October 21, 2020

Richard Hull
US Environmental Protection Agency, Region I
5 Post Office Square, Suite 100
Boston, Massachusetts 02109-3912

**Re: Draft Deep Bedrock Investigation Pumping Test Work Plan
Coakley Landfill – North Hampton and Greenland, New Hampshire**

Dear Mr. Hull:

On behalf of the Coakley Landfill Group (CLG), CES, Inc. (CES) has prepared the following response to comments made by the United States Environmental Protection Agency (USEPA) in its review of the *MW-6 Interval Packer Sampling Results and Pumping Test Viability* memorandum (Memorandum). The Memorandum was submitted to the USEPA and New Hampshire Department of Environmental Services (NHDES) on August 18, 2020. MW-6 was approved for use as the pumping test well by the USEPA on August 26, 2020 via email correspondence. The included Draft Deep Bedrock Investigation Pumping Test Work Plan (Pumping Test Work Plan) has been developed with considerations of the comments addressed below.

USEPA 1. Given the results from the transducer logging of MW-5D during the redevelopment of MW-6, it is possible that pumping from MW-6 will draw flow and contaminant mass from MW-5D into MW-6, creating a short-term increase in contaminant concentration in MW-6. Measuring for this potential should be considered in the pumping test work plan in the form of frequent sampling and analysis of site contaminants during and immediately following the pumping test.

<u>*CLG Response*</u>
The sampling frequency of pumping test water (pre-treatment) and list of analyses have been included in the Pumping Test Work Plan.

USEPA
2. A transducer can be deployed in MW-6 prior to the start of the pumping test to evaluate if there is any influence from nearby private water supply wells (such as 178A Lafayette Road) during periods of normal water use. Additional sampling of 178A Lafayette Road should also be conducted to determine if there are any impacts to contaminant levels from the pumping test. Suggest sampling prior to and immediately following the pumping test, and then quarterly for at least one year.

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CLG Response
The CLG will install a pressure transducer in MW-6 prior to the pumping test to monitor water levels and evaluate the influence, if any, from nearby private water supply wells (e.g., 178A Lafayette Road [178A LR]) during periods of normal water usage. Based on the location of MW-6 relative to 178A LR (1,350 ft north and west) and the anticipated direction of pumping stress applied during the pumping test (towards MW-6), we conclude the current sampling schedule for 178A LR (biannual) is sufficient to monitor changes in contaminant levels prior to (Fall 2020) and immediately following (Spring 2020) the pumping test. The sampling and analysis of untreated pumping test effluent from MW-6, as detailed in the Pumping Test Work Plan, will be used to evaluate short term changes in contaminant levels south of the landfill and determine the necessity of additional sampling of 178A LR.

USEPA

3. CLG should provide notification to the owner of 178A Lafayette Road of the pumping test and increased sampling.

CLG Response
The CLG will provide notification to the resident at 178A Lafayette Road of the pumping test. With regards to the increased sampling of the water supply at 178 A Lafayette Road, see above response to Comment No. 2.

USEPA

4. An individual packer can be installed in MW-6 during the pumping test to isolate the shallow fractures from the deeper fractures to better evaluate response to pumping in the deeper bedrock zones. Suggest a single packer installed at about 50-60 feet below top of casing, just above Zone 3.

CLG Response
The installation and use of a seal (Jaswell-type) within MW-6 to isolate shallow bedrock fractures from those located at depth in an effort to evaluate response to pumping within the deeper bedrock interval will be evaluated. However, based on construction details of the existing bedrock monitoring well network, shallow bedrock wells have typically been defined by those completed within the uppermost 25 - 30 feet of bedrock. According to observations made during well installation (bedrock at 6 feet below ground surface) and the results of borehole geophysical logging and interval packer sampling completed within MW-6 (detailed in the Memorandum), we conclude the seal/packer would be more effectively placed from 34-37 feet below top of casing. This placement isolates the identified fractures within the uppermost portion of Zone 2 (likely transmissive interval) from those deeper within the well and allows for a more consistent comparison with other "shallow" bedrock intervals during the pumping test. The effectiveness of this seal will be evaluated during the variable rate test and results conveyed to the Agencies prior to the start of the constant rate test.

DRAFT DEEP BEDROCK INVESTIGATION PUMPING TEST WORK PLAN COAKLEY LANDFILL SUPERFUND SITE NORTH HAMPTON AND GREENLAND, NEW HAMPSHIRE

FOR

COAKLEY LANDFILL GROUP

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OCTOBER 2020
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DRAFT DEEP BEDROCK INVESTIGATION PUMPING TEST WORK PLAN
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1.0 | INTRODUCTION

On behalf of the Coakley Landfill Group (CLG), CES, Inc. (CES) has prepared the following Draft Deep Bedrock Investigation Pumping Test Work Plan (Work Plan) to provide an approach and protocols for the collection of pumping test data needed to supplement the Deep Bedrock Investigation at the Coakley Landfill Superfund Site (Site). This Work Plan details select tasks included in the Deep Bedrock Investigation Work Plan Addendum (Work Plan Addendum) submitted on July 17, 2020 and conditionally approved by the United States Environmental Protection Agency (USEPA) on August 4, 2020. This Work Plan is intended to outline those activities needed to complete the characterization of the deep bedrock hydrogeology and migration pathways and to address data gaps as detailed in the *Deep Bedrock Investigation Interim Report* (Interim Report). The Interim Report was submitted to USEPA and New Hampshire Department of Environmental Services (NHDES) on November 25, 2019, with comments to the Interim Report received from USEPA on February 6, 2020.

As discussed in the Work Plan Addendum, a pumping test will be completed to assess bedrock fracture connectivity and further evaluate the southern migration pathway in bedrock as detailed in the data gap analysis of the Interim Report. In addition to addressing this migration pathway, the pumping test is intended to assist in:

- Refining the Conceptual Site Model (CSM) and further the understanding of deep bedrock hydrogeology as it relates to anisotropy created by multiple bedrock fracture trends.
- Confirming (along with other lines of evidence) that identified transmissive fractures in bedrock monitoring wells do not provide likely migration pathways for off-site migration of Site contaminants to potential receptors.
- Evaluating inter-fracture groundwater flow and its relationship with overburden and shallow bedrock.

As detailed in the Work Plan Addendum, the pumping test will be completed in existing deep bedrock monitoring well MW-6 based on well construction details and observations made during well installation (**Attachment A**), distance from the landfill, location of available wells relative to mapped bedrock fracture and lineament data (**Figure 1**), and analytical data available for wells within the monitoring network.

Well redevelopment, borehole geophysics, and interval packer sampling activities were completed in MW-6 with results detailed in the *MW-6 Interval Packer Sampling Results and Pumping Test Viability* memorandum (Memorandum) submitted to the USEPA and NHDES on August 18, 2020. MW-6 was approved by the USEPA for use as the pumping test well on August 26, 2020 via email correspondence.

2.0 | PUMPING TEST ACTIVITIES

The following pumping test activities have been developed based on the current CSM, activities performed since completion of the Interim Report and Work Plan Addendum (i.e., MW-6 investigation activities), and regular correspondence between the CLG, USEPA, and NHDES.

2.1 Background Water Level Monitoring

A suite of existing monitoring wells will be selected for water level monitoring prior to, during, and following the completion of the pumping test. As part of the design, a list of wells has been included with Work Plan as **Table 1.** Wells deemed critical for water level monitoring will be instrumented with in-well data loggers, while an additional set of wells will be monitored manually as part of the test protocol. Baseline, background, pumping, and recovery water level data will be collected as part of the implementation of the pumping test.

For a minimum of two weeks prior to commencing the pumping tests, background groundwater levels will be monitored to assess ambient groundwater levels that may affect the interpretation of data prior to and following the variable rate and constant rate pumping tests. Overburden and bedrock wells selected for monitoring are included on **Table 1** with those wells identified as being “Instrumented” considered characteristic of background conditions. To complete the background water level monitoring, pressure transducers will be placed in those monitoring wells considered to represent background conditions to monitor pressure and temperature changes, as identified in the current monitoring well network on **Figure 1**. Pressure transducers will be synchronized to reflect the current time of day prior to installation. Manual groundwater level measurements will be recorded immediately upon installation of the transducers to correlate pressure readings to groundwater levels. Pressure transducers in background wells will be set to record groundwater elevations (pressure) on a linear time scale at 15-minute intervals. Additionally, the day prior to the variable rate pumping test, groundwater levels in surrounding monitoring wells will be recorded and used to establish static aquifer conditions. Pressure transducers will be left in selected wells throughout the duration of the pumping tests to measure effects of pumping on water levels. **Table 1** lists the wells within the monitoring well network and includes their respective distance from the pumping well (MW-6).

In addition to the use of existing groundwater monitoring wells, the use of a newly installed open deep bedrock boring located west of MW-6 (near existing GZ-105) will be used. This well has not been installed at the time of this Work Plan development but is being installed to investigate the vertical extent of landfill related constituents in deep bedrock and conditions along an inferred southern migration pathway. Based on the current bedrock monitoring well nomenclature, this new well will be identified as MW-25. This well location was staked in the field on October 14, 2020 during a Site meeting held between the USEPA, NHDES, and CES. Wells included as part of the monitoring may include wells identified during the residential water supply well records investigation, if any, detailed in

Section 2.8 of the Work Plan Addendum. These will be limited to out of service wells identified during the evaluation and will be subject to well owner approval.

2.2 Variable Rate Pumping Test

A variable rate pumping test (step drawdown test) will be performed on MW-6 to evaluate the well's performance under controlled variable pumping conditions, assess aquifer characteristics, and determine the long-term constant pumping test rate. The specific capacity and transmissivity for the pumping well, estimated from groundwater drawdown measurements recorded during well redevelopment, will be used to estimate proposed pumping rates for each variable rate to be used during the three varying flow rates (e.g., 5, 10, and 12 gallons per minute [gpm]) will be used during the step drawdown pumping test. Each pumping rate will be maintained until drawdown has equalized or until well capacity has been reached, as potential exists for the well capacity to be reached before a higher flow rate can be initiated. The variable rate step drawdown test will be performed in advance of the constant rate pumping test.

Prior to the initiation of the variable rate pumping test, a Jaswell-type seal will be installed in MW-6 to isolate shallow bedrock fractures from those located at depth to better evaluate response to pumping within the deeper bedrock interval. The seal is approximately 12-inches in height and designed to isolate specific sections of borehole. Based on construction details of the existing bedrock monitoring well network, shallow bedrock wells have typically been defined by those completed within the uppermost 25 - 30 feet of bedrock. Observations made during the installation of MW-6 (bedrock at 6 feet below ground surface[bgs]) and the results of borehole geophysical logging and interval packer sampling (**Attachment A**), the seal should be placed from 35 to 36 feet below top of casing (33 to 34 feet bgs). It should be noted that depths based on borehole geophysical data and interval packer sampling results are referenced to feet below top of casing while construction information of MW-6 as noted during installation (depth to bedrock and casing length) is referenced to feet bgs. This placement isolates the identified fractures (likely transmissive interval) within the uppermost portion of Zone 2 (31-42 ft below top of casing) from the deeper zones targeted for the tests, allows for a more consistent comparison with other "shallow" bedrock intervals (water levels above the seal will be monitored separately from those below), and maintains isolation of the deeper bedrock fractures intercepted by the well. Following seal installation, water levels will be monitored above and below the seal for stabilization prior to initiating the variable rate test. This will be completed prior to the two-week background water level monitoring described in **Section 2.1**.

Setting the seal as described above will focus the pumping stress from the fractures located in the lowermost section of Zone 2 and from fractures located below this open bedrock interval (36 to 184 feet below top of casing). The deepest fractures located in Zone 8 (163.6 ft to 169.5 ft) have an estimated transmissivity of 0.04 ft^2/day while the estimated transmissivities for Zone 6 (112.5 ft to 118.5 ft) and Zone 7 (142.5 ft to 148.5 ft) are 0.30 ft^2/day and 0.39 ft^2/day, respectively. Shallower fracture Zone 2, Zone 3 (65.5 ft to 71.5 ft), and Zone 4 (85 ft to 96 ft) have estimated transmissivities of 2.83, 4.18, and 4.43 ft^2/day, respectively. Although the drawdown did not reach steady state during the packer sampling, the estimated transmissivity values can illustrate the expected differences in production rates of the different fracture zones. The estimated transmissivities illustrate how the primary driver of offsite transport of the contaminants of concern, would be from fractures between 30 feet to 107 feet below grade. Meanwhile the potential contaminant mass being transported in the deeper fractures below Zone 5, is much lower. Setting the packer near 35 feet below grade would allow for the identification of potential interconnections between the fractures with the greatest potential for contaminant mass transport. Meanwhile, static water levels of the deeper fractures identified during packer sampling, between Zone 6 and Zone 8, indicate that any decrease in head, would also initiate discharge from these lower fractures and an associated reduction in head of other bedrock wells connected to these fractures.

The variable rate pumping test will be performed using a 4-inch submersible well pump placed near the bottom of the open hole section of MW-6, below the sealed interval. The pump discharge will be controlled using gate and/or ball-style valves with discharge rate monitored using an in-line flowmeter calibrated for the flow rates anticipated during the test. A pressure transducer will be placed within a stilling tube below the seal and used to monitor water levels during the test. These readings will be supplemented with manual readings during test execution.

Data collected during redevelopment of MW-6 in May 2020 indicates that at 7-gallons per minute (gpm), drawdown stabilizes at roughly 32 feet below the static water elevation, resulting in a specific capacity of roughly 0.22 gpm/foot at 7 gpm. It is expected that the specific capacity should decrease with an increased discharge rate. However, using the available data from redevelopment can provide a reasonable estimate of the discharge rates to be used for the step drawdown test. The step drawdown data will be used to further refine the maximum discharge for the constant rate test, determining hydraulic conductivity from the Jacobs Method, and to calculate the pumping rate for the constant rate test.

We plan to set the pump at 175 feet below top of casing, or roughly five feet from the bottom of the well. With a static water elevation that averages 10-feet below top of casing and allowing for a 10-foot safety window of water head above the pump, allows for roughly 155 feet of available drawdown. Using the estimated specific capacity of 0.22 gpm/ft with 155 feet of available water would allow for a discharge rate of roughly 33 gpm. Since specific capacity decreases with increased pumping rate and these values do not account for the placement of a seal to isolate the shallow bedrock portions of the well (and its respective contribution to well capacity), it is expected that this discharge rate is higher than the maximum capacity of the well. As such, we propose to set the maximum rate for the step drawdown test at 20 gpm. The other discharge rates to be used in this test are at 0.75 and 0.5 times the maximum anticipated discharge rate (15 gpm and 10 gpm).

The pumping rate and water quality field parameters (pH, temperature, turbidity, oxidation reduction potential [ORP], and conductivity) will be recorded at 5-minute intervals for the first 15-minutes of the test; then at 15-minute intervals for the first hour, and hourly thereafter at each pumping rate. Parameters will be monitored in accordance with the project Sampling and Analysis Plan (SAP). Monitoring of the pumping rate will allow for adjustments to the rate if it has drifted from the target rate and confirm that the pumping rate is maintained as the dynamic head increases with groundwater elevation drawdown. Adjustments to the pumping rate will be recorded along with the measured rate and water levels during the pumping test.

2.3 Constant Rate Pumping Test

Following completion of the variable rate pumping test on MW-6, and once groundwater has returned to static conditions as determined by background water level monitoring, a constant rate pumping test will be designed and performed to determine boundary effects, aquifer parameters, and interconnectedness of bedrock fractures. The constant rate test will include installation of a pump capable of pumping groundwater at a controlled rate based on the results of the variable rate pumping test. It is anticipated that a pumping rate will be selected to achieve the greatest stress on the bedrock aquifer while accounting for the anticipated 96-hour pumping test duration. The depth of the pump placement may depend on the results of well development or the variable rate pumping test; however, the depth is currently anticipated to be 5-feet from the bottom of the well. To obtain accurate monitoring data during the groundwater recovery period after the pump test has been completed, a check valve will be installed at the base of the discharge pipe to reduce backflow of water into the well. Once the submersible pump has been installed, a 1-inch diameter PVC screen will be installed near the top of the pump to allow for monitoring groundwater levels while reducing the effects of pumping turbulence on measurements. Pumping rates and volumetric totals will be monitored using a digital totalizer/flowmeter, allowing for accurate measurement of flow rates and discharge volumes. These will be calibrated for the flow rate determined for use during the constant rate test.

The pump discharge will be connected to piping plumbed to a temporary polyethylene or steel storage tank staged near the well. The tank will be used as a flow equalization tank to buffer flow prior to treatment and discharge to the Coakley Landfill via spray irrigation following treatment. The management of water generated during the constant rate test is discussed further in **Section 2.5**, below. The flow into the tank will be managed such that discharge of the tank is occurring at a similar or greater rate.

Pressure transducers will be used to monitor groundwater levels within existing monitoring wells to record the influence of pumping. Transducers installed in each well will record data, including pressure and temperature, during the constant rate test. The constant pumping rate, as determined from reducing the variable rate pumping test data, may be adjusted and noted if excessive drawdown (groundwater level within 10 feet from the pumping depth) is observed. The test is anticipated to be a minimum of 96-hours in length and will be based on observed steady state drawdown conditions in observation wells and conference with the USEPA and NHDES. A specific list of observation wells used to establish these steady conditions has not been included with the Work Plan as all wells being monitored during the test will be considered when establishing steady state conditions. It should be noted that a drawdown response is not anticipated to be observed in all wells (i.e., overburden) as a result of the pumping stress applied to the deep bedrock aquifer. Instrumented wells are only a subset of those that will be monitored during the constant rate test and will include a newly installed well west of MW-6 in proximity to current shallow bedrock monitoring well GZ-105. Based on the current bedrock monitoring well nomenclature, this well will be identified as MW-25. As stated in **Section 2.1**, water levels in all wells will be measured daily and will supplement readings recorded by deployed pressure transducers.

The pumping rate and water quality field parameters (pH, temperature, turbidity, ORP, and conductivity) will be recorded at 5-minute intervals for the first 15-minutes of the test; then at 15-minute intervals for the first hour, and hourly thereafter. Monitoring of the pumping rate will allow for adjustments to the rate if it has drifted from the target rate and confirm that the pumping rate is maintained as the dynamic head increases with groundwater elevation drawdown. Adjustments to the pumping rate will be recorded along with the measured rate and water levels during the pumping test.

Every effort will be made to schedule the pumping test to avoid significant forecasted precipitation events as to limit external influences on the interpretation of water levels recorded during the test. In addition, observations that could cause fluctuations in water level that include but are not limited to variations or adjustments in pumping rates, minor precipitation events, and presence of sediment in the discharged water will be recorded on the field log during the test.

During the pumping test, CES will contract with Northeast Geophysical Services (NGS) to collected real time heat pulse flow meter data from multiple bedrock wells (e.g., GZ-125 and GZ-130) to measure variations in ambient flow rate within the borehole resulting from inter-fracture flow during pumping. These wells will be from those previously investigated during the reconnaissance well investigation and those surveyed subsequent to that investigation (i.e., new bedrock boring near GZ-105 [MW-25]). Wells will be selected based on the drawdown observed during the constant rate test. These data will be compared to ambient heat pulse flow meter information recorded during previously recorded heat pulse flowmeter measurements and used to evaluate inter-fracture groundwater flow, if any, resulting from the pumping stress applied during the test. Based on the current monitoring well network, it is anticipated that the wells that will be revisited for heat pulse flowmeter measurements will include GZ-125, GZ-130, MW-24, BP-4, and MW-25. Real-time data recorded during the pumping test (e.g., observed drawdown) will be used to establish the wells to be included for flowmeter measurements with preference given to those wells exhibiting greater amounts of drawdown. Due to the time required for recording of heat pulse flowmeter measurements within each well, location/access to each well, and duration of the test, some wells (i.e., those closest to the pumping well and exhibiting drawdown) will be measured sooner following the start of the test.

At the conclusion of the constant rate pumping test as determined through concurrence with the USEPA and NHDES, deployed transducers will be reset to record in step-test mode to allow for capturing the recovery period of the groundwater aquifer. The recovery test will continue until the aquifer has returned to 90 percent of the measured pre-test level or for 48 hours based on manual water level measurements. Additionally, groundwater levels in wells immediately surrounding the pumping well will be recorded manually at least one minute prior to shutdown of the pumping well and will continue for 30 minutes after the pump has been turned off when the frequency of readings will be reduced. The pump will remain in the test well until the aquifer recovery monitoring is complete. Groundwater level measurements will also be collected from transducers during the recovery period from monitoring wells considered to represent background conditions, to assess potential natural ambient water level fluctuations, and for use in correlation with pre-test water level measurements. A synoptic round of water levels will be completed prior to the startup of the pumping test, daily during the test, prior to shutdown of the event, and immediately prior to removing deployed pressure transducers.

2.4 Groundwater Sampling

In addition to water quality parameters monitored during the completion of both the variable rate and constant rate pumping tests, samples of untreated groundwater effluent will be collected to assess for changes in groundwater quality as a result of artificial aquifer stress induced by pumping. The samples will be collected from a sample port located on the pump discharge line, prior to the equalization tank. This port will be installed and used to provide water to the flow through cell of the multi-parameter water quality instrument. The flow through cell will be disconnected from the port and the sample collected in accordance with water sampling procedures outlined in the project SAP. Groundwater samples will be collected for analysis of PFAS, 1,4-dioxane, arsenic, manganese, and general landfill parameters (ammonia, chemical oxygen demand, chloride, hardness, and nitrate). These samples will be collected prior to the variable rate test, during the constant rate test (every 18 hours), and at the conclusion of the constant rate test following a return to static groundwater conditions. This sampling schedule will result in a minimum of seven samples for analysis. Sampling, chain of custody procedures, and analysis will be completed in accordance with the project SAP (CES, 2018). Tier 1 validation will not be performed on these data.

2.5 Investigation Derived Waste (IDW) Management

Water generated during the variable rate and constant rate pumping tests will be treated using a mobile treatment system that includes inline duplex particulate filtration and granular activated carbon (GAC) vessels. The GAC filtration units have been sized to allow for adequate empty bed contact time (EBCT) to ensure removal of PFAS and other site contaminants to levels that are below the HA/AGQS and applicable Maximum Contaminant Concentrations (MCLs). The system will include two sets of particulate pre-filtration and two GAC vessels. Each vessel will contain 1,000 pounds of virgin coal based GAC. The system design allows for one vessel to be taken offline, if needed, and backflushed with the remaining vessel remaining in service until maintenance has been completed. Concentrations of other Site contaminants (arsenic, manganese, and 1,4-dioxane) were used in the treatment design. Prior to discharge of water generated during the variable rate test, a sample of treated effluent will be collected and submitted for analysis of the parameters listed in **Section 2.4**.

Treated effluent water will be stored in one or more smaller frac tanks (e.g., 5,000 gallon) located between MW-6 and the landfill based on availability of space. These smaller tanks will provide storage capacity for the treated effluent discharged to the landfill via spray irrigation. The rate and areas of application will be based on the anticipated total volume of water generated. This estimated volume will be based on the pumping rate as determined from the variable rate test and minimum 96-hour constant rate pumping test duration. Once the pumping rate has been established, the application rate for the spray irrigation will be calculated. It is also anticipated that the application area at the landfill will be changed throughout the duration of the pumping tests to minimize the amount of water applied to a single area of the cap.

The application of treated pumping test effluent to the cap is designed to reduce and/or eliminate the likelihood of influence in groundwater monitoring wells located north of the site and monitored during the test. The landfill cap and stormwater management system, as detailed in the Stormwater Investigation Report submitted to the USEPA and NHDES on September 24, 2019, is designed to manage the infiltration of water through an engineered cover and water collection system. System outfalls (e.g., underdrain pipe and perimeter ditches) will be monitored during the test for discharge. In the event discharge is observed, changes in application rate and area will be applied. Based on the design of the landfill cap system, application to the southernmost portion of the landfill cap will result in the greatest delay between application, infiltration, and transport to one of the previously identified system outfalls.

3.0 | REFERENCES

CES, Inc. (2018), Sampling and Analysis Plan, Coakley Landfill Superfund Site, North Hampton and Greenland, New Hampshire (July 2018).

CES, Inc. (2019), Deep Bedrock Investigation Interim Report, Coakley Landfill Superfund Site, North Hampton and Greenland, New Hampshire (November 2019).

CES, Inc. (2020), Surface Water Evaluation Scope of Work, Coakley Landfill Superfund Site, North Hampton and Greenland, New Hampshire (January 2020).

United States Environmental Protection Agency, Ground Water Issue – Suggested Operating Procedures for Aquifer Pumping Tests (USEPA, 1993).

Weston, Inc. (1988), Remedial Investigation – Coakley Landfill, North Hampton, New Hampshire (October 1988).

TABLE 1

PUMPING TEST MONITORING WELL NETWORK CONSTRUCTION DETAILS

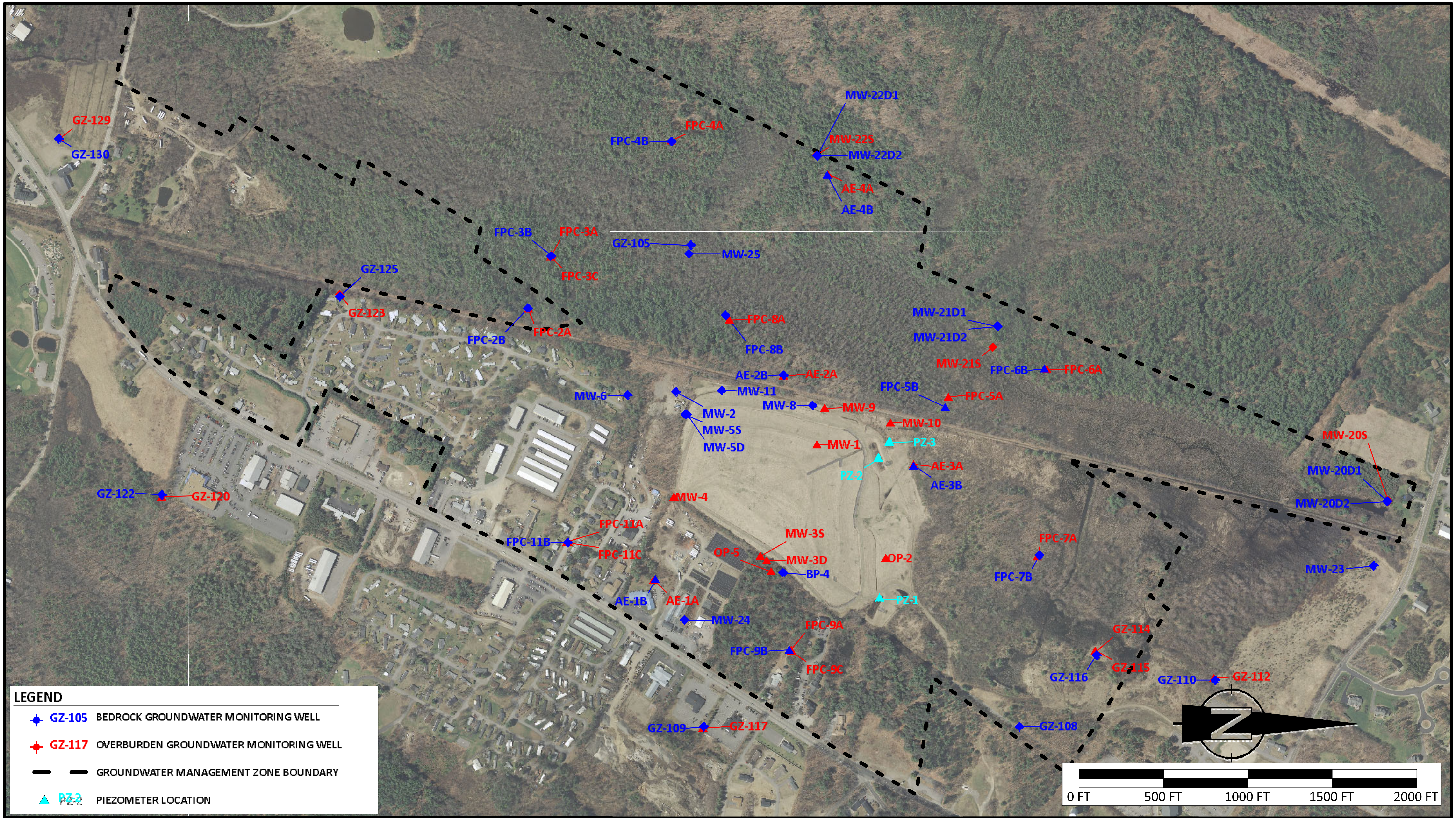
Table 1
Pumping Test Monitoring Well Network - Well Construction Details
Coakley Landfill Superfund Site
North Hampton and Greenland, New Hampshire

Monitoring Well ID	Easting NH State Plane (feet)	Northing NH State Plane (feet)	Installation Date	Distance From Pumping Well	Instrumented Manual	Monitored Lithologic Unit	Well Diameter Material	Measuring Point Elevation (amsl)	Well Depth (feet)	Screen Length (feet)	Top of Screen (feet BGS)	Bottom of Screen (feet BGS)	Top of Screen Elevation (amsl)	Bottom of Screen Elevation (amsl)	Top of Rock (feet BGS)	Bedrock Penetration (feet)	Bottom of Well Screen to Bedrock (feet)
OVERBURDEN																	
AE-1A	1212067.000	182760.000	3/26/1999	1108.38	Manual	Till	2" PVC	127.00	65.0	10	55.0	65.0	72.0	62.0	65.0	NA	0.0
AE-2A	1210855.000	183533.000	7/27/1999	933.19	Manual	Till	2" PVC	79.60	20.0	10	10.0	20.0	69.6	59.6	20.0	NA	0.0
AE-3A	1211380.240	184301.830	3/24/1999	1744.11	Manual	Till	2" PVC	85.00	20.0	10	10.0	20.0	75.0	65.0	20.0	NA	0.0
AE-4A	1209659.376	183794.215	9/15/2003	1767.96	Manual	Outwash	2" PVC	76.45	15.0	10	5.0	15.0	71.4	61.4	15.0	NA	0.0
FPC-11A	1211838.000	182249.000	6/23/1992	939.55	Manual	Till	2" PVC	117.95	52.0	5	47.0	52.0	71.0	66.0	52.0	NA	0.0
FPC-11C	1211844.318	182255.162	6/24/1992	943.08	Manual	Till	2" PVC	117.86	33.0	15	18.0	33.0	99.9	84.9	52.0	NA	19.0
FPC-2A	1210459.000	182018.000	4/3/1992	779.15	Manual	Outwash	2" PVC	78.40	16.0	10	6.0	16.0	72.4	62.4	16.0	NA	0.0
FPC-3A	1210138.665	182155.832	5/4/1992	945.14	Manual	Till	2" PVC	73.17	73.0	10	62.0	72.0	11.2	1.2	73.0	NA	1.0
FPC-3C	1210149.489	182151.021	5/5/1992	937.97	Manual	Outwash	2" PVC	72.36	28.5	10	18.5	28.5	53.9	43.9	70.0	NA	41.5
FPC-4A	1209460.058	182867.634	6/4/1992	1531.57	Manual	Till	2" PVC	75.42	13.0	5	8.0	13.0	67.4	62.4	14.0	NA	1.0
FPC-5A	1210979.690	184509.920	3/17/1992	1903.12	Manual	Till	2" PVC	73.80	70.0	10	60.0	70.0	13.8	3.8	89.5	NA	19.5
FPC-6A	1210817.000	185095.000	8/1/2003	2492.82	Manual	Till	1.5" PVC	79.20	2.8	1	1.8	2.8	77.5	76.5	6.0	NA	3.3
FPC-7A	1211925.710	185037.990	5/11/1992	2612.54	Manual	Till	2" PVC	87.60	22.0	5	17.0	22.0	70.6	65.6	23.0	NA	1.0
FPC-8A	1210524.000	183210.000	4/9/1992	749.71	Manual	Till	2" PVC	73.80	33.0	10	23.0	33.0	50.8	40.8	33.0	NA	0.0
FPC-9A	1212479.830	183576.850	5/28/1992	1795.21	Manual	Till	2" PVC	114.10	68.0	10	58.0	68.0	56.1	46.1	68.0	NA	0.0
FPC-9C	1212488.260	183577.230	5/27/1992	1802.51	Manual	Till	2" PVC	114.60	25.0	10	15.0	25.0	99.6	89.6	62.0	NA	37.0
GZ-112	1212647.479	186083.748	1/22/1987	3860.75	Manual	Till	2" PVC	92.00	38.0	5	33.0	38.0	59.0	54.0	38.0	NA	0.0
GZ-114	1212489.540	185382.297	1/13/1987	3164.57	Manual	Outwash	2" PVC	90.76	13.0	10	3.0	13.0	87.8	77.8	39.0	NA	26.0
GZ-115	1212483.775	185379.971	1/13/1987	3159.76	Manual	Till	2" PVC	88.87	38.0	25	13.0	38.0	75.9	50.9	39.0	NA	1.0
GZ-117	1212943.191	183054.176	2/3/1987	2023.99	Manual	Till	2" PVC	118.10	40.5	10	30.5	40.5	87.6	77.6	93.5	NA	53.0
GZ-120	1211570.848	179844.064	2/4/0987	2827.51	Manual	Outwash	2" PVC	87.16	20.0	10	10.0	20.0	77.2	67.2	43.0	NA	23.0
GZ-123	1210373.323	180898.461	2/25/1987	1809.33	Instrumented	Outwash	2" PVC	86.60	16.5	5	11.5	16.5	75.1	70.1	47.0	NA	30.5
GZ-129	1209442.812	179241.468	2/20/1987	3695.36	Manual	Outwash	2" PVC	81.67	26.0	10	16.0	26.0	65.7	55.7	26.0	NA	0.0
MW-10	1211132.540	184167.680	4/15/1996	1569.37	Manual	Outwash	2" PVC	79.10	10.0	5	5.0	10.0	74.1	69.1	22.0*	NA	12.0
MW-1	1211262.260	183730.250	6/5/1985	1161.00	Manual	Marine	2" PVC	116.90	18.0	10	8.0	18.0	108.9	98.9	UNK	NA	UNK
MW-3S	1211924.455	183393.409	6/7/1985	1237.38	Manual	Till	1" PVC	TBD	34.0	5	29.0	34.0	TBD	TBD	39.0	NA	TBD
MW-3D	1211951.574	183434.086	6/7/1985	1284.25	Manual	Outwash	1" PVC	TBD	23.0	10	13.0	23.0	TBD	TBD	39.0	NA	TBD
MW-4	1211572.000	182884.000	6/14/1985	663.42	Manual	Till	2" PVC	129.12	38.0	10	28.0	38.0	101.1	91.1	38.0	NA	0.0
MW-9	1211047.000	183778.000	4/15/1996	1173.75	Manual	Outwash	2" PVC	81.70	10.0	5	5.0	10.0	76.7	71.7	21.0	NA	11.0
OP-2	1211936.000	184139.000	5/7/1993	1811.67	Manual	Outwash	1.25" PVC	100.00	12.0	5	7.0	12.0	93.0	88.0	27.0*	NA	15.0
OP-5	1212016.540	183457.150	6/11/1993	1349.02	Manual	Outwash	1.25" PVC	108.40	23.0	10	13.0	23.0	95.4	85.4	30.0*	NA	7.0
MW-20S	1211595.213	187117.944	7/13/2018	4554.34	Instrumented	Till	2" PVC	75.09	10.0	5	5.0	10.0	70.1	65.1	10.0	NA	0.0
MW-21S	1210685.775	184770.718	7/13/2018	2182.38	Instrumented	Till/MSC	2" PVC	73.57	14.0	8	6.0	14.0	67.6	59.6	14.0	NA	0.0
MW-22S	1209547.256	183725.334	7/30/2018	1809.18	Instrumented	Till	2" PVC	76.51	14.0	8	6.0	14.0	70.5	62.5	14.0	NA	0.0
BEDROCK																	
AE-1B	1212062.335	182772.106	3/25/1999	1105.50	Manual	Shallow Bedrock	2" PVC	126.80	85.5	10	75.5	85.5	51.3	41.3	65.0	20.5	NA
AE-2B	1210849.472	183530.669	7/27/1999	931.57	Instrumented	Shallow Bedrock	2" PVC	79.50	50.0	10	40.0	50.0	39.5	29.5	22.0	28.0	NA
AE-3B	1211387.700	184304.170	3/23/1999	1748.16	Manual	Shallow Bedrock	2" PVC	86.20	40.0	12	28.0	40.0	58.2	46.2	17.0	23.0	NA
AE-4B	1209665.598	183789.704	9/16/2003	1760.32	Manual	Shallow Bedrock	2" PVC	76.71	44.0	10	34.0	44.0	42.7	32.7	15.0	29.0	NA
BP-4	1212023.740	183528.420	5/17/1993	1400.45	Instrumented	Deep Bedrock	6" Open	107.40	99.0	65.4	33.6	99.0	73.8	8.4	33.0	66.0	NA
FPC-11B	1211841.159	182252.081	6/19/1992	941.31	Instrumented	Shallow Bedrock	2" PVC	117.90	73.0	15	58.0	73.0	59.9	44.9	49.0	24.0	NA
FPC-2B	1210453.809	182014.953	4/3/1992	784.86	Instrumented	Shallow Bedrock	2" PVC	77.98	37.8	15	22.8	37.8	55.2	40.2	16.0	21.8	NA
FPC-3B	1210144.391	182152.754	4/27/1992	941.59	Instrumented	Shallow Bedrock	1.5" PVC	72.22	95.5	15	80.5	95.5	-8.3	-23.3	70.0	25.5	NA
FPC-4B	1209466.270	182866.570	6/3/1992	1525.26	Instrumented	Shallow Bedrock	2" PVC	75.83	33.5	15	18.5	33.5	57.3	42.3	14.0	19.5	NA
FPC-5B	1211039.760	184491.360	5/14/1992	1885.85	Manual	Shallow Bedrock	2" PVC	74.00	110.3	15	95.3	110.3	-21.3	-36.3	89.5	20.8	NA
FPC-6B	1210813.672	185078.807	3/24/1992	2476.87	Manual	Shallow Bedrock	2" PVC	76.11	28.5	15	13.5	28.5	62.6	47.6	6.0	22.5	NA
FPC-7B	1211921.040	185048.080	5/8/1992	2620.23	Instrumented	Shallow Bedrock	2" PVC	85.30	45.0	15	30.0	45.0	55.3	40.3	23.0	22.0	NA
FPC-8B	1210494.038	183186.946	4/8/1992	749.91	Instrumented	Shallow Bedrock	2" PVC	73.60	55.7	15	40.7	55.7	32.9	17.9	33.0	22.7	NA
FPC-9B	1212479.400	183567.730	5/26/1992	1789.93	Manual	Shallow Bedrock	2" PVC	116.00	87.0	15	72.0	87.0	44.0	29.0	62.0	25.0	NA
GZ-105	1210081.131	182980.334	5/7/1987	963.47	Instrumented	Shallow Bedrock	1.5" PVC	73.60	50.0	20	30.0	50.0	43.6	23.6	32.0	18.0	NA
GZ-108	1212934.566	184930.702	3/18/1987	3043.49	Instrumented	Deep Bedrock	6" Open	119.80	155.0	140	15.0	155.0	104.8	-35.2	2.0	153.0	NA
GZ-109	1212936.338	183058.186	4/8/1987	2018.20	Instrumented	Deep Bedrock	6" Open	119.36	252.0	149	103.0	252.0	16.4	-132.6	91.0	161.0	NA
GZ-110	1212658.160	186092.918	3/24/1987	3873.66	Instrumented	Deep Bedrock	6" Open	91.26	188.0	131	57.0	188.0	34.3	-96.7	38.0	150.0	NA
GZ-116	1212510.429	185387.724	3/31/1987	3179.40	Instrumented	Deep Bedrock	6" Open	89.50	163.0	141	22.0	163.0	67.5	-73.5	5.0	158.0	NA
GZ-119	1214266.933	185679.262	3/30/1987	4507.16	Manual	Deep Bedrock	6" Open	119.59	183.0	150	33.0	183.0	86.6	-63.4	31.0	152.0	NA
GZ-122	1211559.197	179846.499	4/22/1987	2822.67	Instrumented	Deep Bedrock	6" Open	87.06	190.0	138	52.0	190.0	35.1	-102.9	37.0	153.0	NA
GZ-125	1210383.426	180898.597	4/13/1987	1805.90	Instrumented	Deep Bedrock	6" Open	87.99	200.0	142	58.0	200.0	30.0	-112.0	47.0	153.0	NA
GZ-130	1209451.614	179232.720	3/17/1987	3699.71	Instrumented	Deep Bedrock	6" Open	82.72	178.0	156	22.0	178.0	60.7	-95.3	22.0	156.0	NA
MW-11	1210942.281	183164.739	4/26/1996	558.56	Instrumented	Shallow Bedrock	2" PVC	92.70	52.0	20	32.0	52.0	60.7	40.7	19.0	33.0	NA
MW-2	1210950.883	182894.175	6/10/1985	287.93	Instrumented	Shallow Bedrock	1" PVC	94.54	20.0	10	10.0	20.0	84.5	74.5	4.0	16.0	NA
MW-5D	1211084.398	182959.140	6/22/1993	370.65	Instrumented	Deep Bedrock	2" PVC	99.72	163.5	20	143.5	163.5	-43.8	-63.8	12.0	151.5	NA
MW-5S	1211085.022	182946.718	8/9/1993	359.06	Instrumented	Shallow Bedrock	2" PVC	101.96	78.0	30	48.0	78.0	54.0	24.0	12.0	66.0	NA
MW-6	**1210969.256**	**182606.830**	**6/19/1985**	**Pumping Well**	**Instrumented**	**Deep Bedrock**	**6" Open**	**101.15**	**184.0**	**159**	**25.0**	**184.0**	**76.2**	**-82.9**	**6.0**	**178.0**	**NA**
MW-8	1211031.776	183703.934	4/25/1996	1098.88	Instrumented	Shallow Bedrock	2" PVC	85.02	65.0	20	45.0	65.0	40.0	20.0	21.0	44.0	NA
MW-20D1	1211600.583	187113.008	8/28/2019	4550.19	Instrumented	Deep Bedrock	1" PVC	75.51	75.0	10	65.0	75.0	10.5	0.5	10.0	65.0	NA
MW-20D2	1211600.583	187113.008	8/28/2019	4550.19	Instrumented	Deep Bedrock	1.5"PVC	75.49	234.0	10	224.0	234.0	-148.5	-158.5	10.0	224.0	NA
MW-21D1	1210561.223	184799.194	8/28/2019	2230.01	Instrumented	Shallow Bedrock	1" PVC	78.66	30.0	10	20.0	30.0	58.7	48.7	10.0	20.0	NA
MW-21D2	1210561.223	184799.194	8/28/2019	2230.01	Instrumented	Deep Bedrock	1.5"PVC	78.71	307.0	10	297.0	307.0	-218.3	-228.3	10.0	297.0	NA
MW-22D1	1209547.564	183731.517	8/28/2019	1812.77	Instrumented	Deep Bedrock	1" PVC	76.75	85.0	10	75.0	85.0	1.8	-8.3	15.0	75.0	NA
MW-22D2	1209547.564	183731.517	8/28/2019	1812.77	Instrumented	Deep Bedrock	1.5"PVC	76.78	220.0	10	210.0	220.0	-133.2	-143.2	15.0	210.0	NA
MW-23	1211981.286	187030.754	7/1/2013	4538.21	Instrumented	Deep Bedrock	6" Open	80.69	282.0	234	48.0	282.0	32.7	-201.3	34.0	248.0	NA
MW-24	1212301.205	182943.883	Unknown	1373.93	Instrumented	Deep Bedrock	6" Open	118.70	142.6	62	80.6	142.6	38.1	-23.9	UNK	UNK	NA

NOTES:
NH State Plane = New Hampshire State Plane North American Datum 1983 (feet)
All elevations in Feet Above Mean Sea Level
* - Estimated value based on adjacent bedrock groundwater monitoring wells.
This table does not include the installation of a new deep bedrock boring proximal to GZ-105 as outlined in the Deep Bedrock Investigation Work Plan Addendum.
MSC - Marine Silt Clay
TBD - To be determined. Locations will be surveyed relative to closest monitoring wells prior to onset of background water level monitoring efforts.
A new bedrock well will be installed in the area west of MW-6/east of GZ-105 prior to the pumping test. The well will be constructed 250-ft into bedrock.

FIGURE 1

SITE PLAN AND MONITORING WELL NETWORK



PROJECT TITLE: COAKLEY LANDFILL SUPERFUND SITE NORTH HAMPTON & GREENLAND, NEW HAMPSHIRE	DWG: FIGURE 1	BY: CFB	REV:		CES INC Engineers • Environmental Scientists • Surveyors
		DATE: 2020-09-25	REV DATE:		
SHEET TITLE: SITE PLAN AND MONITORING WELL NETWORK	JN: 10424.016	APPROVED BY: SLY	ISSUE:		
	SCALE: AS SHOWN	CHECKED BY: CFB	ISSUE DATE:		

NOTE:

1. THIS SITE PLAN IS BASED ON EXISTING SAMPLING LOCATIONS AS PER THE COAKLEY LANDFILL SUPERFUND SITE REVISED SAMPLING AND ANALYSIS PLAN DATED JULY 18, 2018.
2. GMZ BOUNDARY IS BASED UPON "GMZ BOUNDARY PLAN" DATED MAY 9, 2008 INCLUDED IN THE 2008 GMP APPLICATION PREPARED BY HANCOCK ASSOCIATES AND 2013 GMZ EXPANSION AREA ESTABLISHED BY THE 2013 GMP DATED JANUARY 7, 2014.
3. GIS DATA COURTESY OF NEW HAMPSHIRE ONLINE GRANITE DATABASE.
4. MAP IS PROJECTED USING THE NEW HAMPSHIRE STATE PLANE PROJECTION, US FEET AND REFERENCES THE NORTH AMERICAN VERTICAL DATUM OF 1983.

ATTACHMENT A

MW-6 BORING LOG, WELL CONSTRUCTION INFORMATION, AND BOREHOLE GEOPHYSICAL RESULTS

MW-6

NHWS & PCC BEDROCK WELL LOG

SITE: Coakley Landfill, North Hampton

Boring No: MW6
Sheet: 1 of: 2
Date: 6/19/85

Drilling Company: Tasker Well Company
Boring Location: Granite Post Green
Foreman: Danny Tasker
Ground/Casing Elevation:
Geologist/Engineer: M. S. Robinette
Starting Date: 6/19/85
Ending Date: 6/19/85

SAMPLER

Type: chips

air rotary - mudded

hole top 27 feet

Groundwater Readings

Date	Depth to Water	Ref. Pt.	Time/Stabilization

SAMPLE

Depth	Advancement Time	No.	Fracture/Water Bearing?
	11:44	1	Losing water
		2	
	12:00		
	12:07	3	
20			
	12:43	4	
	13:15		
		5	
40			
		6	
60			
	13:42		fracture - 2 1/2
	13:46	7	gpm
80	13:57	8	
		9	fracture/yes
		10	
			fracture/yes
		11	
100	14:22		fracture/yes
		12	fracture/yes
120			

Description

- sandy overburden w/boulders
- weathered, fractured biotite gneiss - much iron staining
- feldspar, bio-gneiss
- biotite gneiss grading to pegmatite
- blow test - 7 1/2 gpm
- packer test - 10 1/2 gpm at 25 psi
- peg. zone/musc.
- ironstained bio-gneiss
- pegmatite zone - qtz/feld/musc.

Construction

Locking Cap

steel casing

open hole, bedrock

REMARKS: 0-25 ft. 8 3/4" hole

Bedrock interpreted to be the Rye Fm.

NHWS & PCC BEDROCK WELL LOG

SITE

Coakley Landfill

North Hampton

Boring No: MW6

Sheet: 2 of: 2

Date: 6/19/85

Drilling Company: Tasker Well Company

Boring Location: Granite Post Green

Foreman: Danny Tasker

Ground/Casing Elevation:

Geologist/Engineer: M. S. Robinette

Starting Date: 6/19/85 Ending Date: 6/19/85

SAMPLER

Type chips

air rotary

Groundwater Readings

Date	Depth to Water	Ref. Pt.	Time/Stabilization

SAMPLE

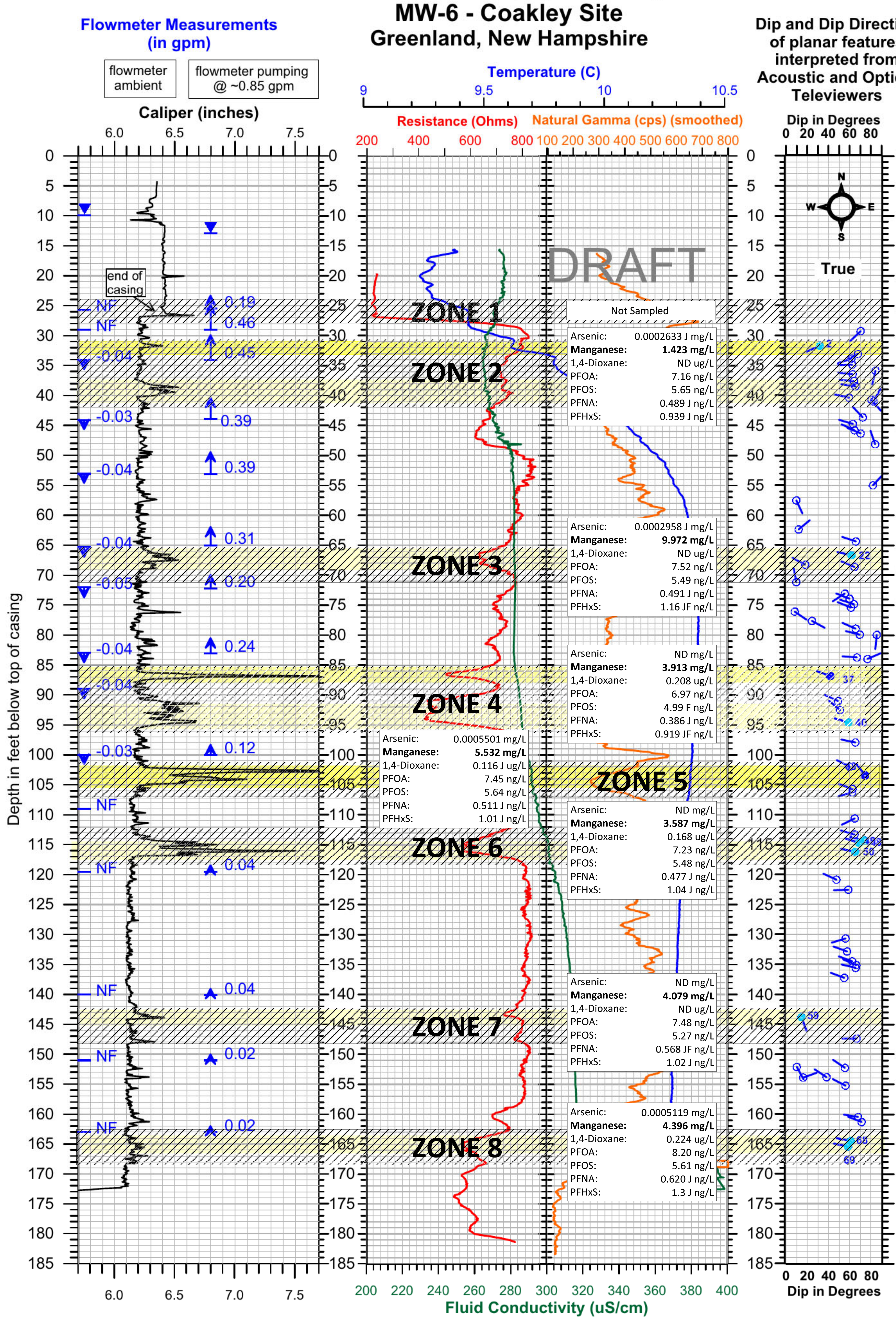
Depth	Advancement Time	No.	Depth	Fracture/Water Bearing?	LOG	Description	Construction
120	15:40					very fractured - pegmatite zone - qtz., garnet tr. biotite, chlorite much iron staining	
		13					
140		14					
				fracture			
		15		fracture			
				fracture			
		16		fracture			
160	16:25						
		17		fracture			
180		18				Bottom of hole	
200							
220							
240							

REMARKS: Well tested (blow test) at 8 1/2+ gpm.
Set 27'6" of 6" casing with drive shoe.
Open hole, locking cap.
Packer test at 74' - 10 1/2 gpm at 25 psi.

Northeast Geophysical Services

PLATE M-1
Borehole Geophysical Log
MW-6 - Coakley Site
Greenland, New Hampshire

Date logged: 5/22/20



= Likely transmissive zone

= Possible transmissive zone

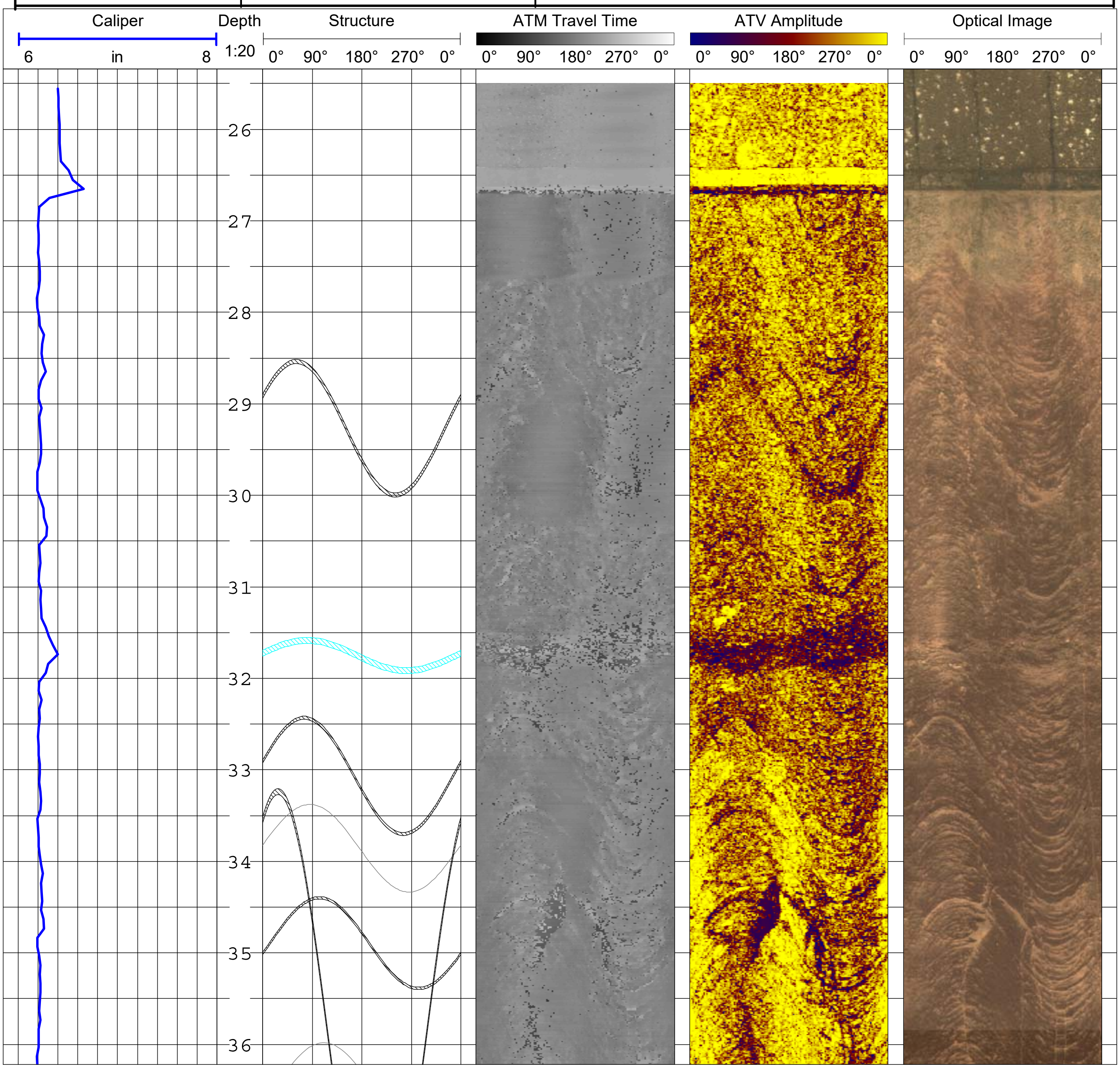
PLATE M-1
Borehole Geophysical Log
MW-6 - Coakley Site
Greenland, New Hampshire

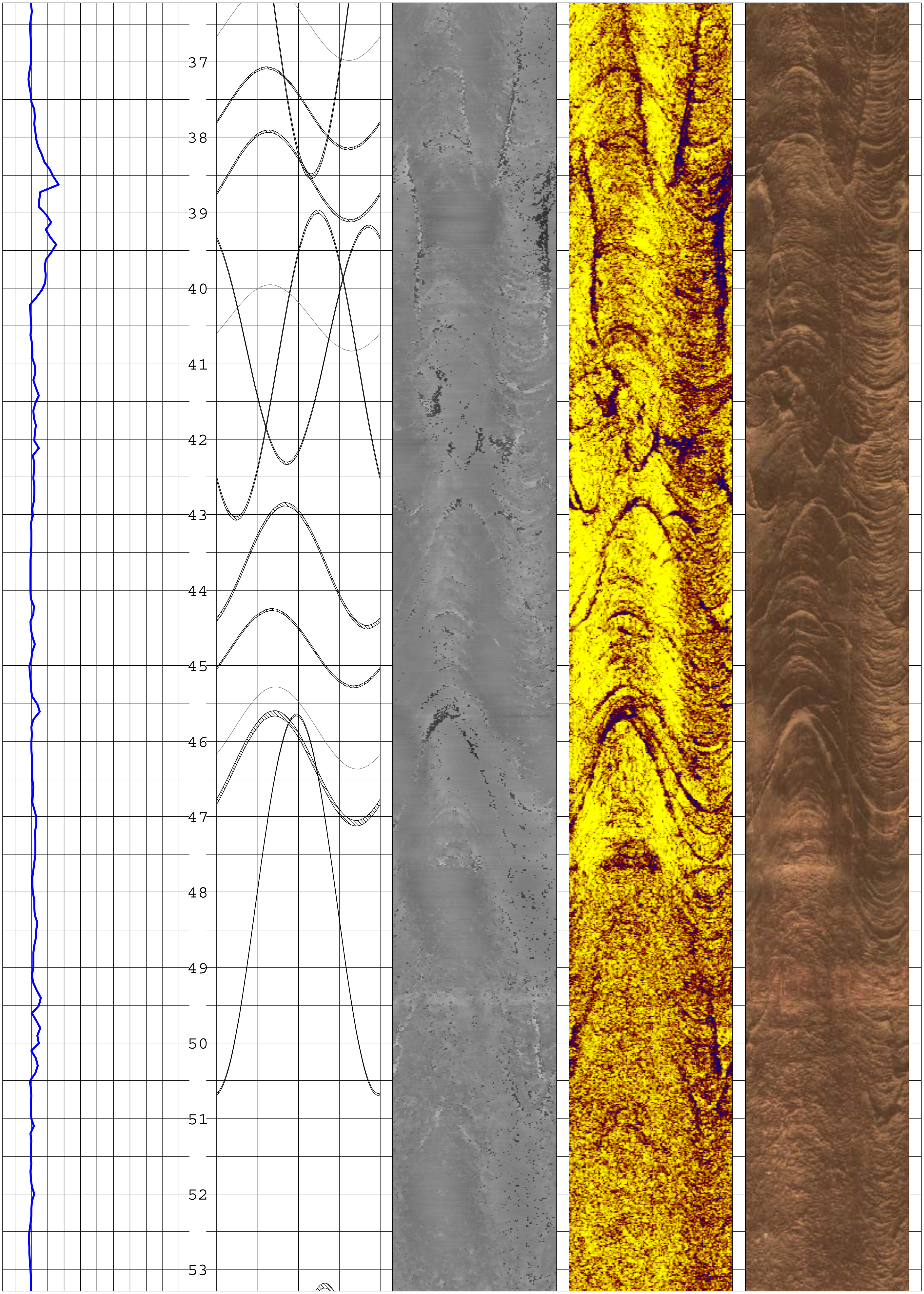
Tadpole tail indicates dip direction.
The solid tadpoles with a feature number are the ones interpreted to be likely or possibly transmissive.

Northeast Geophysical Services
4 Union Street Bangor, Maine 04401
Tel. 207-942-2700
email: ngsinc@negeophysical.com

Log:	**Caliper & Televiewer Logs**
Well:	**MW-6**
Site:	Coakley Landfill
Date:	5/22/20
Location:	North Hampton
Casing Depth:	26.7 ft.
For:	CES
Casing Type:	6 inch steel
Logged by:	R Rawcliffe
Boring Depth:	184.2 ft.
Orientation:	magnetic
Meas. From:	top of casing
Stickup:	2.0 ft.
Water Level:	9.93 ft.

Structure Plots:
black = planar features (faults, foliation, bedding, joints, etc)
light blue = possibly transmissive fracture
dark blue = likely transmissive fracture

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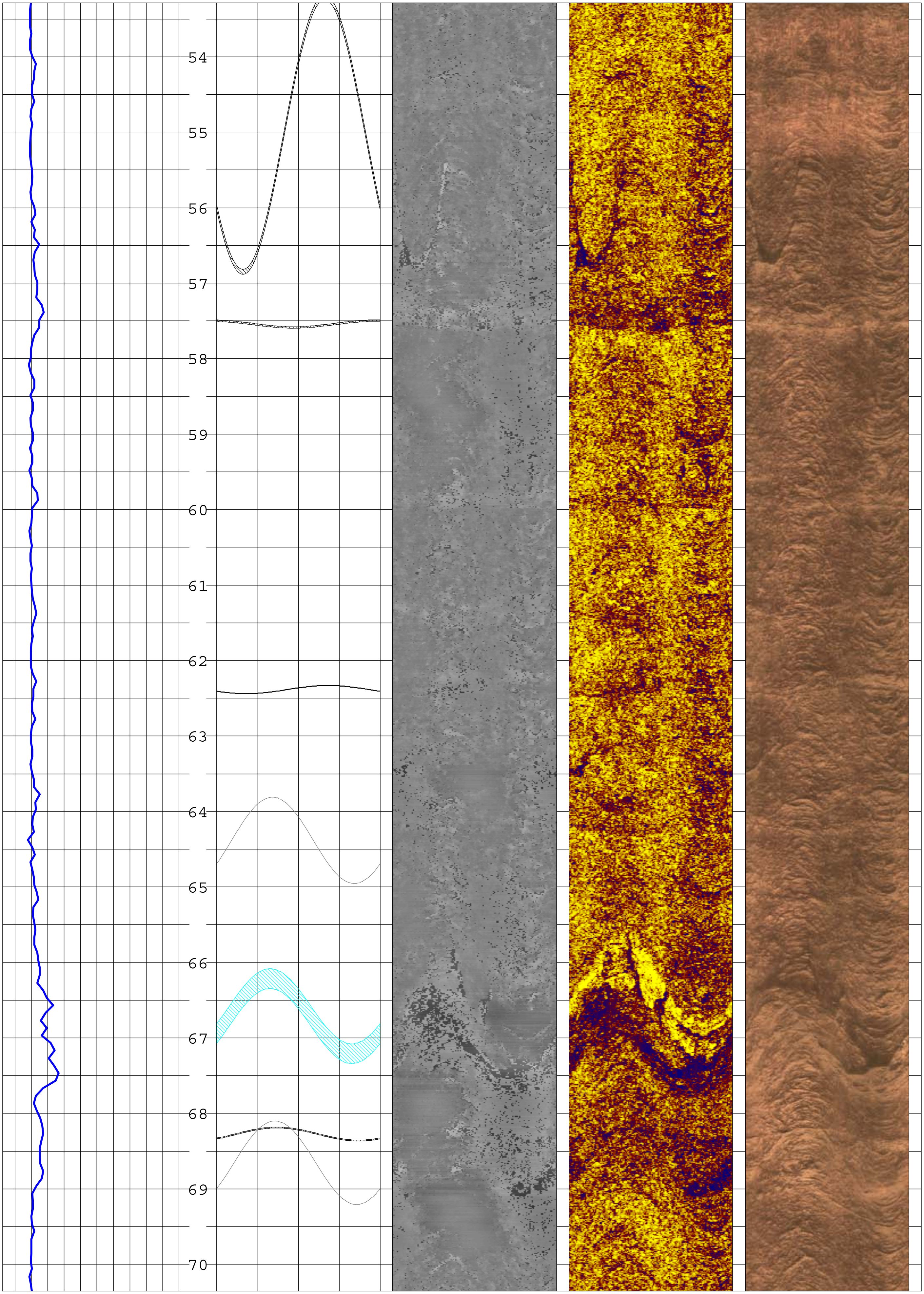
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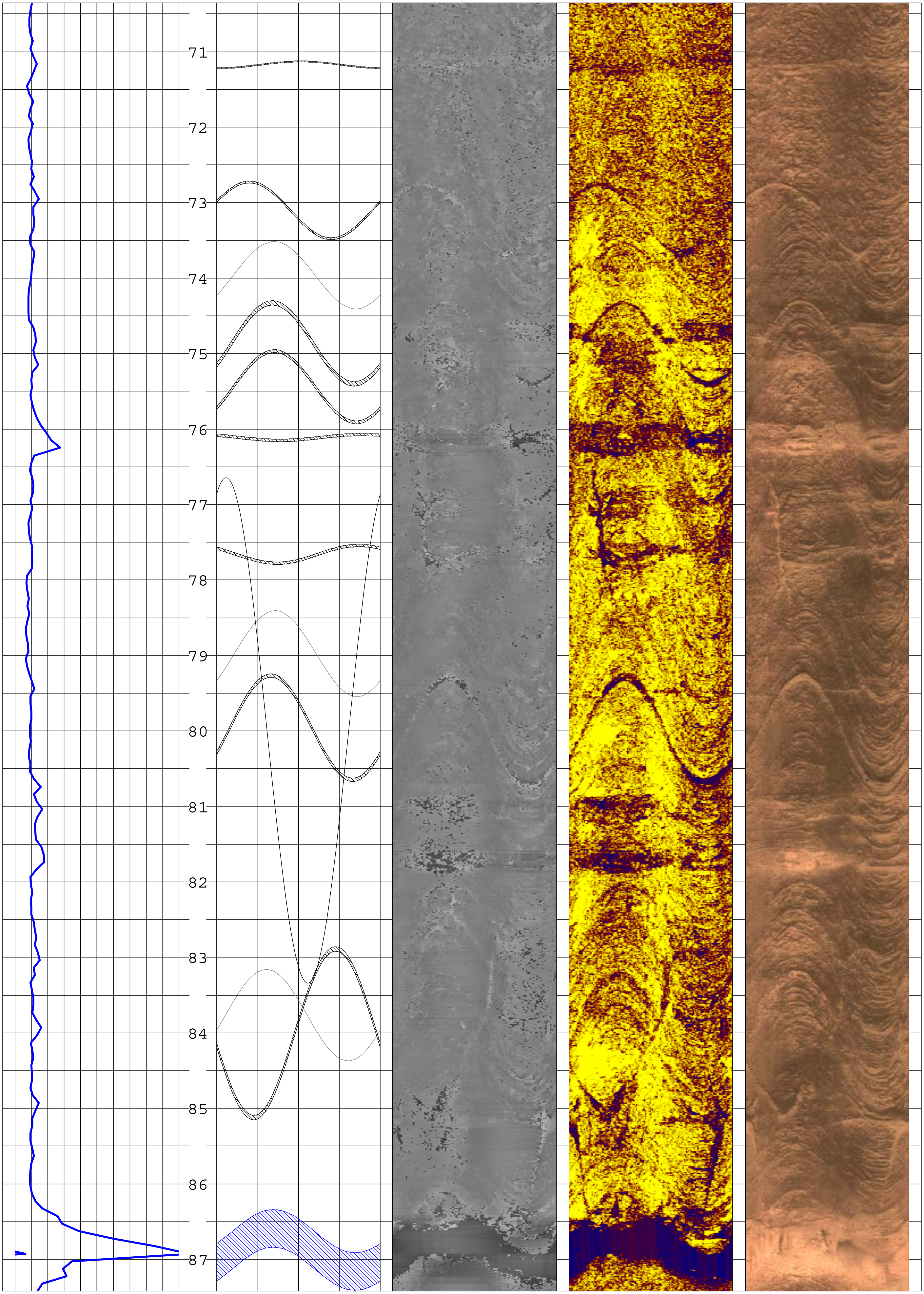
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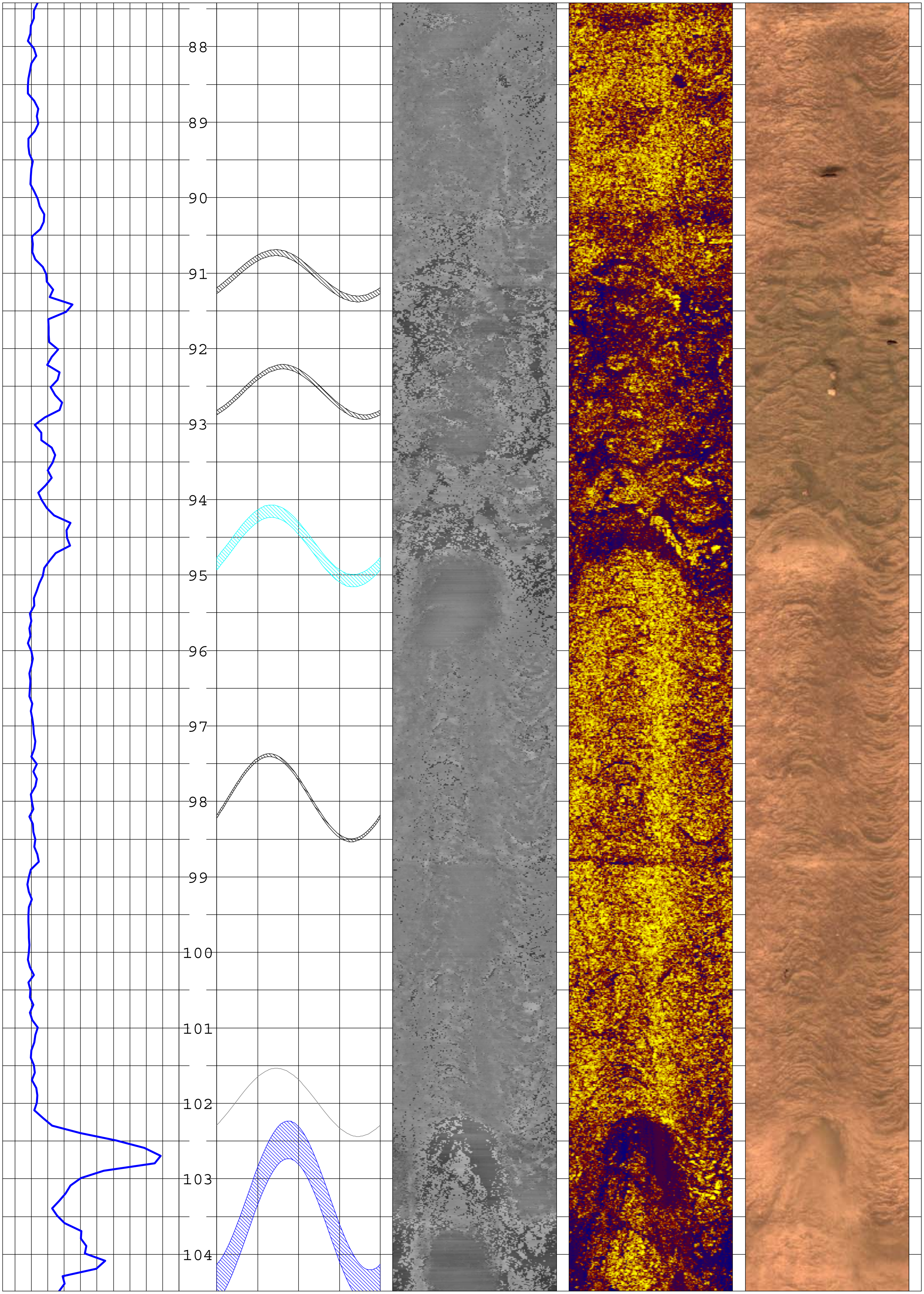
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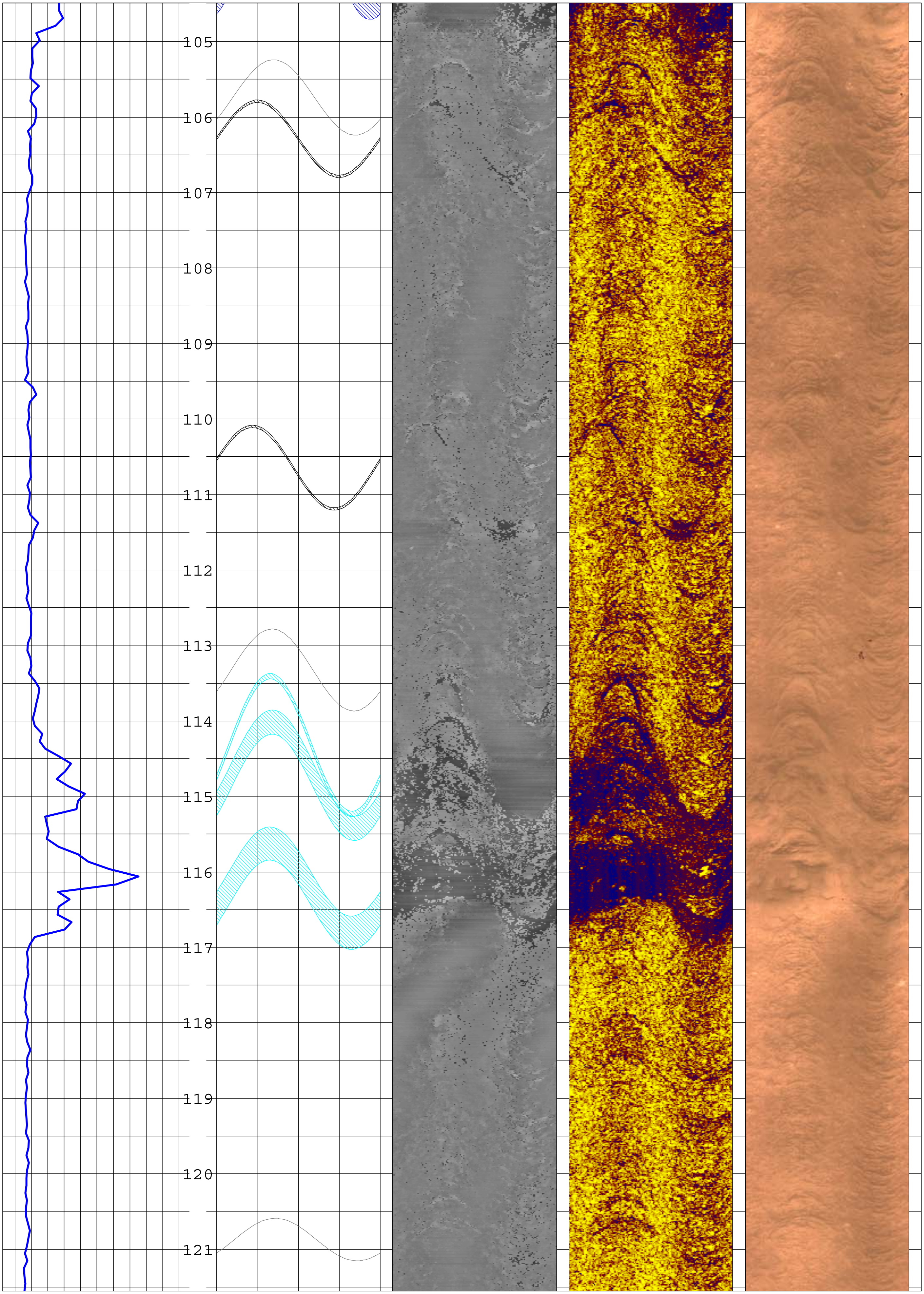
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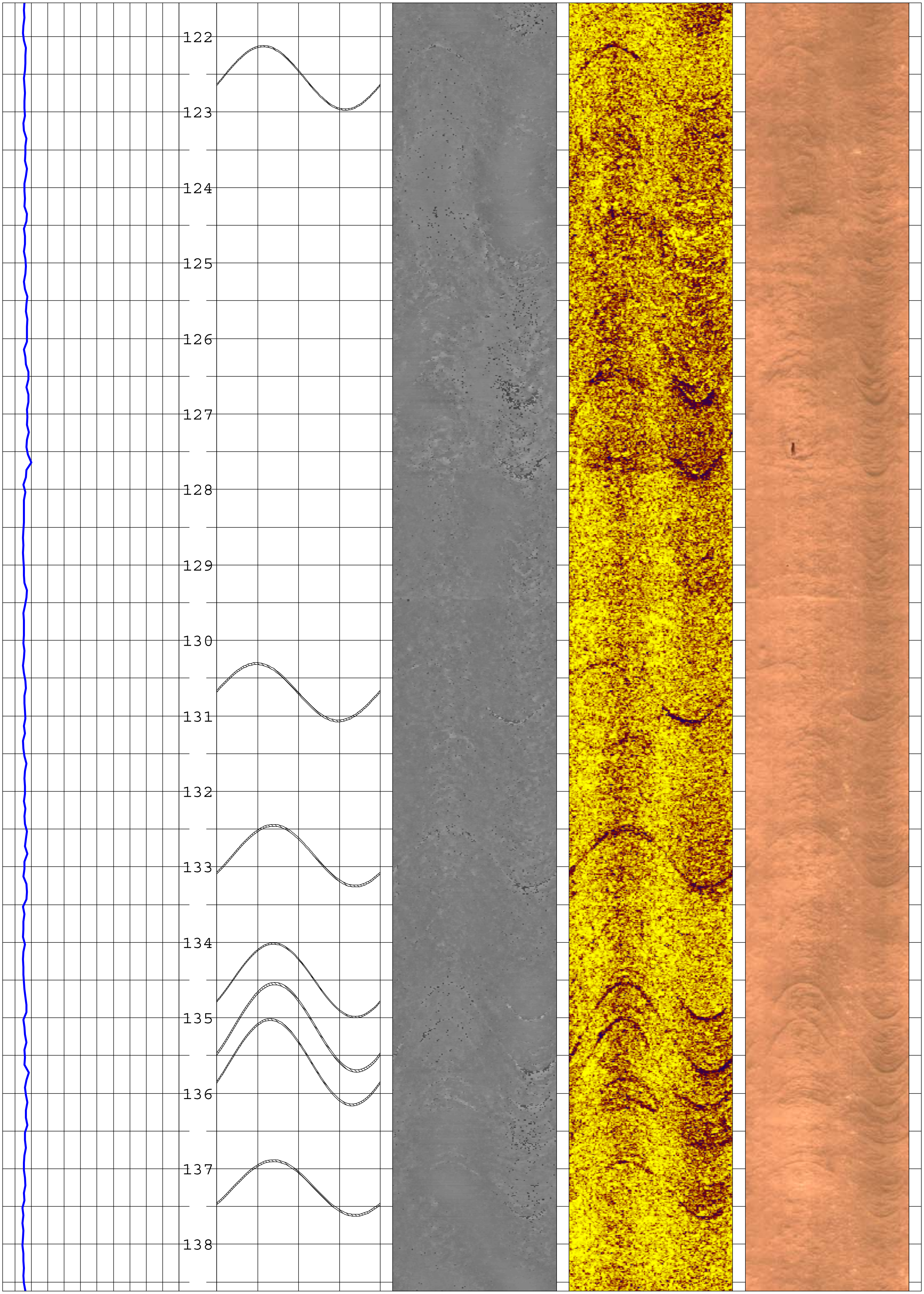
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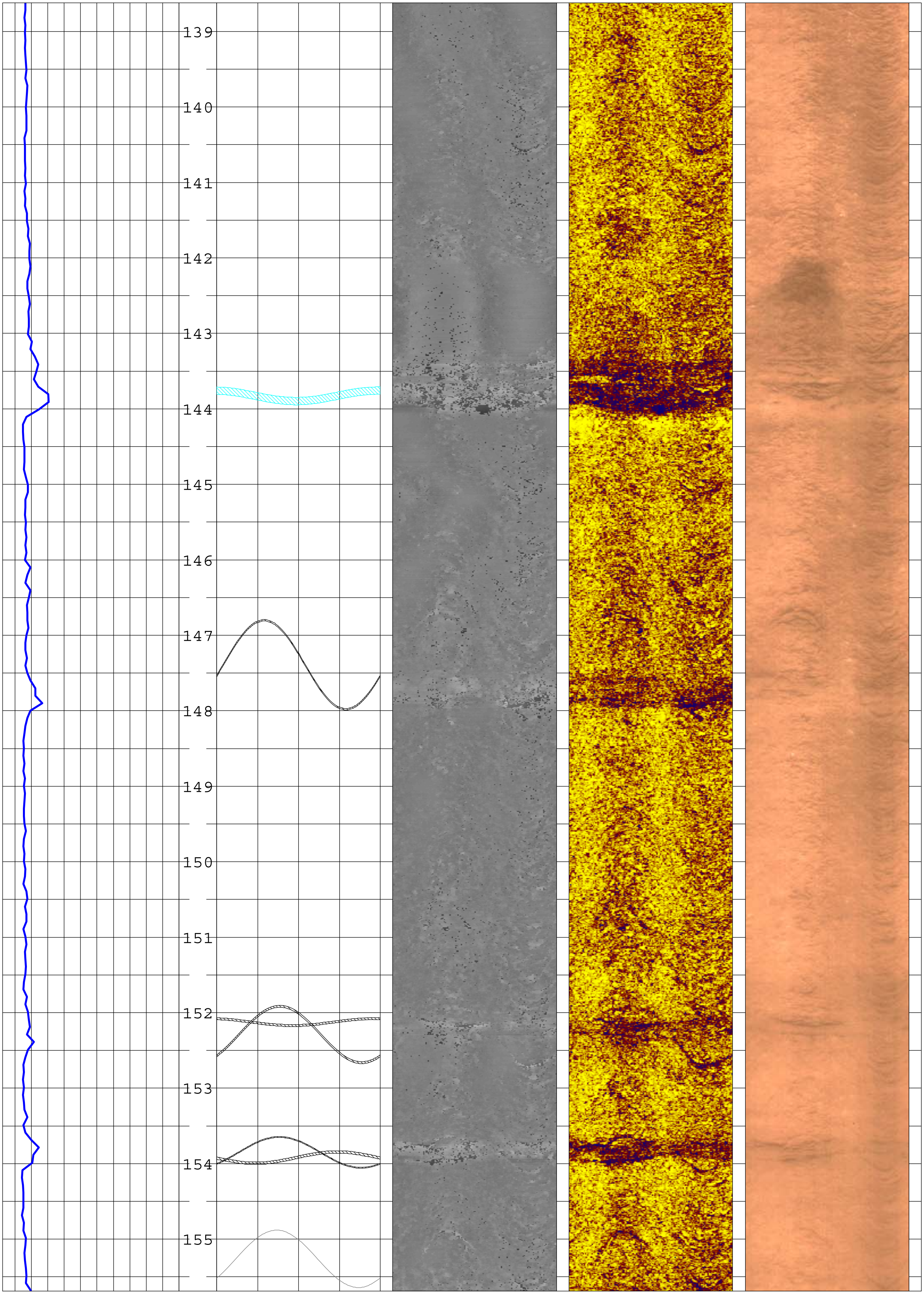
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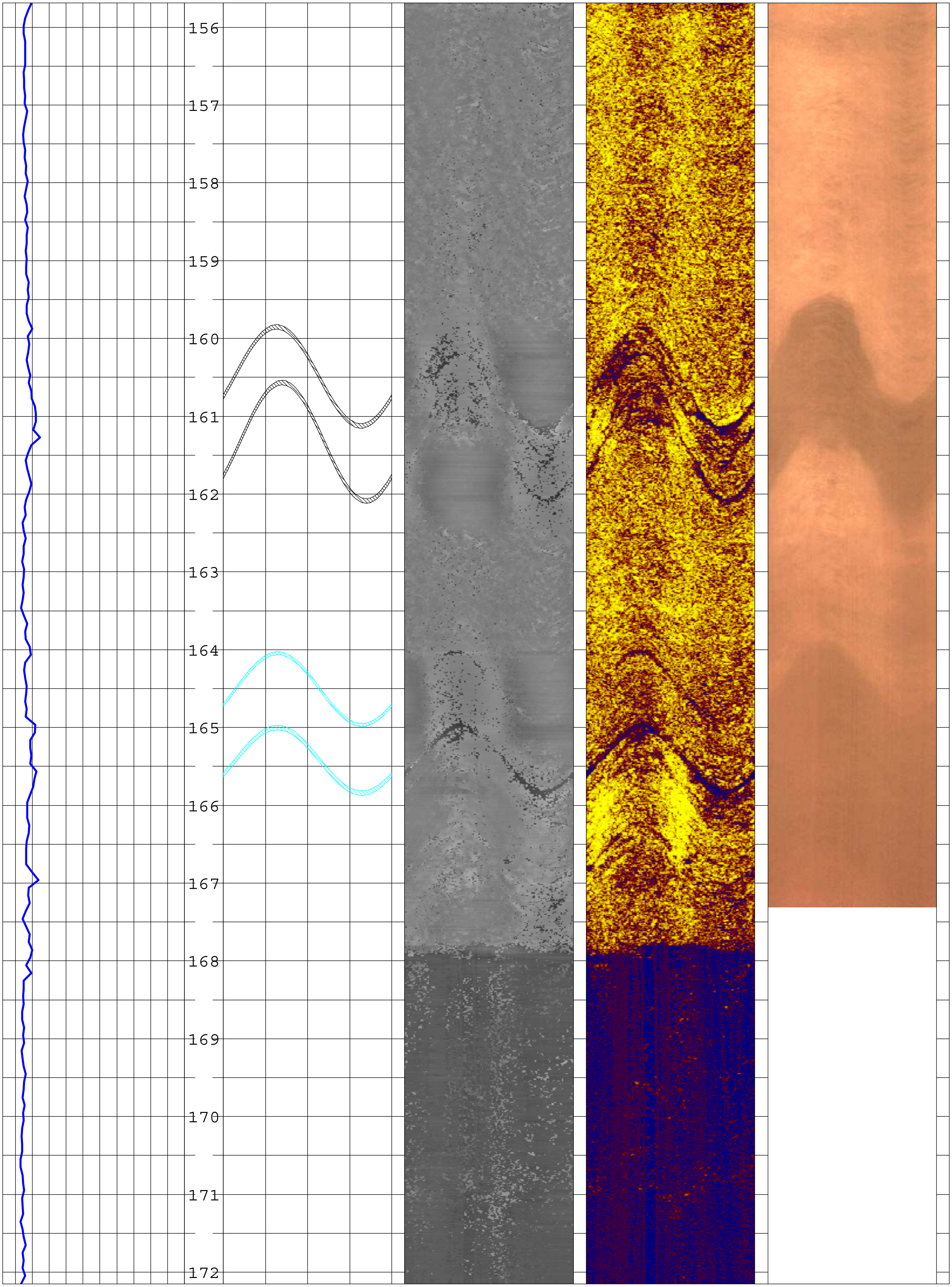
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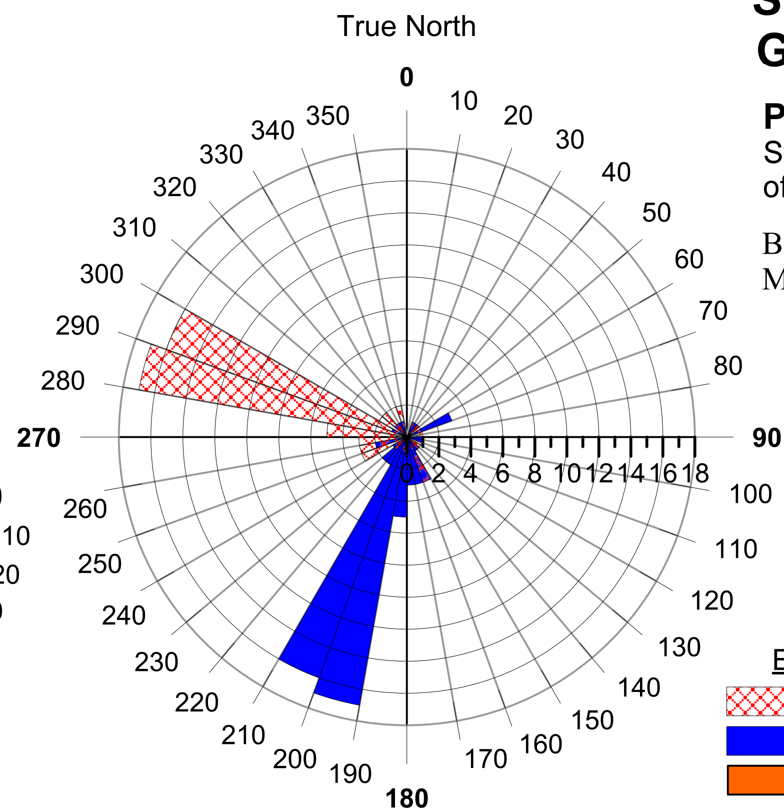
Northeast Geophysical Services

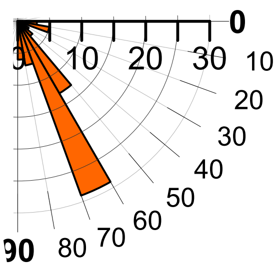
MW-6
Coakley Landfill Superfund Site
Greenland, NH

PLATE M-2

Strike and Dip Direction of all features

Based on 69 measurements in MW-6 borehole





Explanation

- Dip direction of feature
- Strike of feature
- Dip Amount (Tilt)

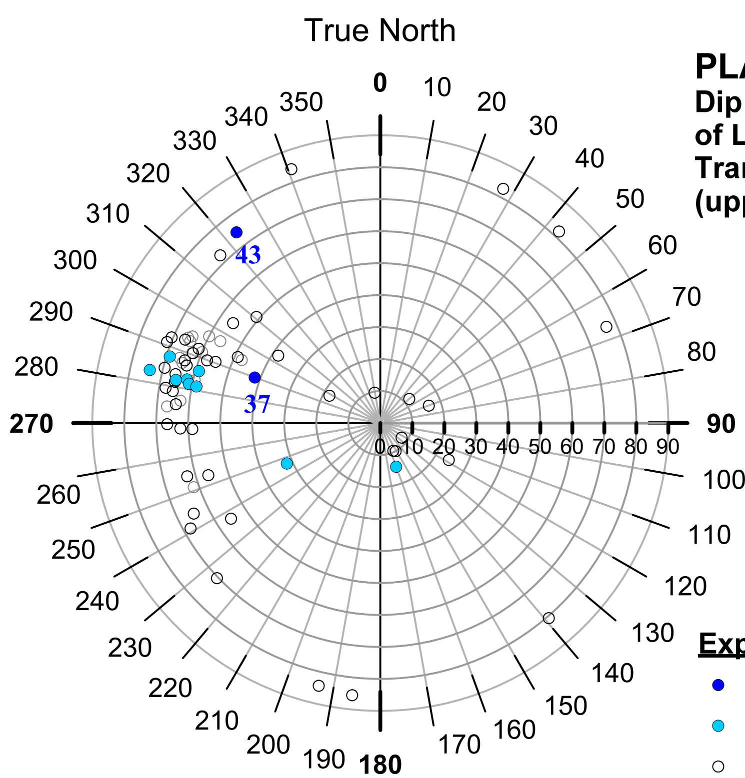


PLATE M-3

Dip Amount and Dip Azimuth of Likely and Possibly Transmissive Fractures (upper hemisphere plot)

Explanation -

- Likely transmissive
- Possibly transmissive
- Aperture > 1 mm
- Aperture < 1 mm

Declination: 14.9 degrees west

TABLE M-1 Planar features interpreted from acoustical and optical televiewers
Coakley Landfill Superfund Site - Greenland, NH **May, 2020**
Declination: 14.9 degrees west

Borehole	Feature # Number	Feature depth Feet	Dip Degrees	Dip Azimuth magnetic	Strike magnetic	Dip Azimuth True	Strike True	Aperture mm	Category Type
MW-6	1	29.3	70	241	151	226	136	5	101
MW-6	2	31.8	32	261	171	246	156	17	108
MW-6	3	33.1	68	256	166	241	151	4	101
MW-6	4	33.9	62	266	176	251	161	<1 mm	100
MW-6	5	34.9	62	283	193	268	178	4	101
MW-6	6	35.9	84	208	118	193	103	2	101
MW-6	7	36.5	63	291	201	276	186	<1 mm	100
MW-6	8	37.6	64	290	200	275	185	4	101
MW-6	9	38.5	66	294	204	279	189	5	101
MW-6	10	40.4	59	298	208	283	193	<1 mm	100
MW-6	11	40.8	81	154	64	139	49	2	101
MW-6	12	41.0	83	43	313	28	298	2	101
MW-6	13	43.7	72	331	241	316	226	4	101
MW-6	14	44.8	63	301	211	287	197	4	101
MW-6	15	45.8	65	310	220	295	205	<1 mm	100
MW-6	16	46.4	70	307	217	292	202	7	101
MW-6	17	48.2	84	356	266	341	251	1	101
MW-6	18	55.0	82	58	328	43	313	3	101
MW-6	19	57.5	10	170	80	155	65	6	101
MW-6	20	62.4	12	65	335	50	320	2	101
MW-6	21	64.4	66	303	213	288	198	<1 mm	100
MW-6	22	66.7	62	298	208	283	193	38	108
MW-6	23	68.3	18	313	223	298	208	5	101
MW-6	24	68.7	65	308	218	293	203	<1 mm	100
MW-6	25	71.2	10	4	274	349	259	5	101
MW-6	26	73.1	55	252	162	237	147	4	101
MW-6	27	74.0	60	307	217	292	202	<1 mm	100
MW-6	28	74.9	64	303	213	288	198	8	101
MW-6	29	75.4	61	307	217	292	202	6	101
MW-6	30	76.1	8	139	49	124	34	11	101
MW-6	31	77.7	24	133	43	118	28	9	101
MW-6	32	79.0	66	309	219	294	204	<1 mm	100
MW-6	33	80.0	70	299	209	284	194	5	101
MW-6	34	80.0	86	201	111	186	96	<1 mm	101
MW-6	35	83.8	67	289	199	274	184	<1 mm	100
MW-6	36	84.0	77	82	352	67	337	4	101
MW-6	37	86.9	42	305	215	290	200	113	107
MW-6	38	91.0	49	310	220	295	205	16	101
MW-6	39	92.6	51	325	235	311	221	11	101
MW-6	40	94.6	59	301	211	286	196	26	108
MW-6	41	98.0	65	296	206	281	191	5	101
MW-6	42	102.0	60	312	222	297	207	<1 mm	100
MW-6	43	103.5	75	338	248	323	233	41	107
MW-6	44	105.7	63	305	215	290	200	<1 mm	100
MW-6	45	106.3	63	269	179	255	165	5	101
MW-6	46	110.7	65	259	169	244	154	5	101
MW-6	47	113.3	65	302	212	287	197	<1 mm	100
MW-6	48	114.3	74	298	208	283	193	6	108
MW-6	49	114.7	69	302	212	288	198	36	108
MW-6	50	116.2	65	297	207	282	192	56	108
MW-6	51	120.9	48	309	219	294	204	<1 mm	100
MW-6	52	122.6	59	283	193	268	178	3	101
MW-6	53	130.7	56	268	178	253	163	5	101
MW-6	54	132.9	58	305	215	290	200	4	101
MW-6	55	134.5	62	305	215	290	200	3	101
MW-6	56	135.1	66	308	218	293	203	4	101
MW-6	57	135.6	66	298	208	283	193	3	101
MW-6	58	137.3	55	305	215	290	200	4	101
MW-6	59	143.8	15	175	85	160	70	29	108
MW-6	60	147.4	67	285	195	270	180	2	101

TABLE M-1 Planar features interpreted from acoustical and optical televiewers
Coakley Landfill Superfund Site - Greenland, NH **May, 2020**
Declination: 14.9 degrees west

Borehole	Feature # Number	Feature depth Feet	Dip Degrees	Dip Azimuth magnetic	Strike magnetic	Dip Azimuth True	Strike True	Aperture mm	Category Type
MW-6	61	152.1	10	166	76	151	61	9	101
MW-6	62	152.3	56	319	229	304	214	5	101
MW-6	63	153.9	38	318	228	303	213	4	101
MW-6	64	153.9	16	85	355	70	340	9	101
MW-6	65	155.3	56	312	222	297	207	<1 mm	100
MW-6	66	160.5	68	294	204	279	189	6	101
MW-6	67	161.3	71	306	216	291	201	5	101
MW-6	68	164.5	61	296	206	282	192	5	108
MW-6	69	165.4	59	296	206	281	191	9	108