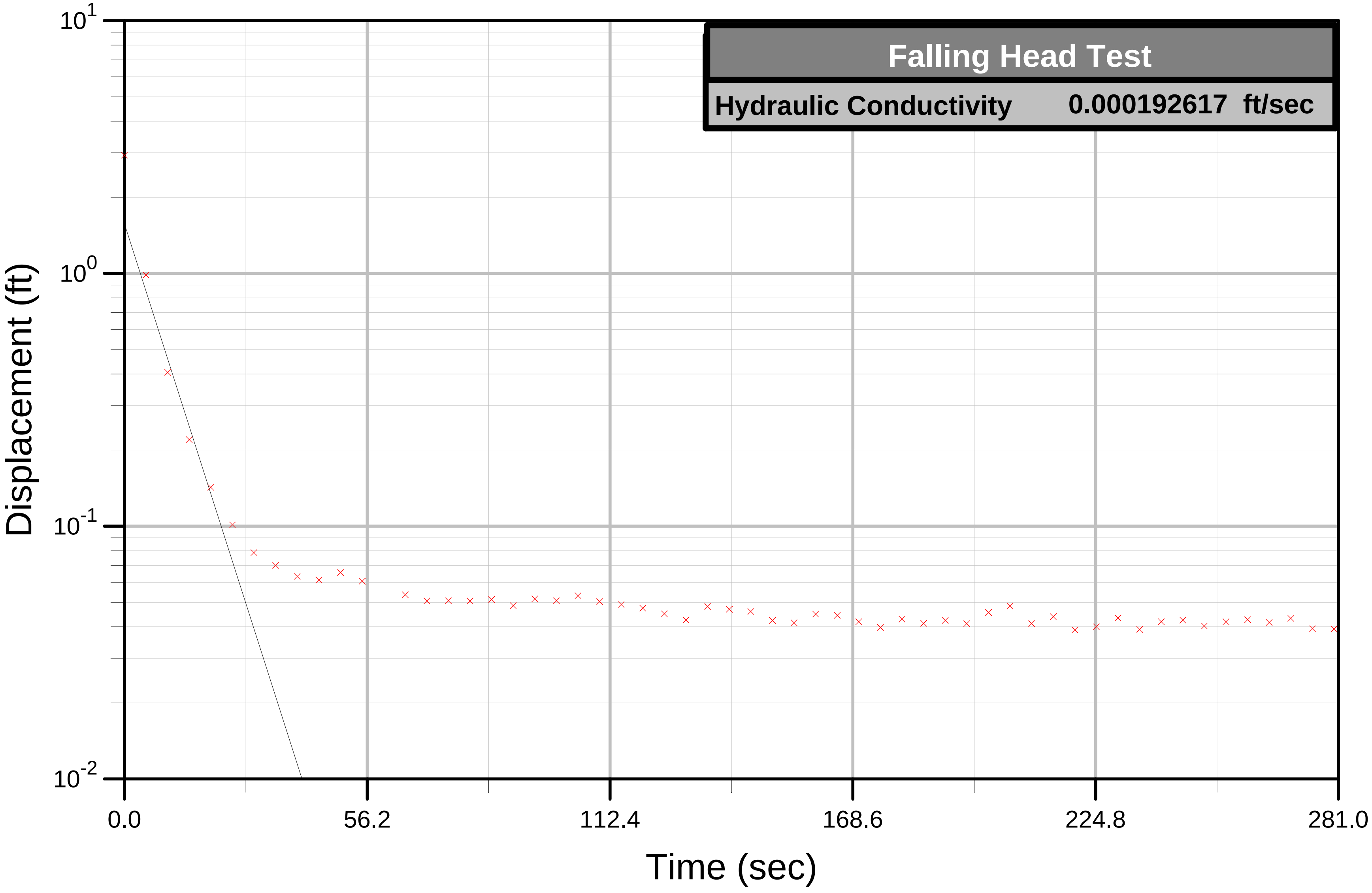
RW-22(I)


Falling Head Test
Hydraulic Conductivity 0.000162476 ft/sec
10^1
10^0
10^{-1}
10^{-2}
Displacement (ft)
0.0
71.2
142.4
213.6
284.8
356.0
Time (sec)

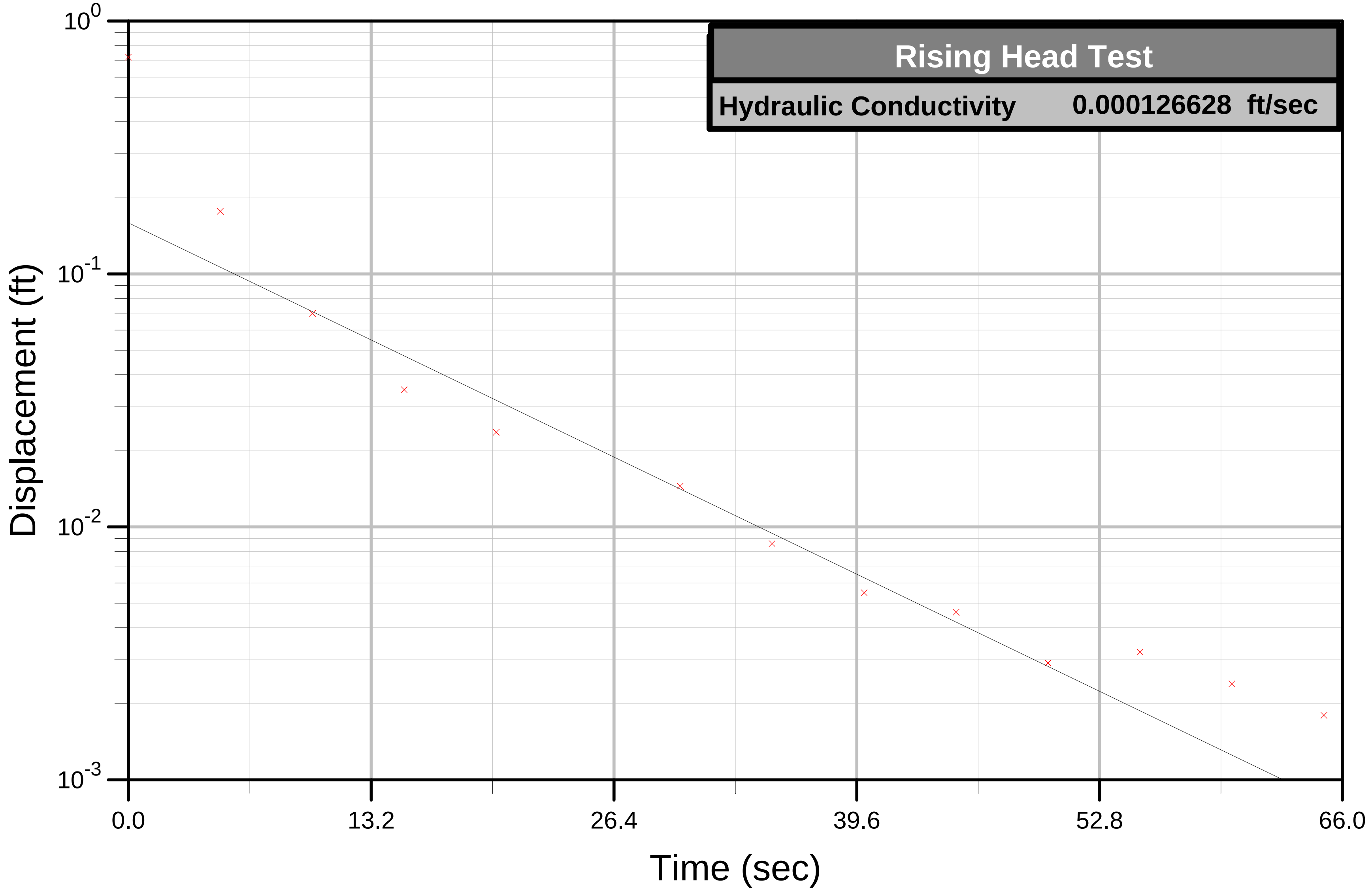
RW-22(I)


Rising Head Test
Hydraulic Conductivity 0.000256688 ft/sec
Displacement (ft)
10^1
10^0
10^{-1}
10^{-2}
10^{-3}
0.0
36.2
72.4
108.6
144.8
181.0
Time (sec)

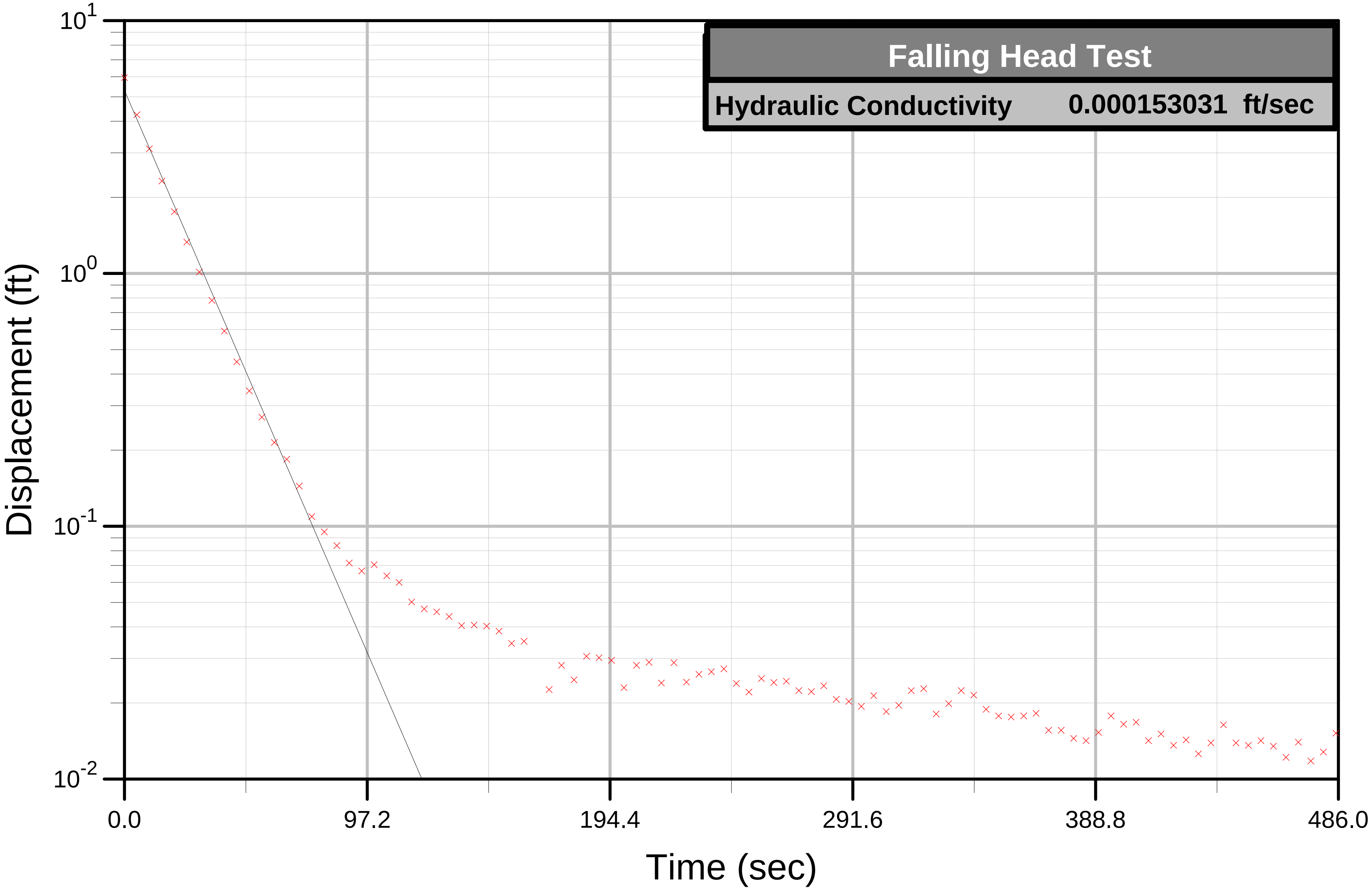
RW-23(I)


Falling Head Test
Hydraulic Conductivity
0.000192617 ft/sec
Displacement (ft)
10^{1}
10^{0}
10^{-1}
10^{-2}
0.0
56.2
112.4
168.6
224.8
281.0
Time (sec)

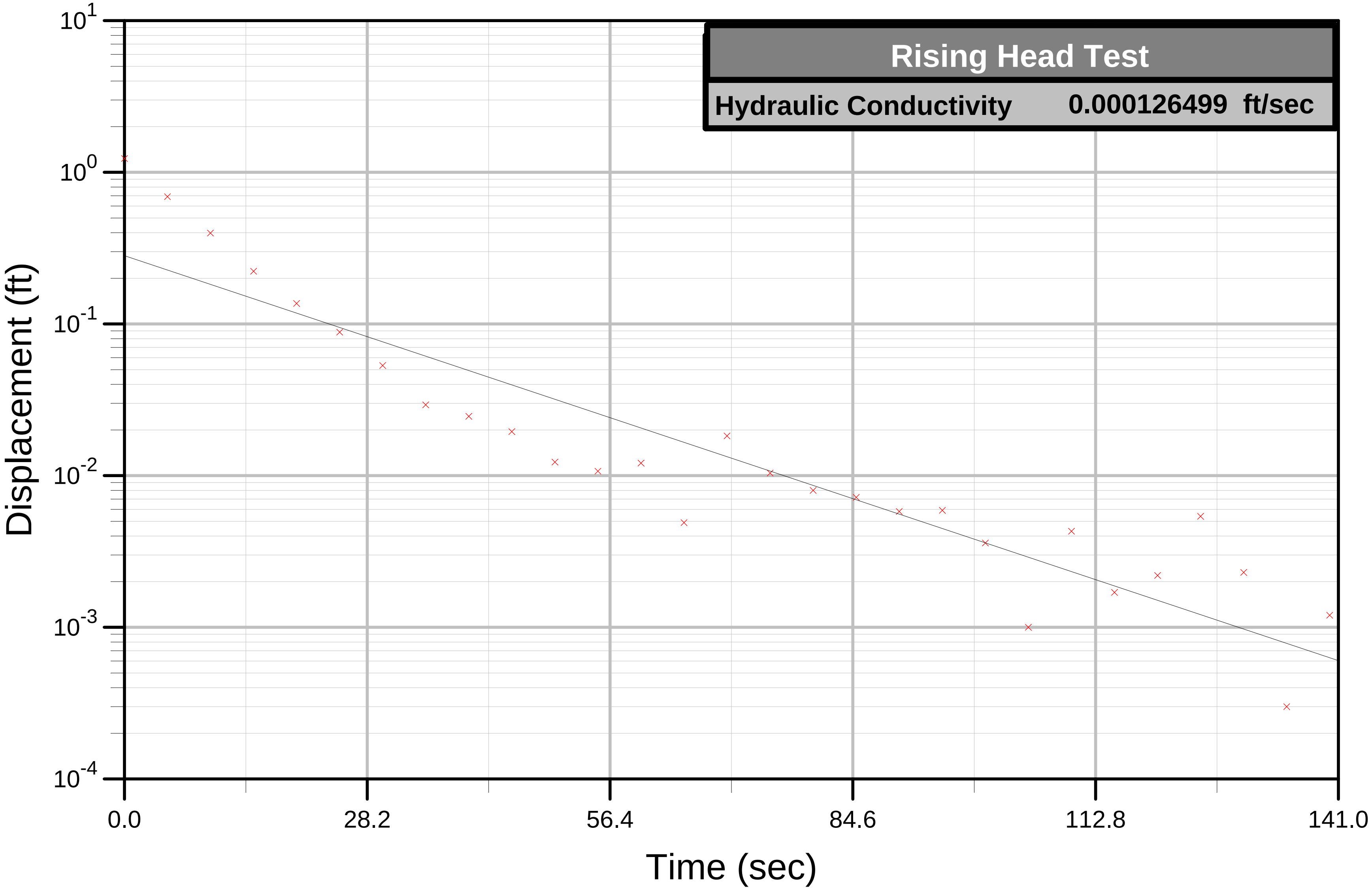
RW-23(I)


Rising Head Test
Hydraulic Conductivity 0.000126628 ft/sec
Displacement (ft)
10^0
10^{-1}
10^{-2}
10^{-3}
0.0
13.2
26.4
39.6
52.8
66.0
Time (sec)

RW-24(I)

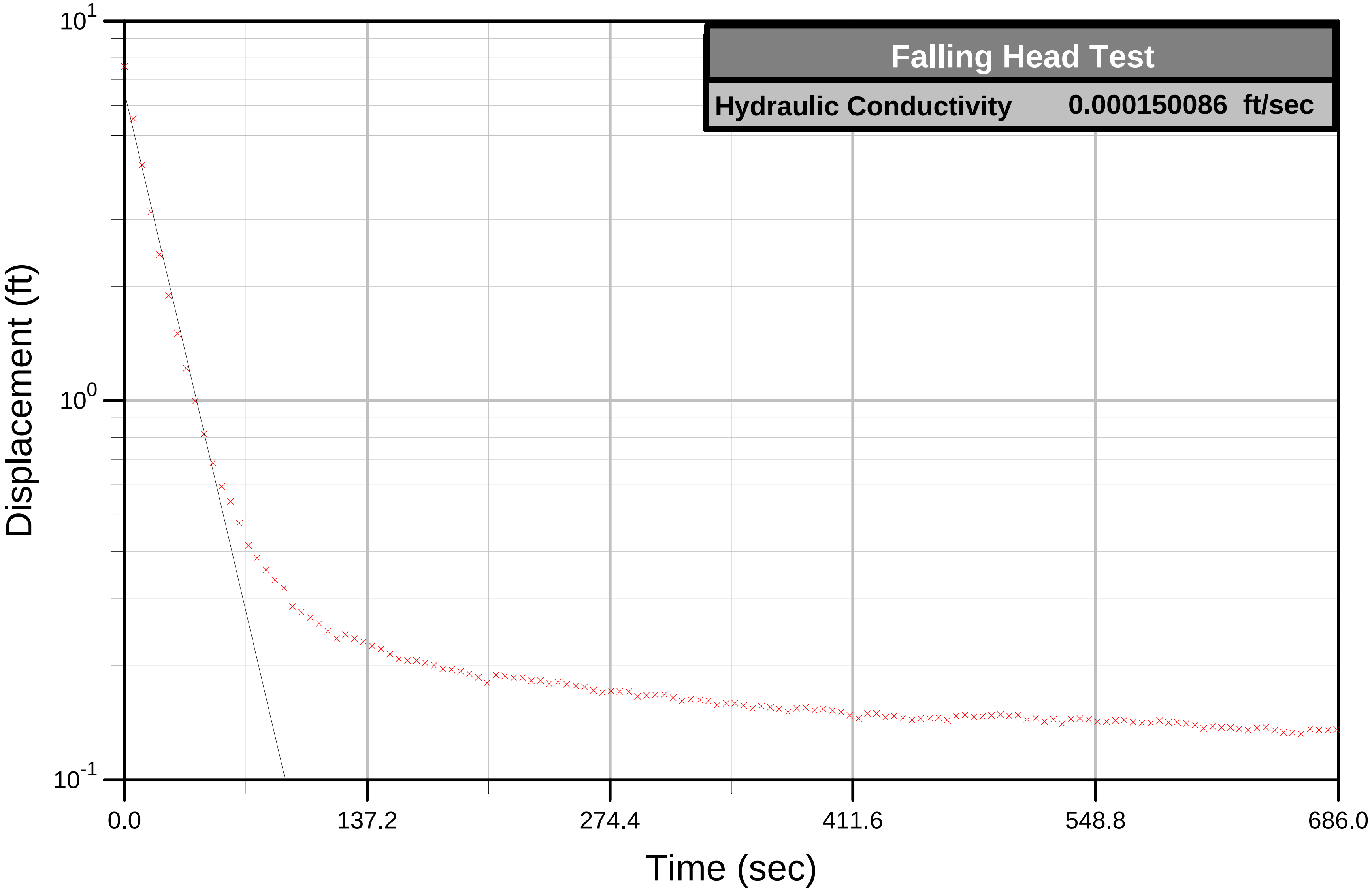

Falling Head Test
Hydraulic Conductivity 0.000153031 ft/sec
Displacement (ft)
10^{1}
10^{0}
10^{-1}
10^{-2}
0.0
97.2
194.4
291.6
388.8
486.0
Time (sec)

RW-24(I)


Rising Head Test
Hydraulic Conductivity 0.000126499 ft/sec
Displacement (ft)
10^1
10^0
10^{-1}
10^{-2}
10^{-3}
10^{-4}
0.0
28.2
56.4
84.6
112.8
141.0
Time (sec)

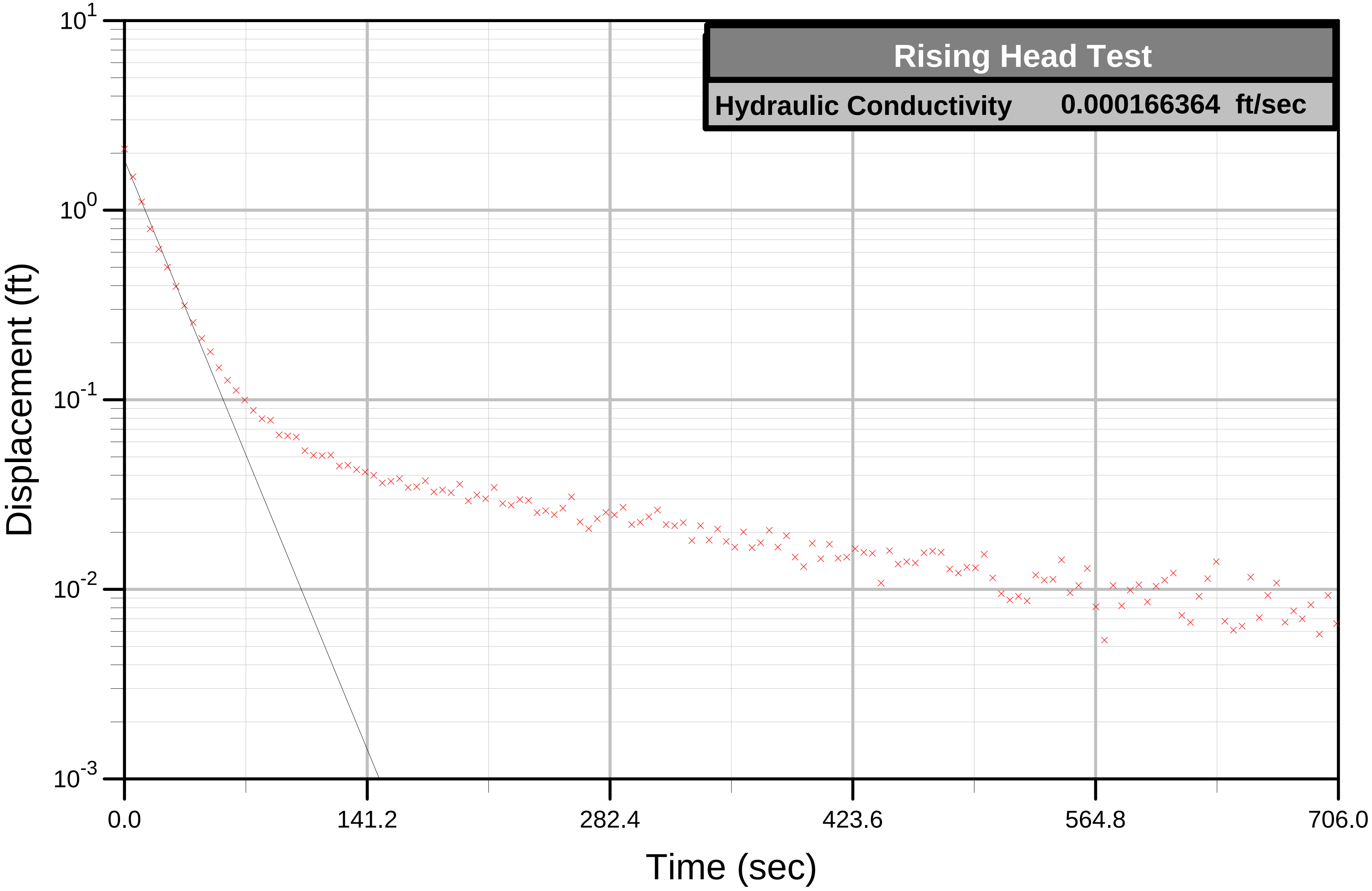
DEEP MONITORING WELLS

RW10-PZM065

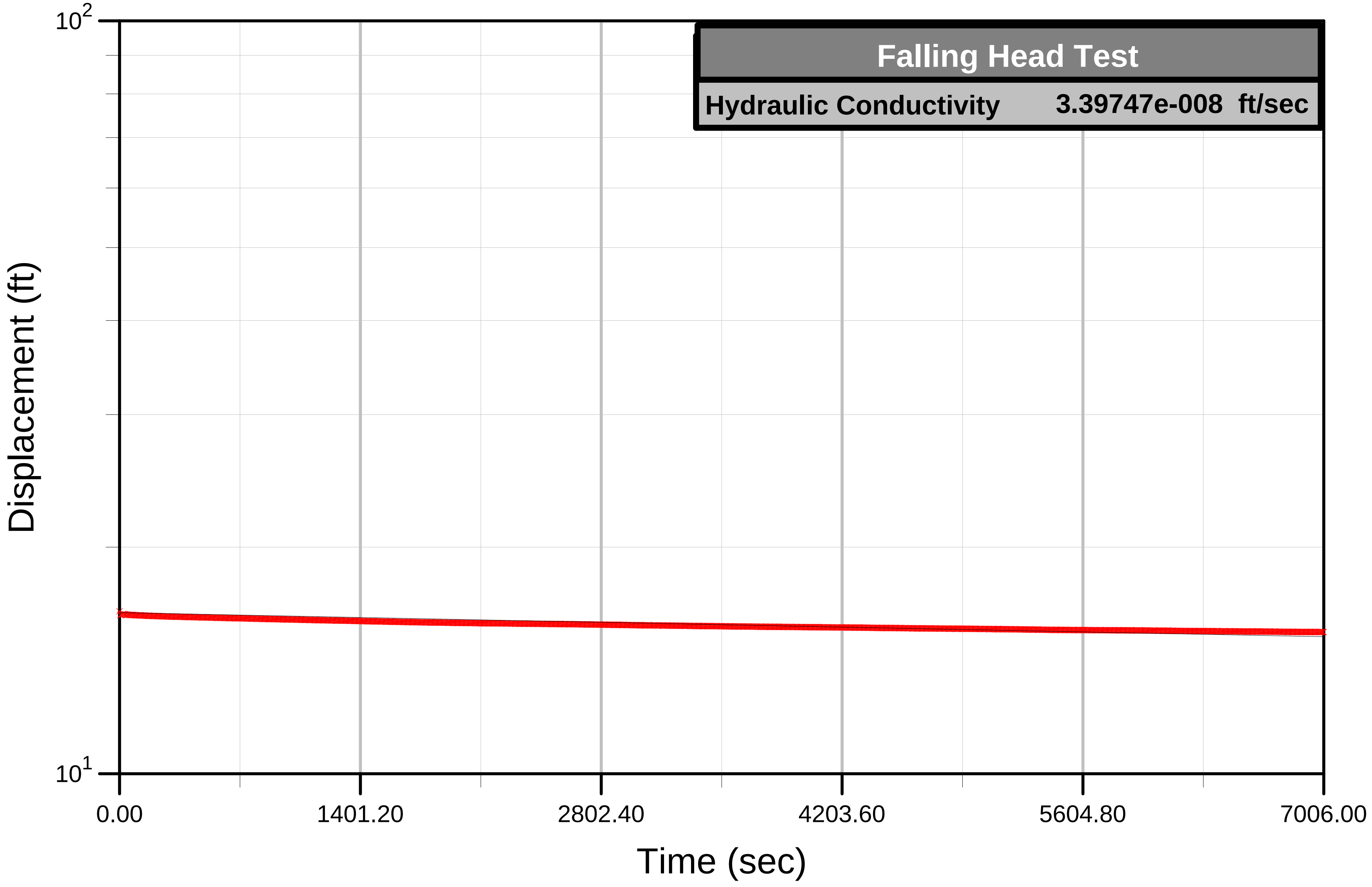


Falling Head Test
Hydraulic Conductivity 0.000150086 ft/sec
Displacement (ft)
10^1
10^0
10^{-1}
0.0
137.2
274.4
411.6
548.8
686.0
Time (sec)

RW10-PZM065

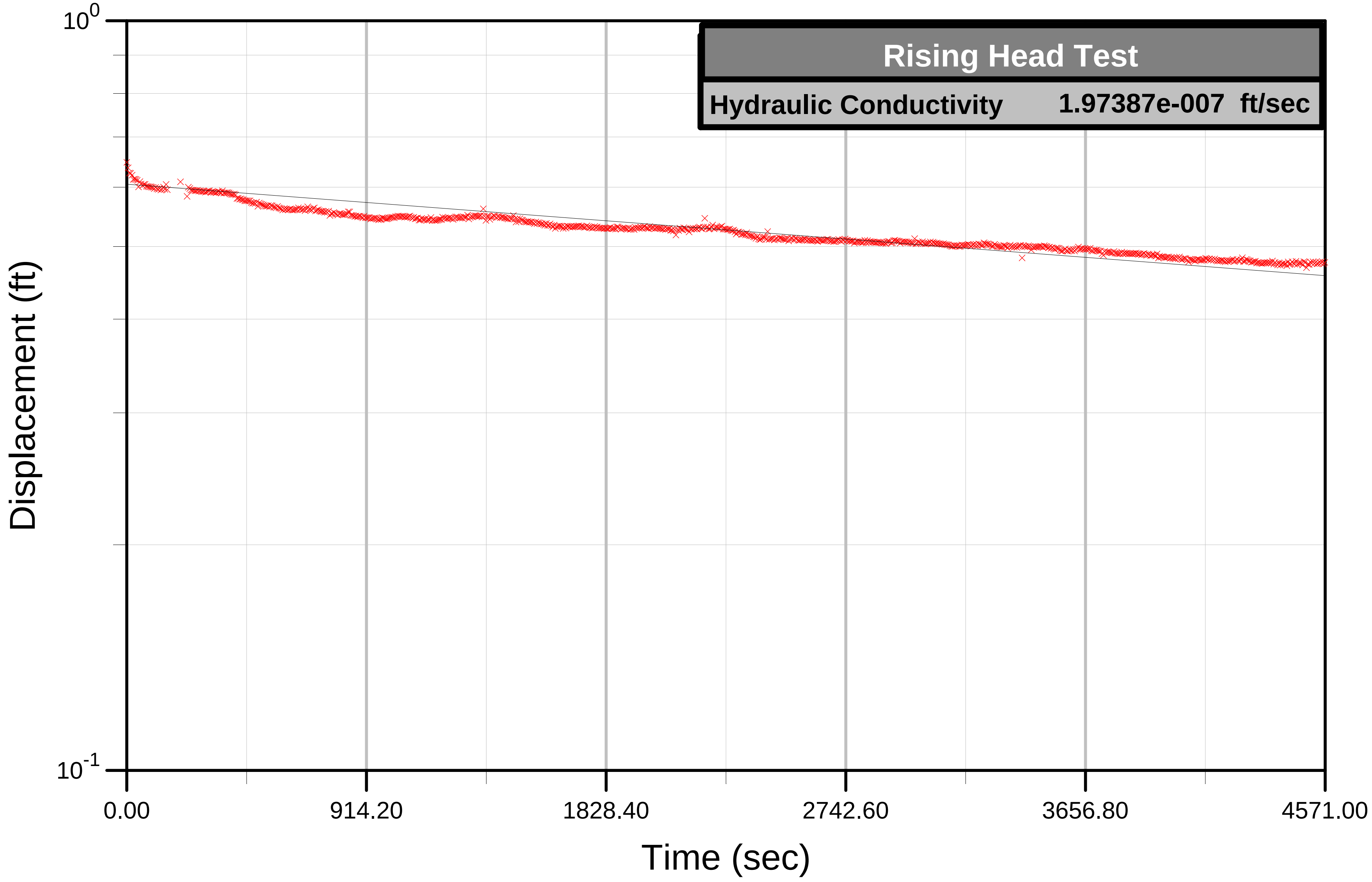

Rising Head Test
Hydraulic Conductivity 0.000166364 ft/sec
Displacement (ft)
10^1
10^0
10^{-1}
10^{-2}
10^{-3}
0.0
141.2
282.4
423.6
564.8
706.0
Time (sec)

RW18-PZM047

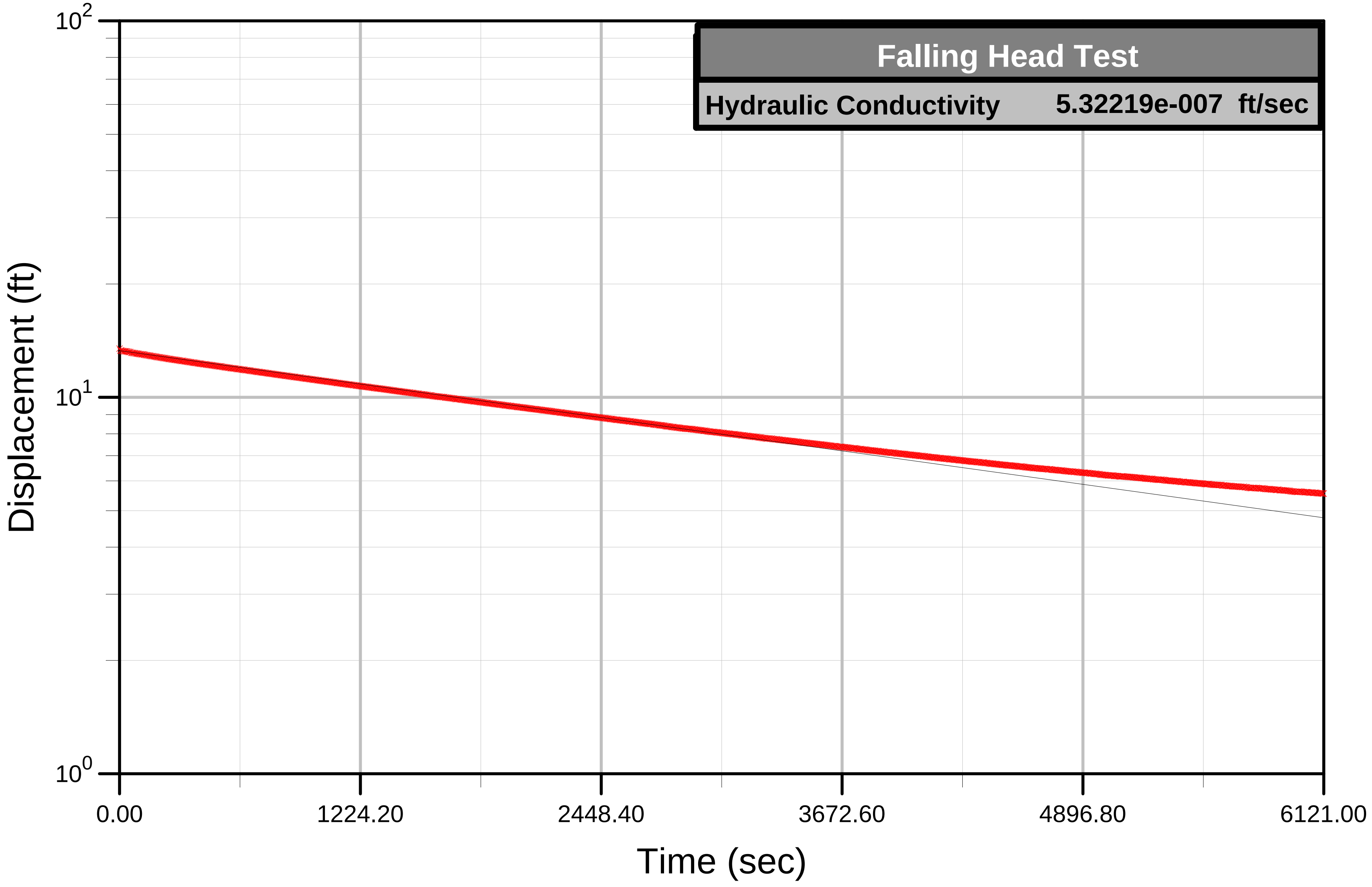


Falling Head Test
Hydraulic Conductivity 3.39747e-008 ft/sec
10^2
10^1
Displacement (ft)
0.00
1401.20
2802.40
4203.60
5604.80
7006.00
Time (sec)

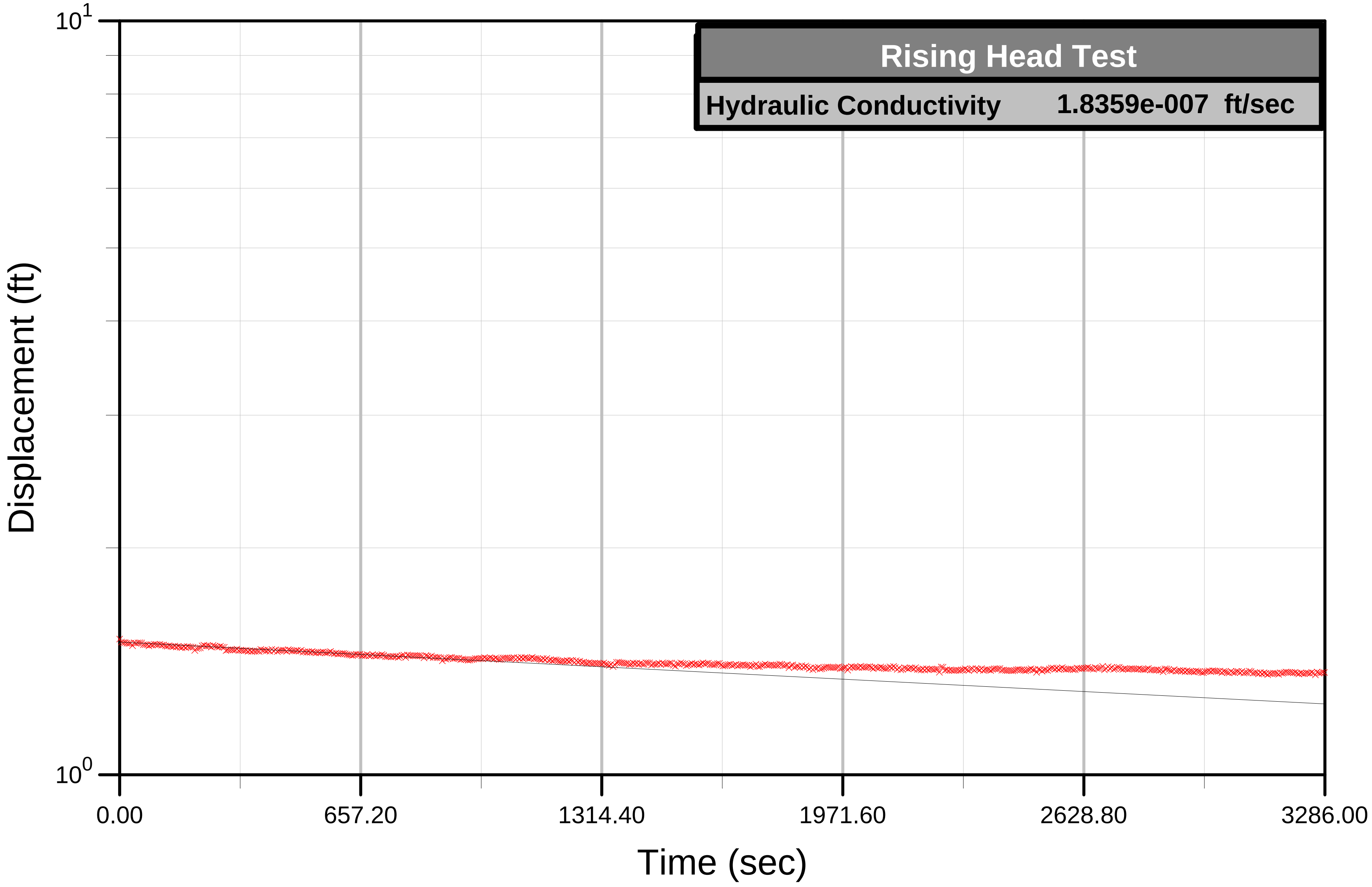
RW18-PZM047


Rising Head Test
Hydraulic Conductivity 1.97387e-007 ft/sec
10^0
10^{-1}
Displacement (ft)
0.00
914.20
1828.40
2742.60
3656.80
4571.00
Time (sec)

RW19-PZM050

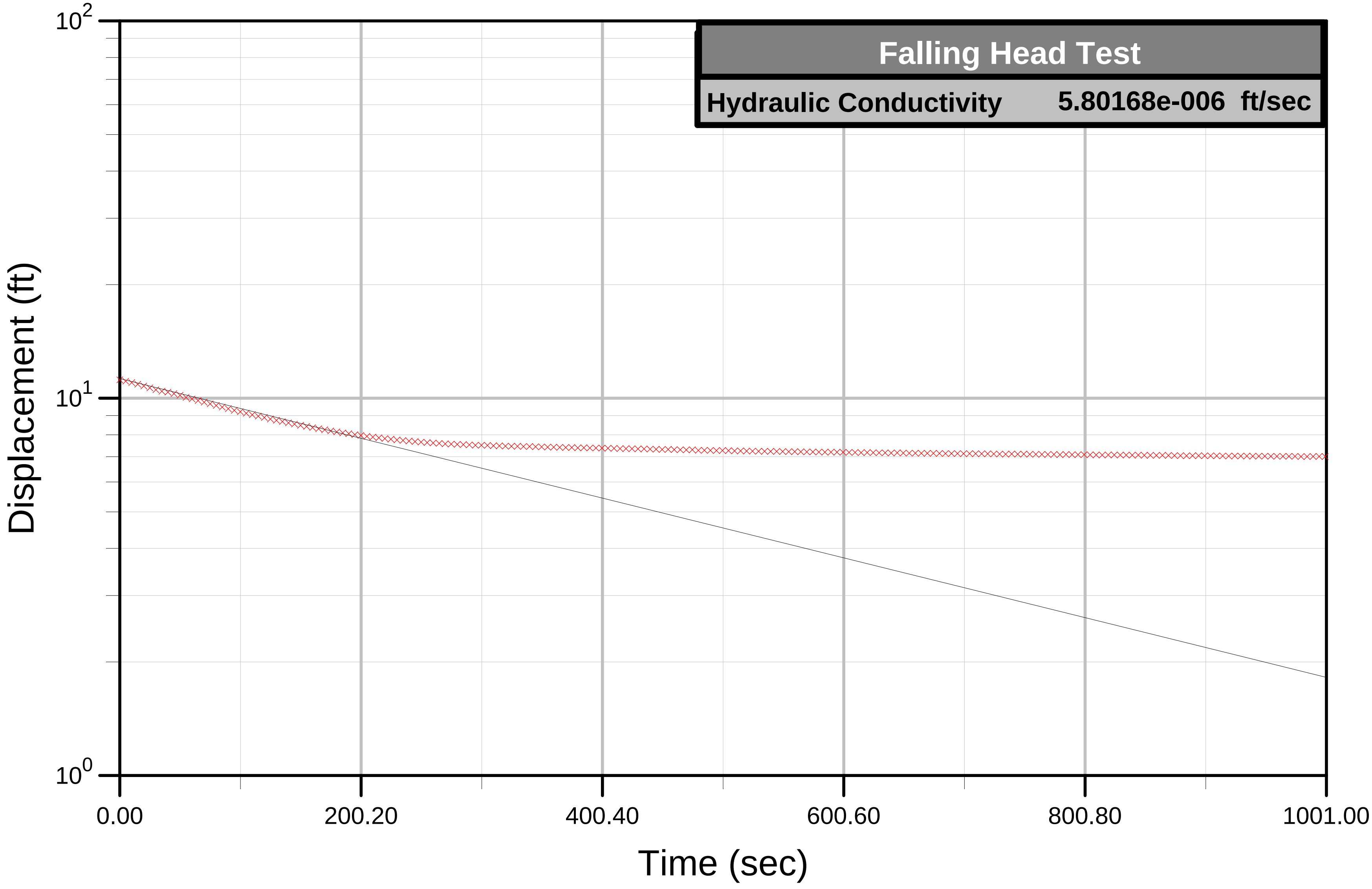

Falling Head Test
Hydraulic Conductivity 5.32219e-007 ft/sec
10^2
10^1
10^0
Displacement (ft)
0.00
1224.20
2448.40
3672.60
4896.80
6121.00
Time (sec)

RW19-PZM050



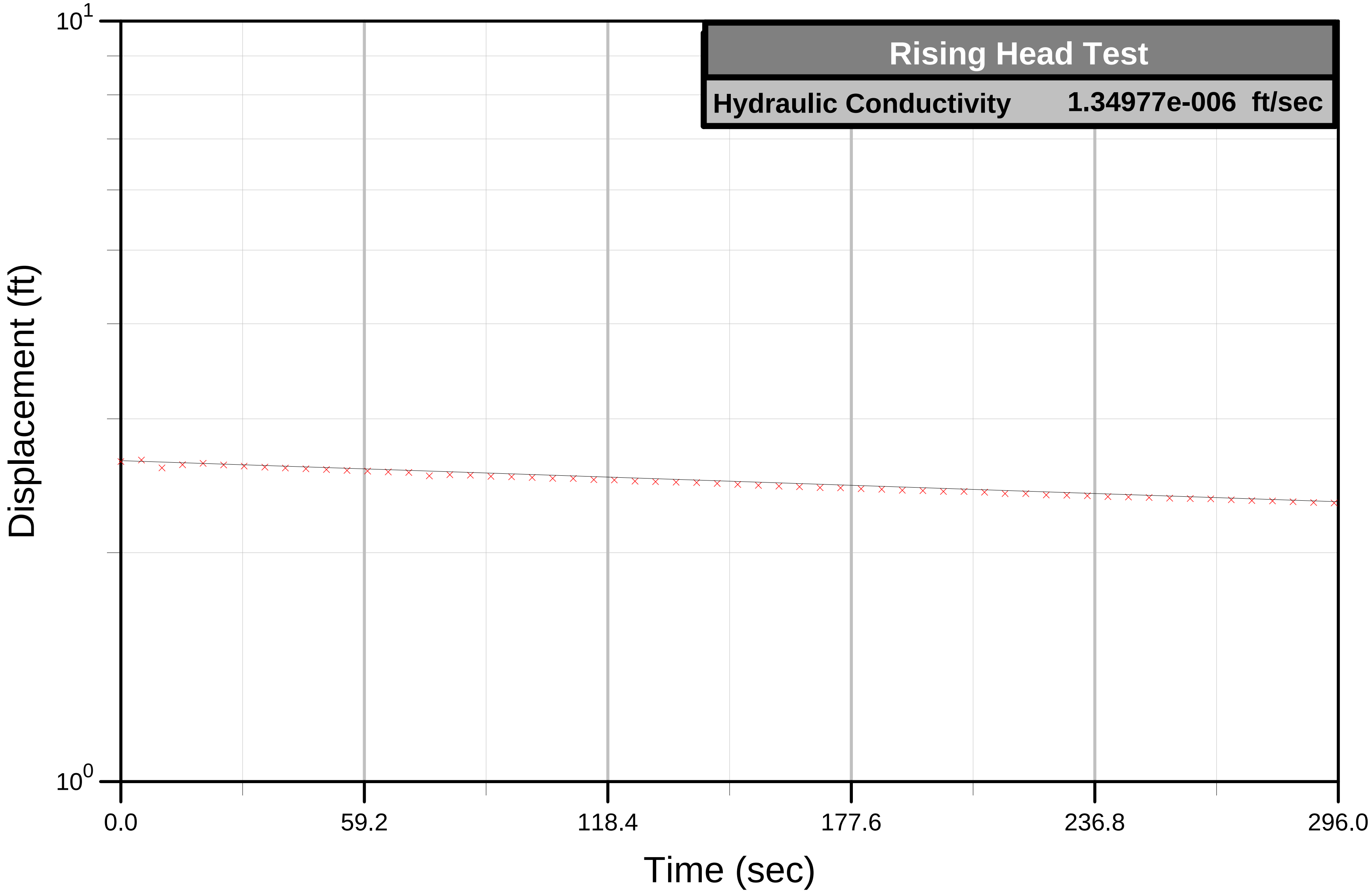
Rising Head Test
Hydraulic Conductivity 1.8359e-007 ft/sec
10^1
10^0
Displacement (ft)
0.00
657.20
1314.40
1971.60
2628.80
3286.00
Time (sec)

RW20-PZM050

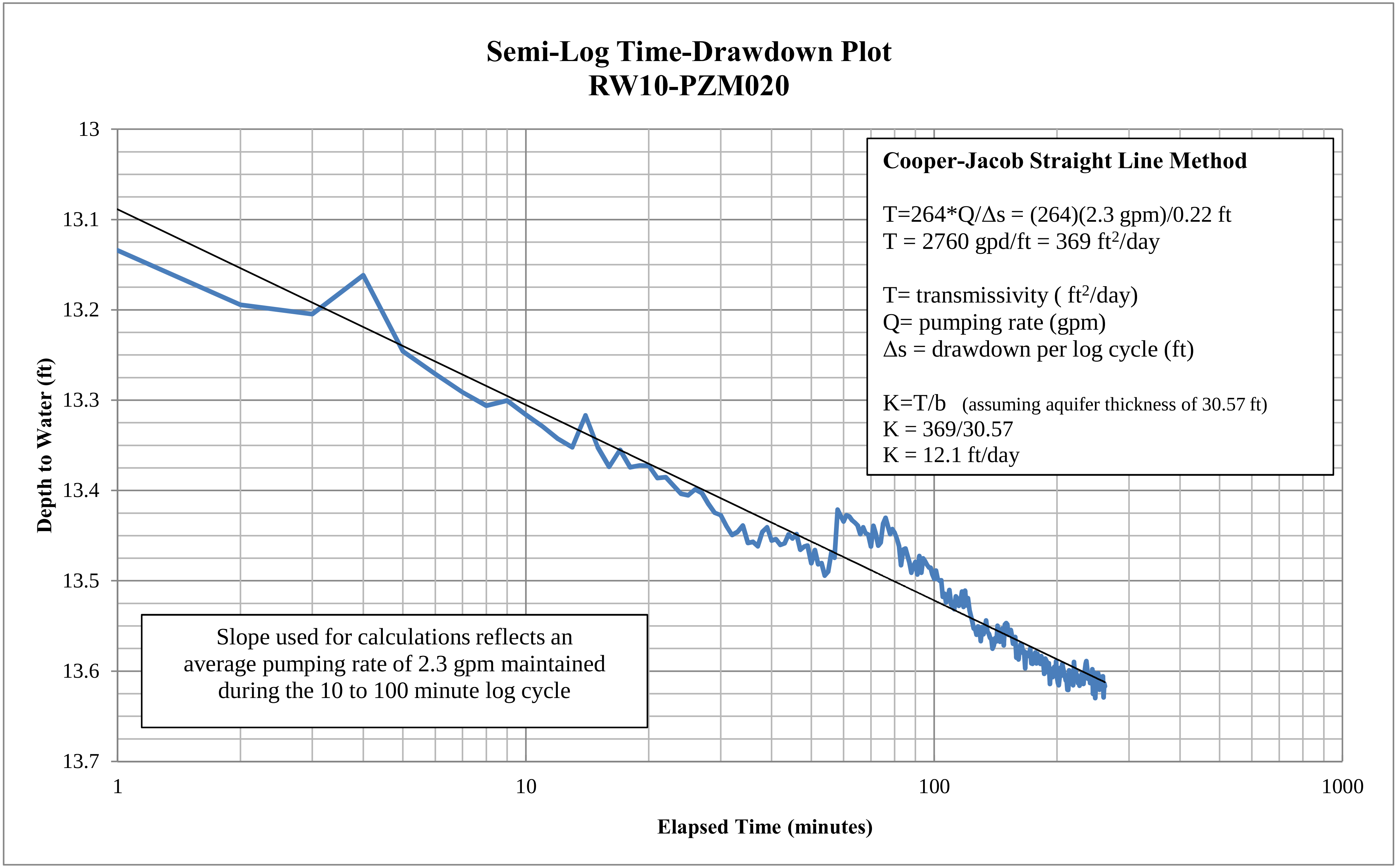


Falling Head Test
Hydraulic Conductivity 5.80168e-006 ft/sec
10^2
10^1
10^0
Displacement (ft)
0.00
200.20
400.40
600.60
800.80
1001.00
Time (sec)

RW20-PZM050


Rising Head Test
Hydraulic Conductivity 1.34977e-006 ft/sec
10^1
10^0
Displacement (ft)
0.0
59.2
118.4
177.6
236.8
296.0
Time (sec)

PUMPING WELLS



Semi-Log Time-Drawdown Plot
RW10-PZM020

Cooper-Jacob Straight Line Method

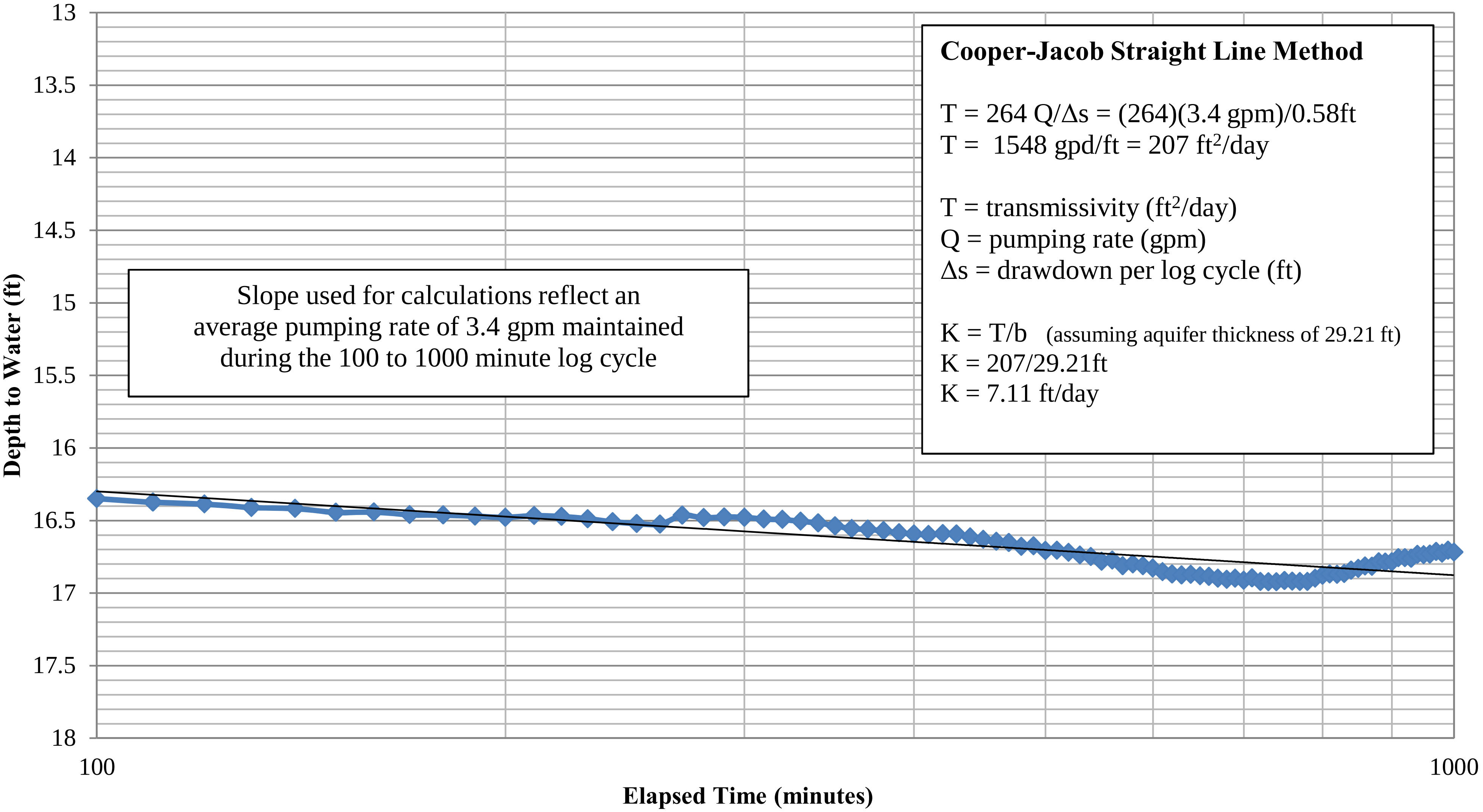
T=264*Q/Δs = (264)(2.3 gpm)/0.22 ft
T = 2760 gpd/ft = 369 ft^2/day

T= transmissivity (ft^2/day)
Q= pumping rate (gpm)
Δs = drawdown per log cycle (ft)

K=T/b (assuming aquifer thickness of 30.57 ft)
K = 369/30.57
K = 12.1 ft/day

Slope used for calculations reflects an average pumping rate of 2.3 gpm maintained during the 10 to 100 minute log cycle

Semi-Log Time-Drawdown Plot
RW15-PZM020



Slope used for calculations reflect an average pumping rate of 3.4 gpm maintained during the 100 to 1000 minute log cycle

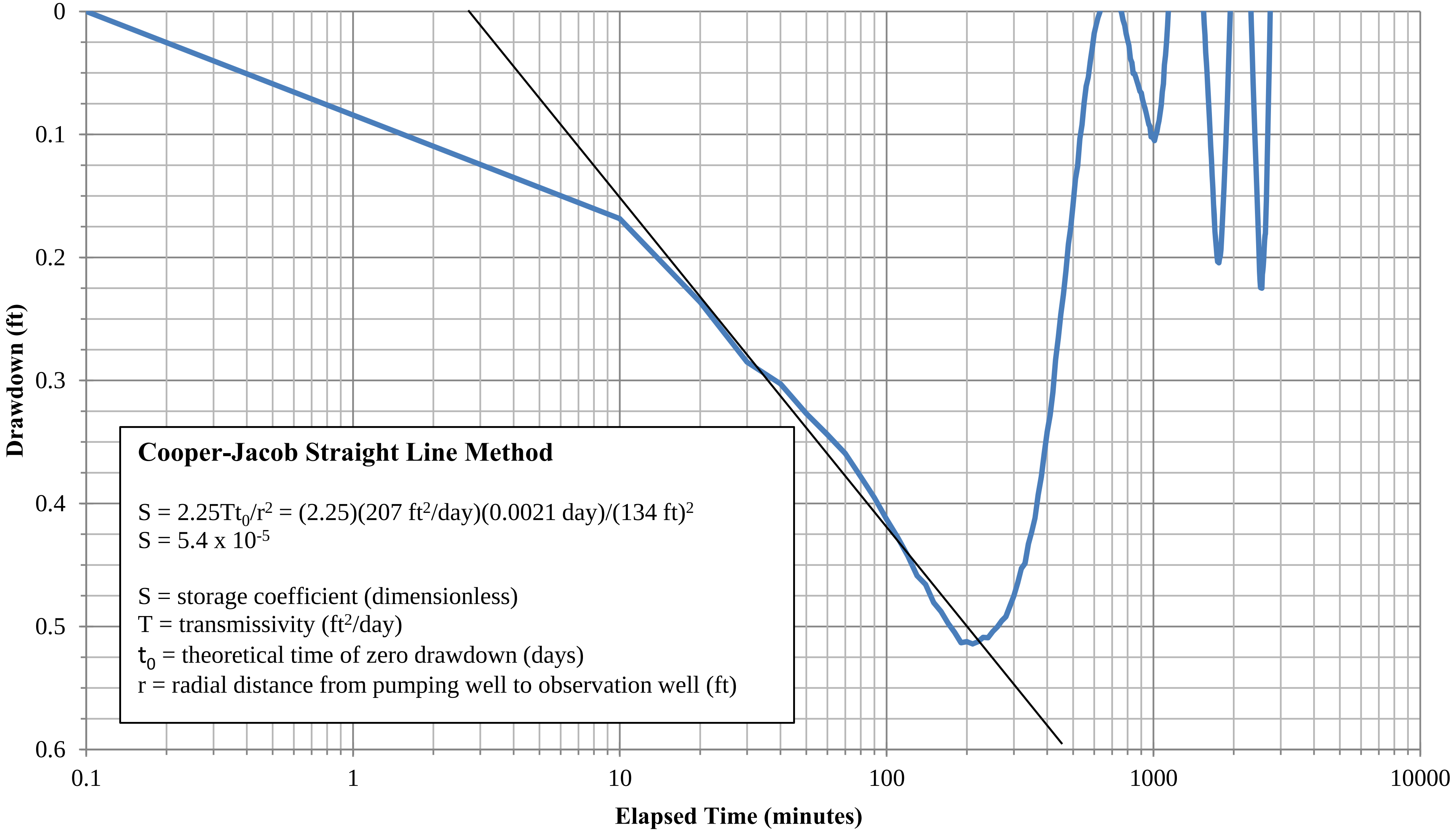
Cooper-Jacob Straight Line Method

T = 264 Q/Δs = (264)(3.4 gpm)/0.58ft
T = 1548 gpd/ft = 207 ft^2/day

T = transmissivity (ft^2/day)
Q = pumping rate (gpm)
Δs = drawdown per log cycle (ft)

K = T/b   (assuming aquifer thickness of 29.21 ft)
K = 207/29.21ft
K = 7.11 ft/day

Semi-Log Time-Drawdown Plot
RW16-PZM020
(Observation Well for RW15-PZM020 Pumping)



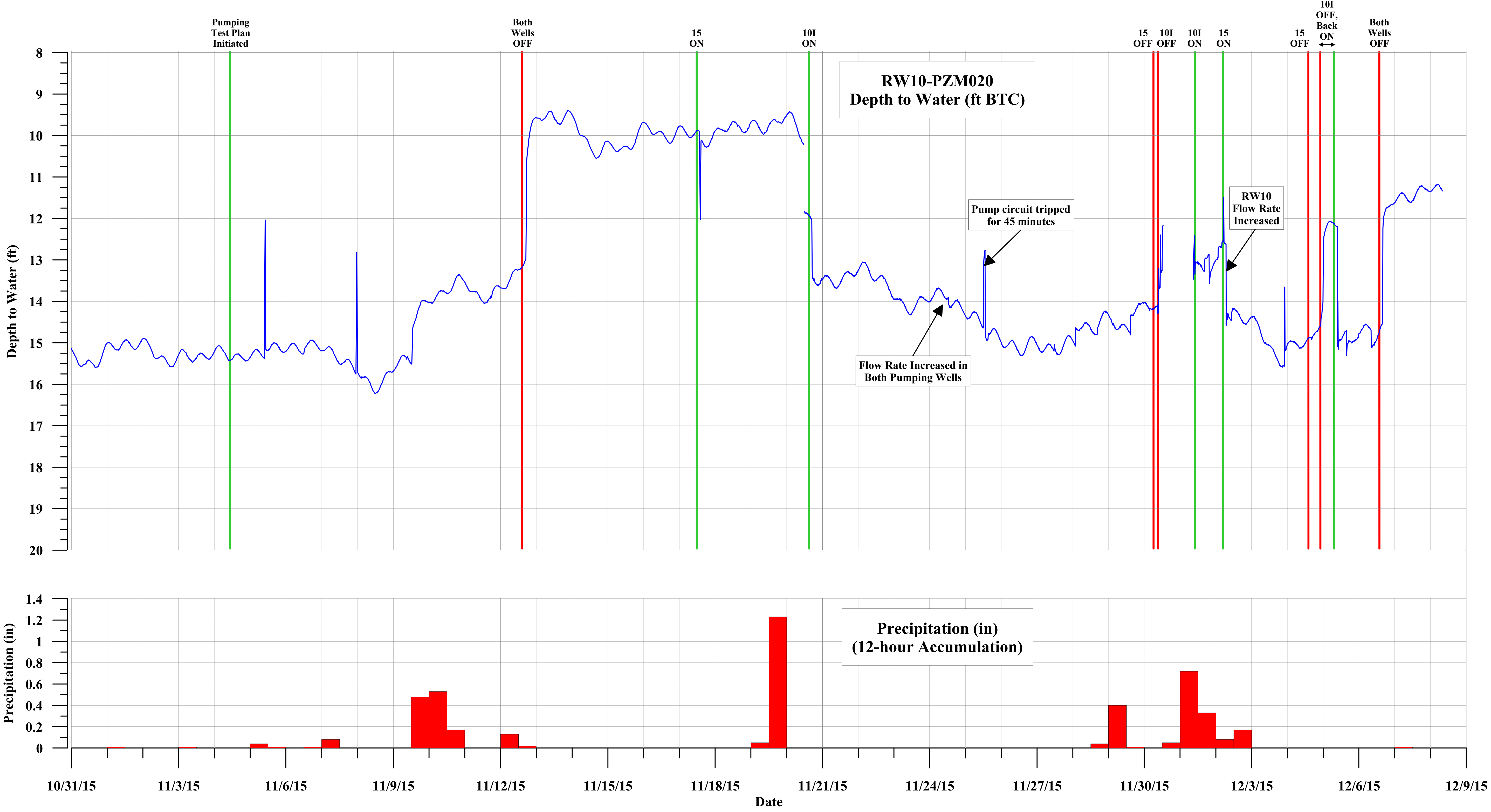
Cooper-Jacob Straight Line Method

$S = 2.25Tt_0/r^2 = (2.25)(207\ ft^2/day)(0.0021\ day)/(134\ ft)^2$
$S = 5.4 \times 10^{-5}$

S = storage coefficient (dimensionless)
T = transmissivity (ft^2/day)
t_0 = theoretical time of zero drawdown (days)
r = radial distance from pumping well to observation well (ft)

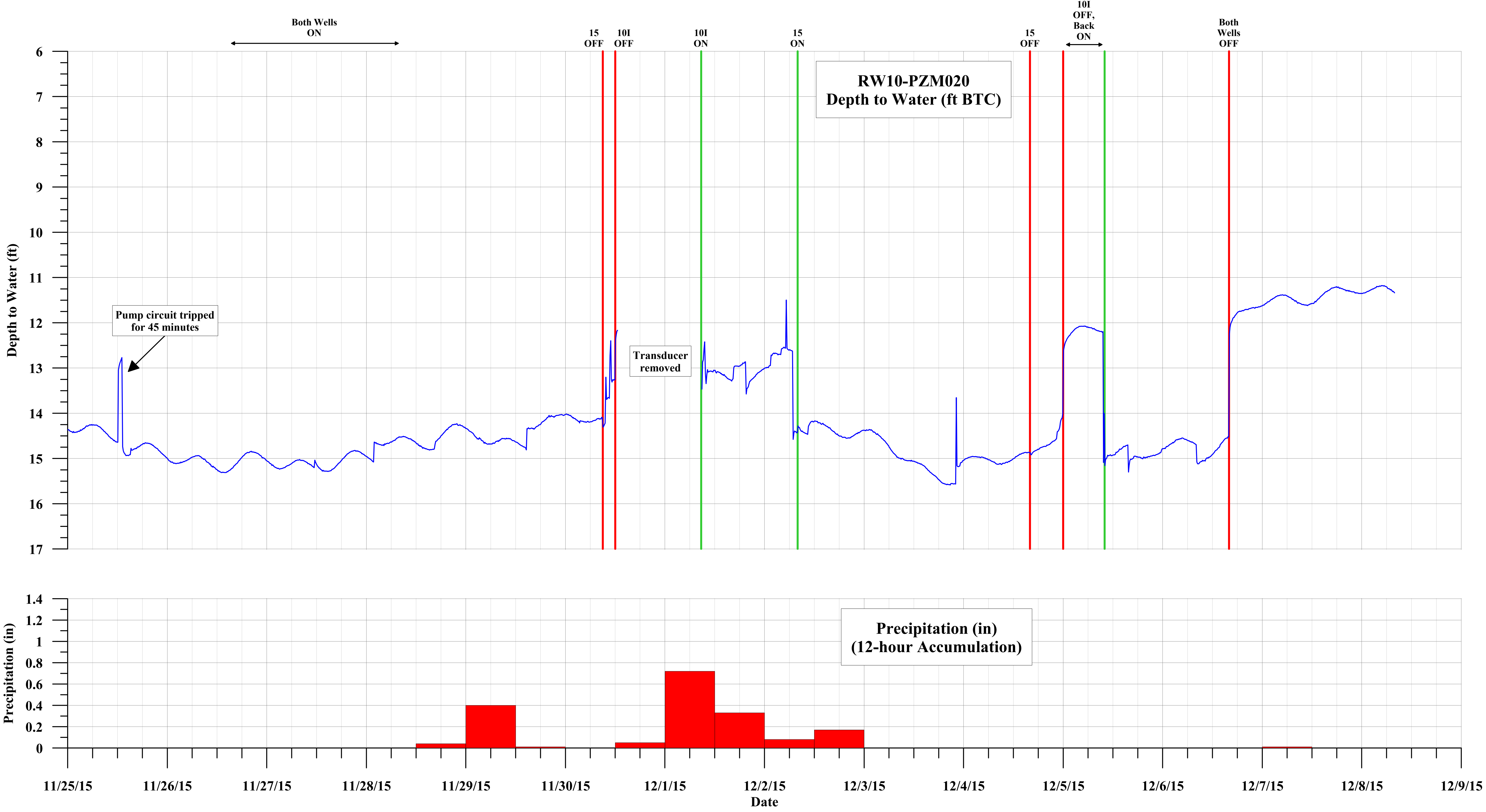
APPENDIX N

Parcel A3 Rod & Wire Mill
Aquifer Test Data
Pumping Well RW10-PZM020



ARM Group Inc. Earth Resource Engineers and Consultants	RW10-PZM020 Pumping Data November - December 2015 Sparrows Point Terminal Baltimore County, Maryland	April 2016 ARM 150298	Figure N1

Parcel A3 Rod & Wire Mill
Aquifer Test Data
Pumping Well RW10-PZM020



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RW10-PZM020 Pumping Data
November - December 2015

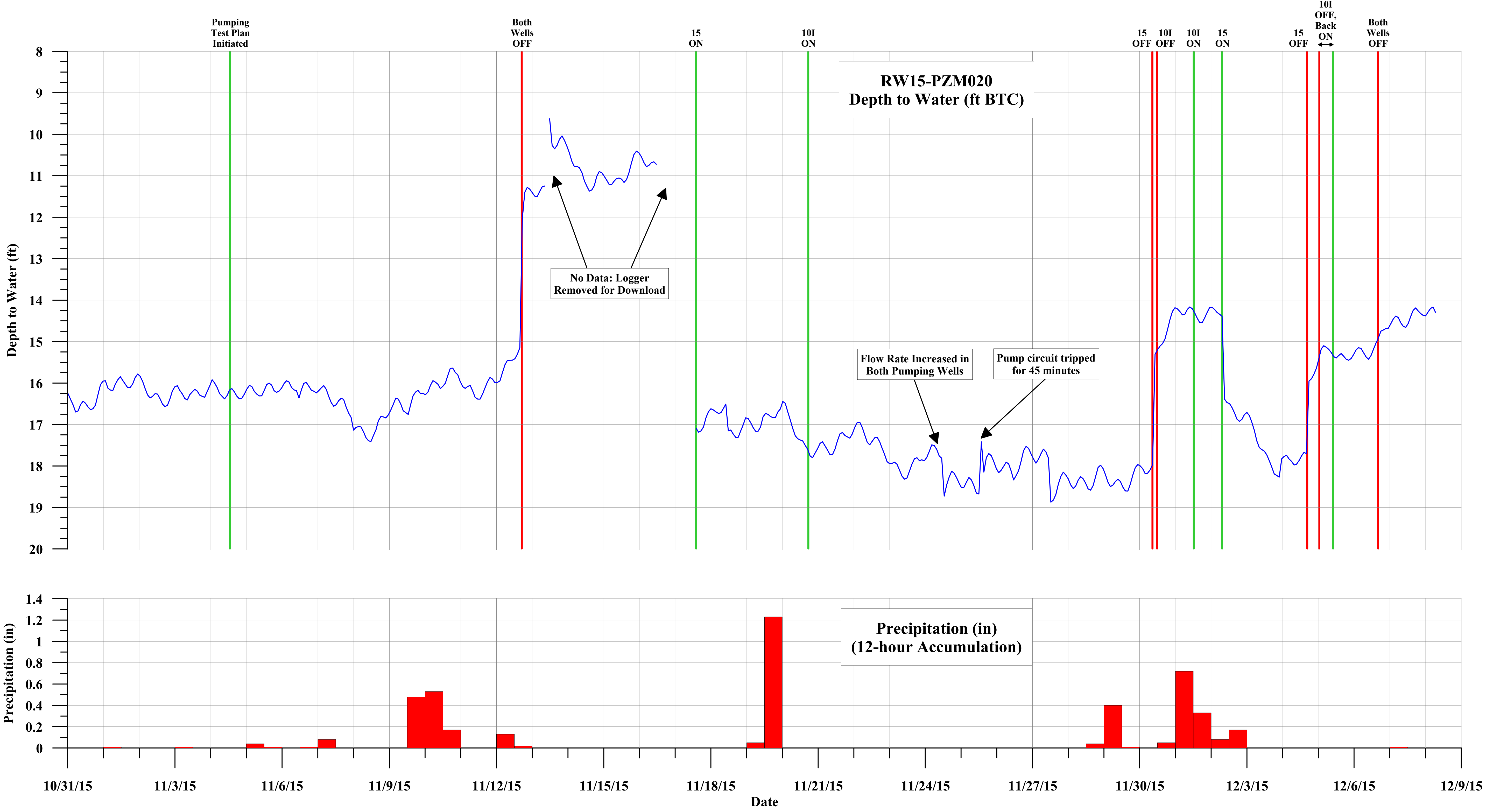
Sparrows Point Terminal
Baltimore County, Maryland

April 2016

ARM 150298

Figure
N1a

Parcel A3 Rod & Wire Mill
Aquifer Test Data
Pumping Well RW15-PZM020



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RW15-PZM020 Pumping Data
November - December 2015

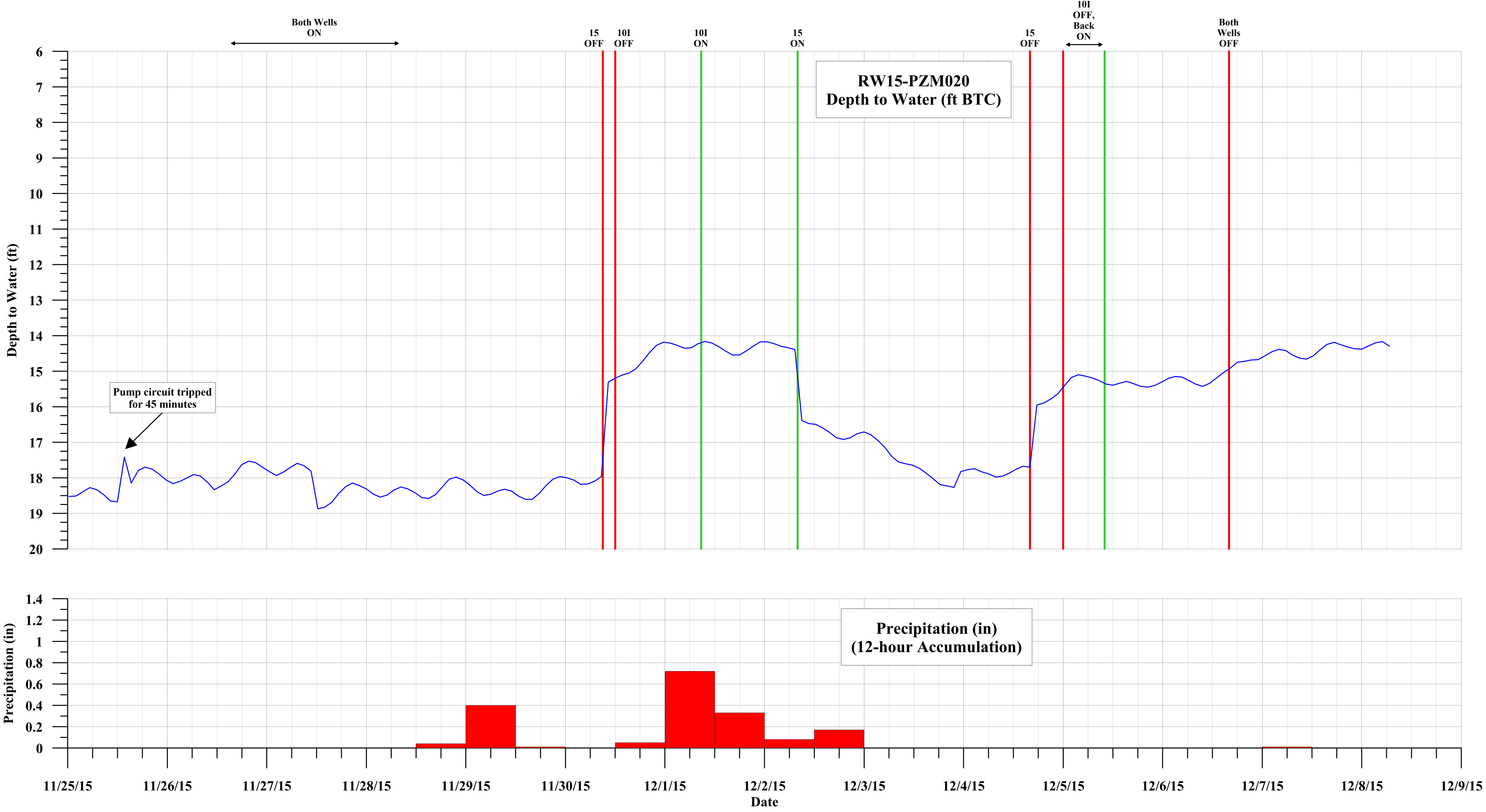
Sparrows Point Terminal
Baltimore County, Maryland

April 2016

ARM 150298

Figure
N2

Parcel A3 Rod & Wire Mill
Aquifer Test Data
Pumping Well RW15-PZM020



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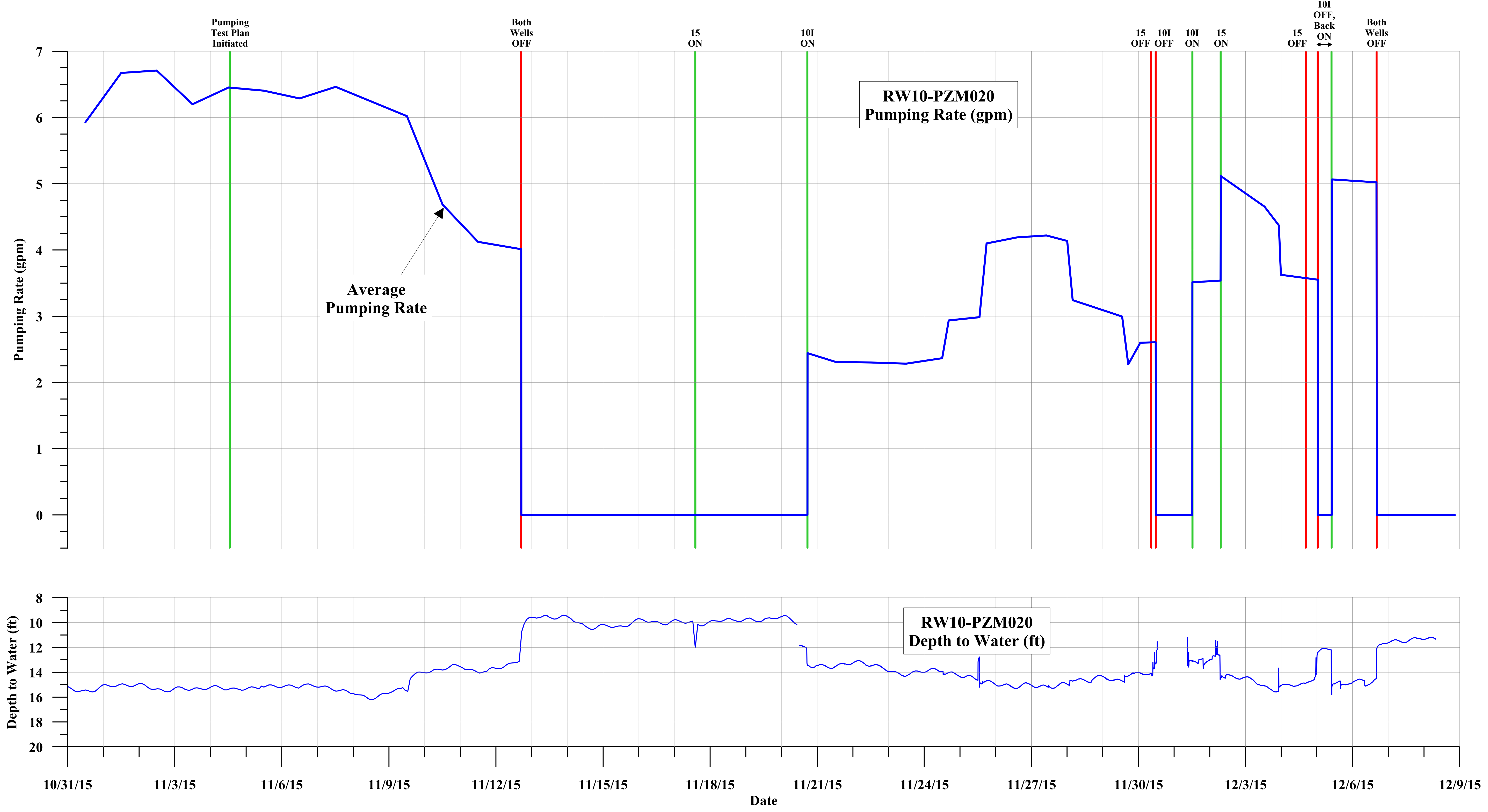
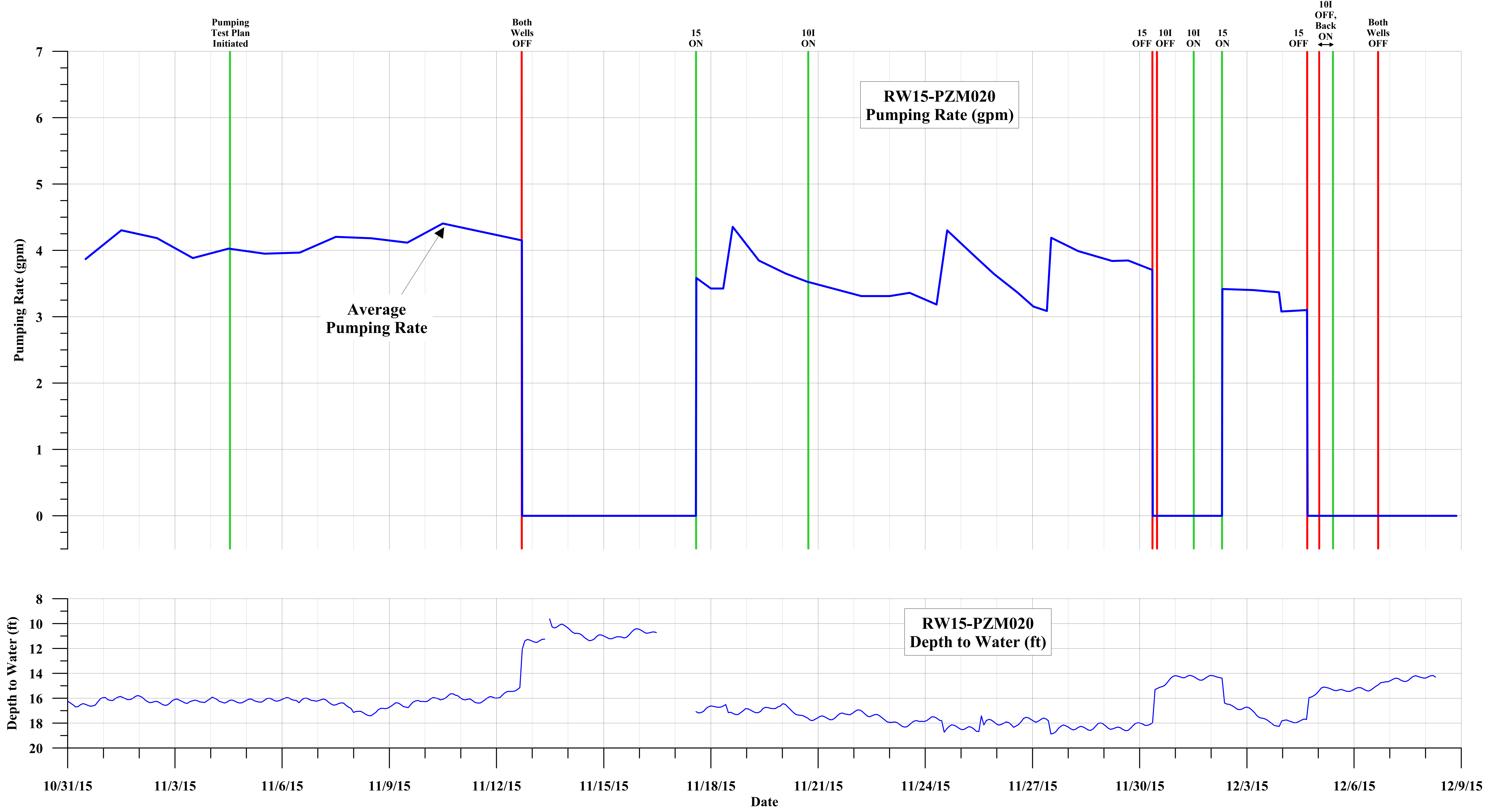
RW15-PZM020 Monitoring Data **November - December 2015** Sparrows Point Terminal Baltimore County, Maryland	April 2016 ARM 150298	Figure N2a

Parcel A3 Rod & Wire Mill
Aquifer Test Data
RW10-PZM020 Pumping Rates



ARM Group Inc. Earth Resource Engineers and Consultants	RW10-PZM020 Pumping Rate Data November - December 2015 Sparrows Point Terminal Baltimore County, Maryland	April 2016 ARM 150298	Figure N3

Parcel A3 Rod & Wire Mill
Aquifer Test Data
RW15-PZM020 Pumping Rates



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RW15-PZM020 Pumping Rate Data
November - December 2015

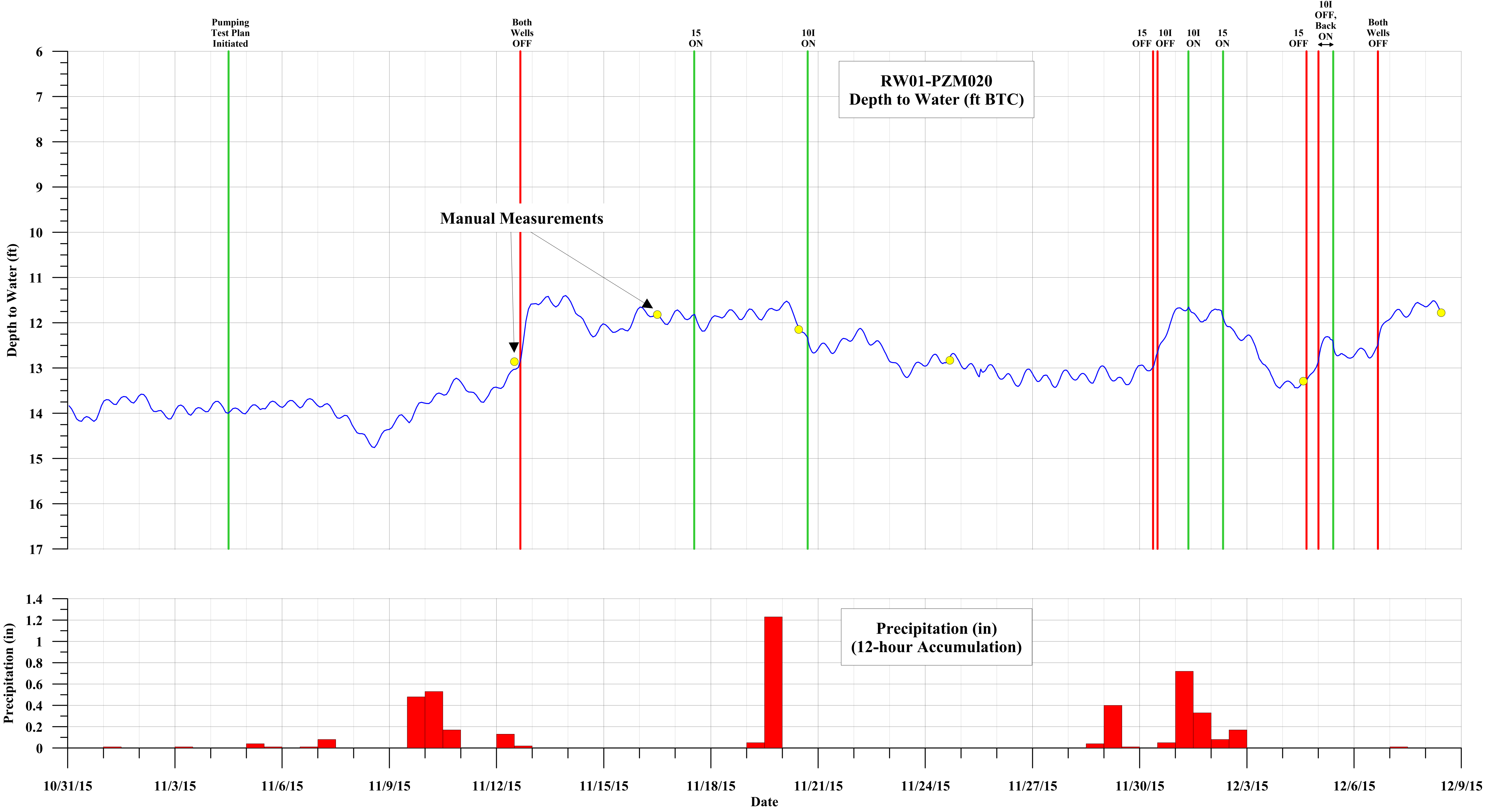
Sparrows Point Terminal
Baltimore County, Maryland

April 2016

ARM 150298

Figure
N4

Parcel A3 Rod & Wire Mill
Aquifer Test Data
Monitoring Well RW01-PZM020



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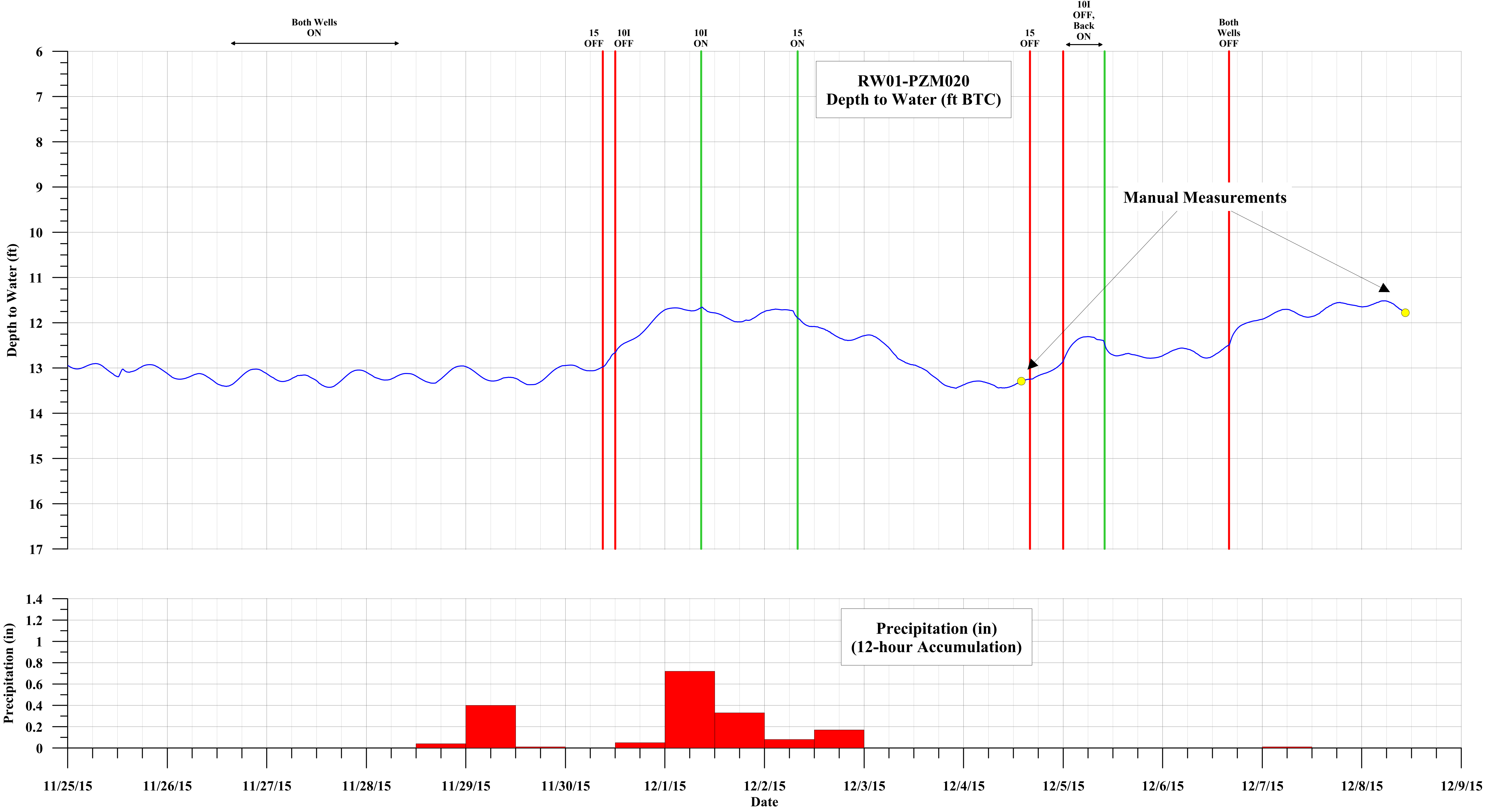
RW01-PZM020 Monitoring Data **November - December 2015** Sparrows Point Terminal Baltimore County, Maryland	April 2016 ARM 150298	Figure N5

Parcel A3 Rod & Wire Mill
Aquifer Test Data
Monitoring Well RW01-PZM020



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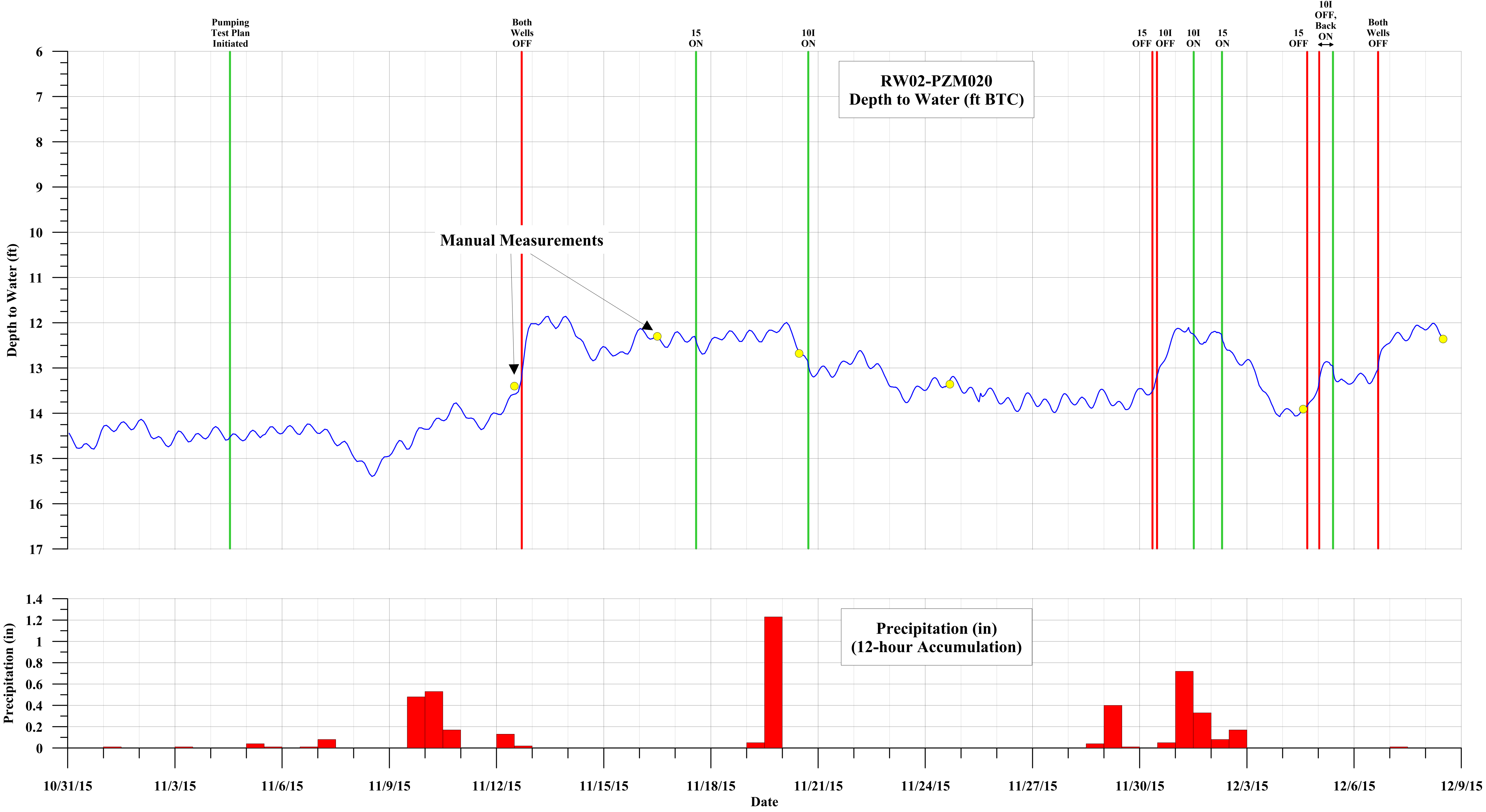
RW01-PZM020 Monitoring Data **November - December 2015** Sparrows Point Terminal Baltimore County, Maryland	April 2016 ARM 150298	Figure N5a

Parcel A3 Rod & Wire Mill
Aquifer Test Data
Monitoring Well RW02-PZM020



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RW02-PZM020 Monitoring Data
November - December 2015

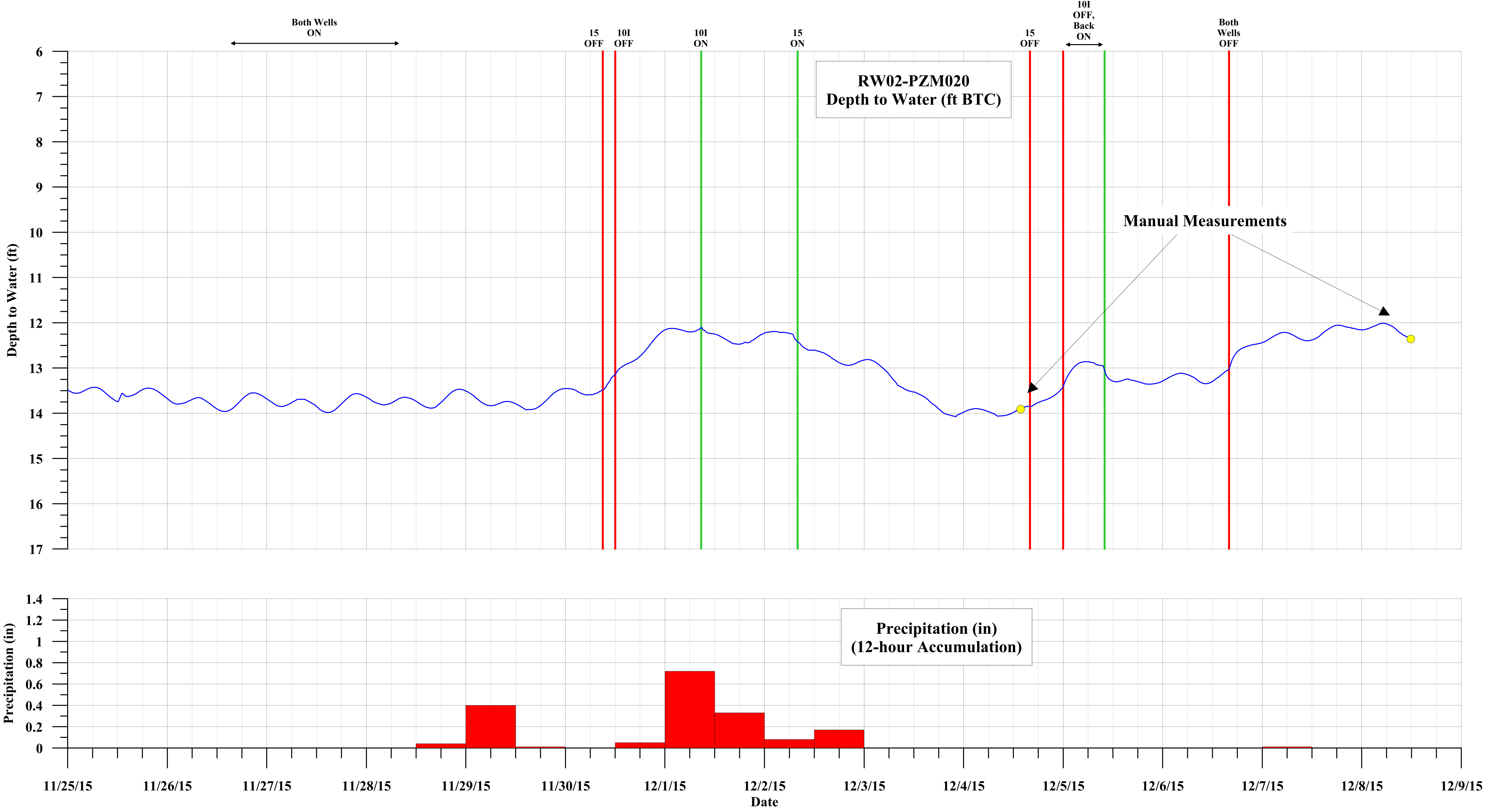
Sparrows Point Terminal
Baltimore County, Maryland

April 2016

ARM 150298

Figure
N6

Parcel A3 Rod & Wire Mill
Aquifer Test Data
Monitoring Well RW02-PZM020



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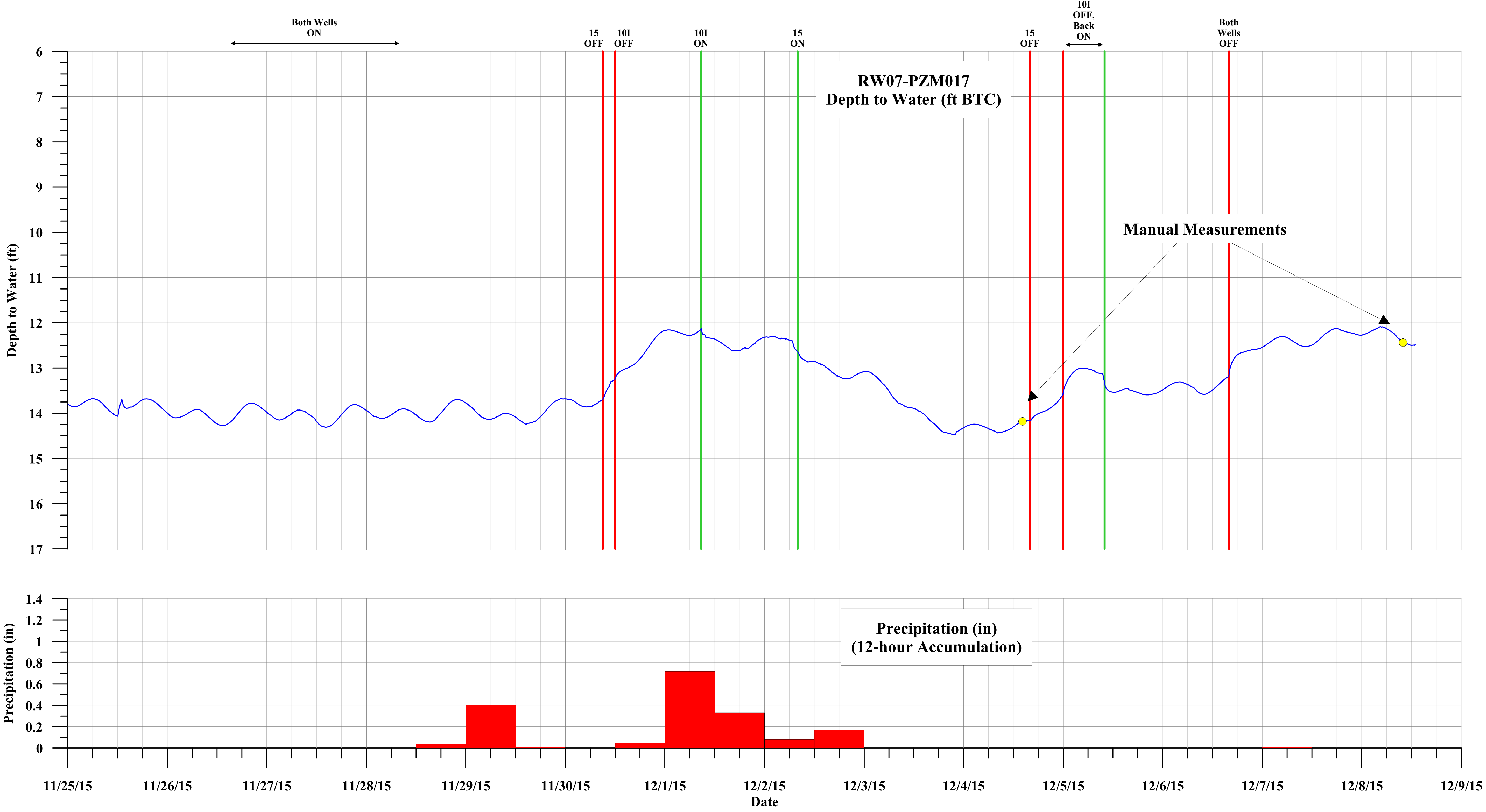
RW02-PZM020 Monitoring Data November - December 2015 Sparrows Point Terminal Baltimore County, Maryland	April 2016 ARM 150298	Figure N6a

Parcel A3 Rod & Wire Mill
Aquifer Test Data
Monitoring Well RW07-PZM017

ARM Group Inc. Earth Resource Engineers and Consultants	RW07-PZM017 Monitoring Data November - December 2015 Sparrows Point Terminal Baltimore County, Maryland	April 2016 ARM 150298	Figure N7

Parcel A3 Rod & Wire Mill
Aquifer Test Data
Monitoring Well RW07-PZM017



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RW07-PZM017 Monitoring Data
November - December 2015

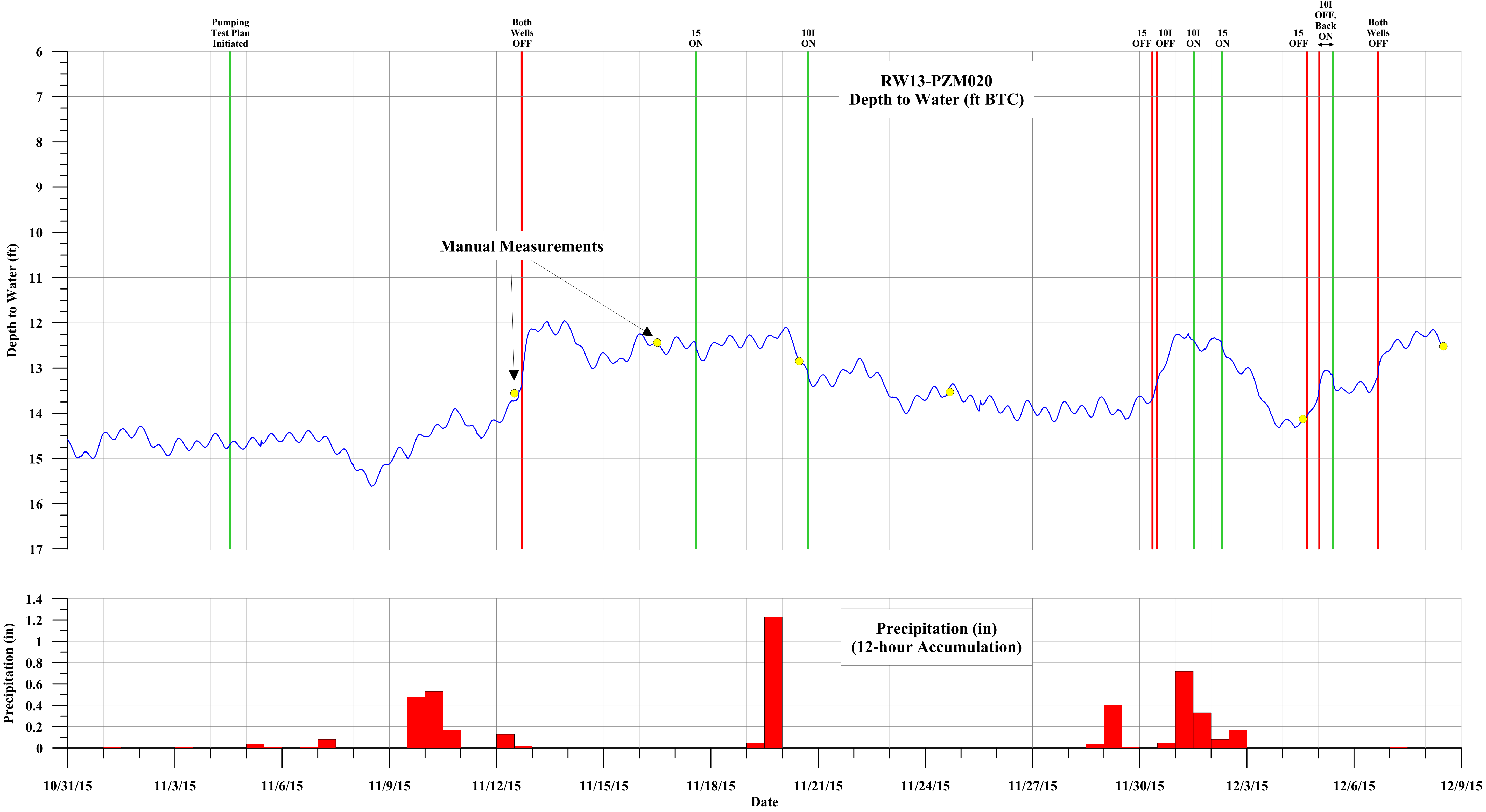
Sparrows Point Terminal
Baltimore County, Maryland

April 2016

ARM 150298

Figure
N7a

Parcel A3 Rod & Wire Mill
Aquifer Test Data
Monitoring Well RW13-PZM020



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RW13-PZM020 Monitoring Data
November - December 2015

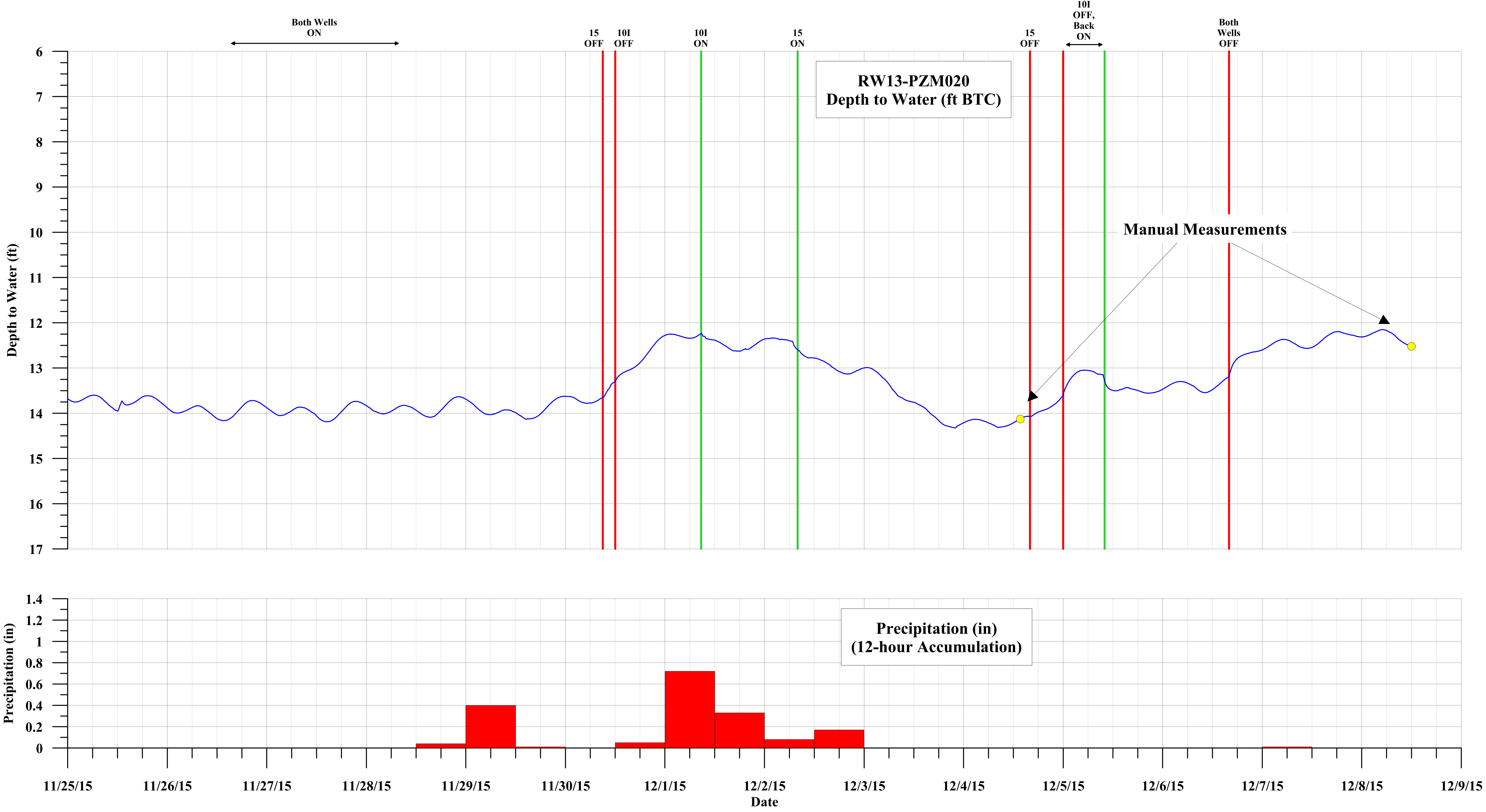
Sparrows Point Terminal
Baltimore County, Maryland

April 2016

ARM 150298

Figure
N8

Parcel A3 Rod & Wire Mill
Aquifer Test Data
Monitoring Well RW13-PZM020



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RW13-PZM020 Monitoring Data
November - December 2015

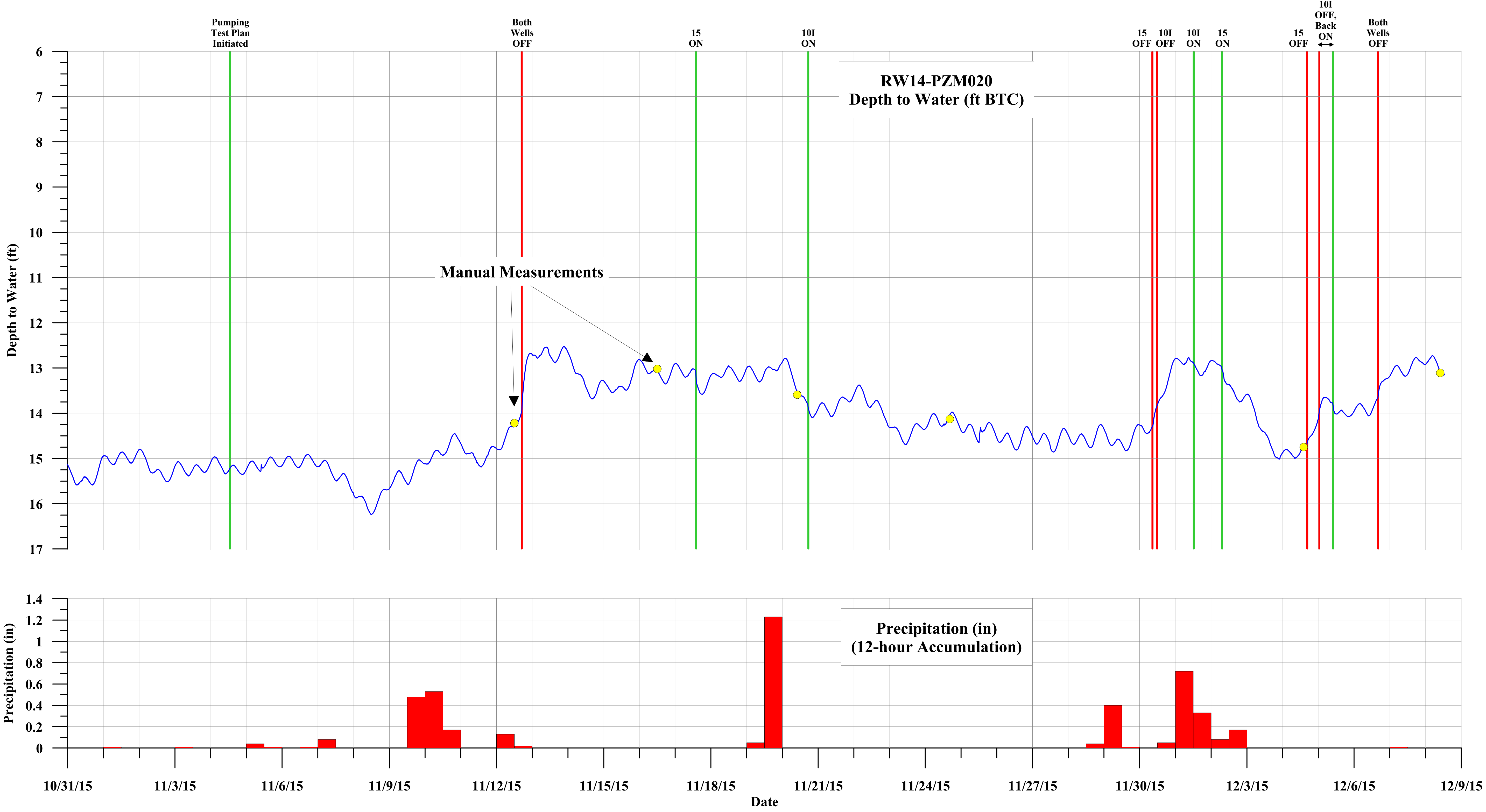
Sparrows Point Terminal
Baltimore County, Maryland

April 2016

ARM 150298

Figure
N8a

Parcel A3 Rod & Wire Mill
Aquifer Test Data
Monitoring Well RW14-PZM020



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RW14-PZM020 Monitoring Data
November - December 2015

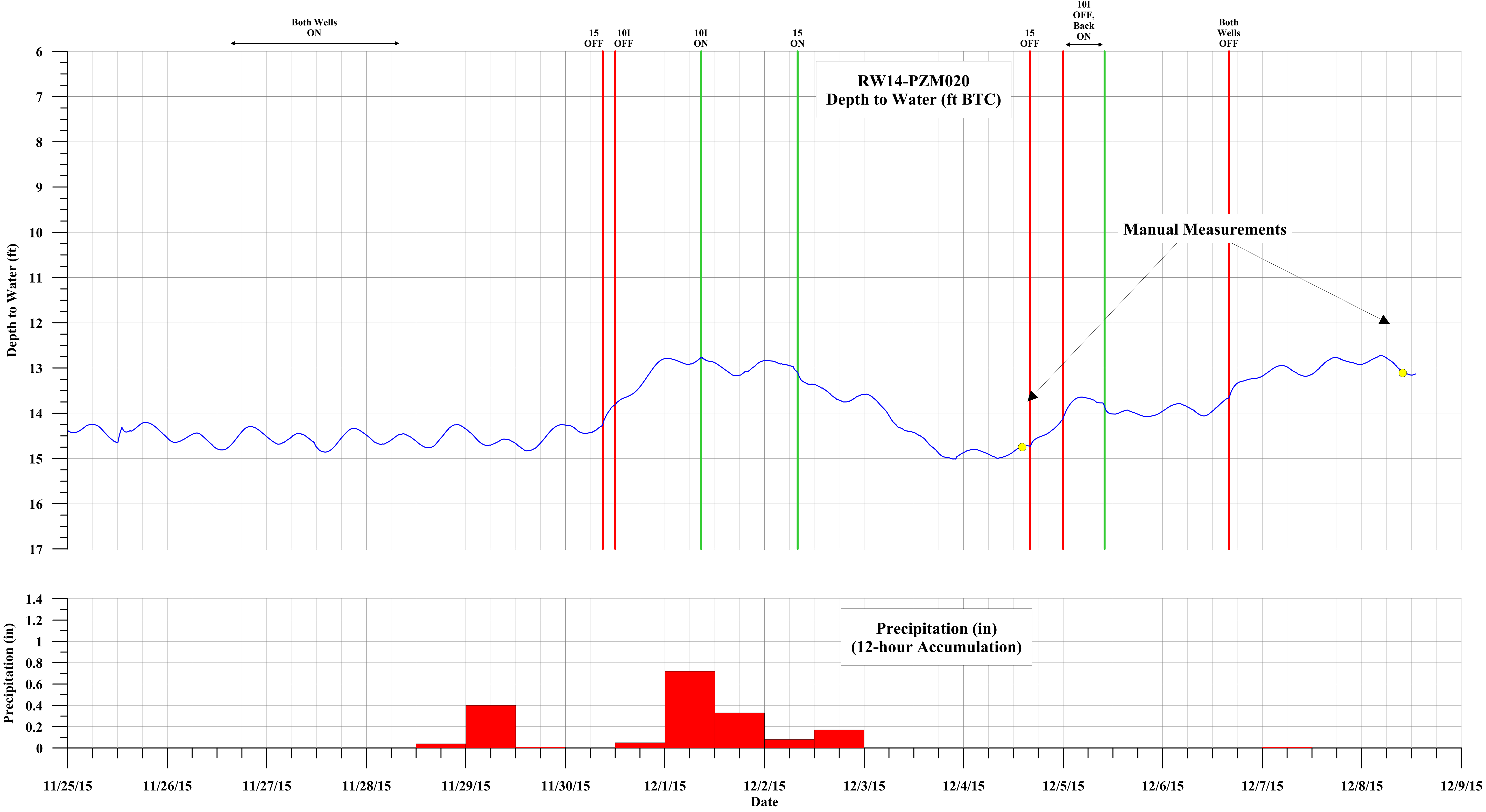
Sparrows Point Terminal
Baltimore County, Maryland

April 2016

ARM 150298

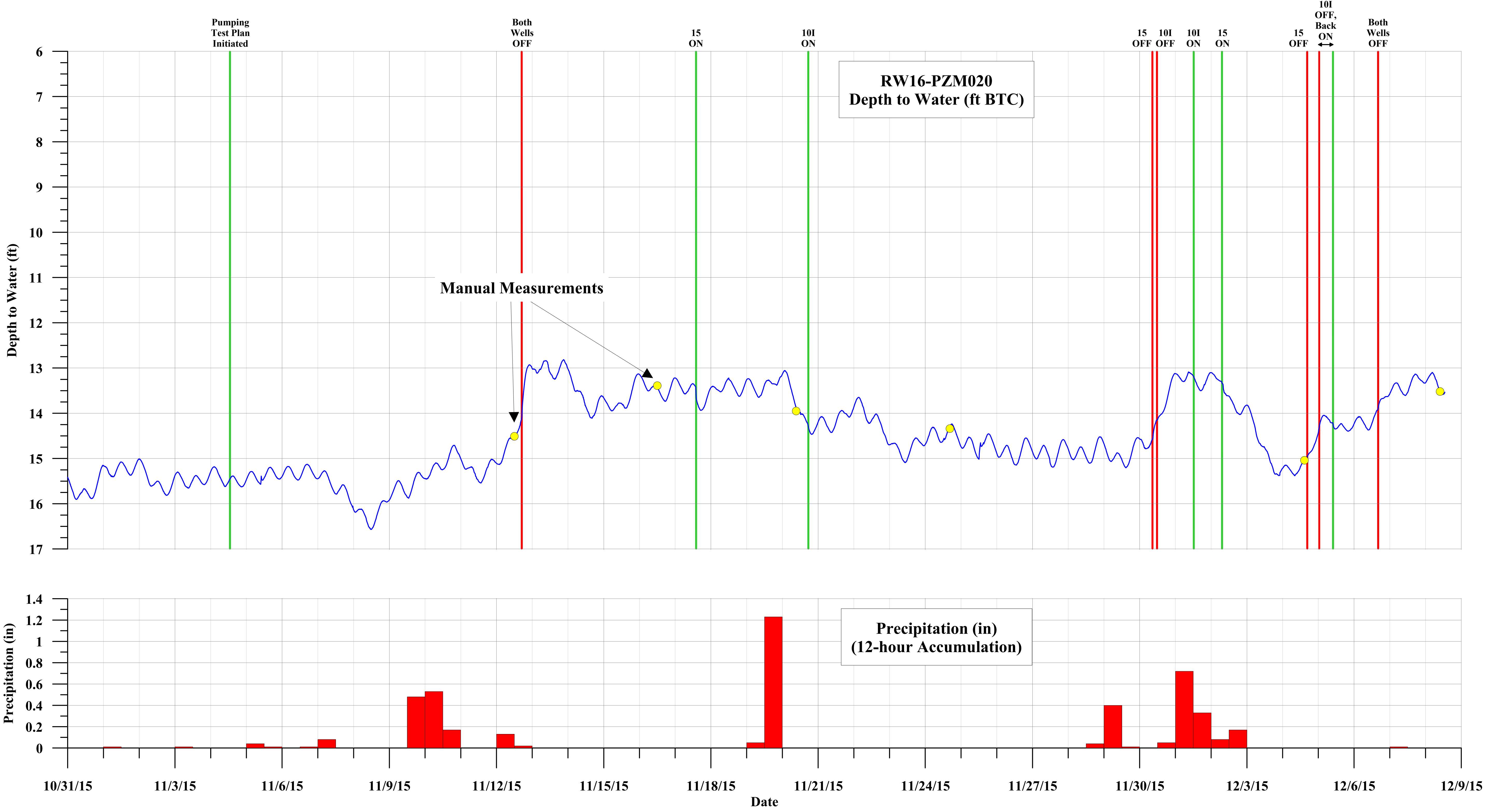
Figure
N9

Parcel A3 Rod & Wire Mill
Aquifer Test Data
Monitoring Well RW14-PZM020



ARM Group Inc. Earth Resource Engineers and Consultants	**RW14-PZM020 Monitoring Data** **November - December 2015** Sparrows Point Terminal Baltimore County, Maryland	April 2016 ARM 150298	Figure N9a

Parcel A3 Rod & Wire Mill
Aquifer Test Data
Monitoring Well RW16-PZM020



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RW16-PZM020 Monitoring Data
November - December 2015

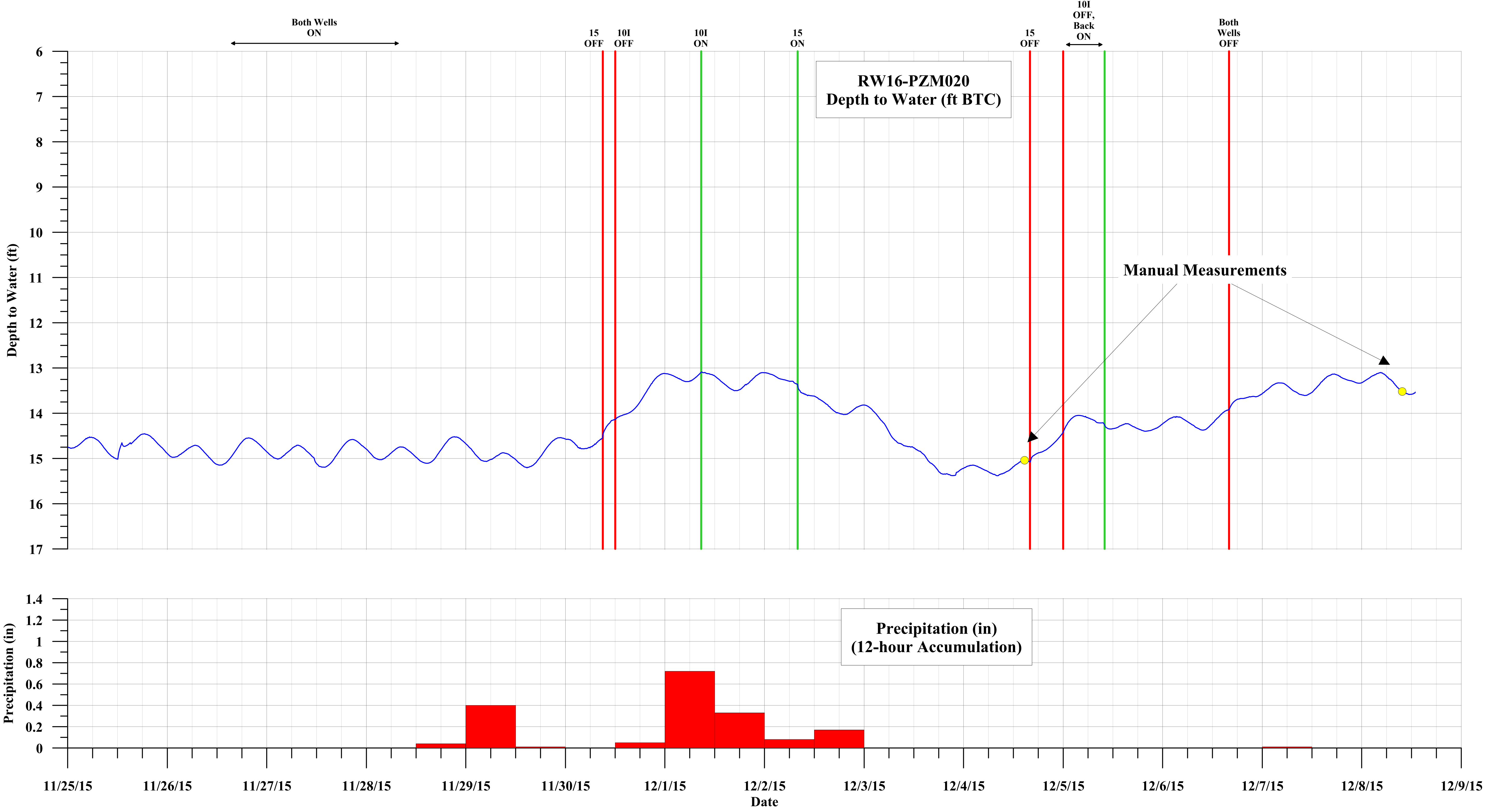
Sparrows Point Terminal
Baltimore County, Maryland

April 2016

ARM 150298

Figure
N10

Parcel A3 Rod & Wire Mill
Aquifer Test Data
Monitoring Well RW16-PZM020



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RW16-PZM020 Monitoring Data
November - December 2015

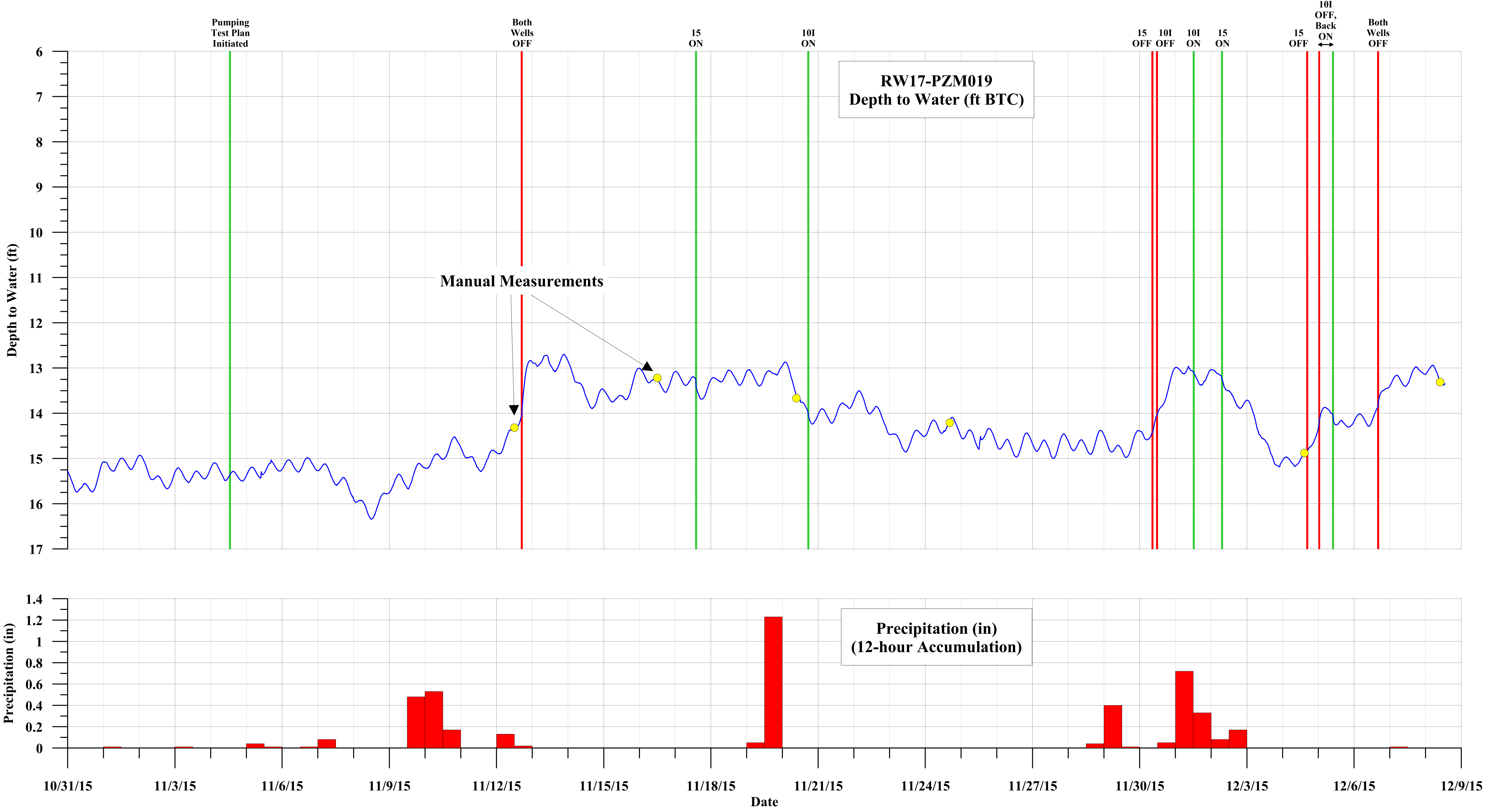
Sparrows Point Terminal
Baltimore County, Maryland

April 2016

ARM 150298

Figure
N10a

Parcel A3 Rod & Wire Mill
Aquifer Test Data
Monitoring Well RW17-PZM019



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RW17-PZM019 Monitoring Data
November - December 2015

Sparrows Point Terminal
Baltimore County, Maryland

April 2016

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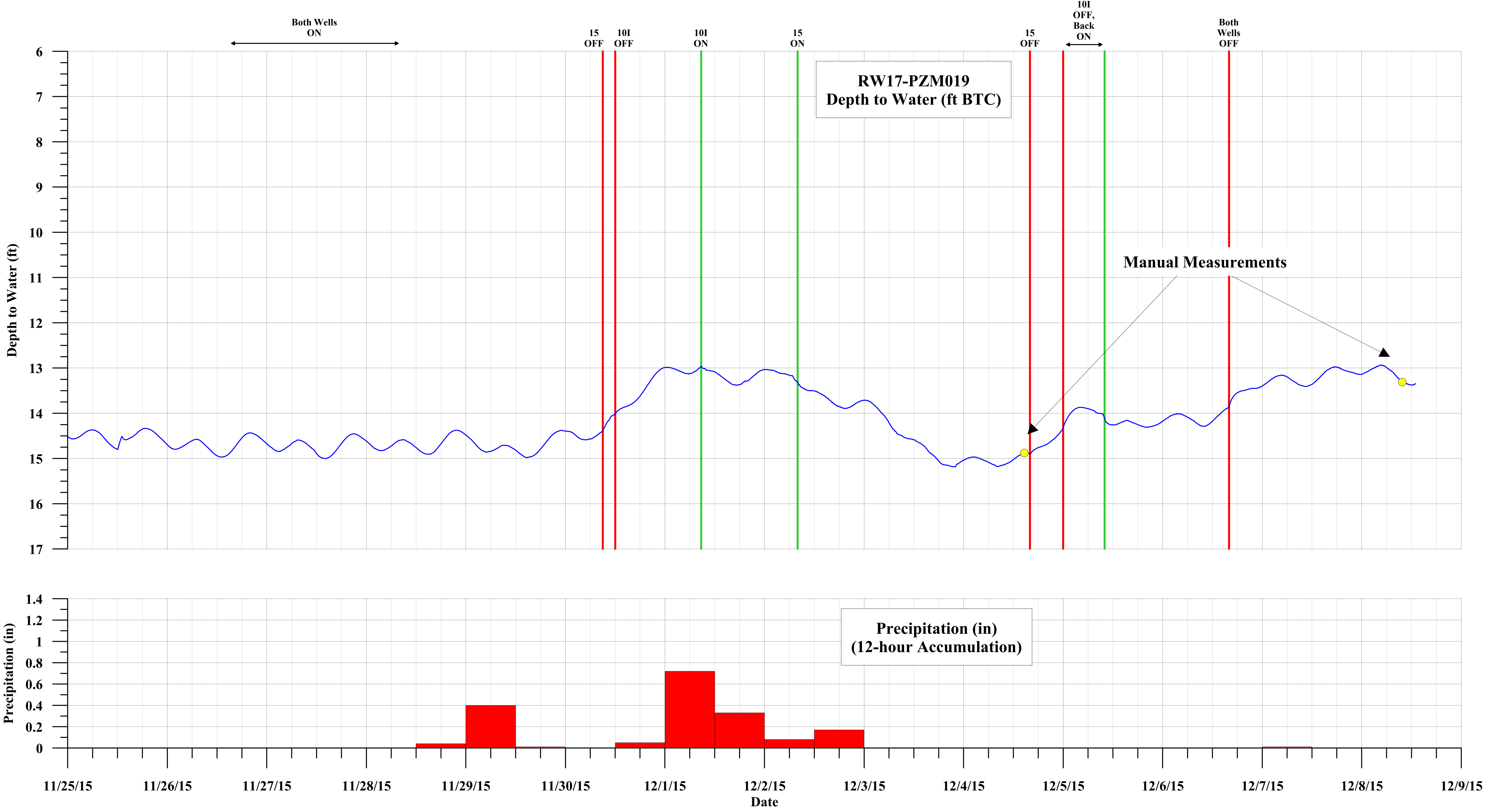
Figure
N11

Parcel A3 Rod & Wire Mill
Aquifer Test Data
Monitoring Well RW17-PZM019



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RW17-PZM019 Monitoring Data
November - December 2015

Sparrows Point Terminal
Baltimore County, Maryland

April 2016

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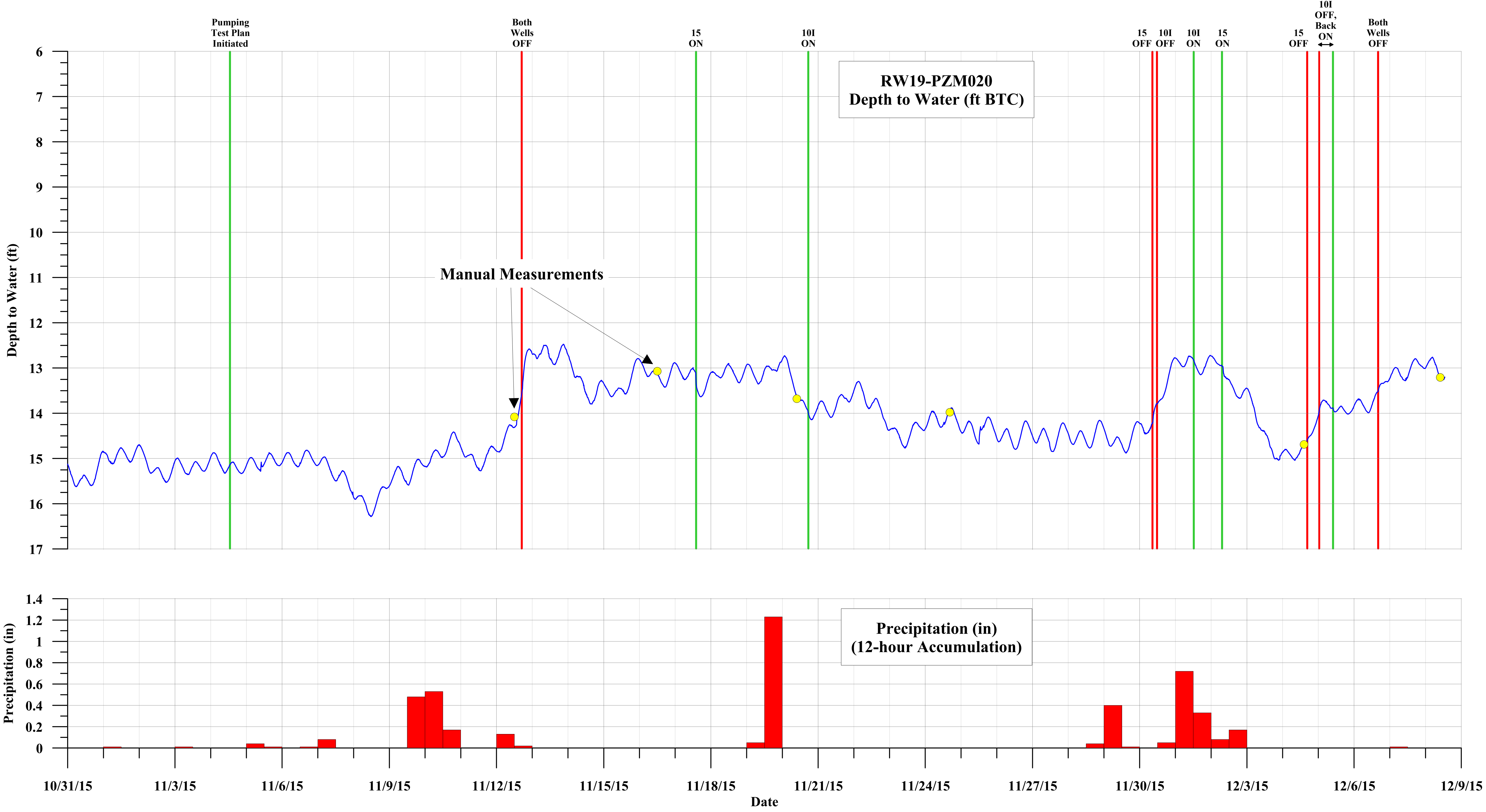
Figure
N11a

Parcel A3 Rod & Wire Mill
Aquifer Test Data
Monitoring Well RW19-PZM020



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RW19-PZM020 Monitoring Data
November - December 2015

Sparrows Point Terminal
Baltimore County, Maryland

April 2016

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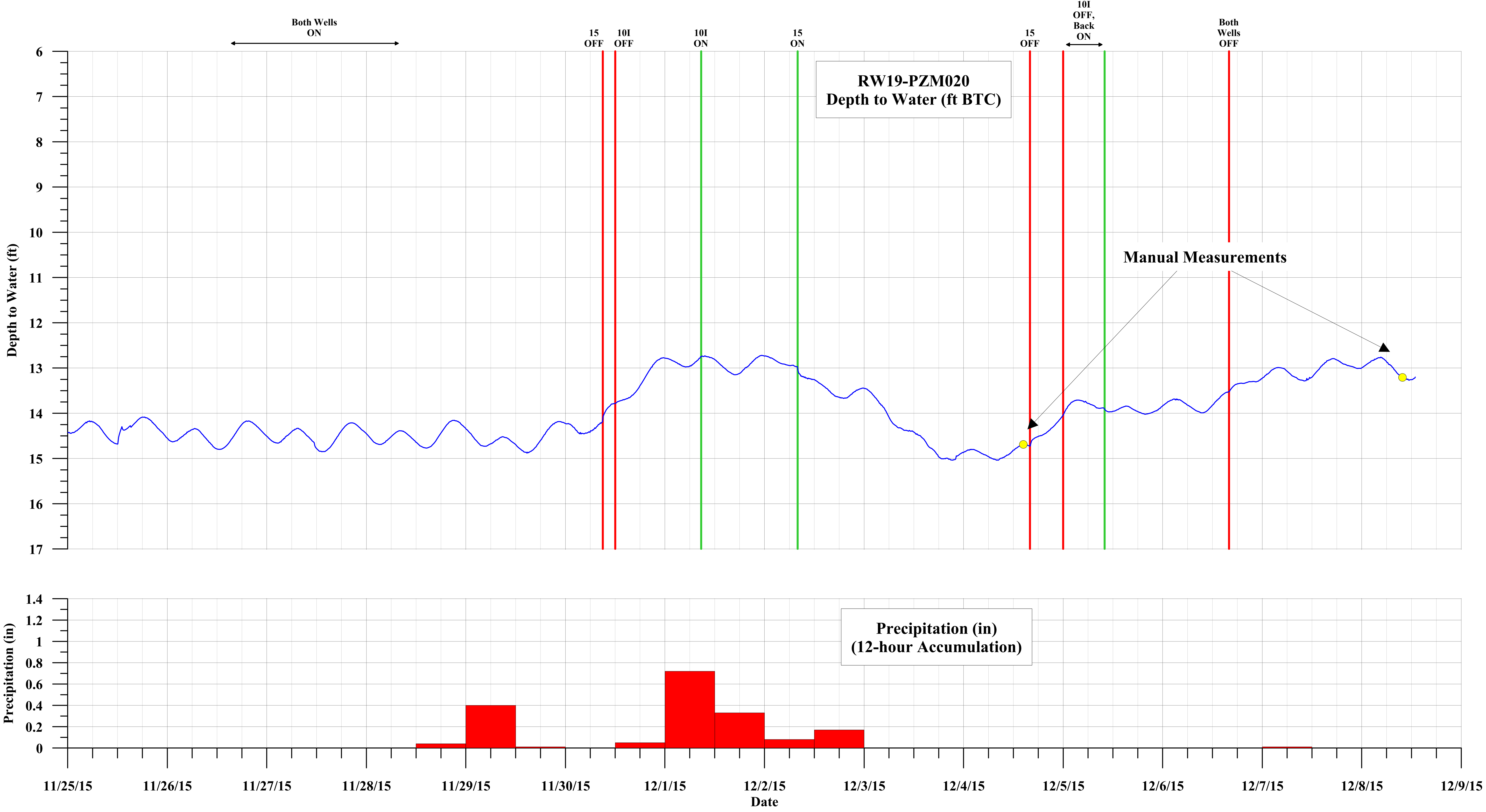
Figure
N12

Parcel A3 Rod & Wire Mill
Aquifer Test Data
Monitoring Well RW19-PZM020



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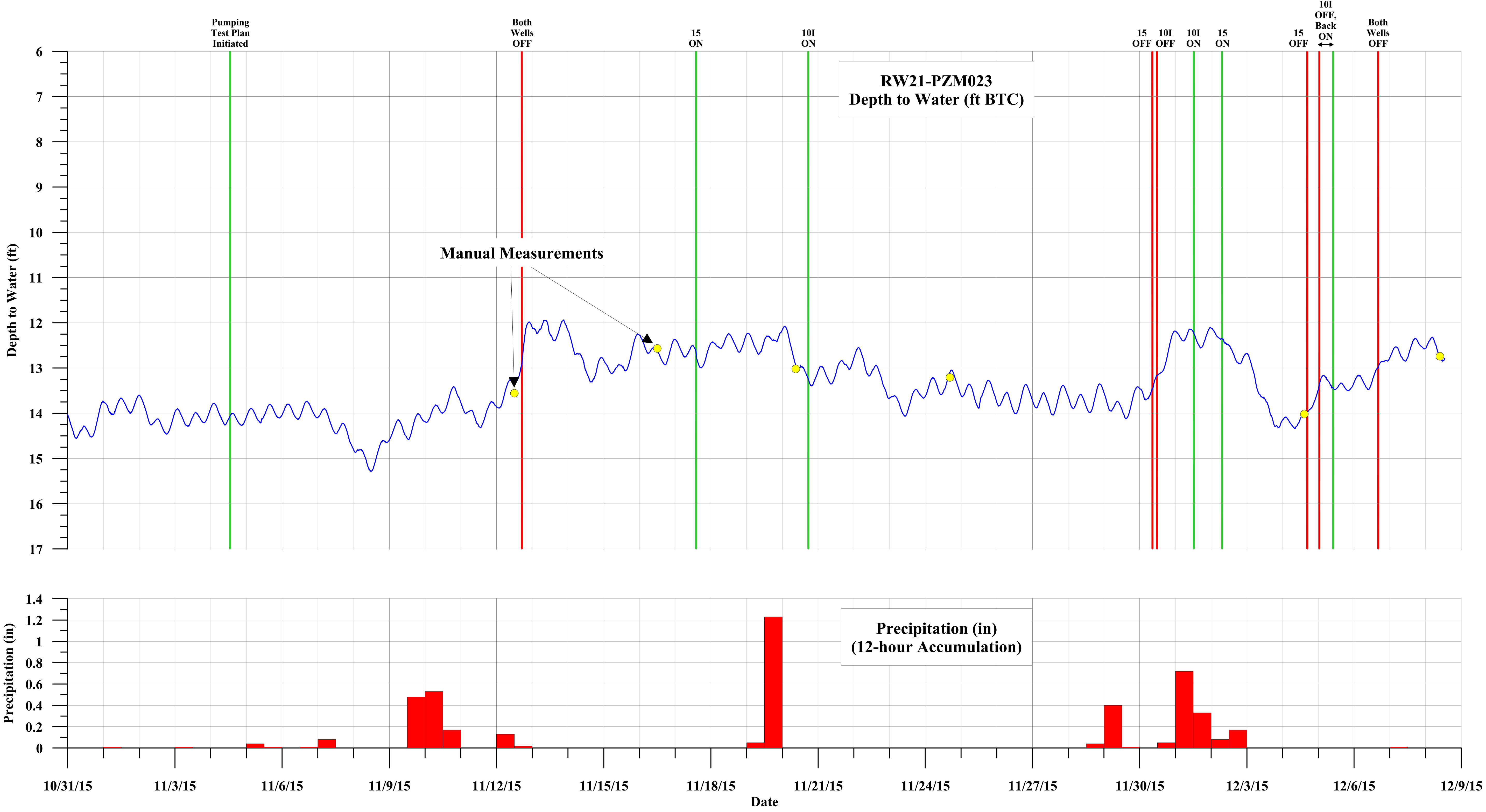
RW19-PZM020 Monitoring Data **November - December 2015** Sparrows Point Terminal Baltimore County, Maryland	April 2016 ARM 150298	Figure N12a

Parcel A3 Rod & Wire Mill
Aquifer Test Data
Monitoring Well RW21-PZM023



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RW21-PZM023 Monitoring Data
November - December 2015

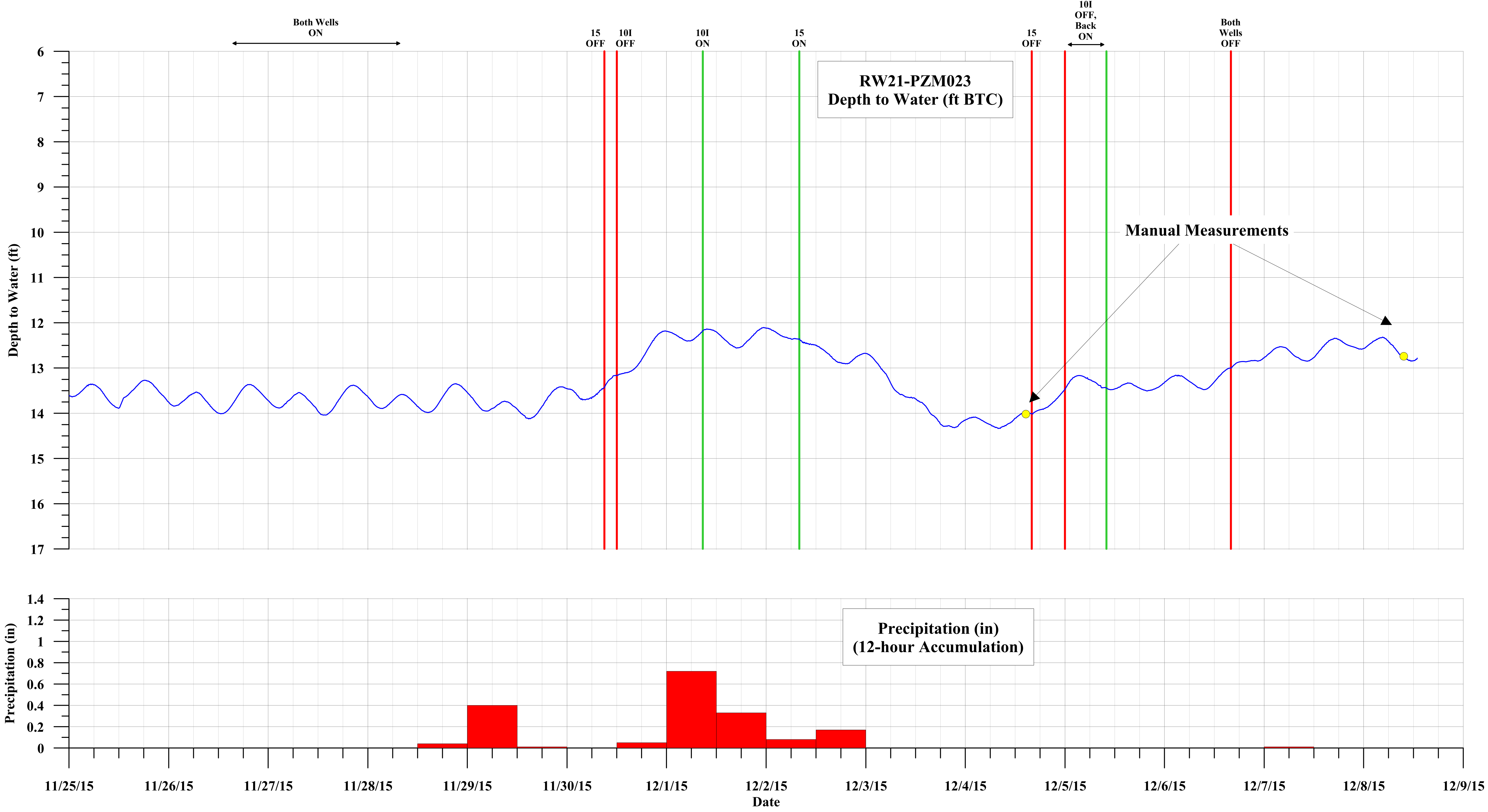
Sparrows Point Terminal
Baltimore County, Maryland

April 2016

ARM 150298

Figure
N13

Parcel A3 Rod & Wire Mill
Aquifer Test Data
Monitoring Well RW21-PZM023



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RW21-PZM023 Monitoring Data
November - December 2015

Sparrows Point Terminal
Baltimore County, Maryland

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Figure
N13a

Parcel A3 Rod & Wire Mill
Aquifer Test Data
Monitoring Well RW-22

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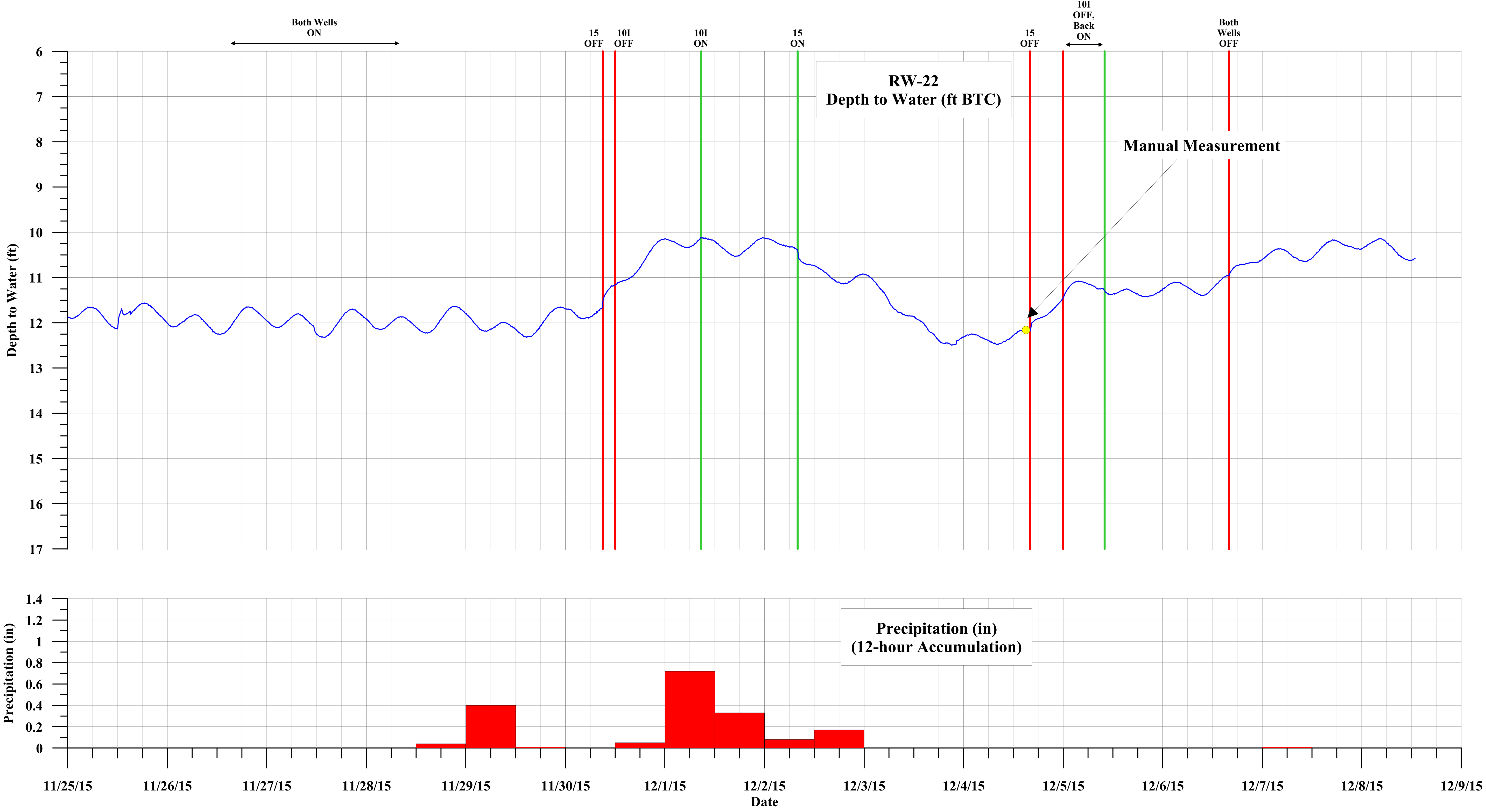
RW-22 Monitoring Data **November - December 2015** Sparrows Point Terminal Baltimore County, Maryland	April 2016 ARM 150298	Figure N14

Parcel A3 Rod & Wire Mill
Aquifer Test Data
Monitoring Well RW-22



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RW-22 Monitoring Data
November - December 2015

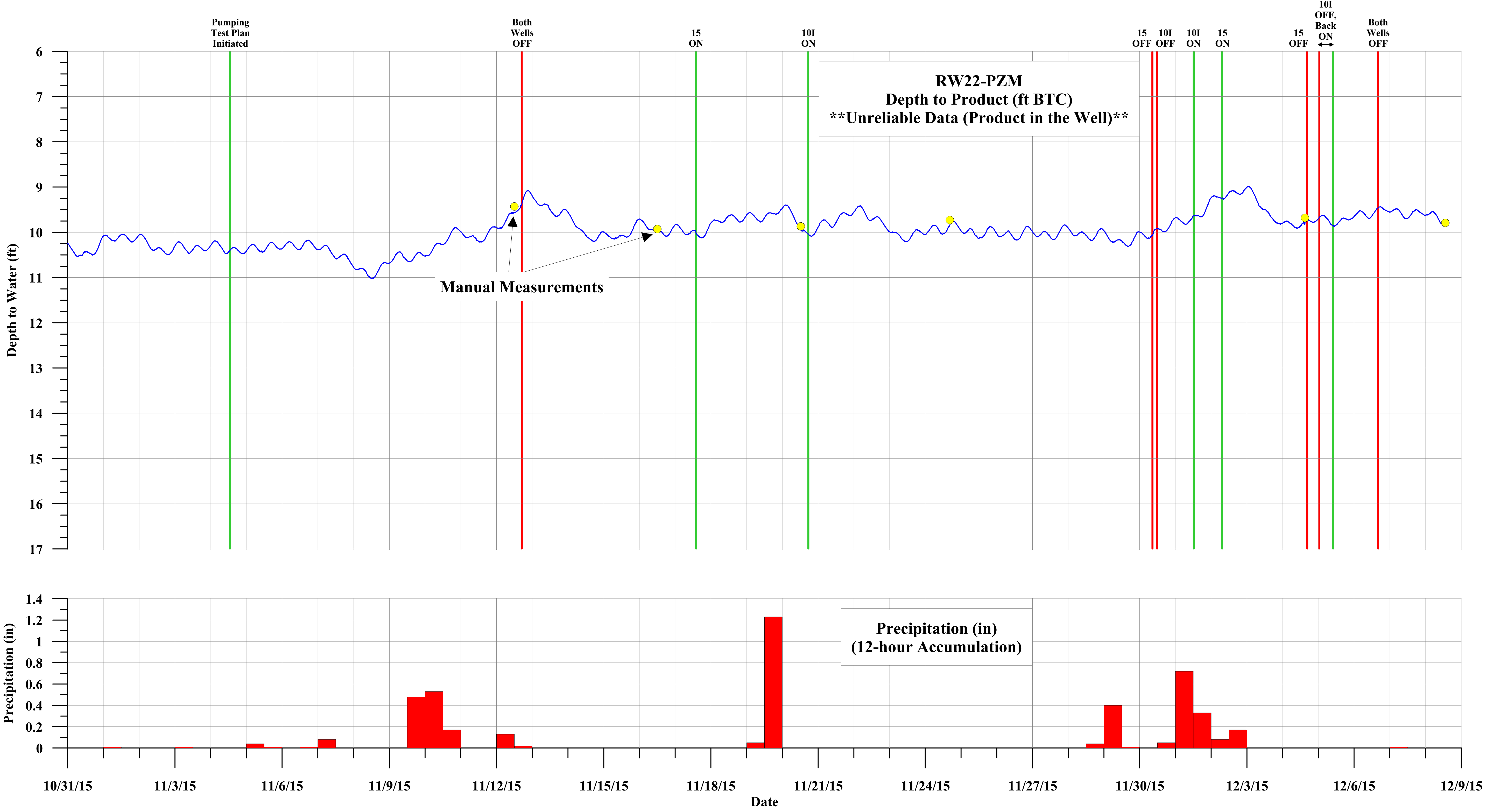
Sparrows Point Terminal
Baltimore County, Maryland

April 2016

ARM 150298

Figure
N14a

Parcel A3 Rod & Wire Mill
Aquifer Test Data
Monitoring Well RW22-PZM



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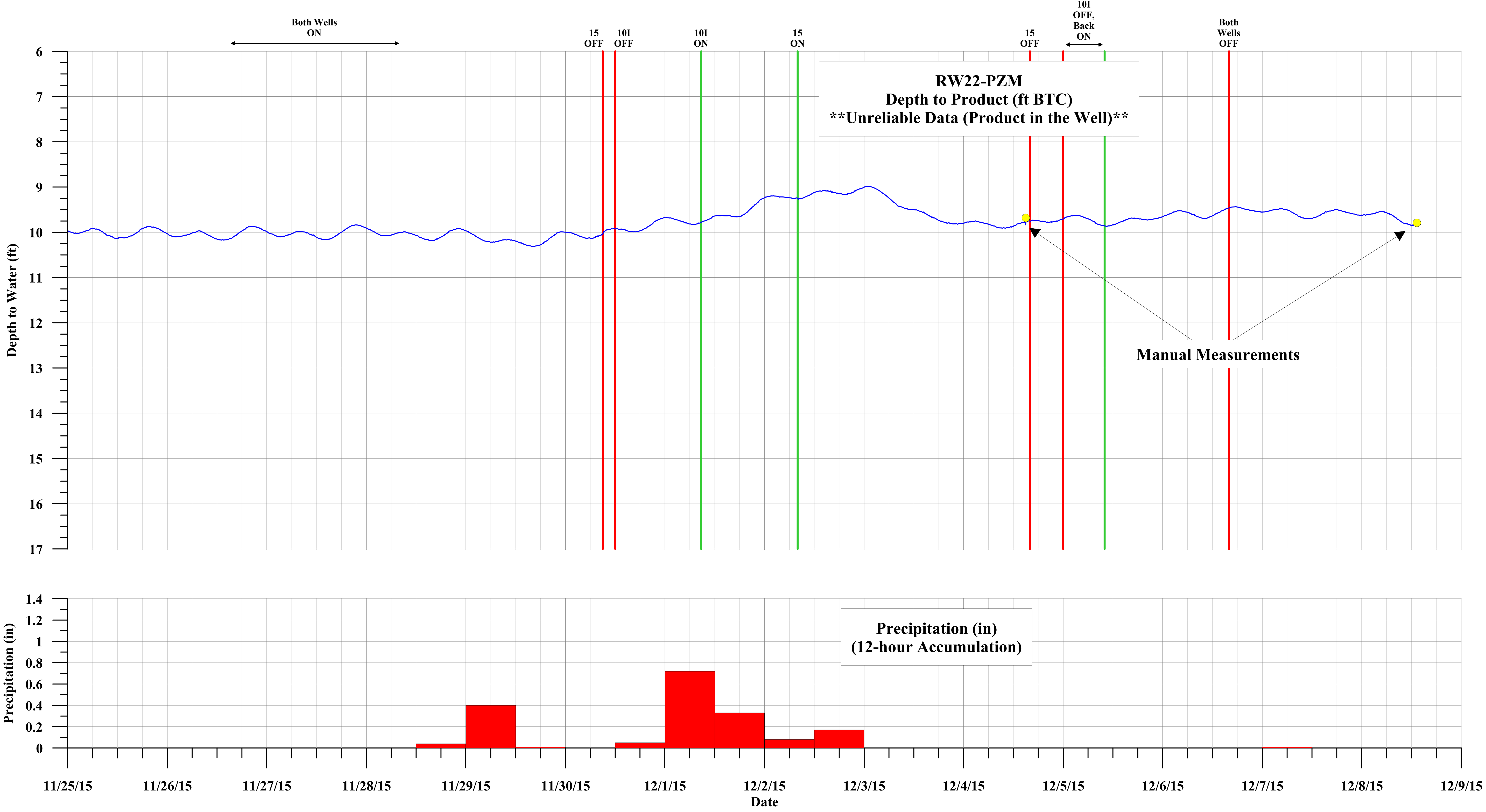
RW22-PZM Monitoring Data November - December 2015 Sparrows Point Terminal Baltimore County, Maryland	April 2016 ARM 150298	Figure N15

Parcel A3 Rod & Wire Mill
Aquifer Test Data
Monitoring Well RW22-PZM



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RW22-PZM Monitoring Data
November - December 2015

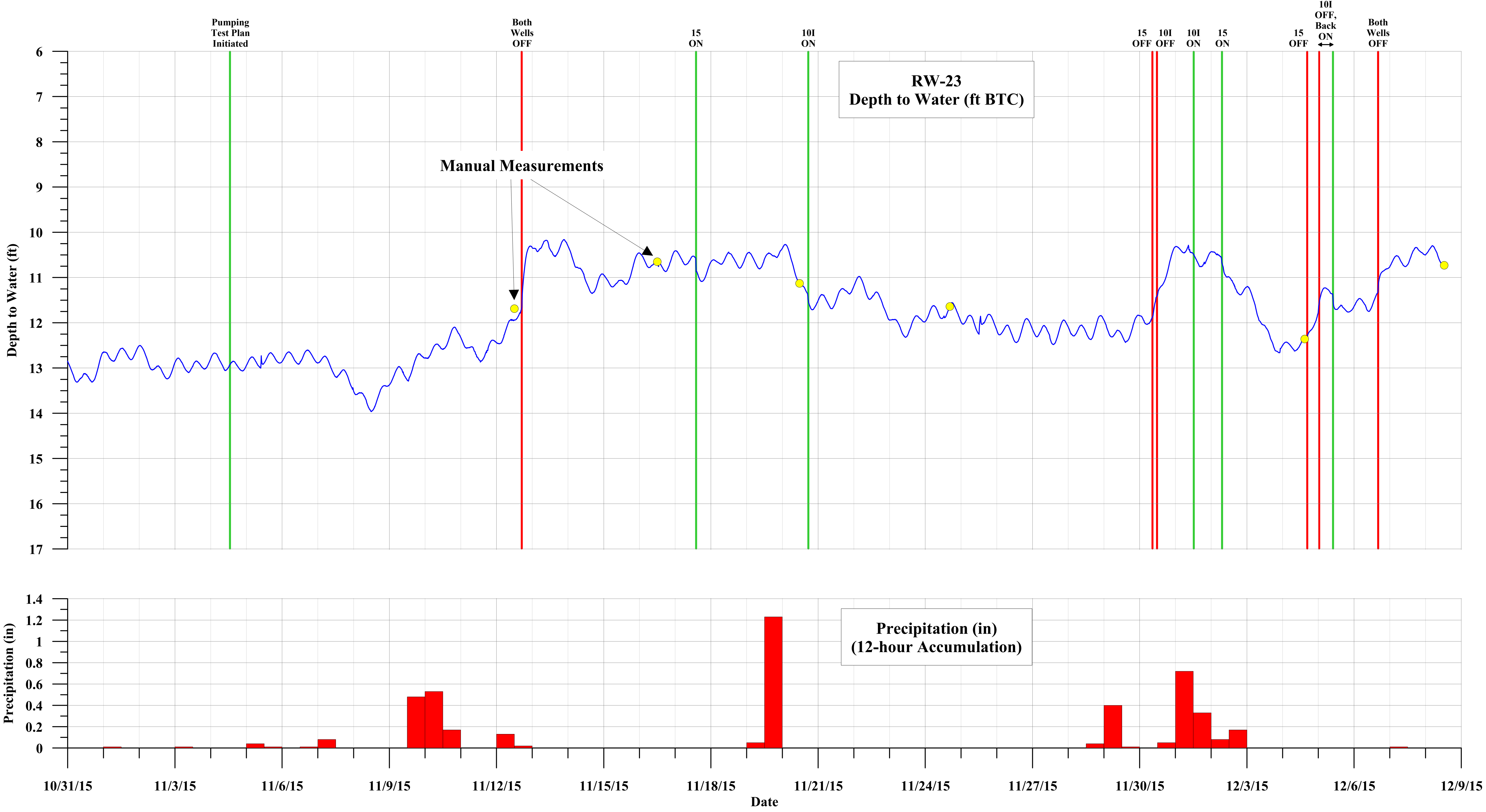
Sparrows Point Terminal
Baltimore County, Maryland

April 2016

ARM 150298

Figure
N15a

Parcel A3 Rod & Wire Mill
Aquifer Test Data
Monitoring Well RW-23



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RW-23 Monitoring Data
November - December 2015

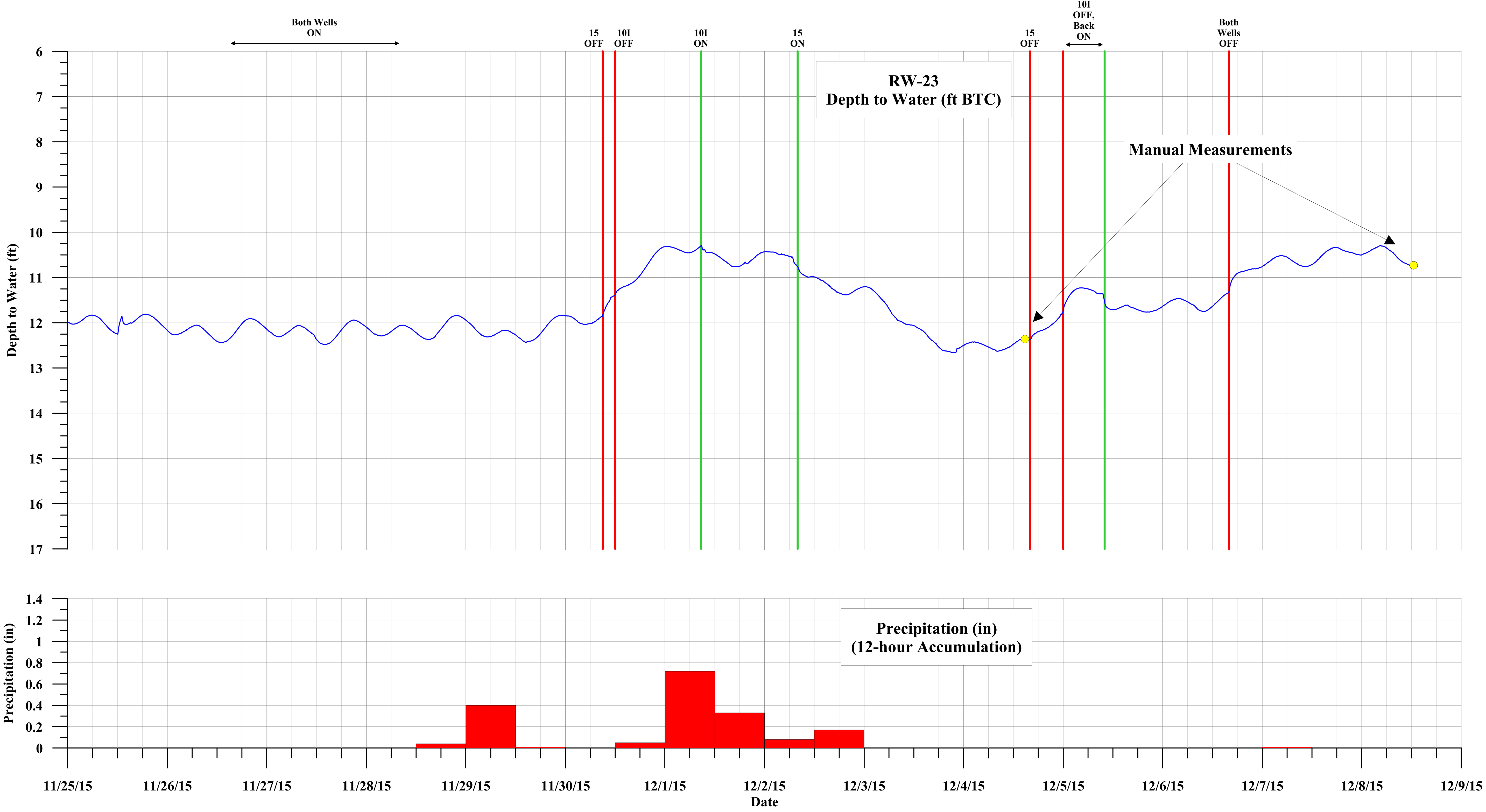
Sparrows Point Terminal
Baltimore County, Maryland

April 2016

ARM 150298

Figure
N16

Parcel A3 Rod & Wire Mill
Aquifer Test Data
Monitoring Well RW-23



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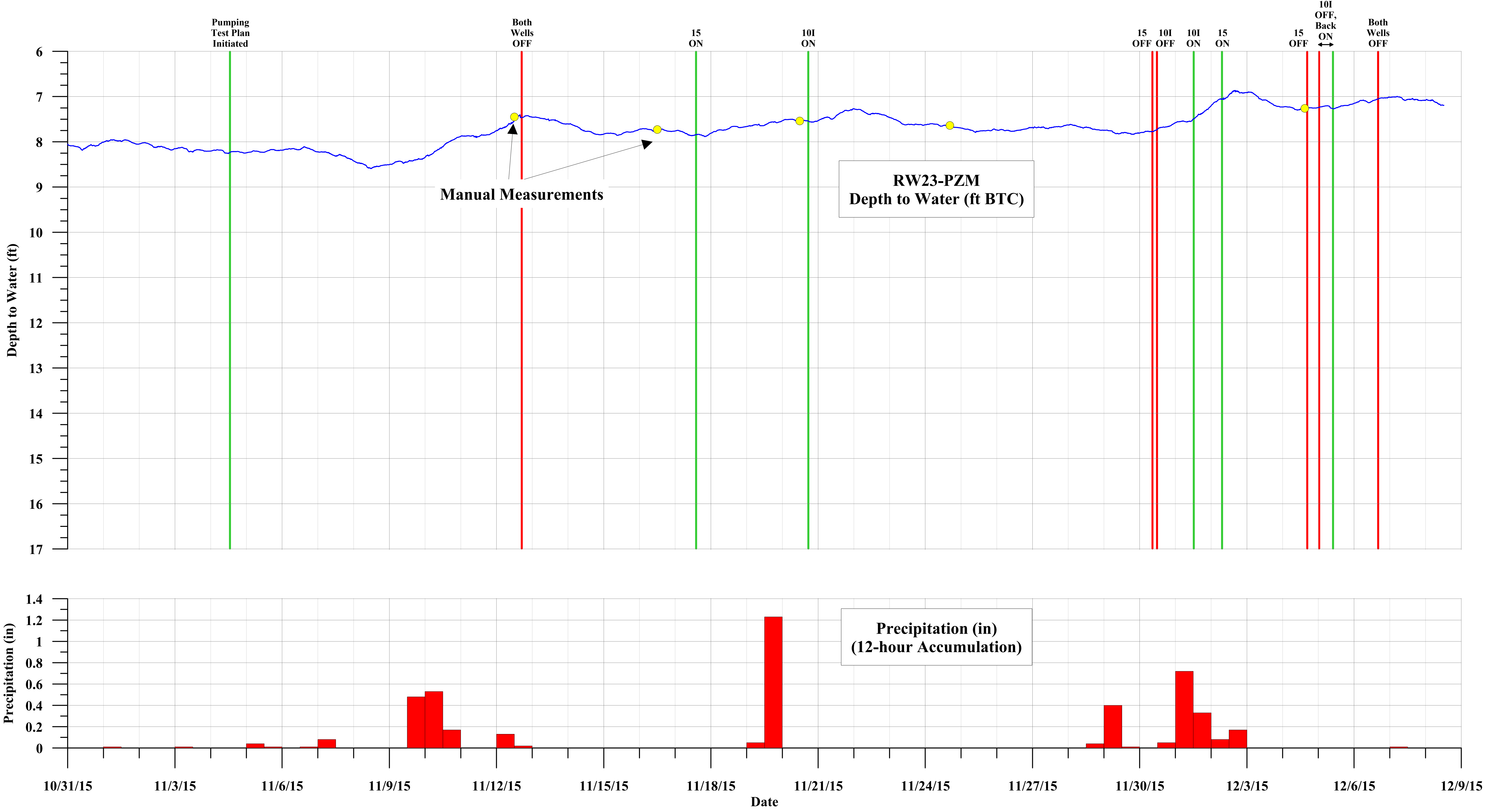
RW-23 Monitoring Data
November - December 2015

Sparrows Point Terminal
Baltimore County, Maryland

April 2016	Figure
	N16a
ARM 150298	

Parcel A3 Rod & Wire Mill
Aquifer Test Data
Monitoring Well RW23-PZM



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RW23-PZM Monitoring Data
November - December 2015

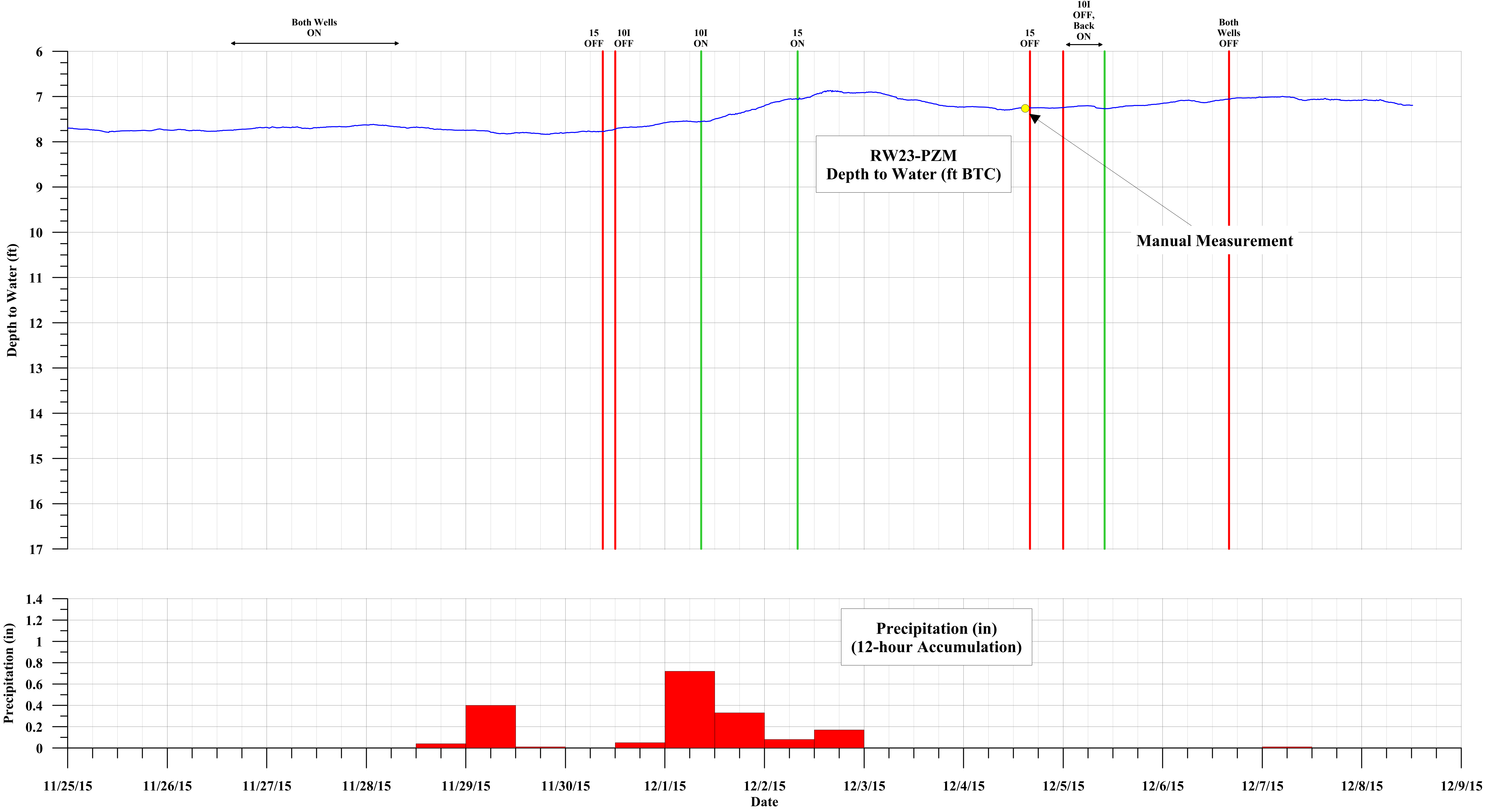
Sparrows Point Terminal
Baltimore County, Maryland

April 2016

ARM 150298

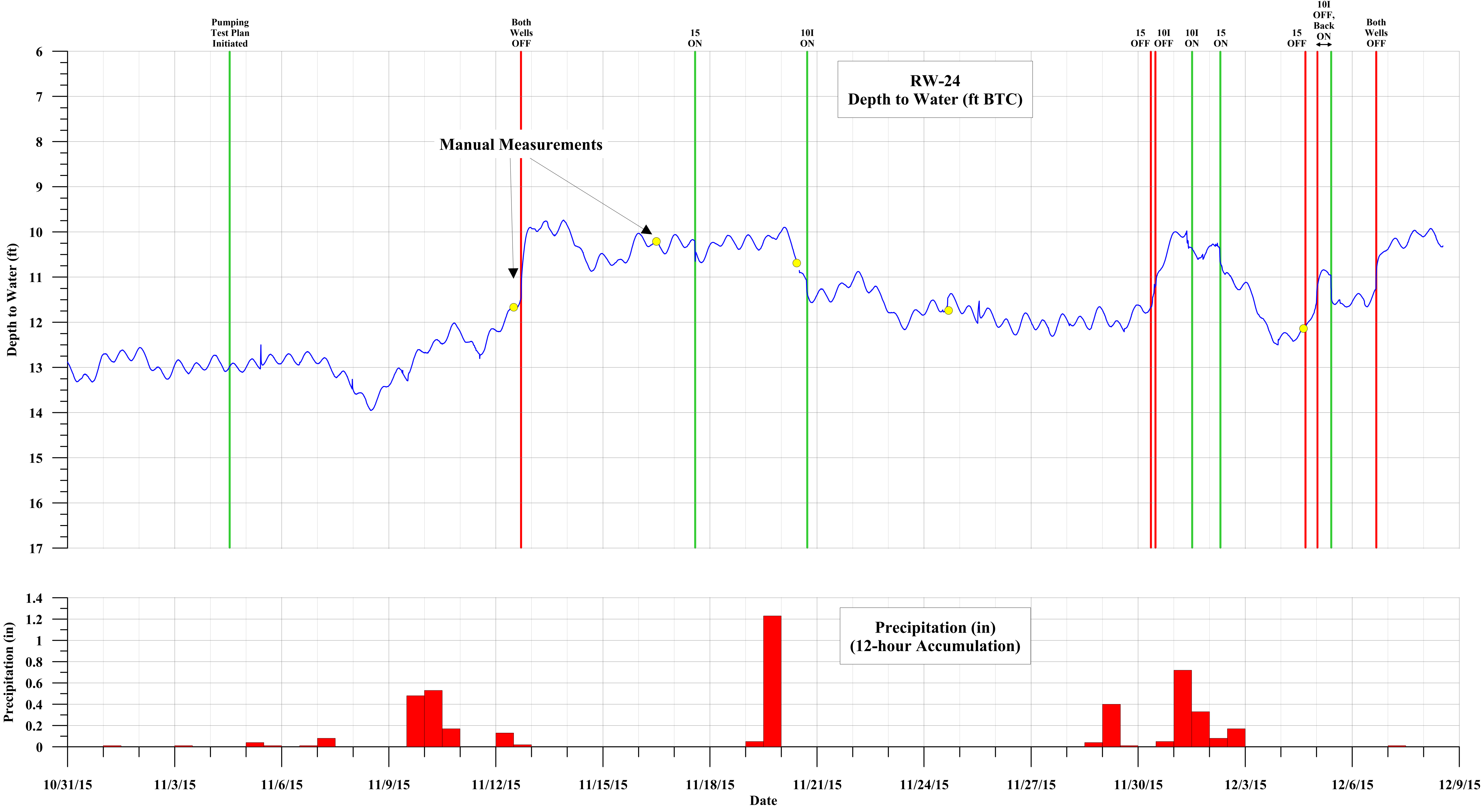
Figure
N17

Parcel A3 Rod & Wire Mill
Aquifer Test Data
Monitoring Well RW23-PZM



ARM Group Inc. Earth Resource Engineers and Consultants	RW23-PZM Monitoring Data November - December 2015 Sparrows Point Terminal Baltimore County, Maryland	April 2016 ARM 150298	Figure N17a

Parcel A3 Rod & Wire Mill
Aquifer Test Data
Monitoring Well RW-24



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RW-24 Monitoring Data
November - December 2015

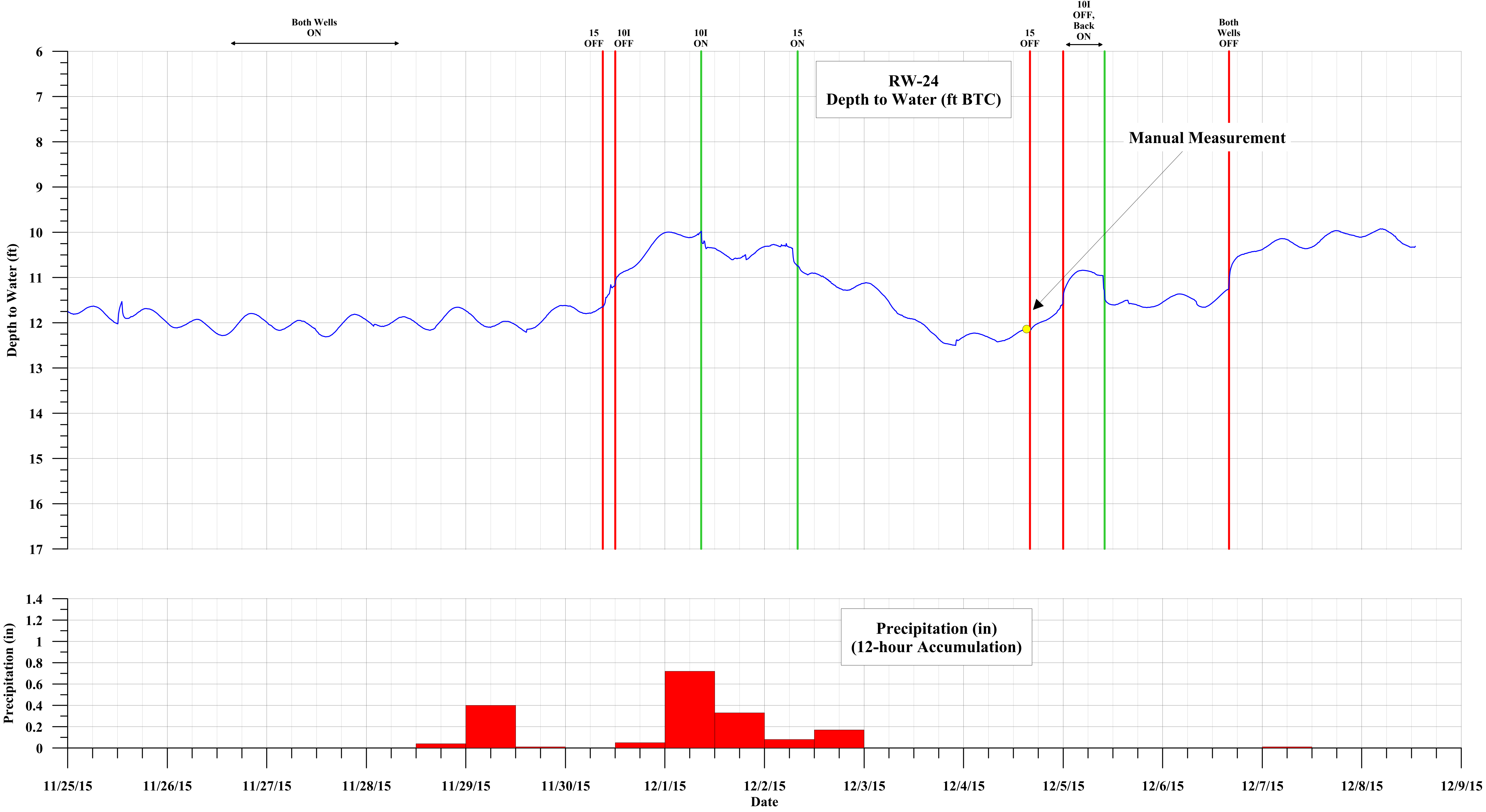
Sparrows Point Terminal
Baltimore County, Maryland

April 2016

ARM 150298

Figure
N18

Parcel A3 Rod & Wire Mill
Aquifer Test Data
Monitoring Well RW-24



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RW-24 Monitoring Data
November - December 2015

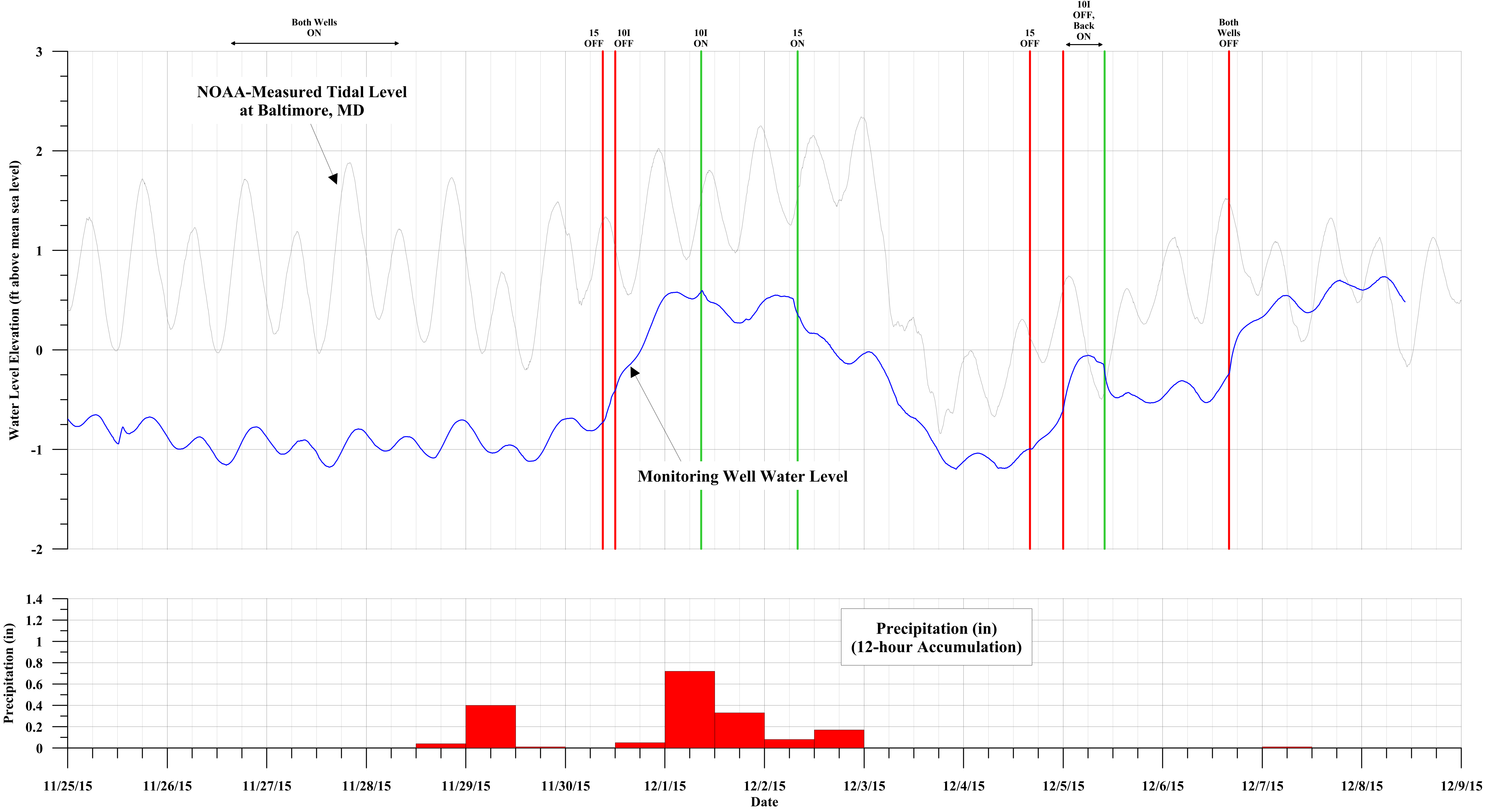
Sparrows Point Terminal
Baltimore County, Maryland

April 2016

ARM 150298

Figure
N18a

Parcel A3 Rod & Wire Mill
Unfiltered Observation Data
Monitoring Well RW01-PZM020



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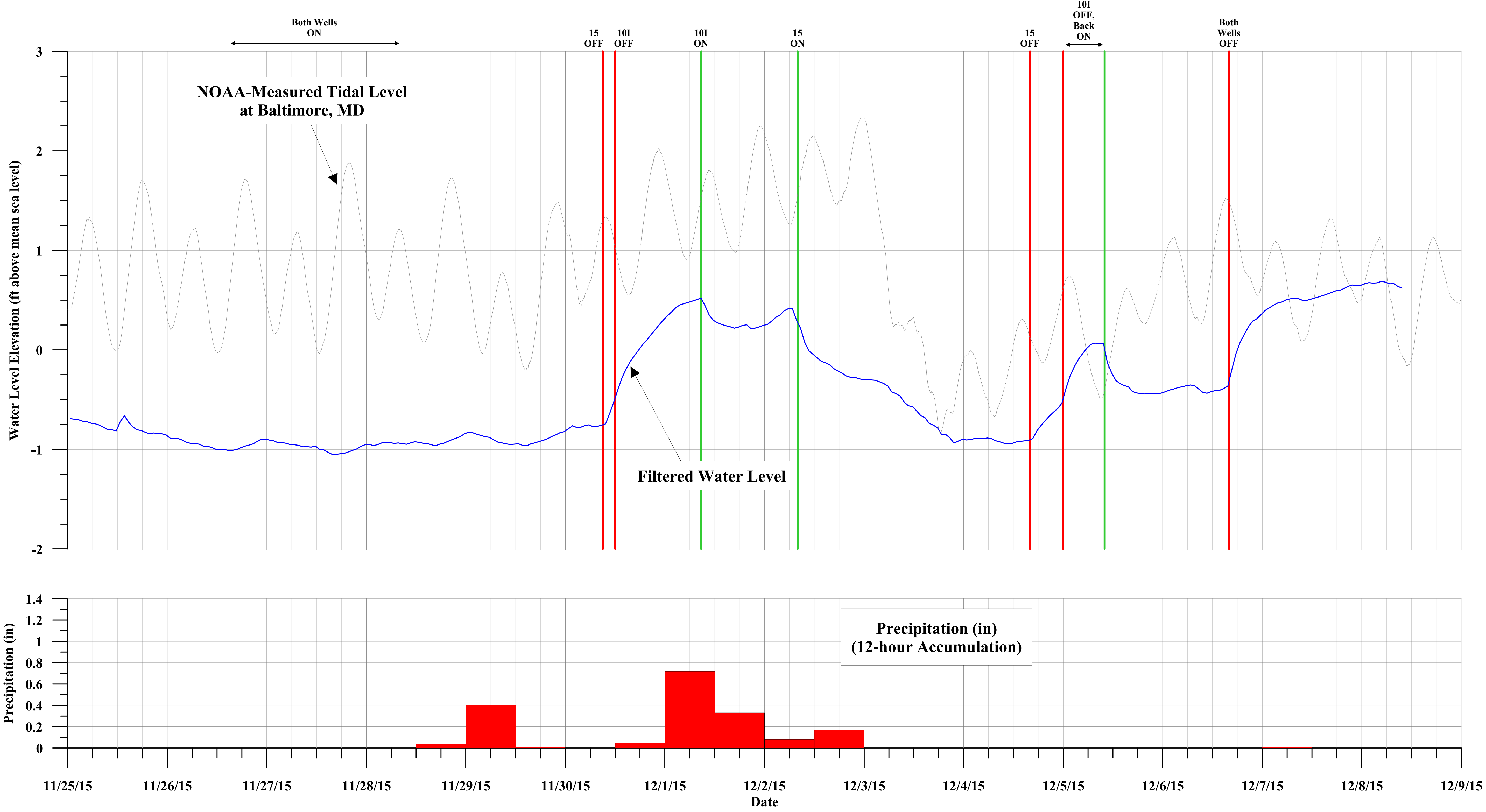
Observed Data: RW01-PZM020 **November - December 2015** Sparrows Point Terminal Baltimore County, Maryland	April 2016 ARM 150298	Figure N19

Parcel A3 Rod & Wire Mill
Tidal-Filtered Observation Data
Monitoring Well RW01-PZM020



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Tidal-Filtered Data: RW01-PZM020
November - December 2015

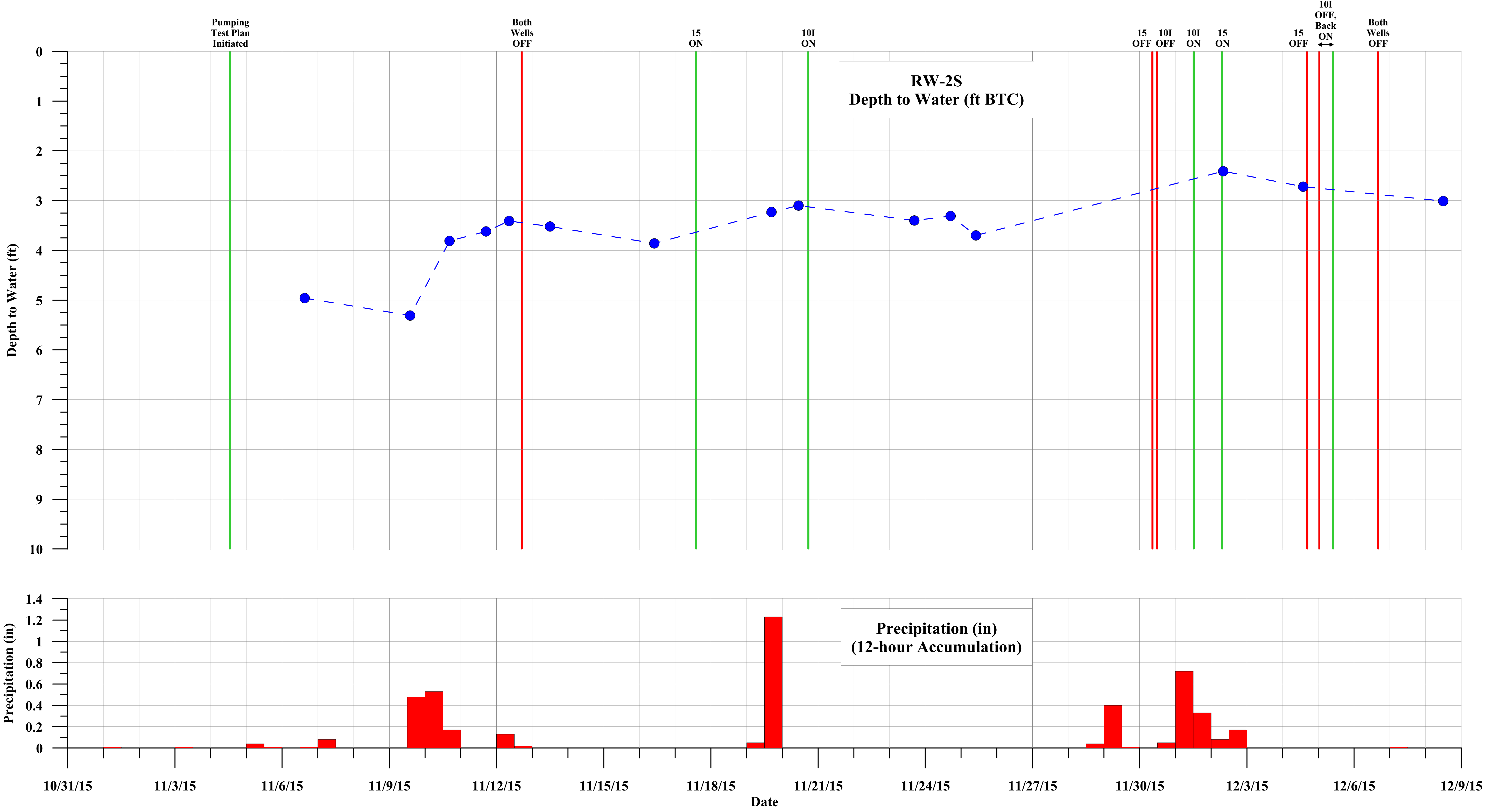
Sparrows Point Terminal
Baltimore County, Maryland

April 2016

ARM 150298

Figure
N20

Parcel A3 Rod & Wire Mill
Aquifer Test Data
Monitoring Well RW-2S (All Manual Data)



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RW-2S Monitoring Data
November - December 2015

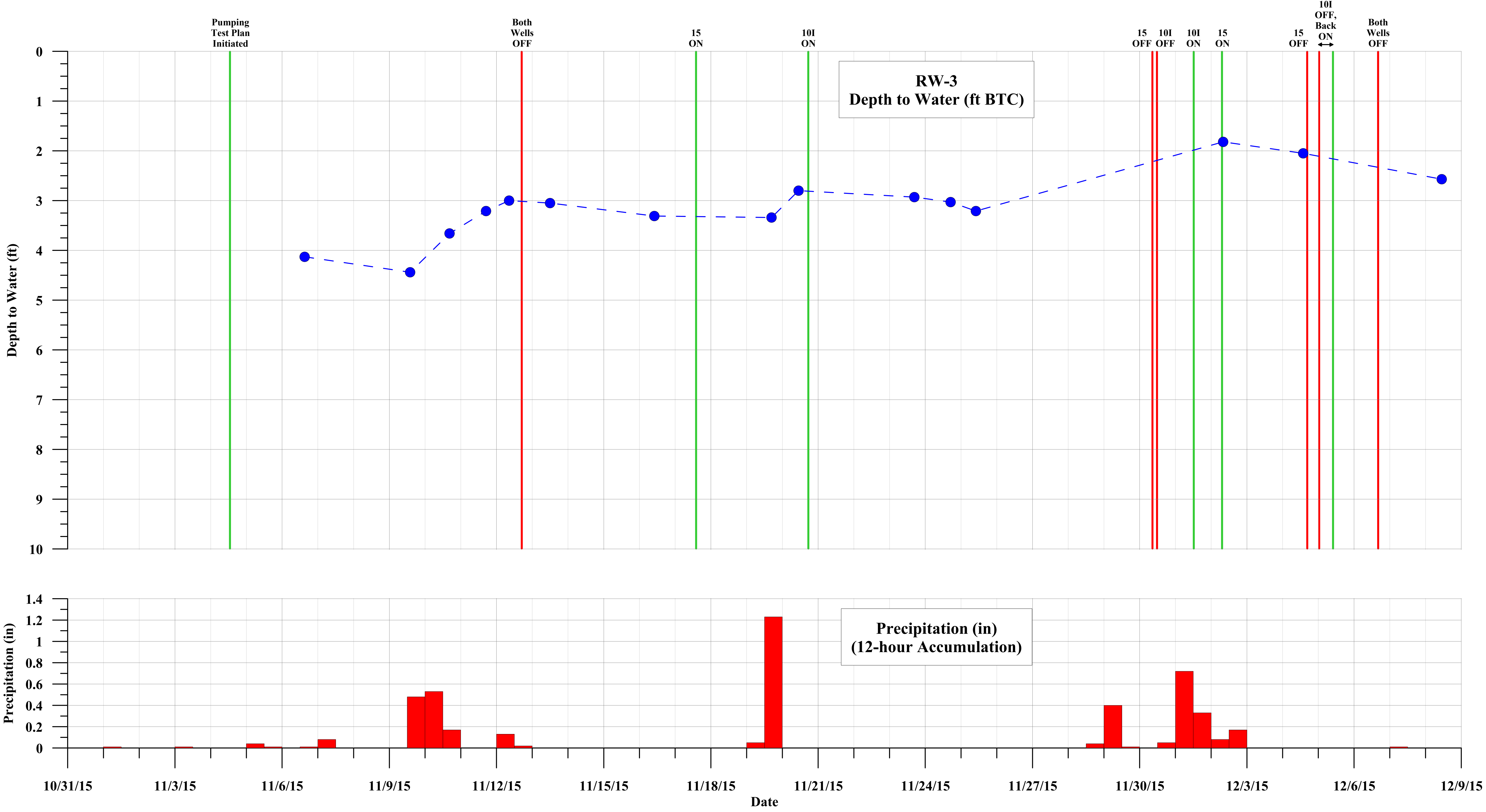
Sparrows Point Terminal
Baltimore County, Maryland

January 2016

ARM 150298

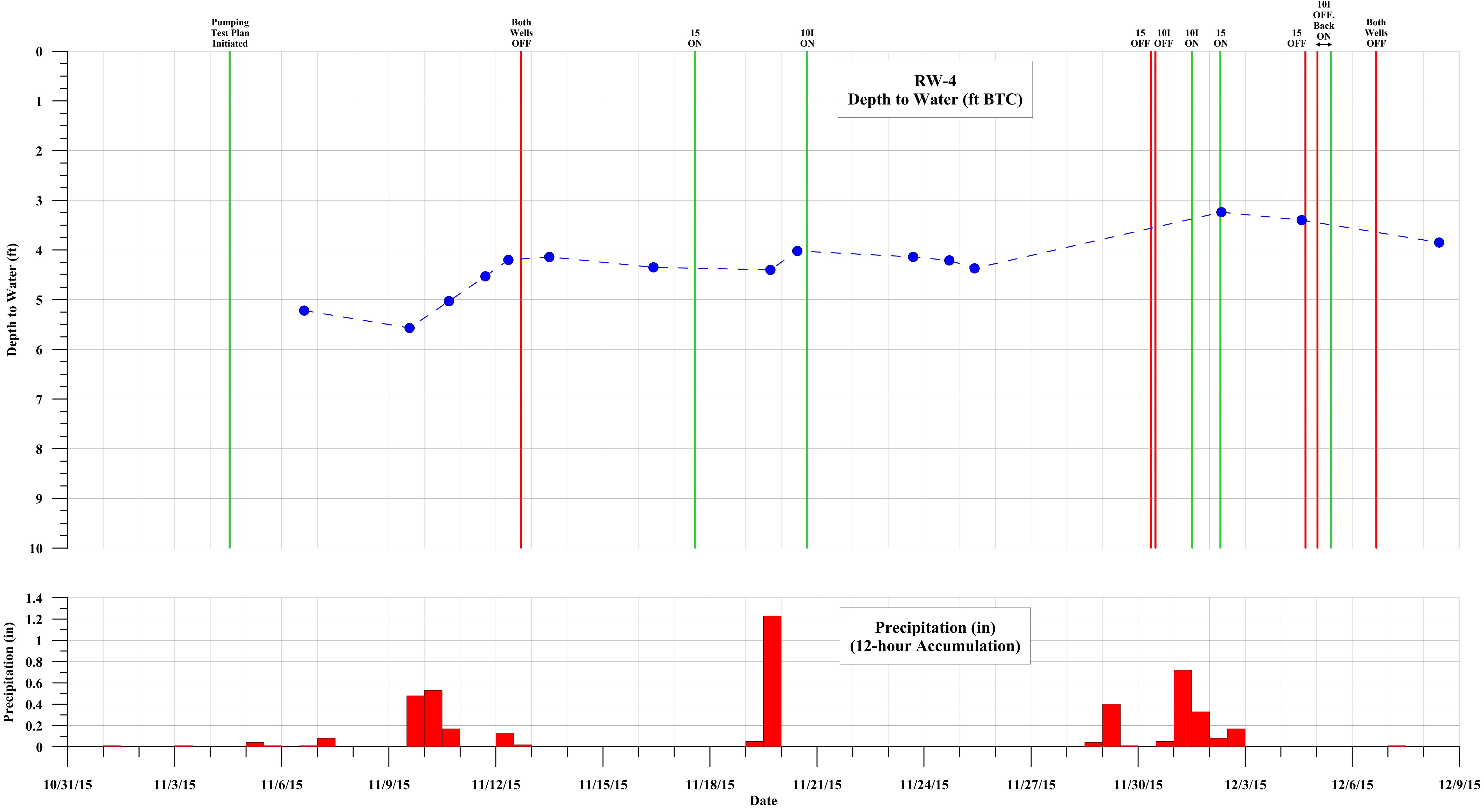
Figure
N21

Parcel A3 Rod & Wire Mill
Aquifer Test Data
Monitoring Well RW-3 (All Manual Data)



ARM Group Inc. Earth Resource Engineers and Consultants	**RW-3 Monitoring Data** **November - December 2015** Sparrows Point Terminal Baltimore County, Maryland	January 2016 ARM 150298	Figure N22

Parcel A3 Rod & Wire Mill
Aquifer Test Data
Monitoring Well RW-4 (All Manual Data)



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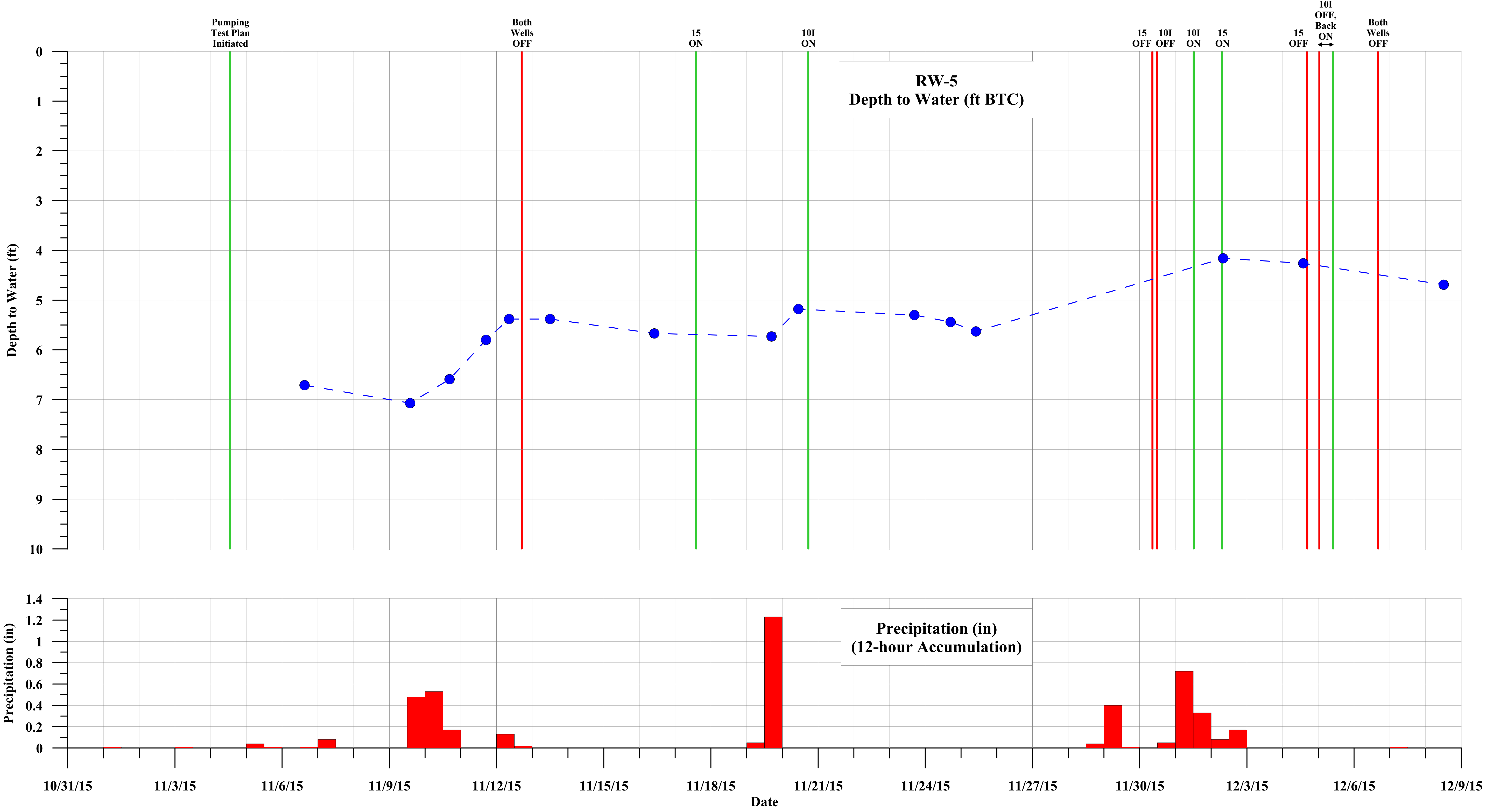
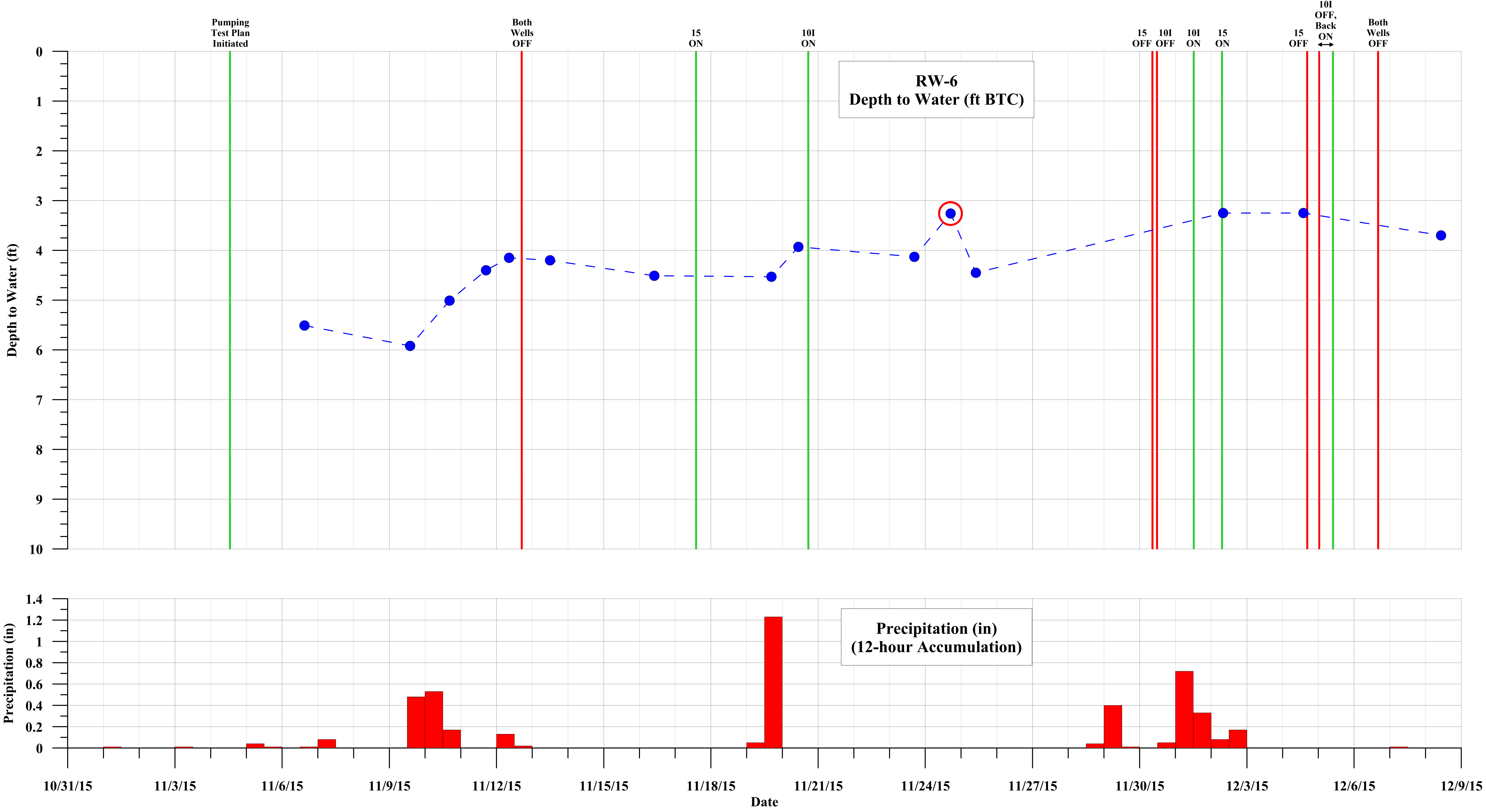
RW-4 Monitoring Data **November - December 2015** Sparrows Point Terminal Baltimore County, Maryland	January 2016 ARM 150298	Figure N23

Parcel A3 Rod & Wire Mill
Aquifer Test Data
Monitoring Well RW-5 (All Manual Data)



ARM Group Inc. Earth Resource Engineers and Consultants	**RW-5 Monitoring Data** **November - December 2015** Sparrows Point Terminal Baltimore County, Maryland	January 2016 ARM 150298	Figure N24

Parcel A3 Rod & Wire Mill
Aquifer Test Data
Monitoring Well RW-6 (All Manual Data)



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RW-6 Monitoring Data
November - December 2015

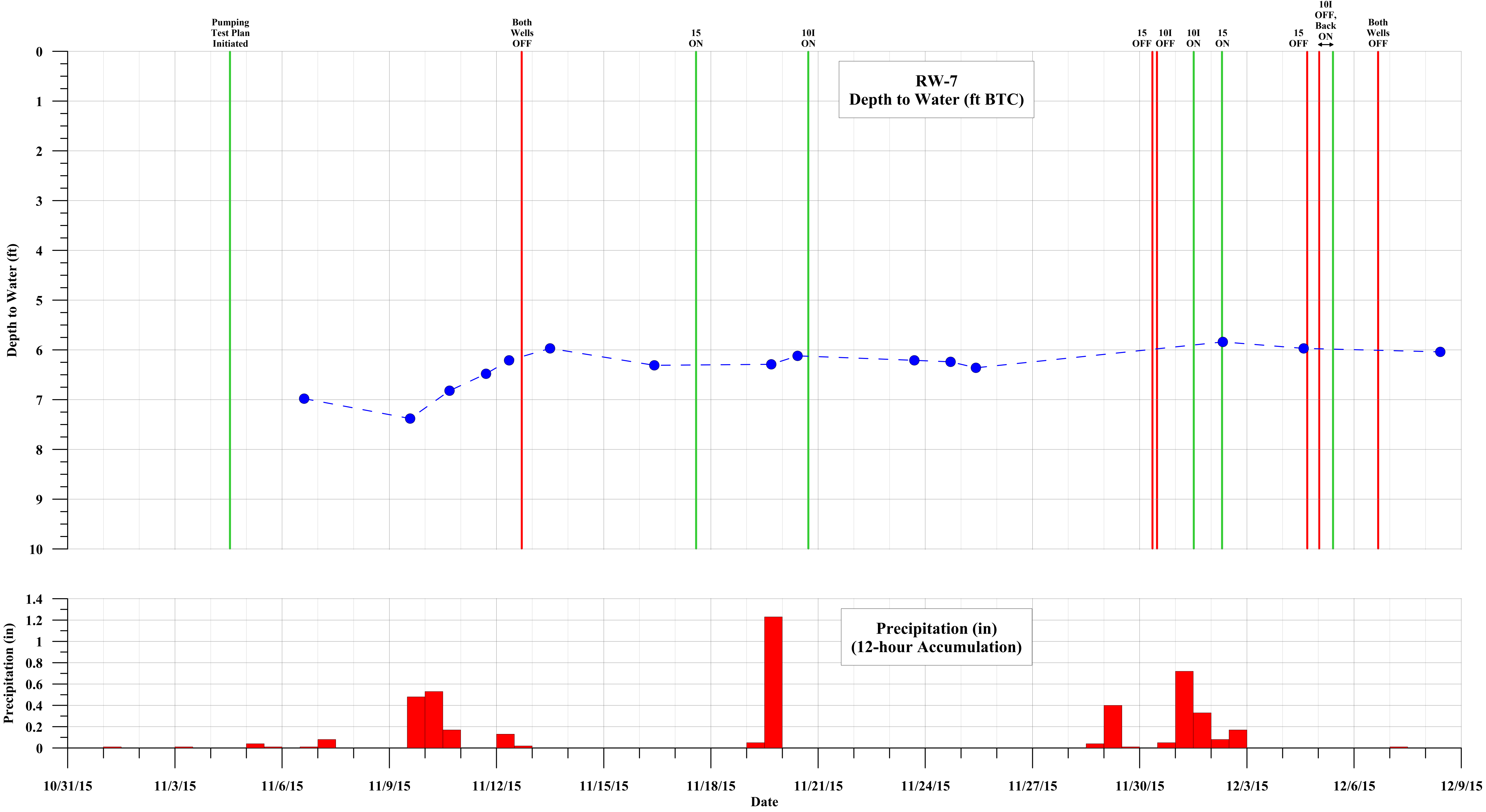
Sparrows Point Terminal
Baltimore County, Maryland

January 2016

ARM 150298

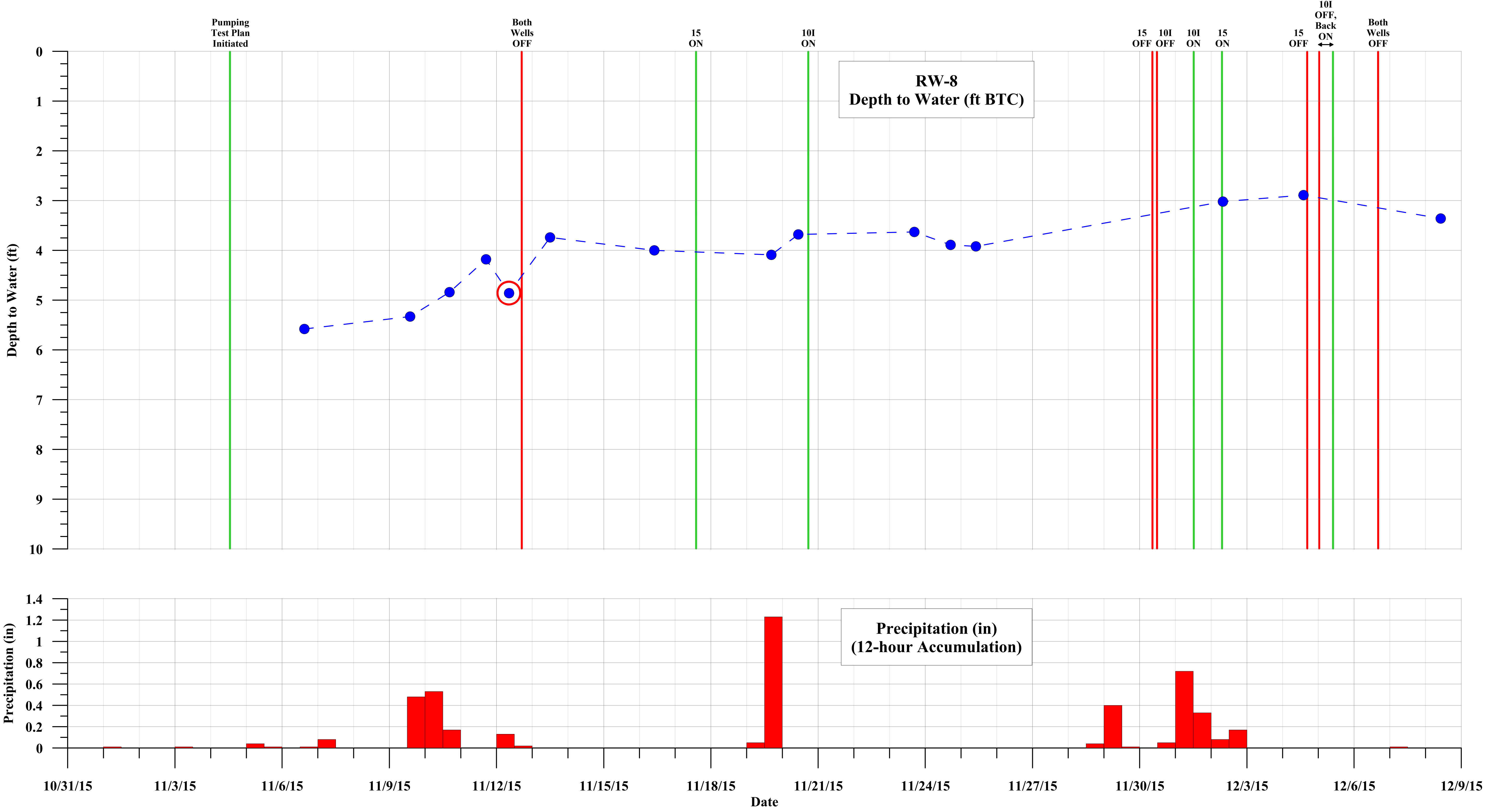
Figure
N25

Parcel A3 Rod & Wire Mill
Aquifer Test Data
Monitoring Well RW-7 (All Manual Data)



ARM Group Inc. Earth Resource Engineers and Consultants	**RW-7 Monitoring Data** **November - December 2015** Sparrows Point Terminal Baltimore County, Maryland	January 2016 ARM 150298	Figure N26

Parcel A3 Rod & Wire Mill
Aquifer Test Data
Monitoring Well RW-8 (All Manual Data)



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RW-8 Monitoring Data
November - December 2015

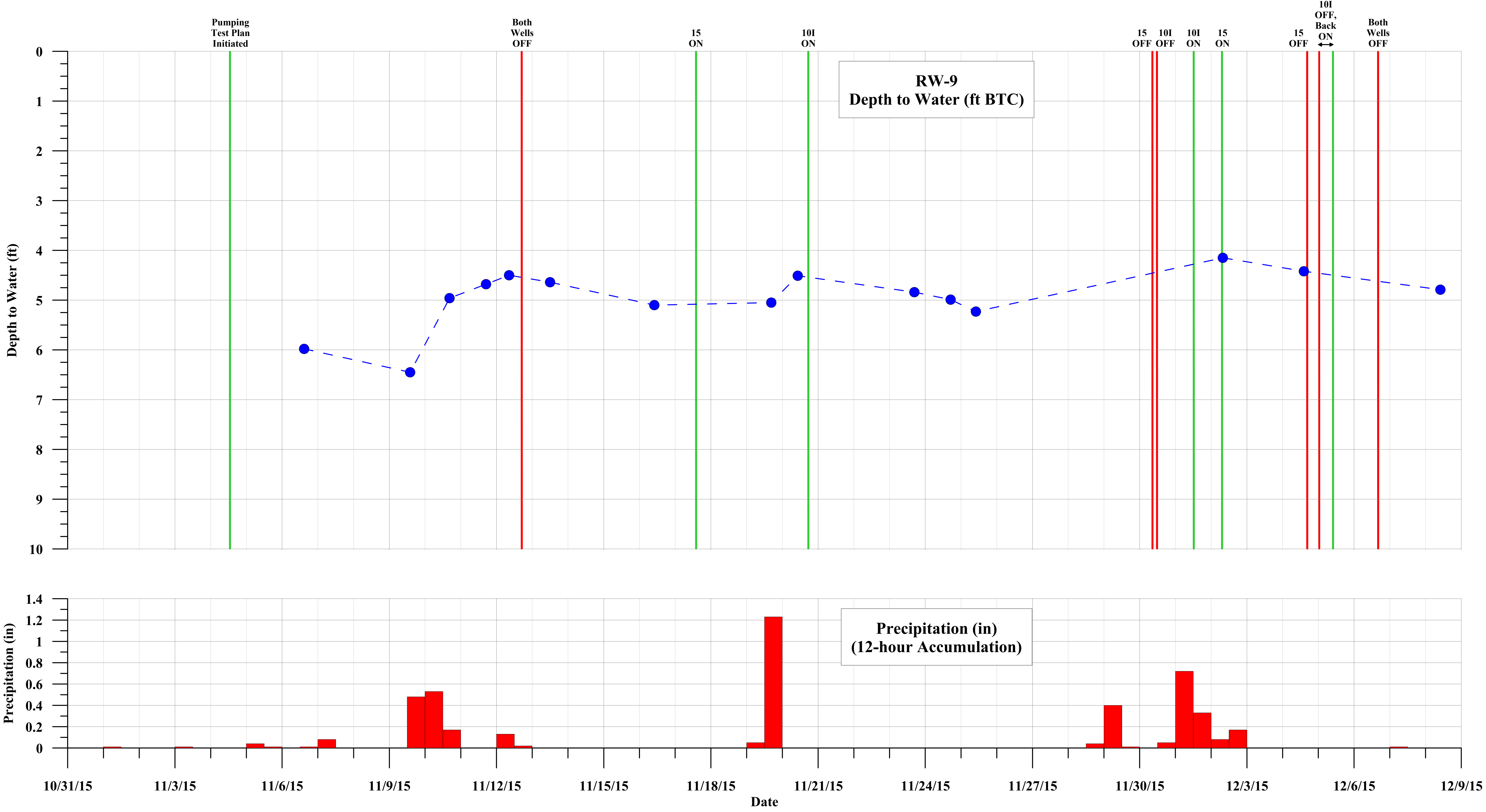
Sparrows Point Terminal
Baltimore County, Maryland

January 2016

ARM 150298

Figure
N27

Parcel A3 Rod & Wire Mill
Aquifer Test Data
Monitoring Well RW-9 (All Manual Data)



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RW-9 Monitoring Data
November - December 2015

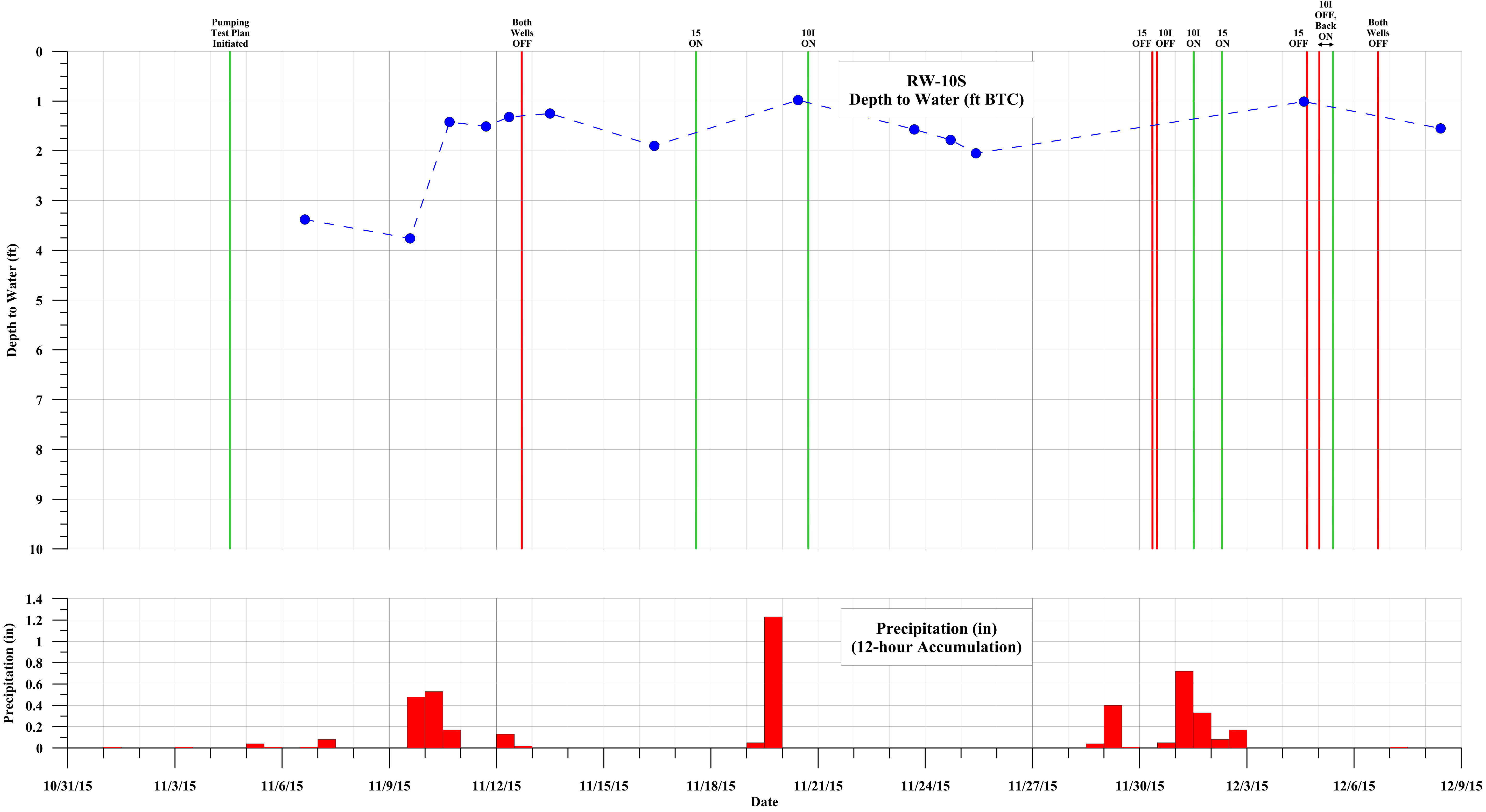
Sparrows Point Terminal
Baltimore County, Maryland

January 2016

ARM 150298

Figure
N28

Parcel A3 Rod & Wire Mill
Aquifer Test Data
Monitoring Well RW-10S (All Manual Data)



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RW-10S Monitoring Data
November - December 2015

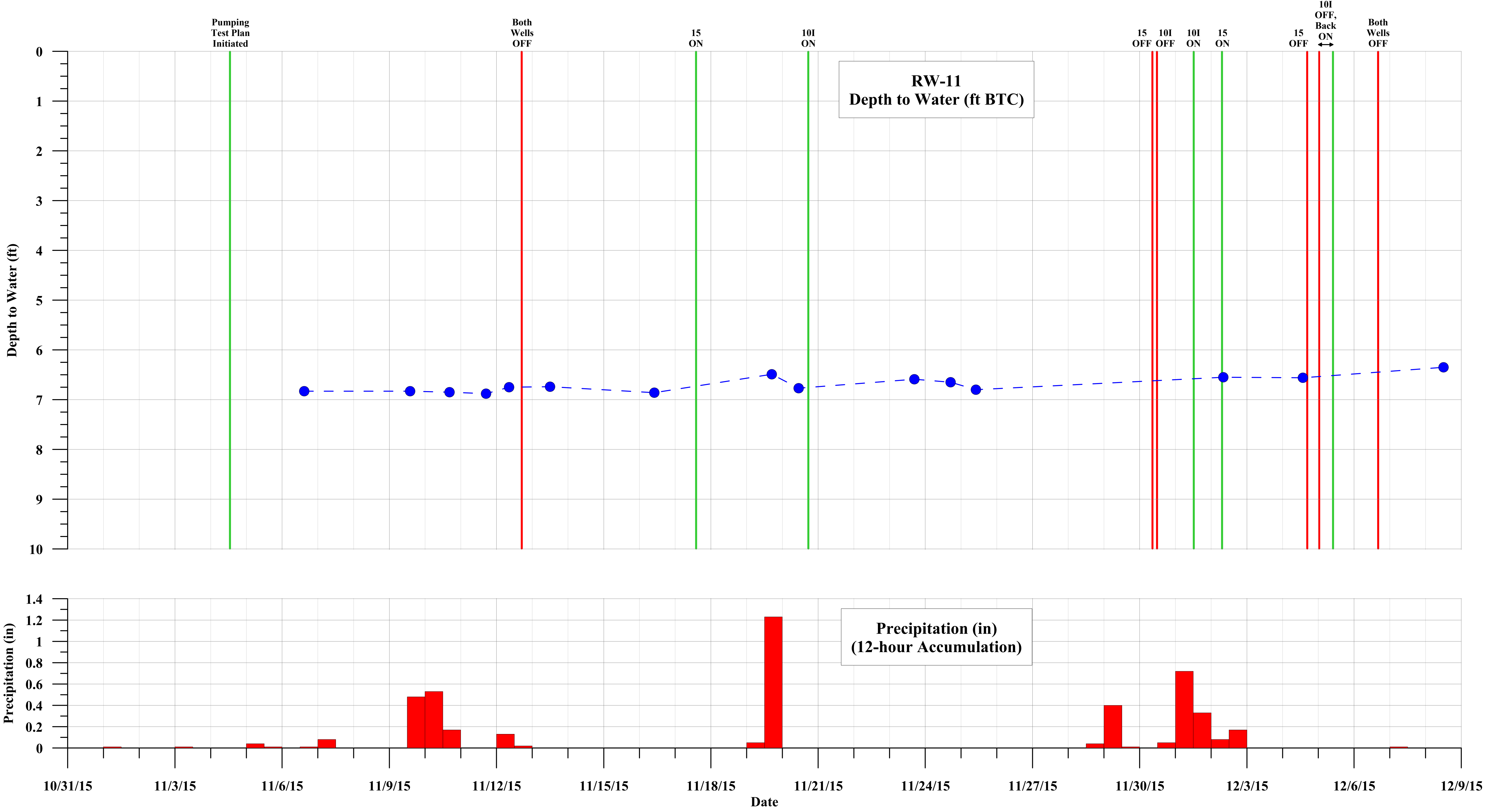
Sparrows Point Terminal
Baltimore County, Maryland

January 2016

ARM 150298

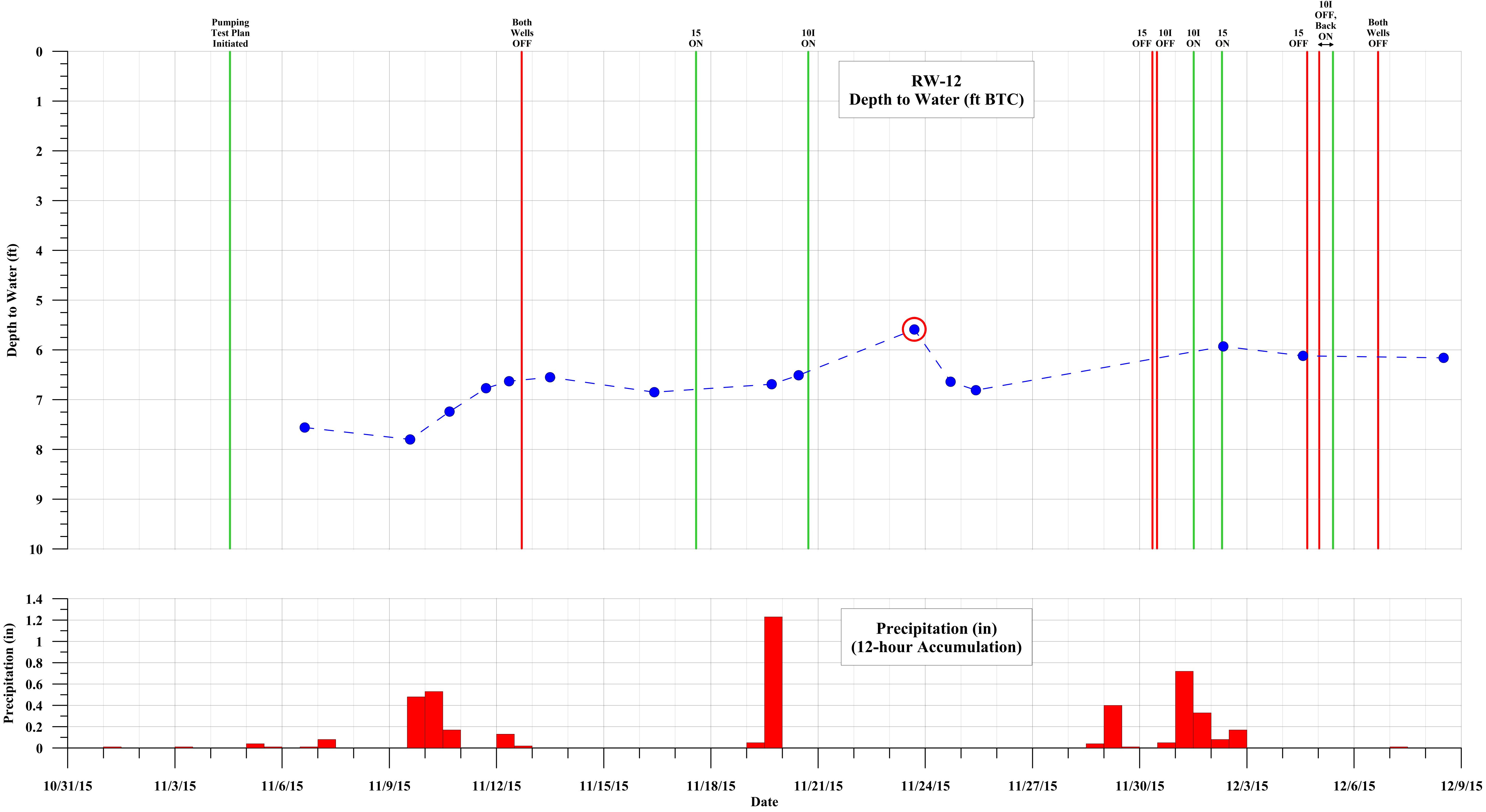
Figure
N29

Parcel A3 Rod & Wire Mill
Aquifer Test Data
Monitoring Well RW-11 (All Manual Data)



ARM Group Inc. Earth Resource Engineers and Consultants	RW-11 Monitoring Data November - December 2015 Sparrows Point Terminal Baltimore County, Maryland	January 2016 ARM 150298	Figure N30

Parcel A3 Rod & Wire Mill
Aquifer Test Data
Monitoring Well RW-12 (All Manual Data)



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RW-12 Monitoring Data
November - December 2015

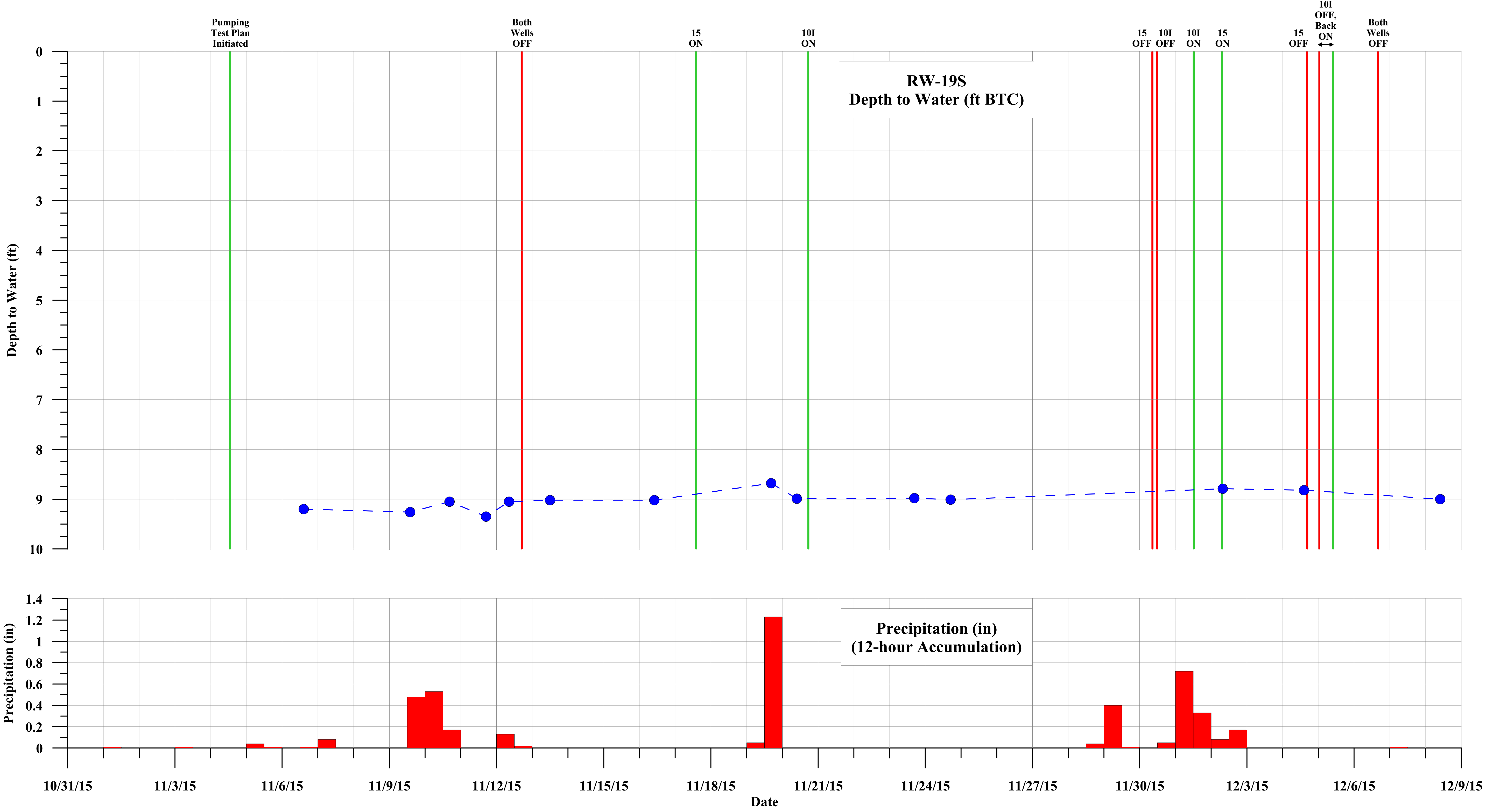
Sparrows Point Terminal
Baltimore County, Maryland

January 2016

ARM 150298

Figure
N31

Parcel A3 Rod & Wire Mill
Aquifer Test Data
Monitoring Well RW-19S (All Manual Data)



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RW-19S Monitoring Data
November - December 2015

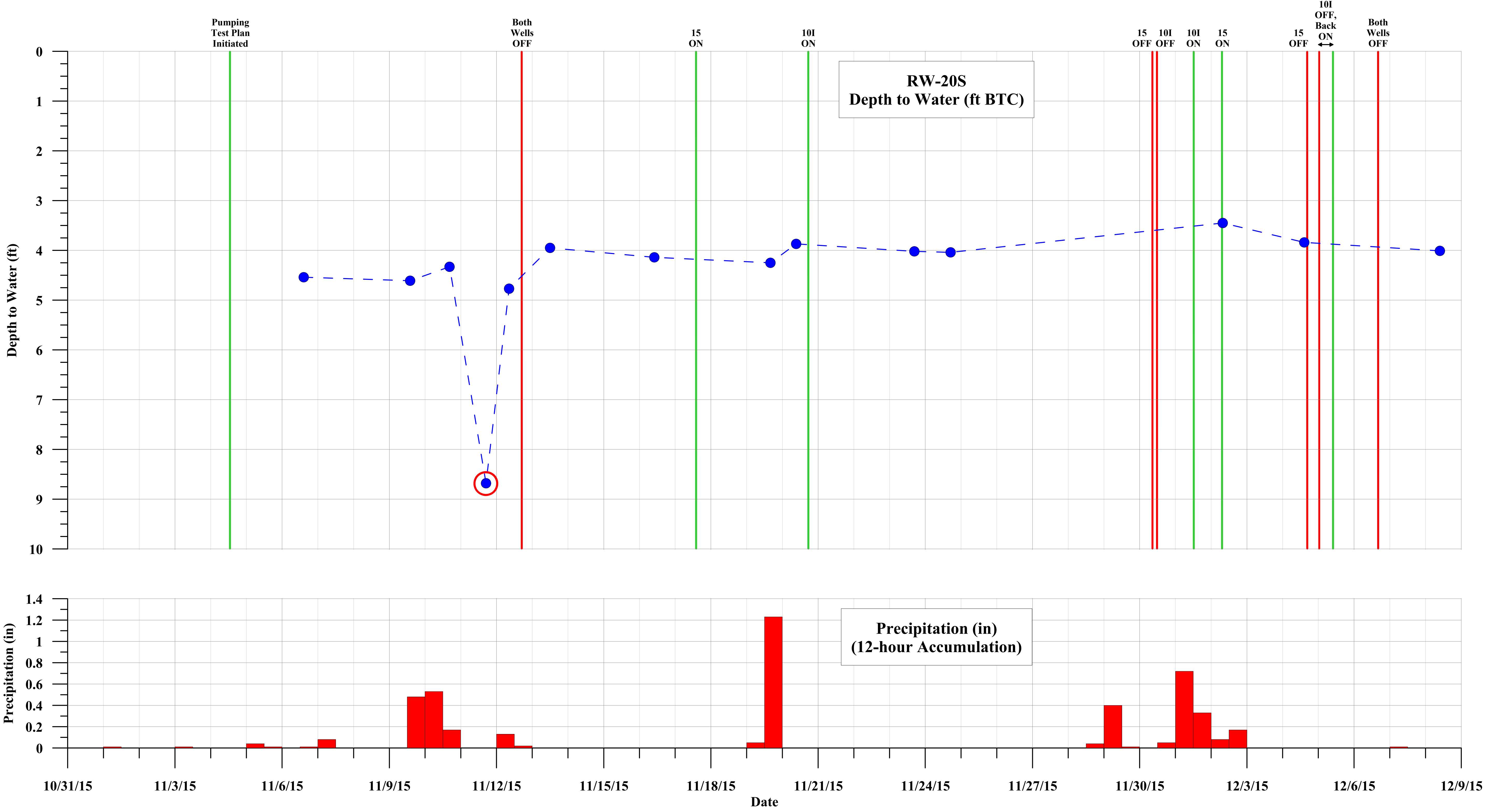
Sparrows Point Terminal
Baltimore County, Maryland

January 2016

ARM 150298

Figure
N32

Parcel A3 Rod & Wire Mill
Aquifer Test Data
Monitoring Well RW-20S (All Manual Data)



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RW-20S Monitoring Data
November - December 2015

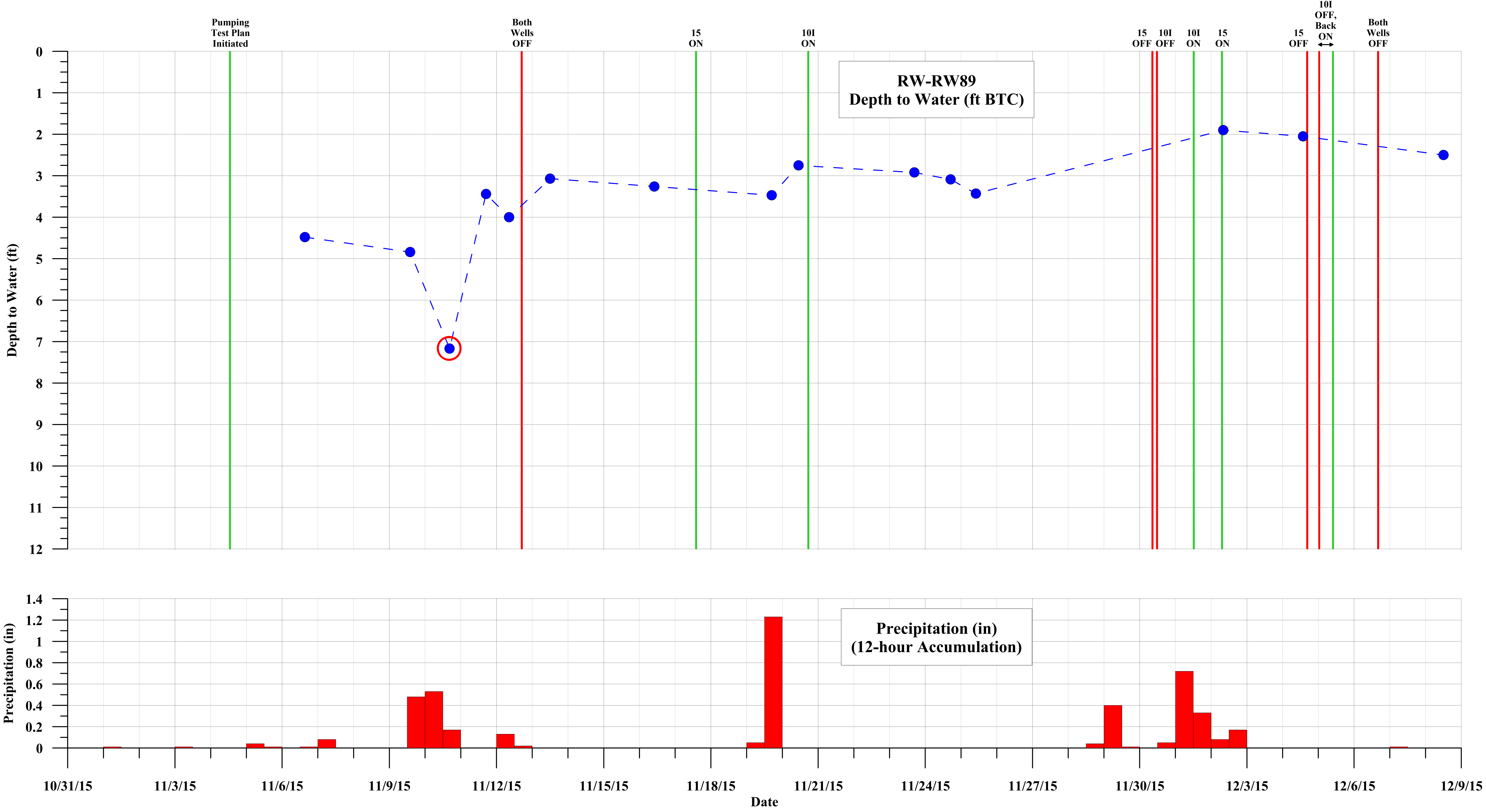
Sparrows Point Terminal
Baltimore County, Maryland

January 2016

ARM 150298

Figure
N33

Parcel A3 Rod & Wire Mill
Aquifer Test Data
Monitoring Well RW-RW89 (All Manual Data)



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RW-RW89 Monitoring Data
November - December 2015

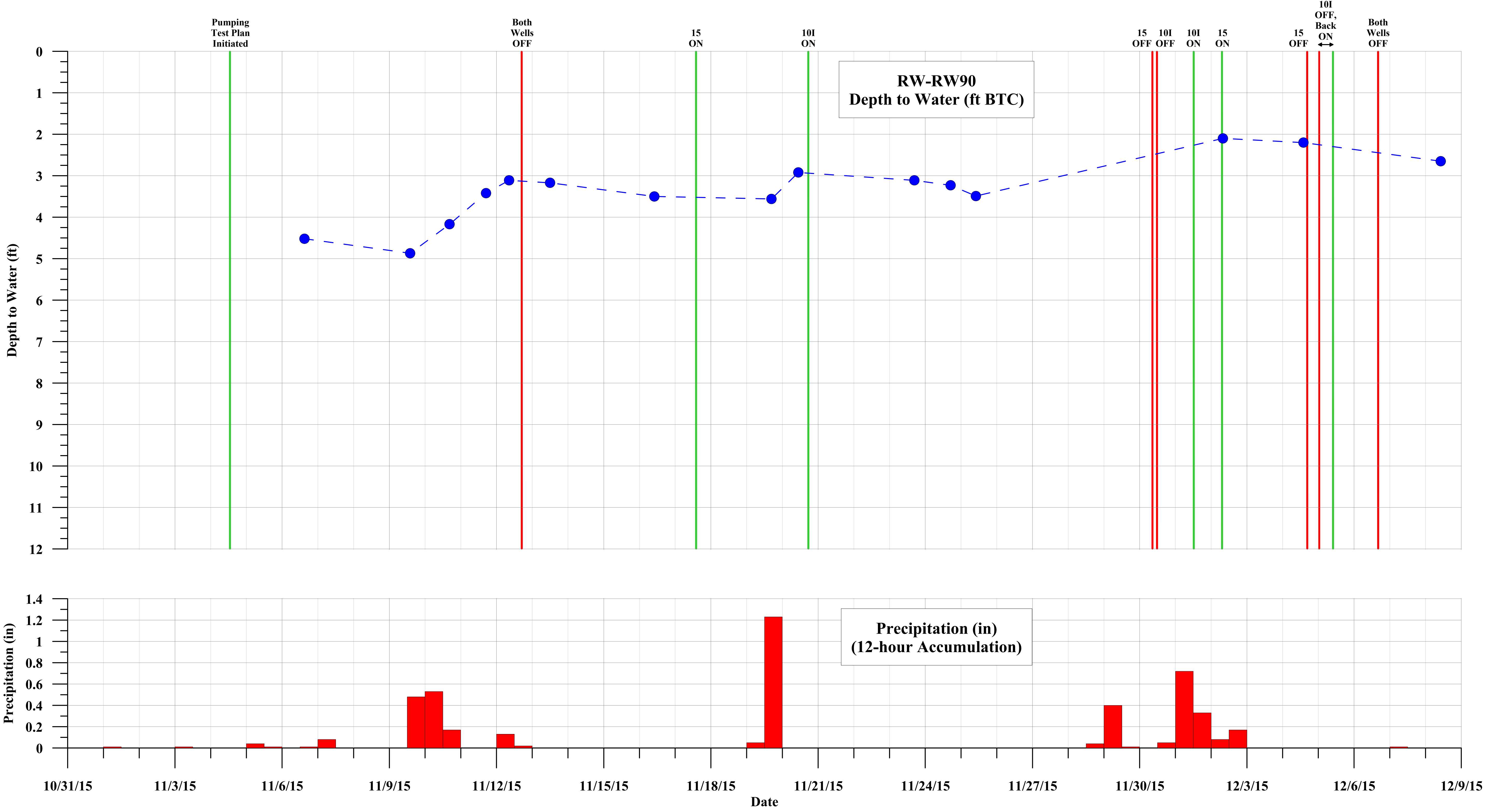
Sparrows Point Terminal
Baltimore County, Maryland

January 2016

ARM 150298

Figure
N34

Parcel A3 Rod & Wire Mill
Aquifer Test Data
Monitoring Well RW-RW90 (All Manual Data)



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RW-RW90 Monitoring Data
November - December 2015

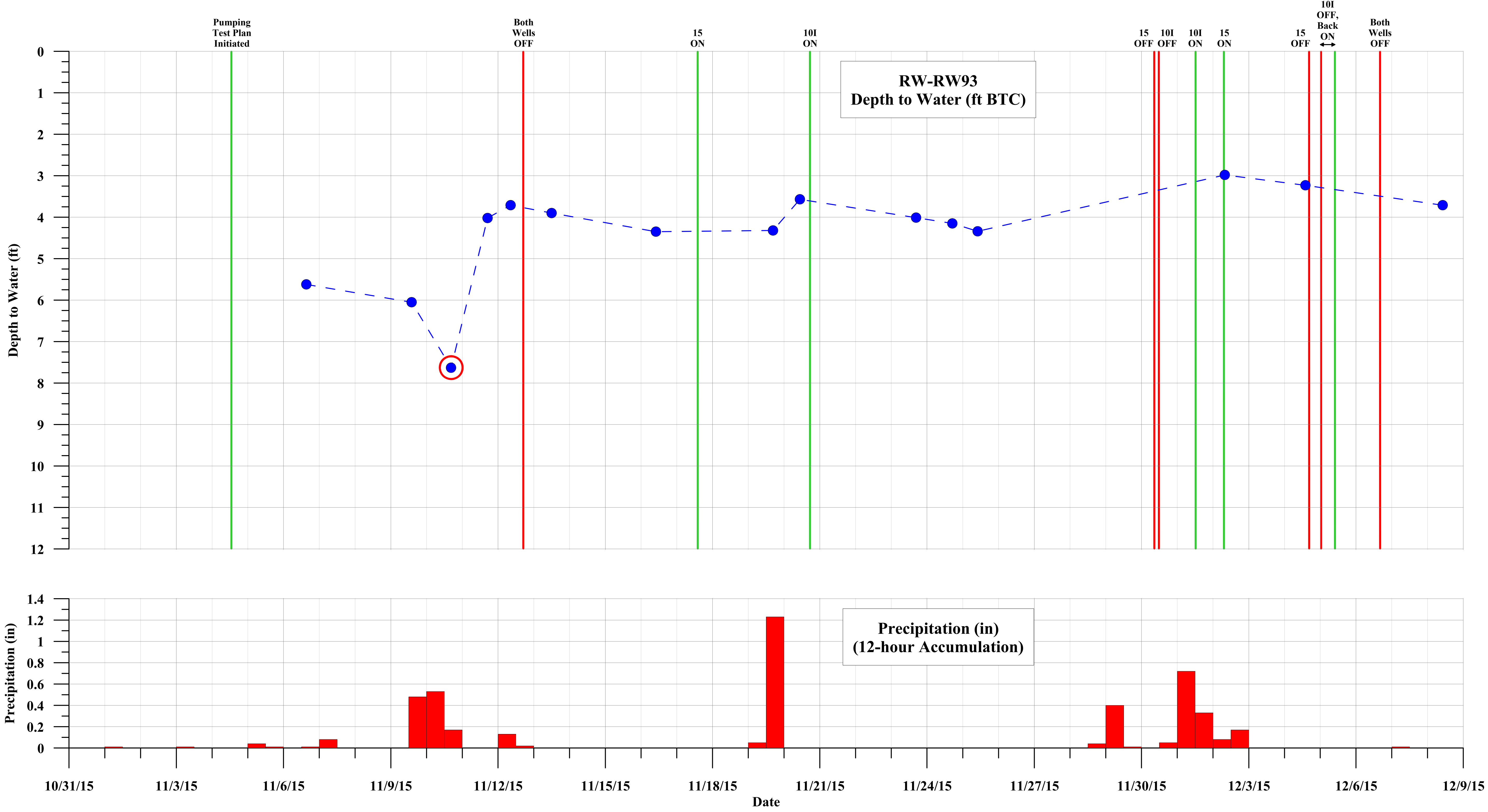
Sparrows Point Terminal
Baltimore County, Maryland

January 2016

ARM 150298

Figure
N35

Parcel A3 Rod & Wire Mill
Aquifer Test Data
Monitoring Well RW-RW93 (All Manual Data)



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RW-RW93 Monitoring Data
November - December 2015

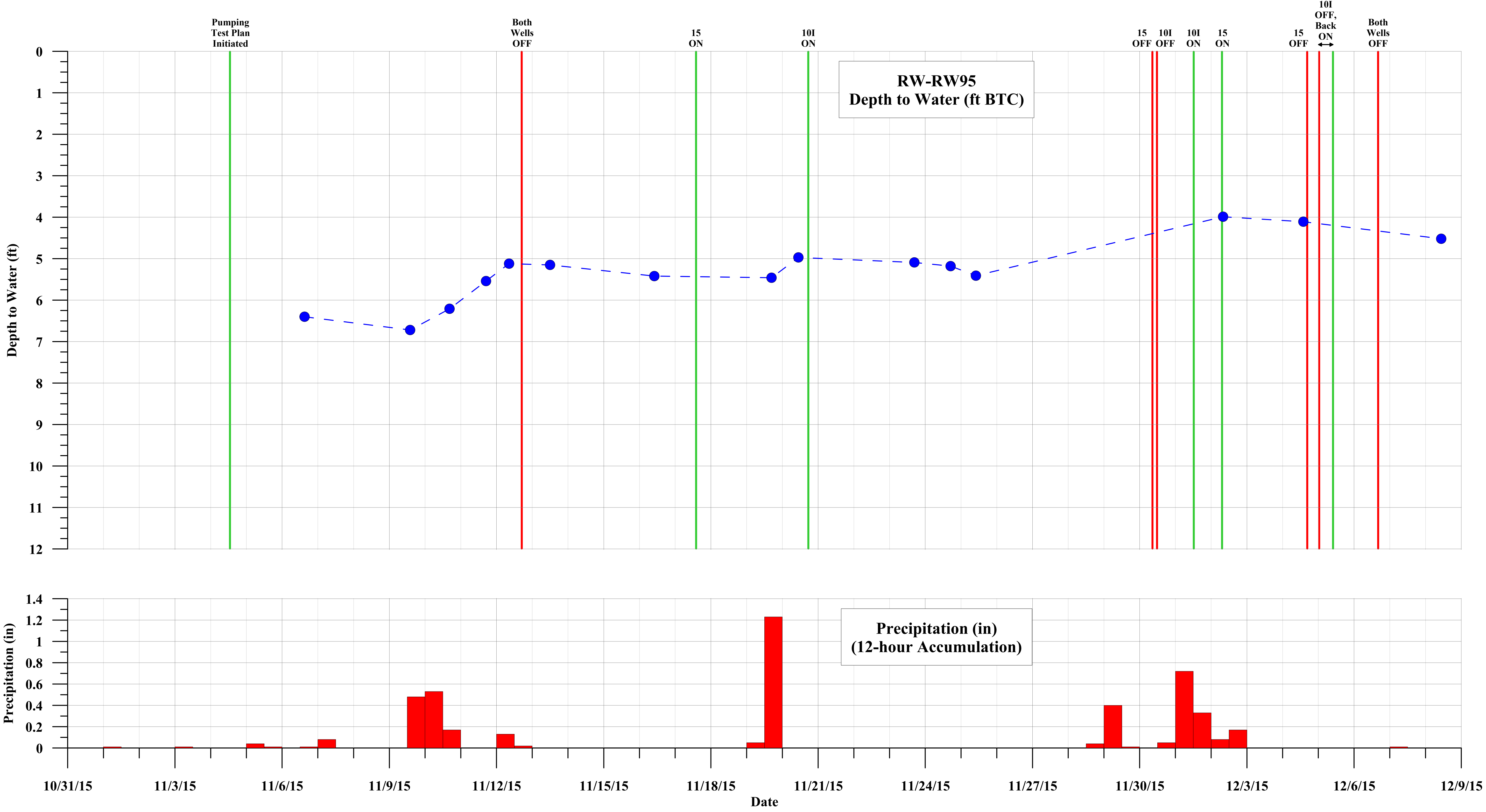
Sparrows Point Terminal
Baltimore County, Maryland

January 2016

ARM 150298

Figure
N36

Parcel A3 Rod & Wire Mill
Aquifer Test Data
Monitoring Well RW-RW95 (All Manual Data)



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RW-RW95 Monitoring Data
November - December 2015

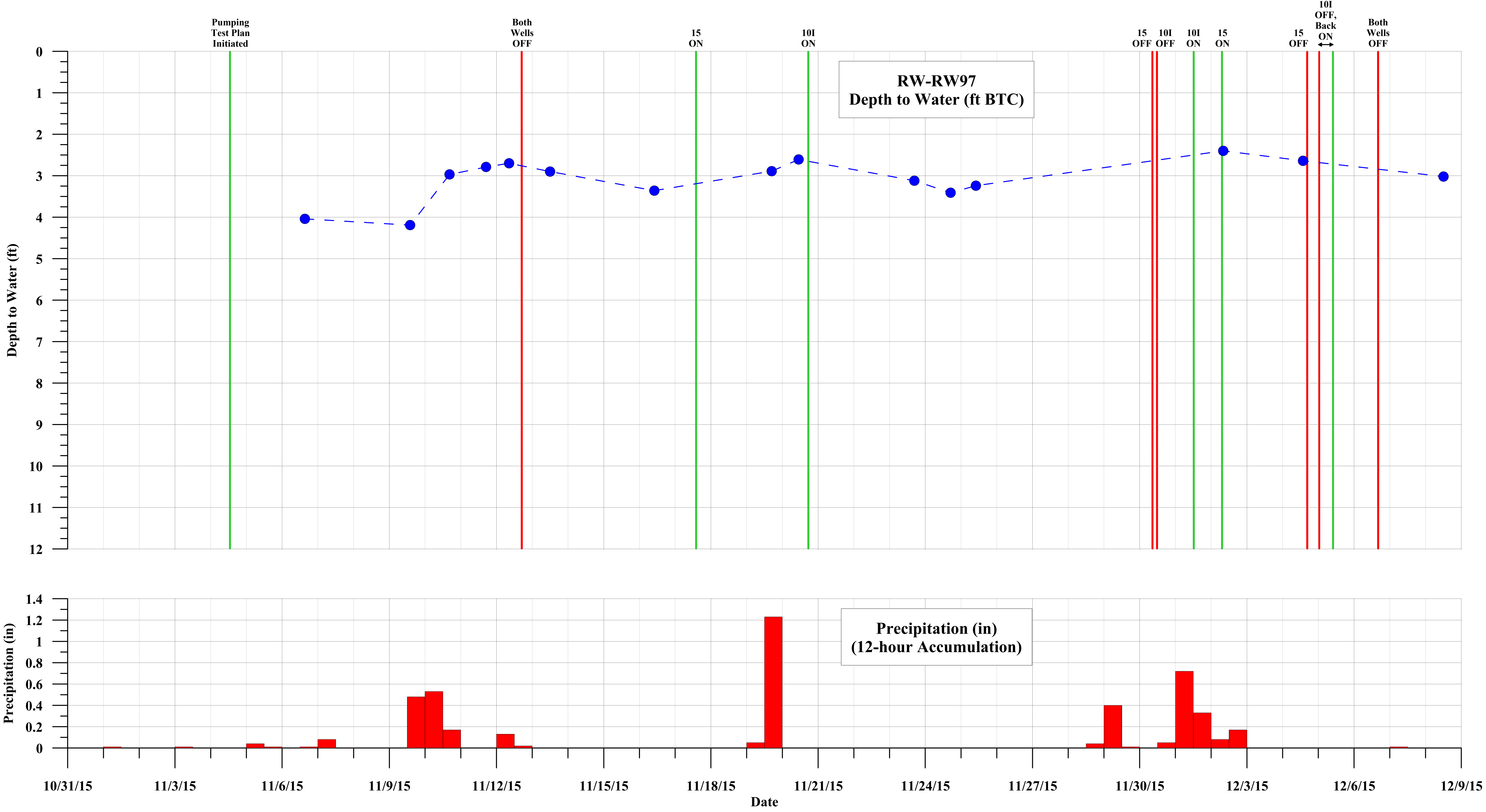
Sparrows Point Terminal
Baltimore County, Maryland

January 2016

ARM 150298

Figure
N37

Parcel A3 Rod & Wire Mill
Aquifer Test Data
Monitoring Well RW-RW97 (All Manual Data)



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RW-RW97 Monitoring Data
November - December 2015

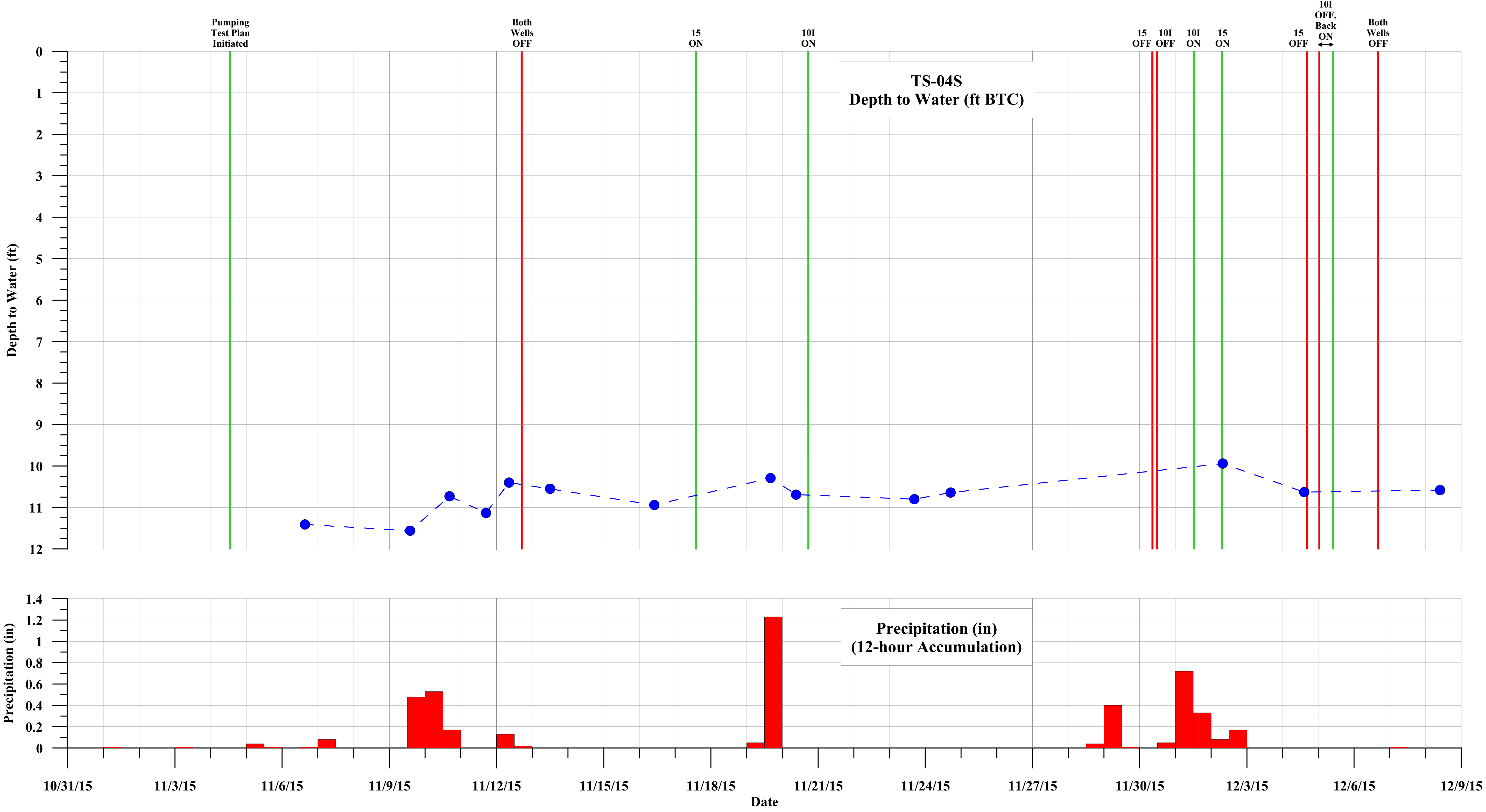
Sparrows Point Terminal
Baltimore County, Maryland

January 2016

ARM 150298

Figure
N38

Parcel A3 Rod & Wire Mill
Aquifer Test Data
Monitoring Well TS-04S (All Manual Data)



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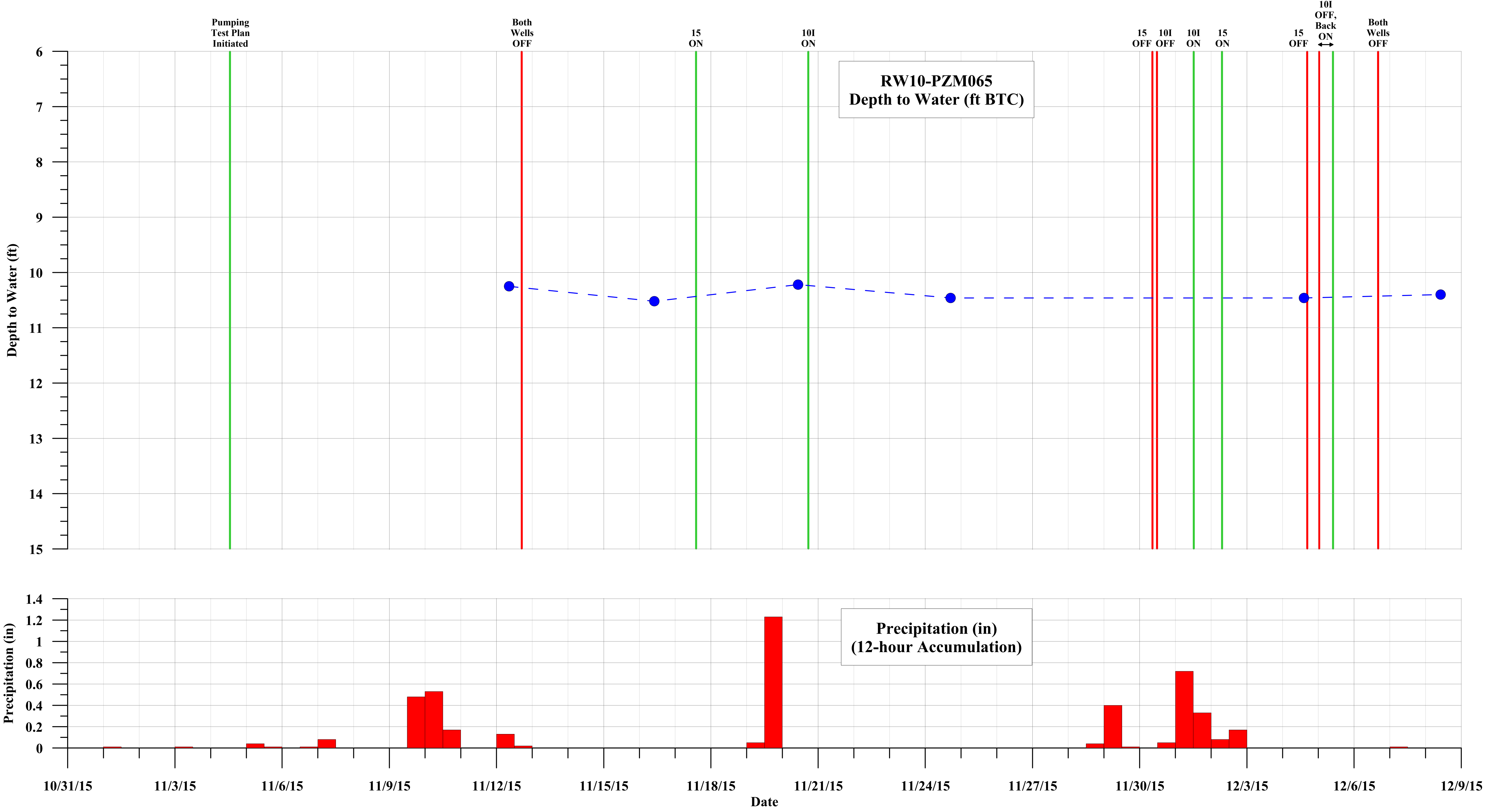
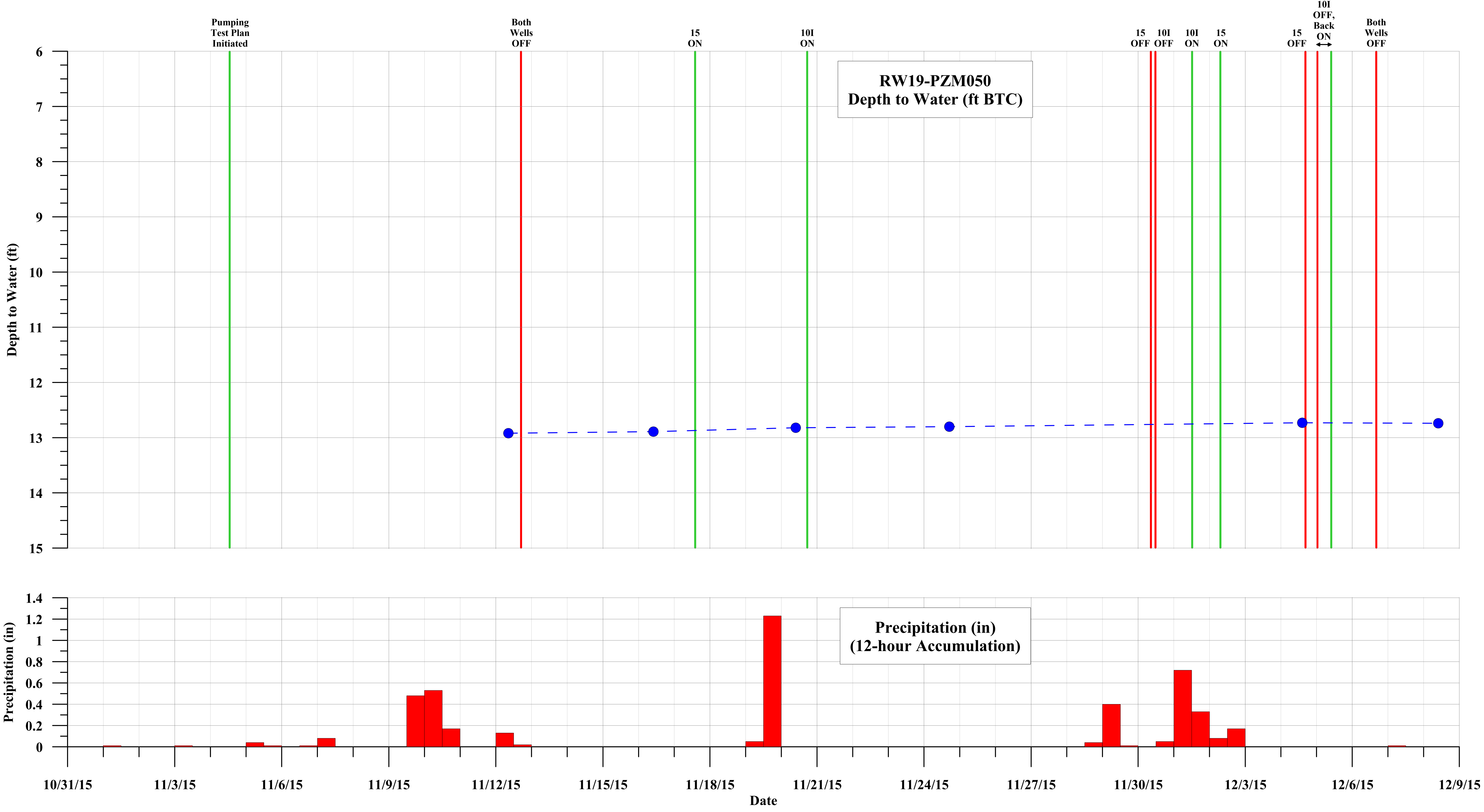
TS-04S Monitoring Data **November - December 2015** Sparrows Point Terminal Baltimore County, Maryland	January 2016 ARM 150298	Figure N39

Parcel A3 Rod & Wire Mill
Aquifer Test Data
Monitoring Well RW10-PZM065 (All Manual Data)



ARM Group Inc. Earth Resource Engineers and Consultants	RW10-PZM065 Monitoring Data November - December 2015 Sparrows Point Terminal Baltimore County, Maryland	April 2016 ARM 150298	Figure N40

Parcel A3 Rod & Wire Mill
Aquifer Test Data
Monitoring Well RW19-PZM050 (All Manual Data)



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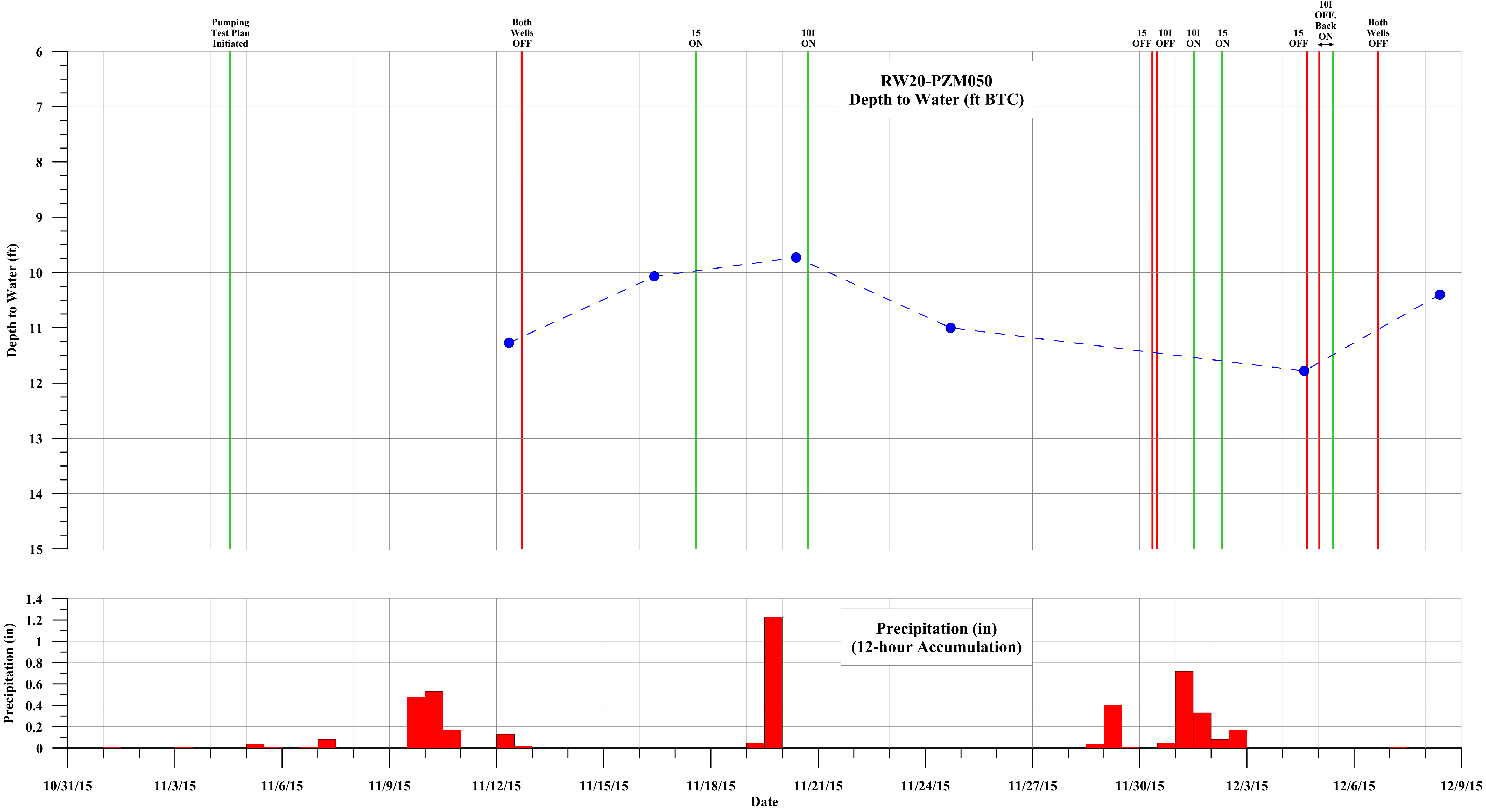
RW19-PZM050 Monitoring Data November - December 2015 Sparrows Point Terminal Baltimore County, Maryland	April 2016 ARM 150298	Figure N41

Parcel A3 Rod & Wire Mill
Aquifer Test Data
Monitoring Well RW20-PZM050 (All Manual Data)



ARM Group Inc. Earth Resource Engineers and Consultants	RW20-PZM050 Monitoring Data November - December 2015 Sparrows Point Terminal Baltimore County, Maryland	April 2016 ARM 150298	Figure N42

APPENDIX O

Groundwater Model Development Report

1. OBJECTIVES

The objectives of initial groundwater model are:

a) Establish a numerical groundwater flow model that incorporates:

- the surrounding surface water,
- the shallow, intermediate, and deep aquifer system,
- the influence of the existing pumping system (RW15 and RW10), and
- prediction / control of cadmium and zinc migration, primarily in the intermediate zone (based on flow, not transport).

b) Screen and evaluate potential options for the final remedial approach, to assist in developing a 60% design of the selected remedy, and to identify additional data requirements for the final remedial design.

2. CONCEPTUAL GROUNDWATER MODEL

The subsurface geology at the site is typical of the Maryland coastal plain and consists of layered sedimentary rocks that are un-lithified to partially consolidated materials composed of clay, silt, and sand-sized grains, overlain by variably thick man-made fill materials (including slag).

Boring logs for RW 22-PZM, RW 23-PZM, RW 24-PZM, RW-GB-01, RW-GB-02, RW-GB-03, and RW-GB-04 were evaluated for layer lithologies and thicknesses, and compared with video log results (length and depth of screened intervals) from the older monitoring wells at the site. From this information the geologic framework was constructed for the groundwater model (**Figure 18**). Estimates of hydraulic conductivity for the aquifer model layers were initially obtained from the slug test data. Aquitard hydraulic conductivities were estimated from published information (Freese and Cherry, 1979).

Inspection of the pumping test hydrographs (**Appendix N**) reveal that the Shallow Aquifer and Deep Aquifer were not measurably impacted by pumping of RW10 and RW15 during the pumping test; which are screened in the Intermediate Aquifer. As such, the groundwater model included aquitards above and below the Intermediate Aquifer in the model domain. Recharge is assumed to enter the Intermediate Aquifer in areas outside of the model domain where overlying materials are more transmissive to the downward vertical movement of fluids.

3. HYDROSTRATIGRAPHIC UNITS

3.1. Shallow Aquifer

The Shallow Aquifer is an unconfined water table aquifer occurring at depths ranging from the earth surface to -2 ft elevation (msl) in the uppermost fill and alluvium in the model area. In general, the water table elevation increases from west (Patapsco River) towards the east across the model area. The saturated thickness of the Shallow aquifer is defined as the depth from the top of the water table to the upper surface of the Layer 2 Aquitard and ranges from approximately 2 feet thick (beneath the Patapsco River) to 14 feet thick (eastern portion of the site area). The Shallow Aquifer was assigned a hydraulic conductivity of 2.5 feet / day; representative of silty sand (Freese and Cherry 1979). Evaluation of the pumping test results indicates that the Shallow Aquifer is hydraulically separated from the Intermediate Aquifer as indicated by the pumping test results (i.e., drawdown in the Intermediate Aquifer caused by the pumping of RW10 and RW15 did not impact water levels in any monitoring points that are completed in the Shallow Aquifer). In addition, fluid conductivity (specific conductance) measurements of samples taken from monitoring wells do not suggest direct hydraulic communication between the Shallow and Intermediate Aquifers (**Figure 19** and **Figure 20**).

As such, the hydraulic heads in the shallow aquifer were assigned as general head boundaries based on water level elevations that were recorded during the pumping test.

3.2. Layer 2 & 3 Aquitards

Information from the boring logs, pumping test results, and previous studies indicated the presence of one or more aquitards between the Shallow Aquifer and the Intermediate Aquifer. In particular, the lack of drawdown or recovery in the Shallow Aquifer associated with pump ON / OFF events during the aquifer pumping test supports the presence of aquitard(s) between the Shallow and Intermediate Aquifers. As such, two aquitards were included in the Groundwater Model; Layer 2 configured as a constant one-foot in thickness and hydraulic conductivity of 1e-5 feet per day (represents a clay material), and Layer 3 with variable thickness between Layer 2 and the top of Layer 4, and hydraulic conductivity of 1e-5 feet per day (represents a clay material). The hydraulic conductivities of Layers 2 & 3 were not changed during the modeling process.

3.3. Intermediate Aquifer (Primary Modeled Aquifer)

The Intermediate Aquifer is a confined aquifer occurring at depths ranging from approximately -5 feet to -25 ft elevation (msl) in the model area. In general, the elevation of the hydraulic head in the Intermediate Aquifer increases from west (Patapsco River) towards the east across the model area.

The saturated thickness of the Intermediate Aquifer is defined as the depth from the base of the Layer 3 Aquitard to the upper surface of the Layer 5 Aquitard, and ranges from approximately 5 feet thick (north, south, east, and west sides of the model domain) to 22 feet thick (central portion of the model domain). The Intermediate Aquifer was assigned a range of hydraulic conductivities from approximately 4 feet / day to 10,000 feet / day representative of clean sand to gravel.

Pumping wells RW10 and RW15 are completed in the Intermediate Aquifer. Drawdowns during the pumping test were only experienced in the monitoring wells completed in the Intermediate Aquifer.

3.4. Layer 5 Aquitard

Information from the boring logs, pumping test results, and previous studies indicated the presence of one or more aquitards between the Intermediate Aquifer and the Deep Aquifer. For the purposes of this report, a single aquitard was included between Layer 4 and Layer 6 with a variable thickness and hydraulic conductivity of 1e-3 feet per day (represents a silty material). The hydraulic conductivity of Layer 5 was not changed during the modeling process.

3.5. Deep Aquifer

The Deep Aquifer is a confined aquifer occurring at depths ranging from approximately -37 feet to -70 feet elevation (msl) in the model area, and was encountered during the installation of the four deep monitoring wells (RW10-PZM065, RW18-PZM047, RW19-PZM050 and RW20-ZM050). The depth of the Deep Aquifer increases from west to east across the model domain.

The saturated thickness of the Deep Aquifer is defined with a constant thickness of 5 feet across the model domain. The Deep Aquifer was assigned a hydraulic conductivity 0.2 feet / day; which is representative of silt to silty sand.

There is no indication that the deep aquifer was impacted by the pumping of RW10 and RW15 (screened in the Intermediate Aquifer) during the pumping test. As such, the hydraulic conductivity of the aquitard that separates the Deep Aquifer from the Intermediate Aquifer was adjusted to eliminate modeled impacts associated with RW10 and RW15 pumping.

3.6. Model Uncertainty

General-head Boundaries and Input Model Water Levels

The uncertainty in the elevation of the general-head boundaries along the north and southeast margins of the Intermediate Aquifer (Layer 4) is relatively low. The elevations of these general-head boundaries were set by extrapolating groundwater elevations from the nearby monitoring wells to the boundaries. The elevation of Layer 1 (Shallow Aquifer / Patapsco River) and the water levels within the Intermediate Aquifer are also relatively certain because of the measured elevations in these features.

3.7. Hydraulic Conductivities

The uncertainty in the hydraulic conductivities in the model is moderate to low. The slug test and pumping test data provided a significant number of hydraulic conductivity measurements that corresponded with visual inspection of split-spoon lithologic samples collected from the borings. The lack of influence on the shallow and deep aquifers during the Intermediate Aquifer (RW10 and RW15) pumping tests supports the presence of aquitards between these layers. The estimated hydraulic conductivities used for this investigation are based upon steady-state modeling and represent approximate conditions in the aquifer. This is an appropriate first step prior to groundwater modeling that involves transient conditions with storage coefficients, recharge, leakance, and other factors used to estimate transport of contaminants.

4. CALIBRATION PROCEDURE

Groundwater modeling was only conducted on the Intermediate Aquifer for this task. The intermediate groundwater flow model was calibrated to the groundwater elevations associated with the pumping test data collected in November and December 2015 (**Figure 21**). The groundwater flow model was calibrated by specifying initial estimates of general head boundary conditions and hydraulic conductivity within the Intermediate Aquifer, and solving the model for steady-state flow conditions. These estimated input parameters were then varied in successive simulations until the steady state head solution most closely matched the pumping test calibration target water levels and the general geometry of the contoured pumping test measurements. Calibration statistics are shown in **Figure 22**.

5. SENSITIVITY OF MODEL TO INPUT PARAMETERS

The sensitivity of the calibrated model to variations in hydraulic conductivity is show in **Figure 23**. Hydraulic conductivity zones coupled with general head boundaries are the primary variables used in this steady state model. The general head boundaries are relatively straight-forward to specify in this model; however, the distribution of hydraulic conductivity is only partially known from the slug test data and an understanding of the local hydrogeology. The hydraulic conductivity zone values used in the calibrated model are represented by the Calibrated Zone Multiplier of "1" on the X axis in **Figure 23**. Note that the sum of squares residual model values increase rapidly in conductivity zones 2 through 5 when the model input hydraulic conductivity parameter is increased or decreased from the calibrated model values. The Zone 1 value is sensitive to decreases in hydraulic conductivity but not as sensitive to increases in hydraulic conductivity.

6. TIDAL INFLUENCE

Monitoring data obtained from several wells during the aquifer testing show evidence of a potential tidal influence via low-amplitude cyclic patterns that appear to be superimposed on the hydrographs in the intermediate flow regime.

Tides are a manifestation of the gravitational forces of the sun and moon acting on the earth, and are most easily recognized as the upward and downward motion of the water in the oceans. As an incoming tide rises, the force exerted by the increased volume of offshore water compresses the materials overlying adjacent coastal aquifers, causing a rise in the water levels in any wells screened in such an aquifer. The water levels fall when the tide recedes, causing a sinusoidal wave signature in time-series water level data that mimics the offshore tidal pattern, with a time lag and decreased amplitude. This effect can be observed in the hydrographs of several Parcel A3 wells, shown in **Appendix N**.

Tidal signatures may be filtered from water level data, resulting in an approximation of the water levels as they would have occurred without a tidal influence. In order to apply such a filter, the tidal data must also be measured throughout the monitoring period. The National Oceanic and

Atmospheric Administration (NOAA) maintains a tidal monitoring station at Fort McHenry, Baltimore, MD (Station #8574680) which is 5 miles upstream of Sparrows Point on the Patapsco River. Data is publicly available from this station at 6-minute intervals.

A tidal filter requires two data sets, the water levels in the well of interest and the tidal measurements (NOAA station data), that have been time-synchronized and aligned to the same elevation datum. The filtered water level data can be calculated using the following equation (Smith, 1994):

$$hF(t) = h(t) - E\left[T\left(t - t_{lag}\right) - \bar{T}\right],$$

where: hF(t) = filtered water level at time t

h(t) = observed water level at time t

E = tidal efficiency of the aquifer surrounding the well

t_{lag} = time lag coefficient

T(t) = observed tidal level at time t

$\bar{\mathrm{T}}$ = mean tidal elevation over the entire monitoring period

The time lag coefficient is estimated by averaging the time difference between several tidal peaks and the corresponding well level peaks. The tidal efficiency reflects the degree to which the materials overlying the aquifer resist the pressure changes induced by tidal oscillation. Factors influencing the tidal efficiency of an aquifer include its transmissivity and storage, the frequency of tidal oscillations, and the monitoring well's distance from the shoreline.

The water level data from RW01-PZM020 was filtered as an example of the results of this method. A time lag of 1.7 hours was calculated by averaging the delay between the peaks observed from November 25-29, 2015; which was a period of relative groundwater level stability without precipitation. A tidal efficiency of approximately 0.18 was estimated by minimizing the sum of the squared residuals relative to the mean of the filtered data from four complete tidal cycles from November 26-28, 2015. This method was chosen in order to arrive at the tidal efficiency that provided the greatest degree of tidal waveform suppression across this time range, during which water levels remained relatively constant, tidal oscillations notwithstanding. As provided in **Appendix N**, **Figure N19** and **Figure N20** show the original and filtered hydrographs for RW01-PZM020, respectively.

Tidal fluctuations appear to influence the groundwater levels in the intermediate zone at Parcel A3. Monitoring data from RW23-PZM (**Appendix N**, **Figure N17**; completed in the shallow zone) shows evidence of tidal influence on the water level changes in the shallow flow regime, albeit to a lesser magnitude. Water levels in RW01-PZM020 appear to fluctuate by as much as

3-4 inches per tidal cycle. However, Smith (1994) noted that tidal influences did not influence the direction of groundwater flow, especially in the areas closest to large surface water bodies.

For this report (including the steady state groundwater modeling), representative average groundwater level measurements for pump-on and pump-off conditions were taken from hydrographs that included tidal influence. Future modeling efforts involving transient flow and transport modeling may include tidal effects as part of the boundary conditions, as the cyclic movement of groundwater may impact the distribution of modeled transport parameters in the aquifer.

7. REFERENCES

Freese and Cherry, 1979, *Groundwater*, Prentice-Hall, Inc., Englewood Cliffs, New Jersey, 604 p

Smith, T.E., 1994, Analysis of Tidal Fluctuation Effects on a Confined and Unconfined Aquifer, *Proceedings of the FOCUS Conference on Eastern Regional Groundwater Issues*, October 3-5, 1994, Burlington, VT, p. 757-771.

APPENDIX P

Space Reserved for PeroxyChem Report

(Batch Testing of Bulk Soil Samples)