FINAL

HYDROGEOLOGIC SITE CHARACTERIZATION SUMMARY REPORT FOR MARSH RUN PARK NEW CUMBERLAND, PENNSYLVANIA FUDS NO. C03PA040301

U.S. Army Corps of Engineers
Baltimore District

EA Engineering, Science, and Technology, Inc.

July 2011

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MARSH RUN PARK
FUDS# C03PA040301

MIFFLIN AVENUE
NEW CUMBERLAND, PENNSYLVANIA

Version 1.0

Prepared for

U.S. Army Corps of Engineers
Baltimore District
Contract W912DR-09-D-0018
Delivery Order 0003

Prepared by

EA Engineering, Science, and Technology, Inc.
One Marketway West
Suite 4C
York, Pennsylvania 17401

July 2011

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U.S. Army Corps of Engineers – Baltimore District
City Crescent Building, Room 10200
10 South Howard Street
Baltimore, Maryland 21201

Prepared by

EA Engineering, Science, and Technology, Inc.
One Marketway West
Suite 4C
York, Pennsylvania 17401
(717) 848-5017

29 July 2011

Sandy Staigerwald
Project Manager

Date

29 July 2011

Denise Wilt, PG
Project Geologist

Date

July 2011

TABLE OF CONTENTS

List of Figures ii
List of Tables ii

1.0 INTRODUCTION 1-1

1.1 Site Background 1-1

2.0 METHODOLOGY 2-1

2.1 Objectives 2-1
2.2 Field Activities 2-1

2.2.1 Open Borehole Installation 2-2
2.2.2 Geophysical 2-3
2.2.3 Straddle Packer Testing 2-3
2.2.4 Pumping Test 2-5
2.2.5 FLUTe™ Well Installation 2-5
2.2.6 Final Well Installation 2-6

2.3 Plan Deviations 2-6
2.5 Investigation Derived Waste 2-7

3.0 RESULTS 3-1

3.1 Open Borehole Installation Observed Geology 3-1
3.2 Results of Geophysical Well Logging 3-1
3.3 Straddle Packer Testing 3-2
3.4 Pumping Test 3-3
3.5 FLUTe™ Well Installation 3-4
3.6 Quality Assurance Samples 3-5

4.0 SUMMARY AND RECOMMENDATIONS 4-1

5.0 REFERENCES 5-1

LIST OF APPENDICES

APPENDIX A Borehole Drilling Logs
APPENDIX B Borehole Geophysics Report
APPENDIX C Straddle Packer Sampling Documentation
APPENDIX D Laboratory Reports
APPENDIX E Pumping Test Documentation
APPENDIX F FLUTe™ Documentation
APPENDIX G Well Construction Diagrams and Development Documentation

LIST OF FIGURES

Number	Title
1	Site Map

LIST OF TABLES

Number	Title
1	Mifflin Avenue Deep Well – Straddle Packer Testing Summary of Intervals Selected, Rationale, and Laboratory Analytical Results
2	MW-15 – Straddle Packer Testing Summary of Intervals Selected, Rationale, and Laboratory Analytical Results
3	Summary of Major Fractures Identified from Geophysical Well Logging
4	Mifflin Avenue Deep Well 6-Hour Pumping Test Summary of Pump Rates and Laboratory Analytical Results
5	Summary of Selected Sample Port Depths and Rationale for FLUTe™ Well Design

LIST OF SYMBOLS, ABBREVIATIONS, AND ACRONYMS

ALSI	Analytical Laboratory Services, Inc.
bgs	Below Ground Surface
Cis 1,2-DCE	Cis-1,2-dichloroethene
°	Degree(s)
DDSP	Defense Depot Susquehanna, PA
DLA	Defense Logistics Agency
EA	EA Engineering, Science, and Technology, Inc.
FLUTe™	Flexible Liner Underground Technologies
ft	Foot/feet
GHASP	General Health and Safety Plan
HDPE	High Density Polyethylene
in.	Inch
lb	Pound
µg/L	microgram/liter
MADW	Mifflin Avenue Deep Well
MS/MSD	Matrix Spike/Matrix Spike Duplicate
MSC	Medium Specific Concentration
NTU	Nephelometric Turbidity Unit
PADEP	Pennsylvania Department of Environmental Protection
PCE	Tetrachloroethene
PPE	Personal Protective Equipment
PVC	Polyvinyl Chloride
SOP	Standard Operating Procedure
TCE	Trichloroethylene
Trans 1,2-DCE	Trans-1,2-dichloroethene
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency

LIST OF SYMBOLS, ABBREVIATIONS, AND ACRONYMS (continued)

VC	Vinyl chloride
VOC	Volatile Organic Compound

1.0 INTRODUCTION

The U.S. Army Corps of Engineers (USACE) – Baltimore District has contracted EA Engineering, Science, and Technology, Inc. (EA) to perform additional hydrogeologic site characterization at Marsh Run Park in Fairview Township, York County, Pennsylvania. The work is being performed under contract W912DR-09-D-0018. The intent of the additional site characterization activities summarized herein is to assess the vertical extent of trichloroethylene (TCE) impact to the bedrock aquifer. The additional site characterization activities included the installation of two deep bedrock wells (MW-15 and Mifflin Avenue Deep Well [MADW]), geophysical well logging, straddle packer testing of targeted intervals in both wells, a 6-hour pumping test of one well (MADW), and completion of both deep bedrock wells, which included installation of a conventional well at location (MW-15) and the installation of a Flexible Liner Underground Technologies (FLUTe™) multiport sampling system in the other (MADW). A figure depicting the locations of the wells is attached as Figure 1.

1.1 Site Background

The Marsh Run site consists of approximately 14 acres of land located in Fairview Township, York County, Pennsylvania (Figure 1). The site is bounded to the south and southwest by Mifflin Avenue and to the north by Norfolk-Southern railroad right-of-way and the Susquehanna River. A railroad access road is located to the west, beyond which is the Defense Depot Susquehanna, PA (DDSP) which is utilized by the Defense Logistics Agency (DLA). The site is bordered immediately to the south by a shallow drainage ditch, which collects surface runoff and channels it into Marsh Run Creek. Marsh Run Creek, which flows in a general west-to-east direction, flows through a wetland area to the east of the site, and ultimately discharges to the Susquehanna River northeast of the site.

Groundwater monitoring has been conducted at the site since February 2002. Prior to the installation of the monitoring wells installed during this investigation, there were a total of 9 overburden monitoring wells, 13 shallow bedrock wells, and 3 deep (100 feet [ft] below ground surface [bgs]) bedrock wells that have been monitored.

Previous investigations have identified a TCE plume in the overburden and bedrock aquifers. Overall, groundwater monitoring results indicate that the dissolved-phase TCE plume has stabilized over time. The extent and concentrations of TCE in groundwater at and around the site (as of the last full sampling event in March 2009) are depicted on Figure 1. As shown on the figure, the overburden dissolved-phase TCE plume is primarily limited to the immediate vicinity of wells MW-1A and MW-4A, where likely interaction with the bedrock groundwater was observed. The configuration of the dissolved-phase plume in the bedrock zone is generally

consistent with the strike of bedding and thrust faulting but is not completely consistent with the primary groundwater flow direction, based on observed water levels in the site monitoring wells, to the north-northeast. The observed difference between groundwater flow direction, as derived from water level monitoring, and the observed migration of the TCE plume in bedrock is potentially attributable to various factors such as fracture orientation or a “smear” effect from the flow of the Susquehanna River to the east. It should be noted that the observed areal extent of the bedrock plume is greater than in the overburden and that the dissolved phase concentrations, as observed in site monitoring wells, are greater in some fractured zones of bedrock than in the overburden.

Marsh Run Park
New Cumberland, PA

Legend

- Residential Property Well
- Site Well
- March 2009 Upper Bedrock TCE Plume
- March 2009 Overburden TCE Plume
- FUDS Boundary

0 100 200 400
Feet

Aerial Photo Source:
PAMAP Program, PA Department of Conservation and Natural Resources, Bureau of Topographic and Geologic Survey, 2006

Figure 1 – Site Map

H:\projects\6233003\Mxd\Figure 1 - Iso

2.0 METHODOLOGY

This report summarizes the findings of the additional site characterization conducted under the Final Well Installation Work Plan (EA 2010a) and the Final Sampling and Analysis Plan which includes the Final Field Sampling Plan and Quality Assurance Project Plan (EA 2010b). Tasks associated with the additional site characterization include:

- Deep Drilling (Task 2B) - Installation of two 200-foot (ft) borings via air rotary through bedrock, designated MW-15 and MADW.
- Borehole Geophysics (Task 2C) - Geophysical well logging of newly installed bedrock borings.
- Pump and Packer Testing (Task 2D) – straddle packer testing of targeted intervals at each new well based upon review of the borehole geophysics. A 6-hour constant rate pumping test of the MADW.
- Final Well Construction (Task 2E) - Installation of casing and screen in order to isolate a specific depth interval in MW-15.
- Water Supply and Disposal (Task 2H) - Disposal of water derived from development and pumping testing.
- Water FLUTe™ multiport sampling liner installation in the MADW (no task assigned).

2.1 Objectives

The overall objective of this investigation was to assess the vertical extent of TCE distribution within the bedrock aquifer and evaluate the potential for conversion of an interval of the MADW for potable water supply. In order to meet these objectives, borehole geophysics was performed to identify bedrock fracture distribution and orientation and to determine intervals for packer testing and sampling. Based on the borehole geophysical results, samples were collected from targeted intervals in MW-15 and MADW. Additional samples were collected based on the targeted interval results. Additionally, a pumping test of the uppermost interval of the MADW was conducted in order evaluate the usability of this interval as a potential potable water source.

2.2 Field Activities

All field activities were conducted in accordance with the following documents with the exception of the deviations described in Section 2.3:

- *Final Well Installation Work Plan, Marsh Run Park, Mifflin Avenue, New Cumberland, Pennsylvania* (EA 2010a)
- *Final Sampling and Analysis Plan, Marsh Run Park, Mifflin Avenue, New Cumberland, Pennsylvania* including the *Final Field Sampling Plan, Marsh Run Park, Mifflin Avenue,*

New Cumberland, Pennsylvania and Final Quality Assurance Project Plan, Marsh Run Park, Mifflin Avenue, New Cumberland, Pennsylvania (EA 2010b)

- *Final Site Specific Addendum to the General Health and Safety Plan (GHASP) for Hazardous Waste and Environmental Services for Groundwater Characterization and Monitoring at Marsh Run Park (formerly New Cumberland Army Depot), New Cumberland, Pennsylvania* (EA 2009)

Prior to conducting intrusive activities, a public utility clearance request was submitted to Pennsylvania One Call System, Inc. None of the contacted utility companies reported a conflict with underground utilities located on either the site or the adjacent properties.

2.2.1 Open Borehole Installation

Deep open boreholes were installed at two locations, MW-15 (original and replacement, see Section 2.3) and MADW using air rotary drilling methods, from 3 May to 6 May 2010. A replacement boring for MW-15 was installed on 18 June 2010. Well locations are illustrated on Figure 1. Drilling was conducted by B.L. Myers of Glenmore, Pennsylvania under the supervision of an EA field geologist. Drill logs for each well are included in Appendix A.

Deep open borehole wells (MW-15 and MADW) were installed into the bedrock to a depth of 202 ft bgs. The replacement to MW-15 (see Section 2.3), was installed into the bedrock to a depth of 181 ft using air rotary drilling methods. Drilling logs are included as Appendix A.

Due to wet site conditions which caused the collapse of overburden sediments at the MADW location, 10-inch (in.) permanent steel outer casing was used to keep the boring open in the overburden to a depth of 13 ft 7 in. A 6-in. permanent polyvinyl chloride (PVC) casing was placed within the 10-in. casing to a depth of 28 feet bgs. A 6-in. diameter borehole was drilled to 202 ft bgs.

At the original MW-15 location, 6-in. permanent PVC casing was placed to a depth of 18 ft bgs and a 6-in. diameter borehole was drilled to approximately 202 ft bgs. Due to grouting issues encountered in the original MW-15 borehole, a replacement borehole for MW-15 was installed on 18 June 2010. At the replacement MW-15 location, 6-in. permanent PVC casing was installed to a depth of 18 feet and a 6-in. diameter borehole was drilled to approximately 181 ft bgs.

Each well was developed with the air rotary rig following completion of drilling as indicated on the drill logs. Turbidity was monitored using a turbidity meter. The original MW-15 and

MADW were further developed using a Grundfos® pump at maximum capacity in order to achieve turbidities suitable for use of an optical televiewer during the geophysical well logging. The replacement MW-15 was developed for approximately one hour with turbidity levels only dropping to 179 nephelometric turbidity units (NTUs).

2.2.2 Geophysical

Following well development, geophysical well logging was conducted at the original MW-15 and MADW in order to further determine the location and orientation of fractures. Geophysical well logging was performed on 7 and 8 May 2010 by ARM Group of Hershey, Pennsylvania under the supervision of an EA field geologist. Well logging included the use of the following:

- Caliper
- Spontaneous potential
- Gamma ray
- Normal resistivity
- Fluid resistivity
- Single point resistivity
- Temperature
- Optical televiewer

All well logging was completed following the Standard Operating Procedure (SOP) for geophysical well logging as included in the Final Well Installation Work Plan (EA 2010a). Findings of the geophysical well logging investigation are included in Appendix B and are discussed in Section 3.2.

Following the installation of the replacement MW-15 borehole on 18 June 2010, USACE personnel utilized an optical televiewer to determine the location of fractures in order to determine screen placement for the final well construction. This investigation was conducted following USACE standard procedures.

2.2.3 Straddle Packer Testing

In order to evaluate the vertical distribution of TCE in the newly installed monitoring wells, straddle packers were placed above and below targeted intervals and groundwater samples from these were collected and submitted for laboratory analysis. Tables 1 and 2 summarize the straddle packer intervals and the rationale for selecting these intervals for sampling at MADW and MW-15, respectively. Specific intervals were selected based on the results of the geophysical well logging (as discussed in Section 3.2). Primarily, water bearing open fractures

were targeted for sampling. In the absence of water bearing fractures bedding planes were targeted. Straddle packer placement was conducted by B.L. Myers under the supervision of an EA field geologist from 12 to 14 May 2010.

The upper and lower packers were spaced at 11-ft based on the findings of the geophysical investigation. This spacing allowed for the capture of flow from identified fractures and bedding planes. Pressure transducers were placed above (top), below (bottom), and within the straddle packer interval to evaluate the effectiveness of the packers and to determine if the packered intervals are connected to underlying or overlying fractures. Charts summarizing pressure transducer data are included as Appendix C. Complete transducer data is also provided electronically.

Groundwater was purged via a submersible Grundfos® pump from each interval prior to one groundwater sample being collected from each interval. One volume of water equivalent to that volume in the 11-ft packered interval (approximately 16.2 gallons) was purged from the packered interval. Once this volume of water was purged, flow rates were lowered for sample collection. Groundwater samples were collected using low flow methodology and analyzed in accordance with the Field Sampling and Analysis Plan (EA, 2010b). The pump was decontaminated between sampling intervals. Sampling logs are included in Appendix C.

Samples were submitted to Analytical Laboratory Services, Inc. (ALSI) of Middletown, Pennsylvania for expedited analysis of targeted volatile organic compounds (VOCs) via United States Environmental Protection Agency (USEPA) Method SW 846 8260B. Targeted VOCs include TCE, tetrachloroethene (PCE), cis-1,2-dichloroethene (cis 1,2-DCE), trans-1,2-dichloroethene (trans 1,2-DCE), and vinyl chloride (VC). During sampling two duplicate samples and one aliquot for a matrix spike/matrix spike duplicate (MS/MSD) were collected and submitted for laboratory analysis. A laboratory-prepared trip blank was also included for VOC analysis in each delivery to the laboratory. Temperature blanks were included in coolers during collection and transport to the laboratory. Samples were preserved in the appropriate laboratory-provided containers and placed in a cooler containing an appropriate amount of ice. Samples were hand-delivered to ALSI under a chain-of-custody. Analytical laboratory reports are included in Appendix D and analytical results are discussed in Section 3.3.

Approximately 300 gallons of water was generated over the course of testing. Disposal of purge water is discussed in Section 2.5.

2.2.4 Pumping Test

Following completion of the borehole geophysics and straddle packer testing, a six-hour constant discharge rate pumping test was conducted at the MADW to determine if there is a hydraulic connection between deeper fractures with higher concentrations of TCE and shallow fractures. The pumping test was conducted by packing off and pumping from the upper most interval (41-52 ft below top of casing), while monitoring VOC concentrations at MADW and water levels in MADW and at surrounding wells throughout the test. The pumping test was conducted by B.L. Myers under the supervision of an EA field geologist on 17 May 2010.

During the pumping test, the packers were spaced at an 11-ft interval. Pressure transducers were placed above, below, and within the straddle packer interval to evaluate the effectiveness of the packers and to determine if the packered interval is connected to underlying or overlying fractures. Pressure transducers were also placed in the two closest wells, MW-14 and the Mifflin Avenue Residential Well. Additionally, water levels were also monitored manually in the surrounding wells throughout the test as a backup to the transducer data. Pressure transducer data is included as Appendix E, complete transducer data is also provided electronically.

A decontaminated Goulds submersible pump was placed in the middle of the pumping interval and a constant discharge rate of approximately 4.6 gallons per minute was maintained throughout the test. A flow meter was utilized to gauge the flow rate. Purge water was pumped into a tanker truck and transported to a holding tank. A total of 1,780 gallons of water was generated over the course of testing. Disposal of purge water is discussed in Section 2.5.

Samples were collected every hour throughout the test from a valve located prior to the flow meter and tank discharge. Samples were submitted to ALSI for analysis of targeted VOCs (TCE, PCE, cis 1,2-DCE, trans 1,2-DCE, and VC) via USEPA Method SW 846 8260B. During sampling one duplicate sample and one MS/MSD were collected and submitted for laboratory analysis for quality assurance purposes. A trip blank was also analyzed and temperature blank accompanied the samples. Samples were preserved in the appropriate laboratory-provided containers and placed in a cooler containing an appropriate amount of ice. Samples were hand-delivered to ALSI under a chain-of-custody. Analytical laboratory reports are included in Appendix D and analytical results are discussed in Section 3.4.

2.2.5 FLUTe™ Well Installation

Based on the finding of elevated TCE concentrations at depth in the MADW, it was determined that a multilevel sampling system would allow for continued monitoring of TCE levels at several fracture depths. FLUTe™ well liner installation procedures were not included in the Well

Installation Work Plan. Installation was completed by FLUTe™ personnel following the FLUTe™ standard operation procedure, which is included in Appendix F. Details of the installation are discussed in Section 3.5.

2.2.6 Final Well Installation

In order to vertically isolate and characterize potential TCE impact, the replacement MW-15 underwent the final installation of PVC casing within the open borehole after the completion of geophysical and straddle packer testing. The targeted screened interval was selected after an evaluation of the geophysical and analytical results from samples collected during the straddle packer test (original MW-15, see Section 2.3). Installation of the PVC casing within the open borehole was completed following the methodology outlined in the Well Installation Work Plan (EA 2010a). The final well construction diagram is provided in Appendix G and details of the final well installation are discussed in Section 3.6.

MW-15 was completed as 2-in. diameter PVC well inside of the 6-in open rock borehole in order to vertically isolate a specific water bearing fracture. The well is constructed of 2-in.-diameter, Schedule 40 PVC well casing and 0.010-in., machine-slotted PVC well screen. The well casing extends approximately 2 ft above the ground surface and is capped. The screen is set from 170 to 160 ft bgs.

The bottom of the open borehole is approximately 181 ft bgs. Bentonite chips were added to raise the bottom of the borehole to approximately 175 ft bgs. Sufficient time was allowed for the expansion of the bentonite. Clean medium sand was used to construct the filter pack from approximately to 175 ft below bgs (5 ft below screen) to 2 ft above the top of the screened interval. A 3-ft-thick bentonite seal was installed above the filter pack.

The annular grout seal was placed above the bentonite seal. The annular seal consisted of cement-bentonite grout, composed by weight of 10 parts cement (Portland cement) to ½ part bentonite combined with 6 gallons of approved potable water per 94-pound (lb) bag of cement (equating to approximately 5 lb of bentonite clay to one 94-lb bag of cement). Bentonite was added after the required amount of cement was mixed with water. The grout was pressure-tremied into the annular space to within 3 ft of the surface (below the frost line).

2.3 Plan Deviations

The following deviations from the Final Well Installation Work Plan (EA 2010a) occurred during the course of field work:

- Outer steel casing utilized at the MADW was of a 10-in. diameter instead of the 8-in. diameter specified in the Final Well Installation Work Plan due to the availability of the drillers supply stock. This change does not affect the integrity of the well.
- As discussed in section 2.2.5, final well completion for MADW included the installation of a Water FLUTe system™.
- Procedures for the installation of the FLUTe™ multiport sampling system were not included in the approved Final Well Installation Work Plan. Packer intervals were selected at the direction of the USACE and installation was completed by the manufacturer using their SOP.
- Replacement of the of the original MW-15 borehole, which was drilled to a depth of 204 ft below top of casing, was necessary due to a failed attempt to complete the well to a shallower depth. An incorrect grout mixture was used, which raised the depth of the well to 130 ft below top of casing, rendering it unusable for the purposes of this investigation. Based on the geophysical well logging and straddle packer testing data from the original MW-15, a replacement well was drilled to a depth of 181 ft bgs.
- The abandonment of the original MW-15 was necessary. The well was abandoned per Pennsylvania Department of Environmental Protection (PADEP) guidance. The well was tremied grouted to the surface with grout mixed to the specifications outlined in Section 3.6.

2.5 Investigation Derived Waste

Prior to the commencement of field work, EA had submitted a request for approval to the PADEP Water Management Program for a temporary discharge of stored groundwater. Approval was granted on 4 May 2010 to discharge stored groundwater produced during packer and pump testing to the ground surface, subject to conditions provided in the approval letter. The primary condition was that purge water VOC concentrations did not exceed the applicable Statewide Health Standard Medium Specific Concentration (MSCs).

Approximately 2,500 gallons of groundwater produced during packer and pump testing was pumped into a temporary storage tank located onsite. At the end of field activities, one water sample (Influent 1) was collected on 18 May 2010 from the water contained in the tank. The sample was submitted for analysis of target compound list VOCs via USEPA method SW 846 8260B. Analytical results are included in Appendix D. TCE was detected at 1.4 micrograms per liter (µg/L) in the influent sample. This concentration is below the applicable MSC (5 µg/L). Therefore, per the conditions of the temporary discharge approval, discharge to the ground surface of water stored in the tank was permissible.

Per the conditions of the temporary discharge approval, EA notified the PADEP Environmental Cleanup Program of the planned discharge via telephone on 28 May and via email on 1 June 2010 and provided the monitoring results to PADEP. The discharge of the stored water occurred on 1 and 2 June 2010. Two samples (Effluent 1 and Effluent 2) were collected as the water discharged to the surface. These samples were submitted for analysis of target compound list VOCs via USEPA method SW 846 8260B. No VOCs were detected above the laboratory reporting limits in either of the discharge effluent samples.

Additionally, the site was monitored during the discharge to insure that erosion of the ground surface, banks, and streambed did not occur. Water was discharged to the surface in the vicinity of the drainage ditch along Mifflin Avenue, standing water was not observed in this ditch during the discharge (i.e. water was absorbed by the ground).

Other investigational derived waste, including personal protective equipment (PPE) and dedicated tubing, was disposed of as municipal waste.

3.0 RESULTS

3.1 Open Borehole Installation Observed Geology

Drilling logs documenting the observed geology at each well are included in Appendix A. At MADW, overburden was observed to be reddish brown silt with subordinate sand and gravel. Bedrock consisting of red shale of the Gettysburg Formation was encountered at approximately 18 ft bgs. Evidence of red shale with some interbedded coarser grained intervals was observed to depth. During drilling the borehole was observed to produce groundwater beyond 120 ft bgs. Actual fracture locations are defined in greater detail in the geophysical report.

At the original MW-15 location, evidence of red shale was observed to approximately 110 ft bgs, evidence of interbedded sandstone, shale, and siltstone was observed from this point to the final depth. Fractures bearing copious amounts of water were observed starting at approximately 145 ft bgs. Actual fracture locations are defined in greater detail in the geophysical report.

3.2 Results of Geophysical Well Logging

A detailed summary of the geophysical well logging of MW-15 and MADW is included in Appendix B. Table 3 summarizes the major water bearing fractures identified and notes if the fracture is producing or receiving groundwater flow under static conditions. This information was primarily used to identify intervals to target for straddle packer testing. Intervals with bedding planes were also targeted for straddle packer testing due to the lack of open water bearing fractures below 167 ft in MW-15. Additional open fractures, filled fractures, and bedding planes were identified and are listed in detail in Appendix B.

Optical televiewer images were utilized to measure the orientations of bedding planes and fractures. Optical televiewer images are included on optical televiewer logs for each well (Appendix B). Observed bedding planes were generally uniform with a mean strike of north (N) 48 degrees (°) east (E) with a dip of 38 ° towards the northwest (NW). Observed fractures were sorted into two groups based on orientation. The first group of fractures exhibited a mean strike of N 46° E and a dip of 42° towards the NW and the second group of fractures exhibited a similar strike to the first group with a mean strike of N 65° E but the second group of fractures were observed to dip in the opposite direction at 53° towards the southeast (SE).

The results of spontaneous potential, gamma ray, caliper, fluid resistivity, temperature, single point and normal resistivity, and heat pulse flow meter analysis are provided on HydroLogs

found in Appendix B. In addition to the optical televiewer, flow meter, caliper, temperature, and resistivity results were used to interpret water producing and receiving zones.

Prior to the final installation of a PVC well within MW-15, an optical televiewer study of the replacement well by the USACE was conducted to determine the location of water bearing fractures at depth to target for the screened interval of the well. The study revealed a water producing fracture at 162.1 ft bgs. This identified fracture is likely connected to the water producing fracture at a similar depth in the original MW-15.

3.3 Straddle Packer Testing

Analytical results associated with the MADW straddle packer testing are summarized in Table 1. TCE was detected at concentrations below the PADEP MSC/ Record of Decision remedial action objective of 5 μg/L in the 41-52 and 94-105 ft intervals (1.9 and 1.7 μg/L, respectively). TCE concentrations increase with depth beyond these intervals with 73.1 μg/L detected in the 121-132 ft interval and 535 μg/L detected in the 170-181 ft interval. Cis and trans 1,2-DCE were both detected in these intervals at concentrations below their respective MSCs. PCE was detected in the 170-181 ft interval at a concentration below the MSC. VC was not detected at concentrations above the laboratory reporting limit in any of the intervals.

Analytical results associated with MW-15 are summarized in Table 2. TCE and cis 1,2-DCE were detected in each of the samples. TCE was detected above the MSC in the 80-91 ft interval at a concentration of 5.2 μg/L. Trans1,2-DCE were detected at estimated concentrations below the laboratory reporting limit in four of the targeted intervals. PCE and VC were not detected at concentrations above the limit of detection in any of the intervals.

Transducer data is summarized on charts, organized by well and date, included in Appendix C. Transducer data was collected using Aquistar transducers and Solinst Leveloger Gold wireless transducers. Per the manufacturer's instructions, barometric correction was not necessary for short term test when the barometric pressure varies insignificantly. Hourly recorded barometric pressures for Capital City Airport, which is located 2 miles to the northwest of the site, were obtained from the Pennsylvania State Climatologist website (http://climate.met.psu.edu) and are included in Appendix E. The greatest change in barometric pressure, 4 millibars, occurred on 12 May. The water column equivalent of 4 millibars is 0.13 ft. Differences of one to two millibars occurred on 13, 14, and 17 May, with the water column equivalent of 0.03 and 0.07 ft. This order of fluctuation is on par with daily variations in water level, therefore wireless transducer data was not corrected for barometric pressure. However, wireless transducer data was corrected (i.e., "zeroed") for elevation using averaged values for groundwater surface elevation.

Transducer data for the transducers located above and below the straddle packers in MADW indicates that packers were properly inflated and there was limited influence from the pumping interval above or below the packered interval (as indicated by limited change in recorded pressures) except for the 170-181 ft interval. Fluctuations in bottom transducer data indicate either interconnected fractures below this interval or improper seal against the borehole wall. However, transducer data from above this interval indicates no influence, which means that the packer seal was properly inflated because if one packer loses pressure both would lose pressure because they were manifolded together (inflated together). Caliper data from the geophysical well logging indicates a relatively smooth borehole wall, which would be conducive to tight seal. Therefore, it is likely that the 170-181 ft interval is connected to underlying fractures.

Data from the pumping interval indicates that the fracture within the 41-52 ft interval produced water at a rate equal or greater to the constant pump rate of approximately 4.6 gallons per minute. Typically a drop in pressure is observed as the interval is purged at a higher rate to remove the initial interval volume. No initial drop was observed in this interval.

Transducer data indicates that packers were properly inflated and there was limited observed influence above or below the pumping interval for the tested depth intervals, with exception of observed influence below the packer assembly during testing of the 170-181 foot interval .

3.4 Pumping Test

Analytical laboratory sample results for hourly samples collected during the MADW pump test of the 41-52 ft interval are summarized in Table 4. Samples collected during the duration of the pumping test indicate that TCE concentrations have a slight decreasing trend throughout the duration of the pumping test. TCE concentrations, which were detected below the MSC, ranged from 2.9 to 2.5 μg/L. Cis 1,2-DCE was detected at an estimated concentration of 0.37 μg/L. No other target VOCs were detected above the laboratory limit of detection.

Charts illustrating transducer data collected during the shallow interval pumping test for MADW (above, between, and below packers), the Mifflin Avenue cabin well, and MW-14 are included in Appendix C. Transducer data from the pumping interval indicates a significant decrease in pressure (water level), this is likely due the nature of the pumping from the interval confined by packers. During the test a cyclic fluctuation of the flow rate was observed at the discharge point (while maintaining a constant flow rate over a minute interval), this is potentially attributed to the nature of the pump causing a cyclone effect inside the pumping interval. The transducer from the bottom interval shows a drop in pressure at the start of the pumping test. It should be noted that water levels within the pumping interval were drawn below the pressure transducer for

the majority of the pumping test; therefore, the zero pressure readings in data depicted in Appendix E reflect water levels below the transducer.

Transducer data from above the top packer in the MADW shows a drop in water level of approximately 5.7 ft at the start of the pumping test. Water levels in the interval above the packer recovered after the pumping was discontinued, indicating that fractures above the packer are likely connected to fractures in the pumping interval.

Transducer data from the Mifflin Avenue cabin potable well indicates that there was an initial down draw at the start of the pumping test of 0.13 ft. The well recovered to pre-pumping conditions within one hour of the start of the test. This suggests some connectivity between fractures in the Mifflin Avenue cabin well and fractures in the shallow pumping interval in MADW.

Transducer data from MW-14, the monitoring well closest to MADW, indicates that a constant draw down of 0.1 ft occurred during the course of the pumping test. This indicates a connectivity between the fractures in MW-14 and the shallow pumping interval in MADW. Water levels were recorded in MW-14 from 12 May to 18 May. Over this period water levels increased, peaking on 16 May 2010 and decreasing thereafter. The pumping test occurred during a decrease in observed water levels; however, the relative affect of the pumping test is evidenced by the increased rate of water level decline observed during the pumping test.

3.5 FLUTe™ Well Installation

Water FLUTe™ liner intervals were selected based on the results of geophysical and straddle packer testing. One additional interval was selected to evaluate TCE concentrations below the lowest straddle packer interval, which had a TCE concentration exceeding the screening criterion. Final as-built information for the liner and installation procedures are provided in Appendix F and port intervals and placement rationale are summarized on Table 5.

The FLUTe™ multiport liner was installed on 8 June by FLUTe™ personnel under the supervision of an EA field geologist. Prior to the installation of the liner B.L. Myers personnel removed two straddle packers which had been set at 120 and 170 ft below top of casing, to prevent cross contamination of fractures during construction of the liner.

Installation of the liner followed FLUTe™ standard operating procedures. Due to the high water table present in MADW, the use of scaffolding was necessary for the installation of the liner. Potable water obtained from Fairview Township was used to fill the liner as it was unfurled into the well. During the installation manipulation of the liner was necessary to work out kinks in

tubing associated with the sampling system. After installation was complete sampling tubes were purged several times to ensure that the sampling system was functional.

3.6 Quality Assurance Samples

Trip blanks were submitted to ALSI with each batch of samples transported to the laboratory and were analyzed for targeted VOCs (TCE, PCE, cis 1,2-DCE, trans 1,2-DCE, and VC) via USEPA Method SW 846 8260B. Trip blanks were submitted on 12, 13, 14, and 17 May 2010. No targeted VOCs were detected above the laboratory limit of detection in the trip blanks, indicating no contamination during transport.

A total of three equipment rinse blanks (RB-1, RB-2, and RB-3) were submitted to ALSI for analysis of targeted VOCs (TCE, PCE, cis 1,2-DCE, trans 1,2-DCE, and VC) via USEPA Method SW 846 8260B to assess equipment decontamination. The rinse blanks were submitted on 12, 13, and 14 May 2010. Rinse blanks were performed on non-dedicated Grundfos pumps that had been decontaminated between sampling intervals. No targeted VOCs were detected above the laboratory limit of detection the rinse blanks, indicating that decontamination procedures were effective. Laboratory reporting is included as Appendix D.

4.0 SUMMARY AND RECOMMENDATIONS

The objective of this investigation was to assess the vertical extent of TCE distribution within the bedrock aquifer and evaluate the potential for conversion of an interval of the MADW for potable water supply. Two deep monitoring wells were installed to the north of and within the previously identified plume and a series of geophysical, pumping, and packer tests were completed to evaluate fracture flow and connectivity related to TCE concentration. Based on the data gathered during straddle packer testing at the MW-15 location, the TCE plume does not appear to extend to depth at this location. However, TCE was detected at depth (121-132 ft and 170-181 ft interval) in the MADW at concentrations above the MSC/Record of Decision remedial action objectives.

Wells previously installed north of the site (i.e. MW-10, MW-11, MW-12, MW-13, and MW-14) do not appear to be deep enough to intercept the fractures exhibiting the highest concentrations of TCE. Although TCE has been reported in MW-11, MW-12, and MW-13, these wells are relatively shallower than MADW.

A review of the pumping test results from the shallow interval of the MADW (41-52 feet) indicates that detected TCE concentrations are below the MSC/Record of Decision remedial action objectives. Additionally, TCE concentrations in the shallower bedrock interval in MADW do not increase as the aquifer is pumped at a constant rate over time. This indicates that the fracture isolated by the packer is not connected or has limited connectivity to underlying fractures that contain higher concentrations of TCE. Limited connectivity to the Mifflin Avenue cabin well was observed at the start of the pumping test. Connectivity was also observed between the pumping interval and the interval above the pumping interval within MADW (41-52 ft) as well as with fractures in MW-14. Based upon the results of the testing, completed as part of this investigation, the shallow interval (41-52 ft) within MADW could potentially be completed as a potable well to replace the Mifflin Avenue cabin well as a source of potable water for the property.

It is recommended that VOC concentrations at MADW and MW-15 be monitored in order to gather data necessary to support a demonstration of attainment of a Site-Specific Standard. Additional monitoring of the shallow bedrock interval (41-52 ft) in MADW to determine if it is suitable as a potable water source is also recommended. Sampling events during varying river water levels is recommend to determine if TCE concentrations observed in the monitoring wells are influenced by the river.

TABLE 1 MIFFLIN AVENUE DEEP WELL - STRADDLE PACKER TESTING SUMMARY OF INTERVALS SELECTED, RATIONALE, AND LABORATORY ANALYTICAL RESULTS

				Analyte/PADEP MSC				
Sample Interval Number	Straddle Packer Interval (ft)	Rational for Interval Selection	Laboratory Sample ID	TCE 5 ug/L	Cis 1,2-DCE 70 ug/L	Trans 1,2-DCE 100 ug/L	PCE 5 ug/L	VC 2 ug/L
1	41-52	Identified Fracture Zone 41-45 ft	MADW 41-53	1.9	<1 U	<1 U	<1 U	<1 U
2	94-105	Identified Fracture Zone 100-102 ft	MADW 94-105	1.7	<1 U	<1 U	<1 U	<1 U
3	121-132	Identified Fracture Zones 122-124 and 127-130 ft	MADW 121-132	**73.1**	1.2	0.52 J	<1 U	<1 U
4	170-181	Identified Fracture Zone 174-177 ft	MADW 170-181	**535**	10.1	5.3	3.6	<1 U

All depths indicated are below top of casing
All analytical results are in micrograms per liter (ug/L)
TCE - Trichloroethylene
Cis 1,2-DCE - Cis 1,2-dichloroethylene
Trans 1,2-DCE - Trans 1,2-dichloroethylene
PCE - Tetrachloroethene
VC - Vinyl chloride
ft - feet
PADEP - Pennsylvania Department of Environmental Protection
MSC - Medium specific concentration
J - Estimated concentration
U - Not detected above laboratory limit of detection
Bold - indicates value exceeds the PADEP MSC

TABLE 2 MW-15 STRADDLE PACKER TESTING - SUMMARY OF INTERVALS SELECTED, RATIONALE, AND LABORATORY ANALYTICAL RESULTS

				Analyte/PADEP MSC				
Sample Interval Number	Straddle Packer Interval (ft)	Rational for Interval Selection	Laboratory Sample ID	TCE 5 ug/L	Cis 1,2-DCE 70 ug/L	Trans 1,2-DCE 100 ug/L	PCE 5 ug/L	VC 2 ug/L
1*	20-31	Identified Fracture Zone 20-22 ft	Not collected	Not collected	Not collected	Not collected	Not collected	Not collected
2	54-65	Identified Fracture Zone 60-63 ft	MW-15 54-65	4.4	3.8	0.66J	<1 U	<1 U
3	80-91	Identified Fracture Zone 84-89 ft	MW-15 80-91	**5.2**	4	0.86 J	<1 U	<1 U
4	115-126	Identified Fracture Zone 123-124 ft	MW-15 115-126	3.1	3.4	0.64J	<1 U	<1 U
			DUP-1	3.3	3.5	0.65J	<1 U	<1 U
5	138-149	Identified Fracture Zone 142-148 ft	MW-15 138-149	1.5	3.2	0.49J	<1 U	<1 U
6	156-167	Identified Fracture Zone 158-162 ft	MW-15 156-167	1.9	1.7	<1 U	<1 U	<1 U
			DUP-2	1.8	1.7	<1 U	<1 U	<1 U
7	172-183	Bedding – Potential Fractures 172-178 ft	MADW-172-183	1.1	2.2	<1 U	<1 U	<1 U
8	184-195	Bedding – Potential Fractures 192-193 ft	MADW 184-195	1.6	2.1	<1 U	<1 U	<1 U

All depths indicated are below top of casing
All analytical results are in micrograms per liter (ug/L)
TCE - Trichloroethylene
Cis 1,2-DCE - Cis 1,2-dichloroethylene
VC - Vinyl chloride
U - Not detected above laboratory reporting limit
ft - feet
PADEP - Pennsylvania Department of Environmental Protection
MSC - Medium specific concentration

* Interval not sampled due to time constraints
Bold - indicates value exceeds the PADEP MSC
J - Estimated concentration

TABLE 3 - SUMMARY OF MAJOR FRACTURES IDENTIFIED FROM GEOPHYSICAL WELL LOGGING

Well	Depth of Fracture (ft)	Producing or Receiving Groundwater	Fracture Orientation - Strike/Dip
MW-15	20 - 22	Receiving	N67E/38NW, N62E/42SE, N21E/42NW, N86E/33SE
MW-15	84 – 89	Receiving	N33E/43NW, N84E/51NW, and N68E/49SE
MW-15	142 - 148	Producing	N73E/68SE, **N64E/63SE**, N70E/59SE, and N89E/64SE
MW-15	158 - 162	Producing	N90E/41SE, **N69E/55SE**, N69E/60SE, and N43E/41NW
Mifflin Ave	32 - 34	Producing	N63E/38NW and N30E/38SE
Mifflin Ave	41 - 45	Producing	N36E/40NW, N45E/42NW, and N55E/55SE
Mifflin Ave	122 – 125	Receiving	N85E/64SE
Mifflin Ave	127 - 130	Receiving	N54E/37NW
Mifflin Ave	174 - 177	Producing	**N57E/39NW** and **N65E/44NW**

ft - feet below top of casing
N - North
NW - Northwest
SE - Southeast
Bold text indicates open fractures that were of a measurable width

TABLE 4 MIFFLIN AVENUE DEEP WELL 6-HOUR PUMPING TEST - SUMMARY OF PUMP RATES AND LABORATORY ANALYTICAL RESULTS

				Analyte/PADEP MSC				
Hour Collected	Flow Rate (gpm)	Laboratory Sample ID	Collection Time	TCE 5 ug/L	Cis 1,2-DCE 70 ug/L	Trans 1,2-DCE 100 ug/L	VC 2 ug/L	PCE 5 ug/L
1	4.6	MADW Hour 1	13:50	2.8	0.37 J	<1 U	<1 U	<1 U
2	4.6	MADW Hour 2	14:50	2.9	<1 U	<1 U	<1 U	<1 U
3	4.6	MADW Hour3	15:50	2.7	<1 U	<1 U	<1 U	<1 U
4	4.6	MADW Hour 4	16:50	2.5	<1 U	<1 U	<1 U	<1 U
		Dup-3	16:50	2.7	<1 U	<1 U	<1 U	<1 U
5	4.6	MADW Hour 5	17:50	2.7	<1 U	<1 U	<1 U	<1 U
6	4.6	MADW Hour 6	18:50	2.5	<1 U	<1 U	<1 U	<1 U

All analytical results are in micrograms per liter (ug/L)
TCE - Trichloroethylene
Cis 1,2-DCE - Cis 1,2-dichloroethylene
Trans 1,2-DCE - Trans 1,2-dichloroethylene
PCE - Tetrachloroethene
VC - Vinyl chloride
U - Not detected above laboratory reporting limit
gpm - gallons per minute
PADEP - Pennsylvania Department of Environmental Protection
MSC - Medium specific concentration
J - Estimated concentration

TABLE 5 SUMMARY OF SELECTED SAMPLE PORT DEPTHS AND RATIONALE FOR FLUTe™ WELL DESIGN

Port Number	Rationale	Sampling Interval (ft)
1	Monitor TCE concentrations for potential use as potable well source	41-52
2	Monitor TCE concentrations due to elevated concentrations observed during straddle packer testing	121-132
3	Monitor TCE concentrations due to elevated concentrations observed during straddle packer testing	170-181
4	Monitor TCE concentrations below impact TCE impact identified during the straddle packer testing	184-195

ft - feet below top of well casing

5.0 REFERENCES

EA Engineering, Science, and Technology, Inc. (EA), 2010a. *Final Well Installation Work Plan, Marsh Run Park, Mifflin Avenue, New Cumberland, Pennsylvania*. April.

EA Engineering, Science, and Technology, Inc. (EA), 2010b. *Final Sampling and Analysis Plan, Marsh Run Park, Mifflin Avenue, New Cumberland, Pennsylvania*. April.

EA, 2009. *Final Site Specific Addendum to the General Health and Safety Plan (GHASP) for Hazardous Waste and Environmental Services for Groundwater Characterization and Monitoring at Marsh Run Park (formerly New Cumberland Army Depot), New Cumberland, Pennsylvania*. September.

APPENDIX A

BOREHOLE DRILLING LOGS

HTRW BORING/WELL LOG

HOLE NUMBER: MW-15 Redrill

1. COMPANY NAME: EA Engineering, Science, and Technology, Inc.
2. DRILL SUBCONTRACTOR: B.L. Meyers
SHEET 1 OF SHEETS
3. PROJECT: MRP
4. GEOLOGIST: Denise Wilt
5. COMPONENT: NA
6. AREA: NA
7. GRID LOC./BIASED POINT: NA
8. NAME OF DRILLER: BL Meyers - Paul
9. MANUFACTURER'S DESIGNATION OF DRILL: Sram
10. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: Air Rotary
TYPE OF LINER USED, IF APPLICABLE:
11. SURFACE ELEVATION AND CONDITIONS: Cleared area, slightly sloping to east
12. DIRECT READING PARAMETERS: PID (ppm) O2 - Ok
13. DATE STARTED: 6/18/10
14. DATE COMPLETED: 6/18/10
15. OVERBURDEN THICKNESS: 13 ft.
16. DEPTH GROUNDWATER ENCOUNTERED:
17. DEPTH DRILLED INTO ROCK: ~~2~~ 180
18. DEPTH TO WATER AND ELAPSED TIME ATFER DRILLING COMPLETED:
19. TOTAL DEPTH OF HOLE:
20. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):
21. WELL INSTALLED? Yes
IF SO COMPLETE CONSTRUCTION DIAGRAM:
22. SAMPLE TYPE: NA
23. SAMPLE INTERVAL AND DESIGNATION FOR LAB ANALYSIS: NA
24. SAMPLE INTERVAL AND DESIGNATION FOR FIELD SCREENING ANALYSIS: NA
25. SCREENING ANALYSIS: PID - VOC & O2
27. DISPOSITION OF HOLE:
28. IF NOT A WELL, BACKFILLED WITH:

USCS LOG (a)	DEPTH (FT) (b)	DESCRIPTION OF MATERIALS (c)	DIRECT READING (d) VOC (ppm)	DIRECT READING (d) O2	ANALYTICAL SAMPLE DESIGN. (e)	DEPTH (FT) PID(f)/O2	RECOVERY (IN.) Time (g)	REMARKS
	20	0-13' - Silt and gravel (sub-rounded) moist 13' - Redshale	0	Ok		0/ok	937	Started
	40	18' - Bottom of casing - 20' - 6" PVC casing set in hole - water in hole when set	0	Ok	Used pellet Bentonite to stabilize PVC casing		948	
	60	20' Redshale 40' Redshale, smooth, consistent	0	Ok			1000	Piece of PVC broke off fixing @ 10:15 - collapsed so down whole was 10:38 using 6" bit to clean out hole 1057 putting 40-60
	70	N45 prev. fracture 60-80 smooth - smooth Red Shale	0	OK	producing H_2O		1115	
	80	80-100 Smooth, Red Shale	0	Ok			1117 1125	
	100	100-120' Slightly coarser, interbeds	0	Ok			1136	
	120	120-140 - smooth, interbeds	0	Ok			1140	
	140	140-160 smooth, fine grained Shale	0	Ok			1150	
	160	160-180 - Smooth Shale	0	Ok			1201 1205	Developed w/ RIS initial = 1,000 NTU 1320 - 179 NTU
	180						1215	1340 done pulling Rods

PROJECT: Marshkow

HOLE NO.: MW-15 Redrill

HTRW BORING/WELL LOG

HOLE NUMBER: MW-15

1. COMPANY NAME: EA Engineering, Science, and Technology, Inc.

2. DRILL SUBCONTRACTOR: BL Meyers

SHEET 1 OF 1 SHEETS

3. PROJECT: MRP

4. GEOLOGIST: D. Wilt

5. COMPONENT:

6. AREA:

7. GRID LOC./BIASED POINT:

8. NAME OF DRILLER: Paul

9. MANUFACTURER'S DESIGNATION OF DRILL:

10. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: Air Rotary

TYPE OF LINER USED, IF APPLICABLE:

11. SURFACE ELEVATION AND CONDITIONS: Cleared area, slopes to East

12. DIRECT READING PARAMETERS: PID (ppm)

13. DATE STARTED: 5/ /10

14. DATE COMPLETED: 5/ /10

15. OVERBURDEN THICKNESS: 12'

16. DEPTH GROUNDWATER ENCOUNTERED:

17. DEPTH DRILLED INTO ROCK: 188'

18. DEPTH TO WATER AND ELAPSED TIME ATFER DRILLING COMPLETED:

19. TOTAL DEPTH OF HOLE: ~200'

20. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):

21. WELL INSTALLED? Yes

IF SO COMPLETE CONSTRUCTION DIAGRAM:

22. SAMPLE TYPE: NA

23. SAMPLE INTERVAL AND DESIGNATION FOR LAB ANALYSIS: NA

24. SAMPLE INTERVAL AND DESIGNATION FOR FIELD SCREENING ANALYSIS: NA

25. SCREENING ANALYSIS:

27. DISPOSITION OF HOLE:

28. IF NOT A WELL, BACKFILLED WITH:

USCS LOG (a)	DEPTH (FT) (b)	DESCRIPTION OF MATERIALS (c)	DIRECT READING (d) VOC (ppm)	DIRECT READING (d) O_2	ANALYTICAL SAMPLE DESIGN. (e)	DEPTH ~~(FT)~~ Time (f)	RECOVERY (IN.) Dust (g)	REMARKS
		0-5' Light reddish br, clayey silt. moist, some gravel	0	Ok	wet, lots of H_2O	845	0.020	
	20	12' ⇒ wet water seems to be sitting on Rock						
		13' - Rock	0	Ok		900	0.023	
	40	28 - Red Shale Pot. fracture						
		35' Pot. fract.						
		45' - slight chatter	0	Ok		915	0.00	
	60	55' wet fract						
		60' Red Shale						Started adding H_2O for dust control
	80	80' Red Shale	0	Ok				
		90' Red Shale				935 - 1000 Start		
		105' - Slight fract - Red Shale (Sh. III)				↓ 950		
	100							
		110 - Red Sandstone	0	Ok		945	0.086	
	120	120 - Red Sandstone - possible shale interbeds	0	Ok		1015	0.005	
		~125 ⇒ Soft possible fracture						
	140	140 - Red Sandstone 145 = wet fract	0	Ok		1020	0.00	
		150 - Red Sandstone				1035		
	160	155 - fract - ~20 spm				↓ 1044		
		160 ⇒ 180 Sandstone - Shale interbeds likely	0	Ok		1045	0	
	180	180 ⇒ 200 Shale / SS / Siltstone interbeds						
	200	190 - SS coarse grained				1100 1110		Developed w/ GIS H water

PROJECT:

HOLE NO.:

Note · Checking PID on cuttings every 5'

HTRW BORING/WELL LOG

HOLE NUMBER: Mifflin Ave. Deep Well

1. COMPANY NAME: EA Engineering, Science, and Technology, Inc.

2. DRILL SUBCONTRACTOR: BLMeyers

SHEET 1 OF SHEETS

3. PROJECT: MLR

4. GEOLOGIST: D. Wilt

5. COMPONENT

6. AREA

7. GRID LOC./BIASED POINT

8. NAME OF DRILLER: Paul

9. MANUFACTURER'S DESIGNATION OF DRILL

10. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT

TYPE OF LINER USED, IF APPLICABLE

11. SURFACE ELEVATION AND CONDITIONS: flat, moist

12. DIRECT READING PARAMETERS: PID (ppm)

13. DATE STARTED: 5/3/10

14. DATE COMPLETED: 5/6/10

15. OVERBURDEN THICKNESS

16. DEPTH GROUNDWATER ENCOUNTERED

17. DEPTH DRILLED INTO ROCK

18. DEPTH TO WATER AND ELAPSED TIME ATFER DRILLING COMPLETED

19. TOTAL DEPTH OF HOLE

20. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)

21. WELL INSTALLED? IF SO COMPLETE CONSTRUCTION DIAGRAM

22. SAMPLE TYPE: NA

23. SAMPLE INTERVAL AND DESIGNATION FOR LAB ANALYSIS

24. SAMPLE INTERVAL AND DESIGNATION FOR FIELD SCREENING ANALYSIS: NA

25. SCREENING ANALYSIS

27. DISPOSITION OF HOLE

28. IF NOT A WELL, BACKFILLED WITH:

USCS LOG (a)	DEPTH (FT) (b)	DESCRIPTION OF MATERIALS (c)	DIRECT READING (d) VOC (ppm)	DIRECT READING (d) O_2	ANALYTICAL SAMPLE DESIGN. (e)	DEPTH (FT) Time	RECOVERY (IN.) Dust	REMARKS
	20	Little return, wet & silty 18 - Red shale - collapse little return	0	ok	Return clean, good Red silt + angular gravel		0.0	Background PID = 0.1 CG-0807
	40	28 - casing (1220) 40 Red shale, no apparent fract.	0	ok	1.1.20		0.0	Dry once casing set 13'8" of 10" steel
	60	60' - Red shale - no apparent fract	0	ok		40' @ 218	0.0	constant Drilling
	80	80 Red shale	0	ok		233 ↓ 245	0.0	
	100	~ 90' Potential H_2O bearing fract 90-100 ft. Constant - Red shale	0	ok		245 ↓ 300	0.0	95' check
	120	pot. coarser layer 110' - Coarser 119-120 - water bearing zone	0	ok		3 ↓ 320	0.0	5/5/2010
	140	SS possible interbedded w/ Shale 120-140 - 5/6/10 Red Shale → Possible Sandy	0	ok		945 ↓ 955	0.0	No water added produces enough
	160	140 - Red shale 130 - Pot. fract 160 →	0	ok		958 ↓ 1015	0.0	
	180	165 - Pot fract. faster drilling 170 Pot fract	0	ok		1017 ↓ 1030	0.0	
	200	Red shale - smooth drilling	0	ok		1031 ↓ 1042	0.0	Developed w/ R18 → 1100

PROJECT: Marsh Run

HOLE NO.: MAD(W)

Cuttings screened w/ PID every 5'

APPENDIX B

BOREHOLE GEOPHYSICS REPORT

June 4, 2010

Ms. Denise E. Wilt
EA Engineering, Science, and Technology
One Marketway West, Suite 4C
York, PA 17401

Subject: Results of Geophysical Well Logging
MW-15 and Mifflin Avenue Deep Well
Marsh Run Park, New Cumberland, Pennsylvania
ARM Project: 09346

Dear Ms. Wilt,

ARM Geophysics is pleased to present this letter report that summarizes the results of borehole geophysical logging performed at the above referenced site on May 6 and 7, 2010. Logging was performed in wells MW-15 and Mifflin Avenue Deep Well (MADW). The objective of the logging was to determine the depth and orientation of fractures and bedding planes and to locate and characterize water-producing zones. To achieve these objectives, standard well logs and borehole images were acquired from each well.

LOGGING METHODS

The logs that were run for this investigation include:

- Natural Gamma
- Fluid Temperature
- Fluid Resistivity
- 3-Arm Caliper
- Short & Long Normal Resistivity
- Single Point Resistance
- Spontaneous Potential (SP)
- Heat Pulse Flowmeter (HPFM) – Static & Pumping
- Optical Televiewer (OTV)

A summary of these logging methods is provided in Attachment A. The data were acquired using MGX II and Matrix acquisition systems manufactured by Mount Sopris Instrument Company (MSI). The probes were manufactured by MSI and Advanced Logic Technology.

BASIC LOG DESCRIPTIONS

The geophysical well logs acquired during this investigation are presented in Attachment B. All log depths are referenced to top of casing as indicated in the header of each log. The majority of the acquired data are presented as standard curves that plot the measured parameter with depth. The format of the heat pulse flowmeter and televiewer logs are discussed in the following paragraphs.

The Vertical Flow track in the HydroLog provides a record of the rate of vertical fluid movement and is derived from the heat pulse flowmeter tool. The X-axis represents the magnitude of flow in gallons/min that was recorded at depths

indicated by the posted value. The flow magnitude is calculated during acquisition by dividing the distance between the grid and thermistors by the travel time. Negative and positive values indicate downward and upward flow, respectively.

The televiewer logs contain borehole images and structural information obtained from the OTV tool. The *Optical View* track is an "unwrapped" photographic image of the borehole wall (Figure 1). In this case, the cylindrical borehole surface is unzipped along the north azimuth and unrolled to a flat strip. The compass orientation (with respect to true north) is presented at the top of the log. The unwrapped format is distorted like any projection of a curved surface on a flat one. Horizontal and vertical planes will be undistorted. However, dipping planes will be represented as a sine wave: the greater the dip, the greater the wave amplitude.

The *Projection* track presents the fracture signatures that are digitized from the unwrapped *Optical View*. The *Dip & Dip Direction* log is a presentation in which the vertical axis is depth and the horizontal is dip angle from 0° to 90°. As shown in Figure 2, the dip direction is indicated by the orientation of the tadpole tail, measured in a clockwise direction from north.

INTERPRETATION OF STRUCTURAL DIAGRAMS

The structural data are presented on polar and rose diagrams for statistical analysis and pattern visualization. Polar diagrams are used in this report to plot the dip and dip direction of planar features. Zero degree dip is represented at the center of the diagram and 90° at the circumference. The dip direction is indicated by the compass azimuth, measured clockwise from north (0°), as shown in Figure 3.

The rose diagram graphically illustrates the strike distribution of a set of planes. Radiating rays are drawn with lengths proportional to the number of strike measurements within each 10° sector. It is important to recognize that the polar diagram represents dip and dip direction, whereas the rose diagram represents strike. Using the right-hand-rule convention, strike equals the dip direction minus 90°.

RESULTS AND DISCUSSION

ORIENTATION ANALYSIS OF PLANAR FEATURES

Optical televiewer images were used to measure the orientations of fractures and bedding planes. A tabulated listing of these planar orientations is presented in Attachment C. Stereographic analysis was performed on these orientation data and the results are presented in the polar and rose diagrams shown in Figures 4 through 9.

Figure 4 presents a polar diagram plotting the orientations of all planes. The planes are classified by symbols corresponding to bedding, filled fracture, and open fracture sets. Predominant groups or "sets" are indicated by the clustering of data points. The bedding plane set consists of tightly clustered points in the NW quadrant. The tight cluster suggests uniform structural dip. Both filled and open fractures are observed with orientations similar to bedding. This group represents partings or bedding-parallel joints. A second grouping of fractures is observed in the SE quadrant that strikes parallel to the first but dips at approximately 90° in the opposite direction.

Figure 5 presents a polar diagram of all planes categorized by well. This display can be useful in identify lateral changes in orientation. In this case, the bedding planes appear to be laterally consistent. Although the dip angles are consistent, there is a slight variation between wells in the dip direction of the SE fracture set. The statistical contouring was used to identify windows in which to calculate the mean orientation of the bedding plane set (Figure 6). The results show a mean dip/dip direction of 38/318. Figure 7 presents a rose diagram showing the strike distribution of bedding planes. A

predominant NE strike direction is observed. Figure 8 shows the results of statistical contouring of the fracture plane sets. A tabulated listing of the calculated mean orientations of these fracture plane sets and the bedding plane sets is presented in Table 1. Finally, the rose diagram shown in Figure 9 indicates a strong NE strike direction parallel to bedding.

Table 1: Mean orientations of planes.

Type	Dip/Dip Direction	Strike/Dip
Bedding	38/318	N48E/38NW
Fracture Set 1	42/316	N46E/42NW
Fracture Set 2	53/155	N65E/53SE

INTERPRETATION OF WATER-PRODUCING OR RECEIVING ZONES

Water-producing or receiving zones are typically identified in the acquired logs by a combination of the following parameters:

A. Start or increase in upward or downward fluid flow identified by heat pulse flowmeter data suggests water-producing zone.
B. End or decrease in upward or downward fluid flow identified by heat pulse flowmeter data suggests water-receiving zone.
C. Open fractures observed in televiewer data.
D. Deflections in caliper curve (suggests fractures).
E. Deflections or change in slope in fluid temperature or fluid resistivity curve.
F. Decrease in formation resistivity.

The most convincing evidence of water-producing or receiving zones is heat pulse flowmeter, fluid temperature, and fluid resistivity deflections since they can indicate flow into or out of the borehole. Fractures observed in televiewer images or caliper curves can indicate water-bearing zones although the evidence is more indirect. A fracture may be observed in the borehole wall that may have been opened or enlarged during the drilling process but may be tight and contain little or no water a short distance into the formation. A decrease in formation resistivity may be caused by an increase in water content but may also be caused by lithologic changes such as an increase in clay mineral content. For this reason, resistivity deflections should be compared to the gamma ray curve to identify lithologic changes. A combination of the above indicators provides the highest level of confidence for identifying water-bearing zones.

Table 2 presents the interpreted flow zones based on the indicators above. These zones are also identified as symbols next to the depth track and annotations to the curves on the HydroLog.

Table 2: Interpreted water-producing or receiving zones and indicators. Letters in "Indicators" column correspond to the selection parameters shown above.

Well	Depth (ft)	Producing or Receiving (under static conditions)	Indicators
MW-15	**20 - 22**	Receiving	B, C, D, E
MW-15	**84 – 89**	Receiving	B, C, D, E
MW-15	**142 - 148**	Producing	A, C, D, E
MW-15	**158 - 162**	Producing	A, C, D, E
MADW	**32 - 34**	Producing	A, C, D, E
MADW	**41 - 45**	Producing	A, C, D, E
MADW	**122 – 125**	Receiving	B, C, D, E
MADW	**127 - 130**	Receiving	B, C, D
MADW	**174 - 177**	Producing	A, C, D, E

CLOSING

The results of this investigation successfully achieved the project objective by determining the depths and orientations of fractures and bedding planes and by locating and characterizing water-producing and receiving zones. The fracture and bedding plane orientations are consistent with those previously derived by ARM from topographic and geologic maps. Finally, these results were used to help direct subsequent packer testing and can be used to corroborate and enhance the site hydrogeologic model.

Please contact us if you have any questions regarding this survey. We appreciate your business and look forward to working with you again.

Kind regards,
ARM Geophysics

M. Scott McQuown, P.G.
Senior Geologist & Geophysicist

FIGURES

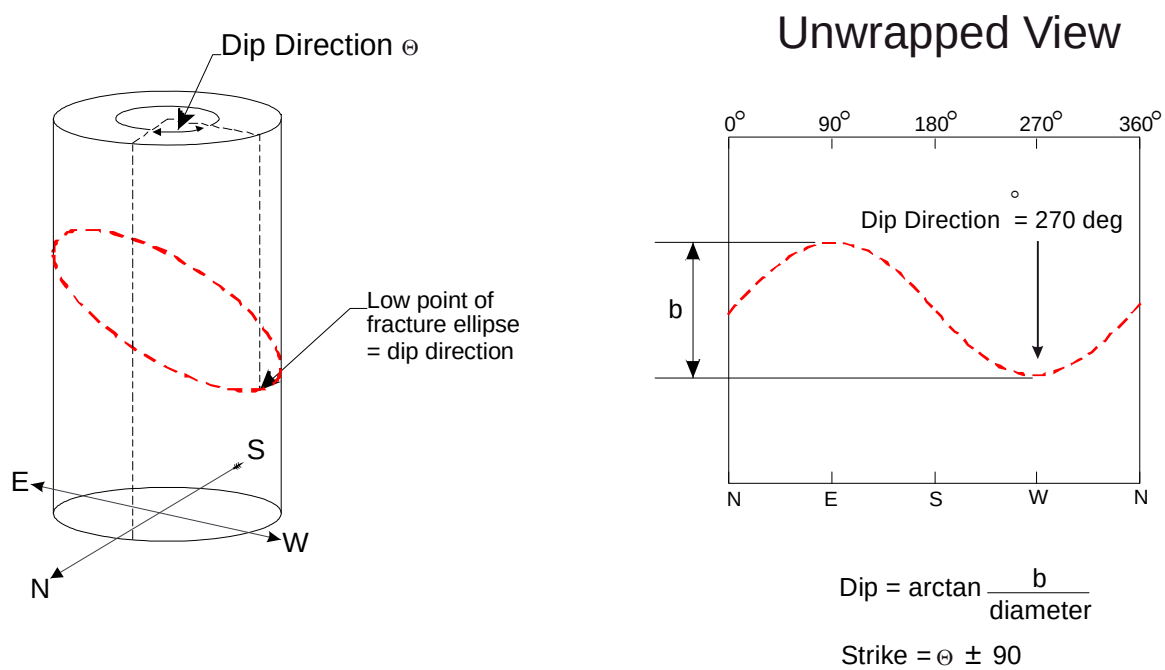


Figure 1: Diagram illustrating unwrapped view of fracture signature.

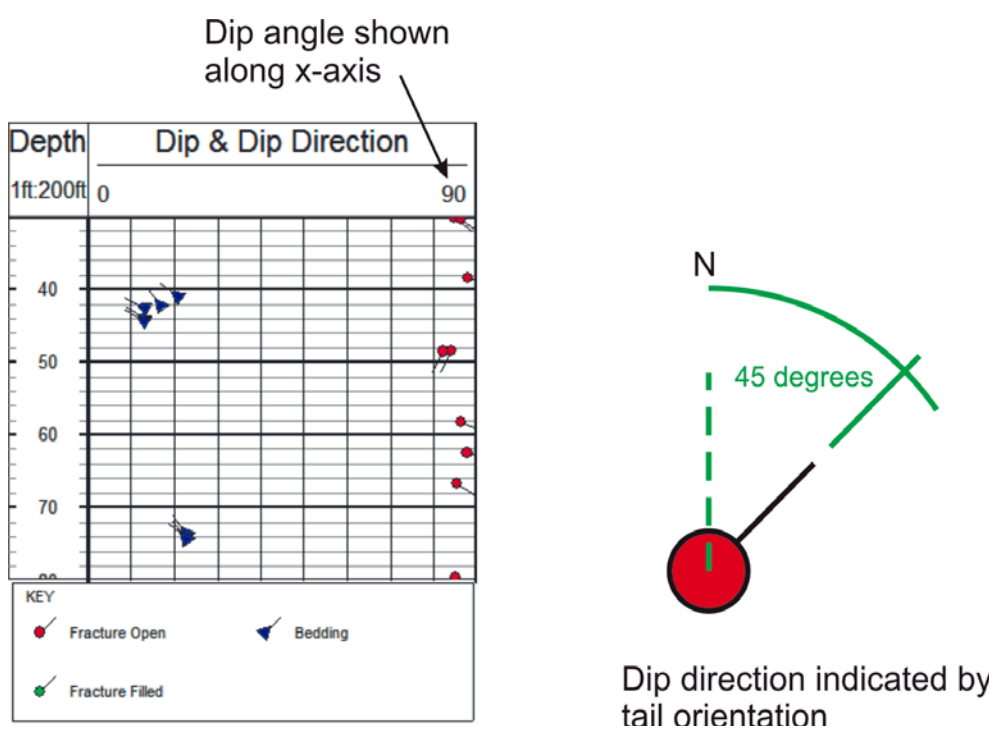


Figure 2: Dip & dip direction determination from the tadpole plot.

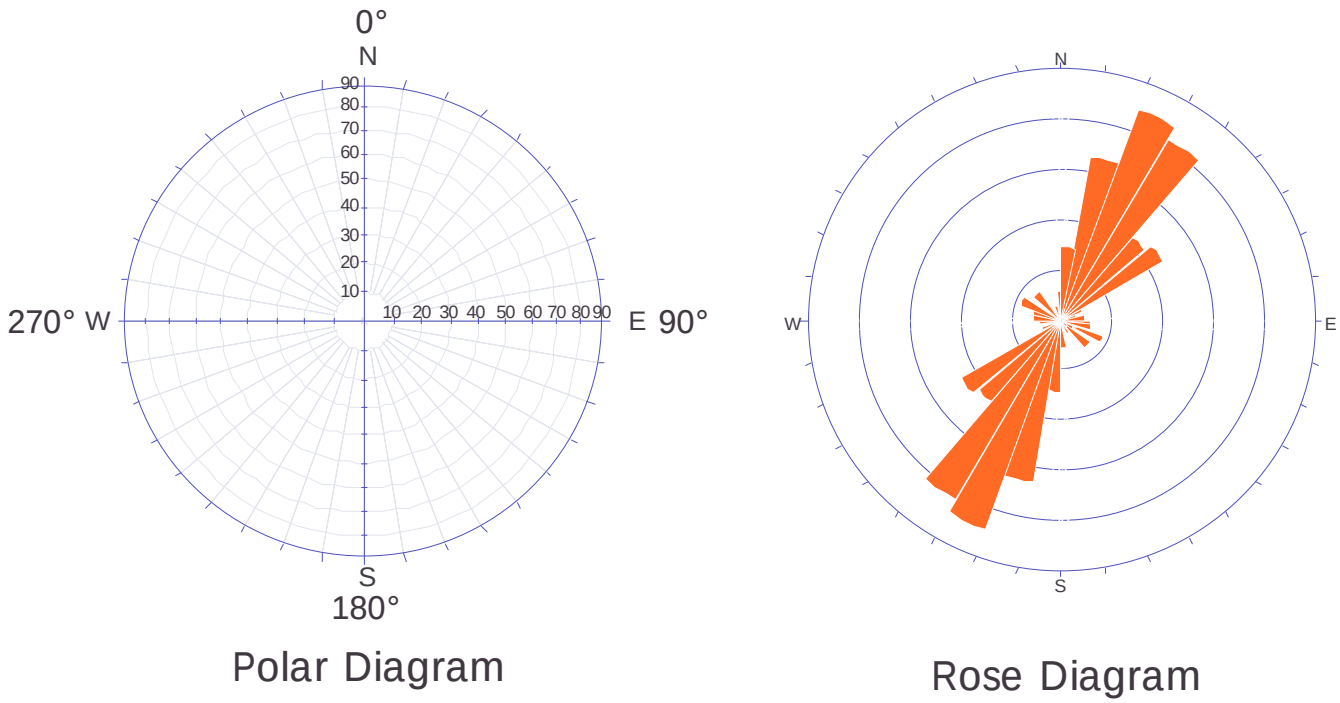


Figure 3: Example polar and rose diagrams. Polar diagram is used in this report for plotting dip and dip direction. Rose diagrams are used for plotting the frequency or number of strike measurements per sector.

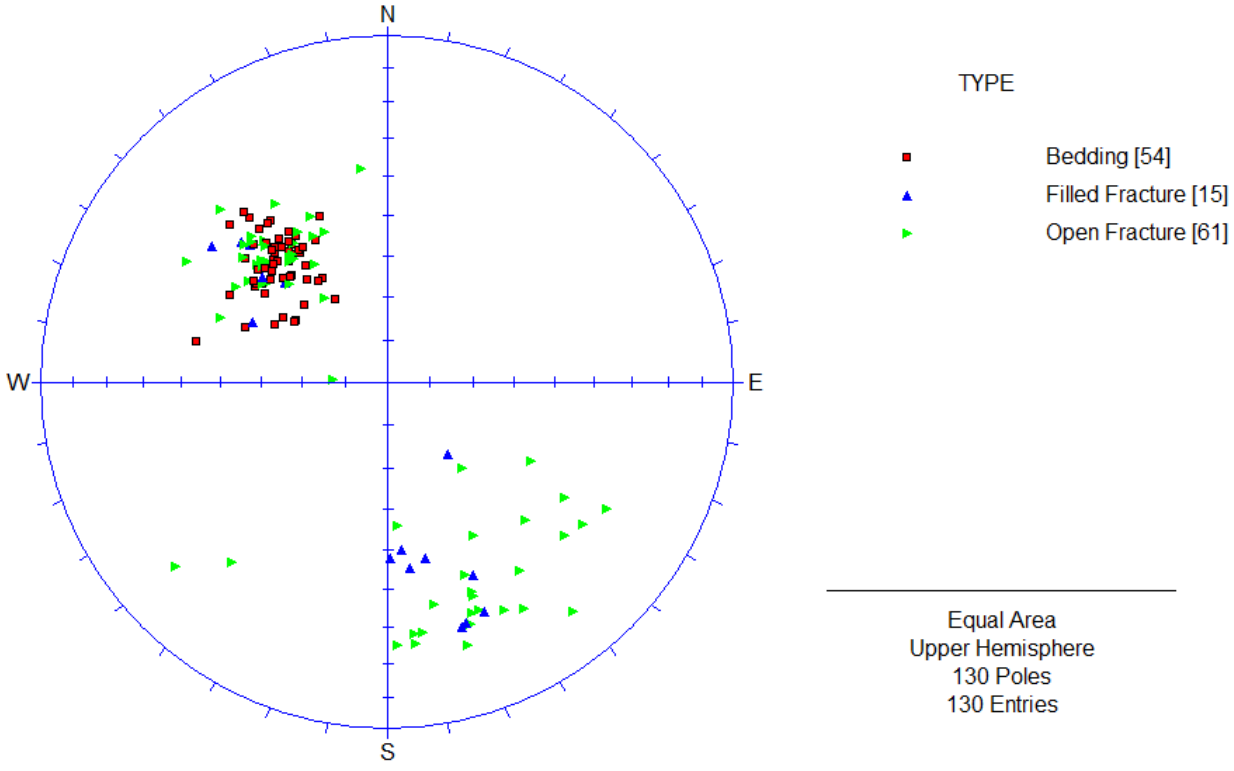


Figure 4: Polar diagram showing dip and dip direction of all planes categorized by plane type.

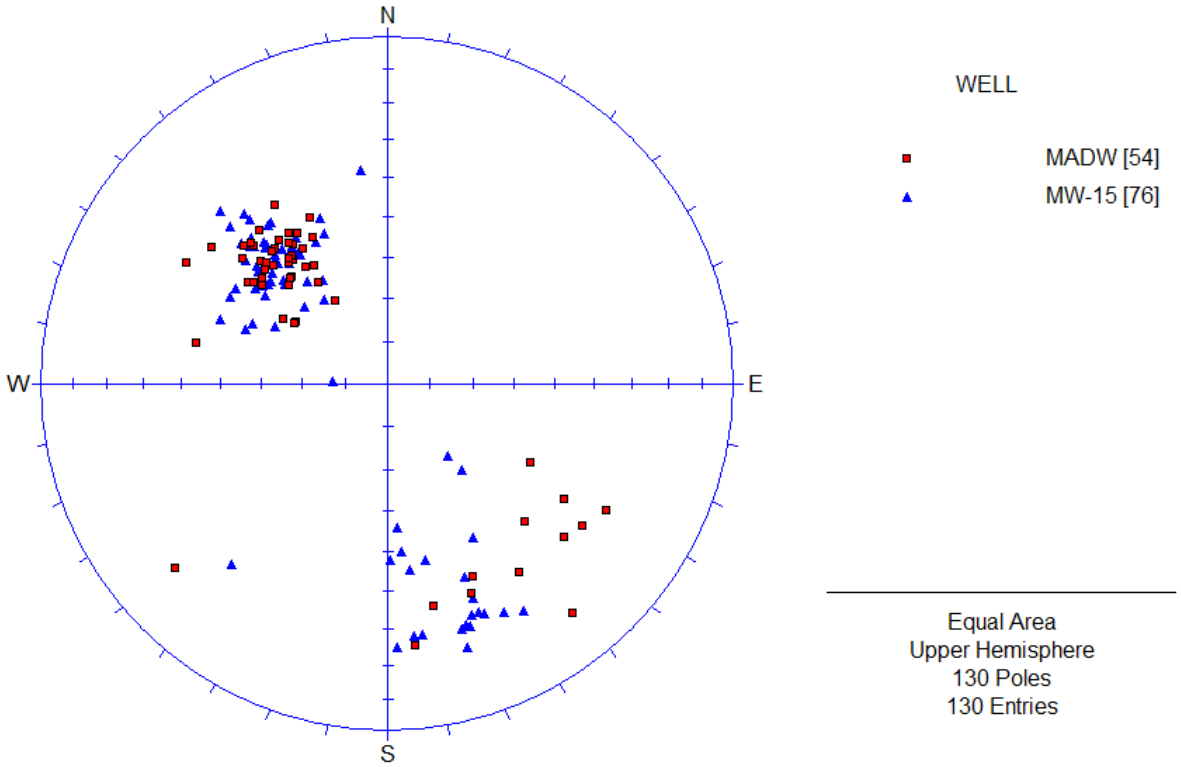


Figure 5: Polar diagram showing dip and dip direction of all planes categorized by well.

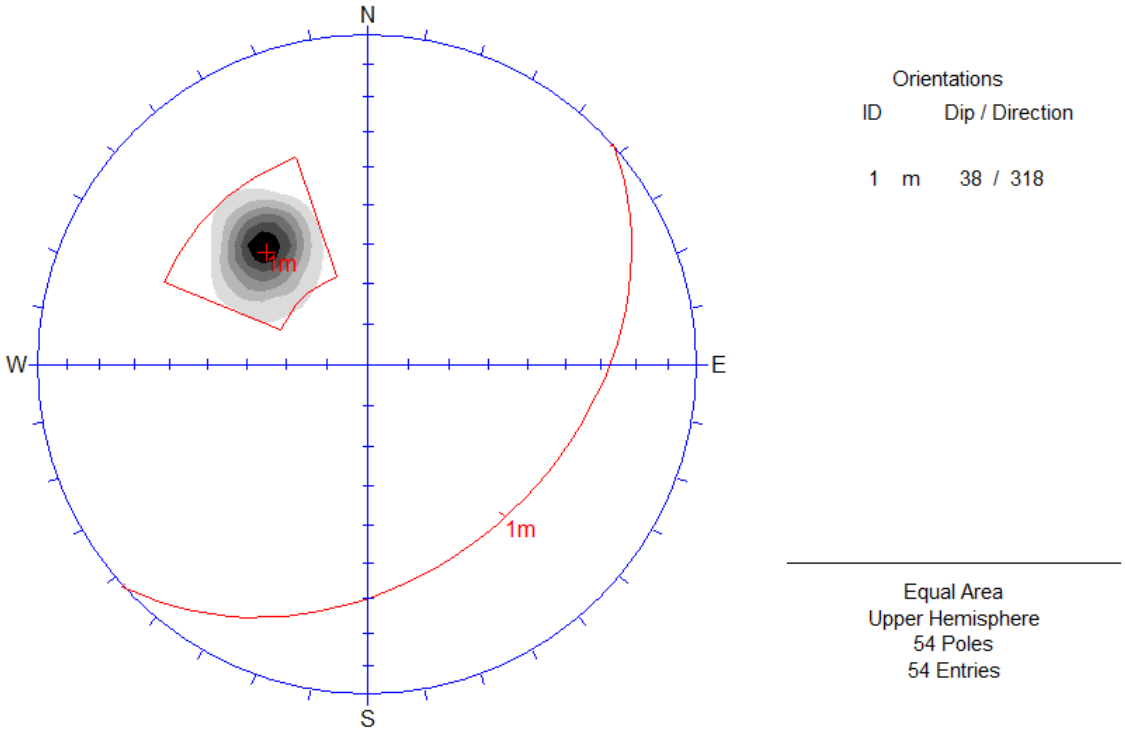


Figure 6: Polar diagram showing statistical contouring and mean orientation of bedding planes. Mean orientation is listed to the right of the diagram and indicated by the letter "m".

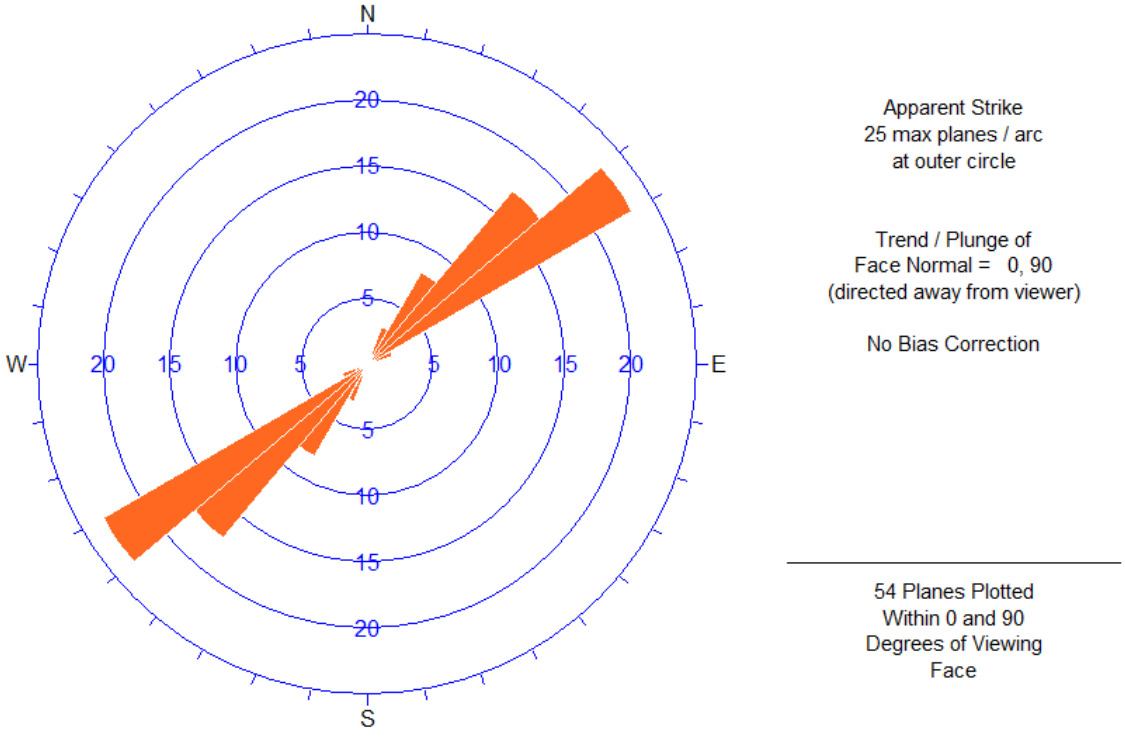


Figure 7: Rose diagram showing the strike distribution of bedding planes.

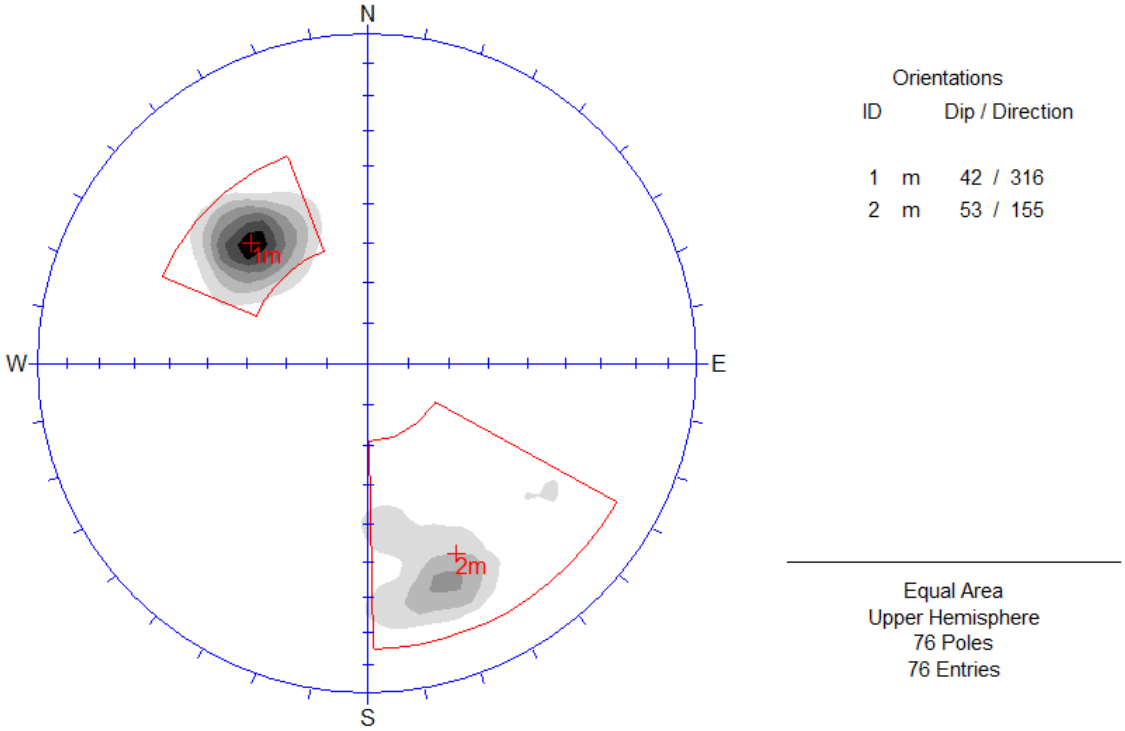


Figure 8: Polar diagram showing statistical contouring and mean orientation of open fracture planes. Mean orientation of each set is listed to the right of the diagram indicated by the letter "m".

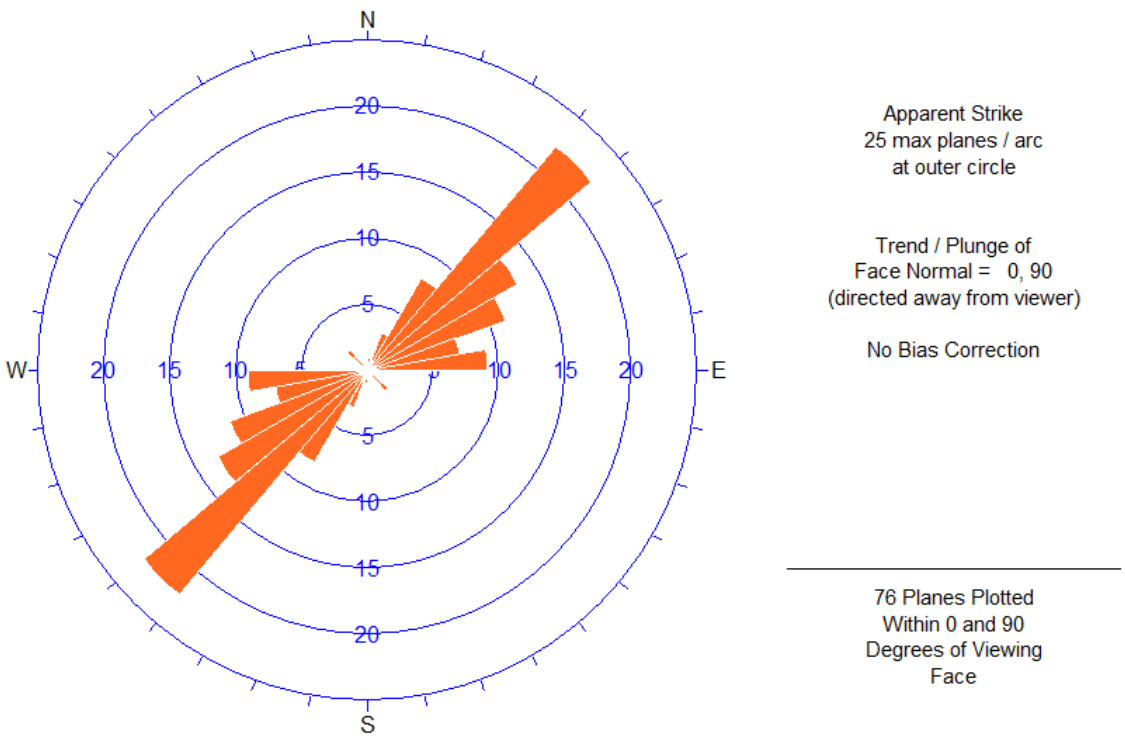


Figure 9: Rose diagram showing the strike distribution of fracture planes.

ATTACHMENT A
LOGGING METHODS

1129 West Governor Road, PO Box 797
Hershey, PA 17033-0797
Voice: (717) 533 - 8600
Fax: (717) 533 - 8605

OVERVIEW OF LOGGING METHODS

CALIPER LOGS

The caliper log measures variations in borehole size as a function of depth in a well. Some example responses of in a caliper log is shown in Figure A- 1 (Rider, 2002[1.]) The log data enables (a) the detection of competent or fractured geologic units, (b) the location of washouts or tight zones, (c) the optimal placement of well screen, sand, and bentonite, and (d) the establishment of appropriate borehole correction factors to be applied to other well log curves. Further, when run in combination with other logs, the caliper log may be an indicator of lithologic makeup and degree of consolidation. The typical caliper response in a fractured, weathered, or karstic unit is a relatively abrupt increase in borehole size.

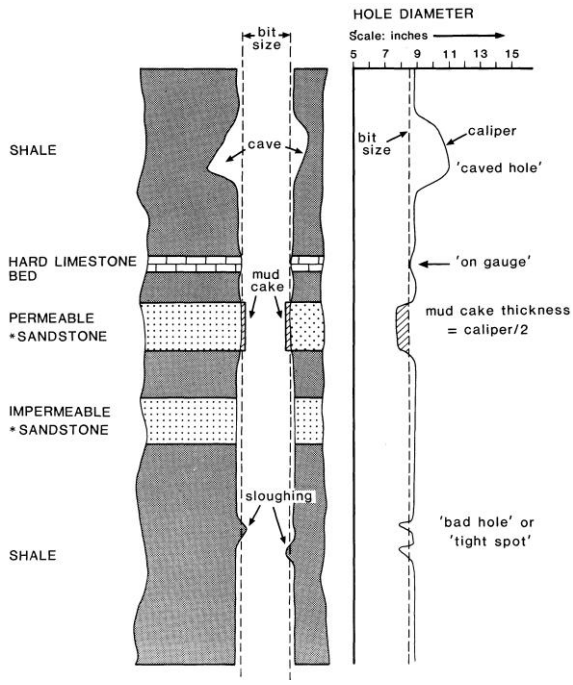


Figure A- 1: The caliper log showing some typical responses. (From Rider, 2002).

SPONTANEOUS POTENTIAL (SP) LOGS

The SP log measures the natural voltages that are created within the borehole due to the presence of borehole fluids, formation fluids, and formation matrix materials. It is recorded by measuring the difference in electrical potential in millivolts between an electrode in the borehole and a grounded electrode at the surface. The SP log is commonly used to 1) detect permeable beds, 2) detect boundaries of permeable beds, 3) determine formation water resistivity, and 4) determine the volume of shale in permeable beds. The constant SP readings observed in thicker shale units define the shale base line, a reference line from which further formation matrix and formation fluid property calculations may be completed. Although this log is consistently used in oil and gas applications, its effectiveness in water wells is limited since the method requires a contrast in salinity between borehole and formation fluids (Figure A- 2). This condition is often not met in ground water wells.

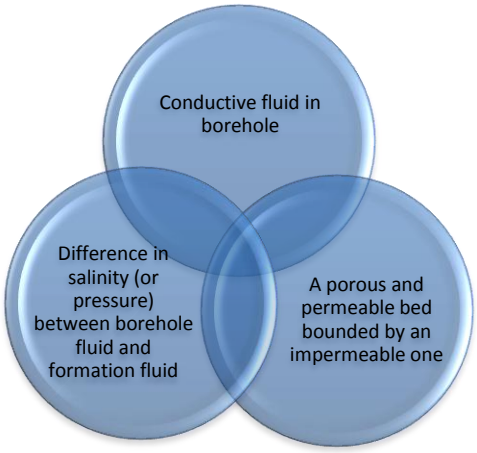


Figure A- 2: Conditions required to produce an SP response.

The SP log can be qualitatively used for permeability recognition. SP deflections from the shale base line commonly indicate the presence of a permeable bed. The

1 Rider, M. (2006) The Geological Interpretation of Well Logs, *Rider-French Consulting, Ltd*., 280pp.

magnitude and direction of the deflection is dependent upon the relative resistivity (or salinity) values of the borehole fluid and the formation fluid. If the formation fluid resistivity is less than the borehole fluid resistivity, then the relative SP values will decrease in a porous, coarse-grained unit. Alternately, if the formation fluid resistivity is greater than the borehole fluid resistivity, the relative SP values will increase in the same body, and the curve shape is referred to as a "reversed SP". If both fluid resistivities are equal, no SP deflection will occur.

GAMMA RAY LOGS

The gamma ray log is a passive instrument that measures the amount of naturally occurring radioactivity from geologic units within the borehole. Commonly occurring radioelements include potassium, thorium, and uranium; the two former elements are predominant within a common fine-grained rock sequence. The gamma ray log is also an excellent lithologic indicator because fine-grained clays and shales contain a higher radioelement concentration than limestones or sands. Gamma ray values are often used to assess the percentage of clay materials (indurated or non-indurated) that are present within a formation by utilizing empirically derived equations and sand-shale base line information.

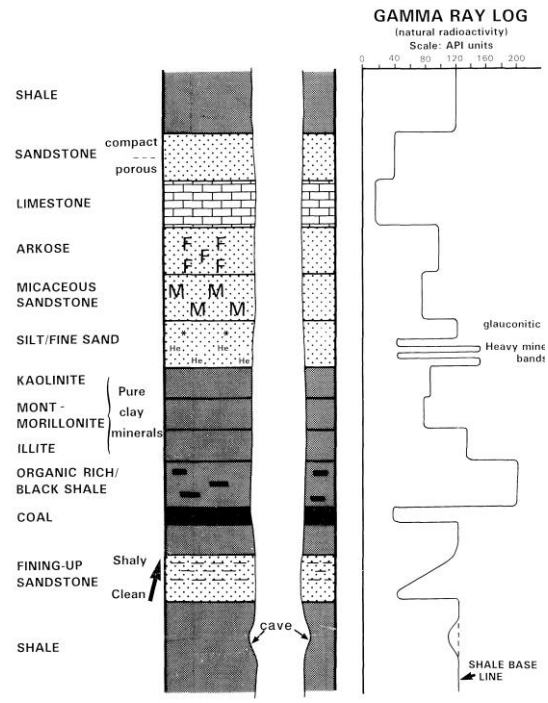


Figure A- 3: Characteristic gamma ray responses. (From Rider, 2002).

NORMAL RESISTIVITY LOGS

Resistivity is a measure of how well an electric current passes through a material. Formation resistivity is an intrinsic property of rocks and depends on the porosity and resistivity of the interstitial fluid and rock matrix.

In sedimentary rocks, the resistivity values of shales (5 - 30 ohm-m) is generally lower than the resistivity of sandstone (30 – 100 ohm-m), which is lower than the resistivity limestone (75 – 300 ohm-m). The resistivity log often shows a picture of the overall depositional sequence in sedimentary environment. Resistivity of igneous and metamorphic rocks is extremely high when compared to resistivity in sedimentary rocks, with values that are commonly thousands of ohm-meters. Example resistivity log responses are shown in Figure A- 4.

FLUID RESISTIVITY LOGS

of fluid resistivity, which is the reciprocal of fluid conductivity, provides data related to the concentration of dissolved solids in the fluid column. Although the quality of the fluid column may not reflect the quality of adjacent interstitial fluids, information can be quite useful when combined with other logs. For example, change in fluid resistivity associated with a water-producing zone that is corroborated by other logs may indicate the inflow of ground water.

SINGLE-POINT RESISTANCE LOGS

Single point resistance measurements are made by passing a constant current between two electrodes and recording the voltage fluctuations as the probe is moved up the borehole. The resistance variations measured in the borehole is primarily due to variations in the immediate vicinity of the downhole electrode.

The resistance log is strongly affected by the resistance of the drilling fluid and variations in borehole diameter. It is extremely useful for detecting fractures in boreholes with relatively constant diameter. In sedimentary environments, the resistance log generally follows the variations in resistivity of the formation. Shales in clay generally exhibit low values, sandstones have intermediate values, while coal and limestone beds have high resistance values.

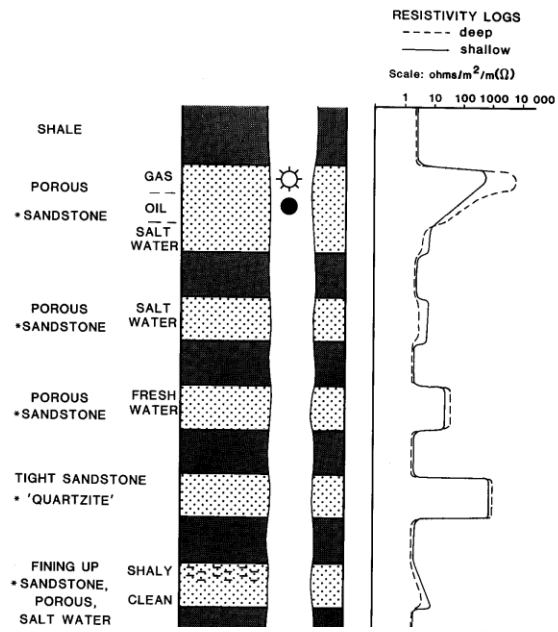


Figure A- 4: Characteristic resistivity responses. (From Rider, 2002)

TEMPERATURE LOGS

Temperature logs measure the change in fluid temperature within the borehole as a function of depth. This log can indicate the location of water- producing strata or fracture zones within the well. The inherent assumption of this technique is that the fluids entering the borehole from water producing zones are either cooler or warmer than the fluid in the borehole. In this case, it is possible to relate a temperature anomaly to a depth range in which waters of different temperature are emanating from a water-producing/receiving or fractured lithologic unit.

HEAT PULSE FLOWMETER (HPFM) LOGS

The heat pulse flowmeter measures the vertical flow rates within a borehole. The log may be used to identify contributing fracture zones under natural and pumping conditions. The system operates by heating a wire grid that is located between two thermistors. The heated body of water moves toward one of the thermistors under the effect of the vertical component of flow within the well. Positive and negative values on the log represent upward and downward flow, respectively. Measurements are recorded while the tool is stationary and the logs are presented as a bar graph (mud log) as shown in Figure A- 5.

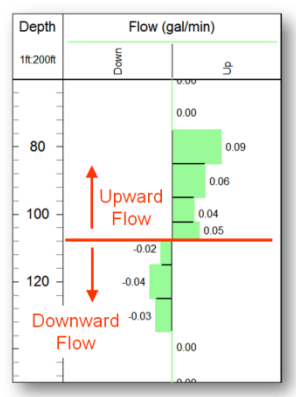


Figure A- 5: Example heat pulse flowmeter log.

A number of techniques have been attempted for measuring horizontal flow in wells without much success. The techniques may not represent the true hydrogeologic conditions due to variations in flow caused by the well.

OPTICAL TELEVIEWER (OTV) LOGS

The optical televiewer probe combines the axial view of a downward looking digital imaging system with a precision ground hyperbolic mirror to obtain an undistorted 360° view of the borehole wall. The probe records

one 360° line of pixels at 0.003-ft depth intervals. The sample circle can be divided into 720 or 360 radial samples to give 0.5° or 1° radial resolution. For this investigation, the highest radial resolution (0.5°) was used. The line of pixels is aligned with respect to True North and digitally stacked to construct a complete, undistorted, and oriented image of the borehole walls. The data are 24 -bit true color and may be used for lithologic determination as part of the interpretation. Since the acquired image is digitized and properly oriented with respect to borehole deviation and tool rotation, it allows data processing to provide accurate strike and dip information of structural features. The borehole image is often shown as an "unwrapped" 360° image in which the cylindrical borehole image is sliced down the northern axis and flattened out as shown in Figure A- 6.

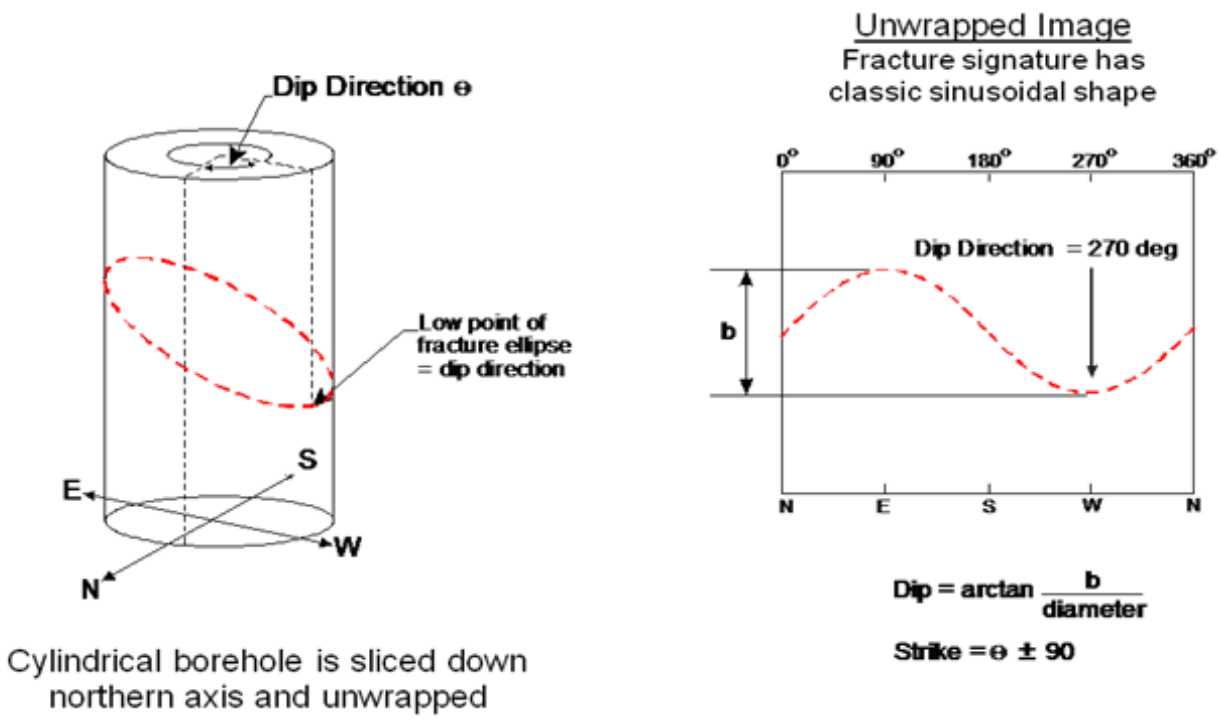


Figure A- 6: Schematic showing the sinusoidal fracture signature in the unwrapped borehole view.

ATTACHMENT B
WELL LOGS

Optical Televiewer

Well Name:	MW-15
API Well Number:	
Company:	EA Engineering
Municipality:	New Cumberland
Farm / Site:	Marsh Run
7.5' Quad Name:	Lemoyne
County:	Cumberland
State:	Pennsylvania
Date:	5-6-2010
Recorded by:	M. Scott McQuown, P.G.
Witness:	

Boring location:	
Surface elevation:	
Log is measured from:	Top of casing, 1.7' from ground level
TD - Driller:	200'
TD - Logger:	204.8'
Drive Pipe Depth:	
Deepest Casing - Driller:	18'
Deepest Casing - Logger:	20.6'
Magnetic Declination Applied:	11.3 deg West

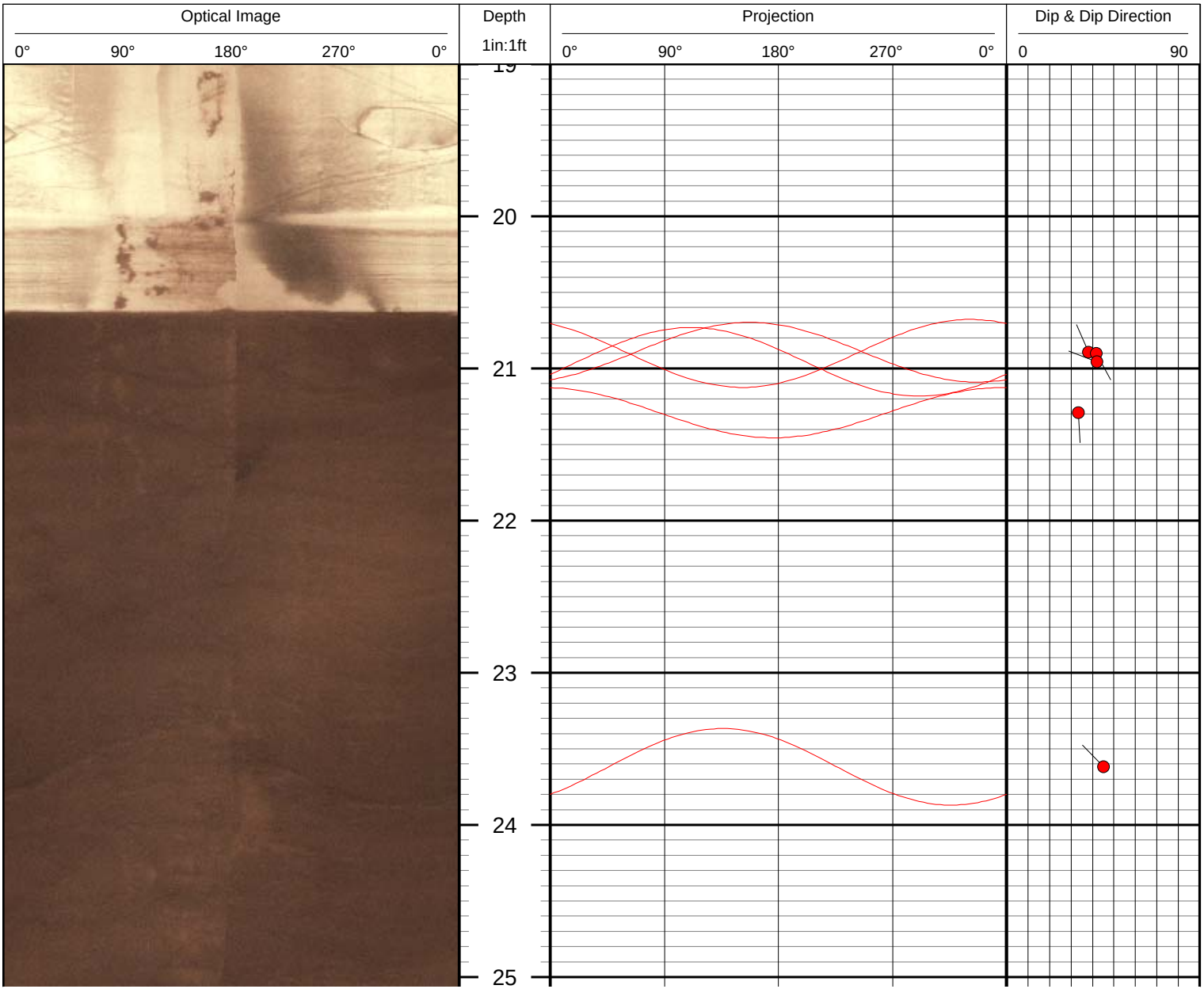
Structural Legend:

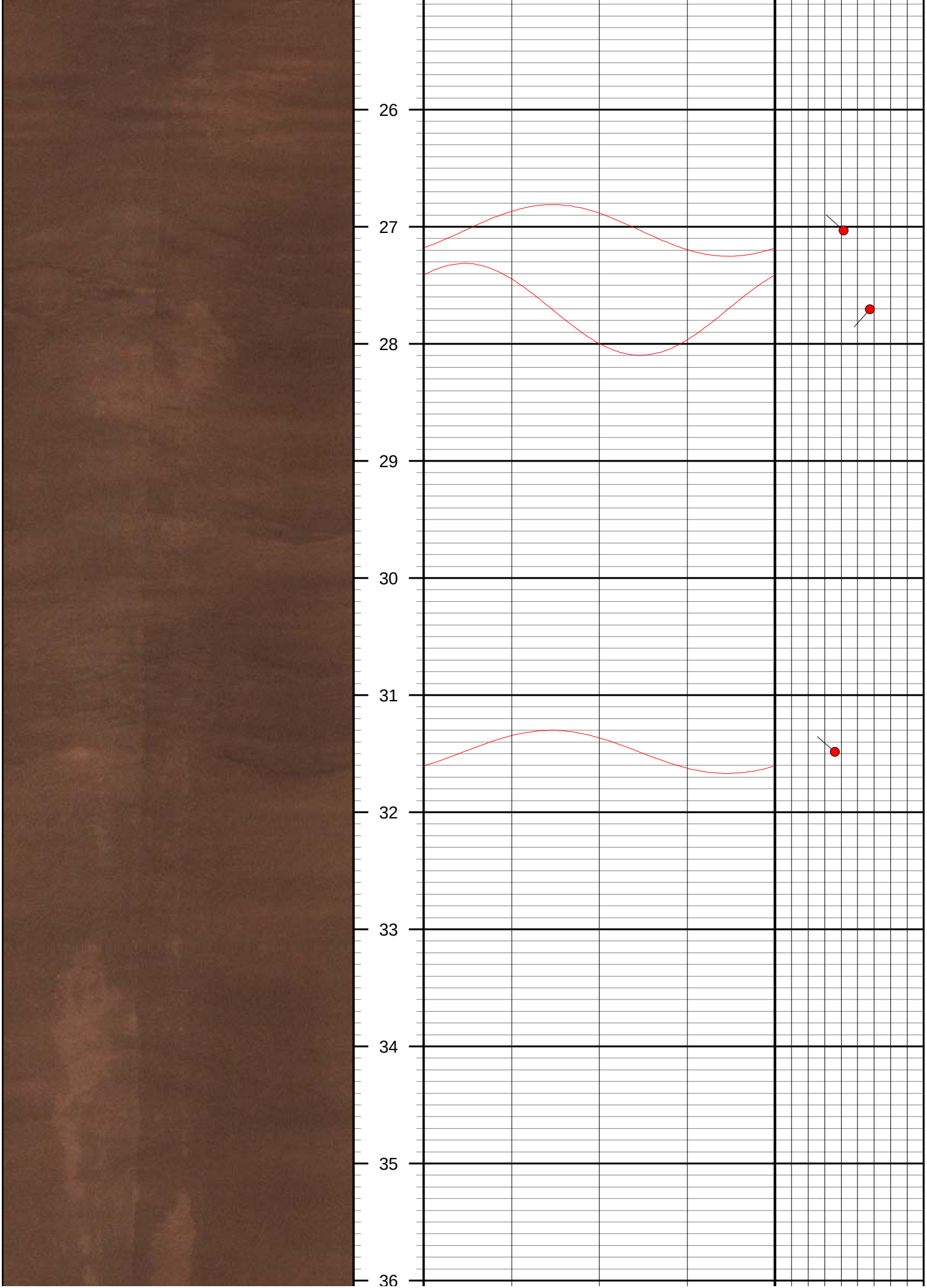
Open Fracture

Bedding / Foliation

Filled Fracture

Notes:

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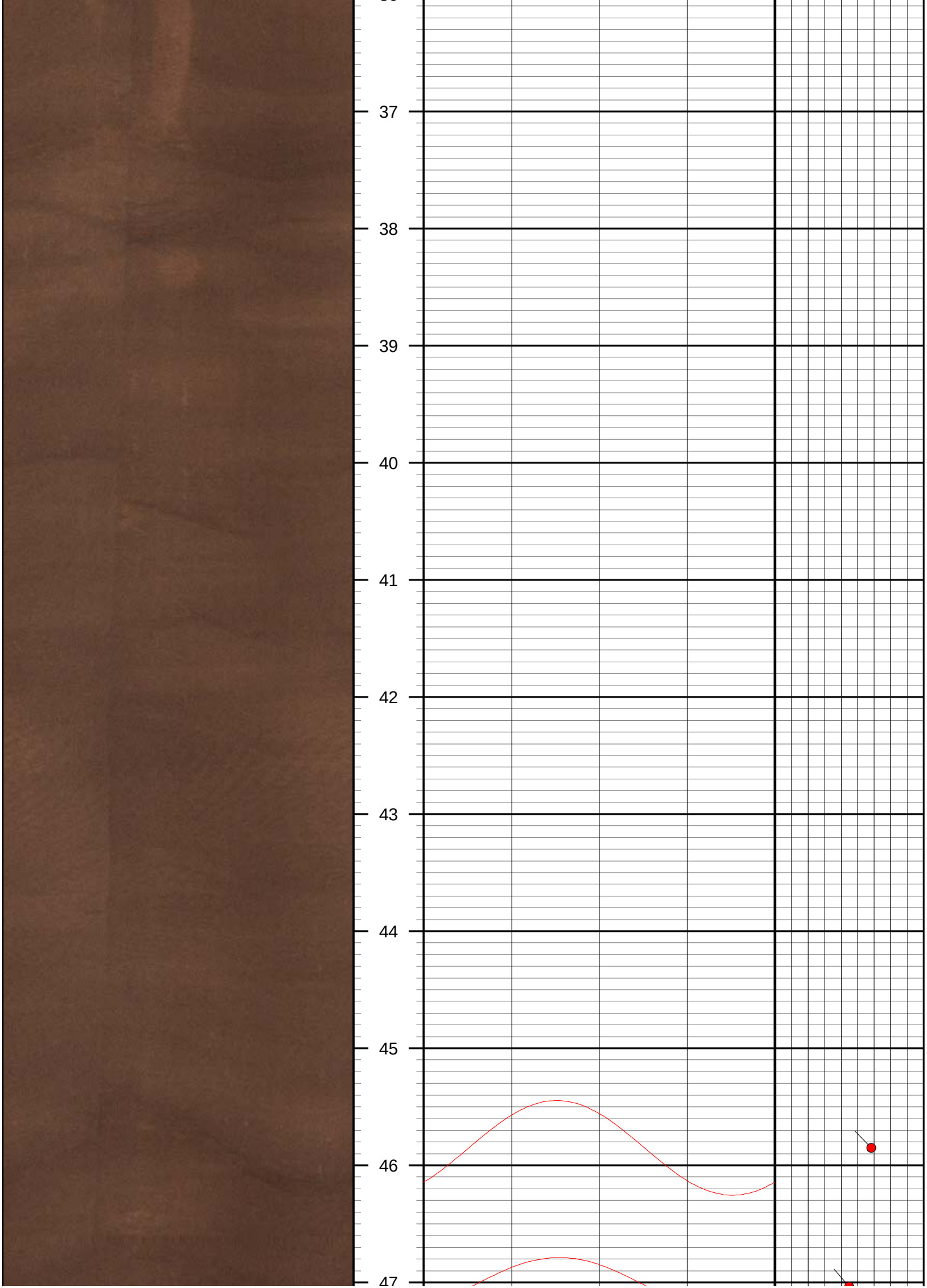
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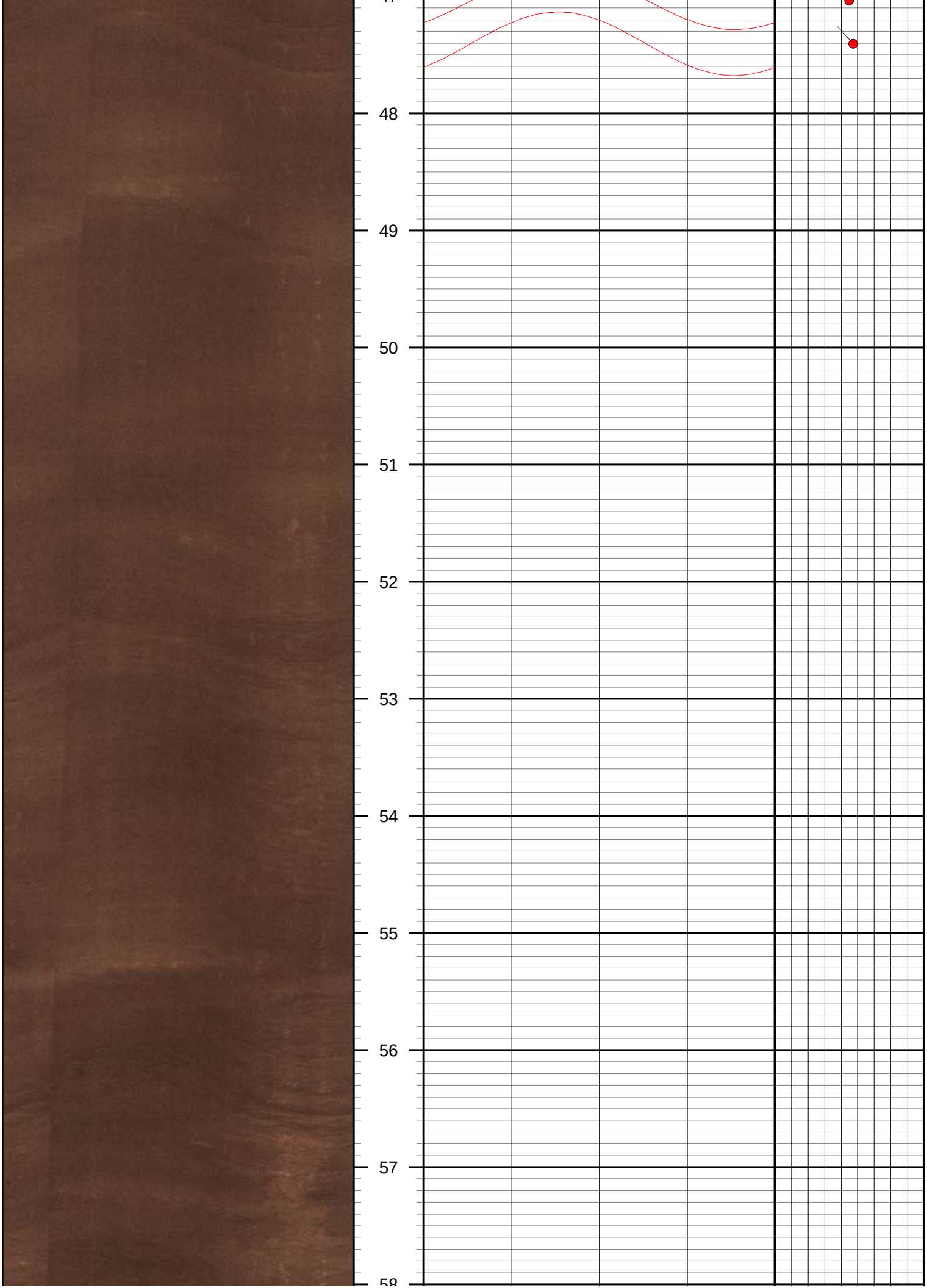
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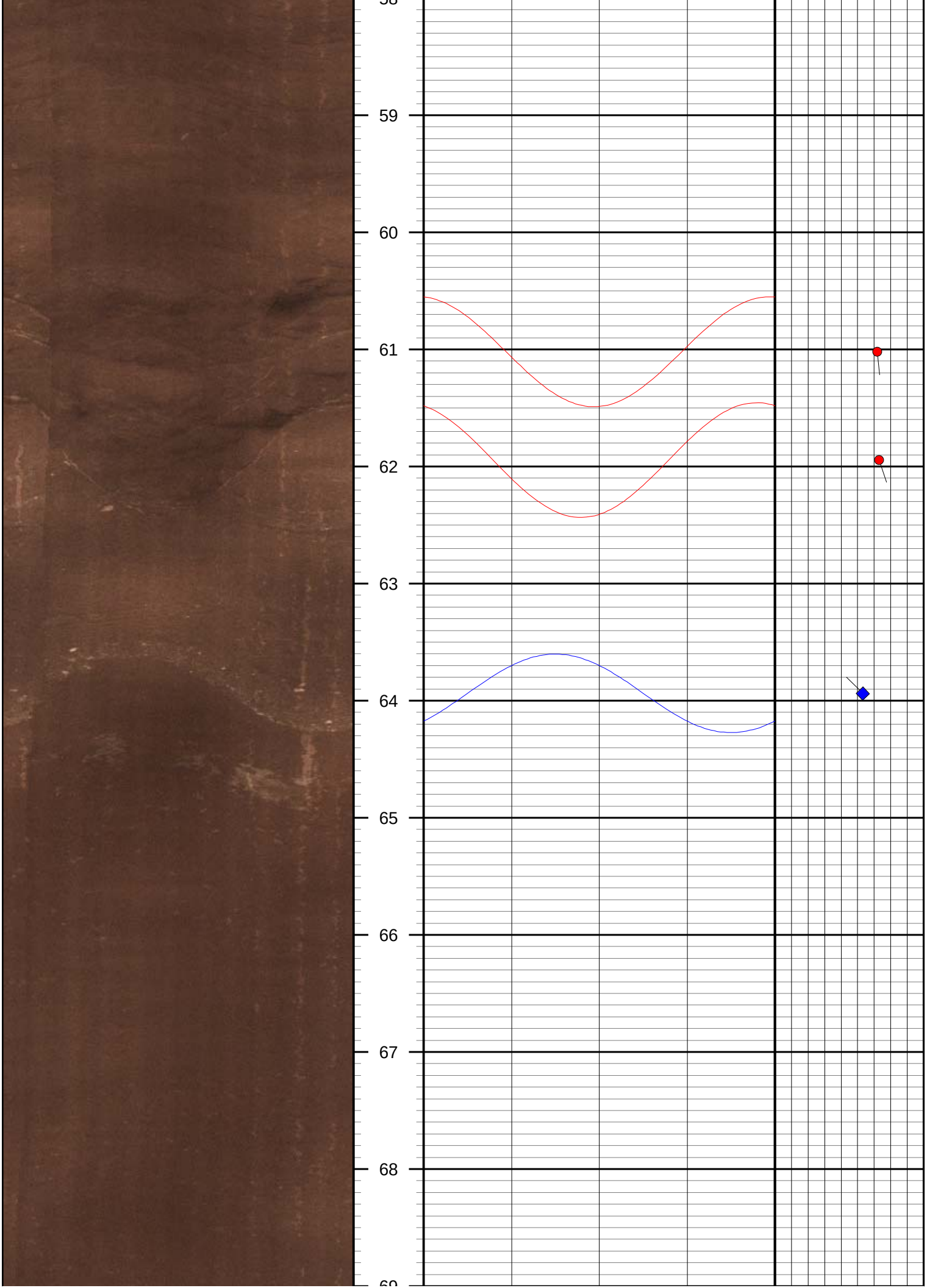
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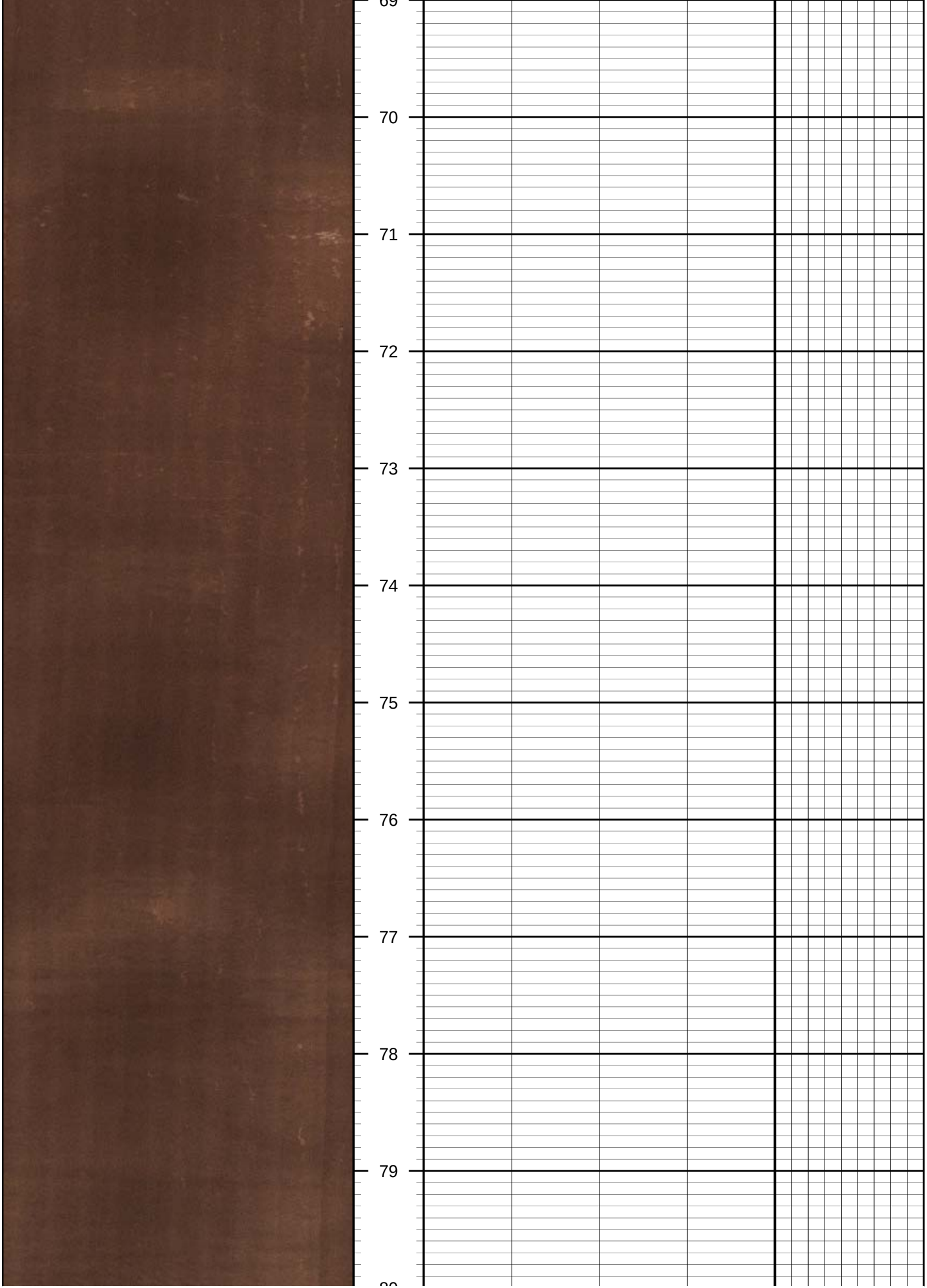
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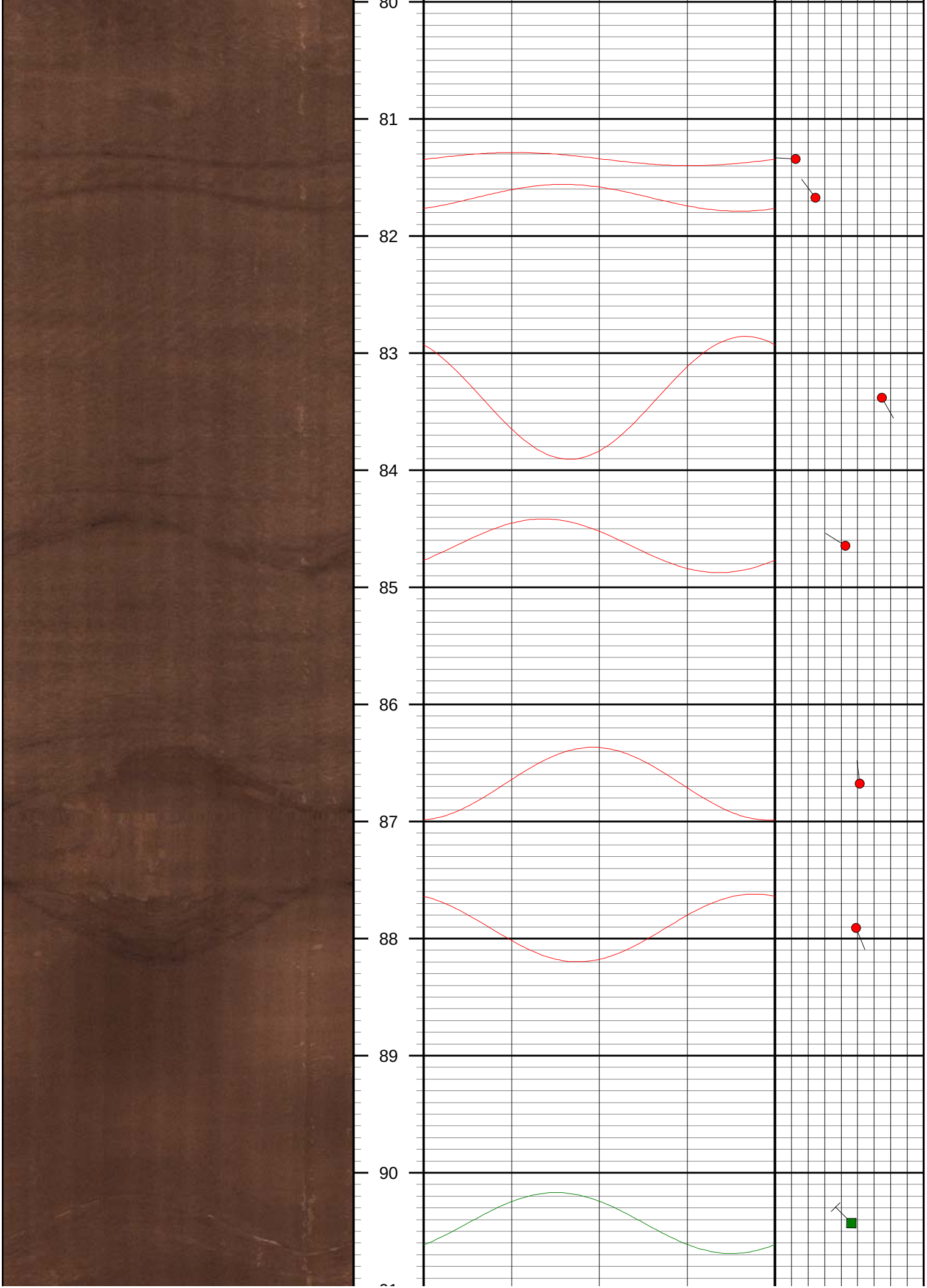
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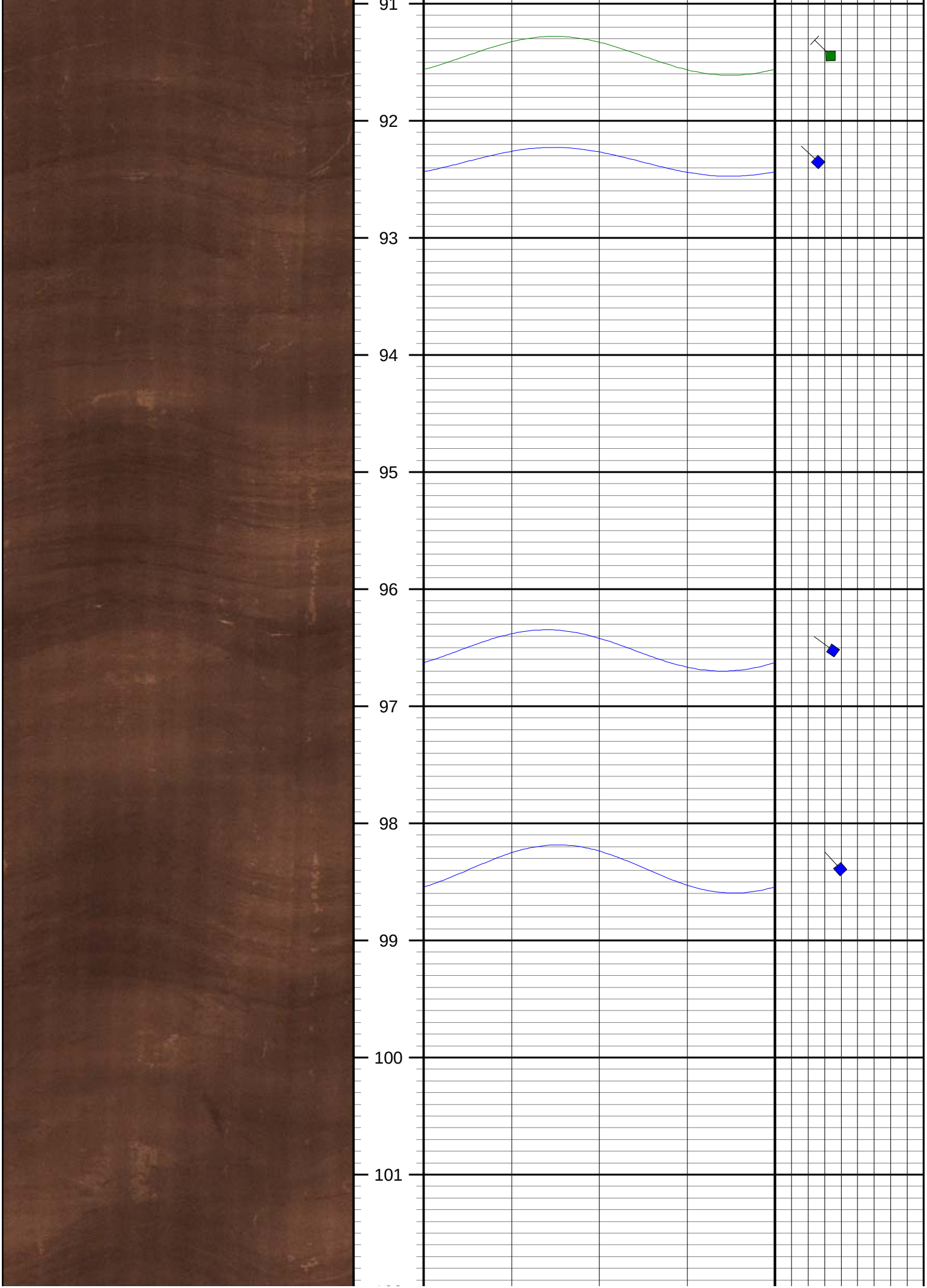
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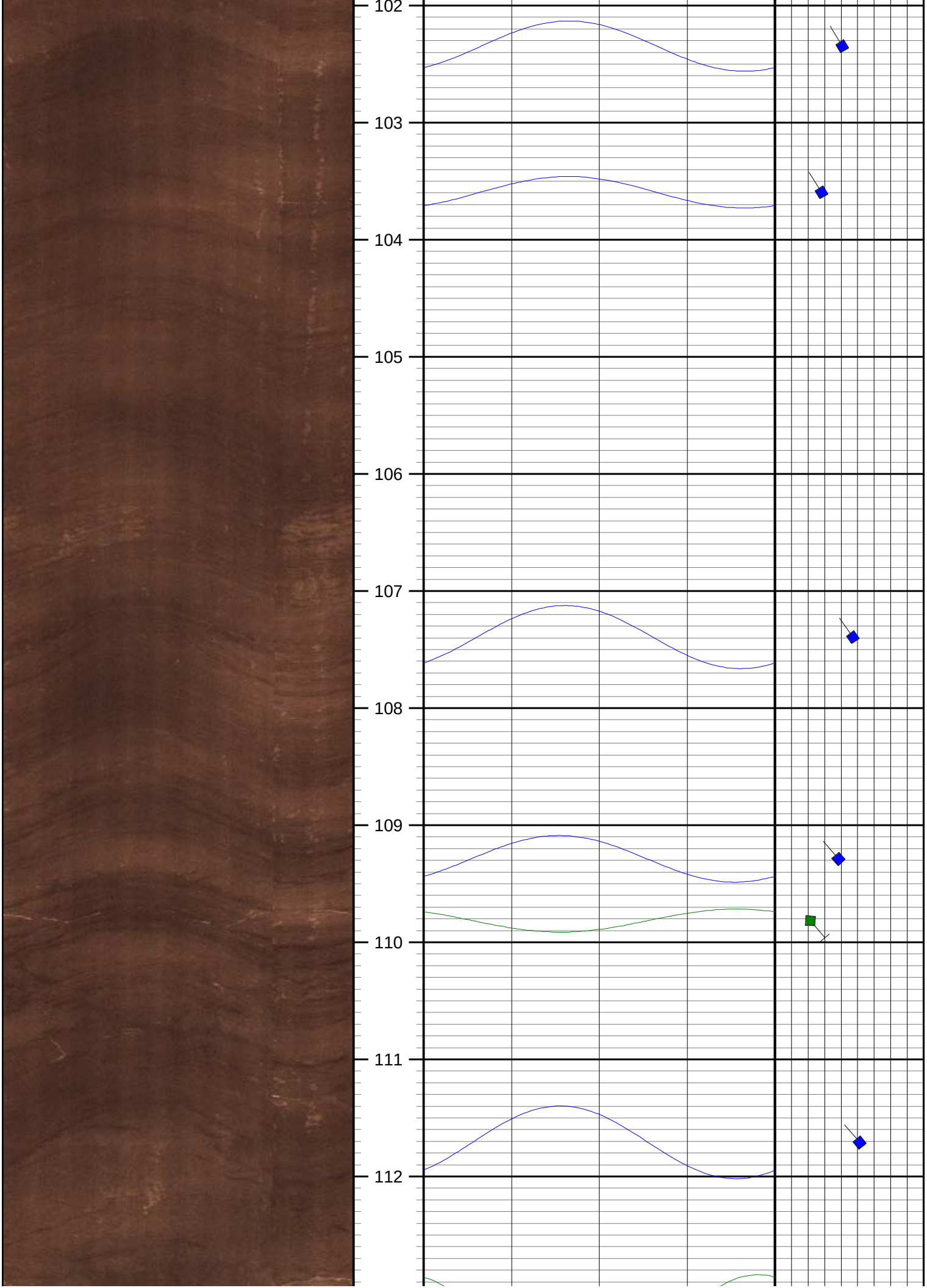
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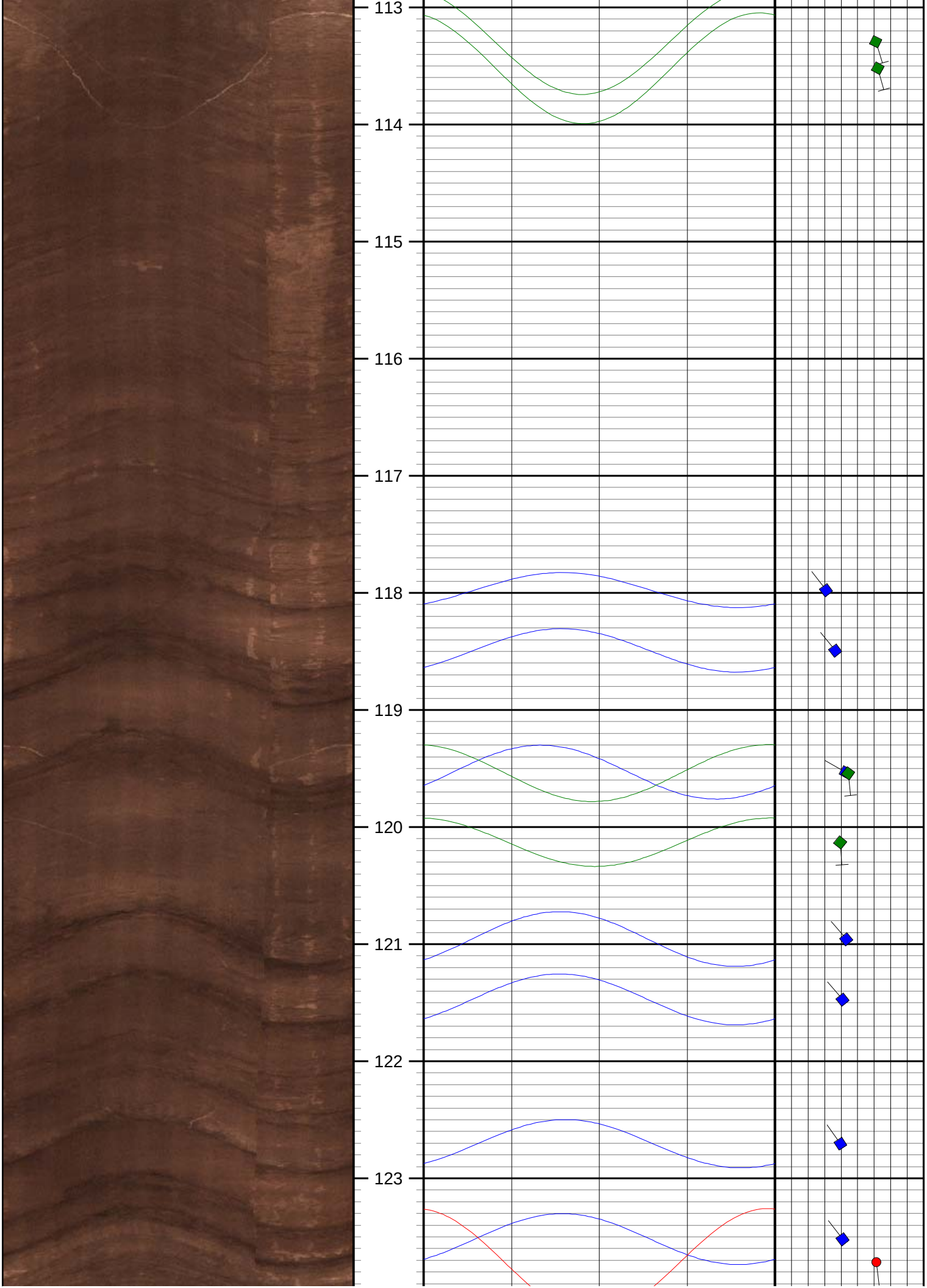
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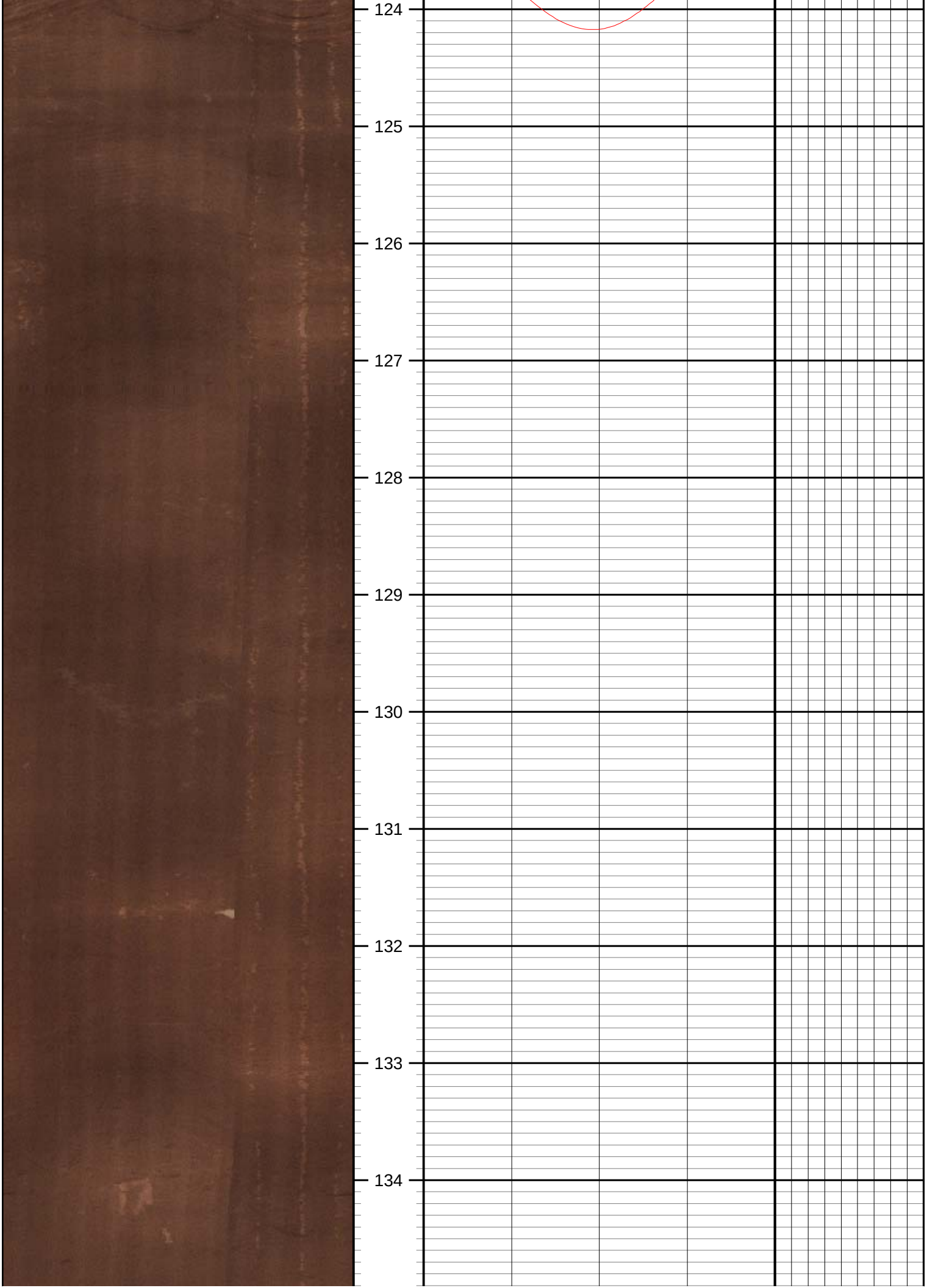
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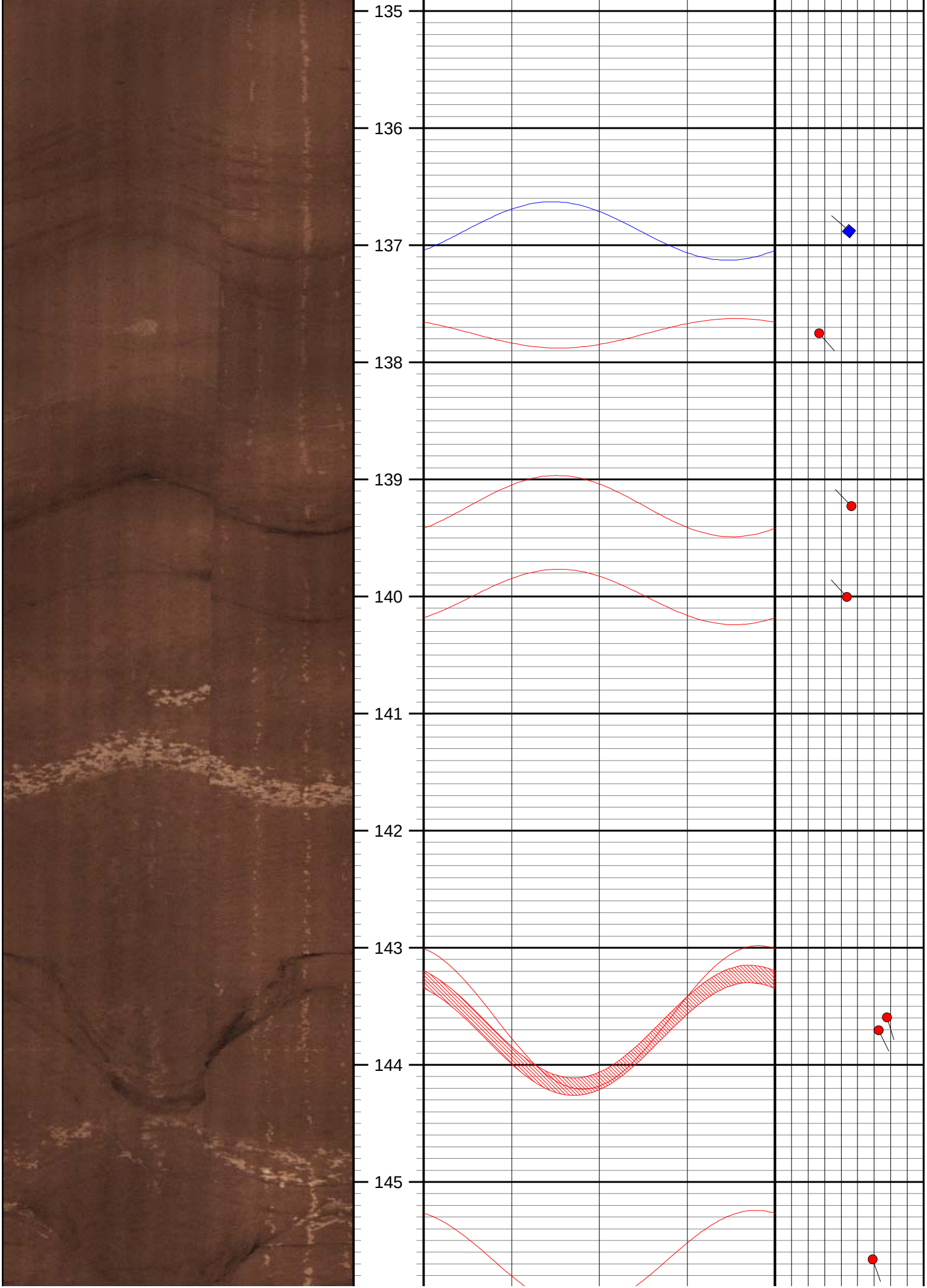
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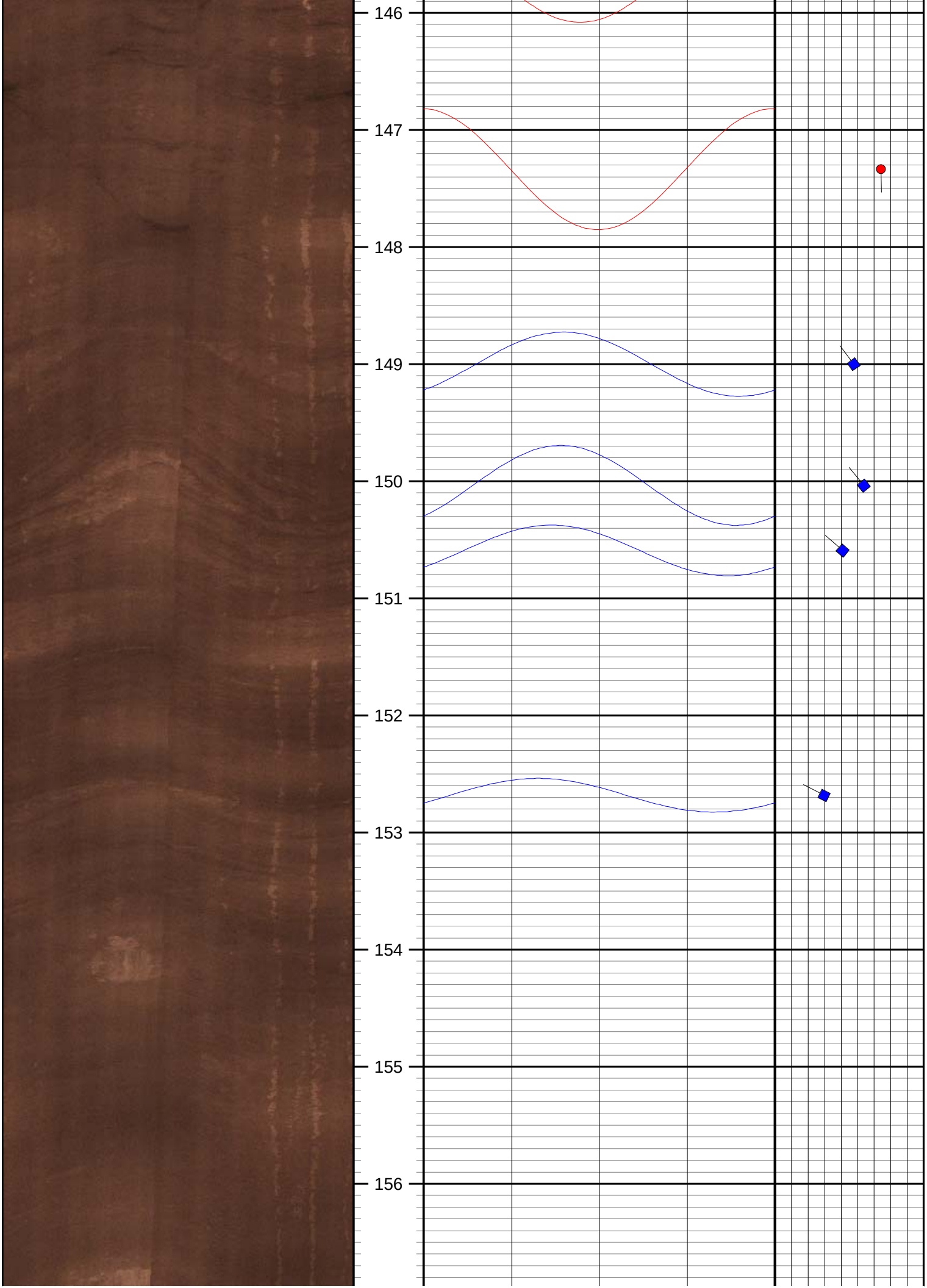
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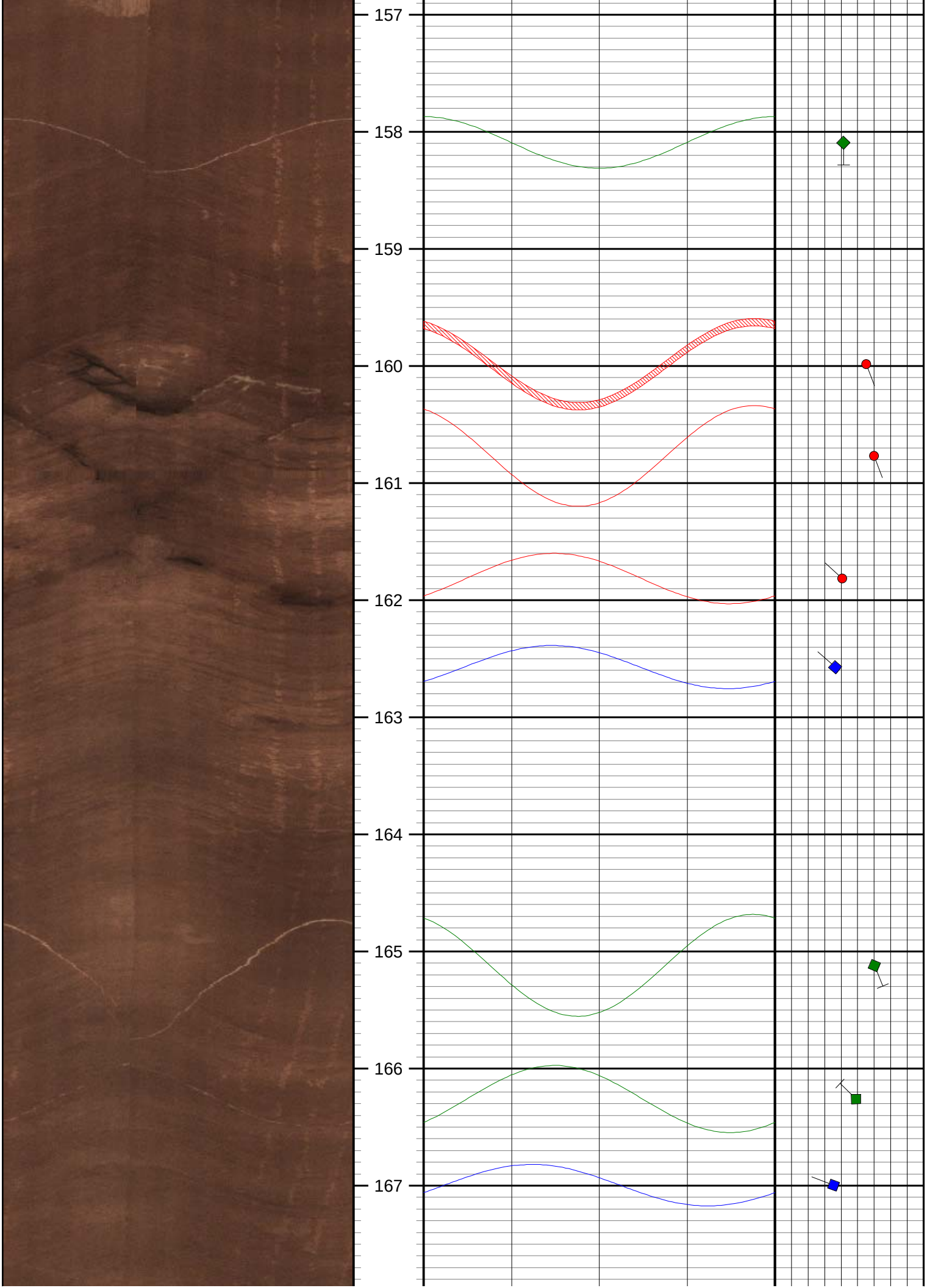
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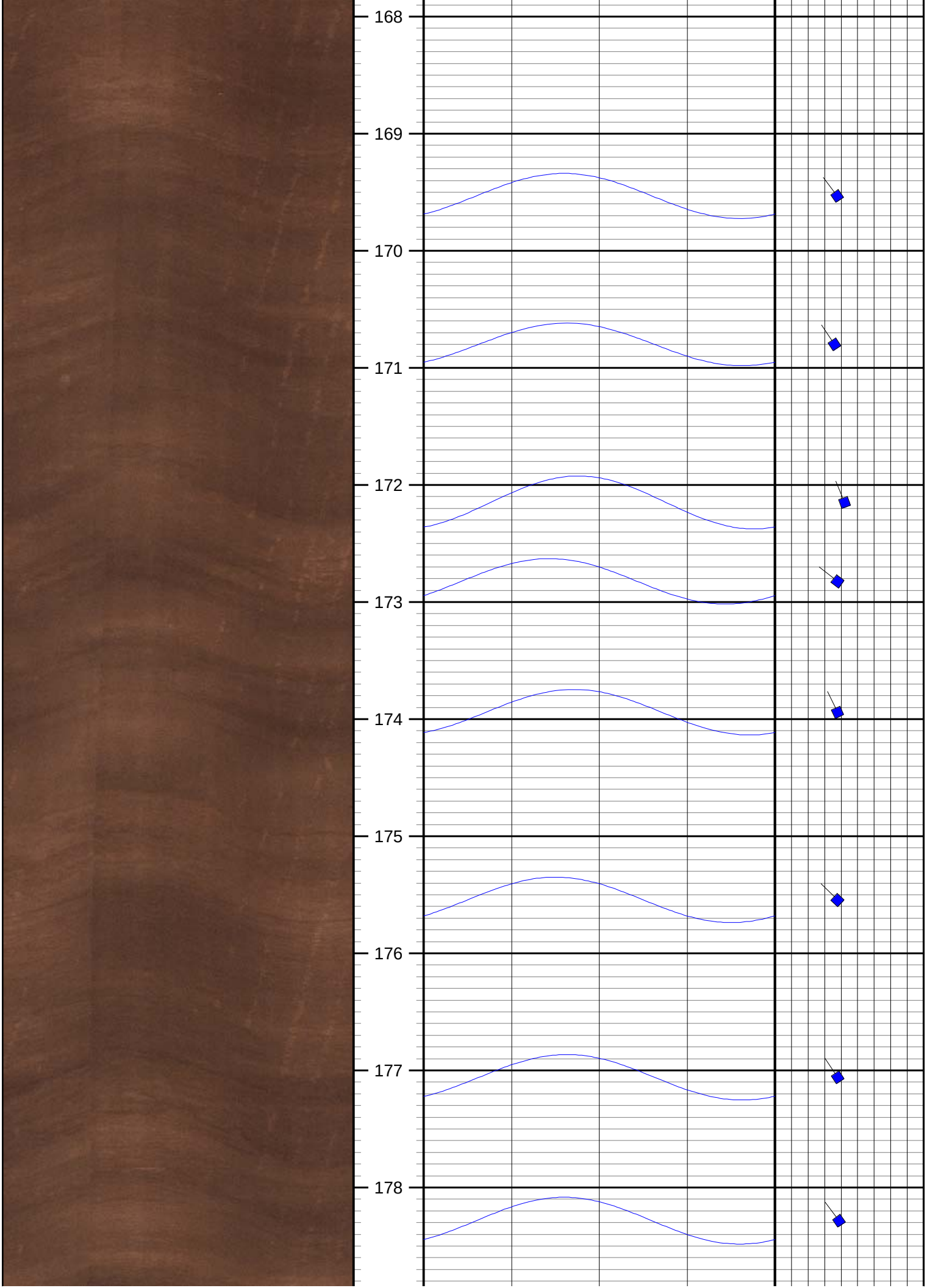
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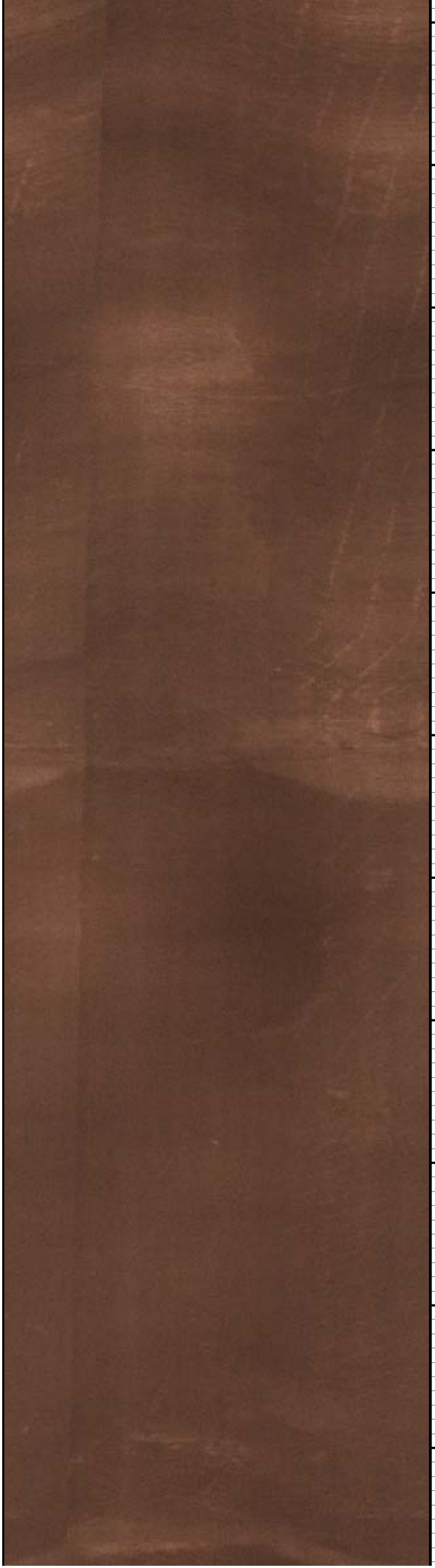

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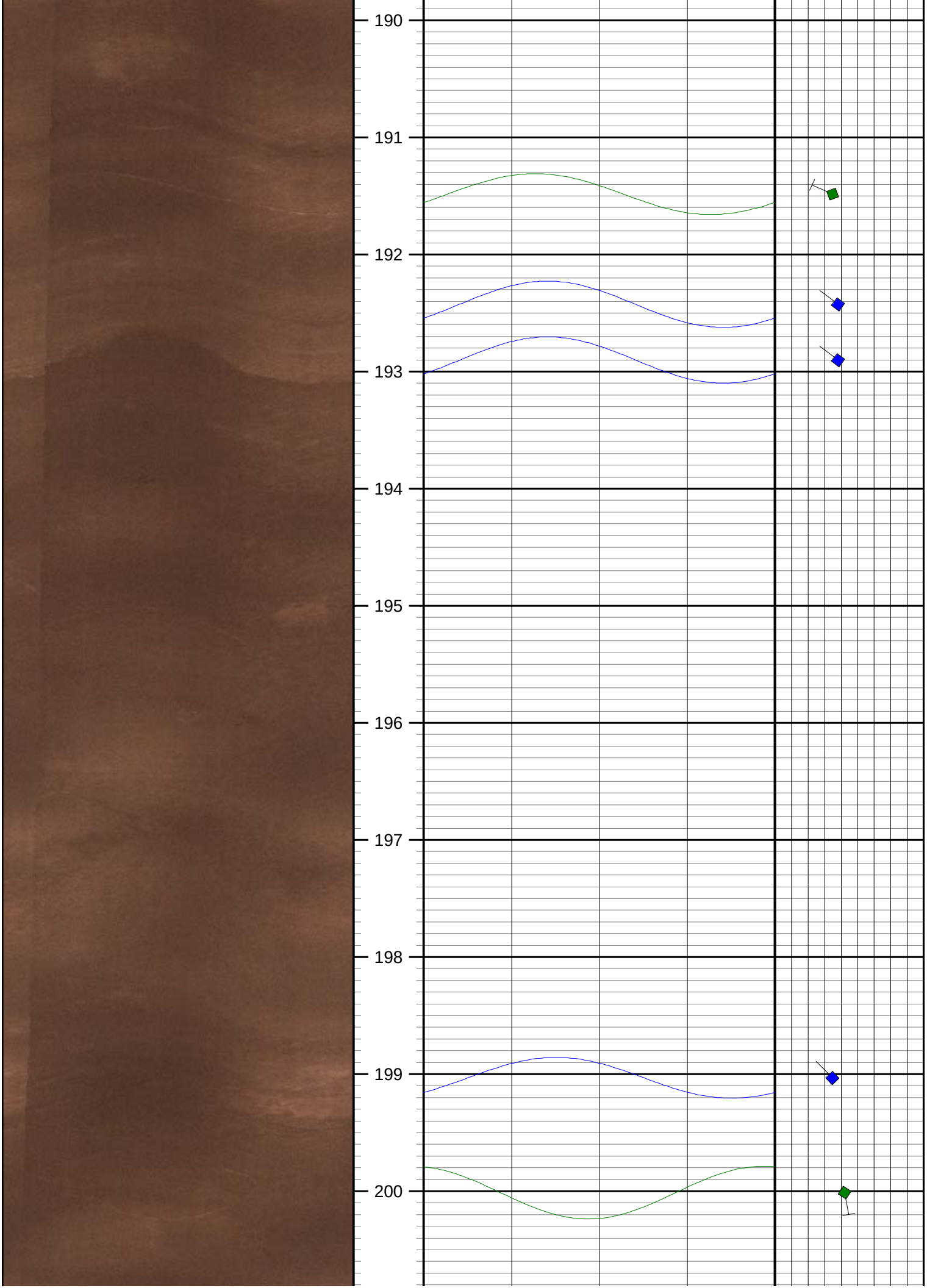
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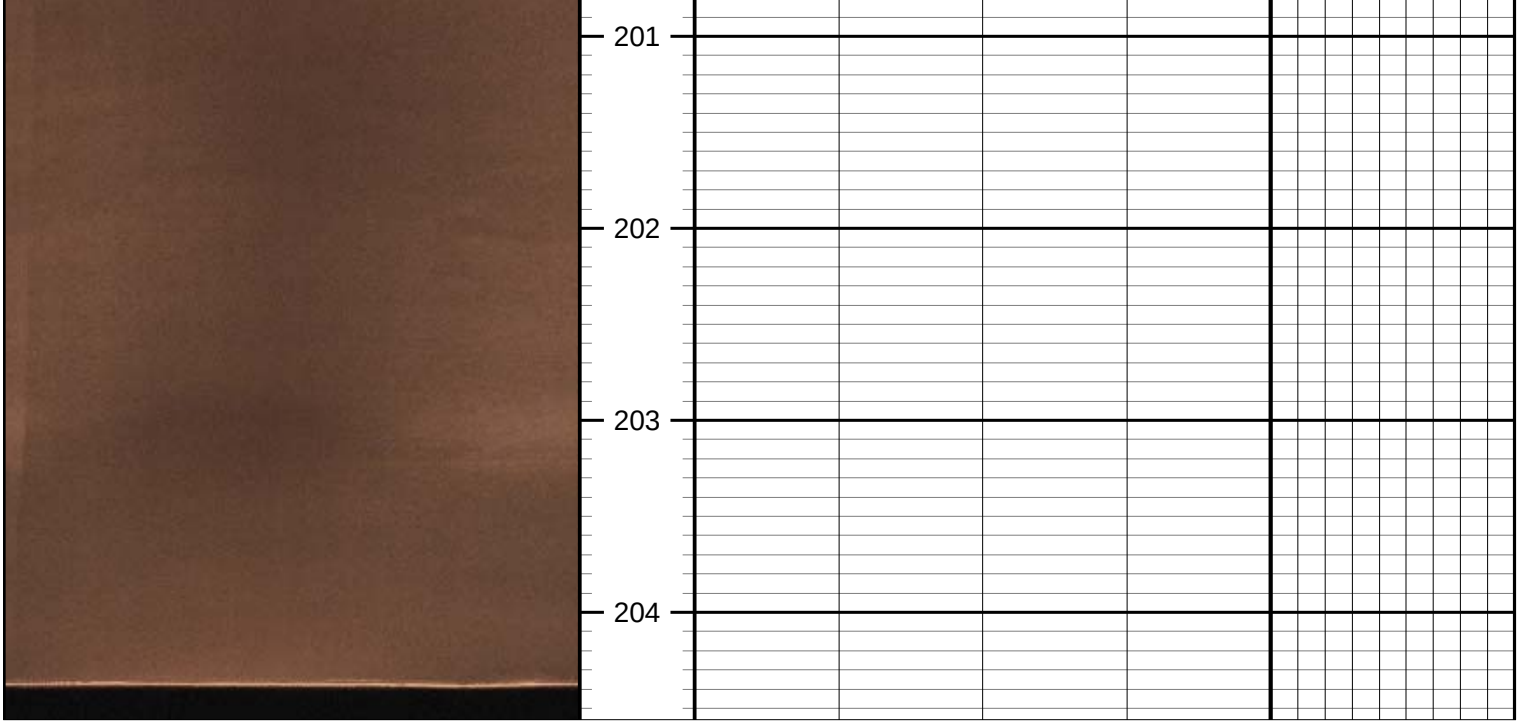
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HydroLog

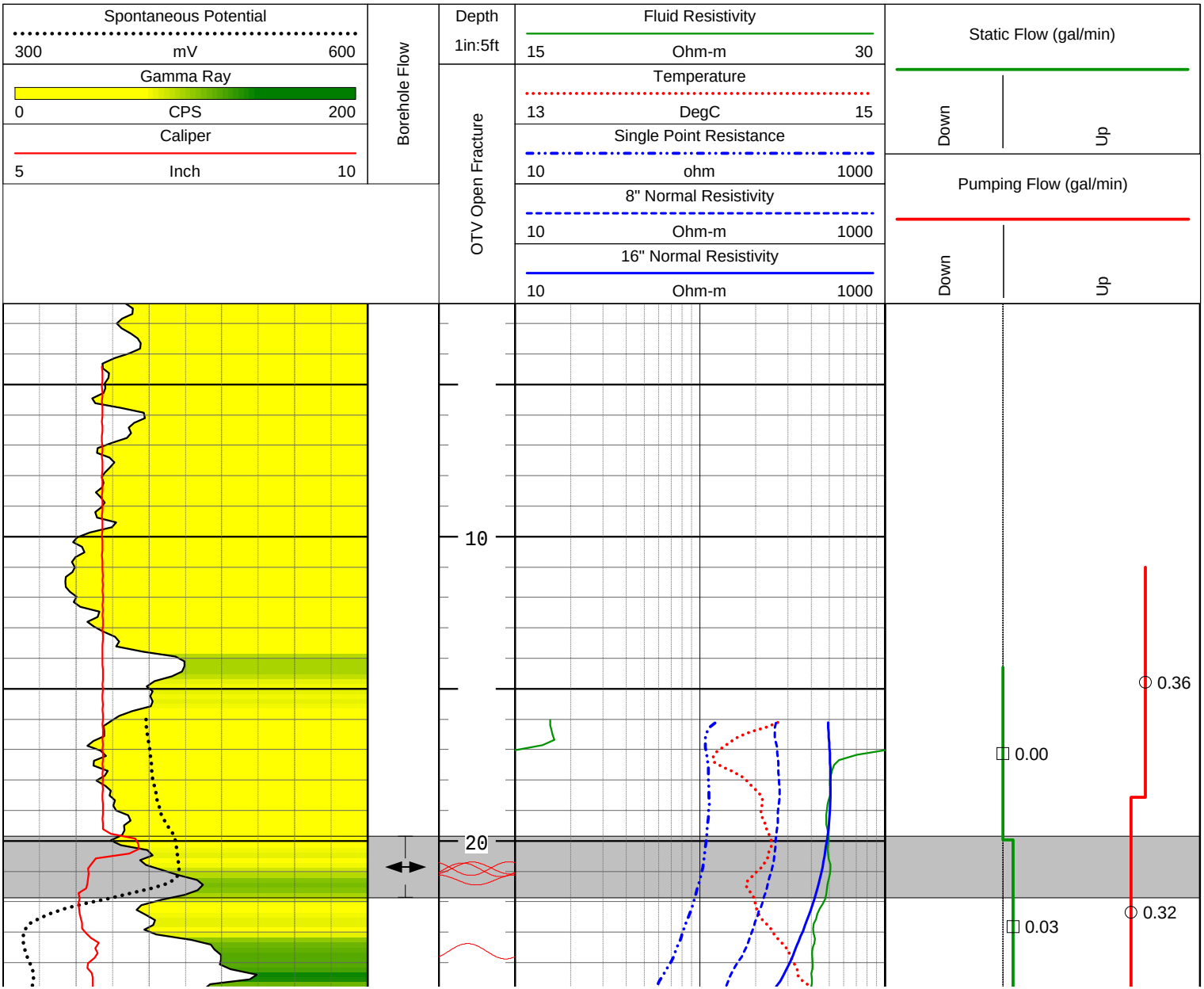
Well Name:	MW-15
API Well Number:	
Company:	EA Engineering
Municipality:	New Cumberland
Farm / Site:	Marsh Run
7.5' Quad Name:	Lemoyne
County:	Cumberland
State:	Pennsylvania
Date:	5-6-2010
Recorded by:	M. Scott McQuown, P.G.
Witness:	

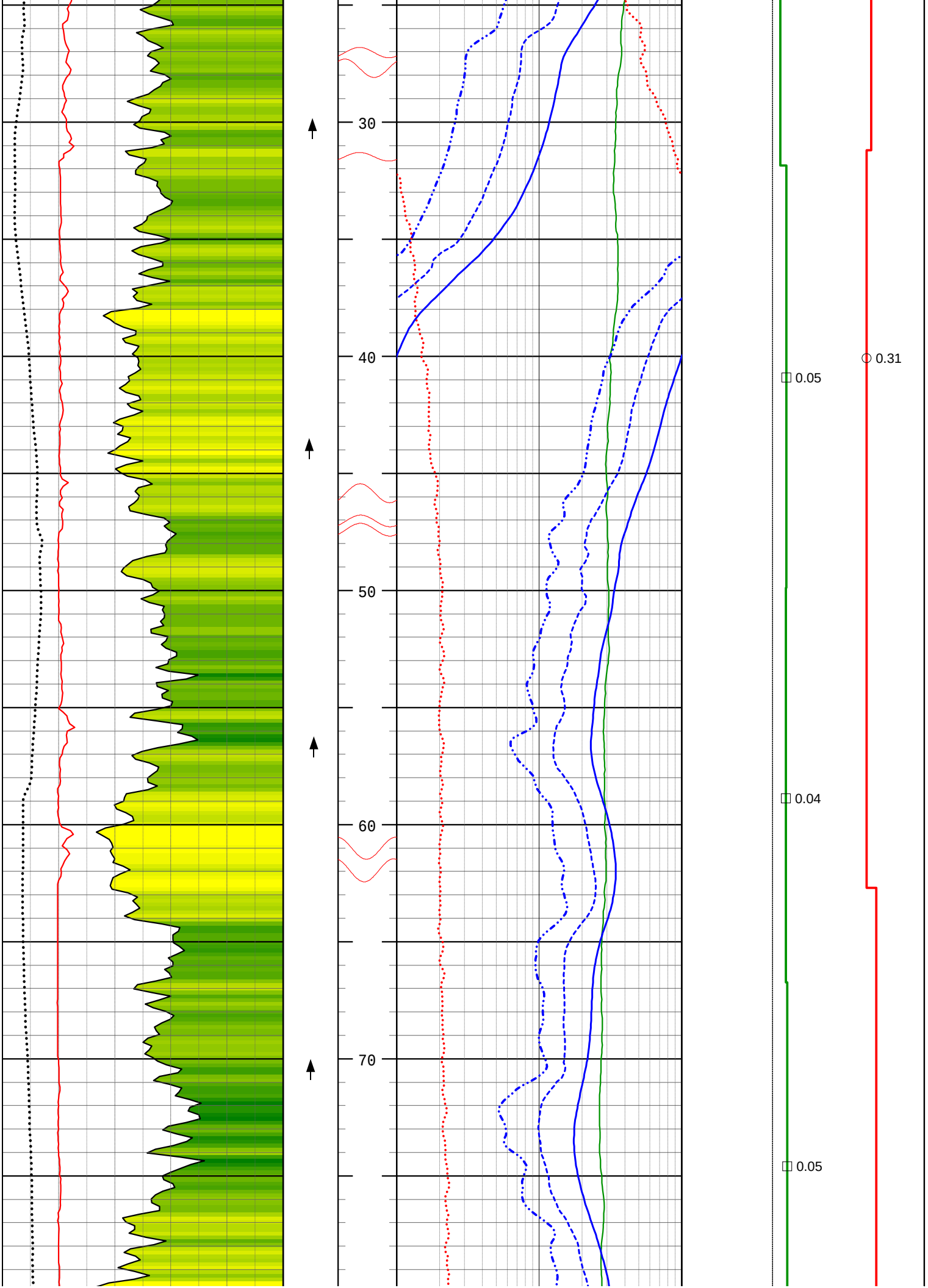
Boring location:	
Surface elevation:	
Log is measured from:	Top of casing, 1.6' from ground level
TD - Driller:	200'
TD - Logger:	204.8'
Drive Pipe Depth:	
Deepest Casing - Driller:	18'
Deepest Casing - Logger:	20.6'

Symbols:

- Producing zone
- Receiving zone
- Upward flow

Notes:

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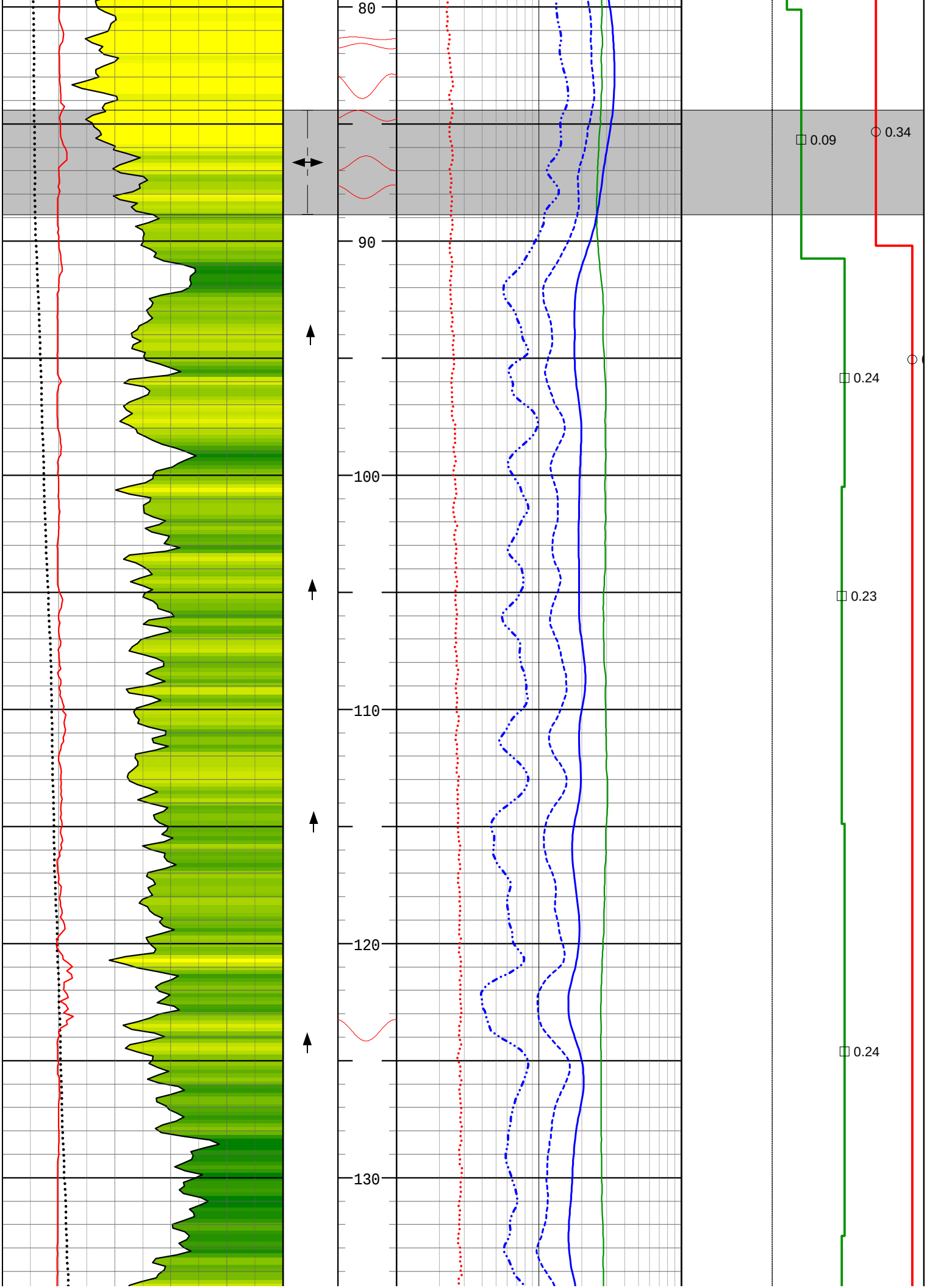
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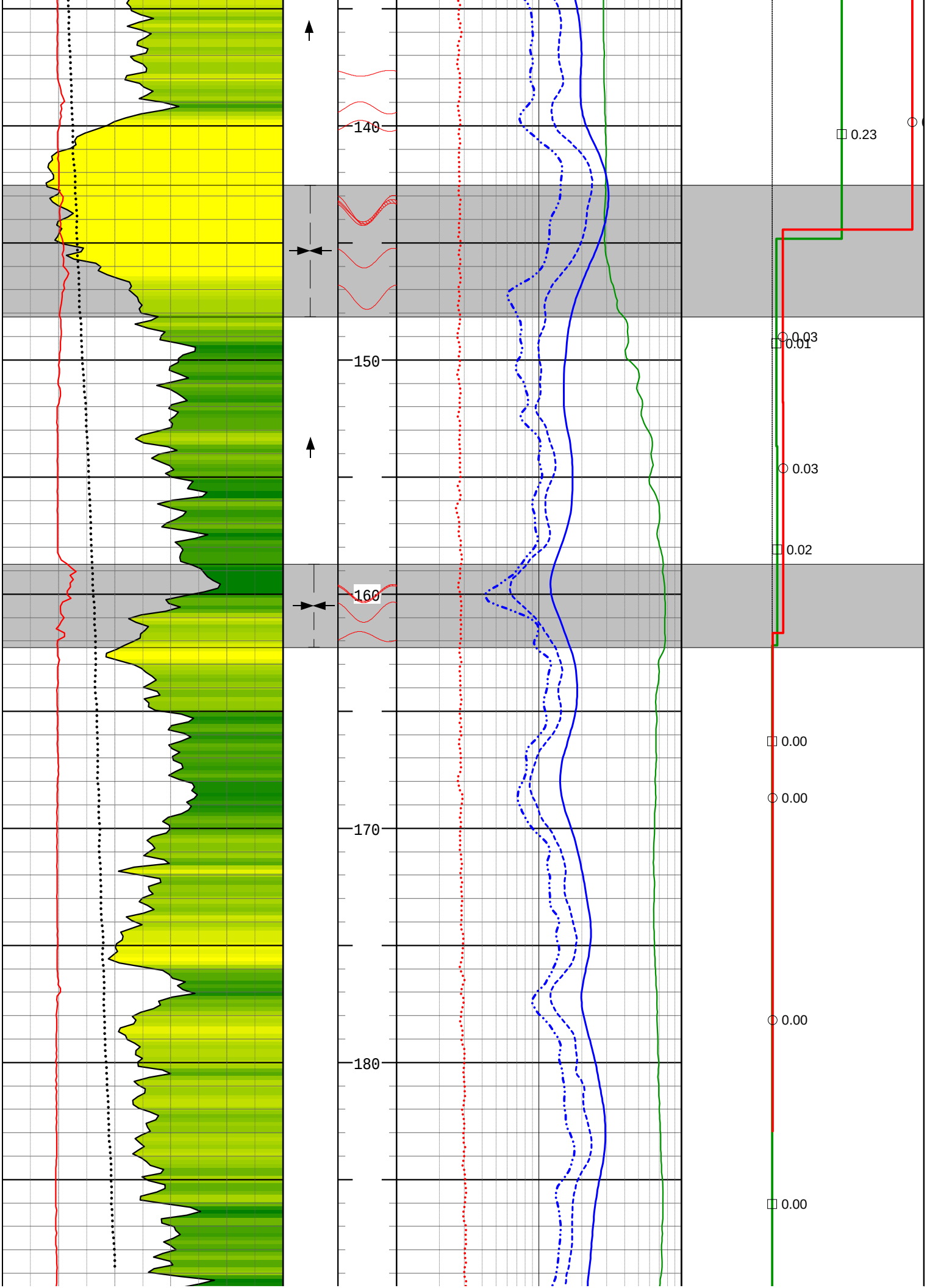
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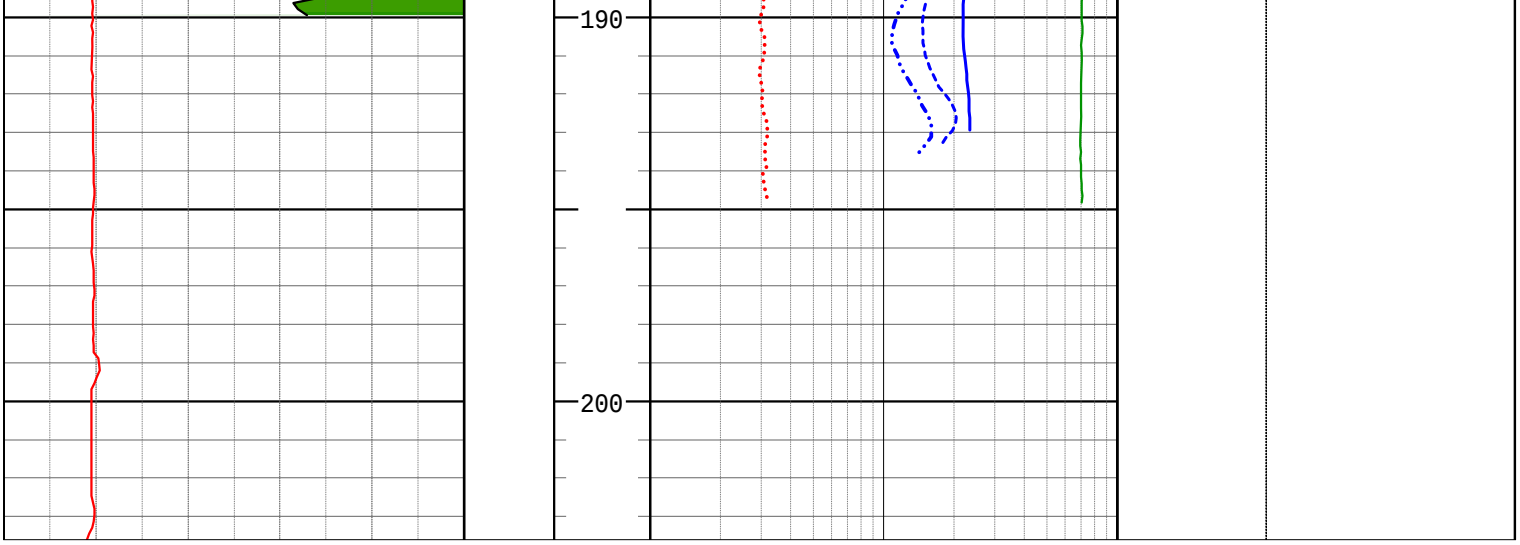
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Optical Televiewer

Well Name:	Mifflin Ave Deep Well
API Well Number:	
Company:	EA Engineering
Municipality:	New Cumberland
Farm / Site:	Marsh Run
7.5' Quad Name:	Lemoyne
County:	Cumberland
State:	Pennsylvania
Date:	5-7-2010
Recorded by:	M. Scott McQuown, P.G.
Witness:	

Boring location:	
Surface elevation:	
Log is measured from:	Top of casing, 1.6' from ground level
TD - Driller:	200'
TD - Logger:	204.7'
Drive Pipe Depth:	
Deepest Casing - Driller:	
Deepest Casing - Logger:	
Magnetic Declination Applied:	11.3 deg West

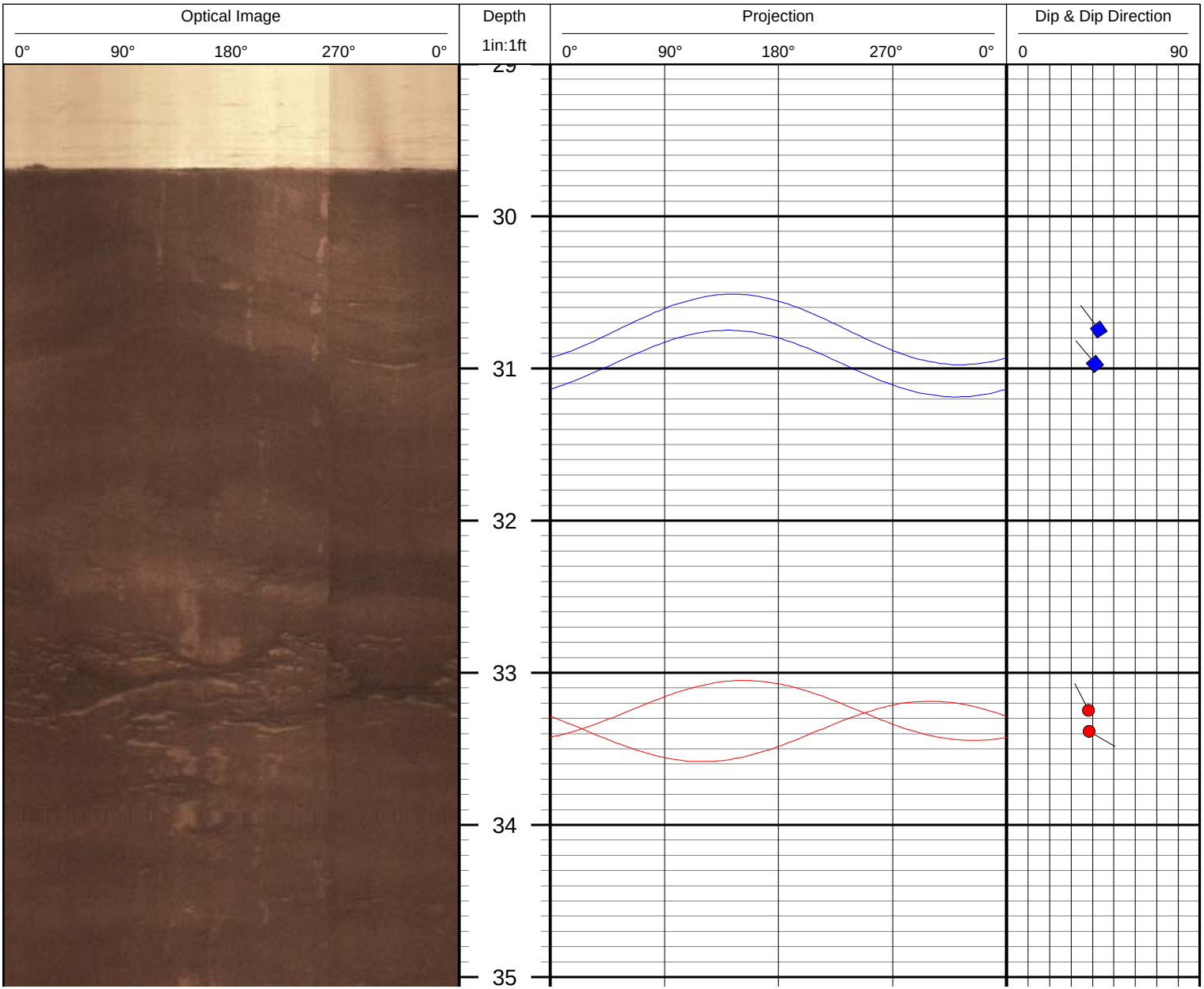
Structural Legend:

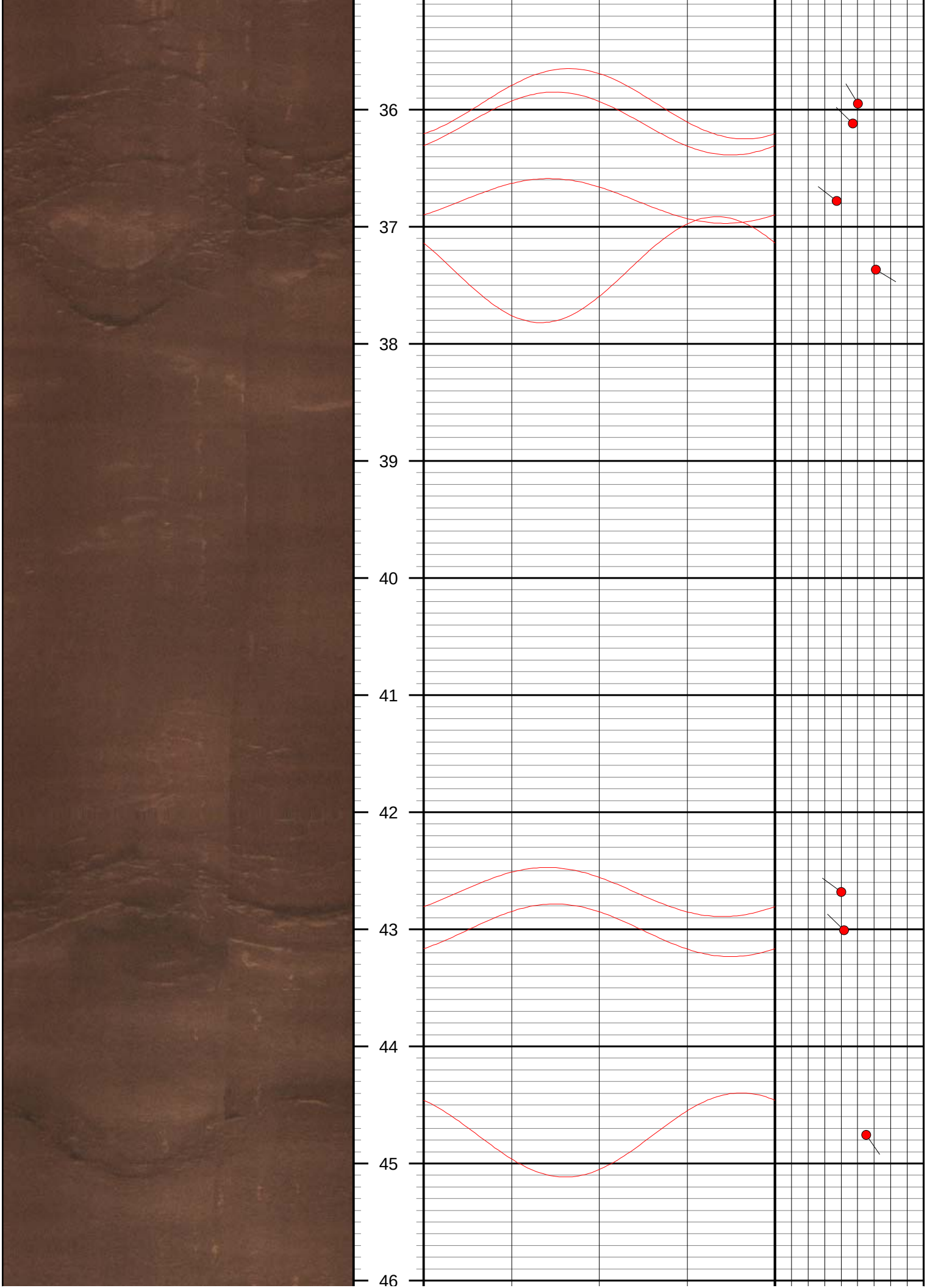
Open Fracture

Bedding / Foliation

Filled Fracture

Notes:

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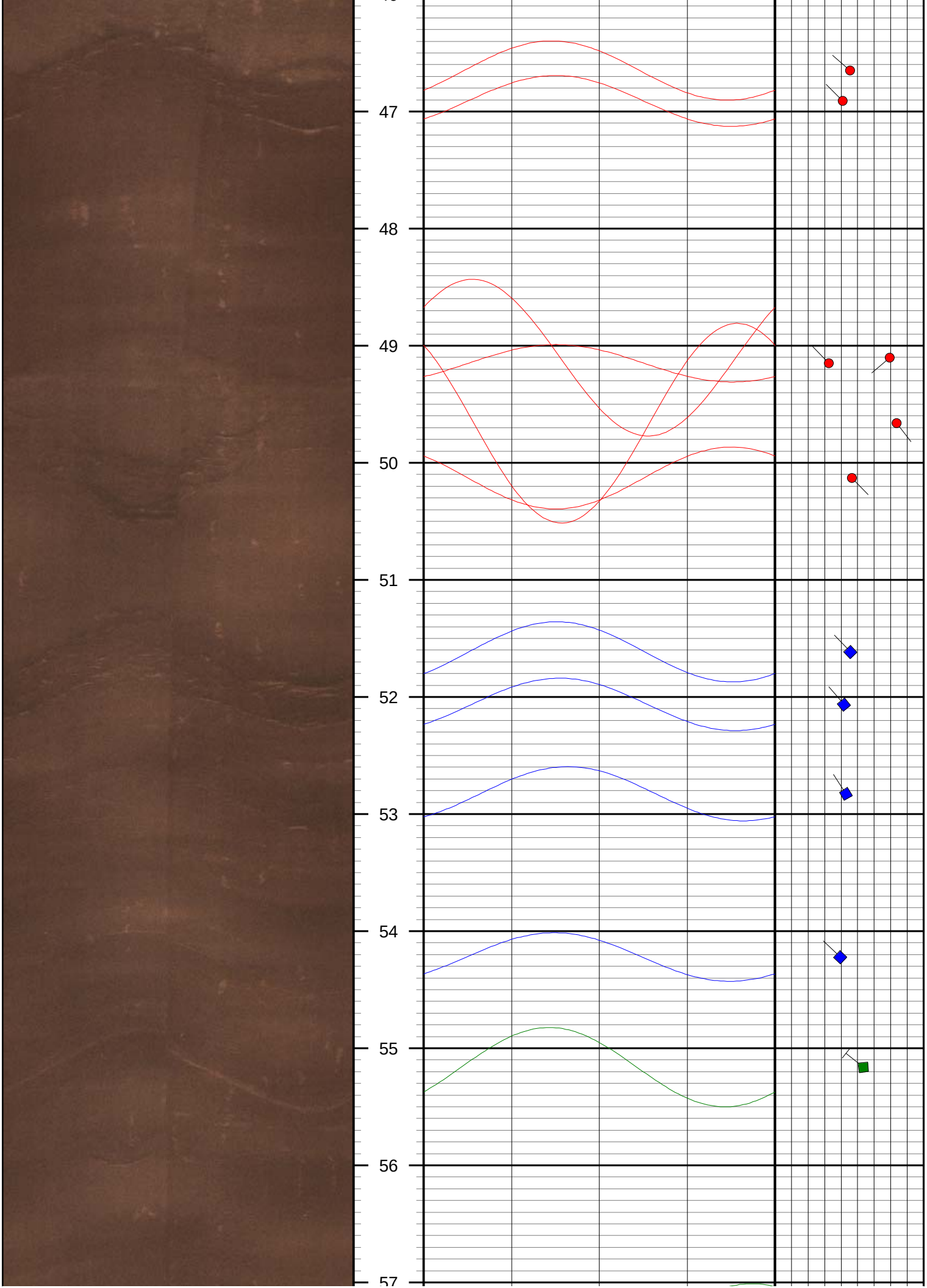
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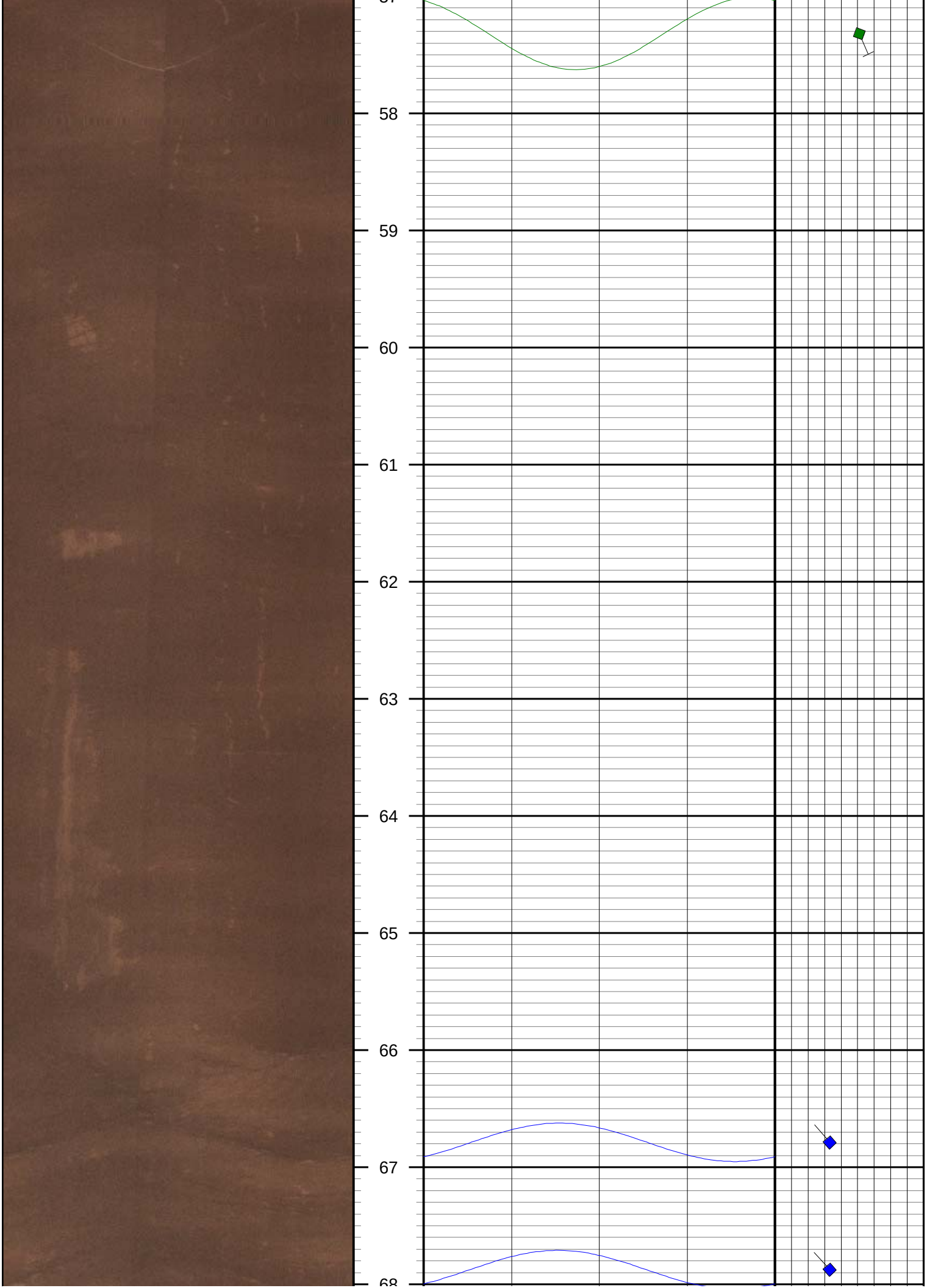
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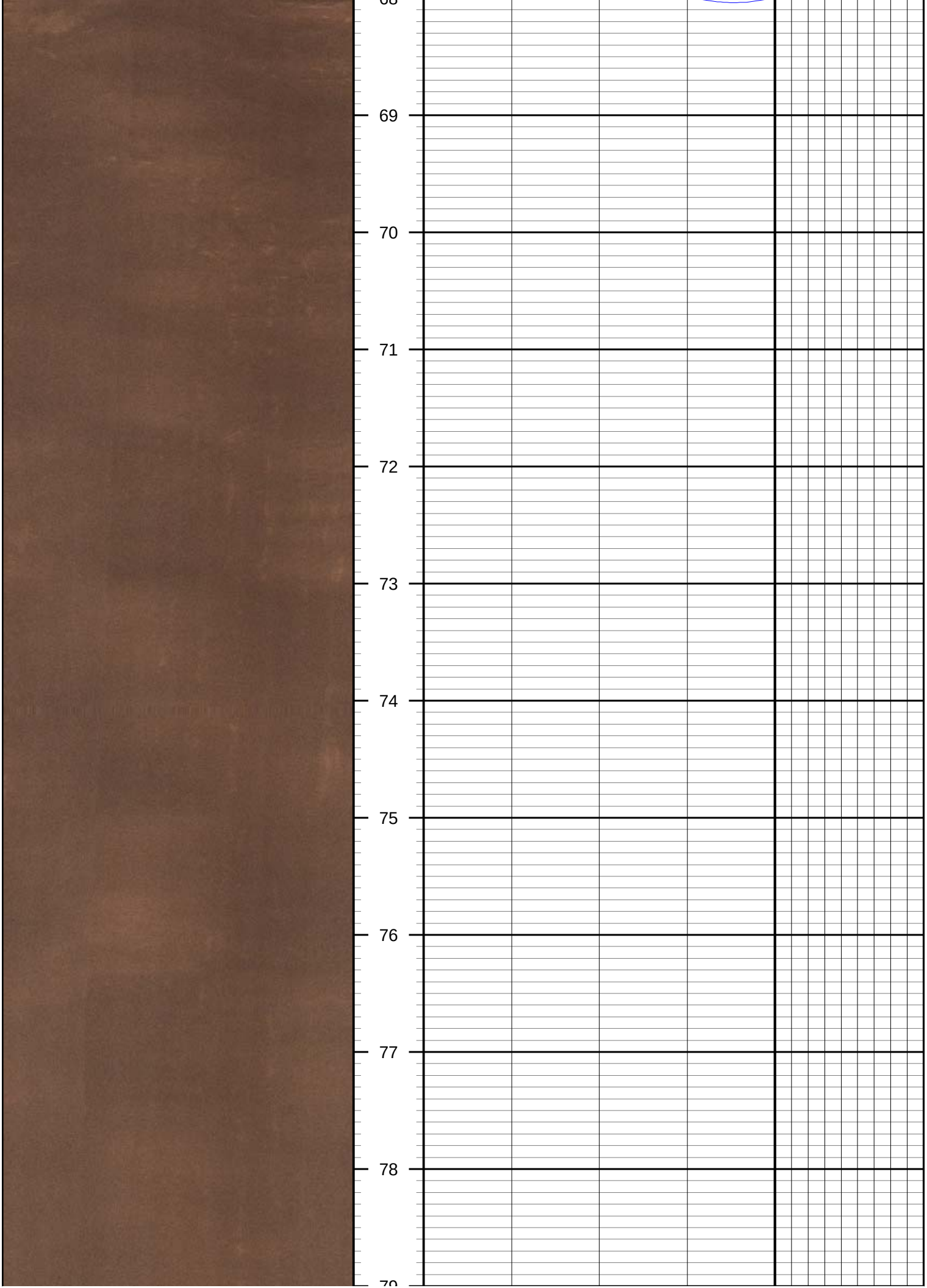
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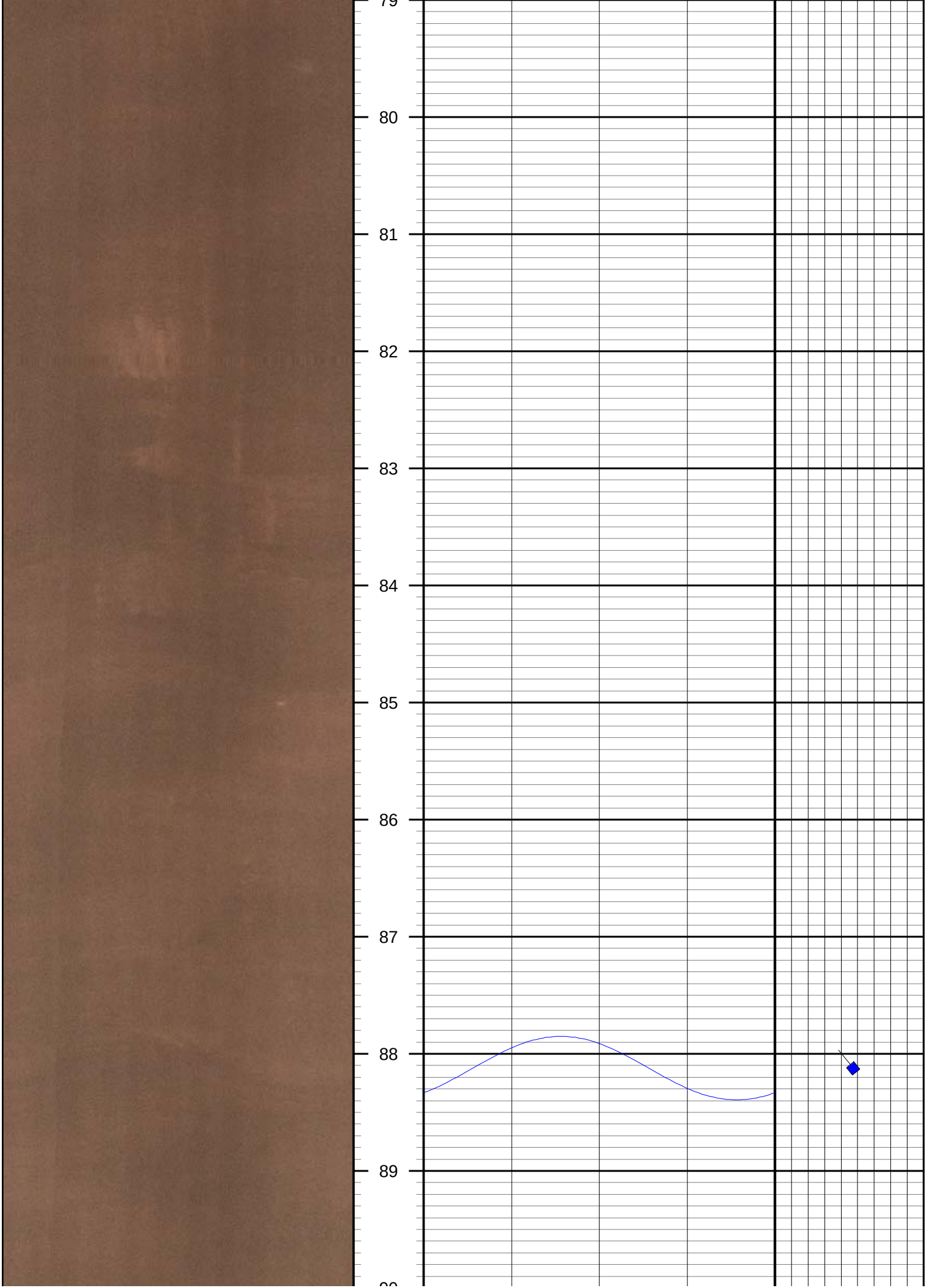
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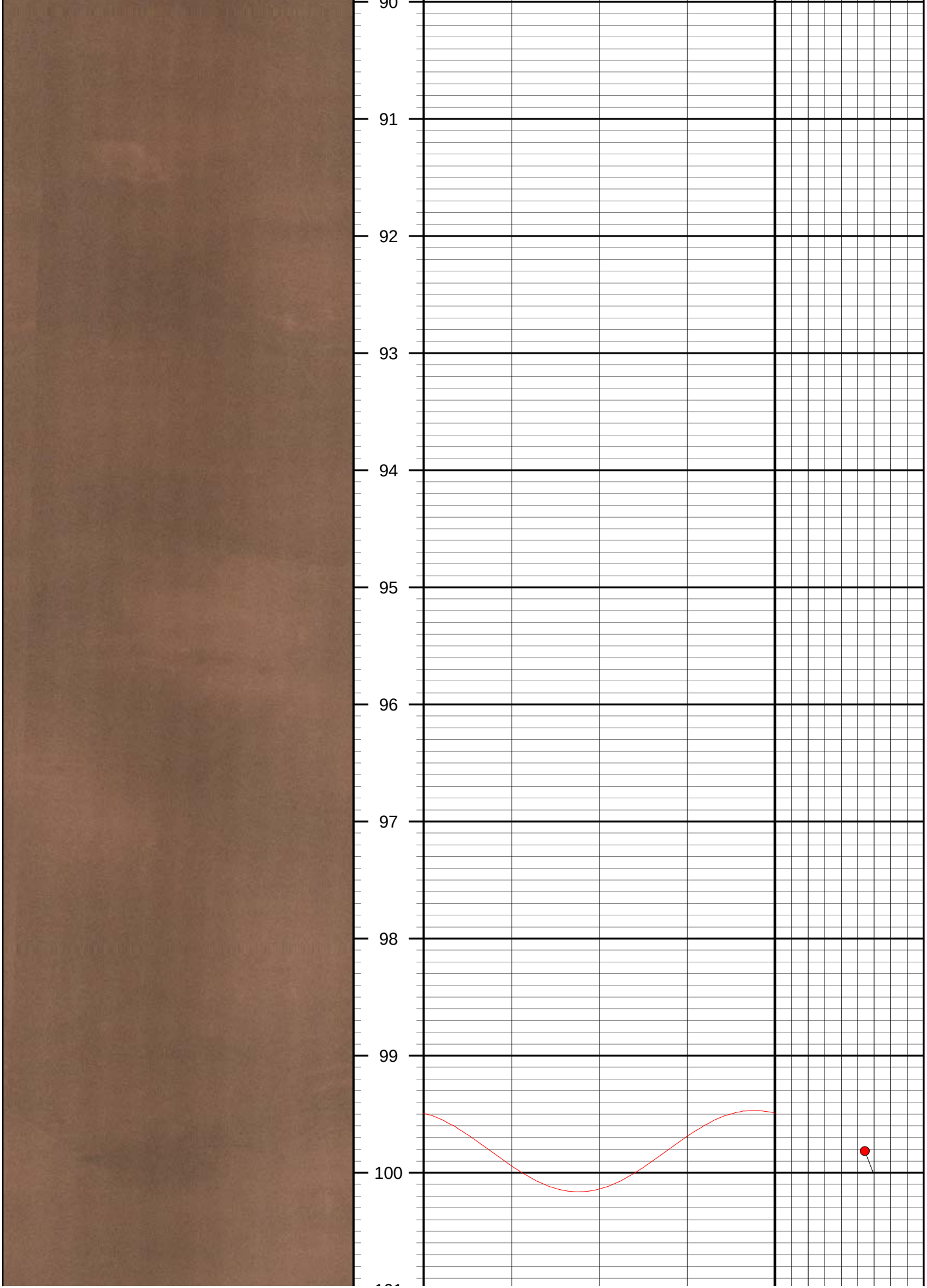
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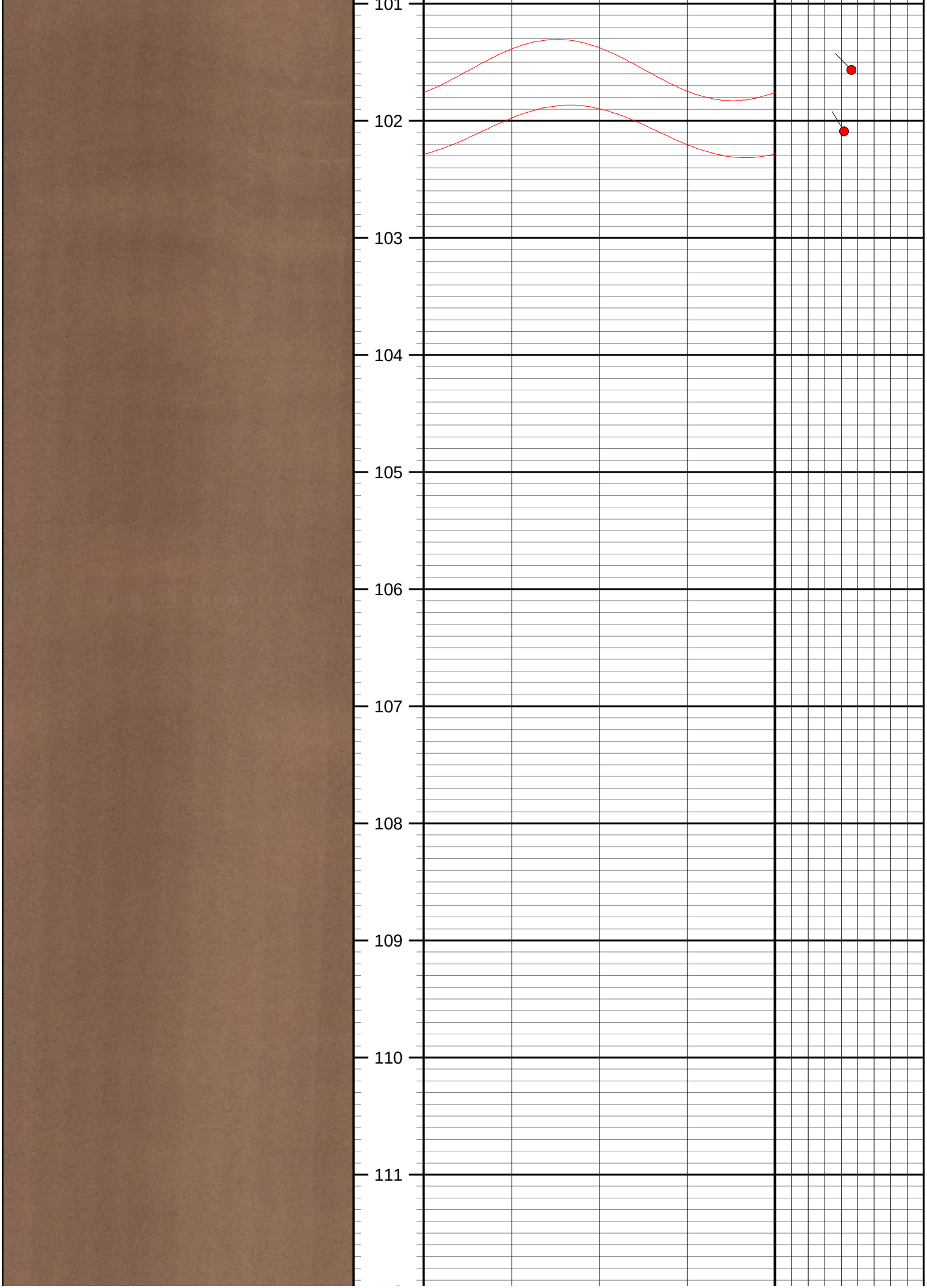
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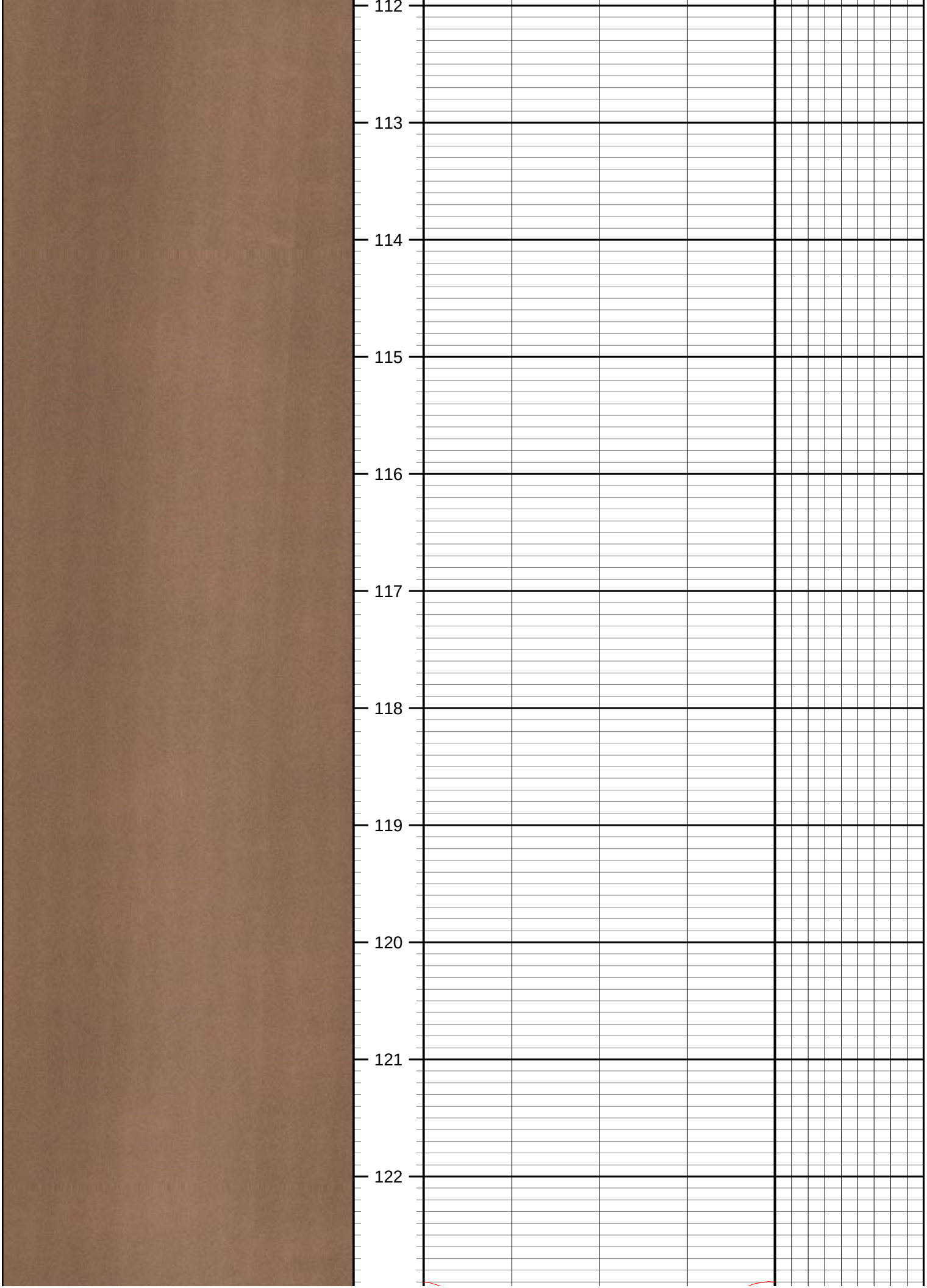
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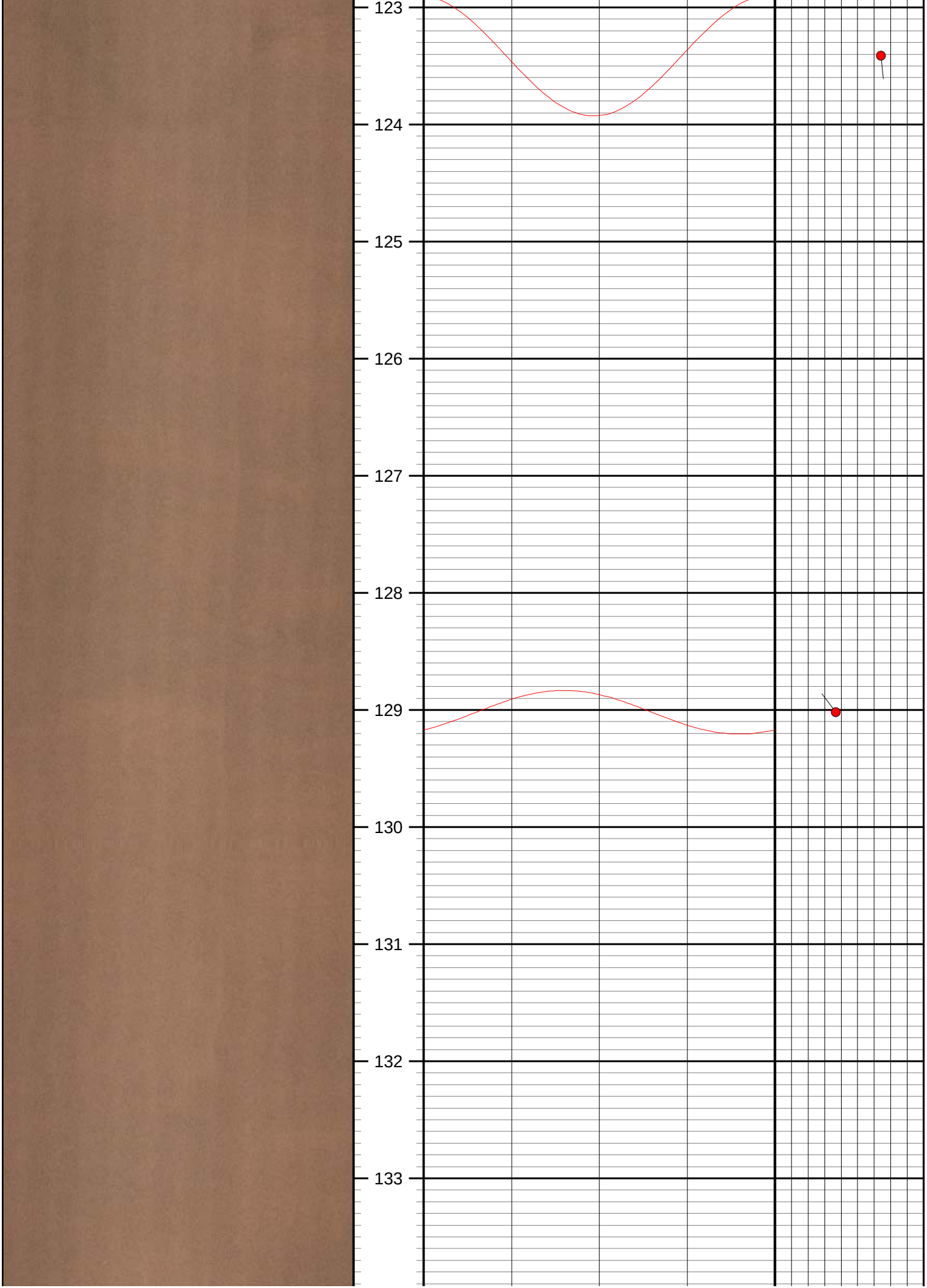
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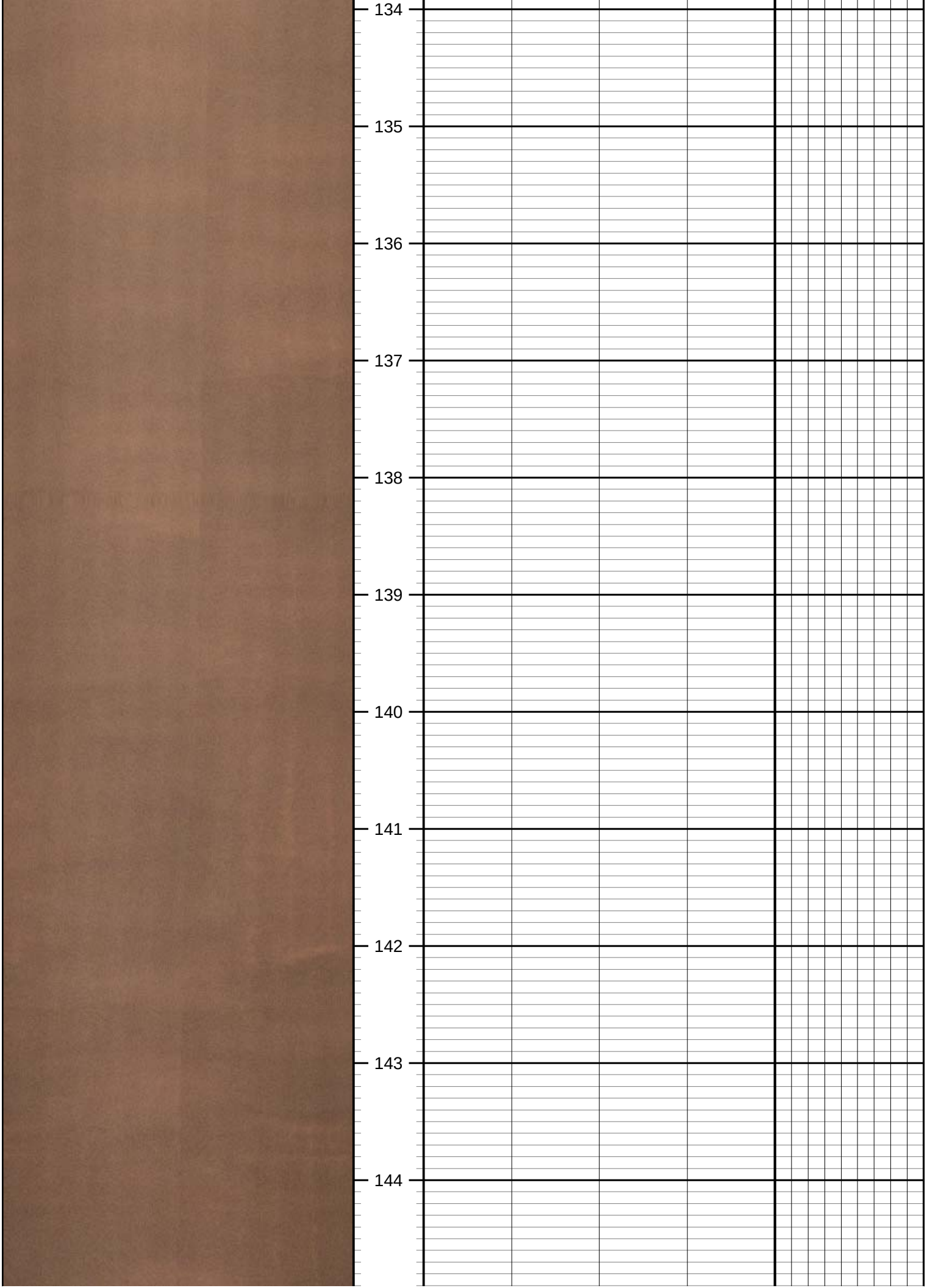
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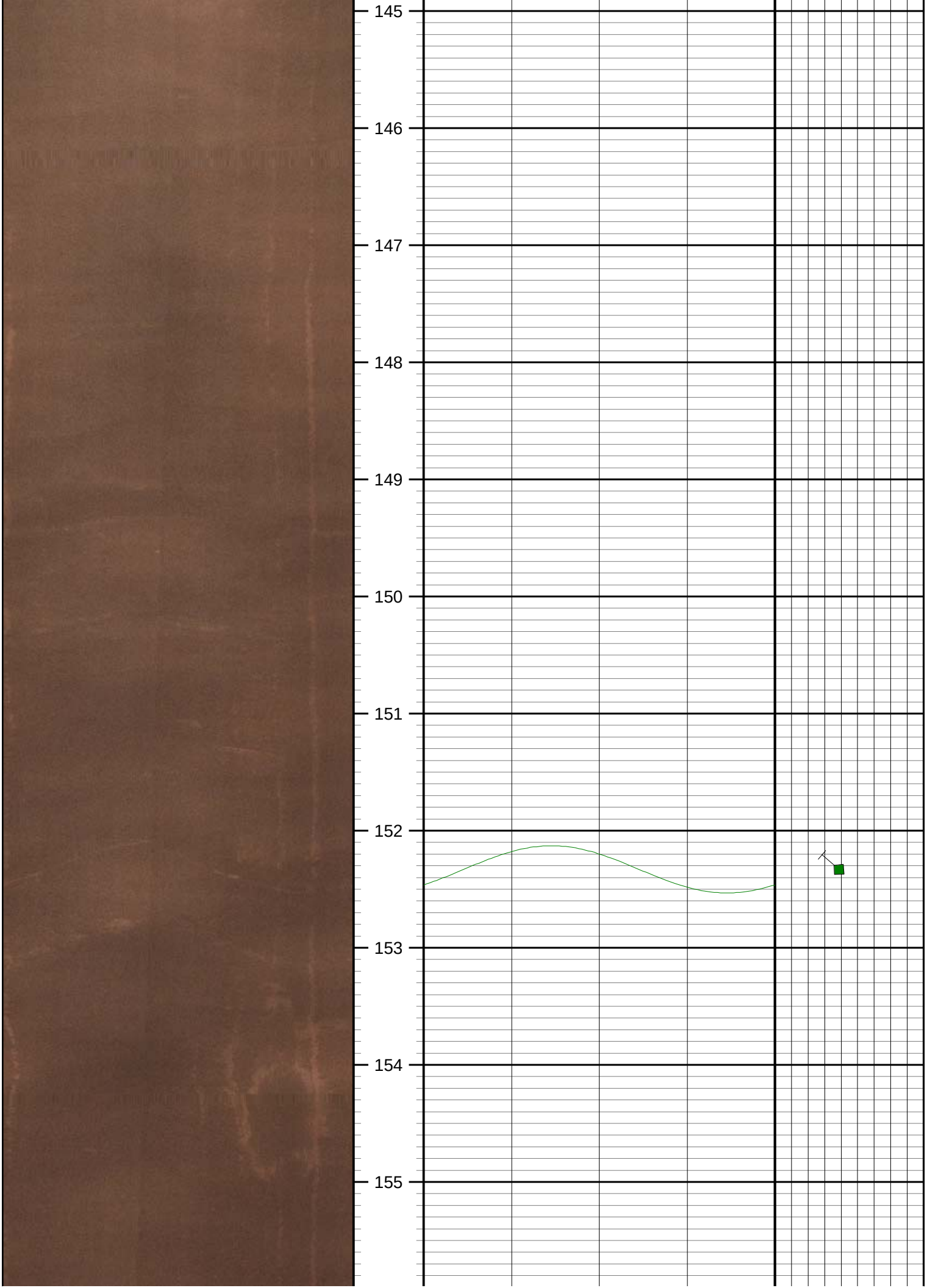
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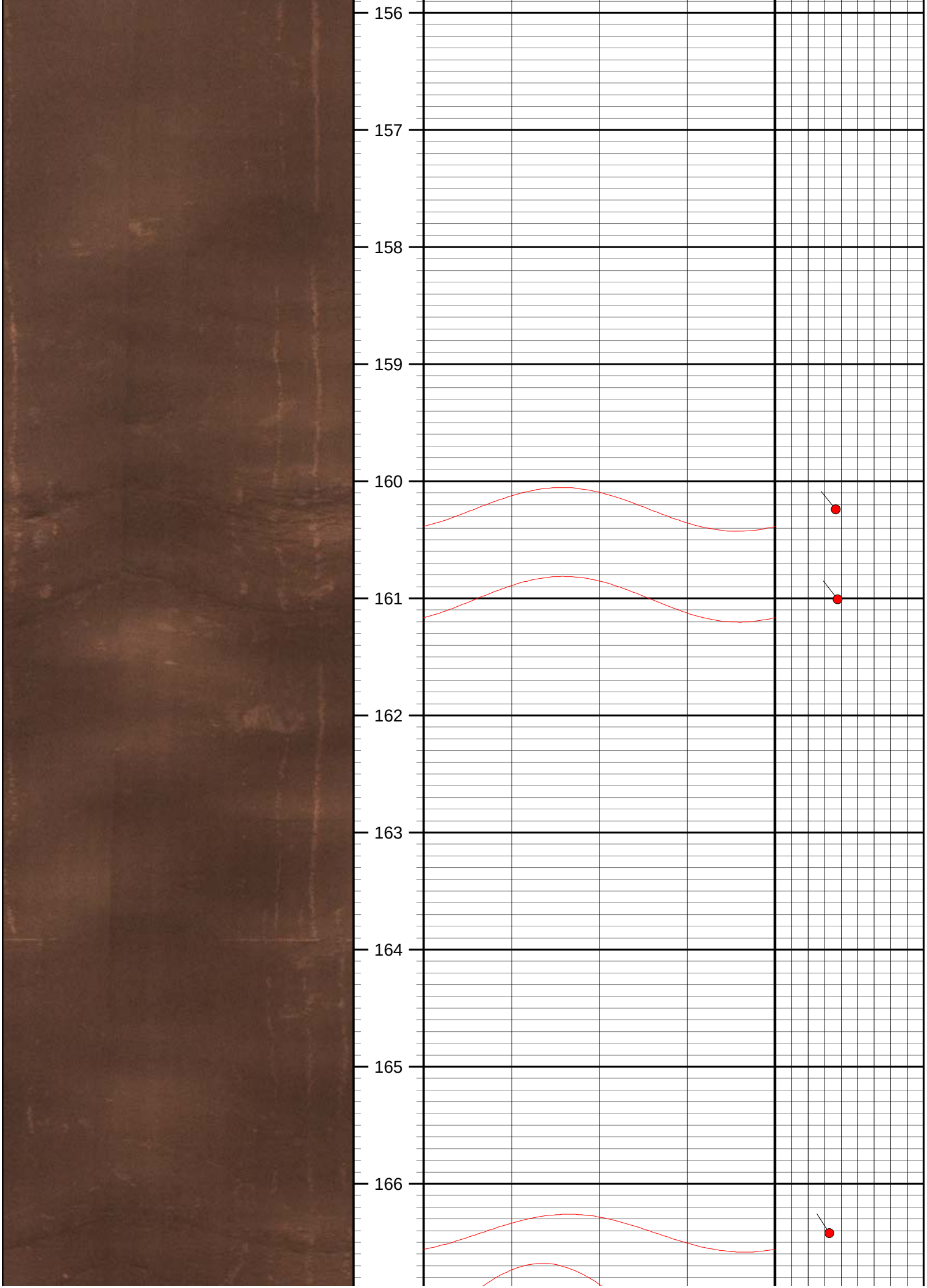
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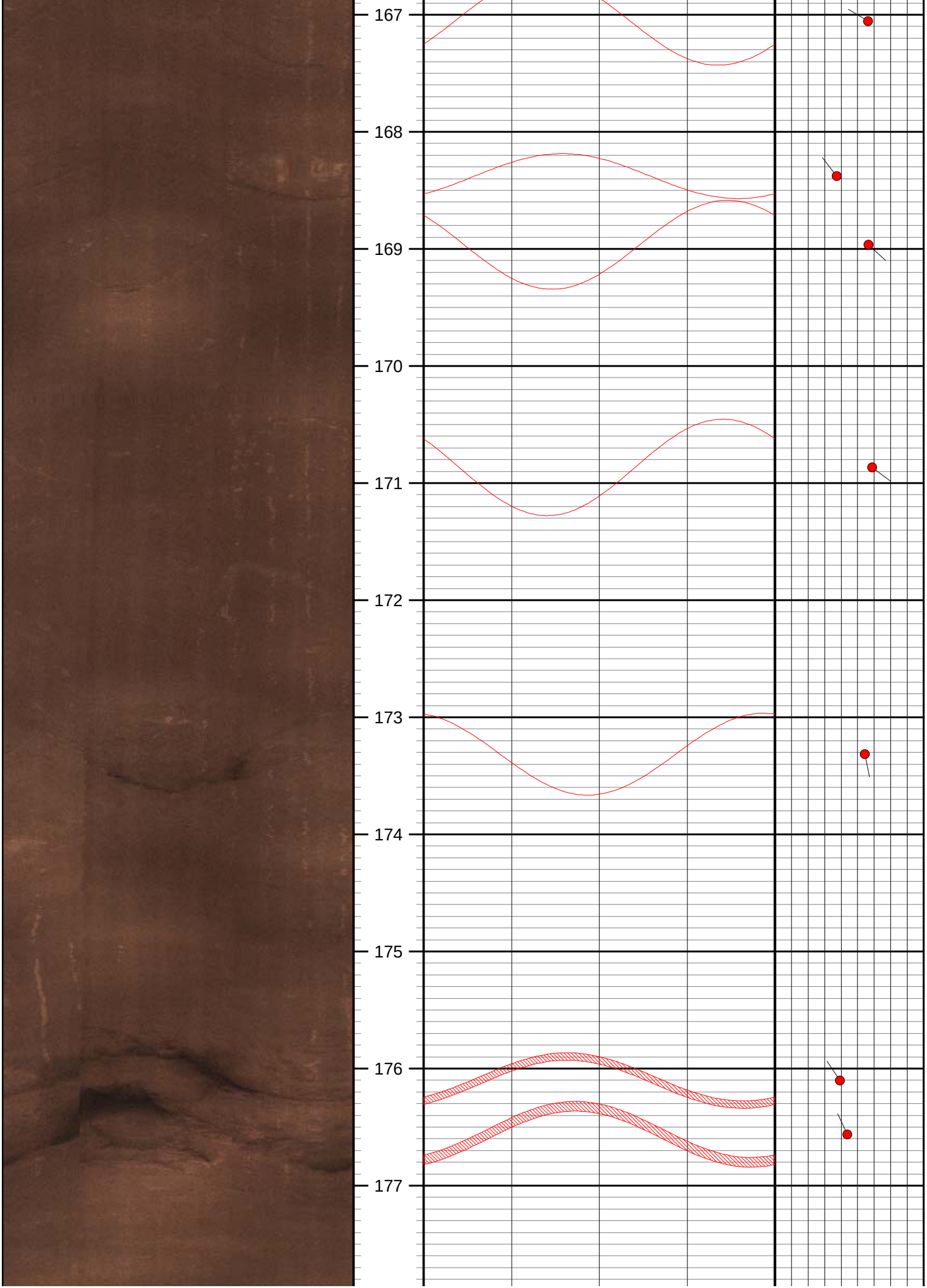
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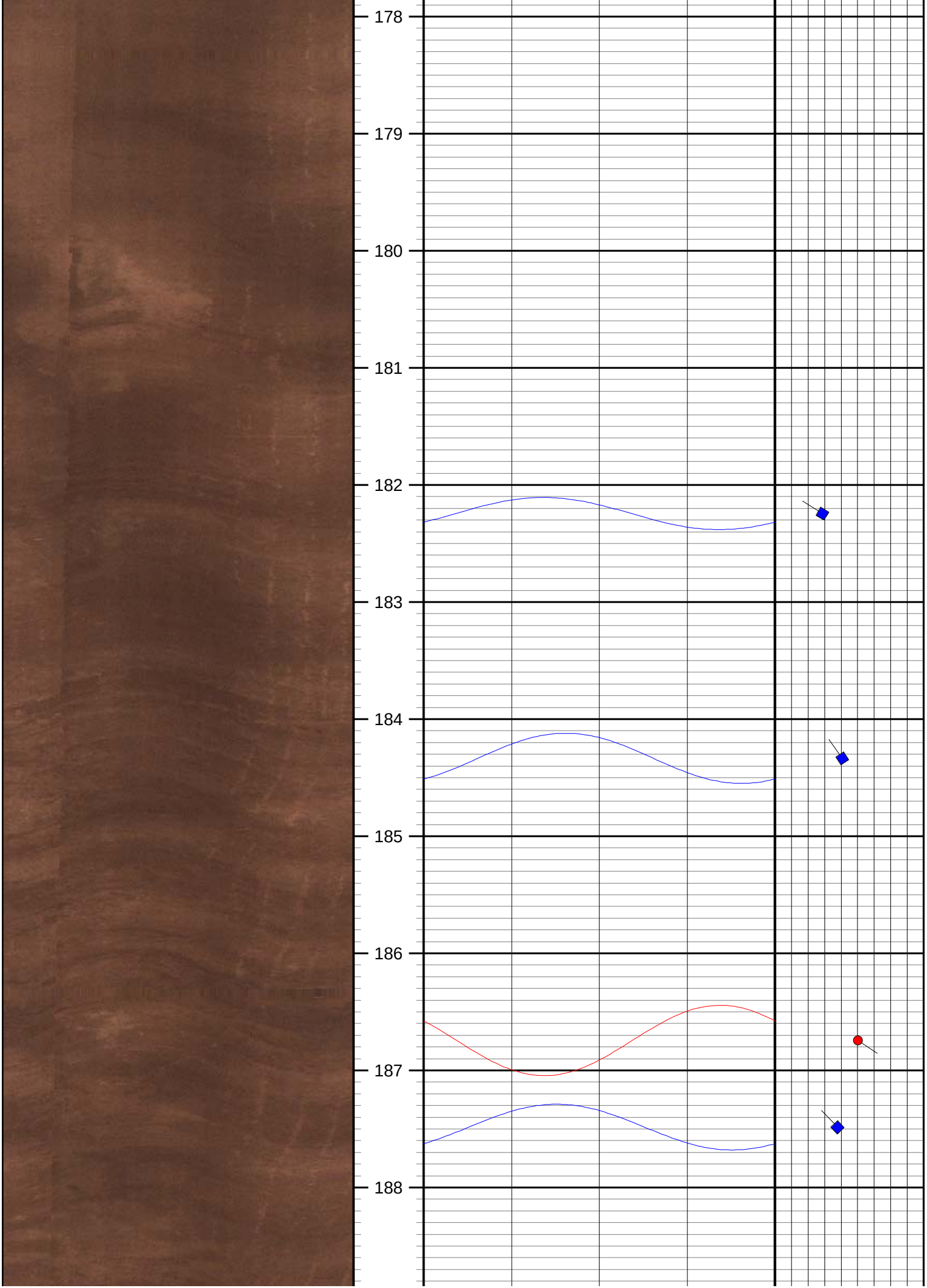
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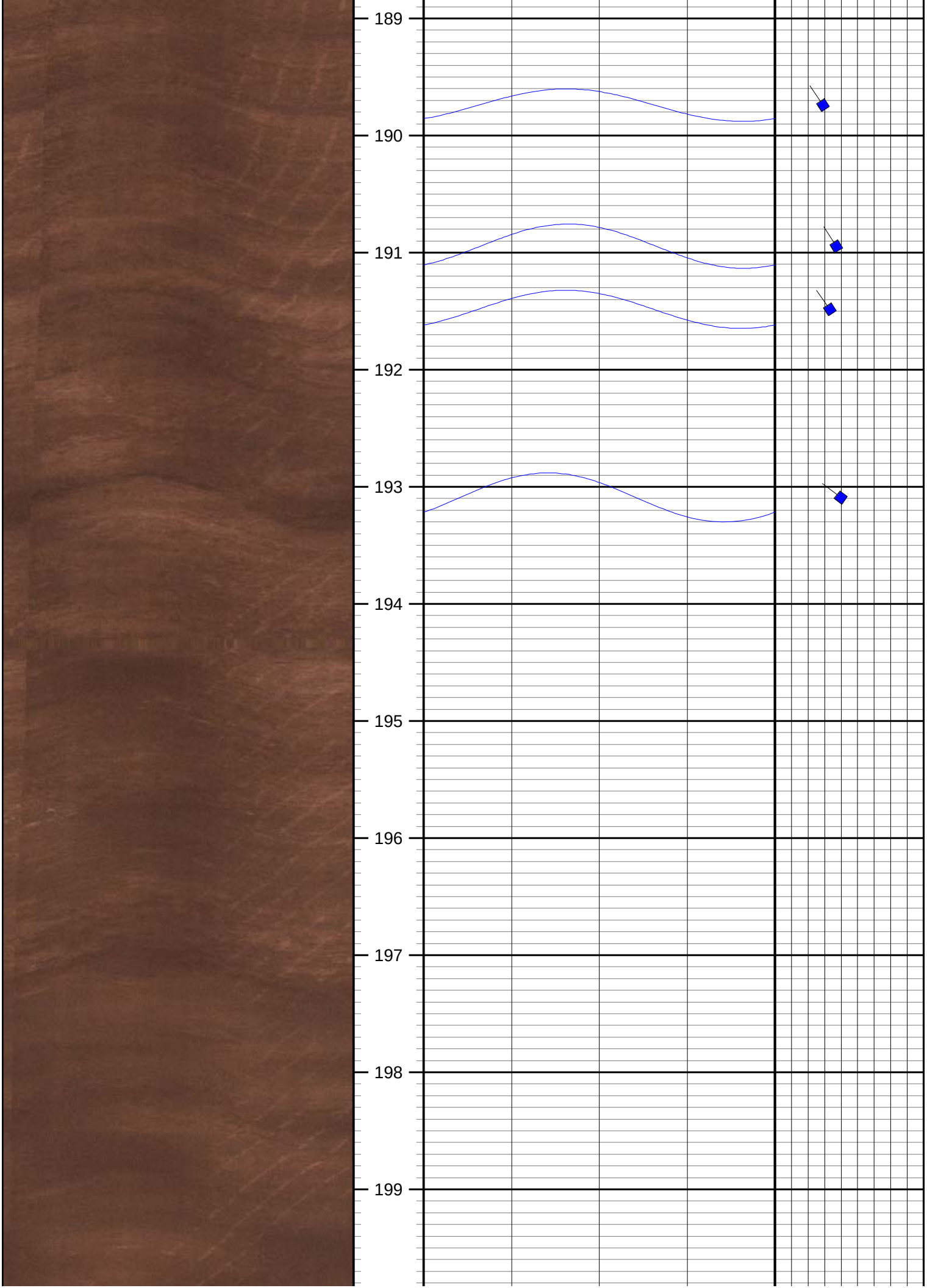
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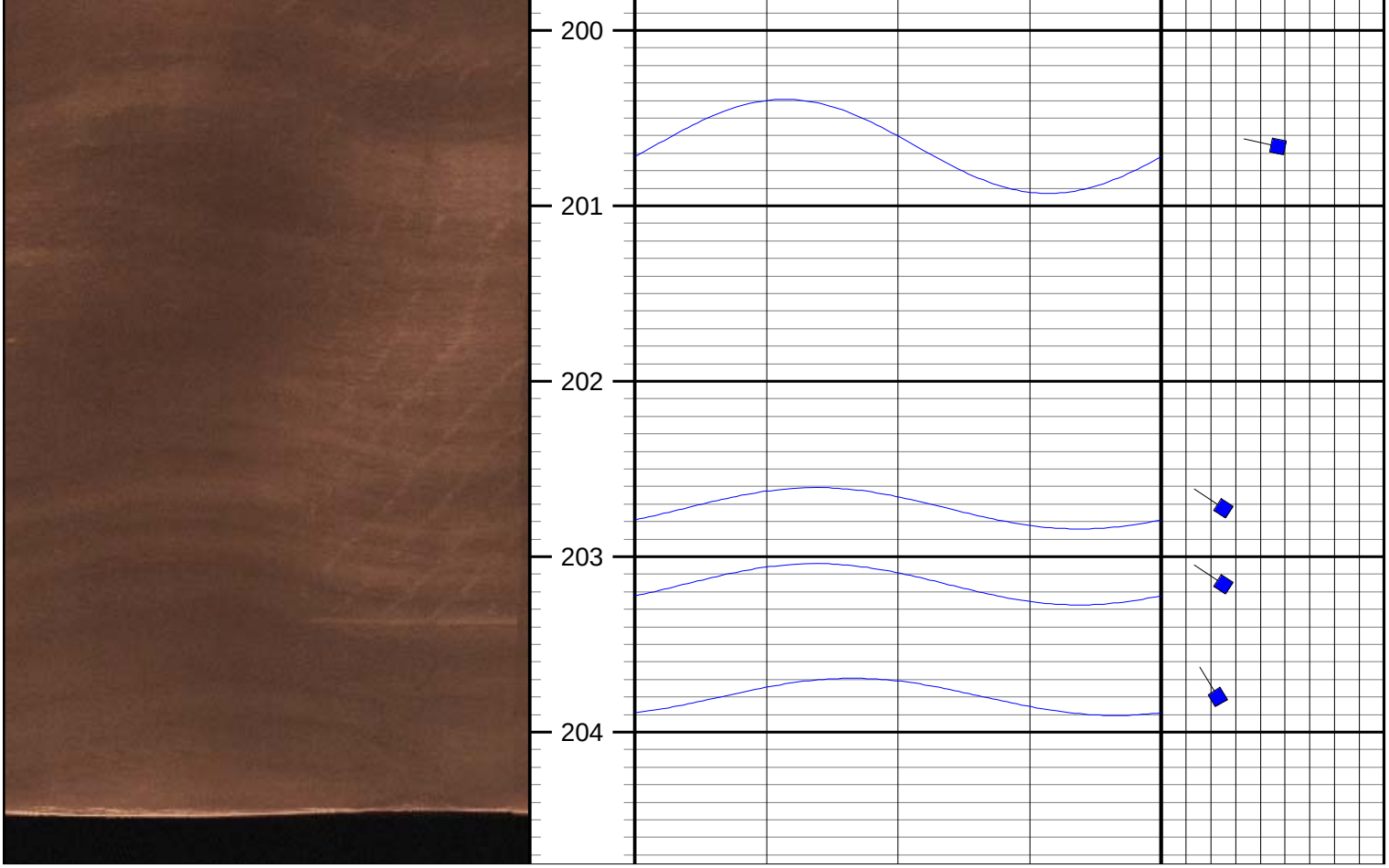
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202
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HydroLog

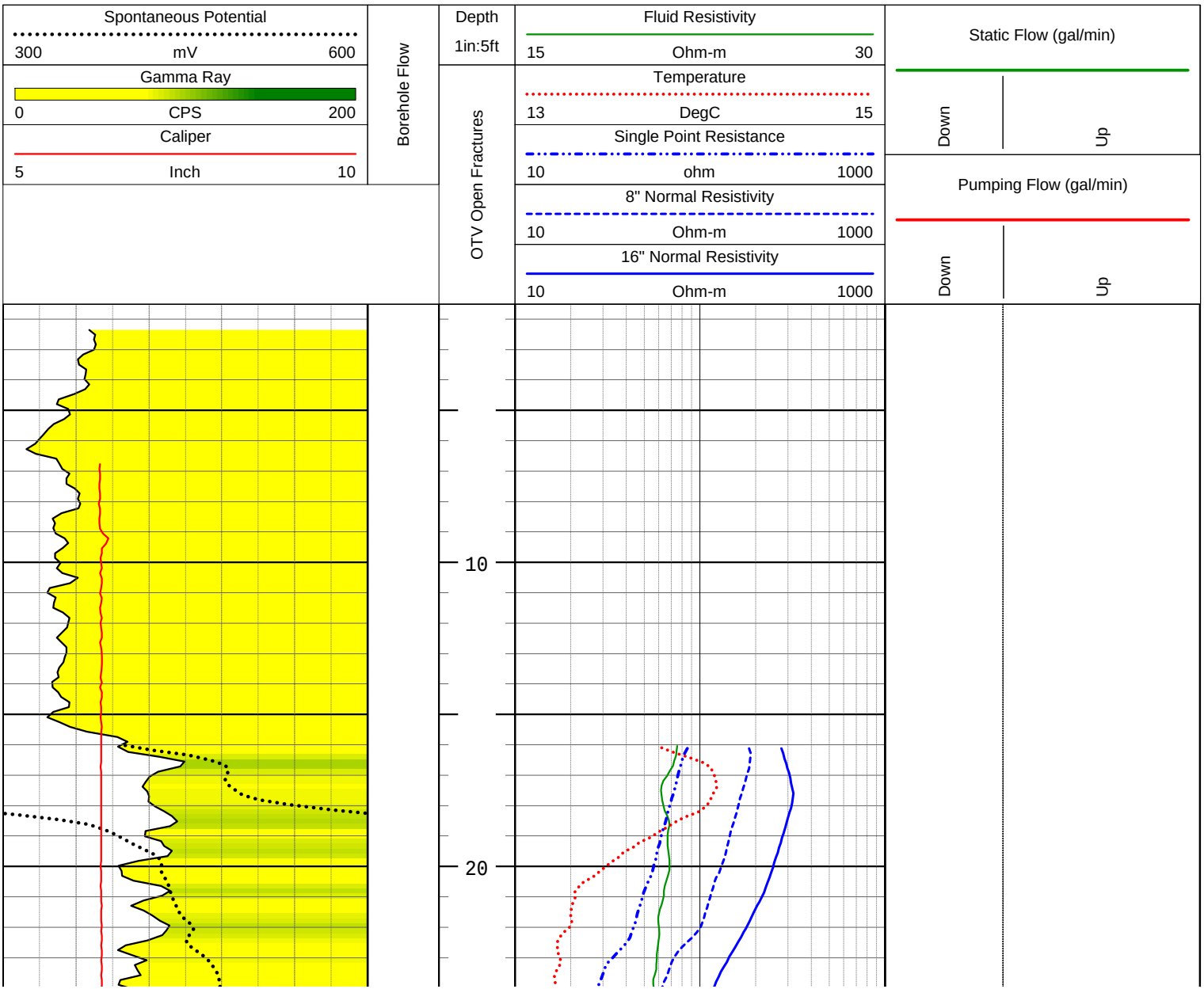
Well Name:	Mifflin Ave Deep Well
API Well Number:	
Company:	EA Engineering
Municipality:	New Cumberland
Farm / Site:	Marsh Run
7.5' Quad Name:	Lemoyne
County:	Cumberland
State:	Pennsylvania
Date:	5-7-2010
Recorded by:	M. Scott McQuown, P.G.
Witness:	

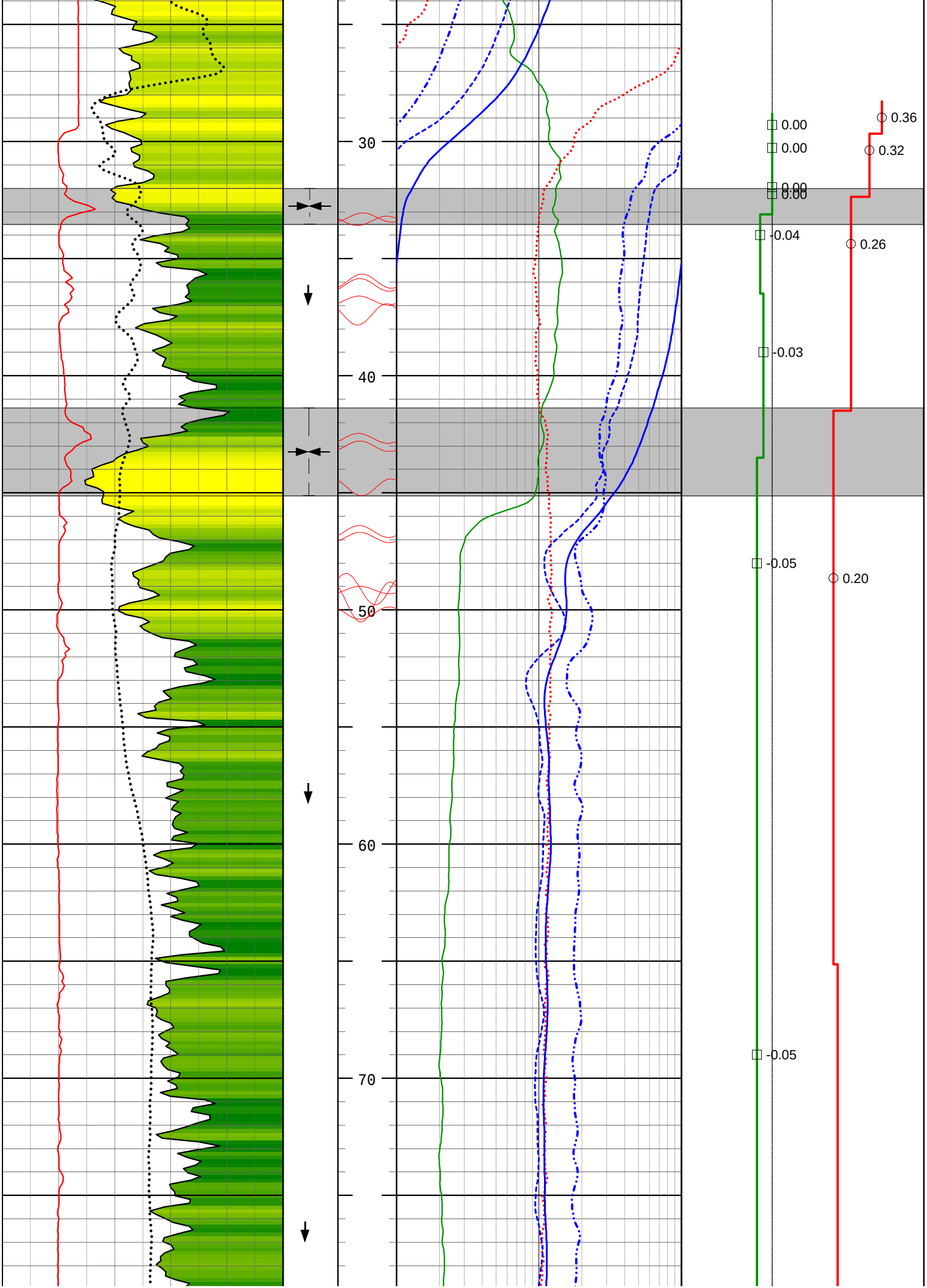
Boring location:	
Surface elevation:	
Log is measured from:	Top of casing, 1.6' from ground level
TD - Driller:	200'
TD - Logger:	204.7'
Drive Pipe Depth:	
Deepest Casing - Driller:	
Deepest Casing - Logger:	

Symbols:

- Producing zone
- Receiving zone
- Downward flow
- Upward flow

Notes:

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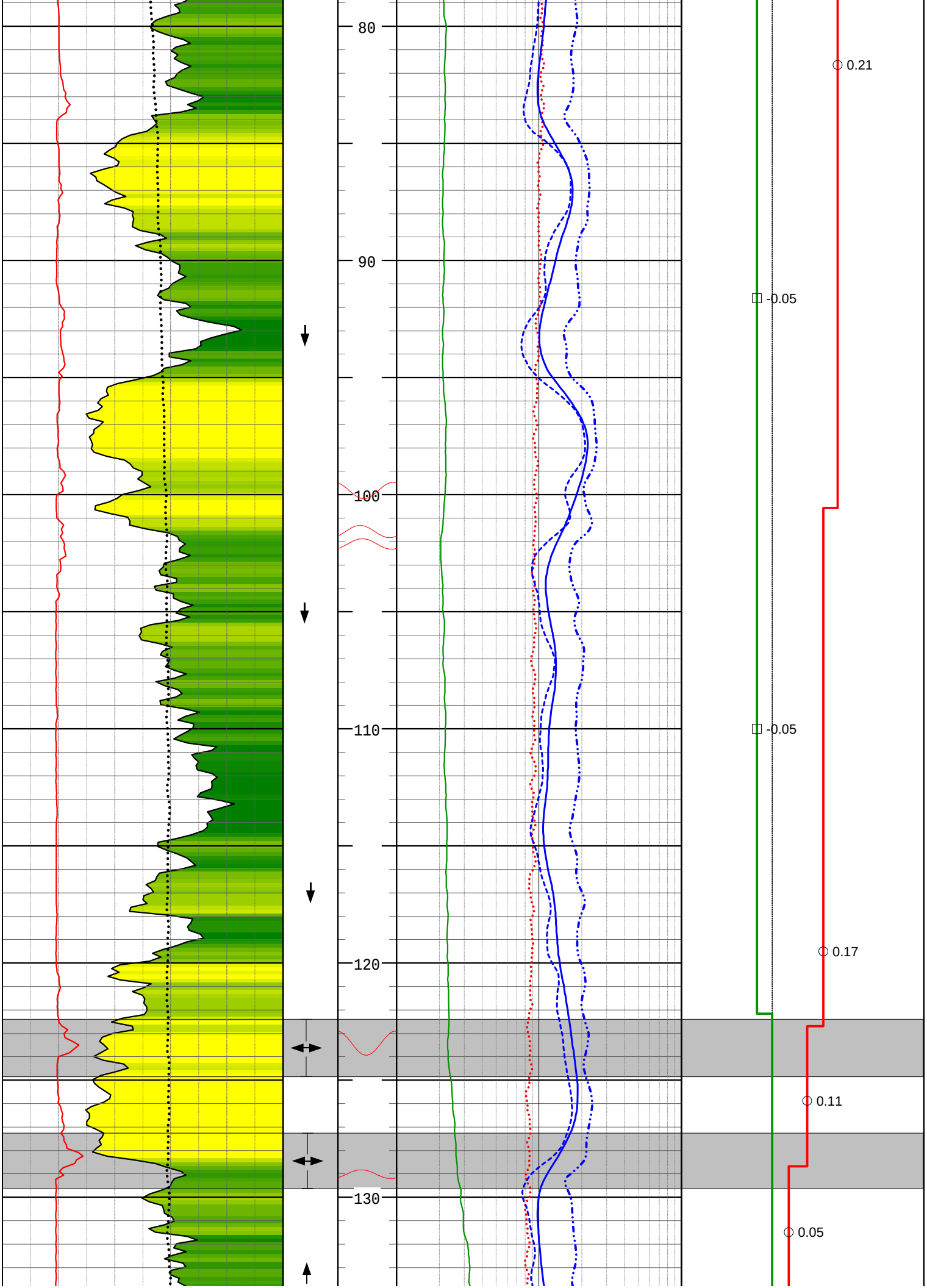
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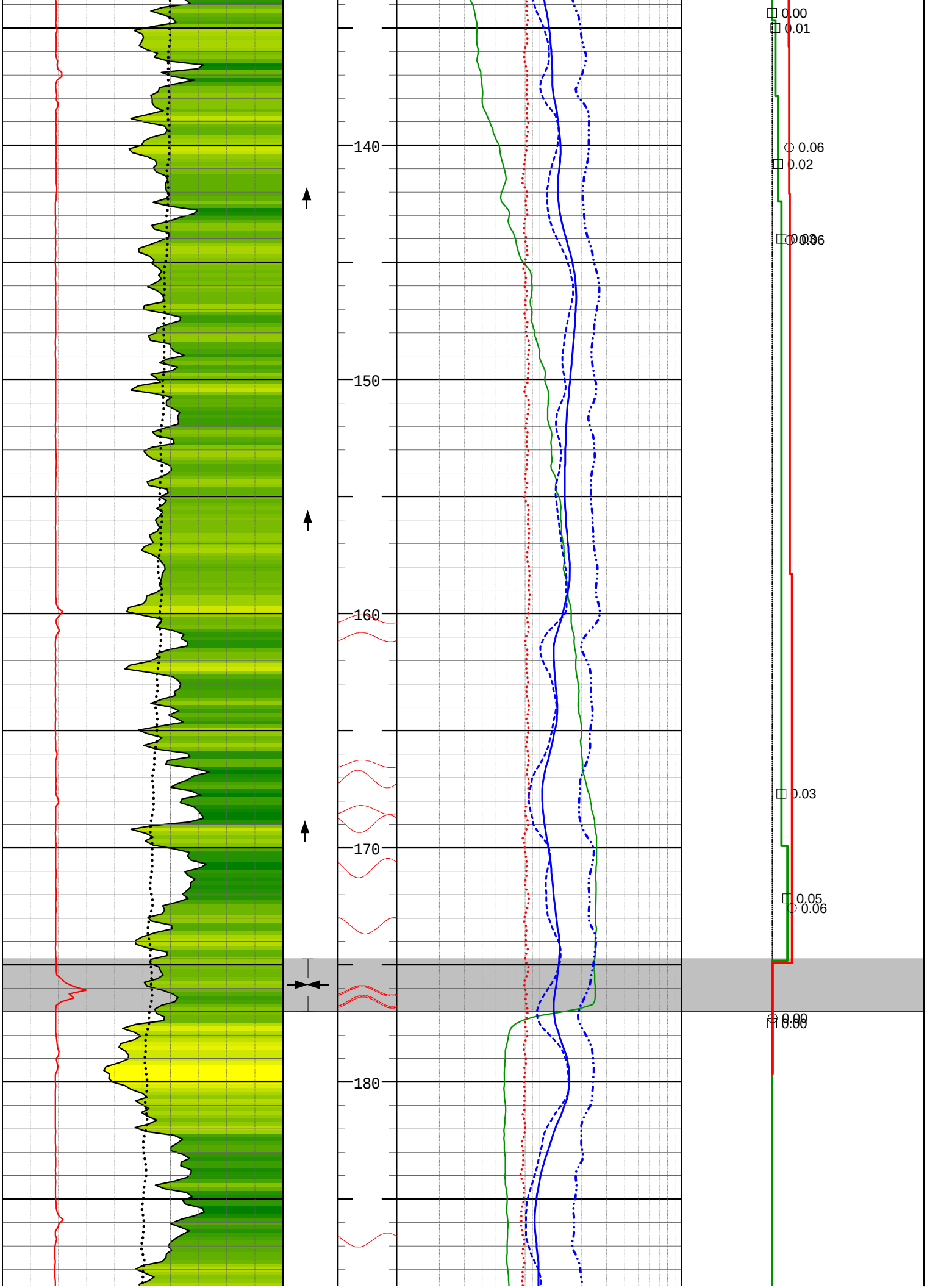
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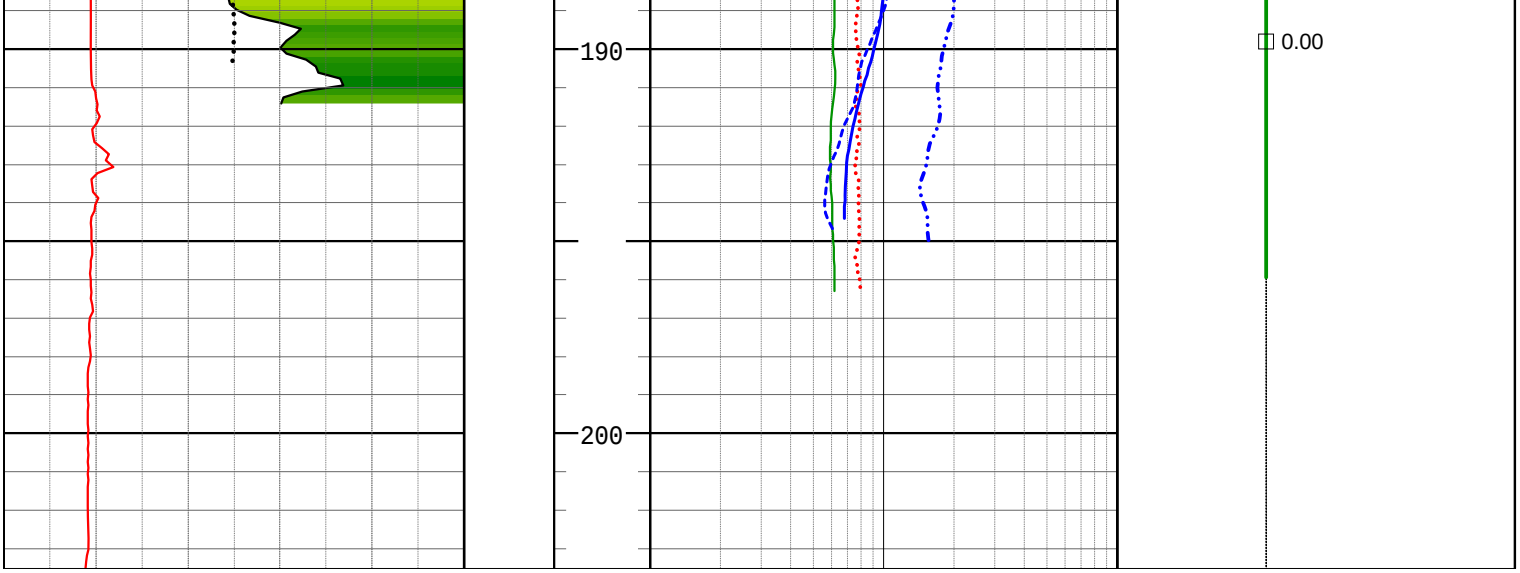
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ATTACHMENT C
TABULATED LISTING OF PLANE ORIENTATIONS

Planar Orientations from MW-15 and MADW
Marsh Run Site

Well ID	Depth (feet)	Dip Dir. (deg)	Dip (deg)	Aperture (mm)	Type	Strike/Dip (Quadrant)	Strike Azimuth (Right-hand-rule)
MW-15	20.89	337.14	38.11	0	Open Fracture	N67E/38NW	247.1
MW-15	20.9	151.61	41.75	0	Open Fracture	N62E/42SE	61.6
MW-15	20.96	291.32	42.01	0	Open Fracture	N21E/42NW	201.3
MW-15	21.29	176.03	33.32	0	Open Fracture	N86E/33SE	86.0
MW-15	23.62	316.16	45.17	0	Open Fracture	N46E/45NW	226.2
MW-15	27.03	312.1	41.4	0	Open Fracture	N42E/41NW	222.1
MW-15	27.71	221.72	57.46	0	Open Fracture	N48W/57SW	131.7
MW-15	31.49	310.93	36.31	0	Open Fracture	N41E/36NW	220.9
MW-15	45.85	316.28	58.28	0	Open Fracture	N46E/58NW	226.3
MW-15	47.03	319.01	44.84	0	Open Fracture	N49E/45NW	229.0
MW-15	47.4	317.99	47.27	0	Open Fracture	N48E/47NW	228.0
MW-15	61.02	174.4	61.96	0	Open Fracture	N84E/62SE	84.4
MW-15	61.95	161.11	62.97	0	Open Fracture	N71E/63SE	71.1
MW-15	63.94	315.08	53.27	0	Bedding	N45E/53NW	225.1
MW-15	81.34	273.13	12.65	0	Open Fracture	N3E/13NW	183.1
MW-15	81.67	323.14	24.62	0	Open Fracture	N53E/25NW	233.1
MW-15	83.38	149.67	64.53	0	Open Fracture	N60E/65SE	59.7
MW-15	84.64	302.66	42.51	0	Open Fracture	N33E/43NW	212.7
MW-15	86.68	353.55	51.18	0	Open Fracture	N84E/51NW	263.6
MW-15	87.91	158.23	49.17	0	Open Fracture	N68E/49SE	68.2
MW-15	90.43	315.59	46.17	0	Filled Fracture	N46E/46NW	225.6
MW-15	91.45	314.08	33.62	0	Filled Fracture	N44E/34NW	224.1
MW-15	92.35	313.31	26.2	0	Bedding	N43E/26NW	223.3
MW-15	96.52	306.31	35.22	0	Bedding	N36E/35NW	216.3
MW-15	98.39	317.93	39.48	0	Bedding	N48E/39NW	227.9
MW-15	102.35	328.92	40.6	0	Bedding	N59E/41NW	238.9
MW-15	103.59	328.35	28.22	0	Bedding	N58E/28NW	238.4
MW-15	107.39	324.76	47.19	0	Bedding	N55E/47NW	234.8
MW-15	109.29	318.72	38.52	0	Bedding	N49E/39NW	228.7
MW-15	109.82	140	21.44	0	Filled Fracture	N50E/21SE	50.0
MW-15	111.71	320	51.17	0	Bedding	N50E/51NW	230.0
MW-15	113.29	162.57	61.04	0	Filled Fracture	N73E/61SE	72.6
MW-15	113.52	163.74	62.15	0	Filled Fracture	N74E/62SE	73.7
MW-15	117.98	322.41	30.91	0	Bedding	N52E/31NW	232.4
MW-15	118.49	321.12	36.59	0	Bedding	N51E/37NW	231.1
MW-15	119.53	299.99	42.66	0	Bedding	N30E/43NW	210.0
MW-15	119.54	173.41	44.19	0	Filled Fracture	N83E/44SE	83.4
MW-15	120.13	175.71	39.61	0	Filled Fracture	N86E/40SE	85.7
MW-15	120.96	319.52	43.13	0	Bedding	N50E/43NW	229.5
MW-15	121.47	319.69	40.99	0	Bedding	N50E/41NW	229.7
MW-15	122.7	325.3	39.58	0	Bedding	N55E/40NW	235.3
MW-15	123.52	322.27	40.99	0	Bedding	N52E/41NW	232.3
MW-15	123.71	172.75	61.36	0	Open Fracture	N83E/61SE	82.8
MW-15	136.88	311.78	44.97	0	Bedding	N42E/45NW	221.8
MW-15	137.75	139.04	26.77	0	Open Fracture	N49E/27SE	49.0
MW-15	139.23	316.36	46.33	0	Open Fracture	N46E/46NW	226.4
MW-15	140	318.42	43.45	0	Open Fracture	N48E/43NW	228.4
MW-15	143.59	163.11	67.81	0	Open Fracture	N73E/68SE	73.1
MW-15	143.7	153.93	62.56	21.07	Open Fracture	N64E/63SE	63.9
MW-15	145.66	160.38	59.16	0	Open Fracture	N70E/59SE	70.4
MW-15	147.33	178.71	64.18	0	Open Fracture	N89E/64SE	88.7
MW-15	149	323.35	47.62	0	Bedding	N53E/48NW	233.4

Planar Orientations from MW-15 and MADW
Marsh Run Site

Well ID	Depth (feet)	Dip Dir. (deg)	Dip (deg)	Aperture (mm)	Type	Strike/Dip (Quadrant)	Strike Azimuth (Right-hand-rule)
MW-15	150.04	320.41	53.76	0	Bedding	N50E/54NW	230.4
MW-15	150.59	311.27	40.84	0	Bedding	N41E/41NW	221.3
MW-15	152.68	297.32	29.93	0	Bedding	N27E/30NW	207.3
MW-15	158.09	179.71	41.39	0	Filled Fracture	N90E/41SE	89.7
MW-15	159.98	158.76	55.14	10.91	Open Fracture	N69E/55SE	68.8
MW-15	160.77	158.59	59.85	0	Open Fracture	N69E/60SE	68.6
MW-15	161.82	313.44	40.69	0	Open Fracture	N43E/41NW	223.4
MW-15	162.57	311.54	36.4	0	Bedding	N42E/36NW	221.5
MW-15	165.12	157.76	60.13	0	Filled Fracture	N68E/60SE	67.8
MW-15	166.26	314.26	48.9	0	Filled Fracture	N44E/49NW	224.3
MW-15	167	291.23	35.32	0	Bedding	N21E/35NW	201.2
MW-15	169.53	323.87	37.58	0	Bedding	N54E/38NW	233.9
MW-15	170.8	326.36	36.07	0	Bedding	N56E/36NW	236.4
MW-15	172.15	338.42	42.07	0	Bedding	N68E/42NW	248.4
MW-15	172.82	308.69	37.81	0	Bedding	N39E/38NW	218.7
MW-15	173.94	333.92	37.81	0	Bedding	N64E/38NW	243.9
MW-15	175.54	314.95	37.81	0	Bedding	N45E/38NW	225.0
MW-15	177.06	326.67	37.81	0	Bedding	N57E/38NW	236.7
MW-15	178.28	323.83	38.65	0	Bedding	N54E/39NW	233.8
MW-15	191.48	294.42	34.87	0	Filled Fracture	N24E/35NW	204.4
MW-15	192.42	306.89	38.29	0	Bedding	N37E/38NW	216.9
MW-15	192.9	307.19	38.29	0	Bedding	N37E/38NW	217.2
MW-15	199.03	315.55	34.9	0	Bedding	N46E/35NW	225.6
MW-15	200.01	168.45	42.01	0	Filled Fracture	N78E/42SE	78.5
MADW	30.74	323.7	42.83	0	Bedding	N54E/43NW	233.7
MADW	30.97	320.22	41.2	0	Bedding	N50E/41NW	230.2
MADW	33.25	333.05	38.23	0	Open Fracture	N63E/38NW	243.1
MADW	33.39	119.86	38.44	0	Open Fracture	N30E/38SE	29.9
MADW	35.95	328.87	50.28	0	Open Fracture	N59E/50NW	238.9
MADW	36.12	314.69	47.11	0	Open Fracture	N45E/47NW	224.7
MADW	36.78	308.6	37.42	0	Open Fracture	N39E/37NW	218.6
MADW	37.37	120.3	61.09	0	Open Fracture	N30E/61SE	30.3
MADW	42.68	306.44	40.06	0	Open Fracture	N36E/40NW	216.4
MADW	43.01	314.57	41.93	0	Open Fracture	N45E/42NW	224.6
MADW	44.75	145.23	55.19	0	Open Fracture	N55E/55SE	55.2
MADW	46.65	311.43	45.37	0	Open Fracture	N41E/45NW	221.4
MADW	46.91	315.29	40.97	0	Open Fracture	N45E/41NW	225.3
MADW	49.1	229.92	69.51	0	Open Fracture	N40W/70SW	139.9
MADW	49.15	315.88	32.54	0	Open Fracture	N46E/33NW	225.9
MADW	49.66	141.39	73.66	0	Open Fracture	N51E/74SE	51.4
MADW	50.13	135.51	46.61	0	Open Fracture	N46E/47SE	45.5
MADW	51.61	316.5	45.76	0	Bedding	N47E/46NW	226.5
MADW	52.06	319.27	41.85	0	Bedding	N49E/42NW	229.3
MADW	52.83	327.8	42.79	0	Bedding	N58E/43NW	237.8
MADW	54.22	313.88	39.68	0	Bedding	N44E/40NW	223.9
MADW	55.16	308.5	53.55	0	Filled Fracture	N39E/54NW	218.5
MADW	57.32	156.16	50.94	0	Filled Fracture	N66E/51SE	66.2
MADW	66.79	318.9	33.24	0	Bedding	N49E/33NW	228.9
MADW	67.87	317.75	33.24	0	Bedding	N48E/33NW	227.8
MADW	88.12	320.59	47.31	0	Bedding	N51E/47NW	230.6
MADW	99.81	158.77	54.29	0	Open Fracture	N69E/54SE	68.8
MADW	101.57	316.79	46.33	0	Open Fracture	N47E/46NW	226.8

Planar Orientations from MW-15 and MADW
Marsh Run Site

Well ID	Depth (feet)	Dip Dir. (deg)	Dip (deg)	Aperture (mm)	Type	Strike/Dip (Quadrant)	Strike Azimuth (Right-hand-rule)
MADW	102.09	329.85	41.91	0	Open Fracture	N60E/42NW	239.9
MADW	123.41	174.53	64.05	0	Open Fracture	N85E/64SE	84.5
MADW	129.02	323.75	36.71	0	Open Fracture	N54E/37NW	233.8
MADW	152.33	310.92	38.86	0	Filled Fracture	N41E/39NW	220.9
MADW	160.24	321.57	36.72	0	Open Fracture	N52E/37NW	231.6
MADW	161.01	323.11	37.94	0	Open Fracture	N53E/38NW	233.1
MADW	166.42	328.18	32.87	0	Open Fracture	N58E/33NW	238.2
MADW	167.05	301.67	56.35	0	Open Fracture	N32E/56NW	211.7
MADW	168.38	322.23	37.43	0	Open Fracture	N52E/37NW	232.2
MADW	168.96	131.44	56.65	0	Open Fracture	N41E/57SE	41.4
MADW	170.87	126.56	58.72	0	Open Fracture	N37E/59SE	36.6
MADW	173.32	168.28	54.44	0	Open Fracture	N78E/54SE	78.3
MADW	176.1	326.94	39.42	15.05	Open Fracture	N57E/39NW	236.9
MADW	176.56	335.34	43.73	17.92	Open Fracture	N65E/44NW	245.3
MADW	182.24	302.6	28.72	0	Bedding	N33E/29NW	212.6
MADW	184.33	325.46	40.59	0	Bedding	N55E/41NW	235.5
MADW	186.74	123.79	50.25	0	Open Fracture	N34E/50SE	33.8
MADW	187.48	316.25	38.02	0	Bedding	N46E/38NW	226.3
MADW	189.74	326.48	28.98	0	Bedding	N56E/29NW	236.5
MADW	190.95	328.03	37.06	0	Bedding	N58E/37NW	238.0
MADW	191.49	325.63	33.08	0	Bedding	N56E/33NW	235.6
MADW	193.09	307.46	39.96	0	Bedding	N37E/40NW	217.5
MADW	200.66	282.72	46.99	0	Bedding	N13E/47NW	192.7
MADW	202.72	304.09	25.21	0	Bedding	N34E/25NW	214.1
MADW	203.16	303.82	25.21	0	Bedding	N34E/25NW	213.8
MADW	203.8	328.83	22.93	0	Bedding	N59E/23NW	238.8

Planar Orientations from MW-15 Mifflin Well
Marsh Run Site

Well ID	Depth (feet)	Dip Dir. (deg)	Dip (deg)	Aperture (mm)	Type	Strike/Dip (Quadrant)	Strike Azimuth (Right-hand-rule)
Mifflin	102.09	329.85	41.91	0	Open Fracture	N60E/42NW	239.9
Mifflin	123.41	174.53	64.05	0	Open Fracture	N85E/64SE	84.5
Mifflin	129.02	323.75	36.71	0	Open Fracture	N54E/37NW	233.8
Mifflin	152.33	310.92	38.86	0	Filled Fracture	N41E/39NW	220.9
Mifflin	160.24	321.57	36.72	0	Open Fracture	N52E/37NW	231.6
Mifflin	161.01	323.11	37.94	0	Open Fracture	N53E/38NW	233.1
Mifflin	166.42	328.18	32.87	0	Open Fracture	N58E/33NW	238.2
Mifflin	167.05	301.67	56.35	0	Open Fracture	N32E/56NW	211.7
Mifflin	168.38	322.23	37.43	0	Open Fracture	N52E/37NW	232.2
Mifflin	168.96	131.44	56.65	0	Open Fracture	N41E/57SE	41.4
Mifflin	170.87	126.56	58.72	0	Open Fracture	N37E/59SE	36.6
Mifflin	173.32	168.28	54.44	0	Open Fracture	N78E/54SE	78.3
Mifflin	176.1	326.94	39.42	15.05	Open Fracture	N57E/39NW	236.9
Mifflin	176.56	335.34	43.73	17.92	Open Fracture	N65E/44NW	245.3
Mifflin	182.24	302.6	28.72	0	Bedding	N33E/29NW	212.6
Mifflin	184.33	325.46	40.59	0	Bedding	N55E/41NW	235.5
Mifflin	186.74	123.79	50.25	0	Open Fracture	N34E/50SE	33.8
Mifflin	187.48	316.25	38.02	0	Bedding	N46E/38NW	226.3
Mifflin	189.74	326.48	28.98	0	Bedding	N56E/29NW	236.5
Mifflin	190.95	328.03	37.06	0	Bedding	N58E/37NW	238.0
Mifflin	191.49	325.63	33.08	0	Bedding	N56E/33NW	235.6
Mifflin	193.09	307.46	39.96	0	Bedding	N37E/40NW	217.5
Mifflin	200.66	282.72	46.99	0	Bedding	N13E/47NW	192.7
Mifflin	202.72	304.09	25.21	0	Bedding	N34E/25NW	214.1
Mifflin	203.16	303.82	25.21	0	Bedding	N34E/25NW	213.8
Mifflin	203.8	328.83	22.93	0	Bedding	N59E/23NW	238.8

APPENDIX C

STRADDLE PACKER SAMPLING DOCUMENTATION

Straddle Packer Sampling Logs

EA Engineering, Science, and Technology, Inc.

WELL PURGING AND SAMPLING RECORD

WELL ID MADW SAMPLE NO. 41-52 ft Interval

WELL/SITE DESCRIPTION Straddle Packer Testing

DATE 5 / 12 / 10 TIME 1325 AIR TEMP. 70's

WELL DEPTH 260 ft CASING HEIGHT NA ft

WATER DEPTH NA ft WELL DIAMETER 6 in

WATER COL. HEIGHT 11 ft SANDPACK DIAM. NA in

EQUIVALENT VOLUME OF STANDING WATER _____ (gal) (L)

PUMP RATE .5 LPM (gpm) (LPM)

PUMP TIME _____ min

WELL WENT DRY? ( ) Yes (X) No PUMP TIME 22 min

VOL. REMOVED _____ (gal) (L) RECOVERY TIME NA min

PURGE AGAIN? ( )Yes ( ) No TOTAL VOL. REMOVED 15 (gal) ~~(L)~~

Date	Time	Volume Removed Unit: L	pH	Cond. mS/sec	Temp. °C	ORP mV	Turb. NTU	DO mg/L	Depth to Water from TOC	Pump Rate LPM
5/12	1328		6.85	0.636	12.80	93	18.3	1.95	NA	0.5 LPM
	1332	2.5	6.82	0.636	12.92	89	21.0	1.44		
	1335	5	6.82	0.638	12.95	90	17.2	1.19		
	1340	7.5	6.82	0.640	12.90	90	12.2	1.06		
	1345	10	6.82	0.638	12.96	91	12.0	1.02		
	1250	12.5	6.82	0.637	~~12.60~~ 12.96	92	12.1	1.02		
	1255	15	6.84	0.641	12.93	92	8.59	1.10		

COMMENTS Sample at MADW 41-52 @1257

SIGNATURE Ben Witt

EA Engineering, Science, and Technology, Inc.

WELL PURGING AND SAMPLING RECORD

WELL ID MADW SAMPLE NO. 94-105 ft. Interval
WELL/SITE DESCRIPTION Straddle Packer Testing

DATE 5/12/10 TIME 1515 AIR TEMP. 70's

WELL DEPTH 280 ft CASING HEIGHT NA ft
WATER DEPTH NA ft WELL DIAMETER 6 in
WATER COL. HEIGHT 11 ft SANDPACK DIAM. NA in
EQUIVALENT VOLUME OF STANDING WATER _____ (gal) (L)
PUMP RATE .5 LPM (gpm) (LPM)
PUMP TIME 13 min
WELL WENT DRY? ( ) Yes (X) No PUMP TIME 18 min
VOL. REMOVED 13 (gal) (L) RECOVERY TIME NA min
PURGE AGAIN? ( ) Yes (X) No TOTAL VOL. REMOVED _____ (gal) (L)

Date	Time	Volume Removed Unit:	pH	Cond. mS/cm	Temp. °C	ORP mV	Turb. NTU	DO mg/L	Depth to Water from TOC	Pump Rate
5/12	1518	–	7.09	0.508	12.72	151	6.8	4.26	NA	.5 LPM
	1520	2.5	7.17	0.506	12.84	102	3.7	1.38		
	1524	4.5	7.19	0.504	12.83	75	2.5	0.87		
	1527	7.5	7.21	0.503	12.87	67	0.7	0.64		
	1530	9.0	7.23	0.502	12.82	64	0.7	0.49		
	1533	11.5	7.24	0.503	12.80	63	0.7	0.47		
	1536	13	7.24	0.503	12.82	60	0.05	0.45		

COMMENTS Sampled @ 1536

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EA Engineering, Science, and Technology, Inc.

WELL PURGING AND SAMPLING RECORD

WELL ID MADW SAMPLE NO. 121-132 Interval
WELL/SITE DESCRIPTION Straddle Packer Testing

DATE 5/12/10 TIME 1645 AIR TEMP. 70's

WELL DEPTH 200 ft CASING HEIGHT NA ft
WATER DEPTH NA ft WELL DIAMETER 6 in
WATER COL. HEIGHT 11 ft SANDPACK DIAM. ____ in
EQUIVALENT VOLUME OF STANDING WATER 16.475 (gal) (L)
PUMP RATE .5LPM (gpm) (LPM)
PUMP TIME 58 min
WELL WENT DRY? ( ) Yes (X) No PUMP TIME ____ min
VOL. REMOVED 28.2 (gal) (L) RECOVERY TIME ____ min
PURGE AGAIN? ( )Yes ( ) No TOTAL VOL. REMOVED ____ (gal) (L)

Date	Time	Volume Removed Unit:	pH	Cond. mS/cm	Temp. 12.64	ORP mV	Turb. NTU	DO mg/L	Depth to Water from TOC	Pump Rate
5/12	1645		6.89	0.521	12.64	110	44.6	2.77	NA	600mL/m
	1648	1.8	6.79	0.522	12.63	118	39.2	1.99		
	1651	2.5 4.2	6.73	0.524	12.60	120	32.1	1.79		
	1659	5.7	6.74	0.524	12.60	120	30.5	1.77		500
	1703	2.5 8.2	6.74	0.525	12.63	117	28.2	1.64		
	1708	2.5 10.7	6.77	0.527	12.63	115	25.7	1.56		
	1713	2.5 13.2	6.75	0.527	12.63	116	23.9	1.55		
	1718	2.5 15.7	6.77	0.528	12.68	113	19.0	1.72		
	1723	2.5 18.2	6.77	0.529	12.67	115	17.9	1.68		
	1728	20.7	6.78	0.529	12.68	115	15.8	1.57		
	1733	2.5 23.2	6.78	0.530	12.68	115	11.6	1.54		
	1738	25.7	6.79	0.530	12.68	116	10.2	1.50		
	1743	2.5 28.2	6.79	0.531	12.68	117	9.7	1.47		

COMMENTS Sampled @ 1745

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EA Engineering, Science, and Technology, Inc.

WELL PURGING AND SAMPLING RECORD

WELL ID MADW SAMPLE NO. 170-181

WELL/SITE DESCRIPTION Straddle Packer Test

DATE 5/13/10 TIME 1100 AIR TEMP. 70's

WELL DEPTH 200 ft CASING HEIGHT NA ft

WATER DEPTH ~~4~~ NA ft WELL DIAMETER 6 in

WATER COL. HEIGHT 11 ft SANDPACK DIAM. NA in

EQUIVALENT VOLUME OF STANDING WATER _____ (gal) (L)

PUMP RATE .6 LMP (gpm) (LPM)

PUMP TIME 35 min

WELL WENT DRY? ( ) Yes (X) No PUMP TIME _____ min

VOL. REMOVED _____ (gal) (L) RECOVERY TIME NA min

PURGE AGAIN? ( )Yes (✓) No TOTAL VOL. REMOVED _____ (gal) (L)

Date	Time	Volume Removed Unit:	pH	Cond. mS/sec	Temp. °C	ORP mV	Turb. NTU	DO mg/L	Depth to Water from TOC	Pump Rate MLPM
5/13	1108		7.70	0.432	12.66	150	31.2	2.19	NA	600ppm
	1113	3	7.78	0.431	12.65	114	28.8	1.71		
	1118	6	7.83	0.430	12.63	90	22.7	1.38		
	1123	9	7.85	0.430	12.62	88	17.4	1.24		
	1128	12	7.84	0.429	12.62	87	10.2	1.06		
	1133	15	7.90	0.429	12.62	78	7.40	.94		
	1138	18	7.84	0.428	12.63	79	6.00	0.87		
	1143	21	7.86	0.428	12.62	80	5.43	0.89		

COMMENTS 1145 - sampled

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EA Engineering, Science, and Technology, Inc.

WELL PURGING AND SAMPLING RECORD

WELL ID MW-15 SAMPLE NO. 54-65 ft. interval

WELL/SITE DESCRIPTION Straddle Packer Test

DATE 5/13/10 TIME 1706 AIR TEMP. 70's

WELL DEPTH 200 ft CASING HEIGHT NA ft

WATER DEPTH NA ft WELL DIAMETER 6 in

WATER COL. HEIGHT 11 ft SANDPACK DIAM. _____ in

EQUIVALENT VOLUME OF STANDING WATER _____ (gal) (L)

PUMP RATE 25 (gpm) (LPM)

PUMP TIME 50 min

WELL WENT DRY? ( ) Yes (X) No PUMP TIME _____ min

VOL. REMOVED _____ (gal) (L) RECOVERY TIME _____ min

PURGE AGAIN? ( )Yes ( ) No TOTAL VOL. REMOVED _____ (gal) (L)

Date	Time	Volume Removed Unit:	pH	Cond. mS/sec	Temp. °C	ORP mV	Turb. NTU	DO mg/L	Depth to Water from TOC	Pump Rate LPM	
	1705		7.44	0.897	13.20	69	32.9	2.18	NA	.500mL	
	1710	2.5	7.44	.898	13.22	63	30.7	2.14			
	1715	5	7.47	.895	13.40	68	28.9	1.20			
	1720	7.5	7.47	.884	13.96	74	27.8	1.00			
	1725	10	7.47	.882	14.21	82	28.9	1.00			
	1730	12.5	7.00	.751	14.64	125	55.4	1.23			Turbidity meter
	1735	15	7.45	.890	13.45	62	24.4	1.97			Turb. 14.9 w/meter
	1740	17.5	7.45	.893	13.28	58	23.5	1.95			13.3
	1745	20	7.45	.891	13.25	60	23.1	1.94			
	1750	22.5	7.45	.889	13.22	58	21.4	1.92			12.4
	1755	25	7.46	.882	13.32	62	15.6	1.90			11.2

COMMENTS Sample @ 1755

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EA Engineering, Science, and Technology, Inc.

WELL PURGING AND SAMPLING RECORD

WELL ID MW-15 SAMPLE NO. 80-91 ft. interval

WELL/SITE DESCRIPTION Straddle Packer Test

DATE 5/13/10 TIME 7 pm AIR TEMP. 70's

WELL DEPTH ~200 ft CASING HEIGHT NA ft

WATER DEPTH NA ft WELL DIAMETER 6 in

WATER COL. HEIGHT 11 ft SANDPACK DIAM. _____ in

EQUIVALENT VOLUME OF STANDING WATER _____ (gal) (L)

PUMP RATE .5 (gpm) (LPM)

PUMP TIME 80 min

WELL WENT DRY? ( ) Yes (X) No PUMP TIME _____ min

VOL. REMOVED 25 (gal) (L) RECOVERY TIME _____ min

PURGE AGAIN? ( )Yes (X)No TOTAL VOL. REMOVED _____ (gal) (L)

Date	Time	Volume Removed Unit:	pH	Cond. mS/sec	Temp. °C	ORP mV	Turb. NTU	DO mg/L	Depth to Water from TOC	Pump Rate
5/13	715 pm	-	7.47	0.858	13.05	187	169	2.61	NA	500 ml/m
	720	2.5	7.44	0.862	12.85	137	168	2.60		
	725	5	7.47	0.854	12.93	115	166	2.58		
	730	7.5	7.44	0.881	12.81	97	162	2.59		
	735	10	7.44	0.854	12.78	96	162	2.57		
	740	12.5	7.46	0.856	12.71	94	162	2.58		
	745	15	7.46	0.857	12.69	96	160	2.57		
	750	17.5	7.46	0.858	12.67	114	189	2.98		
	755	20	7.45	0.858	12.57	103	175	2.74		
	800	22.5	7.46	0.858	12.54	101	169	2.74		
	805	25	7.46	0.858	12.54	101	165	2.67		
	810									
	815									

COMMENTS Sampled @ 805

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EA Engineering, Science, and Technology, Inc.

WELL PURGING AND SAMPLING RECORD

WELL ID MW-15 SAMPLE NO. 115-124 ft. interval

WELL/SITE DESCRIPTION Straddle Packer Test

DATE 5 / 14 / 10 TIME 9AM AIR TEMP. 70's

WELL DEPTH ~200 ft CASING HEIGHT NA ft

WATER DEPTH ft WELL DIAMETER 6 in

WATER COL. HEIGHT 11 ft SANDPACK DIAM. in

EQUIVALENT VOLUME OF STANDING WATER (gal) (L)

PUMP RATE .5 LPM (gpm) (LPM)

PUMP TIME 40 min

WELL WENT DRY? ( ) Yes (X) No PUMP TIME min

VOL. REMOVED 20 (gal) (L) RECOVERY TIME min

PURGE AGAIN? ( )Yes ( ) No TOTAL VOL. REMOVED (gal) (L)

Date	Time	Volume Removed Unit:	pH	Cond.	Temp.	ORP	Turb.	DO	Depth to Water from TOC	Pump Rate LPM	
5/14	9:11	–	6.70	.887	13.90	273	70.8	4.30	NA	500	
	9:16	2.5	7.22	.863	13.77	164	65.3	2.78			
	9:21	5	7.37	.861	13.76	108	60.5	2.57			
	9:26	7.5	7.43	.860	13.78	88	55.7	2.47			
	9:31	10	7.45	.859	13.78	82	54.3	2.34			
	9:36	12.5	7.47	.859	13.81	81	53.9	2.39			
	9:41	15	7.48	.860	13.88	74	52.9	3.74			9:43
	9:46	17.5	7.48	.859	13.90	80	53.1	2.78			
	9:51	20	7.48	.859	13.90	80	51.7	2.57			

COMMENTS Sampled @ 955
Dup-1 collected

– Pumped longer b/c PW ran to get MW-14, transducer down hard

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EA Engineering, Science, and Technology, Inc.

WELL PURGING AND SAMPLING RECORD

WELL ID MW-15 SAMPLE NO. 138-149 ft. interval
WELL/SITE DESCRIPTION Straddle Packer Interval

DATE 5 / 14 / 10 TIME 1115 AM AIR TEMP. 70's

WELL DEPTH 200 ft CASING HEIGHT NM ft
WATER DEPTH NA ft WELL DIAMETER 6 in
WATER COL. HEIGHT 11 ft SANDPACK DIAM. NA in
EQUIVALENT VOLUME OF STANDING WATER _____ (gal) (L)
PUMP RATE .5 LPM (gpm) (LPM)
PUMP TIME 25 min
WELL WENT DRY? ( ) Yes (X) No PUMP TIME _____ min
VOL. REMOVED 12.5 (gal) (L) RECOVERY TIME _____ min
PURGE AGAIN? ( )Yes ( ) No TOTAL VOL. REMOVED _____ (gal) (L)

Date	Time	Volume Removed Unit:	pH	Cond. µS/cm	Temp. °C	ORP mV	Turb. NTU	DO mg/L	Depth to Water from TOC	Pump Rate LPM
5/14	1116	~	7.43	0.893	13.26	172	12.0	9.34	NA	.5
	1121	2.5	7.41	0.904	13.21	97	11.9	2.86		
	1126	5	7.39	.903	13.15	73	11.2	2.20		
	1131	7.5	7.39	0.904	13.22	68	9.7	1.97		
	1136	10	7.40	.906	13.15	72	9.8	1.87		
	1141	12.5	7.40	0.906	13.17	70	9.4	1.79		

COMMENTS Sampled @ 1145 MS/MSD collected

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EA Engineering, Science, and Technology, Inc.

WELL PURGING AND SAMPLING RECORD

WELL ID MW-15 SAMPLE NO. 156-167 ft. interval

WELL/SITE DESCRIPTION Straddle Packer Testing

DATE 5 / 14 / 10 TIME 1255 AIR TEMP. 71°F

WELL DEPTH 200 ft CASING HEIGHT NA ft

WATER DEPTH NA ft WELL DIAMETER 6 in

WATER COL. HEIGHT 11 ft SANDPACK DIAM. NA in

EQUIVALENT VOLUME OF STANDING WATER _____ (gal) (L)

PUMP RATE .5 LPM (gpm) (LPM)

PUMP TIME 35 min

WELL WENT DRY? ( ) Yes (✓) No PUMP TIME _____ min

VOL. REMOVED 17.5 (gal) (L) RECOVERY TIME _____ min

PURGE AGAIN? ( )Yes ( ) No TOTAL VOL. REMOVED _____ (gal) (L)

Date	Time	Volume Removed Unit: L	pH	Cond. mS/sec	Temp. °C	ORP mV	Turb. NTU	DO mg/L	Depth to Water from TOC	Pump Rate LPM
5/14	1257	–	7.69	0.702	14.84	188	30.5	7.59	NA	.5
	1302	2.5	7.56	0.636	13.70	172	29.4	3.25		
	1307	5	7.55	0.621	13.27	99	17.6	1.87		
	1312	7.5	7.57	0.612	13.08	94	14.7	1.72		
	1317	10	7.57	0.605	13.16	88	12.9	1.54		
	1322	12.5	7.56	0.589	13.14	80	7.8	1.31		
	1327	15	7.54	0.581	13.09	79	6.9	1.25		
	1332	17.5	7.55	0.577	13.07	79	6.1	1.19		

COMMENTS Sampled @ 1335
DUP-2 Collected

SIGNATURE [signature]

EA Engineering, Science, and Technology, Inc.

WELL PURGING AND SAMPLING RECORD

WELL ID MW-15 SAMPLE NO. 172-183 ft. interval

WELL/SITE DESCRIPTION Straddle Packer Test

DATE 5/14/10 TIME 1300 AIR TEMP. 70's

WELL DEPTH 200 ft CASING HEIGHT NA ft

WATER DEPTH NA ft WELL DIAMETER 6 in

WATER COL. HEIGHT 11 ft SANDPACK DIAM. NA in

EQUIVALENT VOLUME OF STANDING WATER _____ (gal) (L)

PUMP RATE .5 LPM (gpm) (LPM)

PUMP TIME 20 min

WELL WENT DRY? ( ) Yes (X) No PUMP TIME _____ min

VOL. REMOVED 16 (gal) (L) RECOVERY TIME _____ min

PURGE AGAIN? ( )Yes ( ) No TOTAL VOL. REMOVED _____ (gal) (L)

Date	Time	Volume Removed Unit:	pH	Cond. mS/cm	Temp. °C	ORP mV	Turb. NTU	DO mg/L	Depth to Water from TOC	Pump Rate LPM
5/14/10	3:07 ~~3:54~~	–	7.59	0.765	15.38	182	164	4.45	NA	.5
3:22	~~3:19~~	2.5	7.52	.765	16.44	128	147	2.87		↓
	3:27	5	7.52	.768	17.92	94	138	1.99		
	3:32	7.5	7.58	.756	16.55	95	167	2.84		
	3:37	10	7.54	.771	16.31	65	137	2.18		✓
	3:42									
	3:47									

COMMENTS 1330 – pump stopped upped flow rate
Sampled @ 1545

SIGNATURE [signature]

EA Engineering, Science, and Technology, Inc.

WELL PURGING AND SAMPLING RECORD

WELL ID MW-15 SAMPLE NO. 184 - 195

WELL/SITE DESCRIPTION Straddle Packer Tests

DATE 5/14/20 TIME _____ AIR TEMP. 70s

WELL DEPTH 200 ft CASING HEIGHT NA ft

WATER DEPTH NA ft WELL DIAMETER 6 in

WATER COL. HEIGHT 11 ft SANDPACK DIAM. NA in

EQUIVALENT VOLUME OF STANDING WATER _____ (gal) (L)

PUMP RATE .5LPM (gpm) (LPM)

PUMP TIME _____ min

WELL WENT DRY? ( ) Yes ( ) No PUMP TIME _____ min

VOL. REMOVED _____ (gal) (L) RECOVERY TIME _____ min

PURGE AGAIN? ( )Yes ( ) No TOTAL VOL. REMOVED _____ (gal) (L)

Date	Time	Volume Removed Unit:	pH	Cond. mS/cm	Temp. °C	ORP mV	Turb. NTU	DO mg/L	Depth to Water from TOC	Pump Rate LPM
5/14			6.95						NA	.5
	1748		7.40	0.736	15.58	53	264	2.73		

COMMENTS Water gradually collected during low flow due to thunderstorm/rain. Surged

SIGNATURE [illegible]

Straddle Packer Calibration Logs

FIELD CALIBRATION FORM

~~YSI 3800~~ Horiba

pH, CONDUCTIVITY, TEMPERATURE, TURBIDITY, ORP, AND DISSOVED OXYGEN

CALIBRATION	
DATE:	12 May 2010
TIME:	8pm cal check
METER ID:	Rental Unit

pH CALIBRATION

pH STANDARD	INITIAL READING	FINAL READING
4.0	3.84	4.0
~~7.0~~		
~~10.0~~		

CONDUCTIVITY CALIBARATION

CONDUCTIVITY STANDARD	STANDARD READING	FINAL READING
4.49	4.74	4.49

TEMPERATURE CALIBRATION

	NBS THERMOMETOR	YSI READING
AMBIENT WATER	NA	

FIELD CALIBRATION FORM

~~YSI 3800~~ Horiba

pH, CONDUCTIVITY, TEMPERATURE, TURBIDITY, ORP, AND DISSOVED OXYGEN

TURBIDITY CALIBRATION

STANDARD	INITIAL READING	FINAL READING
0 NTU	0.0	0.0
~~200 NTU~~		
~~800 NTU~~		

ORP CALIBRATION

STANDARD	FINAL READING
234 ~~231~~ MV	234

DISSOLVED OXYGEN CALIBRATION

STANDARD	INTITIAL READING	FINAL READING
100% AIR SATURATION	NA	

COMMENTS

SIGNATURE

FIELD CALIBRATION FORM

~~YSI 3800~~ Horiba

pH, CONDUCTIVITY, TEMPERATURE, TURBIDITY, ORP, AND DISSOVED OXYGEN

CALIBRATION	
DATE:	13 May 2010
TIME:	8AM
METER ID:	Rental Unit

pH CALIBRATION

pH STANDARD	INITIAL READING	FINAL READING
4.0	3.94	4.0
~~7.0~~		
~~10.0~~		

CONDUCTIVITY CALIBARATION

CONDUCTIVITY STANDARD	STANDARD READING	FINAL READING
4.49	4.79	4.49

TEMPERATURE CALIBRATION

	NBS THERMOMETOR	YSI READING
AMBIENT WATER	NA	

10 May

FIELD CALIBRATION FORM

~~YSI 3800~~ Horiba

pH, CONDUCTIVITY, TEMPERATURE, TURBIDITY, ORP, AND DISSOVED OXYGEN

TURBIDITY CALIBRATION

STANDARD	INITIAL READING	FINAL READING
0 NTU	0.0	0.0
20~~0 NT~~U		
~~800 NT~~U		

ORP CALIBRATION

STANDARD	FINAL READING
234 ~~231~~ MV	234

DISSOLVED OXYGEN CALIBRATION

STANDARD	INTITIAL READING	FINAL READING
100% AIR SATURATION	NA on Horiba	

COMMENTS

Rental Horiba.

SIGNATURE

FIELD CALIBRATION FORM
YSI 3800
pH, CONDUCTIVITY, TEMPERATURE, TURBIDITY, ORP, AND DISSOVED OXYGEN

CALIBRATION	
DATE:	May 14, 2010
TIME:	7:15
METER ID:	Rental - Env. Equip & Supply

pH CALIBRATION

pH STANDARD	INITIAL READING	FINAL READING
4.0	3.97	4.00
~~7.0~~		
~~10.0~~		

CONDUCTIVITY CALIBARATION

CONDUCTIVITY STANDARD	STANDARD READING	FINAL READING
4.49	4.52	4.49

TEMPERATURE CALIBRATION

	NBS THERMOMETOR	YSI READING
AMBIENT WATER	NA	

FIELD CALIBRATION FORM
YSI 3800
pH, CONDUCTIVITY, TEMPERATURE, TURBIDITY, ORP, AND DISSOVED OXYGEN

TURBIDITY CALIBRATION

STANDARD	INITIAL READING	FINAL READING
0 NTU	0.0	0.0
~~200 NTU~~		
~~800 NTU~~		

ORP CALIBRATION

STANDARD	FINAL READING
234 ~~231~~ MV	234

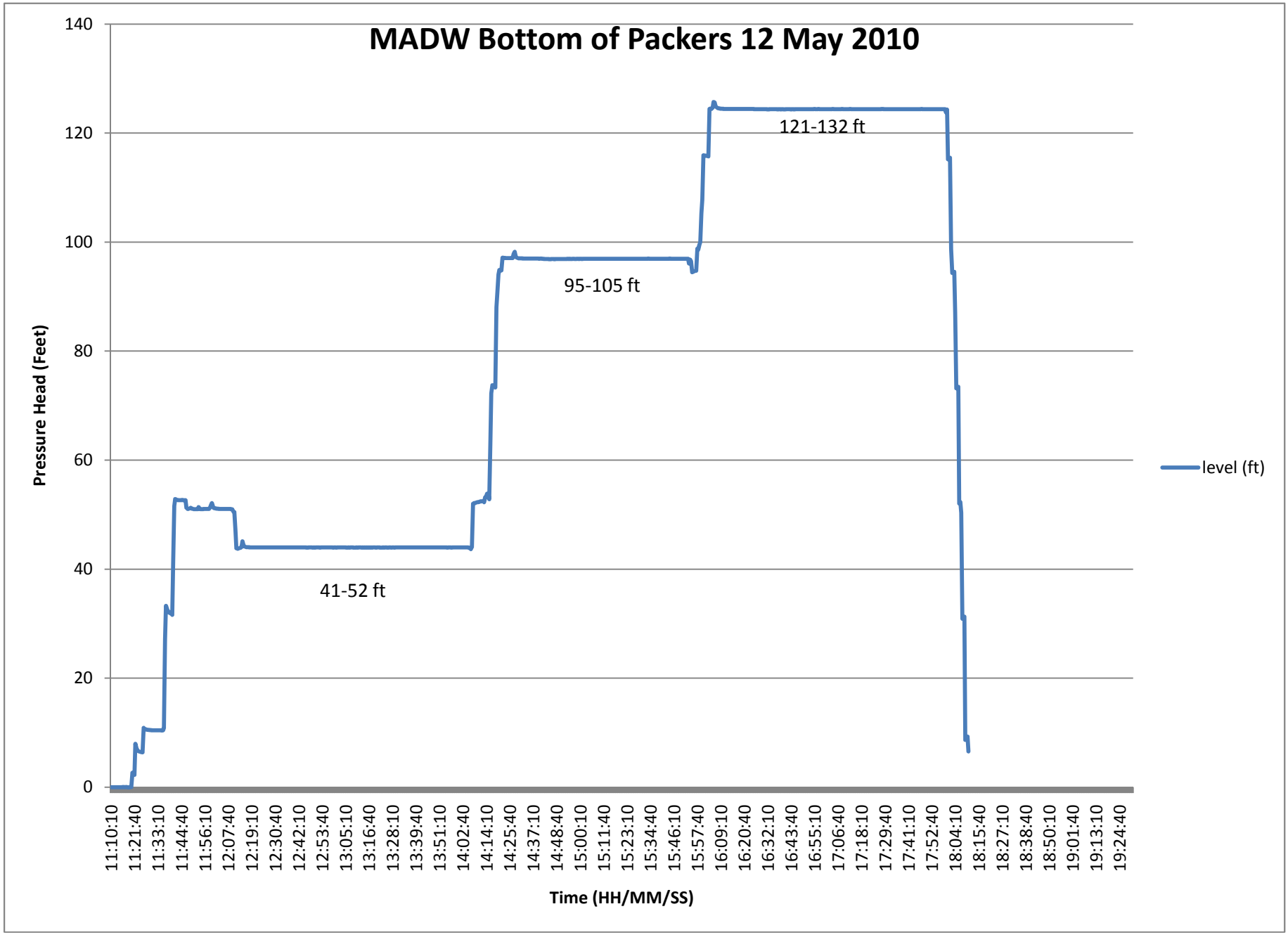
DISSOLVED OXYGEN CALIBRATION

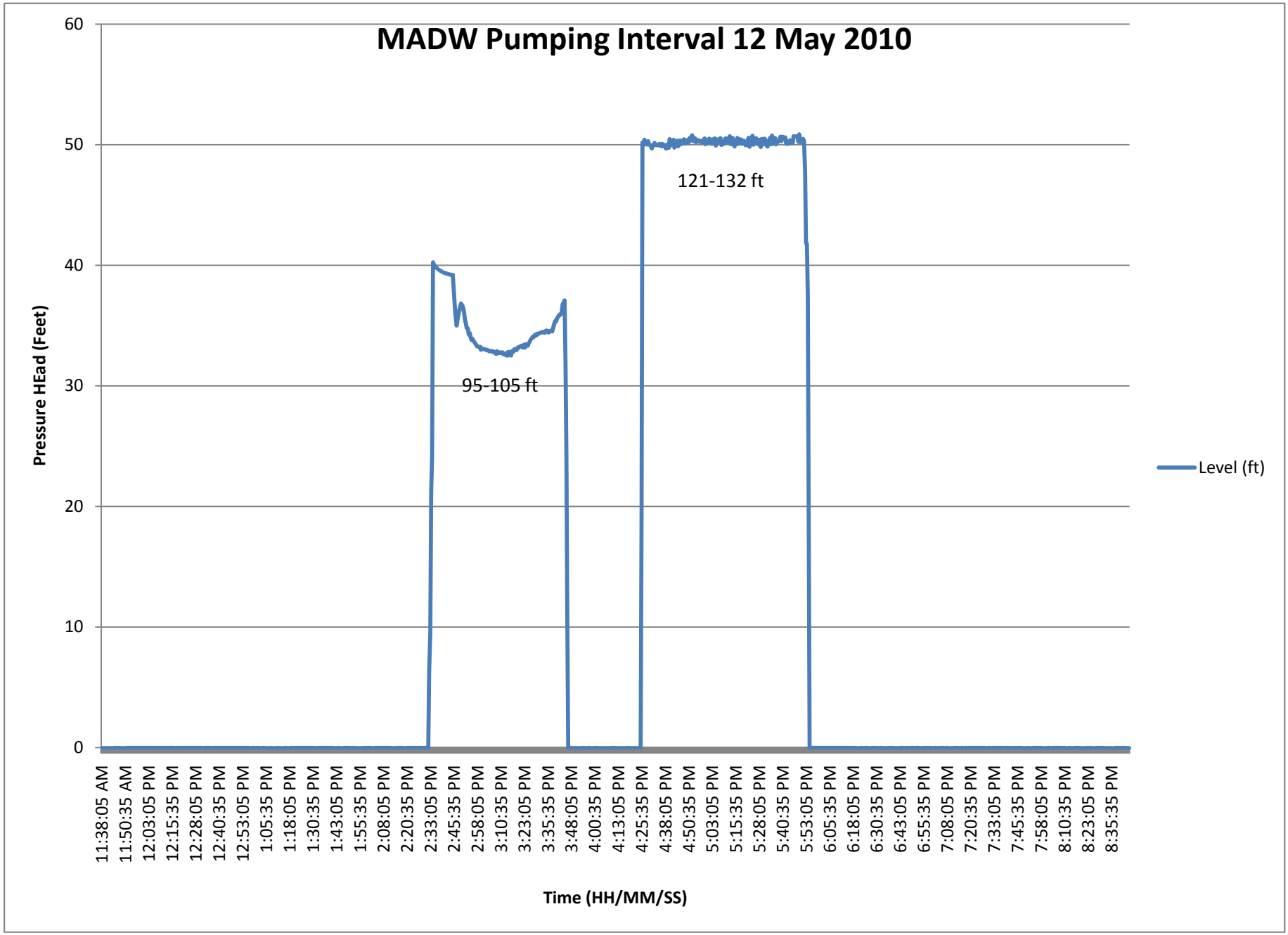
STANDARD	INTITIAL READING	FINAL READING
100% AIR SATURATION	NA on horiba	

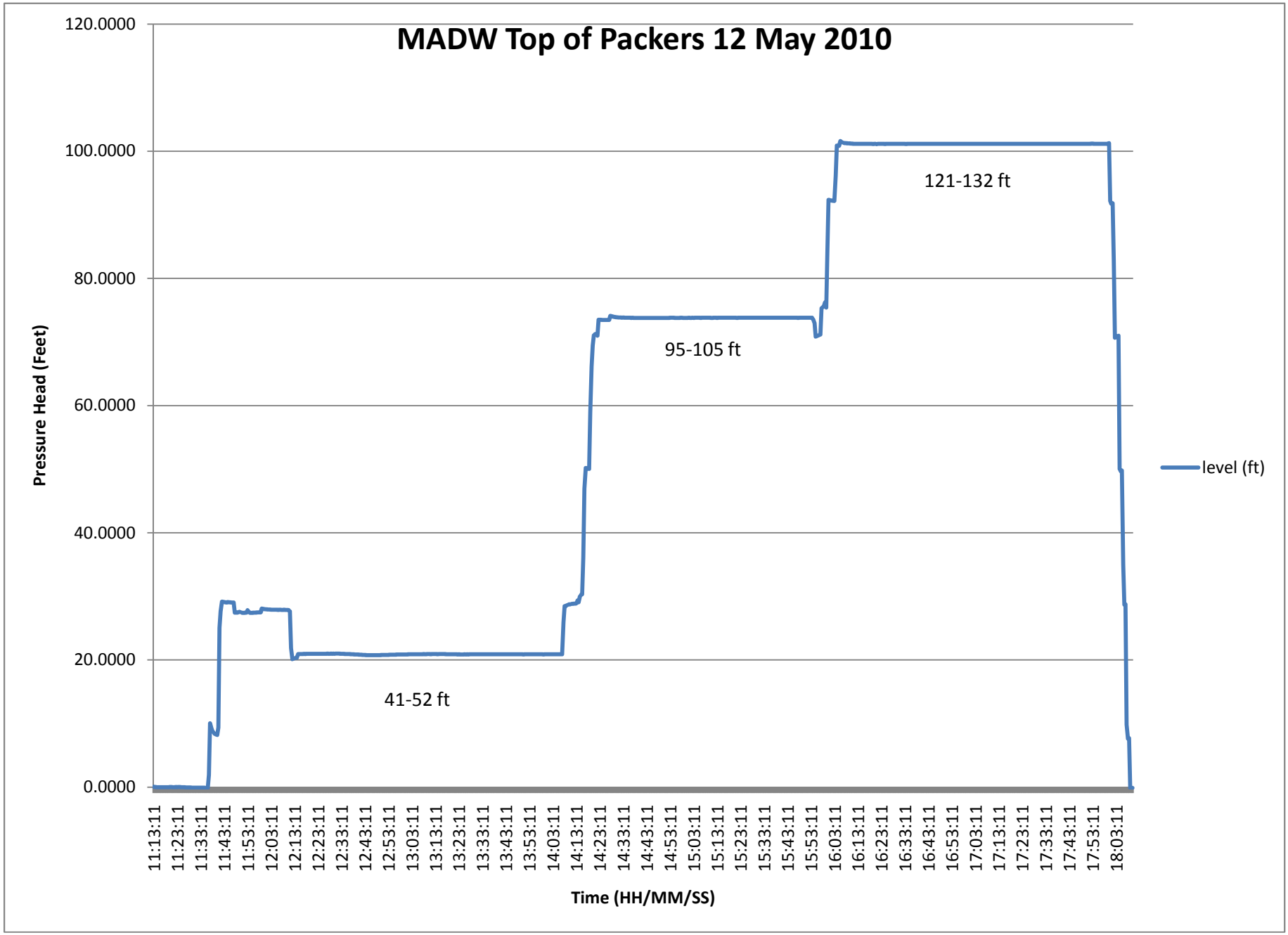
COMMENTS

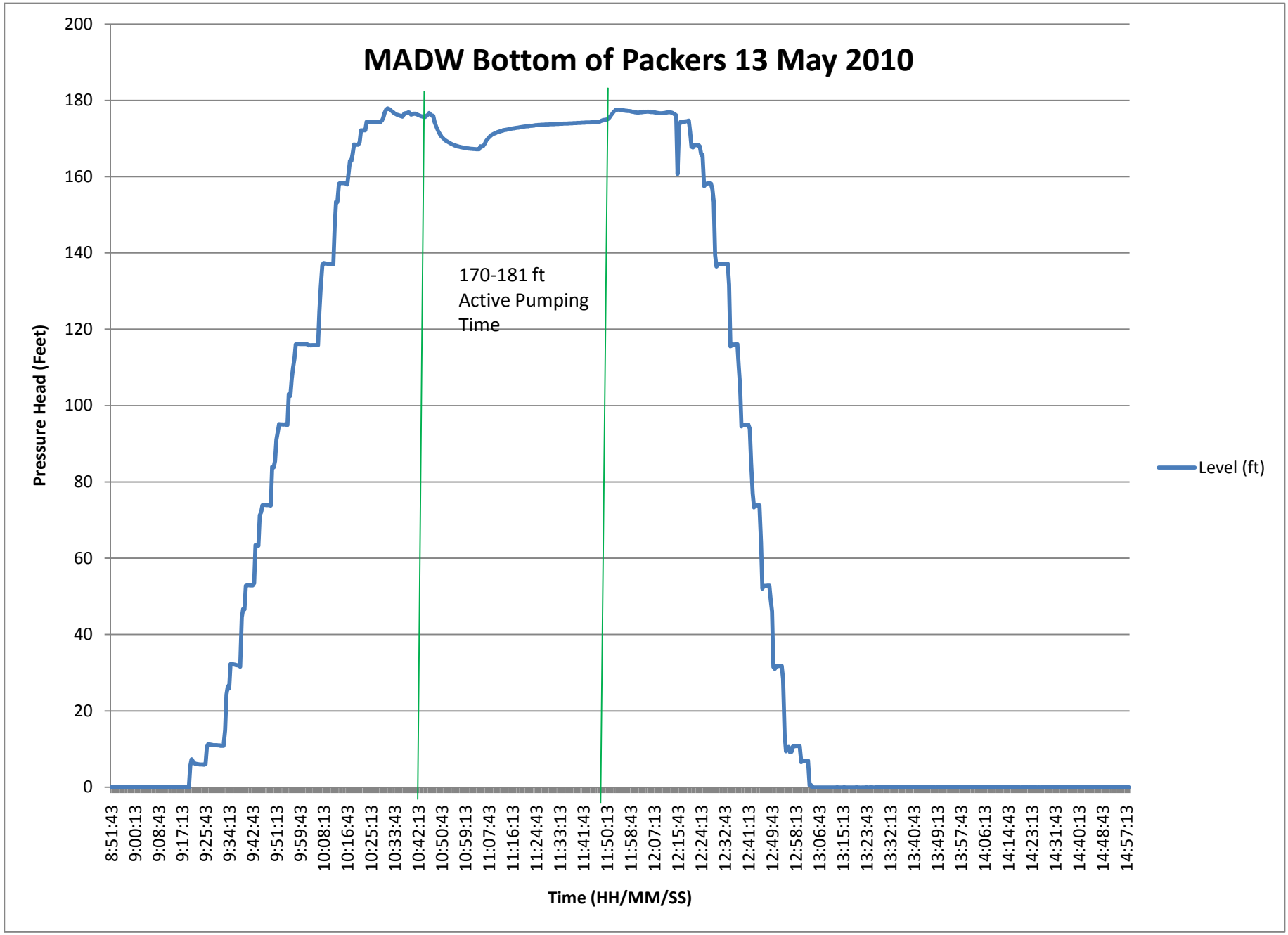
SIGNATURE

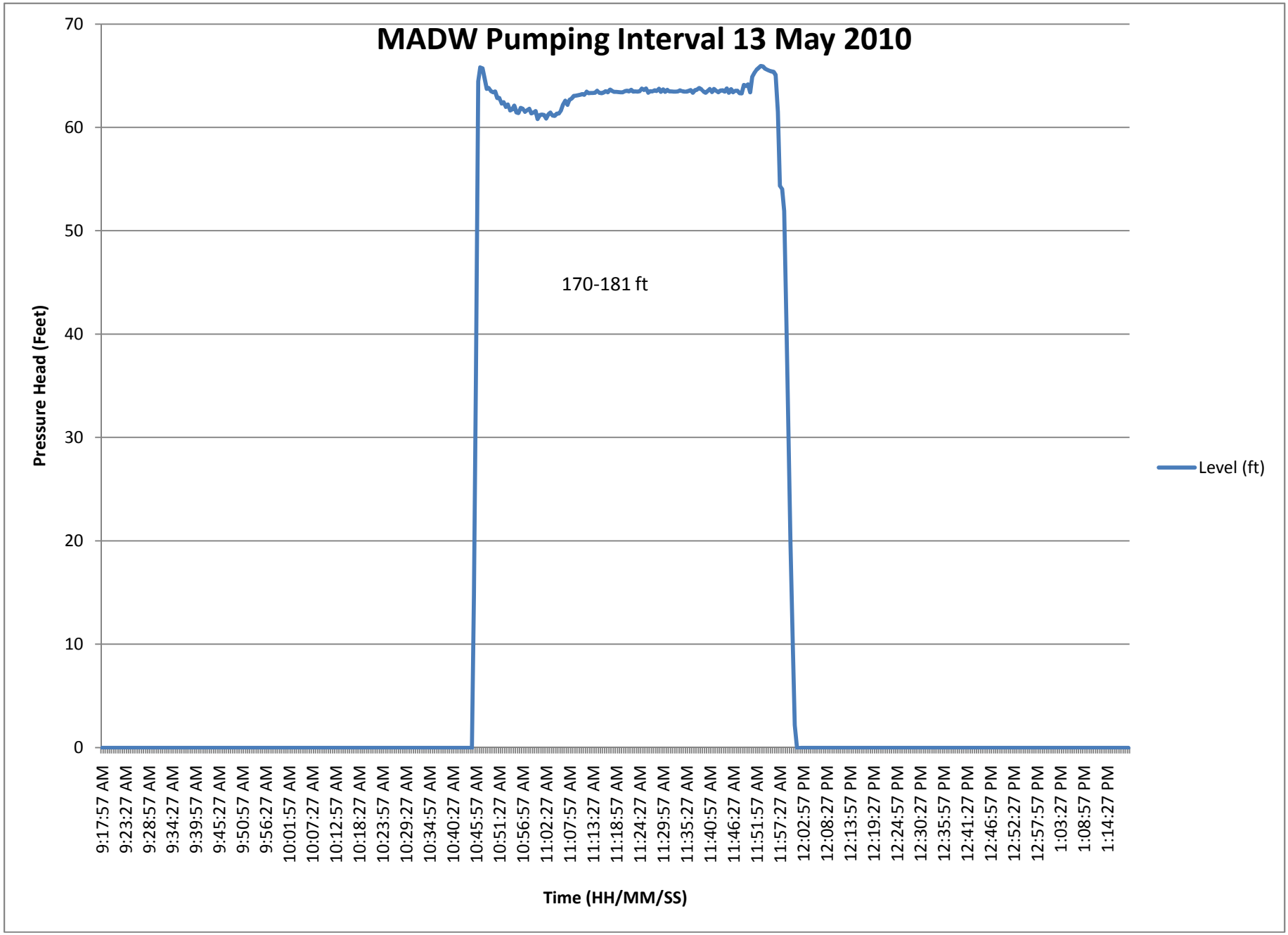
Straddle Packer Transducer Data
(additional electronic data provided)

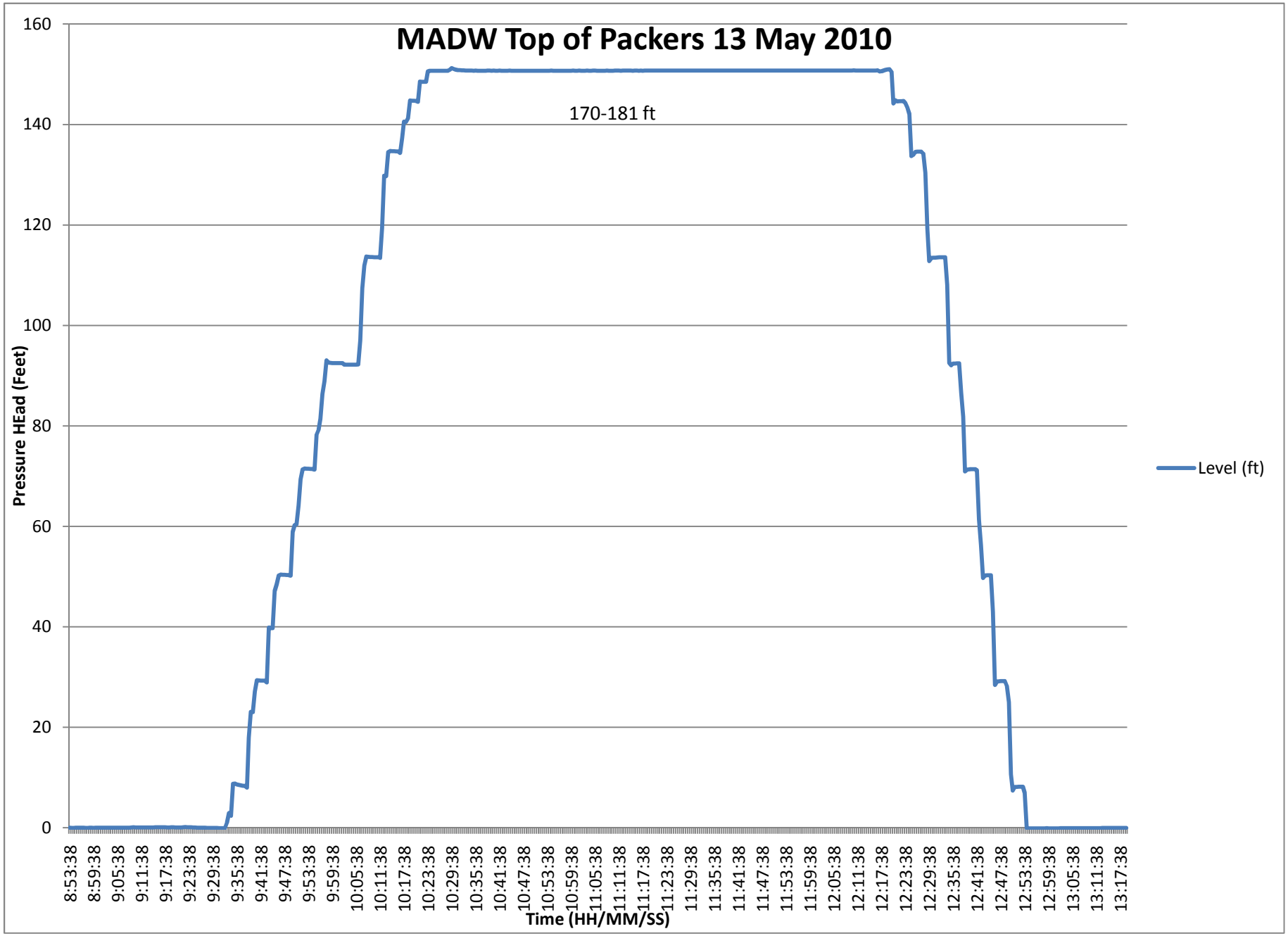

MADW Bottom of Packers 12 May 2010
Pressure Head (Feet)
140
120
100
80
60
40
20
0
121-132 ft
95-105 ft
41-52 ft
level (ft)
11:10:10
11:21:40
11:33:10
11:44:40
11:56:10
12:07:40
12:19:10
12:30:40
12:42:10
12:53:40
13:05:10
13:16:40
13:28:10
13:39:40
13:51:10
14:02:40
14:14:10
14:25:40
14:37:10
14:48:40
15:00:10
15:11:40
15:23:10
15:34:40
15:46:10
15:57:40
16:09:10
16:20:40
16:32:10
16:43:40
16:55:10
17:06:40
17:18:10
17:29:40
17:41:10
17:52:40
18:04:10
18:15:40
18:27:10
18:38:40
18:50:10
19:01:40
19:13:10
19:24:40
Time (HH/MM/SS)

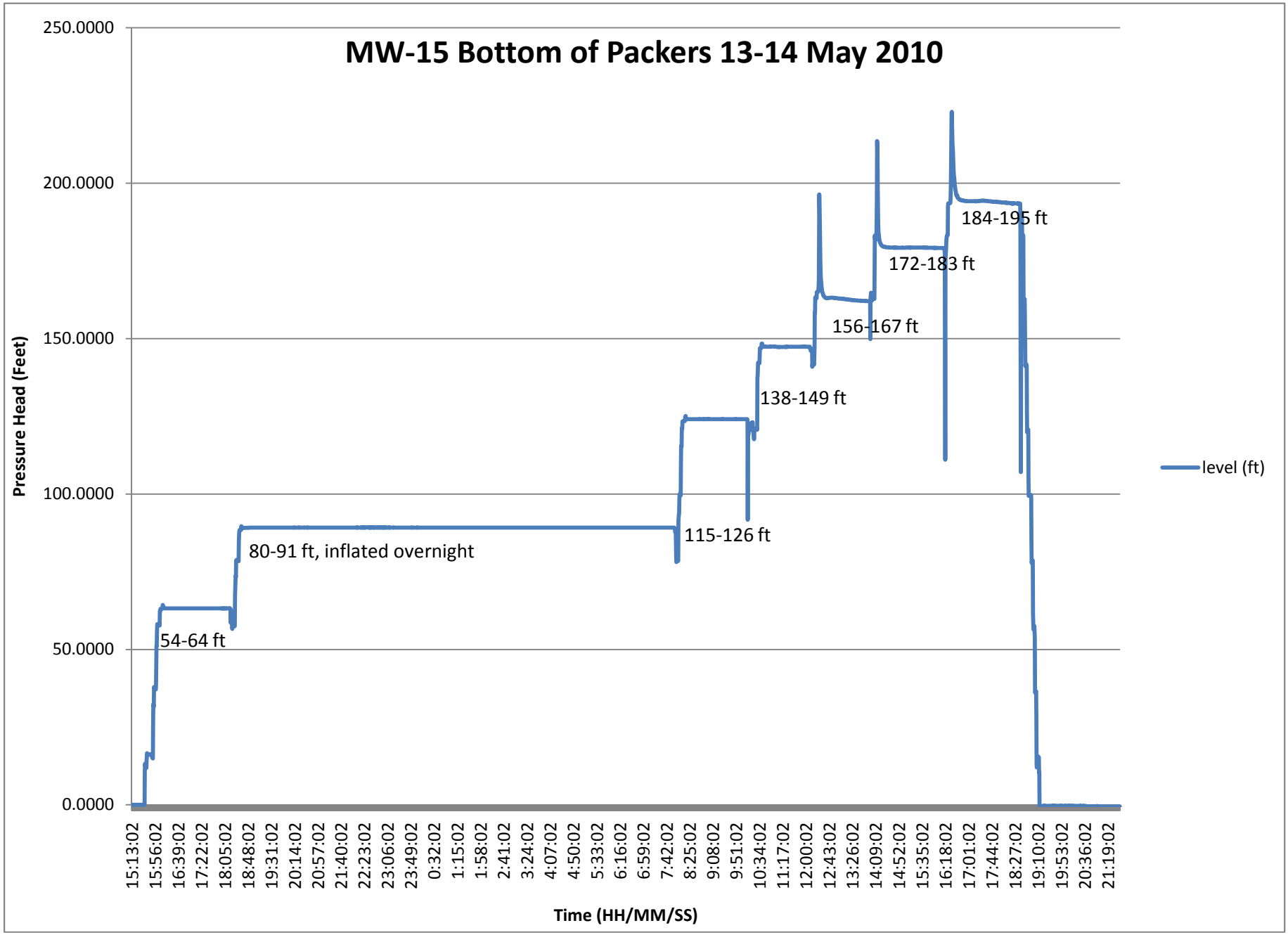

MADW Pumping Interval 12 May 2010
Pressure HEad (Feet)
60
50
40
30
20
10
0
121-132 ft
95-105 ft
Level (ft)
11:38:05 AM
11:50:35 AM
12:03:05 PM
12:15:35 PM
12:28:05 PM
12:40:35 PM
12:53:05 PM
1:05:35 PM
1:18:05 PM
1:30:35 PM
1:43:05 PM
1:55:35 PM
2:08:05 PM
2:20:35 PM
2:33:05 PM
2:45:35 PM
2:58:05 PM
3:10:35 PM
3:23:05 PM
3:35:35 PM
3:48:05 PM
4:00:35 PM
4:13:05 PM
4:25:35 PM
4:38:05 PM
4:50:35 PM
5:03:05 PM
5:15:35 PM
5:28:05 PM
5:40:35 PM
5:53:05 PM
6:05:35 PM
6:18:05 PM
6:30:35 PM
6:43:05 PM
6:55:35 PM
7:08:05 PM
7:20:35 PM
7:33:05 PM
7:45:35 PM
7:58:05 PM
8:10:35 PM
8:23:05 PM
8:35:35 PM
Time (HH/MM/SS)

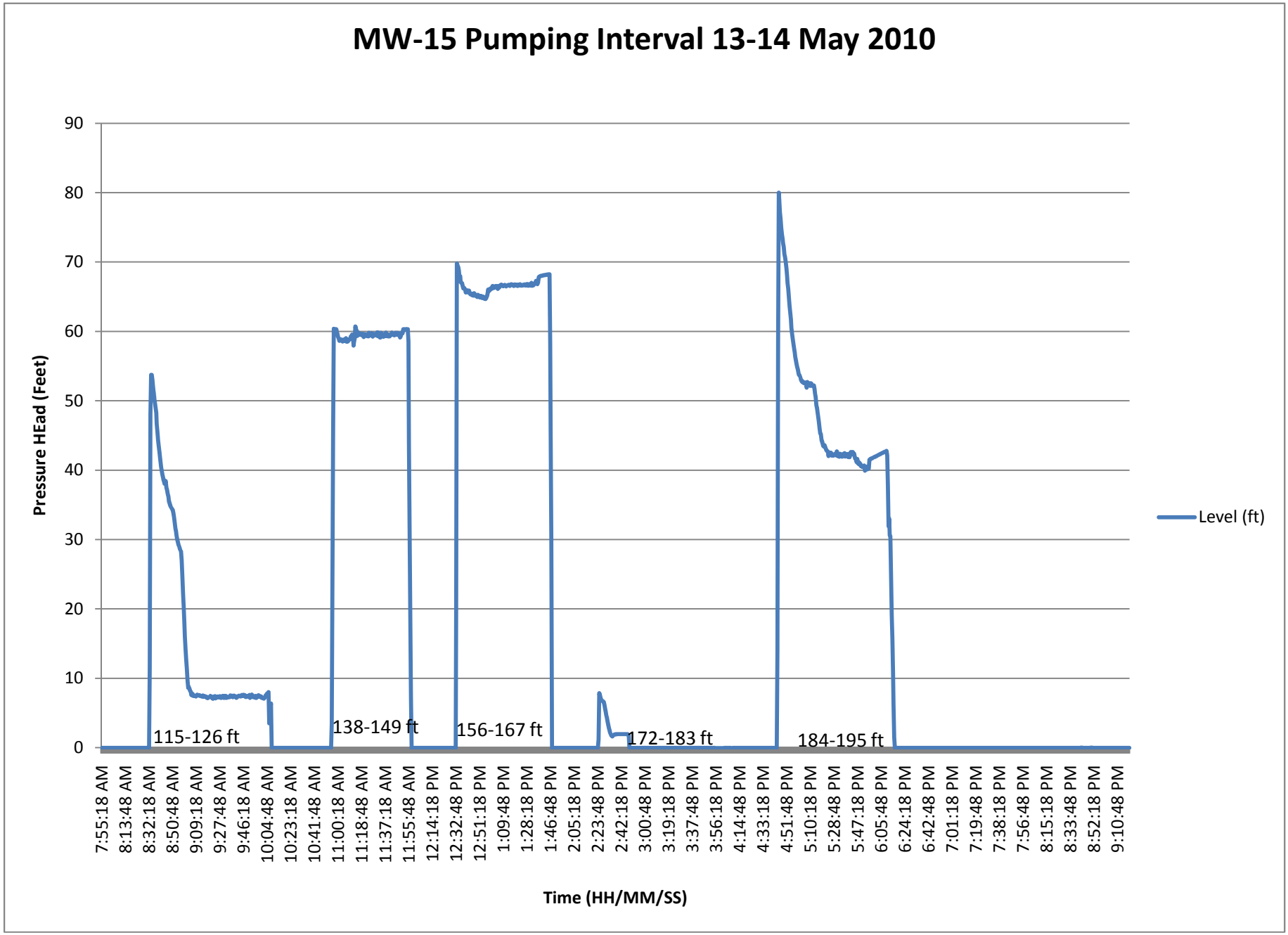

MADW Top of Packers 12 May 2010
120.0000
100.0000
80.0000
60.0000
40.0000
20.0000
0.0000
Pressure Head (Feet)
121-132 ft
95-105 ft
41-52 ft
level (ft)
11:13:11
11:23:11
11:33:11
11:43:11
11:53:11
12:03:11
12:13:11
12:23:11
12:33:11
12:43:11
12:53:11
13:03:11
13:13:11
13:23:11
13:33:11
13:43:11
13:53:11
14:03:11
14:13:11
14:23:11
14:33:11
14:43:11
14:53:11
15:03:11
15:13:11
15:23:11
15:33:11
15:43:11
15:53:11
16:03:11
16:13:11
16:23:11
16:33:11
16:43:11
16:53:11
17:03:11
17:13:11
17:23:11
17:33:11
17:43:11
17:53:11
18:03:11
Time (HH/MM/SS)

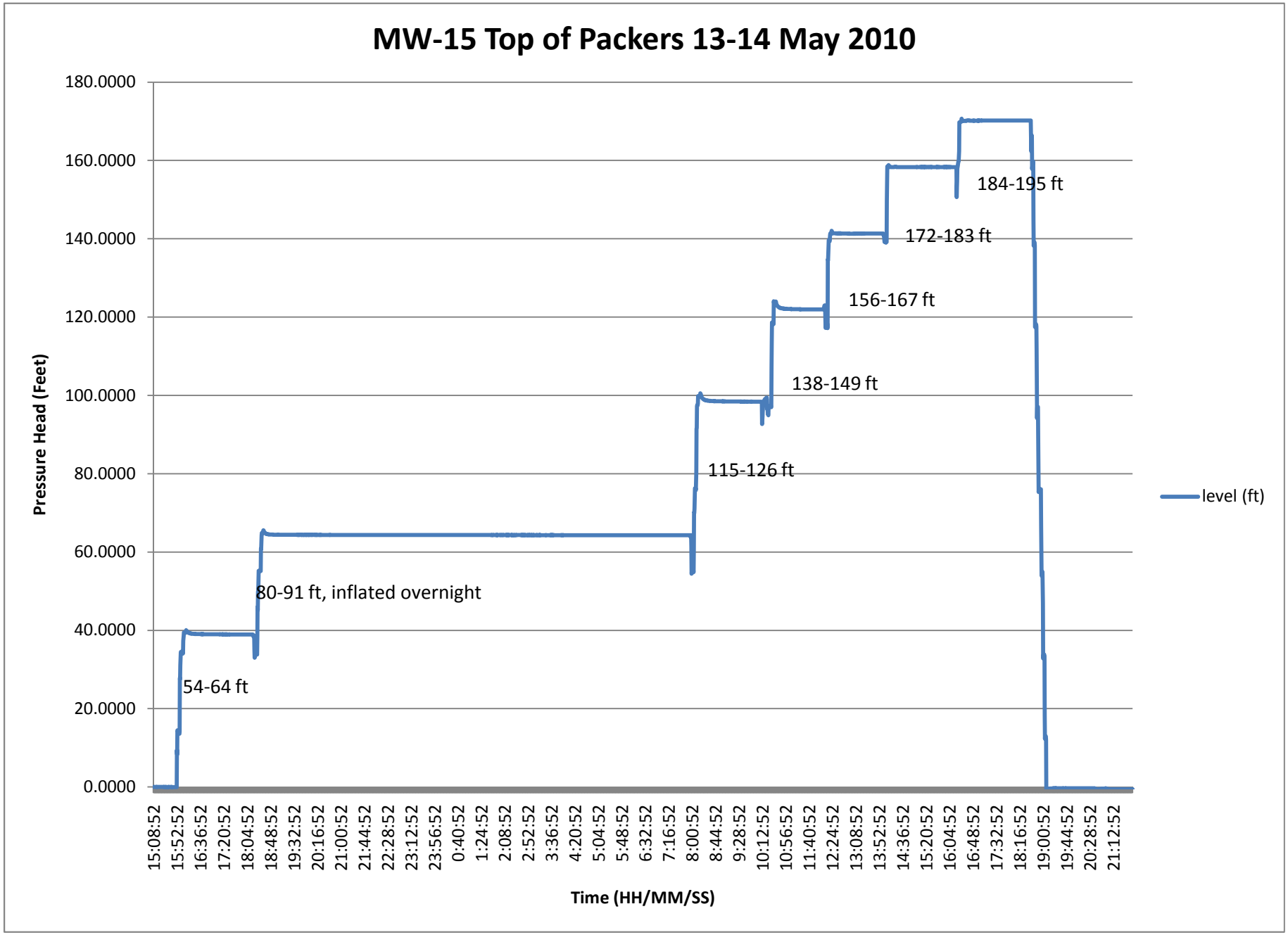

MADW Bottom of Packers 13 May 2010
Pressure Head (Feet)
200
180
160
140
120
100
80
60
40
20
0
170-181 ft
Active Pumping
Time
Level (ft)
8:51:43
9:00:13
9:08:43
9:17:13
9:25:43
9:34:13
9:42:43
9:51:13
9:59:43
10:08:13
10:16:43
10:25:13
10:33:43
10:42:13
10:50:43
10:59:13
11:07:43
11:16:13
11:24:43
11:33:13
11:41:43
11:50:13
11:58:43
12:07:13
12:15:43
12:24:13
12:32:43
12:41:13
12:49:43
12:58:13
13:06:43
13:15:13
13:23:43
13:32:13
13:40:43
13:49:13
13:57:43
14:06:13
14:14:43
14:23:13
14:31:43
14:40:13
14:48:43
14:57:13
Time (HH/MM/SS)


MADW Pumping Interval 13 May 2010
170-181 ft
Pressure Head (Feet)
70
60
50
40
30
20
10
0
9:17:57 AM
9:23:27 AM
9:28:57 AM
9:34:27 AM
9:39:57 AM
9:45:27 AM
9:50:57 AM
9:56:27 AM
10:01:57 AM
10:07:27 AM
10:12:57 AM
10:18:27 AM
10:23:57 AM
10:29:27 AM
10:34:57 AM
10:40:27 AM
10:45:57 AM
10:51:27 AM
10:56:57 AM
11:02:27 AM
11:07:57 AM
11:13:27 AM
11:18:57 AM
11:24:27 AM
11:29:57 AM
11:35:27 AM
11:40:57 AM
11:46:27 AM
11:51:57 AM
11:57:27 AM
12:02:57 PM
12:08:27 PM
12:13:57 PM
12:19:27 PM
12:24:57 PM
12:30:27 PM
12:35:57 PM
12:41:27 PM
12:46:57 PM
12:52:27 PM
12:57:57 PM
1:03:27 PM
1:08:57 PM
1:14:27 PM
Time (HH/MM/SS)
Level (ft)


MADW Top of Packers 13 May 2010
170-181 ft
Pressure HEad (Feet)
160
140
120
100
80
60
40
20
0
8:53:38
8:59:38
9:05:38
9:11:38
9:17:38
9:23:38
9:29:38
9:35:38
9:41:38
9:47:38
9:53:38
9:59:38
10:05:38
10:11:38
10:17:38
10:23:38
10:29:38
10:35:38
10:41:38
10:47:38
10:53:38
10:59:38
11:05:38
11:11:38
11:17:38
11:23:38
11:29:38
11:35:38
11:41:38
11:47:38
11:53:38
11:59:38
12:05:38
12:11:38
12:17:38
12:23:38
12:29:38
12:35:38
12:41:38
12:47:38
12:53:38
12:59:38
13:05:38
13:11:38
13:17:38
Time (HH/MM/SS)
Level (ft)


MW-15 Bottom of Packers 13-14 May 2010
Pressure Head (Feet)
250.0000
200.0000
150.0000
100.0000
50.0000
0.0000
54-64 ft
80-91 ft, inflated overnight
115-126 ft
138-149 ft
156-167 ft
172-183 ft
184-195 ft
level (ft)
15:13:02
15:56:02
16:39:02
17:22:02
18:05:02
18:48:02
19:31:02
20:14:02
20:57:02
21:40:02
22:23:02
23:06:02
23:49:02
0:32:02
1:15:02
1:58:02
2:41:02
3:24:02
4:07:02
4:50:02
5:33:02
6:16:02
6:59:02
7:42:02
8:25:02
9:08:02
9:51:02
10:34:02
11:17:02
12:00:02
12:43:02
13:26:02
14:09:02
14:52:02
15:35:02
16:18:02
17:01:02
17:44:02
18:27:02
19:10:02
19:53:02
20:36:02
21:19:02
Time (HH/MM/SS)


MW-15 Pumping Interval 13-14 May 2010
Pressure HEad (Feet)
90
80
70
60
50
40
30
20
10
0
115-126 ft
138-149 ft
156-167 ft
172-183 ft
184-195 ft
7:55:18 AM
8:13:48 AM
8:32:18 AM
8:50:48 AM
9:09:18 AM
9:27:48 AM
9:46:18 AM
10:04:48 AM
10:23:18 AM
10:41:48 AM
11:00:18 AM
11:18:48 AM
11:37:18 AM
11:55:48 AM
12:14:18 PM
12:32:48 PM
12:51:18 PM
1:09:48 PM
1:28:18 PM
1:46:48 PM
2:05:18 PM
2:23:48 PM
2:42:18 PM
3:00:48 PM
3:19:18 PM
3:37:48 PM
3:56:18 PM
4:14:48 PM
4:33:18 PM
4:51:48 PM
5:10:18 PM
5:28:48 PM
5:47:18 PM
6:05:48 PM
6:24:18 PM
6:42:48 PM
7:01:18 PM
7:19:48 PM
7:38:18 PM
7:56:48 PM
8:15:18 PM
8:33:48 PM
8:52:18 PM
9:10:48 PM
Time (HH/MM/SS)
Level (ft)


MW-15 Top of Packers 13-14 May 2010
Pressure Head (Feet)
180.0000
160.0000
140.0000
120.0000
100.0000
80.0000
60.0000
40.0000
20.0000
0.0000
54-64 ft
80-91 ft, inflated overnight
115-126 ft
138-149 ft
156-167 ft
172-183 ft
184-195 ft
level (ft)
15:08:52
15:52:52
16:36:52
17:20:52
18:04:52
18:48:52
19:32:52
20:16:52
21:00:52
21:44:52
22:28:52
23:12:52
23:56:52
0:40:52
1:24:52
2:08:52
2:52:52
3:36:52
4:20:52
5:04:52
5:48:52
6:32:52
7:16:52
8:00:52
8:44:52
9:28:52
10:12:52
10:56:52
11:40:52
12:24:52
13:08:52
13:52:52
14:36:52
15:20:52
16:04:52
16:48:52
17:32:52
18:16:52
19:00:52
19:44:52
20:28:52
21:12:52
Time (HH/MM/SS)

APPENDIX D

LABORATORY REPORTS

ANALYTICAL LABORATORY SERVICES, INC.
www.analyticallab.com
NELAP Accredited
PA 22-293 NJ PA010
34 Dogwood Lane - Middletown, PA 17057 Phone: 717-944-5541 Fax: 717-944-1430

Certificate of Analysis

Project Name:	**USACE-MARSH RUN PARK - NEW**	Workorder:	**9847765**
Purchase Order:		Workorder ID:	**Marsh Run**

Ms. Denise Wilt
EA Engineering-York PA
One Marketway West, Suite 4C
York, PA 17401

June 8, 2010

Dear Ms. Wilt,

Enclosed are the analytical results for samples received by the laboratory on Wednesday, June 02, 2010

ALSI is a National Environmental Laboratory Accreditation Program (NELAP) accredited laboratory and as such, certifies that all applicable test results meet the requirements of NELAP.

If you have any questions regarding this certificate of analysis, please contact Denise Brooks (Project Coordinator) or Anna G Milliken (Laboratory Manager) at (717) 944-5541.

Please visit us at www.analyticallab.com for a listing of ALSI's NELAP accreditations and Scope of Work, as well as other links to Water Quality documentation on the internet.

This laboratory report may not be reproduced, except in full, without the written approval of ALSI.

NOTE: ALSI has changed the report generation tool and while we have tried to retain the existing format, you will notice some changes in the laboratory report. Please feel free to contact ALSI in case you have any questions.

Analytical Laboratory Services, Inc.

CC: Sandra Staigewald

This page is included as part of the Analytical Report and must be retained as a permanent record thereof.

Anna G Milliken
Laboratory Manager

ANALYTICAL LABORATORY SERVICES, INC.
www.analyticallab.com
NELAP Accredited
PA 22-293 NJ PA010
34 Dogwood Lane - Middletown, PA 17057 Phone: 717-944-5541 Fax: 717-944-1430

SAMPLE SUMMARY

Workorder: 9847765 Marsh Run

Discard Date: 06/21/2010

Lab ID	Sample ID	Matrix	Date Collected	Date Received	Collected By
9847765001	Effluent-1	Water	6/1/10 13:20	6/2/10 11:55	Denise Wilt
9847765002	Effluent-2	Water	6/2/10 09:30	6/2/10 11:55	Denise Wilt

Workorder Comments:

Notes

-- Samples collected by ALSI personnel are done so in accordance with the procedures set forth in the ALSI Field Sampling Plan (20 - Field Services Sampling Plan).
-- All Waste Water analyses comply with methodology requirements of 40 CFR Part 136.
-- All Drinking Water analyses comply with methodology requirements of 40 CFR Part 141.
-- Unless otherwise noted, all quantitative results for soils are reported on a dry weight basis.
-- The Chain of Custody document is included as part of this report.

Standard Acronyms/Flags

J, B	Indicates an estimated value between the Method Detection Limit (MDL) and the Practical Quantitation Limit (PQL) for the analyte
U	Indicates that the analyte was Not Detected (ND)
MDL	Method Detection Limit
PQL	Practical Quantitation Limit
RDL	Reporting Detection Limit
ND	Not Detected - indicates that the analyte was Not Detected at the RDL
Cntr	Analysis was performed using this container
RegLmt	Regulatory Limit
LCS	Laboratory Control Sample
MS	Matrix Spike
MSD	Matrix Spike Duplicate
DUP	Sample Duplicate
%Rec	Percent Recovery
RPD	Relative Percent Difference

ANALYTICAL LABORATORY SERVICES, INC.
www.analyticallab.com
NELAP Accredited
PA 22-293 NJ PA010
34 Dogwood Lane - Middletown, PA 17057 Phone: 717-944-5541 Fax: 717-944-1430

ANALYTICAL RESULTS

Workorder: 9847765 Marsh Run

Lab ID: **9847765001** Date Collected: 6/1/2010 13:20 Matrix: Water

Sample ID: **Effluent-1** Date Received: 6/2/2010 11:55

Parameters	Results	Units	Footnotes	LOQ	LOD	DL	Method	Prepared	Analyzed	By	Cntr
VOLATILE ORGANICS											
Acetone	<5.0U	ug/L		5.0	5.0	1.6	SW846 8260B		6/4/10 11:46	MES	A
Benzene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		6/4/10 11:46	MES	A
Bromochloromethane	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		6/4/10 11:46	MES	A
Bromodichloromethane	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		6/4/10 11:46	MES	A
Bromoform	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		6/4/10 11:46	MES	A
Bromomethane	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		6/4/10 11:46	MES	A
2-Butanone	<5.0U	ug/L		5.0	5.0	1.6	SW846 8260B		6/4/10 11:46	MES	A
Carbon Disulfide	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		6/4/10 11:46	MES	A
Carbon Tetrachloride	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		6/4/10 11:46	MES	A
Chlorobenzene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		6/4/10 11:46	MES	A
Chlorodibromomethane	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		6/4/10 11:46	MES	A
Chloroethane	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		6/4/10 11:46	MES	A
Chloroform	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		6/4/10 11:46	MES	A
Chloromethane	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		6/4/10 11:46	MES	A
1,2-Dibromo-3-chloropropane	<5.0U	ug/L		5.0	5.0	1.6	SW846 8260B		6/4/10 11:46	MES	A
1,2-Dibromoethane	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		6/4/10 11:46	MES	A
1,1-Dichloroethane	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		6/4/10 11:46	MES	A
1,2-Dichloroethane	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		6/4/10 11:46	MES	A
1,1-Dichloroethene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		6/4/10 11:46	MES	A
cis-1,2-Dichloroethene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		6/4/10 11:46	MES	A
trans-1,2-Dichloroethene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		6/4/10 11:46	MES	A
1,2-Dichloropropane	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		6/4/10 11:46	MES	A
cis-1,3-Dichloropropene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		6/4/10 11:46	MES	A
trans-1,3-Dichloropropene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		6/4/10 11:46	MES	A
Ethylbenzene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		6/4/10 11:46	MES	A
2-Hexanone	<5.0U	ug/L		5.0	5.0	1.6	SW846 8260B		6/4/10 11:46	MES	A
4-Methyl-2-Pentanone(MIBK)	<5.0U	ug/L		5.0	5.0	1.6	SW846 8260B		6/4/10 11:46	MES	A
Methylene Chloride	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		6/4/10 11:46	MES	A
Styrene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		6/4/10 11:46	MES	A
1,1,2,2-Tetrachloroethane	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		6/4/10 11:46	MES	A
Tetrachloroethene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		6/4/10 11:46	MES	A
Toluene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		6/4/10 11:46	MES	A
Total Xylenes	<3.0U	ug/L		3.0	3.0	1.0	SW846 8260B		6/4/10 11:46	MES	A
1,1,1-Trichloroethane	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		6/4/10 11:46	MES	A
1,1,2-Trichloroethane	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		6/4/10 11:46	MES	A
Trichloroethene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		6/4/10 11:46	MES	A
Vinyl Chloride	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		6/4/10 11:46	MES	A
o-Xylene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		6/4/10 11:46	MES	A
mp-Xylene	<2.0U	ug/L		2.0	2.0	0.66	SW846 8260B		6/4/10 11:46	MES	A

Surrogate Recoveries	*Results*	*Units*	*Footnotes*	*Limits*	*Method*	*Prepared*	*Analyzed*	*By*	*Cntr*
1,2-Dichloroethane-d4 (S)	106	%		70-120	SW846 8260B		6/4/10 11:46	MES	A
4-Bromofluorobenzene (S)	94.4	%		75-120	SW846 8260B		6/4/10 11:46	MES	A
Dibromofluoromethane (S)	102	%		85-115	SW846 8260B		6/4/10 11:46	MES	A
Toluene-d8 (S)	94.9	%		85-120	SW846 8260B		6/4/10 11:46	MES	A

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ANALYTICAL RESULTS

Workorder: 9847765 Marsh Run

Lab ID:	**9847765001**	Date Collected:	6/1/2010 13:20	Matrix:	Water
Sample ID:	**Effluent-1**	Date Received:	6/2/2010 11:55		

Parameters	Results	Units	Footnotes	LOQ	LOD	DL	Method	Prepared	Analyzed	By	Cntr

Sample Comments:

Anna G Milliken
Laboratory Manager

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ANALYTICAL RESULTS

Workorder: 9847765 Marsh Run

Lab ID: **9847765002** Date Collected: 6/2/2010 09:30 Matrix: Water

Sample ID: **Effluent-2** Date Received: 6/2/2010 11:55

Parameters	Results	Units	Footnotes	LOQ	LOD	DL	Method	Prepared	Analyzed	By	Cntr
VOLATILE ORGANICS											
Acetone	<5.0U	ug/L		5.0	5.0	1.6	SW846 8260B		6/4/10 12:19	MES	A
Benzene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		6/4/10 12:19	MES	A
Bromochloromethane	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		6/4/10 12:19	MES	A
Bromodichloromethane	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		6/4/10 12:19	MES	A
Bromoform	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		6/4/10 12:19	MES	A
Bromomethane	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		6/4/10 12:19	MES	A
2-Butanone	<5.0U	ug/L		5.0	5.0	1.6	SW846 8260B		6/4/10 12:19	MES	A
Carbon Disulfide	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		6/4/10 12:19	MES	A
Carbon Tetrachloride	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		6/4/10 12:19	MES	A
Chlorobenzene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		6/4/10 12:19	MES	A
Chlorodibromomethane	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		6/4/10 12:19	MES	A
Chloroethane	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		6/4/10 12:19	MES	A
Chloroform	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		6/4/10 12:19	MES	A
Chloromethane	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		6/4/10 12:19	MES	A
1,2-Dibromo-3-chloropropane	<5.0U	ug/L		5.0	5.0	1.6	SW846 8260B		6/4/10 12:19	MES	A
1,2-Dibromoethane	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		6/4/10 12:19	MES	A
1,1-Dichloroethane	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		6/4/10 12:19	MES	A
1,2-Dichloroethane	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		6/4/10 12:19	MES	A
1,1-Dichloroethene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		6/4/10 12:19	MES	A
cis-1,2-Dichloroethene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		6/4/10 12:19	MES	A
trans-1,2-Dichloroethene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		6/4/10 12:19	MES	A
1,2-Dichloropropane	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		6/4/10 12:19	MES	A
cis-1,3-Dichloropropene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		6/4/10 12:19	MES	A
trans-1,3-Dichloropropene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		6/4/10 12:19	MES	A
Ethylbenzene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		6/4/10 12:19	MES	A
2-Hexanone	<5.0U	ug/L		5.0	5.0	1.6	SW846 8260B		6/4/10 12:19	MES	A
4-Methyl-2-Pentanone(MIBK)	<5.0U	ug/L		5.0	5.0	1.6	SW846 8260B		6/4/10 12:19	MES	A
Methylene Chloride	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		6/4/10 12:19	MES	A
Styrene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		6/4/10 12:19	MES	A
1,1,2,2-Tetrachloroethane	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		6/4/10 12:19	MES	A
Tetrachloroethene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		6/4/10 12:19	MES	A
Toluene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		6/4/10 12:19	MES	A
Total Xylenes	<3.0U	ug/L		3.0	3.0	1.0	SW846 8260B		6/4/10 12:19	MES	A
1,1,1-Trichloroethane	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		6/4/10 12:19	MES	A
1,1,2-Trichloroethane	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		6/4/10 12:19	MES	A
Trichloroethene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		6/4/10 12:19	MES	A
Vinyl Chloride	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		6/4/10 12:19	MES	A
o-Xylene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		6/4/10 12:19	MES	A
mp-Xylene	<2.0U	ug/L		2.0	2.0	0.66	SW846 8260B		6/4/10 12:19	MES	A

Surrogate Recoveries	*Results*	*Units*	*Footnotes*	*Limits*	*Method*	*Prepared*	*Analyzed*	*By*	*Cntr*
1,2-Dichloroethane-d4 (S)	104	%		70-120	SW846 8260B		6/4/10 12:19	MES	A
4-Bromofluorobenzene (S)	98.9	%		75-120	SW846 8260B		6/4/10 12:19	MES	A
Dibromofluoromethane (S)	99.9	%		85-115	SW846 8260B		6/4/10 12:19	MES	A
Toluene-d8 (S)	92.2	%		85-120	SW846 8260B		6/4/10 12:19	MES	A

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ANALYTICAL RESULTS

Workorder: 9847765 Marsh Run

Lab ID:	**9847765002**	Date Collected:	6/2/2010 09:30	Matrix:	Water
Sample ID:	**Effluent-2**	Date Received:	6/2/2010 11:55		

Parameters	Results	Units	Footnotes	LOQ	LOD	DL	Method	Prepared	Analyzed	By	Cntr

Sample Comments:

Anna G Milliken
Laboratory Manager

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Certificate of Analysis

Project Name:	**USACE-MARSH RUN PARK - NEW**	Workorder:	**9844446**
Purchase Order:	**7739**	Workorder ID:	**EMS001|USACE-MARSH RUN PARK**

Ms. Denise Wilt
EA Engineering-York PA
One Marketway West, Suite 4C
York, PA 17401

May 13, 2010

Dear Ms. Wilt,

Enclosed are the analytical results for samples received by the laboratory on Wednesday, May 12, 2010

ALSI is a National Environmental Laboratory Accreditation Program (NELAP) accredited laboratory and as such, certifies that all applicable test results meet the requirements of NELAP.

If you have any questions regarding this certificate of analysis, please contact Denise Brooks (Project Coordinator) or Anna G Milliken (Laboratory Manager) at (717) 944-5541.

Please visit us at www.analyticallab.com for a listing of ALSI's NELAP accreditations and Scope of Work, as well as other links to Water Quality documentation on the internet.

This laboratory report may not be reproduced, except in full, without the written approval of ALSI.

NOTE: ALSI has changed the report generation tool and while we have tried to retain the existing format, you will notice some changes in the laboratory report. Please feel free to contact ALSI in case you have any questions.

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This page is included as part of the Analytical Report and must be retained as a permanent record thereof.

Anna G Milliken
Laboratory Manager

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SAMPLE SUMMARY

Workorder: 9844446 EMS001|USACE-MARSH RUN PARK NC

Discard Date: 05/27/2010

Lab ID	Sample ID	Matrix	Date Collected	Date Received	Collected By
9844446001	MADW 41-52	Ground Water	5/12/10 13:57	5/12/10 18:24	Denise Wilt
9844446002	MADW 94-105	Ground Water	5/12/10 15:36	5/12/10 18:24	Denise Wilt
9844446003	MADW 121-132	Ground Water	5/12/10 17:45	5/12/10 18:24	Denise Wilt
9844446004	RB-1	Ground Water	5/12/10 18:10	5/12/10 18:24	Denise Wilt
9844446005	TRIP BLANK-12 MAY	Ground Water	5/12/10 18:24	5/12/10 18:24	Denise Wilt

Workorder Comments:

Notes

-- Samples collected by ALSI personnel are done so in accordance with the procedures set forth in the ALSI Field Sampling Plan (20 - Field Services Sampling Plan).
-- All Waste Water analyses comply with methodology requirements of 40 CFR Part 136.
-- All Drinking Water analyses comply with methodology requirements of 40 CFR Part 141.
-- Unless otherwise noted, all quantitative results for soils are reported on a dry weight basis.
-- The Chain of Custody document is included as part of this report.

Standard Acronyms/Flags

J, B	Indicates an estimated value between the Method Detection Limit (MDL) and the Practical Quantitation Limit (PQL) for the analyte
U	Indicates that the analyte was Not Detected (ND)
MDL	Method Detection Limit
PQL	Practical Quantitation Limit
RDL	Reporting Detection Limit
ND	Not Detected - indicates that the analyte was Not Detected at the RDL
Cntr	Analysis was performed using this container
RegLmt	Regulatory Limit
LCS	Laboratory Control Sample
MS	Matrix Spike
MSD	Matrix Spike Duplicate
DUP	Sample Duplicate
%Rec	Percent Recovery
RPD	Relative Percent Difference

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ANALYTICAL RESULTS

Workorder: 9844446 EMS001|USACE-MARSH RUN PARK NC

Lab ID: **9844446001** Date Collected: 5/12/2010 13:57 Matrix: Ground Water

Sample ID: **MADW 41-52** Date Received: 5/12/2010 18:24

Parameters	Results	Units	Footnotes	LOQ	LOD	DL	Method	Prepared	Analyzed	By	Cntr
VOLATILE ORGANICS											
cis-1,2-Dichloroethene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/13/10 00:48	DJB	B
trans-1,2-Dichloroethene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/13/10 00:48	DJB	B
Tetrachloroethene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/13/10 00:48	DJB	B
Trichloroethene	1.9	ug/L		1.0	1.0	0.33	SW846 8260B		5/13/10 00:48	DJB	B
Vinyl Chloride	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/13/10 00:48	DJB	B
Surrogate Recoveries	*Results*	*Units*	*Footnotes*	*Limits*			*Method*	*Prepared*	*Analyzed*	*By*	*Cntr*
1,2-Dichloroethane-d4 (S)	98	%		70-120			SW846 8260B		5/13/10 00:48	DJB	B
4-Bromofluorobenzene (S)	94.2	%		75-120			SW846 8260B		5/13/10 00:48	DJB	B
Dibromofluoromethane (S)	91.1	%		85-115			SW846 8260B		5/13/10 00:48	DJB	B
Toluene-d8 (S)	109	%		85-120			SW846 8260B		5/13/10 00:48	DJB	B

Sample Comments:

Anna G Milliken
Laboratory Manager

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ANALYTICAL RESULTS

Workorder: 9844446 EMS001|USACE-MARSH RUN PARK NC

Lab ID: **9844446002** Date Collected: 5/12/2010 15:36 Matrix: Ground Water

Sample ID: **MADW 94-105** Date Received: 5/12/2010 18:24

Parameters	Results	Units	Footnotes	LOQ	LOD	DL	Method	Prepared	Analyzed	By	Cntr
VOLATILE ORGANICS											
cis-1,2-Dichloroethene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/13/10 01:21	DJB	B
trans-1,2-Dichloroethene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/13/10 01:21	DJB	B
Tetrachloroethene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/13/10 01:21	DJB	B
Trichloroethene	1.7	ug/L		1.0	1.0	0.33	SW846 8260B		5/13/10 01:21	DJB	B
Vinyl Chloride	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/13/10 01:21	DJB	B
Surrogate Recoveries	*Results*	*Units*	*Footnotes*	*Limits*			*Method*	*Prepared*	*Analyzed*	*By*	*Cntr*
1,2-Dichloroethane-d4 (S)	98.8	%		70-120			SW846 8260B		5/13/10 01:21	DJB	B
4-Bromofluorobenzene (S)	92.8	%		75-120			SW846 8260B		5/13/10 01:21	DJB	B
Dibromofluoromethane (S)	86.7	%		85-115			SW846 8260B		5/13/10 01:21	DJB	B
Toluene-d8 (S)	105	%		85-120			SW846 8260B		5/13/10 01:21	DJB	B

Sample Comments:

Anna G Milliken
Laboratory Manager

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ANALYTICAL RESULTS

Workorder: 9844446 EMS001|USACE-MARSH RUN PARK NC

Lab ID: **9844446003** Date Collected: 5/12/2010 17:45 Matrix: Ground Water

Sample ID: **MADW 121-132** Date Received: 5/12/2010 18:24

Parameters	Results	Units	Footnotes	LOQ	LOD	DL	Method	Prepared	Analyzed	By	Cntr
VOLATILE ORGANICS											
cis-1,2-Dichloroethene	1.2	ug/L		1.0	1.0	0.33	SW846 8260B		5/13/10 01:55	DJB	B
trans-1,2-Dichloroethene	0.52J	ug/L		1.0	1.0	0.33	SW846 8260B		5/13/10 01:55	DJB	B
Tetrachloroethene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/13/10 01:55	DJB	B
Trichloroethene	73.1	ug/L		1.0	1.0	0.33	SW846 8260B		5/13/10 01:55	DJB	B
Vinyl Chloride	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/13/10 01:55	DJB	B
Surrogate Recoveries	*Results*	*Units*	*Footnotes*	*Limits*			*Method*	*Prepared*	*Analyzed*	*By*	*Cntr*
1,2-Dichloroethane-d4 (S)	98.1	%		70-120			SW846 8260B		5/13/10 01:55	DJB	B
4-Bromofluorobenzene (S)	93	%		75-120			SW846 8260B		5/13/10 01:55	DJB	B
Dibromofluoromethane (S)	89.7	%		85-115			SW846 8260B		5/13/10 01:55	DJB	B
Toluene-d8 (S)	105	%		85-120			SW846 8260B		5/13/10 01:55	DJB	B

Sample Comments:

Anna G Milliken
Laboratory Manager

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ANALYTICAL RESULTS

Workorder: 9844446 EMS001|USACE-MARSH RUN PARK NC

Lab ID: **9844446004** Date Collected: 5/12/2010 18:10 Matrix: Ground Water

Sample ID: **RB-1** Date Received: 5/12/2010 18:24

Parameters	Results	Units	Footnotes	LOQ	LOD	DL	Method	Prepared	Analyzed	By	Cntr
VOLATILE ORGANICS											
cis-1,2-Dichloroethene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/12/10 23:41	DJB	B
trans-1,2-Dichloroethene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/12/10 23:41	DJB	B
Tetrachloroethene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/12/10 23:41	DJB	B
Trichloroethene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/12/10 23:41	DJB	B
Vinyl Chloride	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/12/10 23:41	DJB	B
Surrogate Recoveries	*Results*	*Units*	*Footnotes*	*Limits*			*Method*	*Prepared*	*Analyzed*	*By*	*Cntr*
1,2-Dichloroethane-d4 (S)	98.7	%		70-120			SW846 8260B		5/12/10 23:41	DJB	B
4-Bromofluorobenzene (S)	95.1	%		75-120			SW846 8260B		5/12/10 23:41	DJB	B
Dibromofluoromethane (S)	90	%		85-115			SW846 8260B		5/12/10 23:41	DJB	B
Toluene-d8 (S)	106	%		85-120			SW846 8260B		5/12/10 23:41	DJB	B

Sample Comments:

Anna G Milliken
Laboratory Manager

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ANALYTICAL RESULTS

Workorder: 9844446 EMS001|USACE-MARSH RUN PARK NC

Lab ID: **9844446005** Date Collected: 5/12/2010 18:24 Matrix: Ground Water

Sample ID: **TRIP BLANK-12 MAY** Date Received: 5/12/2010 18:24

Parameters	Results	Units	Footnotes	LOQ	LOD	DL	Method	Prepared	Analyzed	By	Cntr
VOLATILE ORGANICS											
cis-1,2-Dichloroethene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/13/10 00:14	DJB	B
trans-1,2-Dichloroethene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/13/10 00:14	DJB	B
Tetrachloroethene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/13/10 00:14	DJB	B
Trichloroethene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/13/10 00:14	DJB	B
Vinyl Chloride	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/13/10 00:14	DJB	B
Surrogate Recoveries	*Results*	*Units*	*Footnotes*	*Limits*			*Method*	*Prepared*	*Analyzed*	*By*	*Cntr*
1,2-Dichloroethane-d4 (S)	96.1	%		70-120			SW846 8260B		5/13/10 00:14	DJB	B
4-Bromofluorobenzene (S)	98.1	%		75-120			SW846 8260B		5/13/10 00:14	DJB	B
Dibromofluoromethane (S)	87.9	%		85-115			SW846 8260B		5/13/10 00:14	DJB	B
Toluene-d8 (S)	105	%		85-120			SW846 8260B		5/13/10 00:14	DJB	B

Sample Comments:

Anna G Milliken
Laboratory Manager

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CHAIN OF CUSTODY/ REQUEST FOR ANALYSIS

ALL SHADED AREAS MUST BE COMPLETED BY THE CLIENT / SAMPLER. INSTRUCTIONS ON THE BACK.

Page 1 of 1

Courier:

Tracking #:

9844446

Co. Name: EA Engineering

Contact (Report to): Denise Wilt

Phone: 717. 848, 5017

Address: 1 Marketway West Suite 4C York PA 17401

Bill to (If Different than Report to):

PO#: 623003

Project Name/#:

ALSI Quote #:

TAT: [ ] Normal-Standard TAT is 10-12 business days. [X] Rush-Subject to ALSI approval and surcharges.

Date Required:

Approved By:

Email? [X] -Y dwilt@eaest.com

Fax? [ ] -Y No.:

	Sample Description/Location (as it will appear on the lab report)	COC Comments	Sample Date	Military Time	*G or C	**Matrix	VOC 8260																
							Enter Number of Containers Per Analysis																
1	MADW 41-52	*24TAT	5/12/10	1357	g	gw	x	3															
2	MADW 94-105			1536			x																
3	MADW 121-132			1745			x																
4	RB-1		5/12/10	1810		w	x																
5	TRIP BLANK-12		5/12/10	—	g	w	X	2															
6																							
7																							
8																							

***Container Type: VOA
***Container Size: 40ml
***Preservative: HCL

ANALYSES/METHOD REQUESTED

Receipt Information (completed by Sample Receiver)
Performed by: Brussel 1
* Cooler Temp: 6
Therm. ID: 0030724
No. of Coolers:
Notes:

	Correct containers?	Correct sample volume?	Correct preservation?	Headspace/Volatiles?	Circle appropriate Y or N.
	N	N	N	N	
	✓	✓	✓	✓	
	N	N	N	N	N
	Y	Y	✓	✓	✓

	Custody seals Present?	(If present) Seals intact?	Received on ice?	COC/Labels complete/accurate?	Container in good condition?
	Y	Y	✓	✓	✓

SAMPLED BY (Please Print): Denise Wilt

LOGGED BY (signature): DATE 5/12/10

REVIEWED BY (signature): D Brussel DATE 5/13/10 845

Relinquished By / Company Name	Date	Time	Received By / Company Name	Date	Time
1 Denise Wilt EA	5/12/10	1724	2 [illegible]	5/12/10	1724
3			4		1824
5			6		KCV 5/12/10
7			8		
9			10		

Data Deliverables: [ ] Standard [ ] CLP-like [ ] NJ-Reduced [ ] NJ-Full [ ]

EDDs Required? [ ] If yes, format type:

DOD Criteria Required?

SDWA Forms? yes yes yes yes

State Samples Collected In? MD NJ NY PA Other

Enter PWSID No.

ALSI FIELD SERVICES: [ ] Pickup [ ] Labor [ ] Composite Sampling [ ] Rental Equipment [ ] Other:

* G=Grab; C=Composite **Matrix: Al=Air; DW=Drinking Water; GW=Groundwater; Ol=Oil; OL=Other Liquid; SL=Sludge; SO=Soil; WP=Wipe; WW=Wastewater

Copies: WHITE - ORIGINAL CANARY - CUSTOMER COPY ***Container Type: AG-Amber Glass; CG-Clear Glass, PL-Plastic. Container Size: 250ml, 500ml, 1L, 8oz., etc. Preservative: HCl, HNO3, NaOH, etc. Rev 6/07

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Certificate of Analysis

Project Name:	**USACE-MARSH RUN PARK - NEW**	Workorder:	**9845072**
Purchase Order:	**6233003**	Workorder ID:	**EMS004|USACE-MARSH RUN PARK**

Ms. Denise Wilt
EA Engineering-York PA
One Marketway West, Suite 4C
York, PA 17401

May 17, 2010

Dear Ms. Wilt,

Enclosed are the analytical results for samples received by the laboratory on Friday, May 14, 2010

ALSI is a National Environmental Laboratory Accreditation Program (NELAP) accredited laboratory and as such, certifies that all applicable test results meet the requirements of NELAP.

If you have any questions regarding this certificate of analysis, please contact Denise Brooks (Project Coordinator) or Anna G Milliken (Laboratory Manager) at (717) 944-5541.

Please visit us at www.analyticallab.com for a listing of ALSI's NELAP accreditations and Scope of Work, as well as other links to Water Quality documentation on the internet.

This laboratory report may not be reproduced, except in full, without the written approval of ALSI.

NOTE: ALSI has changed the report generation tool and while we have tried to retain the existing format, you will notice some changes in the laboratory report. Please feel free to contact ALSI in case you have any questions.

Analytical Laboratory Services, Inc.

This page is included as part of the Analytical Report and must be retained as a permanent record thereof.

Anna G Milliken
Laboratory Manager

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SAMPLE SUMMARY

Workorder: 9845072 EMS004|USACE-MARSH RUN PARK Discard Date: 05/31/2010

Lab ID	Sample ID	Matrix	Date Collected	Date Received	Collected By
9845072001	MW-15 80-91	Ground Water	5/13/10 20:05	5/14/10 18:26	Denise Wilt
9845072002	Trip Blank	Ground Water	5/14/10 00:00	5/14/10 18:26	Denise Wilt
9845072003	DUP-1	Ground Water	5/14/10 00:00	5/14/10 18:26	Denise Wilt
9845072004	DUP-2	Ground Water	5/14/10 00:00	5/14/10 18:26	Denise Wilt
9845072005	MW-15 115-126	Ground Water	5/14/10 09:55	5/14/10 18:26	Denise Wilt
9845072006	MW-15 138-149	Ground Water	5/14/10 11:45	5/14/10 18:26	Denise Wilt
9845072007	MW-15 156-167	Ground Water	5/14/10 13:35	5/14/10 18:26	Denise Wilt
9845072008	MW-15 172-183	Ground Water	5/14/10 15:45	5/14/10 18:26	Denise Wilt
9845072009	MW-15 184-195	Ground Water	5/14/10 17:45	5/14/10 18:26	Denise Wilt
9845072010	RB-2	Ground Water	5/13/10 20:15	5/14/10 18:26	Denise Wilt

Workorder Comments:

Notes

-- Samples collected by ALSI personnel are done so in accordance with the procedures set forth in the ALSI Field Sampling Plan (20 - Field Services Sampling Plan).
-- All Waste Water analyses comply with methodology requirements of 40 CFR Part 136.
-- All Drinking Water analyses comply with methodology requirements of 40 CFR Part 141.
-- Unless otherwise noted, all quantitative results for soils are reported on a dry weight basis.
-- The Chain of Custody document is included as part of this report.

Standard Acronyms/Flags

J, B	Indicates an estimated value between the Method Detection Limit (MDL) and the Practical Quantitation Limit (PQL) for the analyte
U	Indicates that the analyte was Not Detected (ND)
MDL	Method Detection Limit
PQL	Practical Quantitation Limit
RDL	Reporting Detection Limit
ND	Not Detected - indicates that the analyte was Not Detected at the RDL
Cntr	Analysis was performed using this container
RegLmt	Regulatory Limit
LCS	Laboratory Control Sample
MS	Matrix Spike
MSD	Matrix Spike Duplicate
DUP	Sample Duplicate
%Rec	Percent Recovery
RPD	Relative Percent Difference

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ANALYTICAL RESULTS

Workorder: 9845072 EMS004|USACE-MARSH RUN PARK

Lab ID: **9845072001** Date Collected: 5/13/2010 20:05 Matrix: Ground Water

Sample ID: **MW-15 80-91** Date Received: 5/14/2010 18:26

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	Cntr
VOLATILE ORGANICS										
cis-1,2-Dichloroethene	4.0		ug/L	1.0	SW846 8260B			5/15/10 03:25	DD	B
trans-1,2-Dichloroethene	0.86J		ug/L	1.0	SW846 8260B			5/15/10 03:25	DD	B
Tetrachloroethene	<1.0U		ug/L	1.0	SW846 8260B			5/15/10 03:25	DD	B
Trichloroethene	5.2		ug/L	1.0	SW846 8260B			5/15/10 03:25	DD	B
Vinyl Chloride	<1.0U		ug/L	1.0	SW846 8260B			5/15/10 03:25	DD	B
Surrogate Recoveries	*Results*	*Flag*	*Units*	*Limits*	*Method*	*Prepared*	*By*	*Analyzed*	*By*	*Cntr*
1,2-Dichloroethane-d4 (S)	98.4		%	70-120	SW846 8260B			5/15/10 03:25	DD	B
4-Bromofluorobenzene (S)	94.8		%	75-120	SW846 8260B			5/15/10 03:25	DD	B
Dibromofluoromethane (S)	90		%	85-115	SW846 8260B			5/15/10 03:25	DD	B
Toluene-d8 (S)	103		%	85-120	SW846 8260B			5/15/10 03:25	DD	B

Sample Comments:

Anna G Milliken
Laboratory Manager

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ANALYTICAL RESULTS

Workorder: 9845072 EMS004|USACE-MARSH RUN PARK

Lab ID: **9845072002** Date Collected: 5/14/2010 00:00 Matrix: Ground Water

Sample ID: **Trip Blank** Date Received: 5/14/2010 18:26

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	Cntr
VOLATILE ORGANICS										
cis-1,2-Dichloroethene	<1.0U		ug/L	1.0	SW846 8260B			5/14/10 23:32	DD	B
trans-1,2-Dichloroethene	<1.0U		ug/L	1.0	SW846 8260B			5/14/10 23:32	DD	B
Tetrachloroethene	<1.0U		ug/L	1.0	SW846 8260B			5/14/10 23:32	DD	B
Trichloroethene	<1.0U		ug/L	1.0	SW846 8260B			5/14/10 23:32	DD	B
Vinyl Chloride	<1.0U		ug/L	1.0	SW846 8260B			5/14/10 23:32	DD	B
Surrogate Recoveries	*Results*	*Flag*	*Units*	*Limits*	*Method*	*Prepared*	*By*	*Analyzed*	*By*	*Cntr*
1,2-Dichloroethane-d4 (S)	96		%	70-120	SW846 8260B			5/14/10 23:32	DD	B
4-Bromofluorobenzene (S)	94.3		%	75-120	SW846 8260B			5/14/10 23:32	DD	B
Dibromofluoromethane (S)	89.6		%	85-115	SW846 8260B			5/14/10 23:32	DD	B
Toluene-d8 (S)	102		%	85-120	SW846 8260B			5/14/10 23:32	DD	B

Sample Comments:

Anna G Milliken
Laboratory Manager

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ANALYTICAL RESULTS

Workorder: 9845072 EMS004|USACE-MARSH RUN PARK

Lab ID: **9845072003** Date Collected: 5/14/2010 00:00 Matrix: Ground Water

Sample ID: **DUP-1** Date Received: 5/14/2010 18:26

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	Cntr
VOLATILE ORGANICS										
cis-1,2-Dichloroethene	3.5		ug/L	1.0	SW846 8260B			5/15/10 03:59	DD	B
trans-1,2-Dichloroethene	0.65J		ug/L	1.0	SW846 8260B			5/15/10 03:59	DD	B
Tetrachloroethene	<1.0U		ug/L	1.0	SW846 8260B			5/15/10 03:59	DD	B
Trichloroethene	3.3		ug/L	1.0	SW846 8260B			5/15/10 03:59	DD	B
Vinyl Chloride	<1.0U		ug/L	1.0	SW846 8260B			5/15/10 03:59	DD	B
Surrogate Recoveries	*Results*	*Flag*	*Units*	*Limits*	*Method*	*Prepared*	*By*	*Analyzed*	*By*	*Cntr*
1,2-Dichloroethane-d4 (S)	97.3		%	70-120	SW846 8260B			5/15/10 03:59	DD	B
4-Bromofluorobenzene (S)	94.2		%	75-120	SW846 8260B			5/15/10 03:59	DD	B
Dibromofluoromethane (S)	88.4		%	85-115	SW846 8260B			5/15/10 03:59	DD	B
Toluene-d8 (S)	105		%	85-120	SW846 8260B			5/15/10 03:59	DD	B

Sample Comments:

Anna G Milliken
Laboratory Manager

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ANALYTICAL RESULTS

Workorder: 9845072 EMS004|USACE-MARSH RUN PARK

Lab ID: **9845072004** Date Collected: 5/14/2010 00:00 Matrix: Ground Water

Sample ID: **DUP-2** Date Received: 5/14/2010 18:26

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	Cntr
VOLATILE ORGANICS										
cis-1,2-Dichloroethene	1.7		ug/L	1.0	SW846 8260B			5/15/10 04:32	DD	B
trans-1,2-Dichloroethene	<1.0U		ug/L	1.0	SW846 8260B			5/15/10 04:32	DD	B
Tetrachloroethene	<1.0U		ug/L	1.0	SW846 8260B			5/15/10 04:32	DD	B
Trichloroethene	1.8		ug/L	1.0	SW846 8260B			5/15/10 04:32	DD	B
Vinyl Chloride	<1.0U		ug/L	1.0	SW846 8260B			5/15/10 04:32	DD	B
Surrogate Recoveries	*Results*	*Flag*	*Units*	*Limits*	*Method*	*Prepared*	*By*	*Analyzed*	*By*	*Cntr*
1,2-Dichloroethane-d4 (S)	98.5		%	70-120	SW846 8260B			5/15/10 04:32	DD	B
4-Bromofluorobenzene (S)	96.5		%	75-120	SW846 8260B			5/15/10 04:32	DD	B
Dibromofluoromethane (S)	87.4		%	85-115	SW846 8260B			5/15/10 04:32	DD	B
Toluene-d8 (S)	104		%	85-120	SW846 8260B			5/15/10 04:32	DD	B

Sample Comments:

Anna G Milliken
Laboratory Manager

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ANALYTICAL RESULTS

Workorder: 9845072 EMS004|USACE-MARSH RUN PARK

Lab ID: **9845072005** Date Collected: 5/14/2010 09:55 Matrix: Ground Water

Sample ID: **MW-15 115-126** Date Received: 5/14/2010 18:26

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	Cntr
VOLATILE ORGANICS										
cis-1,2-Dichloroethene	3.4		ug/L	1.0	SW846 8260B			5/15/10 00:39	DD	B
trans-1,2-Dichloroethene	0.64J		ug/L	1.0	SW846 8260B			5/15/10 00:39	DD	B
Tetrachloroethene	<1.0U		ug/L	1.0	SW846 8260B			5/15/10 00:39	DD	B
Trichloroethene	3.1		ug/L	1.0	SW846 8260B			5/15/10 00:39	DD	B
Vinyl Chloride	<1.0U		ug/L	1.0	SW846 8260B			5/15/10 00:39	DD	B
Surrogate Recoveries	*Results*	*Flag*	*Units*	*Limits*	*Method*	*Prepared*	*By*	*Analyzed*	*By*	*Cntr*
1,2-Dichloroethane-d4 (S)	95.6		%	70-120	SW846 8260B			5/15/10 00:39	DD	B
4-Bromofluorobenzene (S)	92.7		%	75-120	SW846 8260B			5/15/10 00:39	DD	B
Dibromofluoromethane (S)	90.3		%	85-115	SW846 8260B			5/15/10 00:39	DD	B
Toluene-d8 (S)	102		%	85-120	SW846 8260B			5/15/10 00:39	DD	B

Sample Comments:

Anna G Milliken
Laboratory Manager

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ANALYTICAL RESULTS

Workorder: 9845072 EMS004|USACE-MARSH RUN PARK

Lab ID: **9845072006** Date Collected: 5/14/2010 11:45 Matrix: Ground Water

Sample ID: **MW-15 138-149** Date Received: 5/14/2010 18:26

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	Cntr
VOLATILE ORGANICS										
cis-1,2-Dichloroethene	3.2		ug/L	1.0	SW846 8260B			5/15/10 01:12	DD	B
trans-1,2-Dichloroethene	0.49J		ug/L	1.0	SW846 8260B			5/15/10 01:12	DD	B
Tetrachloroethene	<1.0U		ug/L	1.0	SW846 8260B			5/15/10 01:12	DD	B
Trichloroethene	1.5		ug/L	1.0	SW846 8260B			5/15/10 01:12	DD	B
Vinyl Chloride	<1.0U		ug/L	1.0	SW846 8260B			5/15/10 01:12	DD	B
Surrogate Recoveries	*Results*	*Flag*	*Units*	*Limits*	*Method*	*Prepared*	*By*	*Analyzed*	*By*	*Cntr*
1,2-Dichloroethane-d4 (S)	98.3		%	70-120	SW846 8260B			5/15/10 01:12	DD	B
4-Bromofluorobenzene (S)	95.5		%	75-120	SW846 8260B			5/15/10 01:12	DD	B
Dibromofluoromethane (S)	92.4		%	85-115	SW846 8260B			5/15/10 01:12	DD	B
Toluene-d8 (S)	103		%	85-120	SW846 8260B			5/15/10 01:12	DD	B

Sample Comments:

Anna G Milliken
Laboratory Manager

ANALYTICAL LABORATORY SERVICES, INC.
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34 Dogwood Lane - Middletown, PA 17057 Phone: 717-944-5541 Fax: 717-944-1430

ANALYTICAL RESULTS

Workorder: 9845072 EMS004|USACE-MARSH RUN PARK

Lab ID: **9845072007** Date Collected: 5/14/2010 13:35 Matrix: Ground Water

Sample ID: **MW-15 156-167** Date Received: 5/14/2010 18:26

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	Cntr
VOLATILE ORGANICS										
cis-1,2-Dichloroethene	1.7		ug/L	1.0	SW846 8260B			5/15/10 01:46	DD	B
trans-1,2-Dichloroethene	<1.0U		ug/L	1.0	SW846 8260B			5/15/10 01:46	DD	B
Tetrachloroethene	<1.0U		ug/L	1.0	SW846 8260B			5/15/10 01:46	DD	B
Trichloroethene	1.9		ug/L	1.0	SW846 8260B			5/15/10 01:46	DD	B
Vinyl Chloride	<1.0U		ug/L	1.0	SW846 8260B			5/15/10 01:46	DD	B
Surrogate Recoveries	*Results*	*Flag*	*Units*	*Limits*	*Method*	*Prepared*	*By*	*Analyzed*	*By*	*Cntr*
1,2-Dichloroethane-d4 (S)	98.3		%	70-120	SW846 8260B			5/15/10 01:46	DD	B
4-Bromofluorobenzene (S)	93.7		%	75-120	SW846 8260B			5/15/10 01:46	DD	B
Dibromofluoromethane (S)	88.7		%	85-115	SW846 8260B			5/15/10 01:46	DD	B
Toluene-d8 (S)	104		%	85-120	SW846 8260B			5/15/10 01:46	DD	B

Sample Comments:

Anna G Milliken
Laboratory Manager

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ANALYTICAL RESULTS

Workorder: 9845072 EMS004|USACE-MARSH RUN PARK

Lab ID: **9845072008** Date Collected: 5/14/2010 15:45 Matrix: Ground Water

Sample ID: **MW-15 172-183** Date Received: 5/14/2010 18:26

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	Cntr
VOLATILE ORGANICS										
cis-1,2-Dichloroethene	2.2		ug/L	1.0	SW846 8260B			5/15/10 02:19	DD	B
trans-1,2-Dichloroethene	<1.0U		ug/L	1.0	SW846 8260B			5/15/10 02:19	DD	B
Tetrachloroethene	<1.0U		ug/L	1.0	SW846 8260B			5/15/10 02:19	DD	B
Trichloroethene	1.1		ug/L	1.0	SW846 8260B			5/15/10 02:19	DD	B
Vinyl Chloride	<1.0U		ug/L	1.0	SW846 8260B			5/15/10 02:19	DD	B
Surrogate Recoveries	*Results*	*Flag*	*Units*	*Limits*	*Method*	*Prepared*	*By*	*Analyzed*	*By*	*Cntr*
1,2-Dichloroethane-d4 (S)	100		%	70-120	SW846 8260B			5/15/10 02:19	DD	B
4-Bromofluorobenzene (S)	91.2		%	75-120	SW846 8260B			5/15/10 02:19	DD	B
Dibromofluoromethane (S)	91.1		%	85-115	SW846 8260B			5/15/10 02:19	DD	B
Toluene-d8 (S)	103		%	85-120	SW846 8260B			5/15/10 02:19	DD	B

Sample Comments:

Anna G Milliken
Laboratory Manager

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ANALYTICAL RESULTS

Workorder: 9845072 EMS004|USACE-MARSH RUN PARK

Lab ID: **9845072009** Date Collected: 5/14/2010 17:45 Matrix: Ground Water

Sample ID: **MW-15 184-195** Date Received: 5/14/2010 18:26

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	Cntr
VOLATILE ORGANICS										
cis-1,2-Dichloroethene	2.1		ug/L	1.0	SW846 8260B			5/15/10 02:52	DD	B
trans-1,2-Dichloroethene	<1.0U		ug/L	1.0	SW846 8260B			5/15/10 02:52	DD	B
Tetrachloroethene	<1.0U		ug/L	1.0	SW846 8260B			5/15/10 02:52	DD	B
Trichloroethene	1.6		ug/L	1.0	SW846 8260B			5/15/10 02:52	DD	B
Vinyl Chloride	<1.0U		ug/L	1.0	SW846 8260B			5/15/10 02:52	DD	B
Surrogate Recoveries	*Results*	*Flag*	*Units*	*Limits*	*Method*	*Prepared*	*By*	*Analyzed*	*By*	*Cntr*
1,2-Dichloroethane-d4 (S)	101		%	70-120	SW846 8260B			5/15/10 02:52	DD	B
4-Bromofluorobenzene (S)	93.9		%	75-120	SW846 8260B			5/15/10 02:52	DD	B
Dibromofluoromethane (S)	90		%	85-115	SW846 8260B			5/15/10 02:52	DD	B
Toluene-d8 (S)	102		%	85-120	SW846 8260B			5/15/10 02:52	DD	B

Sample Comments:

Anna G Milliken
Laboratory Manager

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ANALYTICAL RESULTS

Workorder: 9845072 EMS004|USACE-MARSH RUN PARK

Lab ID: **9845072010** Date Collected: 5/13/2010 20:15 Matrix: Ground Water

Sample ID: **RB-2** Date Received: 5/14/2010 18:26

Parameters	Results	Flag	Units	RDL	Method	Prepared	By	Analyzed	By	Cntr
VOLATILE ORGANICS										
cis-1,2-Dichloroethene	<1.0U		ug/L	1.0	SW846 8260B			5/15/10 00:06	DD	B
trans-1,2-Dichloroethene	<1.0U		ug/L	1.0	SW846 8260B			5/15/10 00:06	DD	B
Tetrachloroethene	<1.0U		ug/L	1.0	SW846 8260B			5/15/10 00:06	DD	B
Trichloroethene	<1.0U		ug/L	1.0	SW846 8260B			5/15/10 00:06	DD	B
Vinyl Chloride	<1.0U		ug/L	1.0	SW846 8260B			5/15/10 00:06	DD	B
Surrogate Recoveries	*Results*	*Flag*	*Units*	*Limits*	*Method*	*Prepared*	*By*	*Analyzed*	*By*	*Cntr*
1,2-Dichloroethane-d4 (S)	97.5		%	70-120	SW846 8260B			5/15/10 00:06	DD	B
4-Bromofluorobenzene (S)	92.4		%	75-120	SW846 8260B			5/15/10 00:06	DD	B
Dibromofluoromethane (S)	93.7		%	85-115	SW846 8260B			5/15/10 00:06	DD	B
Toluene-d8 (S)	107		%	85-120	SW846 8260B			5/15/10 00:06	DD	B

Sample Comments:

Anna G Milliken
Laboratory Manager

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Certificate of Analysis

Project Name:	**USACE-MARSH RUN PARK - NEW**	Workorder:	**9844809**
Purchase Order:	**6233003**	Workorder ID:	**EMS002|USACE-MARSH RUN PARK**

Ms. Denise Wilt
EA Engineering-York PA
One Marketway West, Suite 4C
York, PA 17401

May 14, 2010

Dear Ms. Wilt,

Enclosed are the analytical results for samples received by the laboratory on Thursday, May 13, 2010

ALSI is a National Environmental Laboratory Accreditation Program (NELAP) accredited laboratory and as such, certifies that all applicable test results meet the requirements of NELAP.

If you have any questions regarding this certificate of analysis, please contact Denise Brooks (Project Coordinator) or Anna G Milliken (Laboratory Manager) at (717) 944-5541.

Please visit us at www.analyticallab.com for a listing of ALSI's NELAP accreditations and Scope of Work, as well as other links to Water Quality documentation on the internet.

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NOTE: ALSI has changed the report generation tool and while we have tried to retain the existing format, you will notice some changes in the laboratory report. Please feel free to contact ALSI in case you have any questions.

Analytical Laboratory Services, Inc.

This page is included as part of the Analytical Report and must be retained as a permanent record thereof.

Anna G Milliken
Laboratory Manager

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SAMPLE SUMMARY

Workorder: 9844809 EMS002|USACE-MARSH RUN PARK NC

Discard Date: 05/28/2010

Lab ID	Sample ID	Matrix	Date Collected	Date Received	Collected By
9844809001	MW-15 54-65	Ground Water	5/13/10 17:55	5/13/10 18:34	Denise Wilt
9844809002	BLANK	Ground Water	5/13/10 18:34	5/13/10 18:34	Denise Wilt

Workorder Comments:

Notes

-- Samples collected by ALSI personnel are done so in accordance with the procedures set forth in the ALSI Field Sampling Plan (20 - Field Services Sampling Plan).
-- All Waste Water analyses comply with methodology requirements of 40 CFR Part 136.
-- All Drinking Water analyses comply with methodology requirements of 40 CFR Part 141.
-- Unless otherwise noted, all quantitative results for soils are reported on a dry weight basis.
-- The Chain of Custody document is included as part of this report.

Standard Acronyms/Flags

J, B	Indicates an estimated value between the Method Detection Limit (MDL) and the Practical Quantitation Limit (PQL) for the analyte
U	Indicates that the analyte was Not Detected (ND)
MDL	Method Detection Limit
PQL	Practical Quantitation Limit
RDL	Reporting Detection Limit
ND	Not Detected - indicates that the analyte was Not Detected at the RDL
Cntr	Analysis was performed using this container
RegLmt	Regulatory Limit
LCS	Laboratory Control Sample
MS	Matrix Spike
MSD	Matrix Spike Duplicate
DUP	Sample Duplicate
%Rec	Percent Recovery
RPD	Relative Percent Difference

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ANALYTICAL RESULTS

Workorder: 9844809 EMS002|USACE-MARSH RUN PARK NC

Lab ID: **9844809001** Date Collected: 5/13/2010 17:55 Matrix: Ground Water

Sample ID: **MW-15 54-65** Date Received: 5/13/2010 18:34

Parameters	Results	Units	Footnotes	LOQ	LOD	DL	Method	Prepared	Analyzed	By	Cntr
VOLATILE ORGANICS											
cis-1,2-Dichloroethene	3.8	ug/L		1.0	1.0	0.33	SW846 8260B		5/14/10 06:32	DD	C
trans-1,2-Dichloroethene	0.66J	ug/L		1.0	1.0	0.33	SW846 8260B		5/14/10 06:32	DD	C
Tetrachloroethene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/14/10 06:32	DD	C
Trichloroethene	4.4	ug/L		1.0	1.0	0.33	SW846 8260B		5/14/10 06:32	DD	C
Vinyl Chloride	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/14/10 06:32	DD	C
Surrogate Recoveries	*Results*	*Units*	*Footnotes*	*Limits*			*Method*	*Prepared*	*Analyzed*	*By*	*Cntr*
1,2-Dichloroethane-d4 (S)	99.5	%		70-120			SW846 8260B		5/14/10 06:32	DD	C
4-Bromofluorobenzene (S)	93.4	%		75-120			SW846 8260B		5/14/10 06:32	DD	C
Dibromofluoromethane (S)	87.8	%		85-115			SW846 8260B		5/14/10 06:32	DD	C
Toluene-d8 (S)	108	%		85-120			SW846 8260B		5/14/10 06:32	DD	C

Sample Comments:

Anna G Milliken
Laboratory Manager

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ANALYTICAL RESULTS

Workorder: 9844809 EMS002|USACE-MARSH RUN PARK NC

Lab ID: **9844809002** Date Collected: 5/13/2010 18:34 Matrix: Ground Water

Sample ID: **BLANK** Date Received: 5/13/2010 18:34

Parameters	Results	Units	Footnotes	LOQ	LOD	DL	Method	Prepared	Analyzed	By	Cntr
VOLATILE ORGANICS											
cis-1,2-Dichloroethene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/14/10 05:25	DD	B
trans-1,2-Dichloroethene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/14/10 05:25	DD	B
Tetrachloroethene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/14/10 05:25	DD	B
Trichloroethene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/14/10 05:25	DD	B
Vinyl Chloride	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/14/10 05:25	DD	B
Surrogate Recoveries	*Results*	*Units*	*Footnotes*	*Limits*			*Method*	*Prepared*	*Analyzed*	*By*	*Cntr*
1,2-Dichloroethane-d4 (S)	99.4	%		70-120			SW846 8260B		5/14/10 05:25	DD	B
4-Bromofluorobenzene (S)	91.9	%		75-120			SW846 8260B		5/14/10 05:25	DD	B
Dibromofluoromethane (S)	90.6	%		85-115			SW846 8260B		5/14/10 05:25	DD	B
Toluene-d8 (S)	107	%		85-120			SW846 8260B		5/14/10 05:25	DD	B

Sample Comments:

Anna G Milliken
Laboratory Manager

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Certificate of Analysis

Project Name:	**USACE-MARSH RUN PARK - NEW**	Workorder:	**9844699**
Purchase Order:	**6233003**	Workorder ID:	**MARSH RUN 5/13/2010**

Ms. Denise Wilt
EA Engineering-York PA
One Marketway West, Suite 4C
York, PA 17401

May 14, 2010

Dear Ms. Wilt,

Enclosed are the analytical results for samples received by the laboratory on Thursday, May 13, 2010

ALSI is a National Environmental Laboratory Accreditation Program (NELAP) accredited laboratory and as such, certifies that all applicable test results meet the requirements of NELAP.

If you have any questions regarding this certificate of analysis, please contact Denise Brooks (Project Coordinator) or Anna G Milliken (Laboratory Manager) at (717) 944-5541.

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Anna G Milliken
Laboratory Manager

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SAMPLE SUMMARY

Workorder: 9844699 MARSH RUN 5/13/2010 Discard Date: 05/28/2010

Lab ID	Sample ID	Matrix	Date Collected	Date Received	Collected By
9844699001	MADW 170-181	Ground Water	5/13/10 11:45	5/13/10 14:15	Denise Wilt
9844699002	Trip Blank	Ground Water	5/13/10 14:15	5/13/10 14:15	Denise Wilt

Workorder Comments:

Notes

-- Samples collected by ALSI personnel are done so in accordance with the procedures set forth in the ALSI Field Sampling Plan (20 - Field Services Sampling Plan).
-- All Waste Water analyses comply with methodology requirements of 40 CFR Part 136.
-- All Drinking Water analyses comply with methodology requirements of 40 CFR Part 141.
-- Unless otherwise noted, all quantitative results for soils are reported on a dry weight basis.
-- The Chain of Custody document is included as part of this report.

Standard Acronyms/Flags

J, B	Indicates an estimated value between the Method Detection Limit (MDL) and the Practical Quantitation Limit (PQL) for the analyte
U	Indicates that the analyte was Not Detected (ND)
MDL	Method Detection Limit
PQL	Practical Quantitation Limit
RDL	Reporting Detection Limit
ND	Not Detected - indicates that the analyte was Not Detected at the RDL
Cntr	Analysis was performed using this container
RegLmt	Regulatory Limit
LCS	Laboratory Control Sample
MS	Matrix Spike
MSD	Matrix Spike Duplicate
DUP	Sample Duplicate
%Rec	Percent Recovery
RPD	Relative Percent Difference

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ANALYTICAL RESULTS

Workorder: 9844699 MARSH RUN 5/13/2010

Lab ID: **9844699001** Date Collected: 5/13/2010 11:45 Matrix: Ground Water

Sample ID: **MADW 170-181** Date Received: 5/13/2010 14:15

Parameters	Results	Units	Footnotes	LOQ	LOD	DL	Method	Prepared	Analyzed	By	Cntr
VOLATILE ORGANICS											
cis-1,2-Dichloroethene	10.1	ug/L		1.0	1.0	0.33	SW846 8260B		5/13/10 15:53	MES	A
trans-1,2-Dichloroethene	5.3	ug/L		1.0	1.0	0.33	SW846 8260B		5/13/10 15:53	MES	A
Tetrachloroethene	3.6	ug/L		1.0	1.0	0.33	SW846 8260B		5/13/10 15:53	MES	A
Trichloroethene	535	ug/L		5.0	5.0	1.7	SW846 8260B		5/14/10 05:59	DD	B
Vinyl Chloride	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/13/10 15:53	MES	A
Surrogate Recoveries	*Results*	*Units*	*Footnotes*	*Limits*			*Method*	*Prepared*	*Analyzed*	*By*	*Cntr*
1,2-Dichloroethane-d4 (S)	101	%		70-120			SW846 8260B		5/13/10 15:53	MES	A
4-Bromofluorobenzene (S)	93.8	%		75-120			SW846 8260B		5/13/10 15:53	MES	A
Toluene-d8 (S)	107	%		85-120			SW846 8260B		5/13/10 15:53	MES	A
Dibromofluoromethane (S)	92	%		85-115			SW846 8260B		5/13/10 15:53	MES	A
1,2-Dichloroethane-d4 (S)	103	%		70-120			SW846 8260B		5/14/10 05:59	DD	B
4-Bromofluorobenzene (S)	94.7	%		75-120			SW846 8260B		5/14/10 05:59	DD	B
Toluene-d8 (S)	108	%		85-120			SW846 8260B		5/14/10 05:59	DD	B
Dibromofluoromethane (S)	90.7	%		85-115			SW846 8260B		5/14/10 05:59	DD	B

Sample Comments:

Anna G Milliken
Laboratory Manager

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ANALYTICAL RESULTS

Workorder: 9844699 MARSH RUN 5/13/2010

Lab ID: **9844699002** Date Collected: 5/13/2010 14:15 Matrix: Ground Water

Sample ID: **Trip Blank** Date Received: 5/13/2010 14:15

Parameters	Results	Units	Footnotes	LOQ	LOD	DL	Method	Prepared	Analyzed	By	Cntr
VOLATILE ORGANICS											
cis-1,2-Dichloroethene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/13/10 15:19	MES	B
trans-1,2-Dichloroethene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/13/10 15:19	MES	B
Tetrachloroethene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/13/10 15:19	MES	B
Trichloroethene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/13/10 15:19	MES	B
Vinyl Chloride	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/13/10 15:19	MES	B
Surrogate Recoveries	*Results*	*Units*	*Footnotes*	*Limits*			*Method*	*Prepared*	*Analyzed*	*By*	*Cntr*
1,2-Dichloroethane-d4 (S)	99.9	%		70-120			SW846 8260B		5/13/10 15:19	MES	B
4-Bromofluorobenzene (S)	94.2	%		75-120			SW846 8260B		5/13/10 15:19	MES	B
Dibromofluoromethane (S)	89.2	%		85-115			SW846 8260B		5/13/10 15:19	MES	B
Toluene-d8 (S)	107	%		85-120			SW846 8260B		5/13/10 15:19	MES	B

Sample Comments:

Anna G Milliken
Laboratory Manager

Analytical Laboratory Services, Inc.
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CHAIN OF CUSTODY/ REQUEST FOR ANALYSIS

ALL SHADED AREAS MUST BE COMPLETED BY THE CLIENT / SAMPLER. INSTRUCTIONS ON THE BACK.

Page 1 of 1
Courier:
Tracking #:
9844699

Co. Name: EA Engineering
Contact (Report to): Denise Wilt
Phone: 717.849.5017
Address: 1 Marketway West Suite 4C York PA 17401

Bill to (if different than Report to):
PO#: 6233003

Project Name/#: Marsh Run
ALSI Quote #:

TAT: [ ] Normal-Standard TAT is 10-12 business days. [X] Rush-Subject to ALSI approval and surcharges.
Date Required:
Approved By:

Email? [ ] Y
Fax? [ ] Y No.:

***Container Type: VOA
***Container Size: 40ml
***Preservative: HCL

ANALYSES/METHOD REQUESTED: VOC - 8260B

Performed by: DMS
Cooler Temp: 6°C
Therm. ID: 10133 2724
No. of Coolers:
Notes:

	Sample Description/Location (as it will appear on the lab report)	COC Comments	Sample Date	Military Time	*G or C	**Matrix	Enter Number of Containers Per Analysis
1	MADW 170-181	Quick TAT	5/13/10	1145	G	GW	X3
2	Trip Blank	DMS 5/13	5/13/10	1415			X2
3							
4							
5							
6							
7							
8							

	Y	N
Correct containers?	Y	N
Correct sample volume?	Y	N
Correct preservation?	Y	N
Headspace/Volatiles?	Y	N
Circle appropriate Y or N.		
Custody seals Present?	Y	N
(if present) Seals intact?	Y	N
Received on ice?	Y	N
COC/Labels complete/accurate?	Y	N
Container in good condition?	Y	N

SAMPLED BY (Please Print): Denise Wilt
LOGGED BY (signature): DATE: 5/13/10 TIME: 1420
REVIEWED BY (signature): DATE: 5/13/10 TIME: 1623

Relinquished By / Company Name	Date	Time	Received By / Company Name	Date	Time
1	5/13/10	1245	2	5/13/10	1245
3	5/13/10	14:15	4		1415
5			6	DMS 5/13	
7			8		
9			10		

Data Deliverables: [ ] Standard [ ] CLP-like [ ] NJ-Reduced [ ] NJ-Full [ ] Other
EDDs Required? [ ] If yes, format type:
SDWA Forms?⇒ yes / yes / yes / yes
State Samples Collected In? MD / NJ / NY / PA / Other
Enter PWSID No.
DOD Criteria Required?

ALSI FIELD SERVICES: [ ] Pickup [ ] Labor [ ] Composite Sampling [ ] Rental Equipment [ ] Other:

* G=Grab; C=Composite
**Matrix: Al=Air; DW=Drinking Water; GW=Groundwater; Ol=Oil; OL=Other Liquid; SL=Sludge; SO=Soil; WP=Wipe; WW=Wastewater
Copies: WHITE - ORIGINAL CANARY - CUSTOMER COPY
***Container Type: AG-Amber Glass; CG-Clear Glass, PL-Plastic. Container Size: 250ml, 500ml, 1L, 8oz., etc. Preservative: HCl, HNO3, NaOH, etc.
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Certificate of Analysis

Project Name:	**USACE-MARSH RUN PARK - NEW**	Workorder:	**9845325**
Purchase Order:	**6233003**	Workorder ID:	**EMS005|USACE-MARSH RUN PARK**

Ms. Denise Wilt
EA Engineering-York PA
One Marketway West, Suite 4C
York, PA 17401

May 18, 2010

Dear Ms. Wilt,

Enclosed are the analytical results for samples received by the laboratory on Monday, May 17, 2010

ALSI is a National Environmental Laboratory Accreditation Program (NELAP) accredited laboratory and as such, certifies that all applicable test results meet the requirements of NELAP.

If you have any questions regarding this certificate of analysis, please contact Denise Brooks (Project Coordinator) or Anna G Milliken (Laboratory Manager) at (717) 944-5541.

Please visit us at www.analyticallab.com for a listing of ALSI's NELAP accreditations and Scope of Work, as well as other links to Water Quality documentation on the internet.

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NOTE: ALSI has changed the report generation tool and while we have tried to retain the existing format, you will notice some changes in the laboratory report. Please feel free to contact ALSI in case you have any questions.

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Anna G Milliken
Laboratory Manager

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SAMPLE SUMMARY

Workorder: 9845325 EMS005|USACE-MARSH RUN PARK Discard Date: 06/01/2010

Lab ID	Sample ID	Matrix	Date Collected	Date Received	Collected By
9845325001	MADW Hour 6	Ground Water	5/17/10 18:50	5/17/10 19:25	Customer

Workorder Comments:

Notes

-- Samples collected by ALSI personnel are done so in accordance with the procedures set forth in the ALSI Field Sampling Plan (20 - Field Services Sampling Plan).
-- All Waste Water analyses comply with methodology requirements of 40 CFR Part 136.
-- All Drinking Water analyses comply with methodology requirements of 40 CFR Part 141.
-- Unless otherwise noted, all quantitative results for soils are reported on a dry weight basis.
-- The Chain of Custody document is included as part of this report.

Standard Acronyms/Flags

J, B	Indicates an estimated value between the Method Detection Limit (MDL) and the Practical Quantitation Limit (PQL) for the analyte
U	Indicates that the analyte was Not Detected (ND)
MDL	Method Detection Limit
PQL	Practical Quantitation Limit
RDL	Reporting Detection Limit
ND	Not Detected - indicates that the analyte was Not Detected at the RDL
Cntr	Analysis was performed using this container
RegLmt	Regulatory Limit
LCS	Laboratory Control Sample
MS	Matrix Spike
MSD	Matrix Spike Duplicate
DUP	Sample Duplicate
%Rec	Percent Recovery
RPD	Relative Percent Difference

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ANALYTICAL RESULTS

Workorder: 9845325 EMS005|USACE-MARSH RUN PARK

Lab ID: **9845325001** Date Collected: 5/17/2010 18:50 Matrix: Ground Water

Sample ID: **MADW Hour 6** Date Received: 5/17/2010 19:25

Parameters	Results	Units	Footnotes	LOQ	LOD	DL	Method	Prepared	Analyzed	By	Cntr
VOLATILE ORGANICS											
cis-1,2-Dichloroethene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/18/10 08:54	MES	B
trans-1,2-Dichloroethene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/18/10 08:54	MES	B
Tetrachloroethene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/18/10 08:54	MES	B
Trichloroethene	2.5	ug/L		1.0	1.0	0.33	SW846 8260B		5/18/10 08:54	MES	B
Vinyl Chloride	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/18/10 08:54	MES	B
Surrogate Recoveries	*Results*	*Units*	*Footnotes*	*Limits*			*Method*	*Prepared*	*Analyzed*	*By*	*Cntr*
1,2-Dichloroethane-d4 (S)	97	%		70-120			SW846 8260B		5/18/10 08:54	MES	B
4-Bromofluorobenzene (S)	95.5	%		75-120			SW846 8260B		5/18/10 08:54	MES	B
Dibromofluoromethane (S)	87	%		85-115			SW846 8260B		5/18/10 08:54	MES	B
Toluene-d8 (S)	103	%		85-120			SW846 8260B		5/18/10 08:54	MES	B

Sample Comments:

Anna G Milliken
Laboratory Manager

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CHAIN OF CUSTODY/ REQUEST FOR ANALYSIS

ALL SHADED AREAS MUST BE COMPLETED BY THE CLIENT / SAMPLER. INSTRUCTIONS ON THE BACK.

Page 1 of 1

Courier:

Tracking #:

* 9 8 4 5 3 2 5 *

Co. Name: EA Engineering

Contact (Report to): Denise Will

Phone: 717.771.5600

Address: 1 Marketway W. Suite 4C York PA 17401

Bill to (if different than Report to):

PO#: 6233063

Project Name/#:

ALSI Quote #:

TAT: [ ] Normal-Standard TAT is 10-12 business days. [X] Rush-Subject to ALSI approval and surcharges.

Date Required:

Approved By:

Email? [X] -Y dwill@eaesh.com

Fax? [ ] -Y No.:

Sample Description/Location (as it will appear on the lab report)	COC Comments	Sample Date	Military Time	*G or C	**Matrix	VOC 8260										
***Container Type						VOA										
***Container Size						40ml										
*** Preservative						HCl										
1 ~~Dup-3~~	3Day TAT	5/17/10	—	G	GW	X3										
2 ~~MADW Hour 1~~	3 Day TAT		1350			X3										
3 ~~MADW Hour 2~~	3Day TAT		1450			X3										
4 ~~MADW Hour 3~~	3Day TAT		1550			X3										
5 ~~MADW Hour 4~~	3 Day TAT		1650			X3										
6 ~~MADW Hour 5~~	3 Day TAT, MS/MSD		1750			X9										
7 MADW Hour 6	24 hr TAT		1850			X3										
8 ~~trip blank~~		5/17/10				X2										

ANALYSES/METHOD REQUESTED — Enter Number of Containers Per Analysis

Performed by: JOHN HERE

Cooler Temp: 4°

Therm. ID: 10133724

No. of Coolers:

Notes:

	1	2	3	4
Correct containers?	N	N	N	Y
Correct sample volume?	Y	Y	Y	Y
Correct preservation?	N	N	N	Y
Headspace/Volatiles?	Y	Y	Y	Y
Circle appropriate Y or N.				

	1	2	3	4
Custody seals Present?	Y	Y	Y	Y
(if present) Seals intact?	N	N	N	N
Received on ice?	N	N	N	N
COC/Labels complete/accurate?	Y	Y	Y	Y
Container in good condition?	N	N	N	N

5-17-10

SAMPLED BY (Please Print): Denise Will / Adrian Hughes

LOGGED BY (signature): DATE 5/17/10 TIME 1931

REVIEWED BY (signature): DJones DATE 5/18/10 TIME 941

Relinquished By / Company Name	Date	Time	Received By / Company Name	Date	Time
1 Denise Will / EA	5/17/10	1905	2	5-17-10	1925
3			4		
5			6		
7			8		
9			10		

Data Deliverables: [ ] Standard [ ] CLP-like [ ] NJ-Reduced [ ] NJ-Full [ ] (other)

EDDs Required? [ ] If yes, format type:

SDWA Forms? yes / yes / yes / yes

State Samples Collected In? MD / NJ / NY / PA / Other

DOD Criteria Required?

ALSI FIELD SERVICES: [ ] Pickup [ ] Labor [ ] Composite Sampling [ ] Rental Equipment [ ] Other:

* G=Grab; C=Composite

**Matrix: AI=Air; DW=Drinking Water; GW=Groundwater; OI=Oil; OL=Other Liquid; SL=Sludge; SO=Soil; WP=Wipe; WW=Wastewater

***Container Type: AG-Amber Glass; CG-Clear Glass, PL-Plastic. Container Size: 250ml, 500ml, 1L, 8oz., etc. Preservative: HCl, HNO3, NaOH, etc.

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Certificate of Analysis

Project Name:	**USACE-MARSH RUN PARK - NEW**	Workorder:	**9845324**
Purchase Order:	**6233003**	Workorder ID:	**EMS006|USACE-MARSH RUN PARK**

Ms. Denise Wilt
EA Engineering-York PA
One Marketway West, Suite 4C
York, PA 17401

May 20, 2010

Dear Ms. Wilt,

Enclosed are the analytical results for samples received by the laboratory on Monday, May 17, 2010

ALSI is a National Environmental Laboratory Accreditation Program (NELAP) accredited laboratory and as such, certifies that all applicable test results meet the requirements of NELAP.

If you have any questions regarding this certificate of analysis, please contact Denise Brooks (Project Coordinator) or Anna G Milliken (Laboratory Manager) at (717) 944-5541.

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Anna G Milliken
Laboratory Manager

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SAMPLE SUMMARY

Workorder: 9845324 EMS006|USACE-MARSH RUN PARK Discard Date: 06/02/2010

Lab ID	Sample ID	Matrix	Date Collected	Date Received	Collected By
9845324001	DUP-3	Ground Water	5/17/10 00:00	5/17/10 19:25	Customer
9845324002	MADW Hour 1	Ground Water	5/17/10 13:50	5/17/10 19:25	Customer
9845324003	MADW Hour 2	Ground Water	5/17/10 14:50	5/17/10 19:25	Customer
9845324004	MADW Hour 3	Ground Water	5/17/10 15:50	5/17/10 19:25	Customer
9845324005	MADW Hour 4	Ground Water	5/17/10 16:50	5/17/10 19:25	Customer
9845324006	MADW Hour 5	Ground Water	5/17/10 17:50	5/17/10 19:25	Customer
9845324007	Trip Blank	Ground Water	5/17/10 19:25	5/17/10 19:25	Customer

Workorder Comments:

Notes

-- Samples collected by ALSI personnel are done so in accordance with the procedures set forth in the ALSI Field Sampling Plan (20 - Field Services Sampling Plan).
-- All Waste Water analyses comply with methodology requirements of 40 CFR Part 136.
-- All Drinking Water analyses comply with methodology requirements of 40 CFR Part 141.
-- Unless otherwise noted, all quantitative results for soils are reported on a dry weight basis.
-- The Chain of Custody document is included as part of this report.

Standard Acronyms/Flags

J, B	Indicates an estimated value between the Method Detection Limit (MDL) and the Practical Quantitation Limit (PQL) for the analyte
U	Indicates that the analyte was Not Detected (ND)
MDL	Method Detection Limit
PQL	Practical Quantitation Limit
RDL	Reporting Detection Limit
ND	Not Detected - indicates that the analyte was Not Detected at the RDL
Cntr	Analysis was performed using this container
RegLmt	Regulatory Limit
LCS	Laboratory Control Sample
MS	Matrix Spike
MSD	Matrix Spike Duplicate
DUP	Sample Duplicate
%Rec	Percent Recovery
RPD	Relative Percent Difference

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ANALYTICAL RESULTS

Workorder: 9845324 EMS006|USACE-MARSH RUN PARK

Lab ID: **9845324001** Date Collected: 5/17/2010 00:00 Matrix: Ground Water

Sample ID: **DUP-3** Date Received: 5/17/2010 19:25

Parameters	Results	Units	Footnotes	LOQ	LOD	DL	Method	Prepared	Analyzed	By	Cntr
VOLATILE ORGANICS											
cis-1,2-Dichloroethene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/18/10 12:48	MES	B
trans-1,2-Dichloroethene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/18/10 12:48	MES	B
Tetrachloroethene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/18/10 12:48	MES	B
Trichloroethene	2.7	ug/L		1.0	1.0	0.33	SW846 8260B		5/18/10 12:48	MES	B
Vinyl Chloride	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/18/10 12:48	MES	B
Surrogate Recoveries	*Results*	*Units*	*Footnotes*	*Limits*			*Method*	*Prepared*	*Analyzed*	*By*	*Cntr*
1,2-Dichloroethane-d4 (S)	102	%		70-120			SW846 8260B		5/18/10 12:48	MES	B
4-Bromofluorobenzene (S)	93.5	%		75-120			SW846 8260B		5/18/10 12:48	MES	B
Dibromofluoromethane (S)	91.6	%		85-115			SW846 8260B		5/18/10 12:48	MES	B
Toluene-d8 (S)	108	%		85-120			SW846 8260B		5/18/10 12:48	MES	B

Sample Comments:

Anna G Milliken
Laboratory Manager

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ANALYTICAL RESULTS

Workorder: 9845324 EMS006|USACE-MARSH RUN PARK

Lab ID: **9845324002** Date Collected: 5/17/2010 13:50 Matrix: Ground Water

Sample ID: **MADW Hour 1** Date Received: 5/17/2010 19:25

Parameters	Results	Units	Footnotes	LOQ	LOD	DL	Method	Prepared	Analyzed	By	Cntr
VOLATILE ORGANICS											
cis-1,2-Dichloroethene	0.37J	ug/L	1	1.0	1.0	0.33	SW846 8260B		5/18/10 20:35	DJB	B
trans-1,2-Dichloroethene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/18/10 20:35	DJB	B
Tetrachloroethene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/18/10 20:35	DJB	B
Trichloroethene	2.8	ug/L		1.0	1.0	0.33	SW846 8260B		5/18/10 20:35	DJB	B
Vinyl Chloride	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/18/10 20:35	DJB	B
Surrogate Recoveries	*Results*	*Units*	*Footnotes*	*Limits*			*Method*	*Prepared*	*Analyzed*	*By*	*Cntr*
1,2-Dichloroethane-d4 (S)	97.5	%		70-120			SW846 8260B		5/18/10 20:35	DJB	B
4-Bromofluorobenzene (S)	89.5	%		75-120			SW846 8260B		5/18/10 20:35	DJB	B
Dibromofluoromethane (S)	89.4	%		85-115			SW846 8260B		5/18/10 20:35	DJB	B
Toluene-d8 (S)	107	%		85-120			SW846 8260B		5/18/10 20:35	DJB	B

Sample Comments:

Anna G Milliken
Laboratory Manager

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ANALYTICAL RESULTS

Workorder: 9845324 EMS006|USACE-MARSH RUN PARK

Lab ID: **9845324003** Date Collected: 5/17/2010 14:50 Matrix: Ground Water

Sample ID: **MADW Hour 2** Date Received: 5/17/2010 19:25

Parameters	Results	Units	Footnotes	LOQ	LOD	DL	Method	Prepared	Analyzed	By	Cntr
VOLATILE ORGANICS											
cis-1,2-Dichloroethene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/18/10 21:08	DJB	B
trans-1,2-Dichloroethene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/18/10 21:08	DJB	B
Tetrachloroethene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/18/10 21:08	DJB	B
Trichloroethene	2.9	ug/L		1.0	1.0	0.33	SW846 8260B		5/18/10 21:08	DJB	B
Vinyl Chloride	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/18/10 21:08	DJB	B
Surrogate Recoveries	*Results*	*Units*	*Footnotes*	*Limits*			*Method*	*Prepared*	*Analyzed*	*By*	*Cntr*
1,2-Dichloroethane-d4 (S)	99.3	%		70-120			SW846 8260B		5/18/10 21:08	DJB	B
4-Bromofluorobenzene (S)	91.7	%		75-120			SW846 8260B		5/18/10 21:08	DJB	B
Dibromofluoromethane (S)	88.8	%		85-115			SW846 8260B		5/18/10 21:08	DJB	B
Toluene-d8 (S)	107	%		85-120			SW846 8260B		5/18/10 21:08	DJB	B

Sample Comments:

Anna G Milliken
Laboratory Manager

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ANALYTICAL RESULTS

Workorder: 9845324 EMS006|USACE-MARSH RUN PARK

Lab ID: **9845324004** Date Collected: 5/17/2010 15:50 Matrix: Ground Water

Sample ID: **MADW Hour 3** Date Received: 5/17/2010 19:25

Parameters	Results	Units	Footnotes	LOQ	LOD	DL	Method	Prepared	Analyzed	By	Cntr
VOLATILE ORGANICS											
cis-1,2-Dichloroethene	<1.0U	ug/L	1	1.0	1.0	0.33	SW846 8260B		5/18/10 21:41	DJB	B
trans-1,2-Dichloroethene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/18/10 21:41	DJB	B
Tetrachloroethene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/18/10 21:41	DJB	B
Trichloroethene	2.7	ug/L		1.0	1.0	0.33	SW846 8260B		5/18/10 21:41	DJB	B
Vinyl Chloride	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/18/10 21:41	DJB	B
Surrogate Recoveries	*Results*	*Units*	*Footnotes*	*Limits*			*Method*	*Prepared*	*Analyzed*	*By*	*Cntr*
1,2-Dichloroethane-d4 (S)	97.8	%		70-120			SW846 8260B		5/18/10 21:41	DJB	B
4-Bromofluorobenzene (S)	90.1	%		75-120			SW846 8260B		5/18/10 21:41	DJB	B
Dibromofluoromethane (S)	88.9	%		85-115			SW846 8260B		5/18/10 21:41	DJB	B
Toluene-d8 (S)	105	%		85-120			SW846 8260B		5/18/10 21:41	DJB	B

Sample Comments:

Anna G Milliken
Laboratory Manager

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ANALYTICAL RESULTS

Workorder: 9845324 EMS006|USACE-MARSH RUN PARK

Lab ID: **9845324005** Date Collected: 5/17/2010 16:50 Matrix: Ground Water

Sample ID: **MADW Hour 4** Date Received: 5/17/2010 19:25

Parameters	Results	Units	Footnotes	LOQ	LOD	DL	Method	Prepared	Analyzed	By	Cntr
VOLATILE ORGANICS											
cis-1,2-Dichloroethene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/18/10 22:14	DJB	C
trans-1,2-Dichloroethene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/18/10 22:14	DJB	C
Tetrachloroethene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/18/10 22:14	DJB	C
Trichloroethene	2.5	ug/L		1.0	1.0	0.33	SW846 8260B		5/18/10 22:14	DJB	C
Vinyl Chloride	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/18/10 22:14	DJB	C
Surrogate Recoveries	*Results*	*Units*	*Footnotes*	*Limits*			*Method*	*Prepared*	*Analyzed*	*By*	*Cntr*
1,2-Dichloroethane-d4 (S)	103	%		70-120			SW846 8260B		5/18/10 22:14	DJB	C
4-Bromofluorobenzene (S)	93.4	%		75-120			SW846 8260B		5/18/10 22:14	DJB	C
Dibromofluoromethane (S)	89.3	%		85-115			SW846 8260B		5/18/10 22:14	DJB	C
Toluene-d8 (S)	107	%		85-120			SW846 8260B		5/18/10 22:14	DJB	C

Sample Comments:

Anna G Milliken
Laboratory Manager

ANALYTICAL LABORATORY SERVICES, INC.
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NELAP Accredited
PA 22-293 NJ PA010
34 Dogwood Lane - Middletown, PA 17057 Phone: 717-944-5541 Fax: 717-944-1430

ANALYTICAL RESULTS

Workorder: 9845324 EMS006|USACE-MARSH RUN PARK

Lab ID: **9845324006** Date Collected: 5/17/2010 17:50 Matrix: Ground Water

Sample ID: **MADW Hour 5** Date Received: 5/17/2010 19:25

Parameters	Results	Units	Footnotes	LOQ	LOD	DL	Method	Prepared	Analyzed	By	Cntr
VOLATILE ORGANICS											
cis-1,2-Dichloroethene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/18/10 13:22	MES	B
trans-1,2-Dichloroethene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/18/10 13:22	MES	B
Tetrachloroethene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/18/10 13:22	MES	B
Trichloroethene	2.7	ug/L		1.0	1.0	0.33	SW846 8260B		5/18/10 13:22	MES	B
Vinyl Chloride	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/18/10 13:22	MES	B
Surrogate Recoveries	*Results*	*Units*	*Footnotes*	*Limits*			*Method*	*Prepared*	*Analyzed*	*By*	*Cntr*
1,2-Dichloroethane-d4 (S)	98.1	%		70-120			SW846 8260B		5/18/10 13:22	MES	B
4-Bromofluorobenzene (S)	92	%		75-120			SW846 8260B		5/18/10 13:22	MES	B
Dibromofluoromethane (S)	91.2	%		85-115			SW846 8260B		5/18/10 13:22	MES	B
Toluene-d8 (S)	107	%		85-120			SW846 8260B		5/18/10 13:22	MES	B

Sample Comments:

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ANALYTICAL RESULTS

Workorder: 9845324 EMS006|USACE-MARSH RUN PARK

Lab ID: **9845324007** Date Collected: 5/17/2010 19:25 Matrix: Ground Water

Sample ID: **Trip Blank** Date Received: 5/17/2010 19:25

Parameters	Results	Units	Footnotes	LOQ	LOD	DL	Method	Prepared	Analyzed	By	Cntr
VOLATILE ORGANICS											
cis-1,2-Dichloroethene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/18/10 08:21	MES	B
trans-1,2-Dichloroethene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/18/10 08:21	MES	B
Tetrachloroethene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/18/10 08:21	MES	B
Trichloroethene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/18/10 08:21	MES	B
Vinyl Chloride	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/18/10 08:21	MES	B
Surrogate Recoveries	*Results*	*Units*	*Footnotes*	*Limits*			*Method*	*Prepared*	*Analyzed*	*By*	*Cntr*
1,2-Dichloroethane-d4 (S)	97.3	%		70-120			SW846 8260B		5/18/10 08:21	MES	B
4-Bromofluorobenzene (S)	91.5	%		75-120			SW846 8260B		5/18/10 08:21	MES	B
Dibromofluoromethane (S)	97.9	%		85-115			SW846 8260B		5/18/10 08:21	MES	B
Toluene-d8 (S)	105	%		85-120			SW846 8260B		5/18/10 08:21	MES	B

Sample Comments:

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ANALYTICAL RESULTS QUALIFIERS\FLAGS

Workorder: 9845324 EMS006|USACE-MARSH RUN PARK

PARAMETER QUALIFIERS\FLAGS

[1] The QC sample type LCS for method SW846 8260B was outside the control limits for the analyte cis-1,2-Dichloroethene. The % Recovery was reported as 127 and the control limits were 70 to 125.

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CHAIN OF CUSTODY/ REQUEST FOR ANALYSIS

ALL SHADED AREAS MUST BE COMPLETED BY THE CLIENT / SAMPLER. INSTRUCTIONS ON THE BACK.

Page 1 of 1
Courier:
Tracking #:

9845324

Co. Name: EA Engineering
Contact (Report to): Denise Will
Phone: 717.791.5600
Address: 1 Marketway W. Suite 4C York PA 17401

Bill to (if different than Report to):
PO#: 6233063

Project Name/#:
ALSI Quote #:
TAT: ☐ Normal-Standard TAT is 10-12 business days. ☒ Rush-Subject to ALSI approval and surcharges.
Date Required:
Approved By:
Email? ☒ Y dwill@eaesh.com
Fax? ☐ Y No.:

Sample Description/Location (as it will appear on the lab report)	COC Comments	Sample Date	Military Time	*G or C	**Matrix	VOC 8260									
***Container Type						VOA									
***Container Size						40ml									
*** Preservative						HCl									
1 DUP-3	3Day TAT	5/17/10	—	G	GW	X3									
2 MADW Hour 1	3 Day TAT		1350			X3									
3 MADW Hour 2	3 Day TAT		1450			X3									
4 MADW Hour 3	3Day TAT		1550			X3									
5 MADW Hour 4	3 Day TAT		1650			X3									
6 MADW Hour 5	3 Day TAT, MS/MSD		1750			X9									
~~7 MADW Hour 6~~	~~124 hr TAT~~		~~1850~~			~~X3~~									
8 trip blank		5/17/10	—			X2									

Enter Number of Containers Per Analysis

5-17-10

	Y	Y	Y	Y	Y
Correct containers?	Y	Y	Y	Y	Y
Correct sample volume?	Y	Y	Y	Y	Y
Correct preservation?	Y	Y	Y	Y	Y
Headspace/Volatiles?	Y	Y	Y	Y	Y
Circle appropriate Y or N.					
Custody seals Present?	Y	Y	Y	Y	Y
(if present) Seals intact?	Y	Y	Y	Y	Y
Received on ice?	Y	Y	Y	Y	Y
COC/Labels complete/accurate?	Y	Y	Y	Y	Y
Container in good condition?	Y	Y	Y	Y	Y

Receipt Information (completed by Sample Receiver)
Performed by: JH INITIAL HERE
Cooler Temp: 4°
Therm. ID: 10133724
No. of Coolers:
Notes:

SAMPLED BY (Please Print): Denise Will / Adrian Hughes
LOGGED BY (signature): DATE 5/17/10 TIME 2133
REVIEWED BY (signature): D. Brown DATE 5/18/10 TIME 940

Relinquished By / Company Name	Date	Time	Received By / Company Name	Date	Time
1 Denise Will / EA	5/17/10	1905	2	5-17-10	1925
3			4		
5			6		
7			8		
9			10		

Data Deliverables: ☐ Standard ☐ CLP-like ☐ NJ-Reduced ☐ NJ-Full ☐ other
EDDs Required? ☐ If yes, format type:
SDWA Forms? ⇒ yes ☐ yes ☐ yes ☐ yes ☐
State Samples Collected In? MD ☐ NJ ☐ NY ☐ PA ☐ Other
Enter PWSID No.
DOD Criteria Required?

ALSI FIELD SERVICES: ☐ Pickup ☐ Labor ☐ Composite Sampling ☐ Rental Equipment ☐ Other:

* G=Grab; C=Composite
**Matrix: Al=Air; DW=Drinking Water; GW=Groundwater; Ol=Oil; OL=Other Liquid; SL=Sludge; SO=Soil; WP=Wipe; WW=Wastewater
Copies: WHITE - ORIGINAL CANARY - CUSTOMER COPY
***Container Type: AG-Amber Glass; CG-Clear Glass, PL-Plastic. Container Size: 250ml, 500ml, 1L, 8oz., etc. Preservative: HCl, HNO3, NaOH, etc.
Rev 6/07

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Certificate of Analysis

Project Name:	**USACE-MARSH RUN PARK - NEW**	Workorder:	**9845480**
Purchase Order:	**623303**	Workorder ID:	**EMS007|USACE-MARSH RUN PARK**

Ms. Denise Wilt
EA Engineering-York PA
One Marketway West, Suite 4C
York, PA 17401

May 21, 2010

Dear Ms. Wilt,

Enclosed are the analytical results for samples received by the laboratory on Tuesday, May 18, 2010

ALSI is a National Environmental Laboratory Accreditation Program (NELAP) accredited laboratory and as such, certifies that all applicable test results meet the requirements of NELAP.

If you have any questions regarding this certificate of analysis, please contact Denise Brooks (Project Coordinator) or Anna G Milliken (Laboratory Manager) at (717) 944-5541.

Please visit us at www.analyticallab.com for a listing of ALSI's NELAP accreditations and Scope of Work, as well as other links to Water Quality documentation on the internet.

This laboratory report may not be reproduced, except in full, without the written approval of ALSI.

NOTE: ALSI has changed the report generation tool and while we have tried to retain the existing format, you will notice some changes in the laboratory report. Please feel free to contact ALSI in case you have any questions.

Analytical Laboratory Services, Inc.

This page is included as part of the Analytical Report and must be retained as a permanent record thereof.

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Laboratory Manager

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SAMPLE SUMMARY

Workorder: 9845480 EMS007|USACE-MARSH RUN PARK Discard Date: 06/03/2010

Lab ID	Sample ID	Matrix	Date Collected	Date Received	Collected By
9845480001	Trip Blank	Ground Water	5/18/10 15:25	5/18/10 15:25	Denise Wilt
9845480002	RB-3	Ground Water	5/18/10 09:15	5/18/10 15:25	Denise Wilt
9845480003	RB-4	Ground Water	5/18/10 13:00	5/18/10 15:25	Denise Wilt
9845480004	Influent 1	Ground Water	5/18/10 13:30	5/18/10 15:25	Denise Wilt

Workorder Comments:

Notes

-- Samples collected by ALSI personnel are done so in accordance with the procedures set forth in the ALSI Field Sampling Plan (20 - Field Services Sampling Plan).
-- All Waste Water analyses comply with methodology requirements of 40 CFR Part 136.
-- All Drinking Water analyses comply with methodology requirements of 40 CFR Part 141.
-- Unless otherwise noted, all quantitative results for soils are reported on a dry weight basis.
-- The Chain of Custody document is included as part of this report.

Standard Acronyms/Flags

J, B	Indicates an estimated value between the Method Detection Limit (MDL) and the Practical Quantitation Limit (PQL) for the analyte
U	Indicates that the analyte was Not Detected (ND)
MDL	Method Detection Limit
PQL	Practical Quantitation Limit
RDL	Reporting Detection Limit
ND	Not Detected - indicates that the analyte was Not Detected at the RDL
Cntr	Analysis was performed using this container
RegLmt	Regulatory Limit
LCS	Laboratory Control Sample
MS	Matrix Spike
MSD	Matrix Spike Duplicate
DUP	Sample Duplicate
%Rec	Percent Recovery
RPD	Relative Percent Difference

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ANALYTICAL RESULTS

Workorder: 9845480 EMS007|USACE-MARSH RUN PARK

Lab ID: **9845480001** Date Collected: 5/18/2010 15:25 Matrix: Ground Water

Sample ID: **Trip Blank** Date Received: 5/18/2010 15:25

Parameters	Results	Units	Footnotes	LOQ	LOD	DL	Method	Prepared	Analyzed	By	Cntr
VOLATILE ORGANICS											
cis-1,2-Dichloroethene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/19/10 10:34	MES	C
trans-1,2-Dichloroethene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/19/10 10:34	MES	C
Tetrachloroethene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/19/10 10:34	MES	C
Trichloroethene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/19/10 10:34	MES	C
Vinyl Chloride	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/19/10 10:34	MES	C
Surrogate Recoveries	*Results*	*Units*	*Footnotes*	*Limits*			*Method*	*Prepared*	*Analyzed*	*By*	*Cntr*
1,2-Dichloroethane-d4 (S)	94.2	%		70-120			SW846 8260B		5/19/10 10:34	MES	C
4-Bromofluorobenzene (S)	97.5	%		75-120			SW846 8260B		5/19/10 10:34	MES	C
Dibromofluoromethane (S)	87.2	%		85-115			SW846 8260B		5/19/10 10:34	MES	C
Toluene-d8 (S)	107	%		85-120			SW846 8260B		5/19/10 10:34	MES	C

Sample Comments:

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ANALYTICAL RESULTS

Workorder: 9845480 EMS007|USACE-MARSH RUN PARK

Lab ID: **9845480002** Date Collected: 5/18/2010 09:15 Matrix: Ground Water

Sample ID: **RB-3** Date Received: 5/18/2010 15:25

Parameters	Results	Units	Footnotes	LOQ	LOD	DL	Method	Prepared	Analyzed	By	Cntr
VOLATILE ORGANICS											
cis-1,2-Dichloroethene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/19/10 11:07	MES	B
trans-1,2-Dichloroethene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/19/10 11:07	MES	B
Tetrachloroethene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/19/10 11:07	MES	B
Trichloroethene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/19/10 11:07	MES	B
Vinyl Chloride	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/19/10 11:07	MES	B
Surrogate Recoveries	*Results*	*Units*	*Footnotes*	*Limits*			*Method*	*Prepared*	*Analyzed*	*By*	*Cntr*
1,2-Dichloroethane-d4 (S)	95.8	%		70-120			SW846 8260B		5/19/10 11:07	MES	B
4-Bromofluorobenzene (S)	90.5	%		75-120			SW846 8260B		5/19/10 11:07	MES	B
Dibromofluoromethane (S)	89.7	%		85-115			SW846 8260B		5/19/10 11:07	MES	B
Toluene-d8 (S)	105	%		85-120			SW846 8260B		5/19/10 11:07	MES	B

Sample Comments:

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ANALYTICAL RESULTS

Workorder: 9845480 EMS007|USACE-MARSH RUN PARK

Lab ID: **9845480003** Date Collected: 5/18/2010 13:00 Matrix: Ground Water

Sample ID: **RB-4** Date Received: 5/18/2010 15:25

Parameters	Results	Units	Footnotes	LOQ	LOD	DL	Method	Prepared	Analyzed	By	Cntr
VOLATILE ORGANICS											
cis-1,2-Dichloroethene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/19/10 11:40	MES	B
trans-1,2-Dichloroethene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/19/10 11:40	MES	B
Tetrachloroethene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/19/10 11:40	MES	B
Trichloroethene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/19/10 11:40	MES	B
Vinyl Chloride	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/19/10 11:40	MES	B
Surrogate Recoveries	*Results*	*Units*	*Footnotes*	*Limits*			*Method*	*Prepared*	*Analyzed*	*By*	*Cntr*
1,2-Dichloroethane-d4 (S)	97.3	%		70-120			SW846 8260B		5/19/10 11:40	MES	B
4-Bromofluorobenzene (S)	97.9	%		75-120			SW846 8260B		5/19/10 11:40	MES	B
Dibromofluoromethane (S)	89.5	%		85-115			SW846 8260B		5/19/10 11:40	MES	B
Toluene-d8 (S)	107	%		85-120			SW846 8260B		5/19/10 11:40	MES	B

Sample Comments:

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ANALYTICAL RESULTS

Workorder: 9845480 EMS007|USACE-MARSH RUN PARK

Lab ID: **9845480004** Date Collected: 5/18/2010 13:30 Matrix: Ground Water

Sample ID: **Influent 1** Date Received: 5/18/2010 15:25

Parameters	Results	Units	Footnotes	LOQ	LOD	DL	Method	Prepared	Analyzed	By	Cntr
VOLATILE ORGANICS											
Acetone	<5.0U	ug/L		5.0	5.0	1.6	SW846 8260B		5/19/10 14:27	MES	B
Benzene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/19/10 14:27	MES	B
Bromochloromethane	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/19/10 14:27	MES	B
Bromodichloromethane	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/19/10 14:27	MES	B
Bromoform	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/19/10 14:27	MES	B
Bromomethane	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/19/10 14:27	MES	B
2-Butanone	<5.0U	ug/L		5.0	5.0	1.6	SW846 8260B		5/19/10 14:27	MES	B
Carbon Disulfide	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/19/10 14:27	MES	B
Carbon Tetrachloride	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/19/10 14:27	MES	B
Chlorobenzene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/19/10 14:27	MES	B
Chlorodibromomethane	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/19/10 14:27	MES	B
Chloroethane	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/19/10 14:27	MES	B
Chloroform	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/19/10 14:27	MES	B
Chloromethane	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/19/10 14:27	MES	B
1,2-Dibromo-3-chloropropane	<5.0U	ug/L		5.0	5.0	1.6	SW846 8260B		5/19/10 14:27	MES	B
1,2-Dibromoethane	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/19/10 14:27	MES	B
1,1-Dichloroethane	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/19/10 14:27	MES	B
1,2-Dichloroethane	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/19/10 14:27	MES	B
1,1-Dichloroethene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/19/10 14:27	MES	B
cis-1,2-Dichloroethene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/19/10 14:27	MES	B
trans-1,2-Dichloroethene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/19/10 14:27	MES	B
1,2-Dichloropropane	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/19/10 14:27	MES	B
cis-1,3-Dichloropropene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/19/10 14:27	MES	B
trans-1,3-Dichloropropene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/19/10 14:27	MES	B
Ethylbenzene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/19/10 14:27	MES	B
2-Hexanone	<5.0U	ug/L		5.0	5.0	1.6	SW846 8260B		5/19/10 14:27	MES	B
4-Methyl-2-Pentanone(MIBK)	<5.0U	ug/L		5.0	5.0	1.6	SW846 8260B		5/19/10 14:27	MES	B
Methylene Chloride	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/19/10 14:27	MES	B
Styrene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/19/10 14:27	MES	B
1,1,2,2-Tetrachloroethane	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/19/10 14:27	MES	B
Tetrachloroethene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/19/10 14:27	MES	B
Toluene	0.60J	ug/L		1.0	1.0	0.33	SW846 8260B		5/19/10 14:27	MES	B
Total Xylenes	<3.0U	ug/L		3.0	3.0	1.0	SW846 8260B		5/19/10 14:27	MES	B
1,1,1-Trichloroethane	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/19/10 14:27	MES	B
1,1,2-Trichloroethane	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/19/10 14:27	MES	B
Trichloroethene	1.4	ug/L		1.0	1.0	0.33	SW846 8260B		5/19/10 14:27	MES	B
Vinyl Chloride	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/19/10 14:27	MES	B
o-Xylene	<1.0U	ug/L		1.0	1.0	0.33	SW846 8260B		5/19/10 14:27	MES	B
mp-Xylene	<2.0U	ug/L		2.0	2.0	0.66	SW846 8260B		5/19/10 14:27	MES	B

Surrogate Recoveries	*Results*	*Units*	*Footnotes*	*Limits*	*Method*	*Prepared*	*Analyzed*	*By*	*Cntr*
1,2-Dichloroethane-d4 (S)	96.6	%		70-120	SW846 8260B		5/19/10 14:27	MES	B
4-Bromofluorobenzene (S)	94.6	%		75-120	SW846 8260B		5/19/10 14:27	MES	B
Dibromofluoromethane (S)	91.6	%		85-115	SW846 8260B		5/19/10 14:27	MES	B
Toluene-d8 (S)	107	%		85-120	SW846 8260B		5/19/10 14:27	MES	B

ANALYTICAL LABORATORY SERVICES, INC.
www.analyticallab.com
NELAP Accredited
PA 22-293 NJ PA010
34 Dogwood Lane - Middletown, PA 17057 Phone: 717-944-5541 Fax: 717-944-1430

ANALYTICAL RESULTS

Workorder: 9845480 EMS007|USACE-MARSH RUN PARK

Lab ID:	**9845480004**	Date Collected:	5/18/2010 13:30	Matrix:	Ground Water
Sample ID:	**Influent 1**	Date Received:	5/18/2010 15:25		

Parameters	Results	Units	Footnotes	LOQ	LOD	DL	Method	Prepared	Analyzed	By	Cntr

Sample Comments:

Anna G Milliken
Laboratory Manager

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Analytical Laboratory Services, Inc.
Environmental • Industrial Hygiene • Field Services
34 Dogwood Lane • Middletown, PA 17057 • 717.944.5541 • Fax: 717.944.1430

CHAIN OF CUSTODY/ REQUEST FOR ANALYSIS

ALL SHADED AREAS MUST BE COMPLETED BY THE CLIENT/SAMPLER. INSTRUCTIONS ON THE BACK.

Page __ of __
Courier:
Tracking #:

9845480

Co. Name: EA
Contact: Denise Witt
Phone: 717.741.5600
Address: 1 Marketway W Suite 4C York PA 17401
Bill to:
PO#: 623303
Project Name/#: Marsh Run
ALSI Quote #:
TAT: [ ] Normal-Standard TAT is 10-12 business days. [X] Rush-Subject to ALSI approval and surcharges.
Date Required:
Approved By:
Email? -Y
Fax? -Y No

***Container Type: VOA | VOA
***Container Size: 40ml | 40ml
***Preservative: HCl | HCl

ANALYSES/METHOD REQUESTED: VOC 8260 Marsh Run list | tcl VOC 8260

Enter Number of Containers Per Analysis

	Sample Description/Location (as it will appear on the lab report)	COC Comments	Sample Date	Military Time	*G or C	**Matrix	VOC 8260 Marsh Run list	tcl VOC 8260
1	trip blank	3 day tat	5/18/10	-		W	X	
2	RB-3	"	↓	915	g	W	X	
3	RB-4	"		1300	g	W	X	
4	Influent 1	need tcl "		1330	g	W		X
5	~~Influent 2~~ DW							
6								
7								
8								

SAMPLED BY (Please Print): Denise Witt
LOGGED BY (signature): [signature] Date 5/18/10 Time 1720
REVIEWED BY (signature): [signature] Date 5/19/10 Time 1144

	Relinquished By / Company Name	Date	Time		Received By / Company Name	Date	Time
1	[signature] / EA	5/18/10	1525	2	[signature] ALSI	5/18/10	1525
3				4			
5				6			
7				8			
9				10			

Data Deliverables: [ ] Standard [ ] CLP-like [ ] NJ-Reduced [ ] NJ-Full [ ]
EDDs Required? [ ] If yes, format type:
SDWA Forms? yes [ ] yes [ ] yes [ ] yes [ ] Other
State Samples Collected In? MD [ ] NJ [ ] NY [ ] PA [ ]
DOD Criteria Required?

Receipt Information (completed by Sample Receiving)
Performed by: [initials]
Cooler Temp: 3°
Therm. ID: 01332724
No. of Coolers:
Notes:

Correct containers?	(Y)	N
Correct sample volume?	(Y)	N
Correct preservation?	(Y)	N
Headspace/Volatiles?	Y	(N)
Circle appropriate Y or N.		
Custody seals Present?	Y	(N)
(if present) Seals intact?	Y	N
Received on ice?	(Y)	N
COC/Labels complete/accurate?	(Y)	N
Container in good condition?	(Y)	N

ALSI FIELD SERVICES
[ ] Pickup
[ ] Labor
[ ] Composite Sampling
[ ] Rental Equipment
[ ] Other:

* G=Grab; C=Composite
**Matrix: AI=Air; DW=Drinking Water; GW=Groundwater; OI=Oil; OL=Other Liquid; SL=Sludge; SO=Soil; WP=Wipe; WW=Wastewater
***Container Type: AG-Amber Glass; CG-Clear Glass, PL-Plastic. Container Size: 250ml, 500ml, 1L, 8oz., etc. Preservative: HCl, HNO3, NaOH, etc.

Copies: WHITE - ORIGINAL CANARY - CUSTOMER COPY
Rev 6/07

APPENDIX E

PUMPING TEST DOCUMENTATION

Retrieving data from CXY for period 2010-06-12 to 2010-06-17

Query returned 171 observations in 1.35 seconds

Station Metadata

Station: CXY - CAPITAL CITY
Data Source: FAA
Period of Record: 1991-01-02 through 2010-08-11
Nearest City, State: , PA **County:**YORK
Latitude: 40.22° N **Longitude:** 76.85° W **Elevation:** 340.0
Climate Division: 4 **Weather Forecasting Office:** CTP **& Zone:**

Date GMT	Station Pressure mb
2010-06-12 00:56:00	1019.0
2010-06-12 01:56:00	1020.0
2010-06-12 02:56:00	1020.0
2010-06-12 03:56:00	1020.0
2010-06-12 04:56:00	1019.0
2010-06-12 05:56:00	1019.0
2010-06-12 06:56:00	1019.0
2010-06-12 07:56:00	1019.0
2010-06-12 08:56:00	1019.0
2010-06-12 09:56:00	1019.0
2010-06-12 10:56:00	1019.0
2010-06-12 11:56:00	1019.0
2010-06-12 12:56:00	1019.0
2010-06-12 13:56:00	1019.0
2010-06-12 14:56:00	1018.0
2010-06-12 15:56:00	1017.0
2010-06-12 16:56:00	1016.0
2010-06-12 17:56:00	1015.0
2010-06-12 18:56:00	1014.0
2010-06-12 19:56:00	1014.0
2010-06-12 20:56:00	1013.0
2010-06-12 21:56:00	1012.0
2010-06-12 22:31:00	1013.0
2010-06-12 22:45:00	1014.0
2010-06-12 22:56:00	1014.0
2010-06-12 23:03:00	1014.0
2010-06-12 23:14:00	1014.0
2010-06-12 23:25:00	1014.0
2010-06-12 23:28:00	1013.0

2010-06-12 23:35:00	1013.0
2010-06-12 23:56:00	1013.0
2010-06-13 00:08:00	1013.0
2010-06-13 00:20:00	1013.0
2010-06-13 00:56:00	1013.0
2010-06-13 01:56:00	1013.0
2010-06-13 02:56:00	1012.0
2010-06-13 03:56:00	1012.0
2010-06-13 04:56:00	1012.0
2010-06-13 05:56:00	1012.0
2010-06-13 06:34:00	1012.0
2010-06-13 06:43:00	1012.0
2010-06-13 06:56:00	1012.0
2010-06-13 07:04:00	1012.0
2010-06-13 07:10:00	1012.0
2010-06-13 07:56:00	1012.0
2010-06-13 08:04:00	1012.0
2010-06-13 08:27:00	1012.0
2010-06-13 08:40:00	1012.0
2010-06-13 08:56:00	1011.0
2010-06-13 09:56:00	1012.0
2010-06-13 10:56:00	1011.0
2010-06-13 11:56:00	1011.0
2010-06-13 12:56:00	1011.0
2010-06-13 13:56:00	1011.0
2010-06-13 14:56:00	1011.0
2010-06-13 15:56:00	1011.0
2010-06-13 16:39:00	1011.0
2010-06-13 16:56:00	1011.0
2010-06-13 17:56:00	1010.0
2010-06-13 18:35:00	1010.0
2010-06-13 18:42:00	1010.0
2010-06-13 18:56:00	1010.0
2010-06-13 19:56:00	1009.0
2010-06-13 20:56:00	1009.0
2010-06-13 21:56:00	1009.0
2010-06-13 22:56:00	1010.0
2010-06-13 23:56:00	1010.0
2010-06-14 00:56:00	1011.0
2010-06-14 01:56:00	1011.0
2010-06-14 02:56:00	1012.0
2010-06-14 03:56:00	1012.0
2010-06-14 04:56:00	1012.0
2010-06-14 05:56:00	1011.0
2010-06-14 06:56:00	1011.0
2010-06-14 07:56:00	1011.0
2010-06-14 08:56:00	1011.0
2010-06-14 09:56:00	1011.0
2010-06-14 10:56:00	1011.0
2010-06-14 11:56:00	1012.0
2010-06-14 12:56:00	1012.0

2010-06-14 13:56:00	1011.0
2010-06-14 14:56:00	1011.0
2010-06-14 15:56:00	1012.0
2010-06-14 16:56:00	1011.0
2010-06-14 17:56:00	1011.0
2010-06-14 18:56:00	1011.0
2010-06-14 19:56:00	1011.0
2010-06-14 20:56:00	1011.0
2010-06-14 21:56:00	1011.0
2010-06-14 22:56:00	1011.0
2010-06-14 23:56:00	1011.0
2010-06-15 00:56:00	1011.0
2010-06-15 01:56:00	1012.0
2010-06-15 02:56:00	1012.0
2010-06-15 03:56:00	1013.0
2010-06-15 04:56:00	1014.0
2010-06-15 05:56:00	1014.0
2010-06-15 06:56:00	1014.0
2010-06-15 07:56:00	1015.0
2010-06-15 08:56:00	1015.0
2010-06-15 09:56:00	1015.0
2010-06-15 10:56:00	1016.0
2010-06-15 11:56:00	1017.0
2010-06-15 12:56:00	1018.0
2010-06-15 13:56:00	1018.0
2010-06-15 14:56:00	1018.0
2010-06-15 15:56:00	1018.0
2010-06-15 16:56:00	1019.0
2010-06-15 17:56:00	1019.0
2010-06-15 18:38:00	1019.0
2010-06-15 18:56:00	1019.0
2010-06-15 19:56:00	1018.0
2010-06-15 20:56:00	1018.0
2010-06-15 21:56:00	1018.0
2010-06-15 22:56:00	1018.0
2010-06-15 23:56:00	1018.0
2010-06-16 00:56:00	1018.0
2010-06-16 01:56:00	1018.0
2010-06-16 02:56:00	1019.0
2010-06-16 03:56:00	1019.0
2010-06-16 04:56:00	1019.0
2010-06-16 05:56:00	1019.0
2010-06-16 06:56:00	1019.0
2010-06-16 07:56:00	1019.0
2010-06-16 08:56:00	1019.0
2010-06-16 09:56:00	1019.0
2010-06-16 10:56:00	1019.0
2010-06-16 11:56:00	1019.0
2010-06-16 12:56:00	1019.0
2010-06-16 13:47:00	1018.0
2010-06-16 13:56:00	1018.0

2010-06-16 14:56:00	1018.0
2010-06-16 15:56:00	1017.0
2010-06-16 16:56:00	1017.0
2010-06-16 17:56:00	1016.0
2010-06-16 18:56:00	1015.0
2010-06-16 19:56:00	1014.0
2010-06-16 20:56:00	1013.0
2010-06-16 21:56:00	1013.0
2010-06-16 22:56:00	1012.0
2010-06-16 23:44:00	1012.0
2010-06-16 23:56:00	1012.0
2010-06-17 00:56:00	1012.0
2010-06-17 01:47:00	1012.0
2010-06-17 01:56:00	1012.0
2010-06-17 02:11:00	1012.0
2010-06-17 02:14:00	1012.0
2010-06-17 02:23:00	1012.0
2010-06-17 02:30:00	1012.0
2010-06-17 02:56:00	1012.0
2010-06-17 03:56:00	1012.0
2010-06-17 04:56:00	1011.0
2010-06-17 05:56:00	1011.0
2010-06-17 06:56:00	1011.0
2010-06-17 07:56:00	1011.0
2010-06-17 08:56:00	1011.0
2010-06-17 09:56:00	1011.0
2010-06-17 10:56:00	1012.0
2010-06-17 11:56:00	1012.0
2010-06-17 12:56:00	1013.0
2010-06-17 13:56:00	1013.0
2010-06-17 14:56:00	1013.0
2010-06-17 15:56:00	1013.0
2010-06-17 16:56:00	1014.0
2010-06-17 17:56:00	1014.0
2010-06-17 18:56:00	1014.0
2010-06-17 19:56:00	1014.0
2010-06-17 20:56:00	1014.0
2010-06-17 21:56:00	1014.0
2010-06-17 22:56:00	1015.0
2010-06-17 23:56:00	1016.0

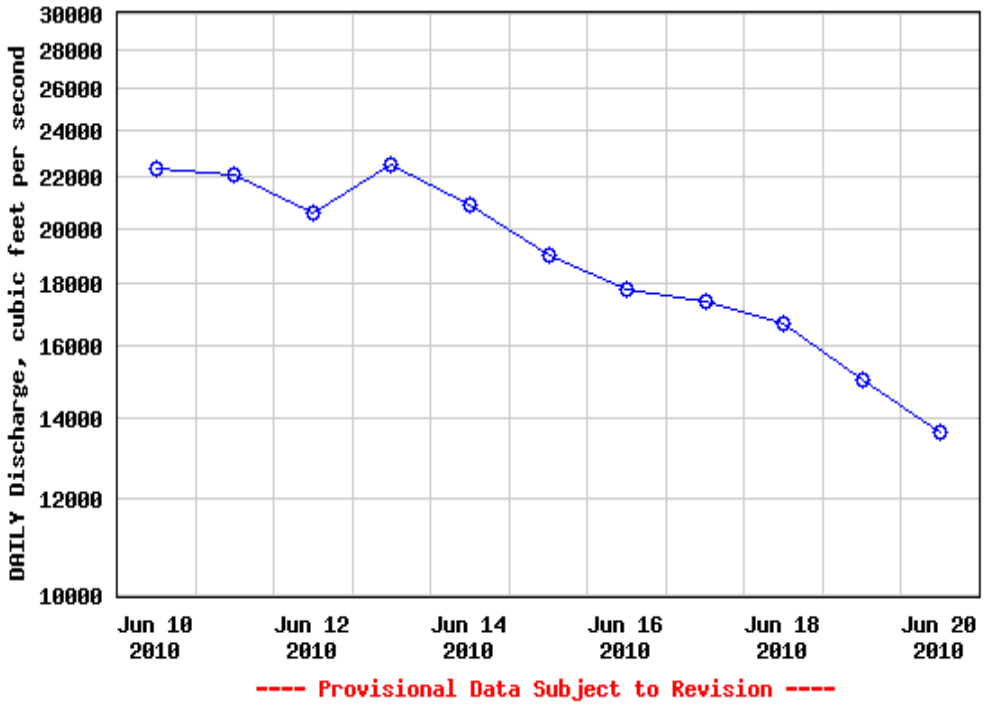
Mailing Address:
Pennsylvania State Climatologist
503 Walker Building
University Park, PA 16802

Phone:
814-865-8732
Fax:
814-865-3663
E-mail:
psc@mail.meteo.psu.edu

Recognized State Climate Office

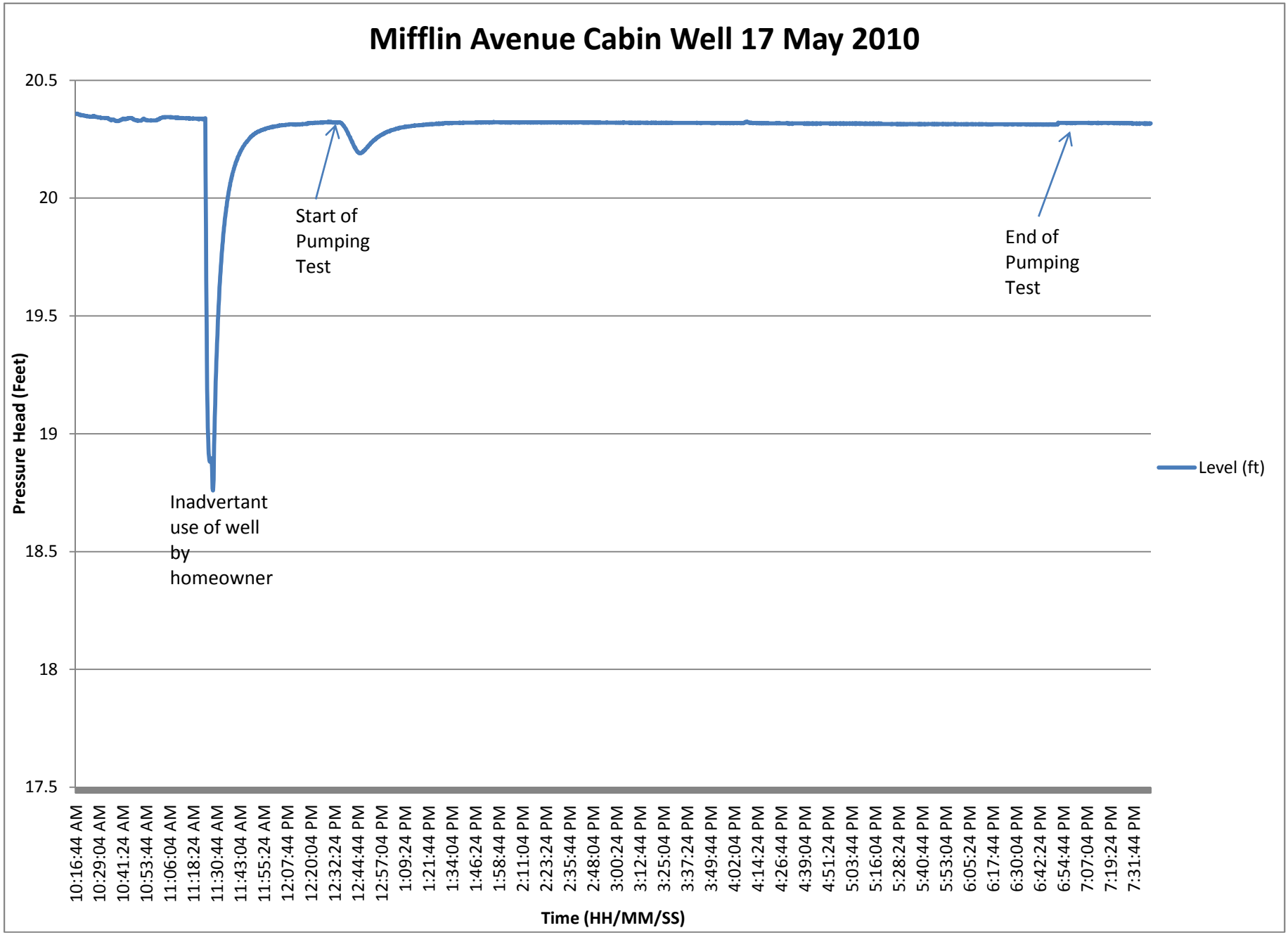
USGS

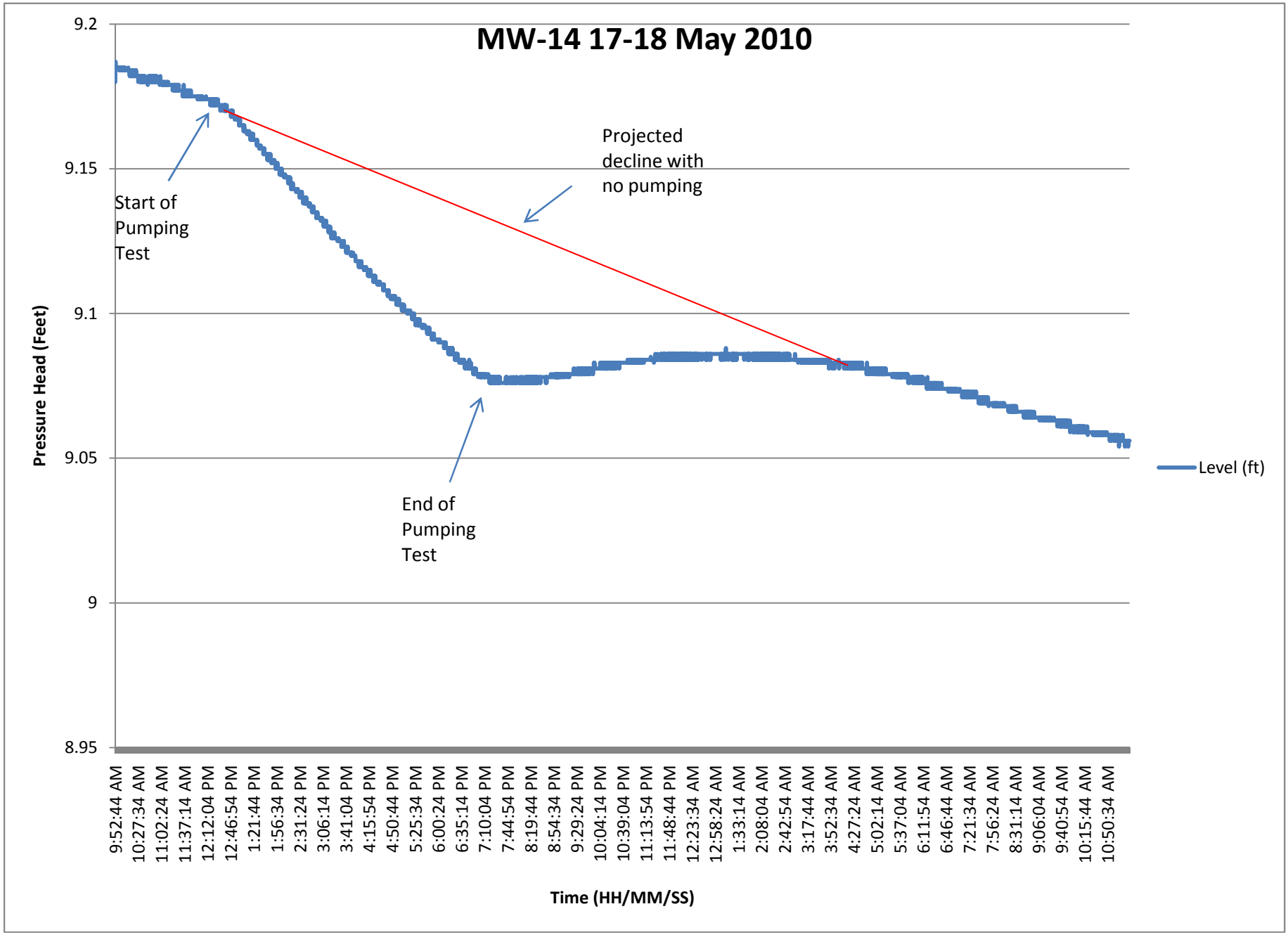
USGS 01570500 Susquehanna River at Harrisburg, PA

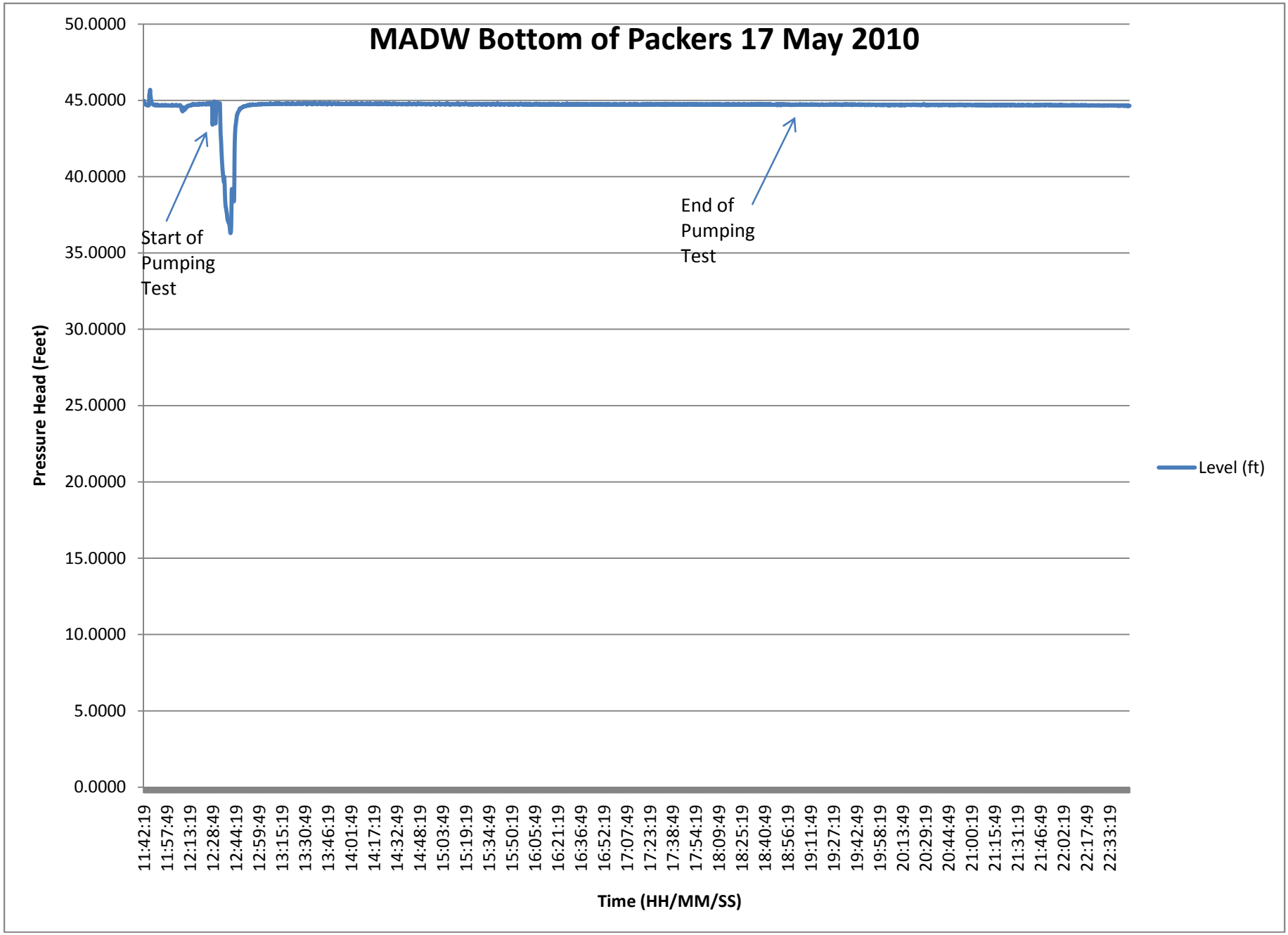


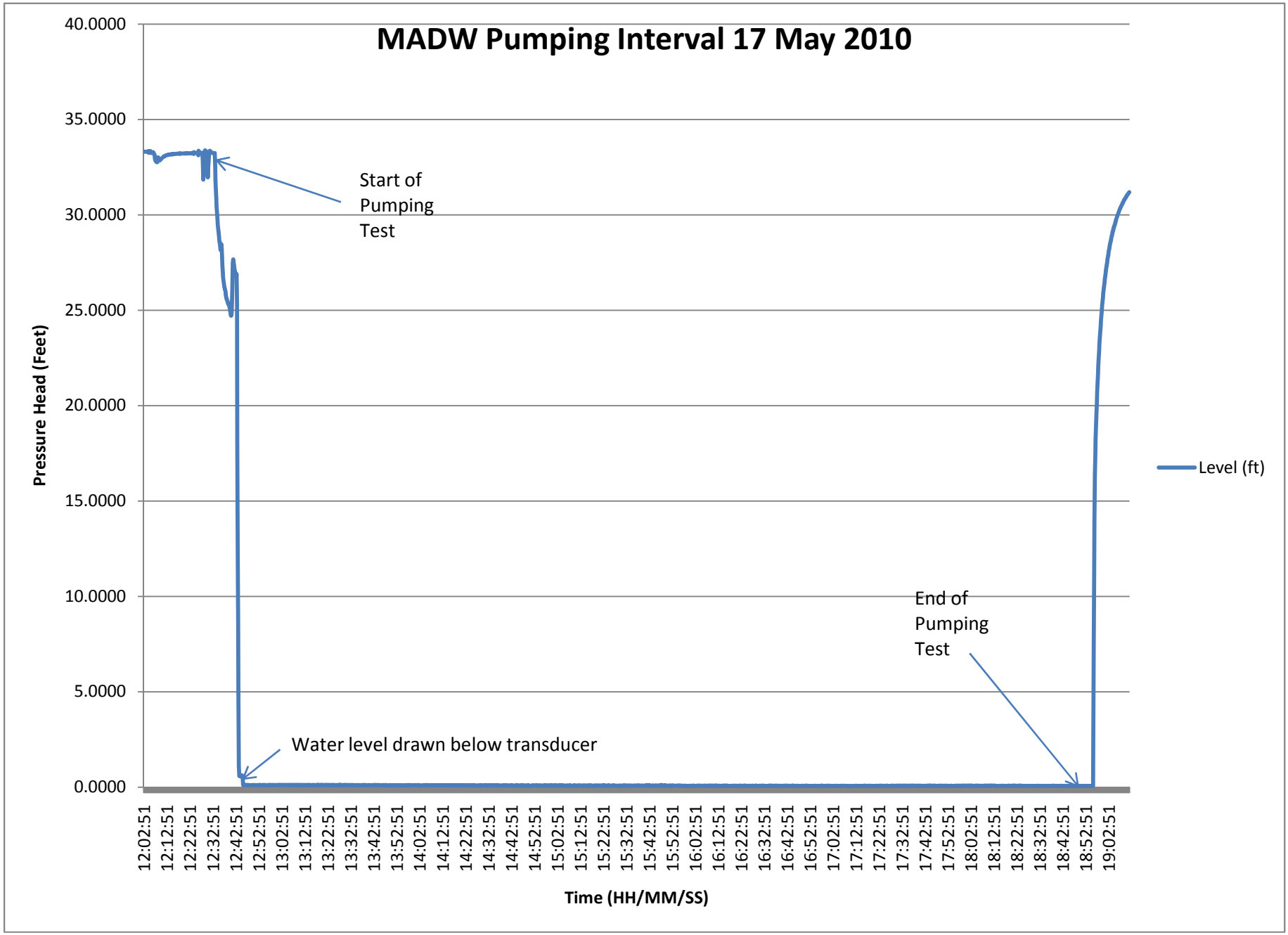
---- Provisional Data Subject to Revision ----

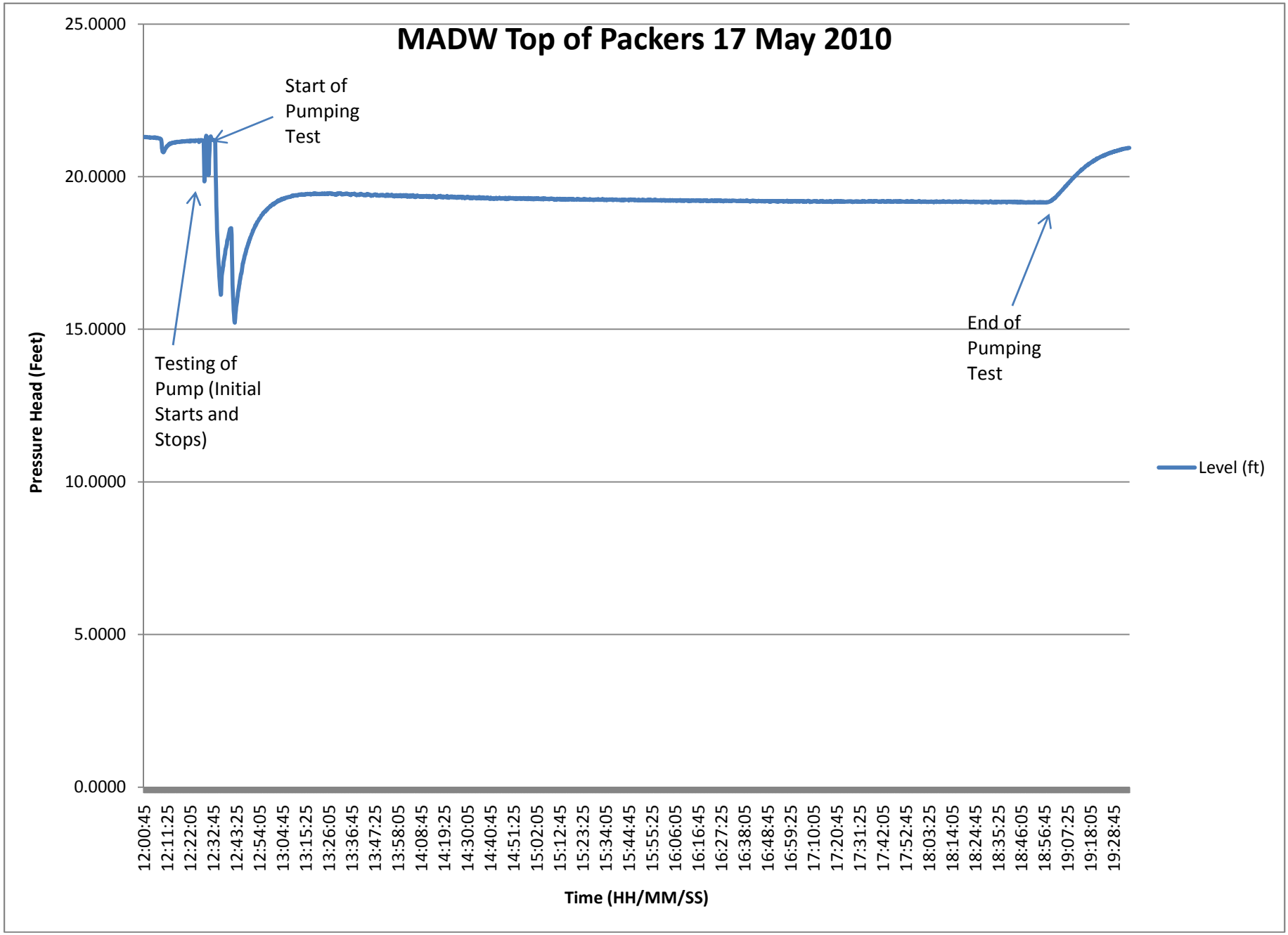
Pumping Test Transducer Data


Mifflin Avenue Cabin Well 17 May 2010
Pressure Head (Feet)
20.5
20
19.5
19
18.5
18
17.5
Start of Pumping Test
End of Pumping Test
Inadvertant use of well by homeowner
Level (ft)
10:16:44 AM
10:29:04 AM
10:41:24 AM
10:53:44 AM
11:06:04 AM
11:18:24 AM
11:30:44 AM
11:43:04 AM
11:55:24 AM
12:07:44 PM
12:20:04 PM
12:32:24 PM
12:44:44 PM
12:57:04 PM
1:09:24 PM
1:21:44 PM
1:34:04 PM
1:46:24 PM
1:58:44 PM
2:11:04 PM
2:23:24 PM
2:35:44 PM
2:48:04 PM
3:00:24 PM
3:12:44 PM
3:25:04 PM
3:37:24 PM
3:49:44 PM
4:02:04 PM
4:14:24 PM
4:26:44 PM
4:39:04 PM
4:51:24 PM
5:03:44 PM
5:16:04 PM
5:28:24 PM
5:40:44 PM
5:53:04 PM
6:05:24 PM
6:17:44 PM
6:30:04 PM
6:42:24 PM
6:54:44 PM
7:07:04 PM
7:19:24 PM
7:31:44 PM
Time (HH/MM/SS)


MW-14 17-18 May 2010
Pressure Head (Feet)
9.2
9.15
9.1
9.05
9
8.95
Start of Pumping Test
Projected decline with no pumping
End of Pumping Test
Level (ft)
9:52:44 AM
10:27:34 AM
11:02:24 AM
11:37:14 AM
12:12:04 PM
12:46:54 PM
1:21:44 PM
1:56:34 PM
2:31:24 PM
3:06:14 PM
3:41:04 PM
4:15:54 PM
4:50:44 PM
5:25:34 PM
6:00:24 PM
6:35:14 PM
7:10:04 PM
7:44:54 PM
8:19:44 PM
8:54:34 PM
9:29:24 PM
10:04:14 PM
10:39:04 PM
11:13:54 PM
11:48:44 PM
12:23:34 AM
12:58:24 AM
1:33:14 AM
2:08:04 AM
2:42:54 AM
3:17:44 AM
3:52:34 AM
4:27:24 AM
5:02:14 AM
5:37:04 AM
6:11:54 AM
6:46:44 AM
7:21:34 AM
7:56:24 AM
8:31:14 AM
9:06:04 AM
9:40:54 AM
10:15:44 AM
10:50:34 AM
Time (HH/MM/SS)


MADW Bottom of Packers 17 May 2010
Pressure Head (Feet)
50.0000
45.0000
40.0000
35.0000
30.0000
25.0000
20.0000
15.0000
10.0000
5.0000
0.0000
Start of Pumping Test
End of Pumping Test
Level (ft)
11:42:19
11:57:49
12:13:19
12:28:49
12:44:19
12:59:49
13:15:19
13:30:49
13:46:19
14:01:49
14:17:19
14:32:49
14:48:19
15:03:49
15:19:19
15:34:49
15:50:19
16:05:49
16:21:19
16:36:49
16:52:19
17:07:49
17:23:19
17:38:49
17:54:19
18:09:49
18:25:19
18:40:49
18:56:19
19:11:49
19:27:19
19:42:49
19:58:19
20:13:49
20:29:19
20:44:49
21:00:19
21:15:49
21:31:19
21:46:49
22:02:19
22:17:49
22:33:19
Time (HH/MM/SS)


MADW Pumping Interval 17 May 2010
Pressure Head (Feet)
40.0000
35.0000
30.0000
25.0000
20.0000
15.0000
10.0000
5.0000
0.0000
Start of Pumping Test
End of Pumping Test
Water level drawn below transducer
Level (ft)
12:02:51
12:12:51
12:22:51
12:32:51
12:42:51
12:52:51
13:02:51
13:12:51
13:22:51
13:32:51
13:42:51
13:52:51
14:02:51
14:12:51
14:22:51
14:32:51
14:42:51
14:52:51
15:02:51
15:12:51
15:22:51
15:32:51
15:42:51
15:52:51
16:02:51
16:12:51
16:22:51
16:32:51
16:42:51
16:52:51
17:02:51
17:12:51
17:22:51
17:32:51
17:42:51
17:52:51
18:02:51
18:12:51
18:22:51
18:32:51
18:42:51
18:52:51
19:02:51
Time (HH/MM/SS)


MADW Top of Packers 17 May 2010
Start of Pumping Test
Testing of Pump (Initial Starts and Stops)
End of Pumping Test
Pressure Head (Feet)
25.0000
20.0000
15.0000
10.0000
5.0000
0.0000
Time (HH/MM/SS)
12:00:45
12:11:25
12:22:05
12:32:45
12:43:25
12:54:05
13:04:45
13:15:25
13:26:05
13:36:45
13:47:25
13:58:05
14:08:45
14:19:25
14:30:05
14:40:45
14:51:25
15:02:05
15:12:45
15:23:25
15:34:05
15:44:45
15:55:25
16:06:05
16:16:45
16:27:25
16:38:05
16:48:45
16:59:25
17:10:05
17:20:45
17:31:25
17:42:05
17:52:45
18:03:25
18:14:05
18:24:45
18:35:25
18:46:05
18:56:45
19:07:25
19:18:05
19:28:45
Level (ft)

APPENDIX F

FLUTE™ DOCUMENTATION

FLUTe™ Flexible Liner Underground Technologies, Ltd. L.C.
For a medley of innovative designs
6 Easy St., Santa Fe, NM 87506
505-455-1300, www.flut.com

As-Built Information

Job # 1017

General:

Job Description:	204.7 6.5" 4 Port Water FLUTe
Customer:	Denise Wilt / EA Engineering Science & Tech
Location:	New Cumberland, PA
Well Designation:	Mifflin Ave. Deep Well
Hole Depth:	204.7'
Water Table:	25'
Drilling Method:	
Casing Information:	1.5' AGS
Installation Method:	Water Eversion
Bubbler / Tag:	Bubbler 1/4 nylon set to 25' / Tag 1" Nylon set to 204.7'

Liner:

Material:	400d Red double coat 2 sleeves
Diameter:	6.5"
Material Above Casing:	15' Liner Extension ATOC
Uneverted Material:	4'
Rough Fabrication Legnth:	226'
Termination:	End Seal Knot
Knot Diameter Allowance:	2"
Markings on Liner:	Ink stamp indicating FLUTe T.O.C. & FLUTe Job# 1017
Spacer Design:	2 Material Heliflex spacer Design (blue mesh) and Mylar

Spacer #	Spacer Bottom [ft]	Spacer Top [ft]
1	52'	41'
2	132'	121'
3	181'	170'
4	195'	184'

Tubing & Ports:							
		Tubing In Bundle:	PVDF & NYLON				
		Tubing In Sleeves:	PVDF & NYLON				
		Bubbler Details:	1/4 NYLON				
		Port Design:	Superthane feed thru				
		Port Locations:	6" @ bottom of spacer				
		Vent Design:	1/4 Superthane feed thru w/ 3/8 tygon tubing connected to duct				
		Vent Location:	208.7				
Pump Assembly:							
Port #:	**Transducer Serial #:**	**Transducer Pressure Rating [psi]:**	**Diaphragm Depth [ft. btoc]**	**Cable Serial #:**	**Cable Length [ft.]**	**Brass Elbow Depth [ft. btoc]**	**5/8" Tube Depth [ft. btoc]**
1						97'	82'
2						98'	83'
3						99'	84'
4						100'	85'

Other Info:	
Transducer Type:	N/A
Kellum Design:	2" & 1" webbing wrap
Kellum Locations:	1st Kellum 18' BTOC: Others every 40' Intervals
Tether:	1/4"
Marking on Tubing:	Port # and Color Coded
Marking on Cables:	N/A
Bundle Sheating:	White Diagonal / Taped every 20' Interval
Marks on Bundle:	Port #'s And TOC
Pump Tube:	3/4" Black Polytubing 204.7' + 20' ATOC
Reel / Packaging:	#12/ SF FLUTe
Casing Adapter Info:	Alb. FLUTe
Wellhead Info:	Lockable Wellhead Cover
Vent Tube:	n/a
Clamps:	Alb. FLUTe
Shipped Via:	Pilot Overnight
Other Notes:	

FLUTe™ Flexible Liner Underground Technologies, Ltd. L.C.
For a medley of innovative designs
6 Easy St., Santa Fe, NM 87504
505-455-1300, www.flut.com

Installation Procedure for FLUTe Liners
<u>Below the Water Table</u>

(Rev. 7/06)

Installation Procedure for FLUTe Liners <u>Below the Water Table</u>
(Rev. 5/02)

Before installing a liner in a water filled hole, there are several important considerations in the selection of the best procedure:

If the formation is permeable and the water table is 10 ft. or more below the surface, the installation is simple. One drives the liner down the hole with an excess water head and the water in the hole is pushed into the formation. If the water table is very deep, the hanging load is best supported by a "linear capstan", a FLUTe device for such installations.

If the water table is shallow, there may not be enough head to evert the liner into the hole. In that case, the liner may need an extension above the surface or/and the water in the hole must be pumped down/out as the liner is installed to "suck" the liner down the hole. If the formation flows freely, one can not "suck" the liner down the hole. Sometimes a short scaffold is used with a temporary extension of the casing to install with a shallow water table. "Shallow" is less than 6 ft to the water table for a 4" liner and less than 3 ft for an 8" liner. If the water table is less than the minimum depths, the liner can be filled with a "heavy water" which is a bentonite baroid mixture as is commonly used for weighted mud well drilling in unstable formations. The heavy mud provides a higher pressure in the liner than water with a density of about 25% more than water. The mud fill does not contact the formation or sample water. Another design difference for very shallow water tables may be to install the liner by lowering it down the hole rather than inverting it into the hole. The lowering of the liner down the hole is done without any special equipment and very simple. Once in place, the liner is then filled with water or mud.

If the formation is very tight and the water can not be pushed into the formation, the water must be pumped from the hole, even if the water table is deep. If the formation is very tight, it is also necessary to provide a means of supplying water below the liner as it is being inverted from the hole. Otherwise, the vacuum formed will prevent the inversion of the liner, with a few exceptions for small diameter liners in shallow holes. The device for water removal from the tight hole is called a pump tube liner or is sometimes just a pump tube alone.

The following installation procedure covers most circumstances. One must be aware of whether the special aids like a pump tube to the bottom of the hole or an extension on the wellhead are needed for the installation.

If a blank liner has been easily installed to the bottom of the hole without any pump tube, the sampling liner may not need a pump tube either. Removal of the pump tube can take 1-3 hrs sometimes in deep holes (>300 ft).

Installing a liner in a water filled hole

1. Locate the liner reel on an axle adjacent to the wellhead, 5-20 ft distant.

2. Locate the wellhead roller over the hole to guide the liner into the hole and for the removal if needed.
3. Obtain a water supply source with a means of controlling the flow rate.
4. Tag the depth of the well and the static water level. If the water table in shallow wells is less than that in the hole, note the shallow well water table level.
5. Assure the top of the casing is faired or set a surface conductor on the well.
6. Lower a chain into the casing if water(or the formation) seals the bottom of the casing. This chain allows air to flow from beneath the liner as it descends to the water table. (Do not float a clump of plastic chain on the water. It may impede the liner descent.)
7. If needed, lower a flat tube to the bottom to supply water during retrieval.
8. If needed, lower a pump tube liner (PTL, a 2" diam. sleeve containing a 1/2" id tube) into the well (if the well is to be purged during liner installation). Fill the 2" pump tube liner with a small amount of water (e.g., 1/4 the sleeve volume from bottom of the hole to the water table, ~0.04 gal/ft). If the water table is shallow, less than ~30 ft., only a tube in a 2" diam. sleeve needs to be lowered into the hole, but if the water table is deep (>50 ft.), it may be necessary to have a pump on the bottom of the pump tube liner. That pump requires a liner that will encompass the pump, if the pump tube liner is to be inverted out of the well with the blank liner in place.
9. Notch the bubbler tube (if there is a bubbler tube) in the liner sleeve at the appropriate depth below GS (this is usually at the water table depth). Record the depth of the notch.
10. Slit the liner to allow the GS mark to be properly located at the ground surface when the liner is clamped to the casing.
11. Invert ~4' of the liner into the well.
12. Clamp the liner to the well casing with the hose and chain in the well lying in the slit area (or use the reducer coupling or camlock fitting if available). Tape the liner before clamping to prevent cutting the liner with the clamp. (The liner might be attached to a wellhead device like a camlock reducer instead of the casing. In that case, the hose/tube and chain may be lowered thru a side port in a PVC tee set on the casing.)
13. Connect the bubbler and set the bubbler flow rate at 1-2 SCFH, if a bubbler is needed.
14. Add water to the liner until it settles into the well. Add water until there is about 10# of tension on the liner. Lower the liner to the water table. (Deep water tables (>100 ft) should be emplaced with twice that amount of tension to prevent wet film tension from stopping the descent or the formation of horizontal wrinkles from the tension.)
15. When the liner reaches the water table, note the response of the bubbler(if a bubbler was not in a sleeve, the bubbler tube can be lowered at this time to the water table depth). Mark the gauge on the bubbler with the preferred level of water above the bubbler notch or open end.
16. Add water and let the liner descend with the prescribed tension (the tension should be more than the wt. of the liner above the water level. FLUTe has a spreadsheet that calculates the appropriate tension.). If a purge pump is used in the hole, , the purge pump flow rate must be controlled so as to not pull the liner and the water level in the liner to below the water table. The bubbler can assure the proper maintenance of the water level in the liner when a purge pump is being used below the liner. (A hand pump is sometimes used on the surface as a purge pump for removal of the water below the liner)
17. As the tether end of the liner is about to enter the well, or if air is ballooning the liner, vent the trapped air in the several ways available. Be careful to stop water addition while

venting air in that the open vent might otherwise be pulled into the well. If the water table is deep, the air can be removed with a vacuum pump before the end of the liner enters the hole. The air will vent of its own accord if a vent tube and check valve are connected to the end of the liner as part of its fabrication (the usual case). However, a rapid liner descent rate at the time that the balloon forms in the liner end above the water, causing the liner to be stopped, is hazardous to the liner and the tubing sleeves in the liner. The FLUTe spread sheet calculates the liner depth when this may be a concern.

18. When the trapped air is thoroughly vented, reconnect the vent tube to the pressure relief valve, and continue lowering the liner via the tether or tubing bundle.
19. Upon nearing the bottom, do not overfill the liner.
20. **For deep water tables and heavy tubing bundles: As the last portion of the tubing bundle (approximately the last 50 ft.) is lowered into the borehole, the tubing bundle must be secured at the surface with kellum straps attached to safety lines. Two sets of kellum straps and safety lines should be used so that the hanging load of the tubing bundle can be alternated between each set as one kellum strap and safety line is being repositioned. The safety line in use should be snubbed around a convenient anchor such as the cleats on the linear capstan or a similar strong fair anchor which allows the safety line to be slacked as needed, yet remains securely anchored. The final positioning of the tubing bundle in the borehole can be facilitated using a winch attached to a kellum strap. A kellum attachment of the tubing bundle to the reel serves as an additional precaution against the loss of the tubing bundle into the hole as the end of the bundle is approached. These anchors are especially important for very deep water tables and large hanging loads (i.e., many ports). The FLUTe spreadsheet calculates the hanging load expected versus depth in the hole for guidance on this procedure. The PVDF tubing is 70% heavier than Nylon and leads to some awkward hanging loads unless the installer is cautious.***
21. As the descending liner envelopes the end of the pump tube liner, do not try to pump all of the water from the hole beneath the liner. With a pump at the bottom of the pump tube, it is possible to damage the liner by pumping the water out of the hole entirely. (If you do, the entire head in the liner will then load the bottom end. Any head over about 50 ft. of water is excessive for the pressurization of the liner.)
22. When on the bottom, note the head inside the liner. It is best near the long term value preferred.
23. Secure the tether very well, so as to not to drop it into the well.
24. Note the length of the tether or tubing to the nearest depth mark from the wellhead. Record it. Calculate the depth of the liner. Is it on the bottom? (if the liner is not marked, measure the tether remaining to determine the depth of the liner in the well.)
25. Gather the tubing in the wellhead assembly. Make sure that the tubing bundle is well supported by the tether. Make sure of the tube numbers related to the port locations. The tubes are located clockwise according to the port no. in the wellhead. No. 1 is the most shallow port, etc… Use the same convention for all tubes in the wellhead assembly. *****
26. Trim tubes and connect fittings. The sampling tubes do not need to be trimmed. Are the sampling tubes and air drive tubes compatible with the customer's connectors? *****
27. Pump the sampling system for each port at least twice. Purge all of the water on the last stroke. Tag the water level in the pump tubes when the water levels have recovered.

Record. Read the pressure transducers at the same time and record the readings to determine the transducer elevation relative to the head in the pump. *****

If a pump tube was used, the removal procedure for the tube is to pump the water from the fully emplaced liner until the head is at or below the local water table (i.e., deflate the liner in the hole). Then pull the pump tube from the hole. This should be done before the wellhead and fittings are completed to allow room to pull the tube. One often needs to be patient until the water in the hole fills the interstitial space next to the pump tube to allow the liner friction to drop so that the tube can be removed. After the tube is removed, refill the liner to its excess head desired. Because it may take some time for the liner to fully dilate in the hole again, the water level in the liner may need to be restored to the desired level numerous times. The effect of the falling head in the liner is called a virtual leak. It seems that the liner is leaking until it is fully dilated again.*

If a pump tube was used for a blank liner installation, it is best to not remove the tube before the blank liner is removed. Otherwise, it may be very difficult to reinstall the tube to supply water to the bottom of the hole (and the liner must then be pumped completely empty to remove it). A lay flat tube may be better used with a blank liner. It does not need to be removed and it can still be used to supply water below the inverting liner as needed. However, blank liners installed without a pump tube usually do not need to go to the bottom of the hole to obtain a sufficient seal of the hole.

* These steps only apply to the water sampling liner system.

The Removal Procedure

In removing a liner, it is important that the liner has a higher pressure/head inside the liner than outside to prevent the liner buckling instead of inverting while being pulled from the well.

If the liner is in a very tight formation or if the water table is very deep, install a pump, or pumping tube, inside the liner to remove the water down to a level **several ft. above** the shallow water table. This assures that the liner will not be pumped down to a condition that does not have enough pressure inside the liner.

If the hole is larger than 4 inches or the formation is very tight, a roller will be needed at the wellhead to allow a winch to be attached to the tether to provide a strong steady pull on the liner to assure that has a good positive pressure inside the liner as it inverts from the hole. For very deep water tables (>100 ft) or large liners (>6”), a linear capstan is very useful for the removal of the liner assembly from the hole.

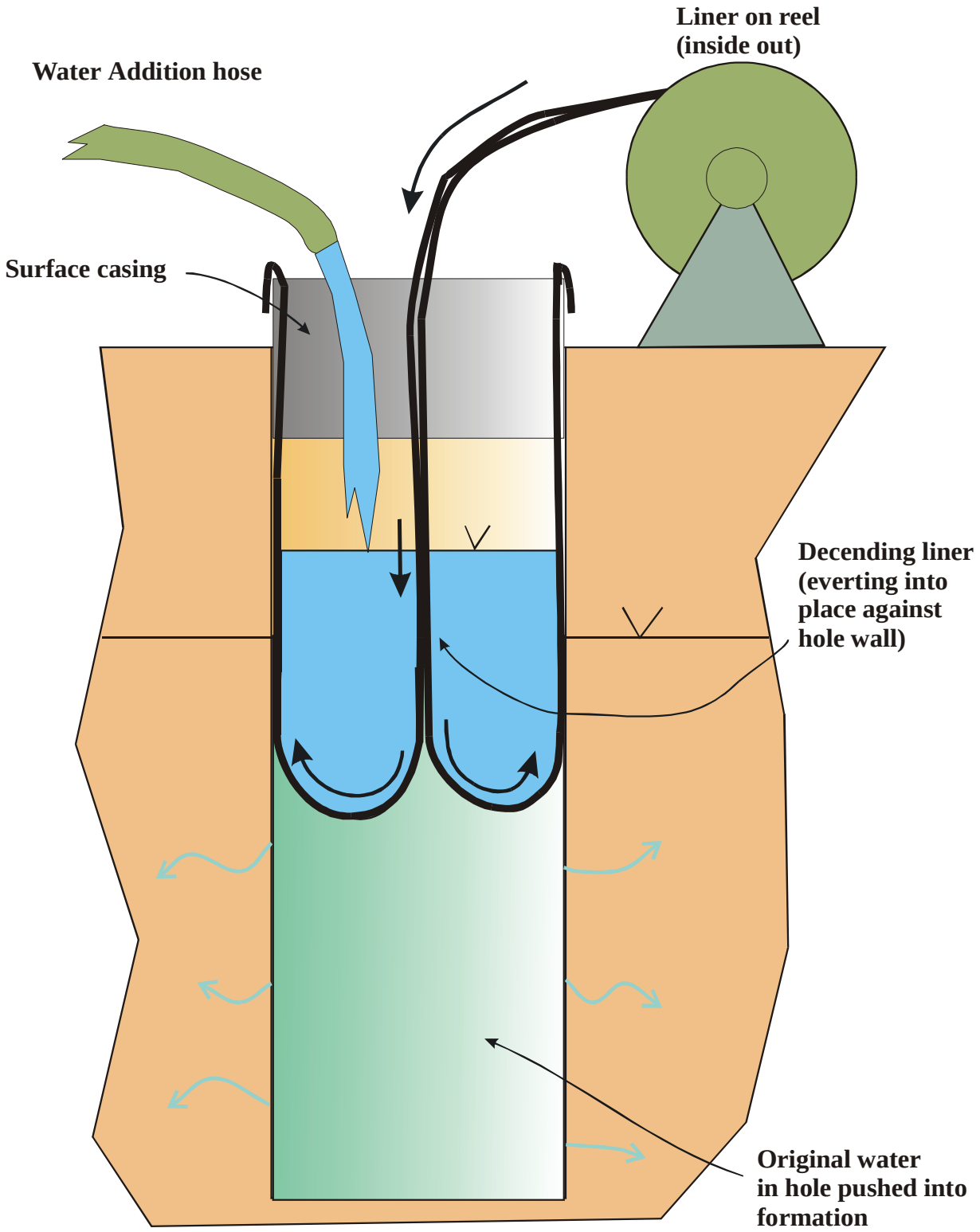
If the formation is very tight, water must be supplied to the bottom end of the hole below the liner to allow it to be inverted from the hole. It is best if that water is supplied from the interior of the liner to assure that the water added below the liner does not exceed that needed to only relieve the vacuum that tends to form below the liner. This is well done by connecting the outlet of the pump removing the water from the liner to the inlet of the tube to the bottom of the hole.

If too much water is added below the liner, the liner loses its differential pressure which dilates it in the hole, and it will buckle in the hole instead of inverting. Maintaining a constant tension on the liner is critical during any water addition to the bottom of the hole to assure that the liner is not allowed to collapse in the hole due to a lack of differential pressure.

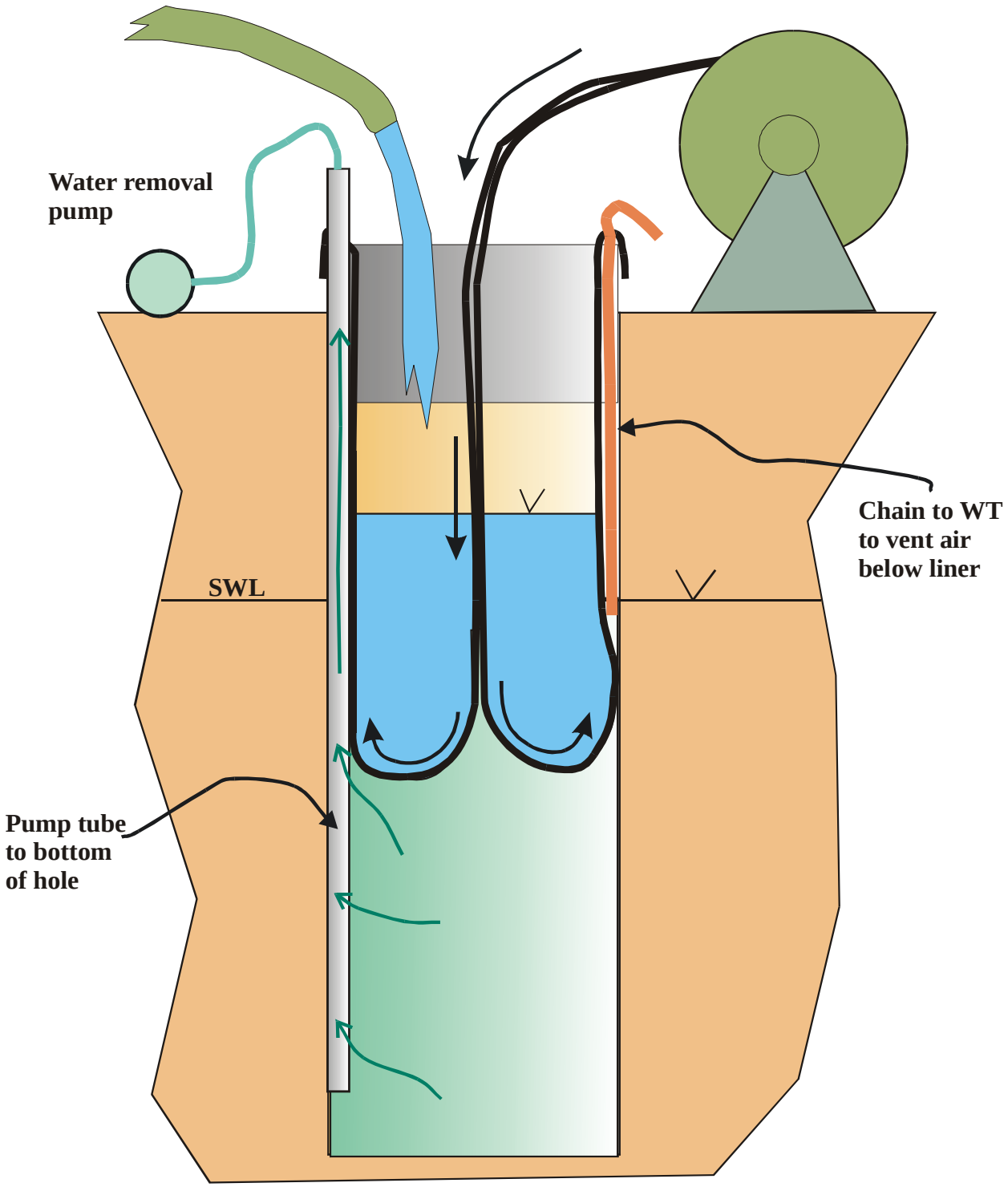
As the liner is raised from the hole, the water level tends to rise in the liner. That level must be pumped down by the removal pump for a deep water table, or the tension on the liner/tether becomes too great to lift.

For a shallow water table and a very permeable medium, the liner can be simply pulled from the hole allowing the water to spill out of the liner. However, if water must be added below the liner, as for a tight formation, the liner must be lifted with a good tension to assure that the liner stays dilated and inverting instead of buckling as the liner is raised.

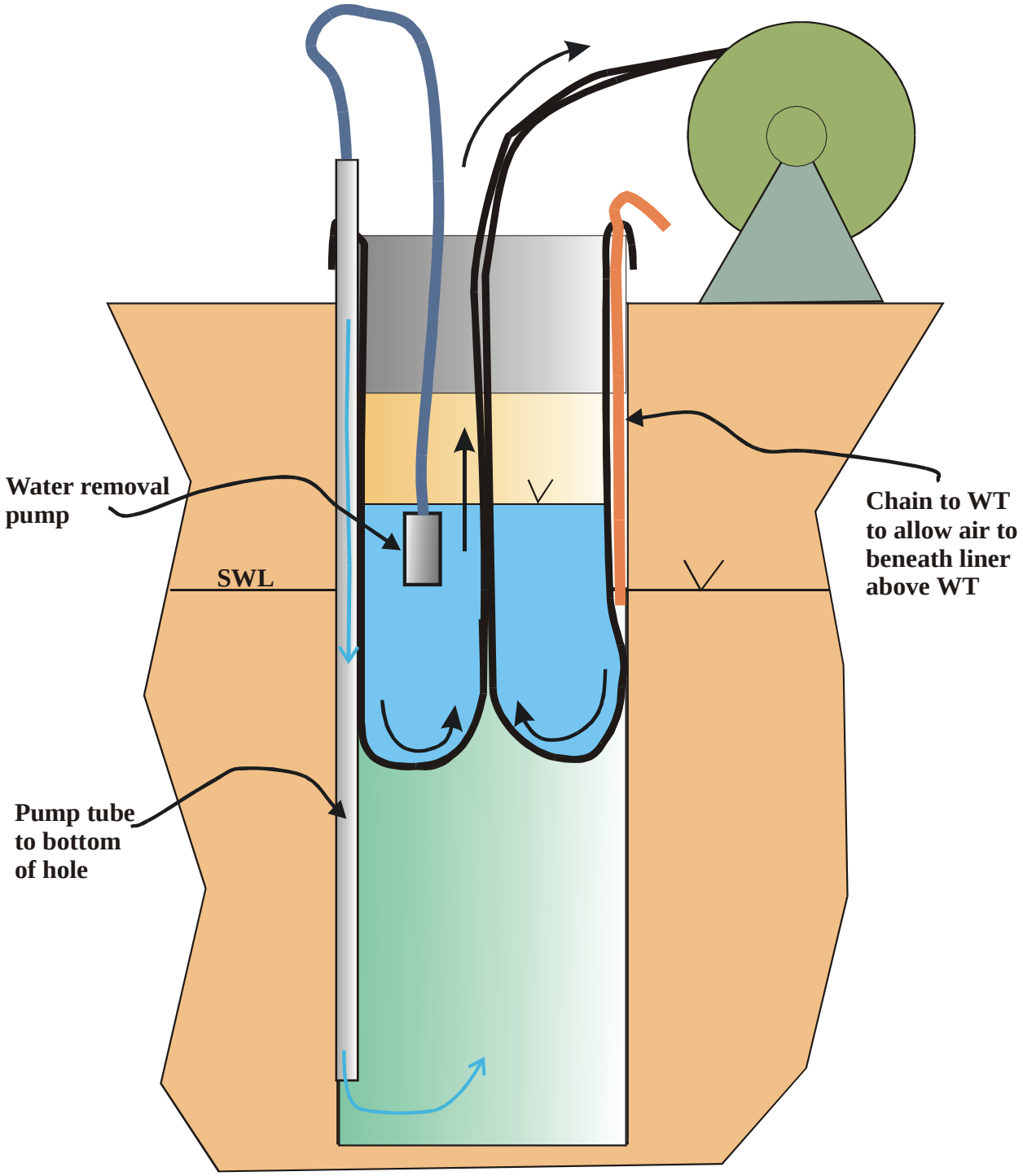
Typical Blank Liner Installation



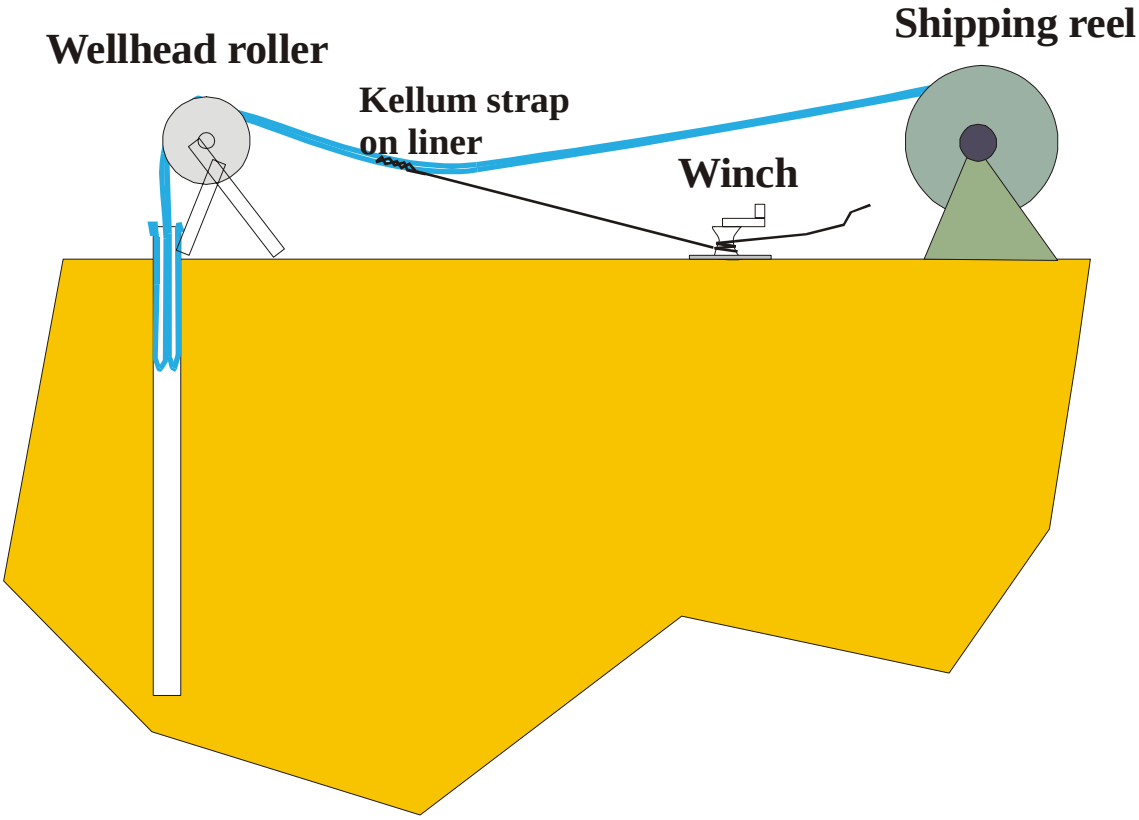
Aids to Liner Installation



Liner Removal Procedure (pump tube optional)



Winch pulling liner from deep/large hole



Linear Capstan installation for very deep water tables

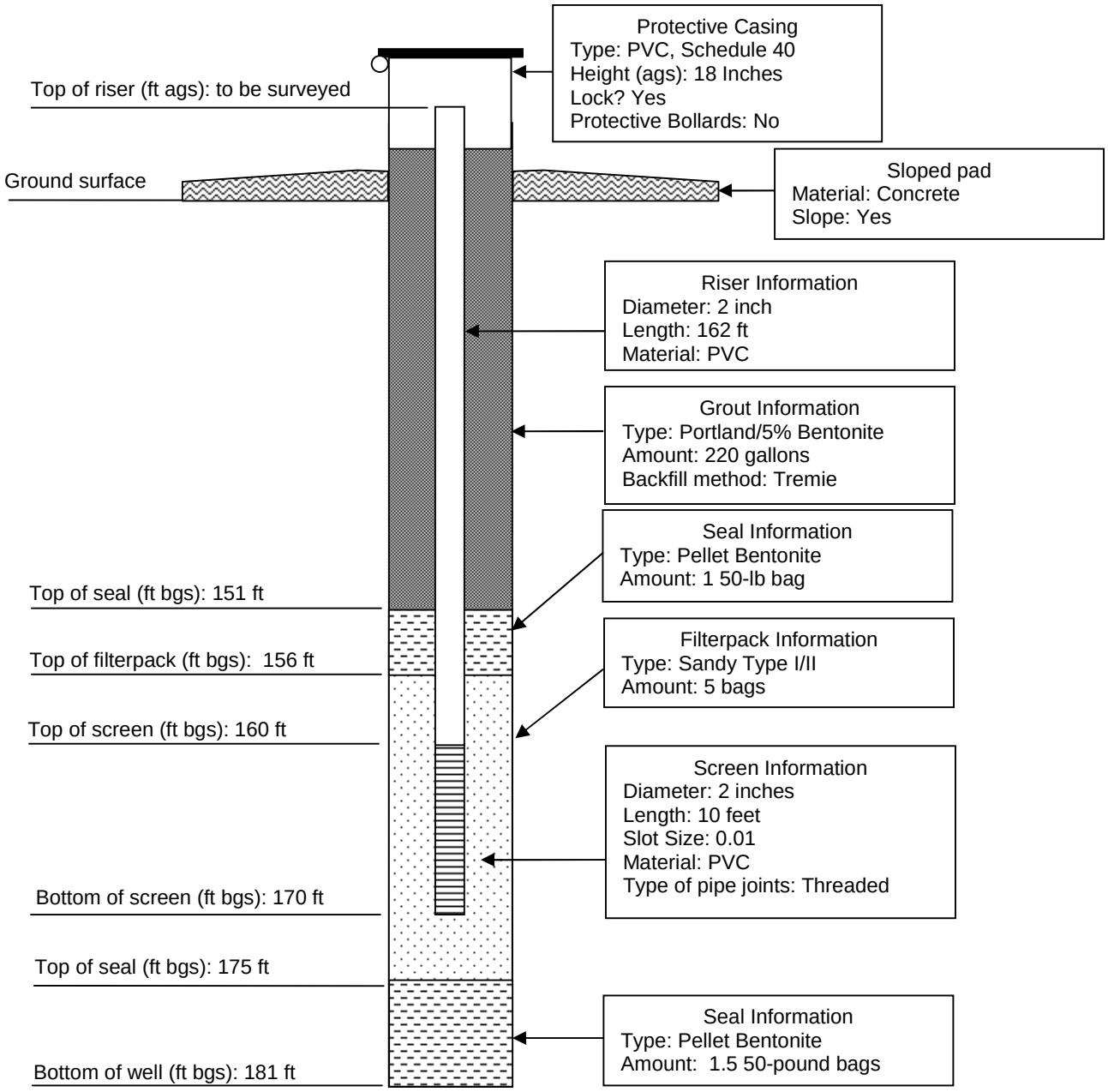
The linear capstan greatly reduces the labor of installations and removals of liners from holes involving large hanging weights. The capstan is instrumented to monitor the wellhead tension, installation speed and water level in the liner. FLUTe has a more compact version for rental. The capstan is only rented with a FLUTe trained operator.

APPENDIX G

WELL CONSTRUCTION DIAGRAMS AND DEVELOPMENT DOCUMENTATION

RECORD OF MONITORING WELL CONSTRUCTION
(STICK-UP)

EA Engineering, Science, and Technology, Inc.	Monitoring Well/Soil Boring ID No.: MW-15
Project Title/ Project No.: Marsh Run Park	Date/Time Installed: 18 and 20 May 2010 Time Finished: 20 May 14:00
Location: Cleared area in woods	Depth to Water: 9.67
Site Geologist: Denise Wilt	Drilling Method: Air Rotary



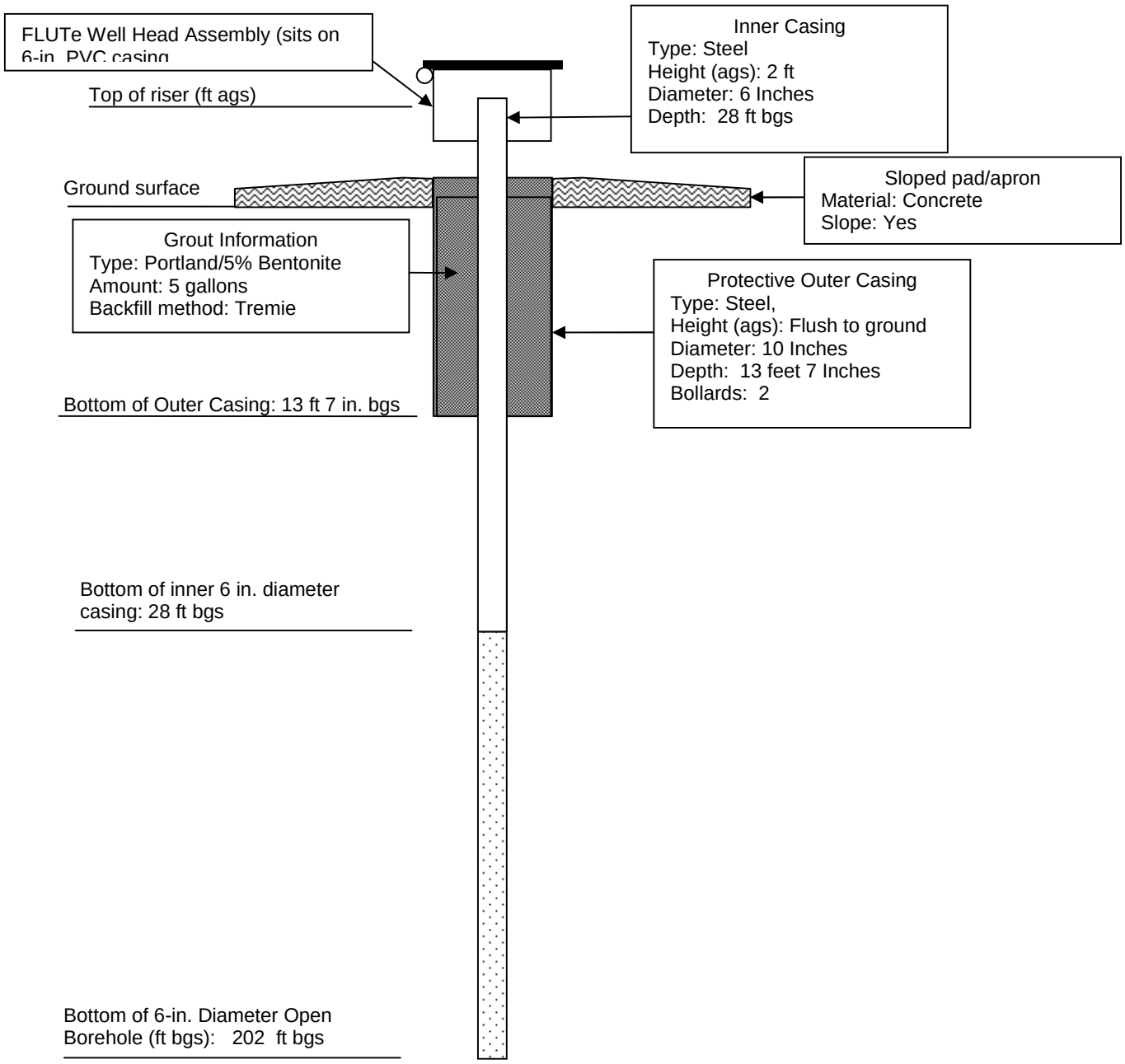
Note: All features not to scale

ags – Above Ground Surface
bgs – Below Ground Surface

RECORD OF MONITORING WELL CONSTRUCTION

(STICK-UP)

EA Engineering, Science, and Technology, Inc.	Monitoring Well/Soil Boring ID No.: Mifflin Avenue Deep Well
Project Title/ Project No.: Marsh Run Park	Date/Time Installed: 6 May 2010 Time Finished: 6 May 11:00
Location: Along dirt road adj to river	Depth to Water: 14.5 ft toc
Site Geologist: Denise Wilt	Drilling Method: Air Rotary



Note: All features not to scale

ags – Above Ground Surface
bgs – Below Ground Surface

EA Engineering, Science, and Technology, Inc.

FIELD RECORD OF WELL DEVELOPMENT

Well Designation	MW-15	Project Name	Marsh Run
Condition	muddy	Project Location	Marsh Run
Well Grout Date	5/4/10	Developer Initials	DW
Well Installation Date	5/5/10	Well Development Date	5/5/10
Gauge Date	5/5/10	Gauge Time	
Sounding Method	WL	Measurement Ref.	TOC
Stick up/down (ft)	2	Well Diameter	6"
Static Water Level	9.69	Screen Length	NA openborehole
Development Time	4hrs		
Surge Device	grundfos pump		
Weather	clear		

Well Volume Determination:

A. Well Depth 200 ft
B. Depth to Water 9.69 ft
C. Liquid Depth (A-B) (ft) 190.31
D. Well Volume/ft 1.47 279.75 gal
E. Liquid screen length (ft) N/A

	Beginning	1	2	3	4	5
Surge Time (min)	900	910	920	930	946	
Pump Rate (gpm)	~1.5 gpm					
Volume purged					~~80~~ 60 gal	
Turbidity (NTU)		29.7	20.9	14.7	9.7	

Total volume of water removed (gal): 60
Estimated Recharge Rate: unknown
Depth to sediment before development: NA
Depth to sediment after development: NA

Total Surging Time: _____

Development Description: Also Developed w/ rig on 5/3 w/ bailer
Turbidity measurement taken @ ~~greater~~ interval (~ 5min) during developed

EA Engineering, Science, and Technology, Inc.

FIELD RECORD OF WELL DEVELOPMENT

Well Designation	Mifflin Ave. Deep well	Project Name	Marsh Ken
Condition	New	Project Location	Marsh Ken
Well Grout Date	5/5	Developer Initials	DW
Well Installation Date	5/6	Well Development Date	5/6/10
Gauge Date	5/6	Gauge Time	430
Sounding Method	WL1	Measurement Ref.	TOC
Stick up/down (ft)	2	Well Diameter	6"
Static Water Level	14.50	Screen Length	N/A
Development Time	1 hr.		
Surge Device	grad fos		
Weather	warm		

Well Volume Determination:

A. Well Depth ~200
B. Depth to Water 14.50
C. Liquid Depth (A-B) (ft) 185.5
D. Well Volume/ft 1.47 273
E. Liquid screen length (ft) N/A

	Beginning	1	2	3	4	5
Surge Time (min)	5pm	515	530	545	6pm	
Pump Rate (gpm)	1.5	→				
Volume purged					~100gal	
Turbidity (NTU)	157	93.2	75.3	43.2	28.3	

Total volume of water removed (gal): 100
Estimated Recharge Rate: unkown
Depth to sediment before development: _____ Depth to sediment after development: _____

Total Surging Time: _____

Development Description: Well was also developed w/ air rotary rig after drilling completed. Well did not reach <10NTU. Turbidity measurements taken ~5min int.

MW-15 – Photograph of final well development water.

Photo not available for MADW