FINAL GEOTECHNICAL DATA REPORT
FIELD AND LABORATORY DATA COLLECTION PHASE
CAMINADA HEADLANDS BACK BARRIER
MARSH CREATION INCREMENT II (BA-193)
OFFSHORE BORROW INVESTIGATION

LAFOURCHE & JEFFERSON PARISHES, LOUISIANA

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February 9, 2018
AAI File: 17-2810A

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Attention: Ms. Renee Bennett– PMP
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CC: Mr. Binh Dao, E.I.
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Re: Final Data Report – Field and Laboratory Data Collection Phase
Caminada Headlands Back Barrier Marsh Creation Increment II (BA-193)
Offshore Borrow Investigation
Lafourche & Jefferson Parishes, Louisiana

We have completed the field exploration and the laboratory data collection phase for the Caminada Headlands Back Barrier Marsh Creation Increment II (B-193) Offshore Borrow Investigation project. A summary of the field exploration and laboratory testing results are provided in the attached Final Data Report. This work was authorized by an Amendment #1 to our Task #5 Notice to Proceed dated June 2, 2017 under our existing contract No. 4400005545 with the Coastal Protection and Restoration Authority (CPRA).

Sincerely,
ARDAMAN & ASSOCIATES, INC.
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FINAL GEOTECHNICAL DATA REPORT
FIELD AND LABORATORY DATA COLLECTION PHASE
CAMINADA HEADLANDS BACK BARRIER MARSH CREATION INCREMENT II (BA-193)
OFFSHORE BORROW INVESTIGATION

LAFOURCHE & JEFFERSON PARISHES, LOUISIANA

Results and findings of the field exploration and laboratory testing phases of the Caminada Headlands Back Barrier Marsh Creation Increment II (BA-193) Offshore Borrow Investigation are provided herein. Logs of the Vibracores and generalized subsurface profiles, along with a description of terms and symbols used on the logs of the vibracores, are provided in Appendix A. Laboratory testing data plots are included in Appendix B, results of a Magnetometer Survey are provided in Appendix C, and the vibracore sediment sampling operations report is provided in Appendix D. Appendix E contains selected data from a previous geotechnical investigation of the same borrow area performed by Eustis Engineering Services, LLC for the Coastal Protection and Restoration Authority. The data was obtained from Report No. 22729 dated August 3, 2015.

SECTION 1. GENERAL PROJECT INFORMATION

1.1 Project Description

The Caminada Headlands Back Barrier Marsh Creation Increment II project has two main goals; to create and/or nourish 444 acres of back barrier marsh through the use of pumped sediment from an offshore borrow site, and to create a platform upon which beach and dune can migrate, thereby reducing the likelihood of breaching. The proposed project is expected to slow the current trend of degradation in the headland. According to CPRA, the Caminada Headland has experienced some of the highest shoreline retreat rated in Louisiana, with recent measurements exceeding 80 feet per year between 2006 and 2011. These increased losses are said to occur in the wake of Hurricanes, which formed breaches in the headlands, that remained open for extended periods of time, thus increasing the net export of sediment from the headlands.

The scope of work associated with the field and laboratory data collection phase for the planned offshore borrow area for this project consisted of performing a total of three (3) vibracores to a depth of about 30 feet below the existing mudline at locations established in coordination with the Coastal Protection and Restoration Authority (CPRA). Figure 1 shows the limits of the proposed borrow area.

1.2 Site Location and Description

The offshore Borrow Site is located approximately 1½ to 2 miles offshore from the proposed marsh creation area, and encompasses and area approximately 0.6 square miles. Approximate coordinates for the center of the borrow area are 29° 09′ 18.83″ N, and 90° 06′ 41.92″ W (NAD83).

SECTION 2. FIELD EXPLORATION

2.1 Permission and Access

Permission to perform the geotechnical investigation was previously obtained by CPRA under the Coastal Use Permit (CUP) No. P20170360, dated May 3, 2017.

2.2 Magnetometer Survey

As per Section 4.3.2 of the *Scope of Services for Geotechnical Investigations and Engineering Services, Caminada Headlands Back Barrier Marsh creation Increment II (BA-193) Borrow Area Work* document, a magnetometer survey was performed by T. Baker Smith (TBS) for Ardaman & Associates, Inc. (Ardaman) at all of the proposed vibracore sampling locations. Results of the survey are provided in Appendix C of this report for reference. In conjunction with the magnetometer survey, the location of the vibracores were surveyed by TBS in terms of NAD83 state plane and geographic coordinates, and the mudline elevation was recorded in terms of NAVD88 vertical datum.

2.3 Vibracores

Ardaman subcontracted Ocean Surveys, Inc. (OSI) to provide the means and equipment necessary to perform the three vibracores (V-1 thru V-3) at locations agreed upon with CPRA, and as approximately shown in plan on Figure 2. The vibracores were performed between July 9 and July 11, 2017. OSI's operations report it provided in its entirety in Appendix D of this report for reference.

All vibracores were performed using a self-propelled lift-boat equipped with a crane, a fully enclosed cabin and living quarters, and with a navigation systems using a precision marine DGPS interface with a real-time positioning and digital logging computer. The vibracores were advanced by means of a pneumatic vibratory corer equipped with a 30 feet long 4-inch inside diameter core barrel, which is fitted with a 3.5-inch Lexan liner for recovery of continuous sediment cores. Once recovered, the continuous sediment core was cut into 5-foot nominal length sections, for storage and transportation. Upon completion of OSI's field operations, all the sample tubes obtained were transported to our laboratory for extrusion and testing. The following table presents the location and elevation of the vibracores.

TABLE 2-1 VIBRACORE DETAILS

Vibracore ID	Recovery (feet)	Latitude	Longitude	Mudline Elevation (feet, NAVD88)	Approximate Water Depth (feet)
V-1	23.2	29° 06′ 59.39″	90° 07′ 16.36″	-30.4	31.5
V-2	29.9	29° 07′ 37.15″	90° 05′ 58.47″	-31.1	32.2
V-3	24.6	29° 08′ 09.24″	90° 05′ 26.91″	-29.5	30.6

A total of 77.7 feet of sample was recovered during the field exploration program, corresponding to an average recovery of 86 percent.

SECTION 3. LABORATORY TESTING

Upon completion the field exploration work, samples were transported to our New Orleans laboratory. The samples were generally cut into 1-foot nominal sections, a photograph of the cross section was obtained, and then a moisture content of the sample was obtained for each section.

An overview of the scope of the laboratory testing phase in terms of the type and number of tests performed is presented in Table 3-1. Results of the laboratory tests and their implication with respect to design material property selection are presented and discussed in the following sections of this report.

TABLE 3-1 LABORATORY TESTING SUMMARY

Test Method	Reference	Number of Tests Performed
Atterberg Limit Determination	ASTM D4318	42
Moisture Content	ASTM D2216	78
Grain Size Analysis	ASTM D1140, and D422	12
Unit Weight Determination	ASTM D2937	78
Settling Column	USACE 1110-2-5027	6
Slurry Consolidation (Low Stress Consolidation)	ASTM D2435 (mod.)	3

3.1 Classification and Index Testing

Subsurface conditions, in terms of soil classification, and geotechnical index properties at the vibracore locations within the borrow area are somewhat heterogeneous. For a detailed description refer to the individual vibracore logs provided in Appendix A. In general, the soil profile consists of very soft to medium stiff clay with isolated pockets or seams of silt and sand. More frequent sand seams were encountered at the location of Vibracore V-3.

3.1.1 Visual Classification

Visual classification included description of soil color, consistency and type, and identification of structural conditions (layering, seams, etc.) and variations (organics, oxide inclusions, etc.). Visual classifications for the soil samples obtained from the site are incorporated into the vibracore logs in Appendix A.

3.1.2 Moisture Content and Density

Moisture content determinations (ASTM D2216) and total unit weight determinations (ASTM D2937) were performed in conjunction with the sample extrusion process and preparation of test specimens. Total unit weights were computed based on sample volume and weight measurements taken prior to sample extrusion from the 1-foot nominal sections. Moisture content determinations were made for each extruded sample, and dry densities were computed for each sample. Considering that all samples were obtained below the water surface, degrees of saturation were computed to confirm that the density and moisture content values correspond to near 100 percent saturation as a quality control measure. Moisture content and total density values for each sample are included on the soil boring logs in Appendix A.

Variations in moisture content and total unit weights versus depth below the mudline at all of the vibracore locations within the project area are illustrated on Figures B.1-1 thru B.1-3 (Appendix B) alongside the preliminary design property selection. Samples generally exhibited a decline in the moisture content with depth, along with an increase in the unit weight with depth. Moisture contents generally ranged between 40 and 70 percent for clays and between 20 and 40 for the more granular samples. Unit weights typically ranged from 100 to 115 pound per cubic foot (pcf) for clays, and approached 130 pcf for the more granular samples.

3.1.3 Atterberg Limits

A total of 42 Atterberg limit determinations (ASTM D4318) were performed on selected samples to assist in soil classification and to enable correlation to pertinent clay behavior properties. The Atterberg limit data consist of measured liquid limit (LL) and plastic limit (PL) values from which the plasticity index (PI = LL – PL) is derived. The individual test data are included on the vibracore logs in Appendix A. The test results are also presented in terms of the plasticity chart on Figure B.2, and variation with depth on Figures B.1-1 thru B.1-3 (Appendix B). The data indicate that the majority of the sediments encountered consist of highly plastic clay or organic clay, classifying as CH- or OH-type soils in accordance with the Unified Soil Classification System. Liquid limits are relatively variable, ranging from a minimum of 36 to a maximum of 94 percent.

The Liquidity Index (LI) is a parameter that characterizes the *in-situ* moisture content of a sample in relation to its liquid and plastic limit values (LI= [MC-PL]/PI). Clay soils having high liquidity indices, i.e., approaching or even greater than 1.0, have *in-situ* water contents that are near to or above their liquid limit, which is characteristic of very soft and compressible "normally consolidated" or very lightly overconsolidated conditions. As can be seen on Figures B.1-1 thru B.1-3, liquidity index values throughout the borrow area are somewhat heterogeneous, but generally range from 0.5 to 1.0.

3.1.4 Particle Size Distribution

Three (3) hydrometer analyses (ASTM D422) and nine (9) fines content determinations (ASTM D 1140) were performed on selected samples. The test results, in terms of percent fines (i.e., percent by dry weight finer than the U.S. No. 200 sieve size, 0.074 mm, or combined silt and clay fraction) are included on the soil boring logs in Appendix A. Individual hydrometer test results for the three composite samples, in terms of grain size distribution curves, are included on Figures B.3-1 thru B.3-3 (Appendix B).

3.2 Settling and Consolidation Tests

3.2.1 Settling Column Test

One composite sample was prepared from each vibracore using samples obtained from the upper 10 feet, as this is the anticipated dredge excavation depth. Laboratory settling tests were performed in a 20-cm diameter graduated plexi-glass settling columns. The test samples were mixed with synthesized marsh water having a salinity, in terms of total dissolved solids, of 10.5 g/l. Each composite sample was tested at a lower bound and upper bound solids content generally ranging from 12 to 16 percent, with corresponding initial total suspended solids concentrations ranging from about 130 g/L to 180 g/L, respectively. These initial concentrations were based off a bench-scale study where the initial solids concentration was increased from 8 to 20 percent, and the concentrations assumed at the discharge pipe during dredging. The slurry was mixed with a hand-held stirrer to provide a homogeneous sample, and remove any segregation of particles which may have occurred during placement of the slurry into the column. The columns were then covered with clear plastic wrap to prevent evaporation of the supernatant fluid during the test period.

The settling column tests are intended to simulate the sedimentation of a dredged material in a quiescent environment. This test provides information regarding two types of settling regimes; zone settling, and compression settling. The settling tests consist of measuring the fall of the liquid-solid interface over time. These data are plotted in terms of height of the interface over time in Appendix B. The initial slope of the curve is the zone settling velocity. Samples were observed to transition between zone settling and compression settling within 48 hours, as can be seen on Figures B.4-1 thru B.4-9 (Appendix B). A summary of the observed zone settling velocities are provided in Table 3-2.

TABLE 3-2 SETTLING COLUMN VELOCITIES

Composite Sample	Zone Settling Velocity (cm/min)	
	12% Initial Solids	16% Initial Solids
V-1	0.0571	0.0345
V-2	0.0401	0.0450
V-3	0.0416	0.0316

Compression settling refers to the compression of the lattice structure observed in the liquid-solid interface due to self-weight consolidation. This behavior was monitored for a period of 30 days. At the end of the test (for the higher concentration), discrete samples were taken from ports along the height of the settling column for a determination of solids content, moisture, and void ratio with depth. Results of these are provided in Appendix B. It should be noted that during the initial settling (zone settling) segregation between the coarse and fine grained portion of the sample was observed. In general a disassociation of the sand and silt portion of the sample resulted in a bed thickness of about 6 to 10 cm. Final settled sediment heights ranged from about 45 to 58 cm, with corresponding average final solids contents ranging from about 32 to 40 percent solids content. These were used to develop unit weight profiles characteristic of the near-surface settled dredge deposits in order to incorporate them into a void ratio versus effective vertical stress relationship for use in the self-weight consolidation of the proposed marsh fill. Results of these are presented graphically on Figures B.7-1 thru B.7-3 (Appendix B).

TABLE 3-3 FINAL SOLIDS CONCENTRATION

Composite Sample	Final Solid Concentration (S_f)	
	12% Initial Solids	16% Initial Solids
V-1	33.4	32.7
V-2	34.7	36.9
V-3	38.0	40.1

Table 3-3 summarized the final measured solids concentration. This was generally observed to increase with an increase in the initial solids concertation, however, this was not the case for Composite V-1. The increase was generally observed to be on the order of 2%, which is similar to the difference in initial solids concentration between the two rounds of tests.

3.2.2 Slurry Consolidation Tests

One-dimensional incremental slurry consolidation tests were performed each of the composite samples prepared from the dredge borrow area. These tests are performed using specially designed and fabricated equipment with a counterbalance pulley system (to counteract a portion of the normal load associated with the top loading piston) that is similar to a conventional one-dimensional consolidation device, except that the equipment used allows for evaluation of the consolidation behavior at stresses as low as 0.001 kg/cm^2. For this test, the specimen is settled from a slurry having an initial solids concentration of 14 percent, and then incrementally loaded within a 10.2-cm diameter by 60-cm tall settling column to produce a specimen height at the end of settling of approximately 9 cm. After gravity settling is substantially complete, the specimen is loaded one-dimensionally under stresses of 0.001 to 2.0 kg/cm^2 using a load increment ratio of 1.

The change in specimen height with time under each load is monitored and evaluated to characterize the one-dimensional compressibility, consolidation and drained creep properties of the sediment. Tabulated results of the slurry consolidation tests are included for reference on Figures B.5-1 thru B.5-9 (Appendix B). A comparison graph depicting the void ratio versus vertical effective stress relationships for all the slurry consolidation tests is presented on Figure B.6. For comparison, figures depicting the results of both the slurry consolidation test and the settling column are provided on Figures B.7-1 thru B.7-3.

At the end of the settling column test, discrete samples are obtained along the length of the sample. Moisture content determinations are then made which allow for the determination of dry densities, which can be used to determine a density profile with depth. This density profile is then used to estimate the vertical effective stress with depth along the sample. Figure B.7-1 shows the void ratio with depth profile for the settling columns performed with an initial solids concentration of 16%. Figure B.7-2 shows the void ratio versus assumed vertical effective stress. As can be seen, the high void ratios are associated with samples obtained near the interface, which may not have fully consolidated at the end of 30 days. Figure B.7-3 shows the void ratio versus vertical effective stress profile for both the settling column and the slurry consolidation test. As can be seen, the settling column indicates higher void ratios are lower effective stresses, which are associated with those sample obtained from near the interface. The data points observed to fall below the slurry consolidation values could be a result of segregation during the initial sedimentation phase, which would tend to have a higher sand and silt concentration, resulting in lower void ratios. Another explanation for the observed difference between the settling column and the slurry consolidation test may be due in part to the difference in diameter of the testing equipment, which may lead to arching effects.

SECTION 4. DISCUSSION

4.1 Preliminary Bench Scale testing

To assist in selection of initial solids concentrations for composite sample settling column and slurry consolidation testing, a series of bench-scale settling column tests were performed. The sample consisted of homogenized sediment obtained from Vibracore V-2, from below the maximum anticipated dredge depth. The samples were tested at initial solids concentration of 8%, 12%, 16%, and 20% in columns roughly 30-cm (1-foot) tall. Measurements were taken periodically over a 14-day period, by which time the samples appeared to have essentially finished settling. Figure 3 presets a summary of the results obtained from this bench-scale study. Pictures taken during this 14-day period are provided in Appendix F. The upper plot summarizes the recorded interface height over time for the various initial solids concentrations. As can be seen, it was observed that as the initial solids concentration increased, the initial settling zone characterized by a rapid decrease in the interface height is not as pronounced or may not have even occurred with the compression settling regime becoming more pronounced. The lower plot on Figure 3 presents the final settled average void ratio versus the initial solids concentration and illustrates the inverse relationship between these variables.

From this data it was established that a "worst case" and "best case" scenario should be considered in design for the marsh fill, meaning that the hydraulically dredged fill comes out the discharge pipe at either a low initial solids concentration or a relatively elevated one. Based on discussions with CPRA, consideration of historic dredge rates, and available sample mass 12% and 16% target initial solids concentration where selected for use in the large-scale settling column tests..

4.2 Previous Borrow Area Investigation

A previous geotechnical investigation of the same borrow area was performed in February 2015, results of which are contained in Report No. 22729 dated August 3, 2015 from Eustis Engineering Services, LLC. Pertinent pages from this previous investigation along with a comparison of the results obtained from the current geotechnical investigation are provided in Appendix E of this report. This previous investigation consisted of ten (10) vibracores throughout the borrow area. The three vibracores performed for this investigation were selected to coincide with the previously performed vibracores; Vibracore V-1 was performed adjacent to B-10/10A; V-2 was performed adjacent to B-16; and V-3 was performed adjacent to B-14/14A. Results from these three pairs of vibracores are in general agreement, as shown on Figures E.4 thru E.6 (Appendix E).

The previous investigation additionally performed a settling column test on a bulk composite sample along with a "self-weight" consolidation test on the same sample. A comparison of the results obtained in the settling column is provided on Figure E.34. Results of the "self-weight" consolidation test cannot be compared directly to the "slurry consolidation test". The self-weight consolidation test consists of a composite sample which is homogenized to a moisture content equal to about 3 times the liquid limit, allowed to consolidate, and then discrete samples are

obtained from the final settled specimen. The test provides a relationship between stress and void ratio, however, it does not provide information regarding the time-rate of the consolidation, which is a crucial element to marsh creation projects. The slurry consolidation test however, is similar to a conventional one-dimensional consolidation test whereby time-rate parameters such as hydraulic conductivity and the coefficient of consolidation can be measured over discrete intervals. This allows for the development of relationship curves between void ratio, vertical effective stress, and hydraulic conductivity.

Results of the settling column tests and slurry consolidation tests performed by Ardaman, the "self-weight" consolidation test performed by Eustis, and the void ratio-effective stress relationship used by GeoEngineers in their analyses are summarized on the upper plot on Figure 4. The filled symbols represent results from the settling column test. Discrete samples were obtained from the column at the end of the test. The samples obtained near surface had elevated moisture content and corresponding elevated void ratios in a non log-linear trend. The open colored symbols represent the results of the slurry consolidation test taken at individual load increments. The solid black line represents the relationship obtained from the "self-weight" consolidation test, which terminated at an effective vertical stress of about 3 psf. The dashed black line represents the extrapolation beyond the self-weight data employed by GeoEngineers in the PSDDF model used to estimate self-weight consolidation of hydraulically dredged fill. As can be seen, most of the data from the settling column plot above the solid and dashed line used by Eustis and GeoEngineers, while the data from the slurry consolidation plot below. This indicates that the fill material may be more compact at the end of consolidation than previously estimated. A more compact material with a lower void ratio will occupy less volume, therefore the dredge volume required may be greater than previously estimated.

The lower portion of Figure 4 presents a summary of the relationship between hydraulic conductivity and vertical effective stress obtained from the slurry consolidation tests, and the empirical relationship employed by GeoEngineers based on previous experience. As can be seen, the data obtained from the slurry consolidation test data plot above the dashed line used by GeoEngineers, which indicates that the material may be more permeable that previously estimated. This indicates that faster consolidation settlements may occur.

4.3 Borrow Material Selection and Design Properties

Borrow material design properties will be discussed in a separate report, as authorized by Amendment #1 to our Task #5 under our existing contract with CPRA. This report was intended to characterize the proposed *in-situ* borrow material in terms of index tests, and perform specialized low-stress consolidation testing and settling column tests on manufactured "composite" samples. The results of this Borrow Area Geotechnical Data Report will be used in the Design Report.

4.4 Design Report

Based on an evaluation of the data obtained during the field and laboratory testing phase of work, we believe that sufficient data has been collected in order to perform the analyses required

for the design phase, notwithstanding a final determination of the alignment, potential impacts from the existing oyster lease, and archeological survey.

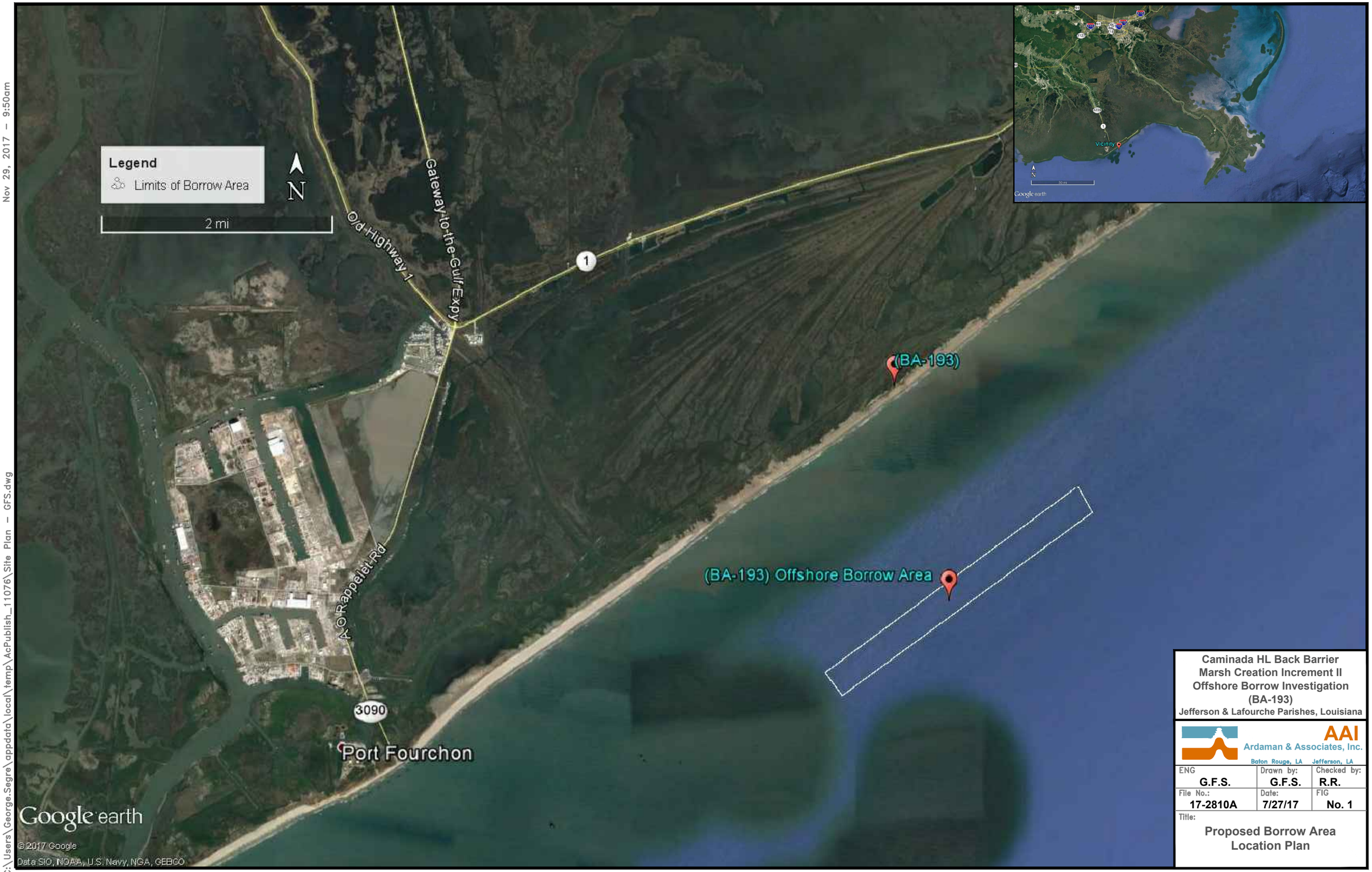
FIGURES:

Figure 1 – Project Location Plan

Figure 2 – Vibracore Location Plan

Figure 3 – Bench Scale Settling Column Results

Figure 2 – Summary of Results Compared to Previous Investigations



Caminada HL Back Barrier
Marsh Creation Increment II
Offshore Borrow Investigation
(BA-193)
Jefferson & Lafourche Parishes, Louisiana

AAI
Ardaman & Associates, Inc.
Baton Rouge, LA Jefferson, LA

ENG	Drawn by:	Checked by:
G.F.S.	G.F.S.	R.R.
File No.: 17-2810A	Date: 7/27/17	FIG No. 1

Title:
Proposed Borrow Area
Location Plan

Nov 29, 2017 – 9:50am

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Borrow Area Vibracores		
Vibracore I.D	Latitude	Longitude
V1	29° 6'59.39"N	90° 7'16.36"W
V2	29° 7'37.15"N	90° 5'58.47"W
V3	29° 8'9.24"N	90° 5'26.91"W

Caminada HL Back Barrier Marsh Creation Increment II Offshore Borrow Investigation (BA-193)
Jefferson & Lafourche Parishes, Louisiana

AAI
Ardaman & Associates, Inc.
Baton Rouge, LA Jefferson, LA

ENG	Drawn by:	Checked by:
G.F.S.	G.F.S.	R.R.
File No.: 17-2810A	Date: 7/27/17	FIG No. 2

Title:
Borrow Area Vibracore Location Plan

Nov 29, 2017 – 9:50am

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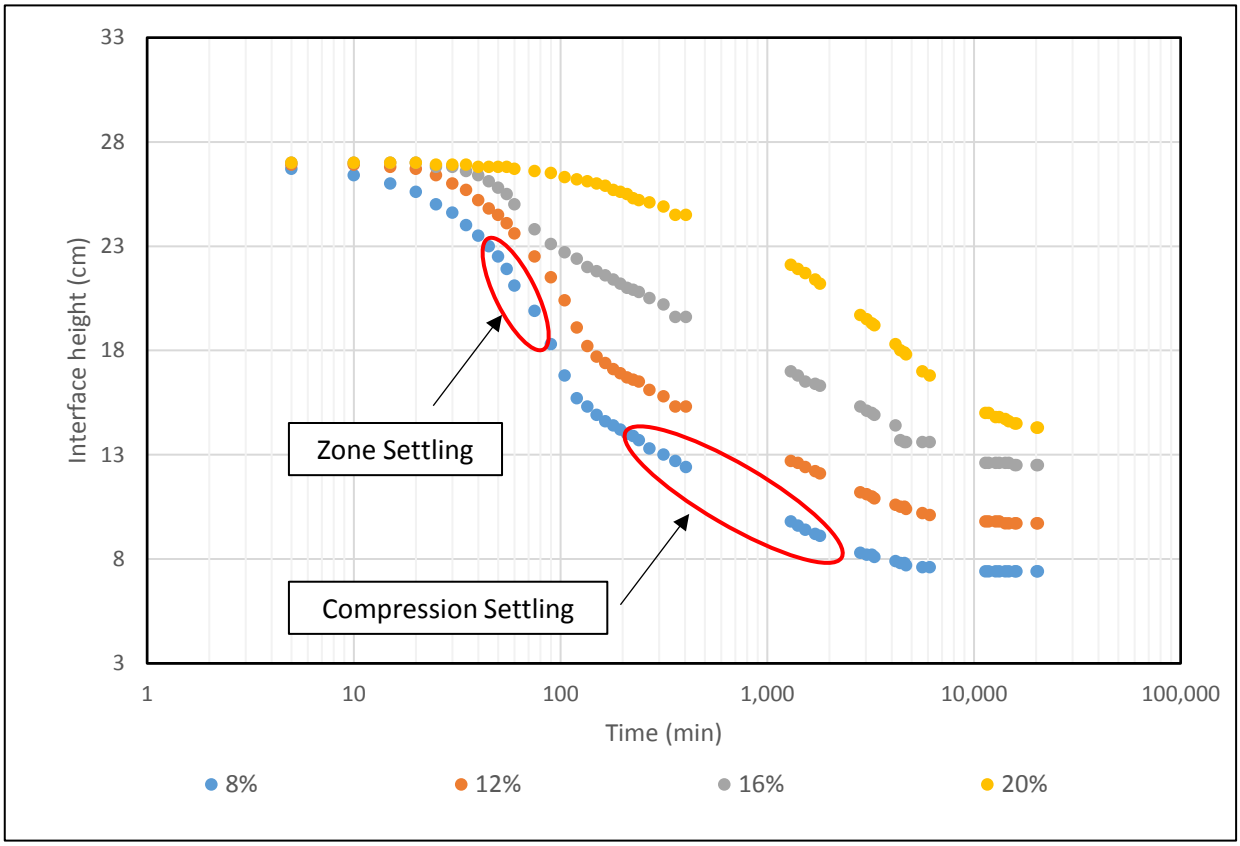

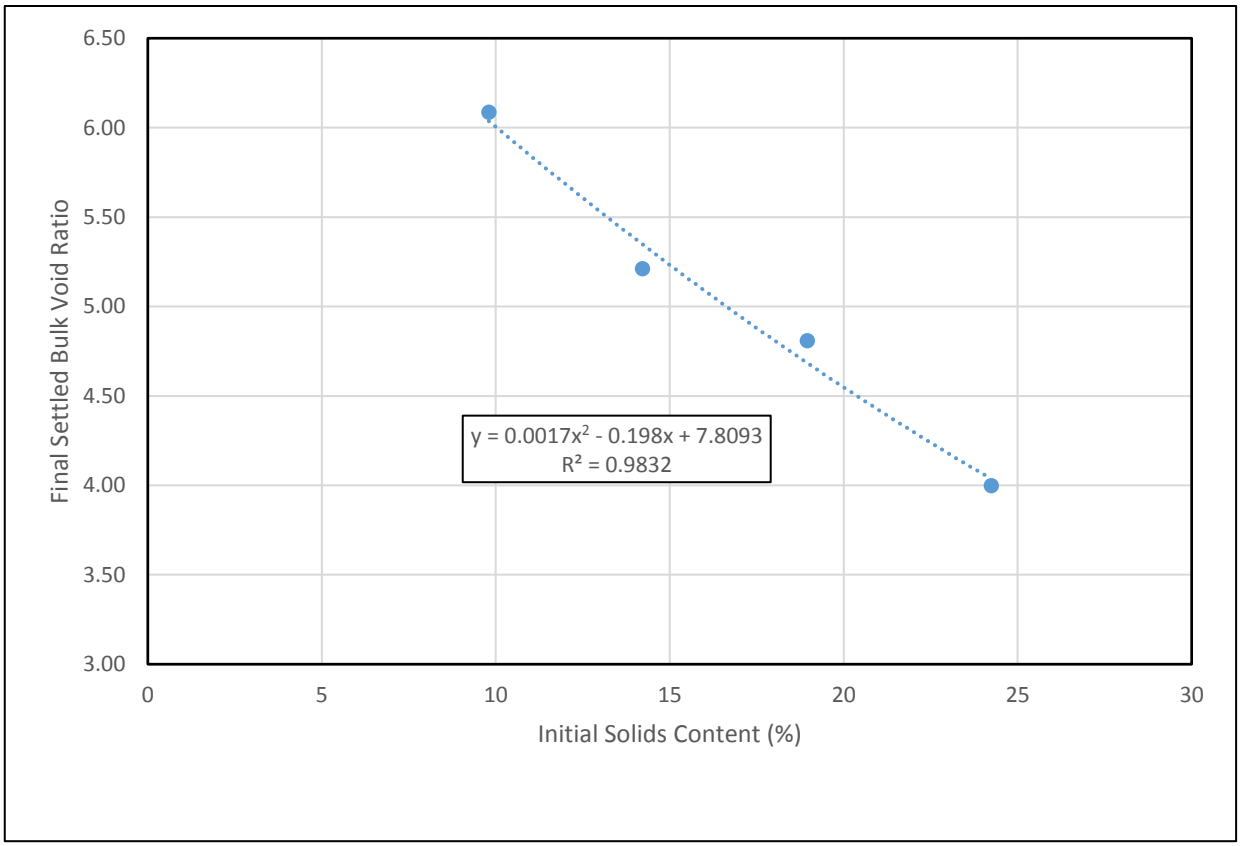

Figure No. 3

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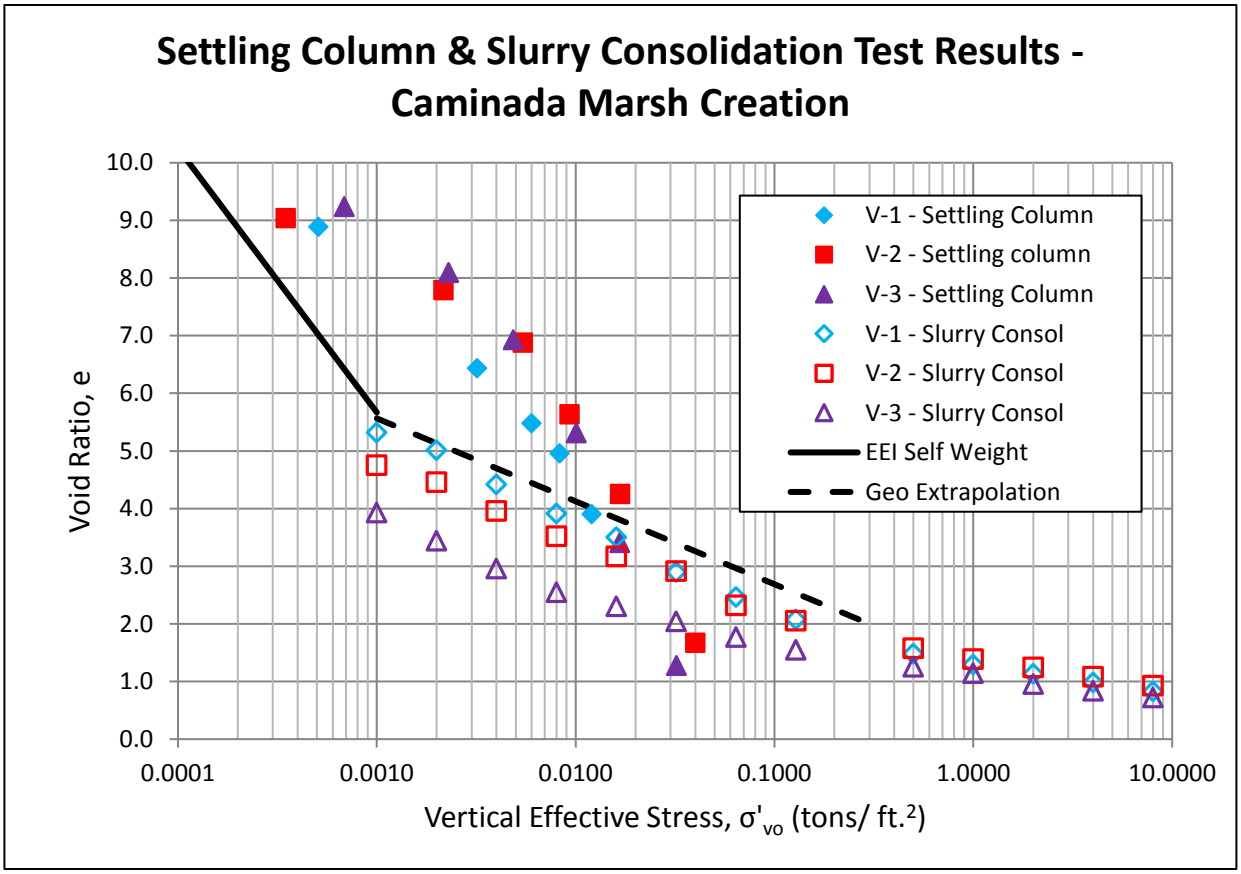
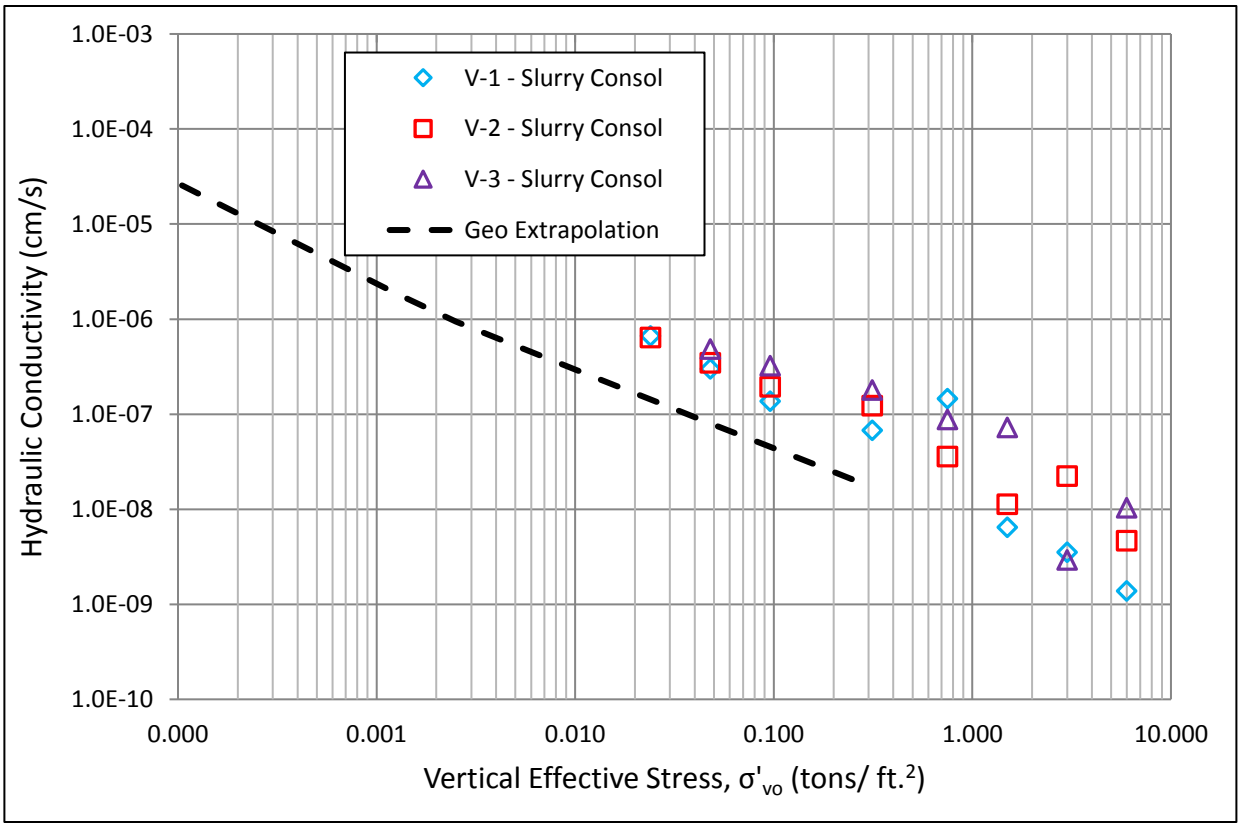
Caminada Offshore Borrow Investigation





Ardaman & Associates, Inc.

Figure No. 4
17-2810A
Caminada Offshore Borrow Investigation

Appendix A. VIBRACORE LOGS AND PROFILES

This Appendix contains the following:

A.1 Vibracore Logs

A.2 Vibracore Extrusion Pictures

A.3 Fence Diagram

Caminada HL BB MC Offshore
Lafourche and Jefferson Parishes, LA

Coastal Protection and Restoration Authority (CPRA)
150 Terrace Ave.
Baton Rouge, LA 70802

LOG OF VIBRACORE V-1

Ardaman & Associates, Inc.

Sheet 1 of 1

File: 17-2810A
Date: 7/10/17
Logged by: E. D'Antoni
Driller: OSI
Rig: 1500 Vibratory Corer

Location: Lat. 29° 6' 59.45"
Long. 90° 7' 12.77"
Surface Elevation: -30.4 (ft., NAVD 88)

FIELD DATA				LABORATORY DATA									
Ground Water Level	Depth (feet)	Samples	SAMPLE NAME	Compressive Strength (tsf)	Water Content (%)	Wet Unit Weight (pcf)	Atterberg Limits LL	Atterberg Limits PL	Atterberg Limits PI	Percent Passing #200 Sieve	Elev. (feet)	Soil Type	Description
											-30		
▽			E-1		70	107	77	23	54				Dark gray CLAY (CH)
			E-2		59	112							Light gray to gray CLAY (CH)
			E-3		54	125	69	22	47				
			D-1		66	104							
	5		D-2		60	104	74	24	50		-35		
			D-3		64	102							
			D-4		60	104	78	23	55				
			D-5		56	102							
			C-1		50	104	77	24	53				Gray SILTY SAND (SM)
	10		C-2		63	103					-40		Light gray to gray CLAY (CH) w/ silt seams and lenses
			C-3		55	104	94	18	76				
			C-4		55	106							
			C-5		40	105	69	22	47	20			Gray SILTY SAND (SM)
			B-1		32	107				8			Light gray to gray CLAY (CH)
			B-2		50	107	62	19	43				Brown SAND (SP)
	15		B-3		45	111					-45		Light gray to gray CLAY (CH) w/ silt seams
			B-4		47	109	50	17	33				
			B-5		45	103							
			A-1		49	112	60	19	41				
	20		A-2		52	109					-50		
			A-3		50	110	56	21	35				
			A-4		51	108							
			A-5		55	102	71	21	50				
													Boring completed at 23 ft.
	25										-55		
	30										-60		

Ground Water Level Data	Boring Advancement Method	Notes
▽ Borings Performed in Open Ocean	Vibrated Continuously: 0 to 23 ft.	
	Boring Abandonment Method	
	n/a	Strata Boundaries May Not Be Exact

ARD LOG01R - ELEV & DEPTH VIBRACORE 17-2810A.GPJ LOG01.GDT 11/29/17

Figure No. A.1-1

Caminada HL BB MC Offshore
Lafourche and Jefferson Parishes, LA

Coastal Protection and Restoration Authority (CPRA)
150 Terrace Ave.
Baton Rouge, LA 70802

LOG OF VIBRACORE V-2

Ardaman & Associates, Inc.

Sheet 1 of 1

File: 17-2810A
Date: 7/10/17
Logged by: E. D'Antoni
Driller: OSI
Rig: 1500 Vibratory Corer

Location: Lat. 29° 7' 37.25"
Long. 90° 5' 54.84"
Surface Elevation: -31.1 (ft., NAVD 88)

FIELD DATA				LABORATORY DATA									
Ground Water Level	Depth (feet)	Samples	SAMPLE NAME	Compressive Strength (tsf)	Water Content (%)	Wet Unit Weight (pcf)	Atterberg Limits LL	Atterberg Limits PL	Atterberg Limits PI	Percent Passing #200 Sieve	Elev. (feet)	Soil Type	Description
											-31		
▽			F-1		73	96							Dark gray and black CLAY (CH)
			F-2		35	117	70	38	32				Gray and tan CLAY (CH)
			F-3		56	106							Brownish gray CLAYEY SILT (ML)
			F-4		64	103	71	24	47				Light gray and gray CLAY (CH) w/ trace silt seams
	5		F-5		54	97					-36		
			E-1		56	110	73	24	49				
			E-2		41	113							Gray SILTY SAND (SM) w/ clay
			E-3		35	109	52	17	35	76			Gray SANDY CLAY (CL) w/ silt
			E-4		63	104							Light gray and gray CLAY (CH)
	10		E-5		57	104	68	23	45		-41		w/ silty sand seams
			D-1		52	110							
			D-2		58	106	90	26	64				
			D-3		60	106							w/ silty seams
			D-4		50	108	56	20	36				
	15		D-5		53	108					-46		
			C-1		56	108	86	26	60				
			C-2		44	112							
			C-3		48	109	58	23	35				
			C-4		46	111							w/ silty sand seams
	20		C-5		45	113	50	18	32		-51		
			B-1		46	113							
			B-2		40	114	53	19	34				
			B-3		43	113							
			B-4		46	111	62	19	43				
	25		B-5		56	102					-56		
			A-1		56	110	68	23	45				
			A-2		40	115							
			A-3		49	110	74	24	50				
			A-4		51	108							
	30		A-5		47	105	58	19	39		-61		Boring completed at 30 ft.

Ground Water Level Data	Boring Advancement Method	Notes
▽ Borings Performed in Open Ocean	Vibrated Continuously: 0 to 30 ft.	
	Boring Abandonment Method	
	n/a	Strata Boundaries May Not Be Exact

ARD LOG01R - ELEV & DEPTH VIBRACORE 17-2810A.GPJ LOG01.GDT 11/29/17

Figure No. A.1-2

Caminada HL BB MC Offshore
Lafourche and Jefferson Parishes, LA

Coastal Protection and Restoration Authority (CPRA)
150 Terrace Ave.
Baton Rouge, LA 70802

LOG OF VIBRACORE V-3

Ardaman & Associates, Inc.

Sheet 1 of 1

File: 17-2810A
Date: 7/10/17
Logged by: E. D'Antoni
Driller: OSI
Rig: 1500 Vibratory Corer

Location: Lat. 29° 8' 9.09"
Long. 90° 5' 23.3"
Surface Elevation: -29.5 (ft., NAVD 88)

FIELD DATA				LABORATORY DATA									
Ground Water Level	Depth (feet)	Samples	SAMPLE NAME	Compressive Strength (tsf)	Water Content (%)	Wet Unit Weight (pcf)	Atterberg Limits LL	Atterberg Limits PL	Atterberg Limits PI	Percent Passing #200 Sieve	Elev. (feet)	Soil Type	Description
			E-1		44	94	76	23	53		-30		Black CLAY & SAND (CH-SC)
			E-2		38	114				12			Gray SILTY SAND (SM) w/ shells
			E-3		63	105	68	22	46				Gray CLAY (CH) w/ silty clay layers
			E-4		59	105							
			E-5		50	106	61	21	40				
	5		D-1		40	116					-35		Brownish gray SILTY CLAY (CL)
			D-2		34	115	36	17	19				
			D-3		40	114							
			D-4		46	112	70	24	46	53			Gray CLAY (CH) w/ sandy silt seams and pockets
			D-5		48	109							
	10		C-1		51	110	68	24	44		-40		
			C-2		56	110							
			C-3		56	106	83	25	58				
			C-4		55	108							Grayish brown SANDY SILT (ML)
			C-5		48	107	67	18	49				Gray CLAY (CH) w/ silt layers
	15		B-1		40	118				14	-45		Gray SILTY SAND (SM)
			B-2		59	106	82	24	58				Gray CLAY (CH) w/ silt seams
			B-3		60	104							
			B-4		48	109	76	25	51				
			B-5		25	115				12			Light Gray SILTY SAND (SM)
	20		A-1		21	130					-50		
			A-2		21	130				11			
			A-3		35	116	60	21	39				Gray SANDY CLAY (CL)
			A-4		28	123				61			Light Gray SANDY SILT (MLS)
			A-5		38	107	54	21	33				Gray SANDY CLAY (CL) w/ sand pockets
	25										-55		Gray CLAY (CH)
													Boring completed at 24.5 ft.
	30										-60		

Ground Water Level Data	Boring Advancement Method	Notes
Borings Performed in Open Ocean	Vibrated Continuously: 0 to 24.5 ft.	
	Boring Abandonment Method	
	n/a	Strata Boundaries May Not Be Exact

ARD LOG01R - ELEV & DEPTH VIBRACORE 17-2810A.GPJ LOG01.GDT 11/29/17

Figure No. A.1-3

Figure No. A.2-1

Figure No. A.2-2

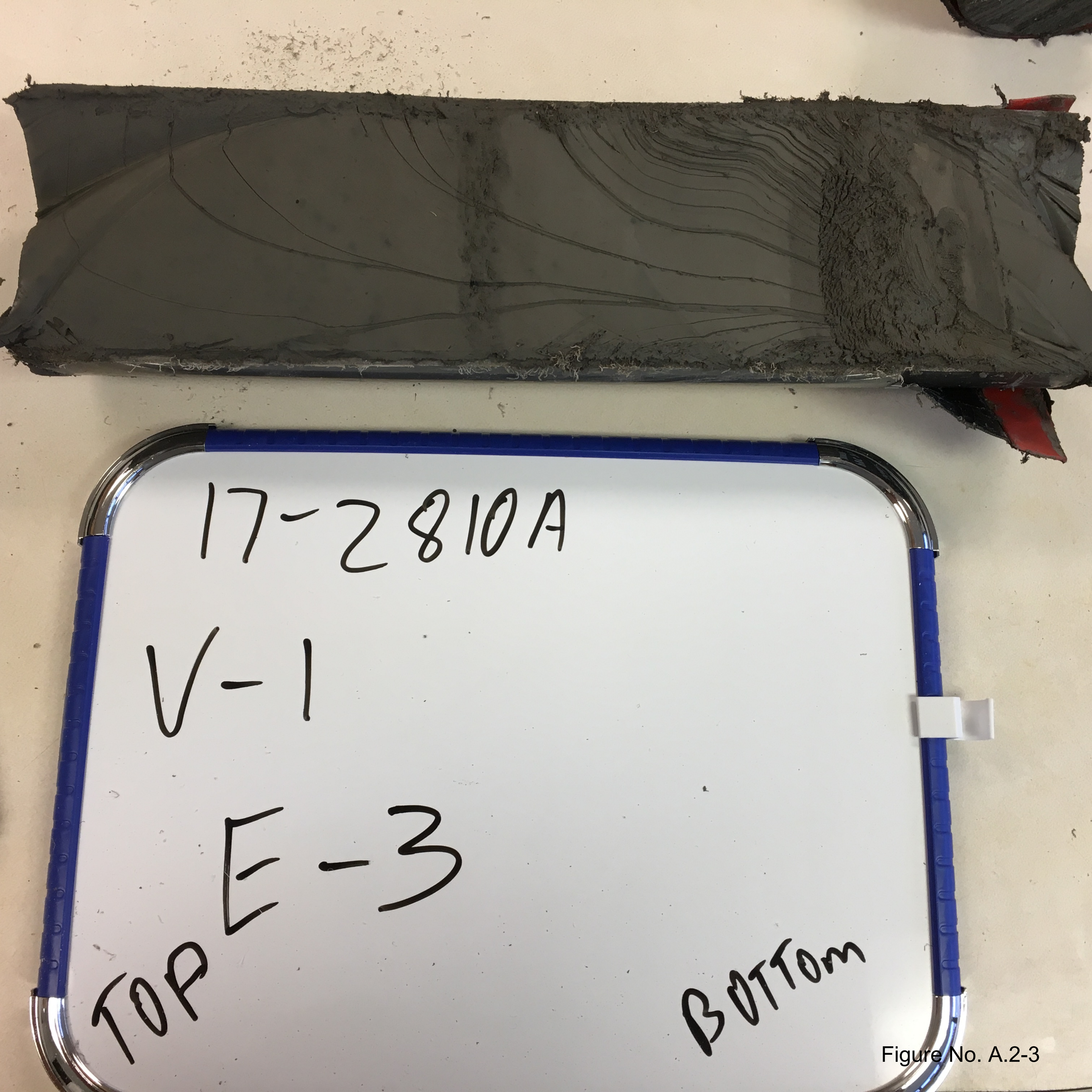
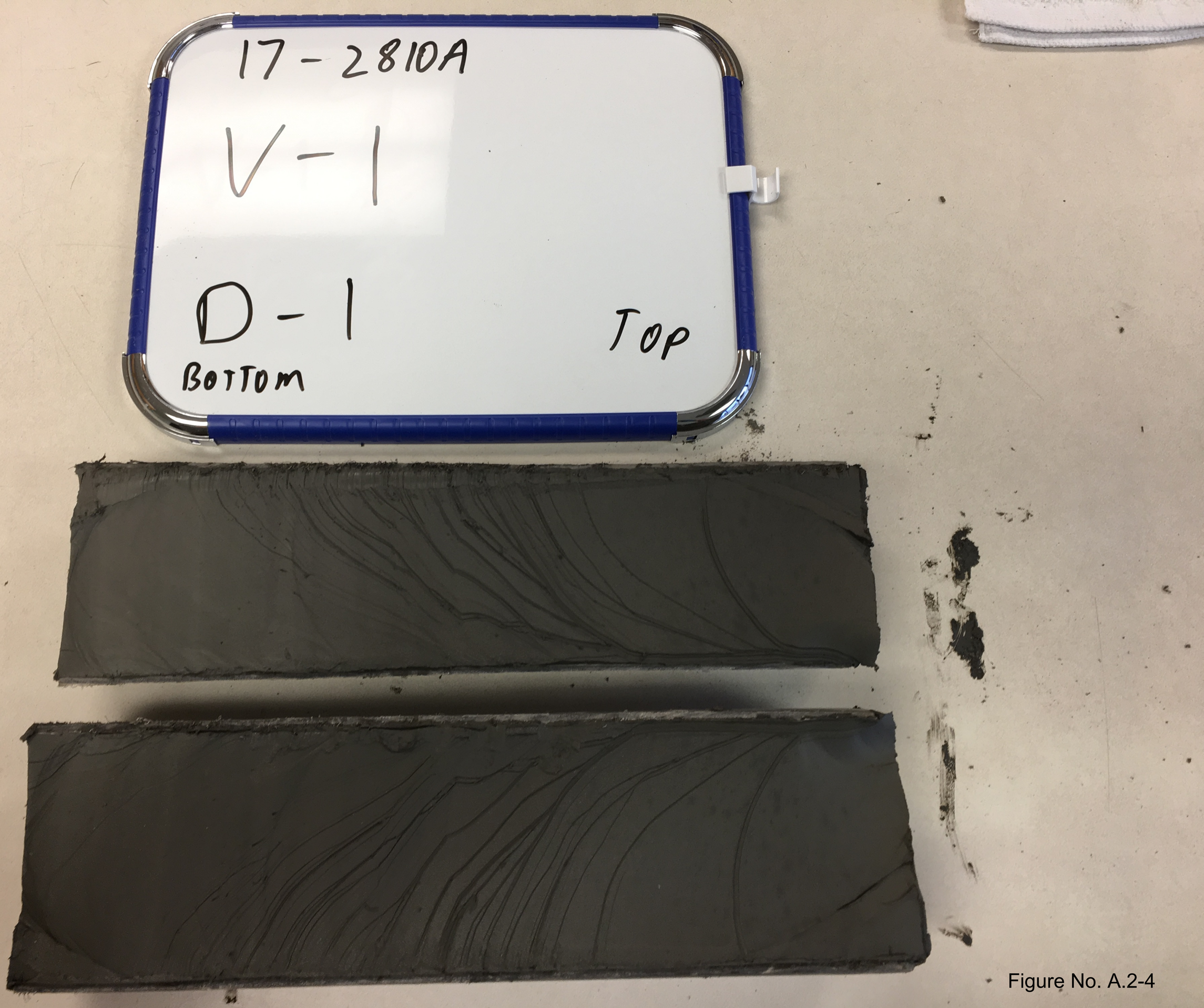


Figure No. A.2-3



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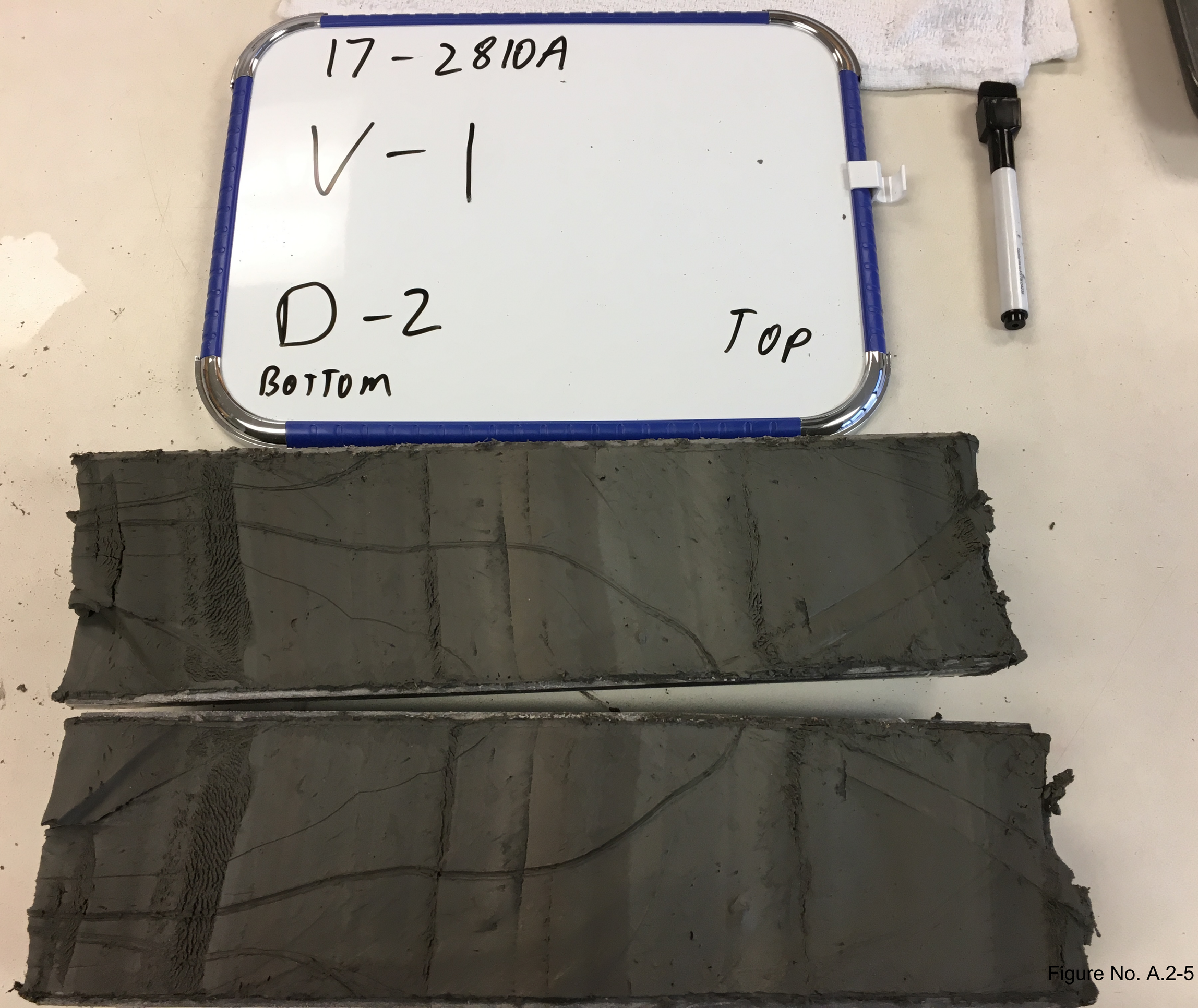

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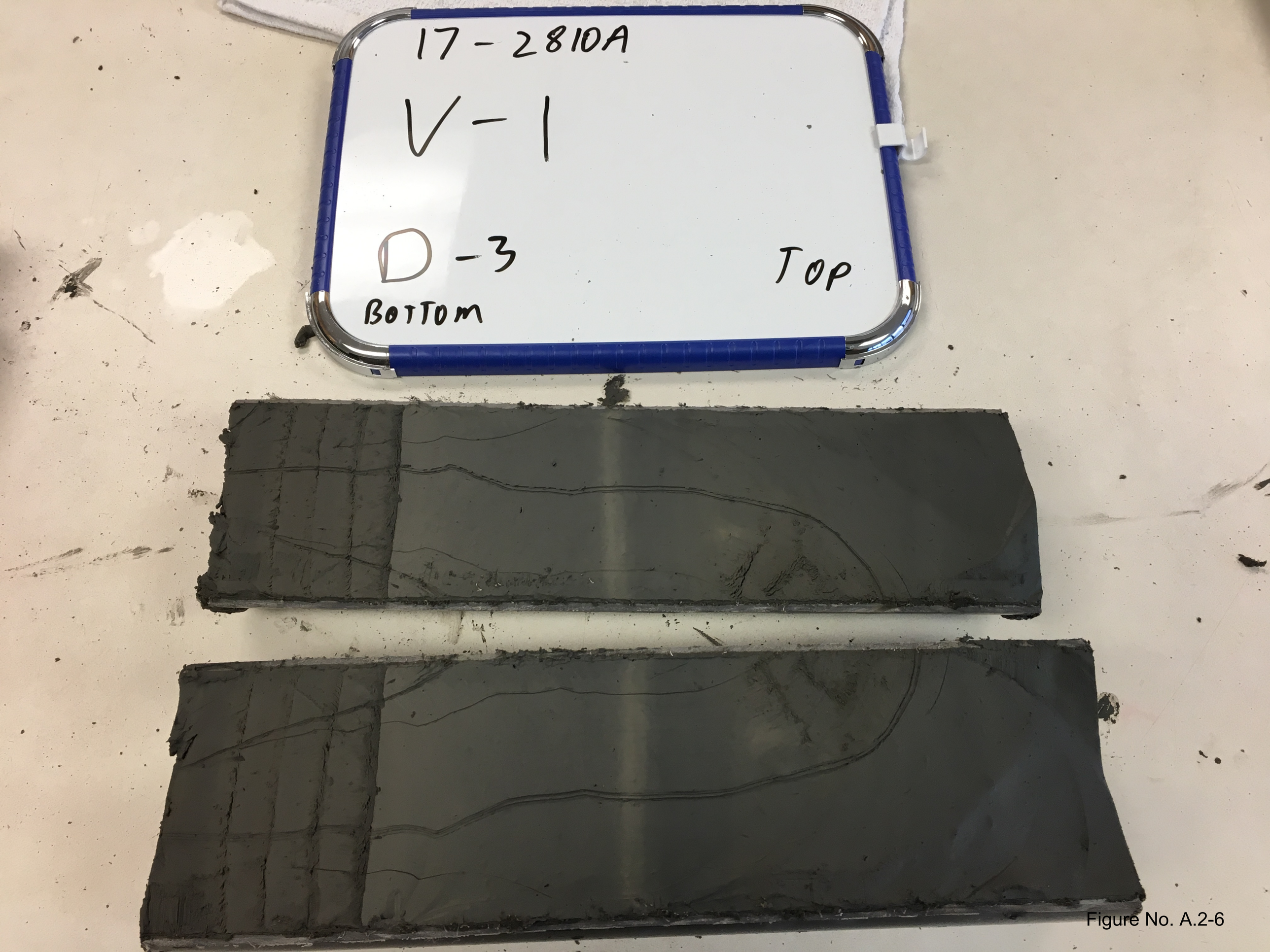

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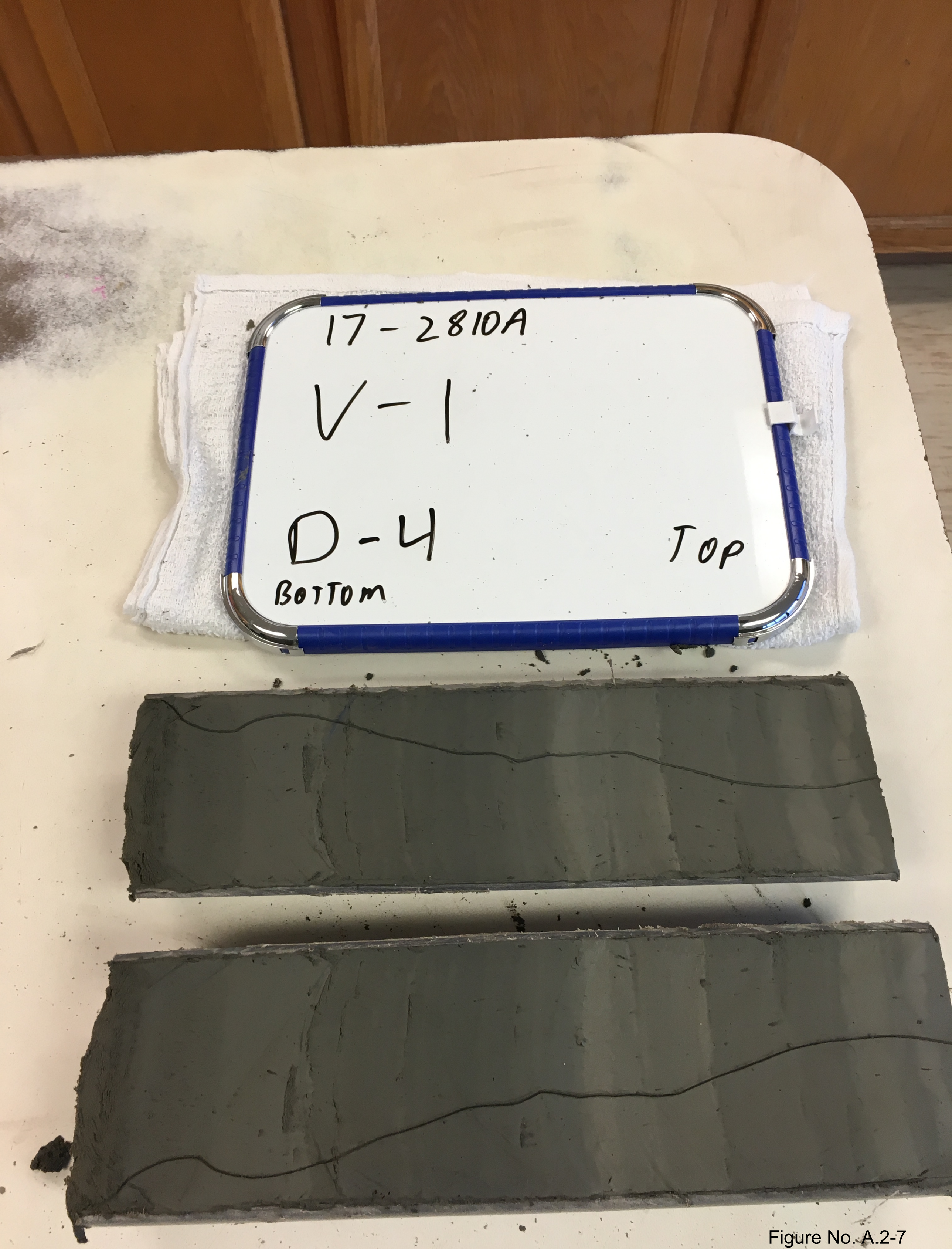

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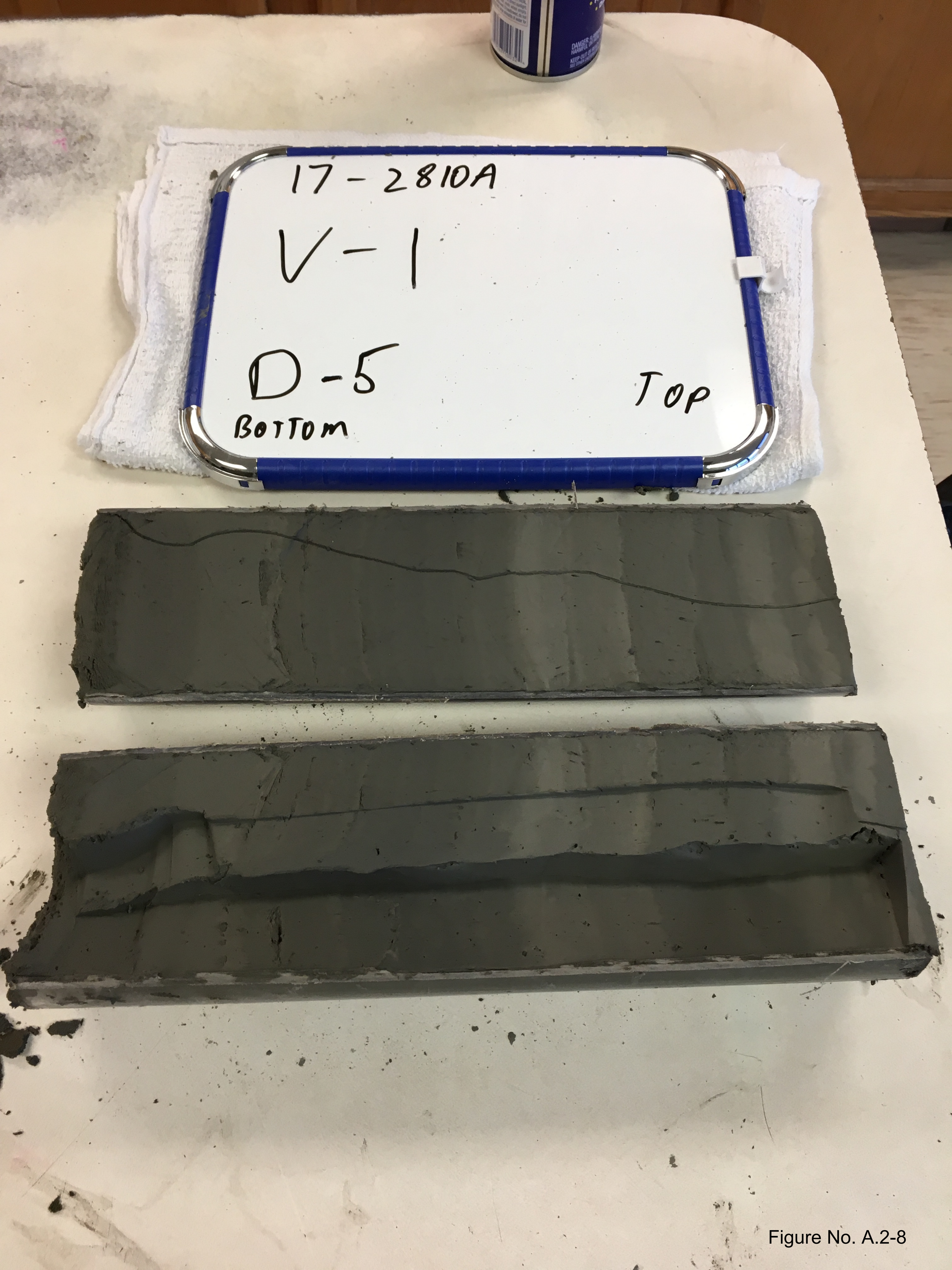

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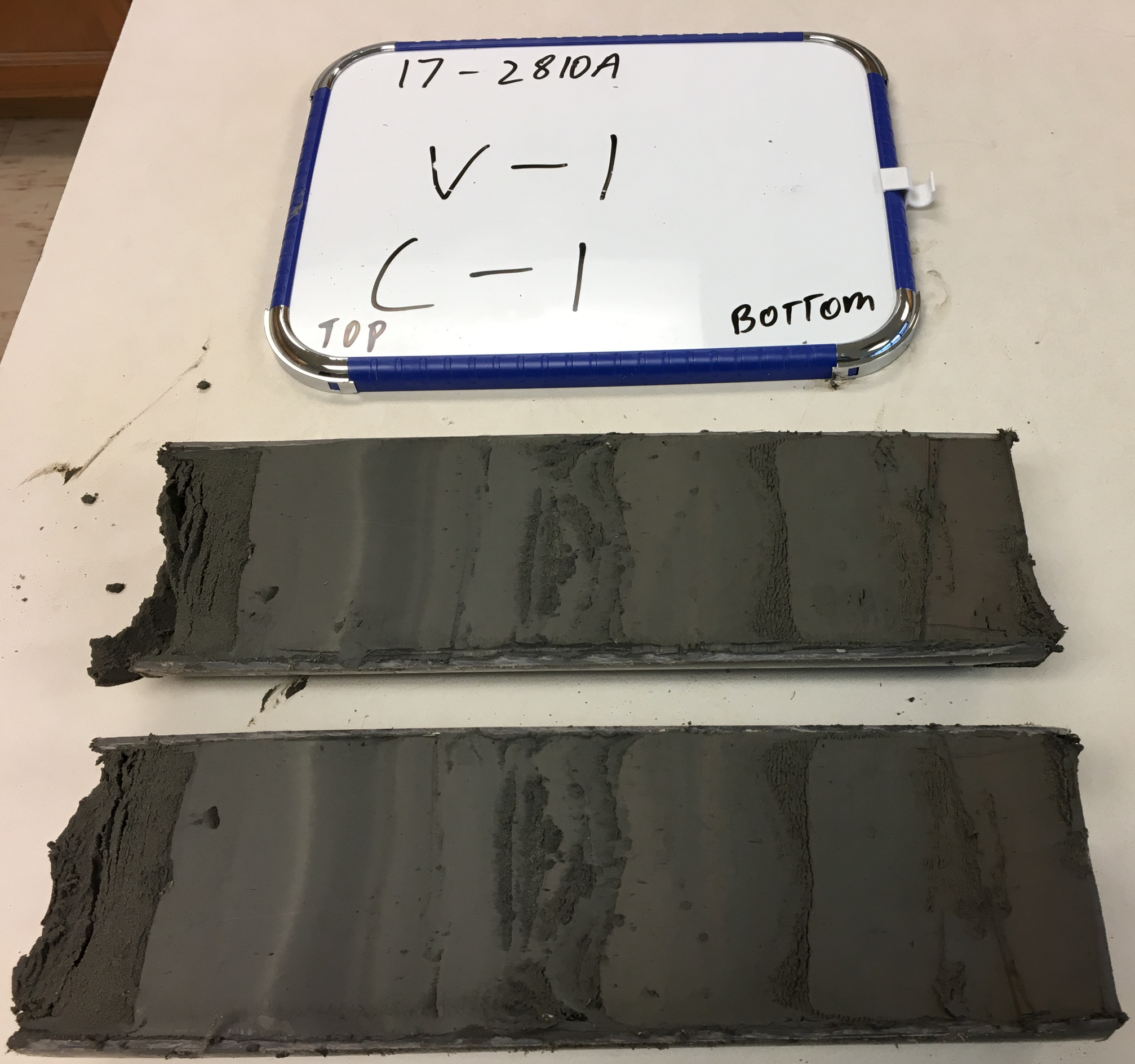

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Figure No. A.2-10

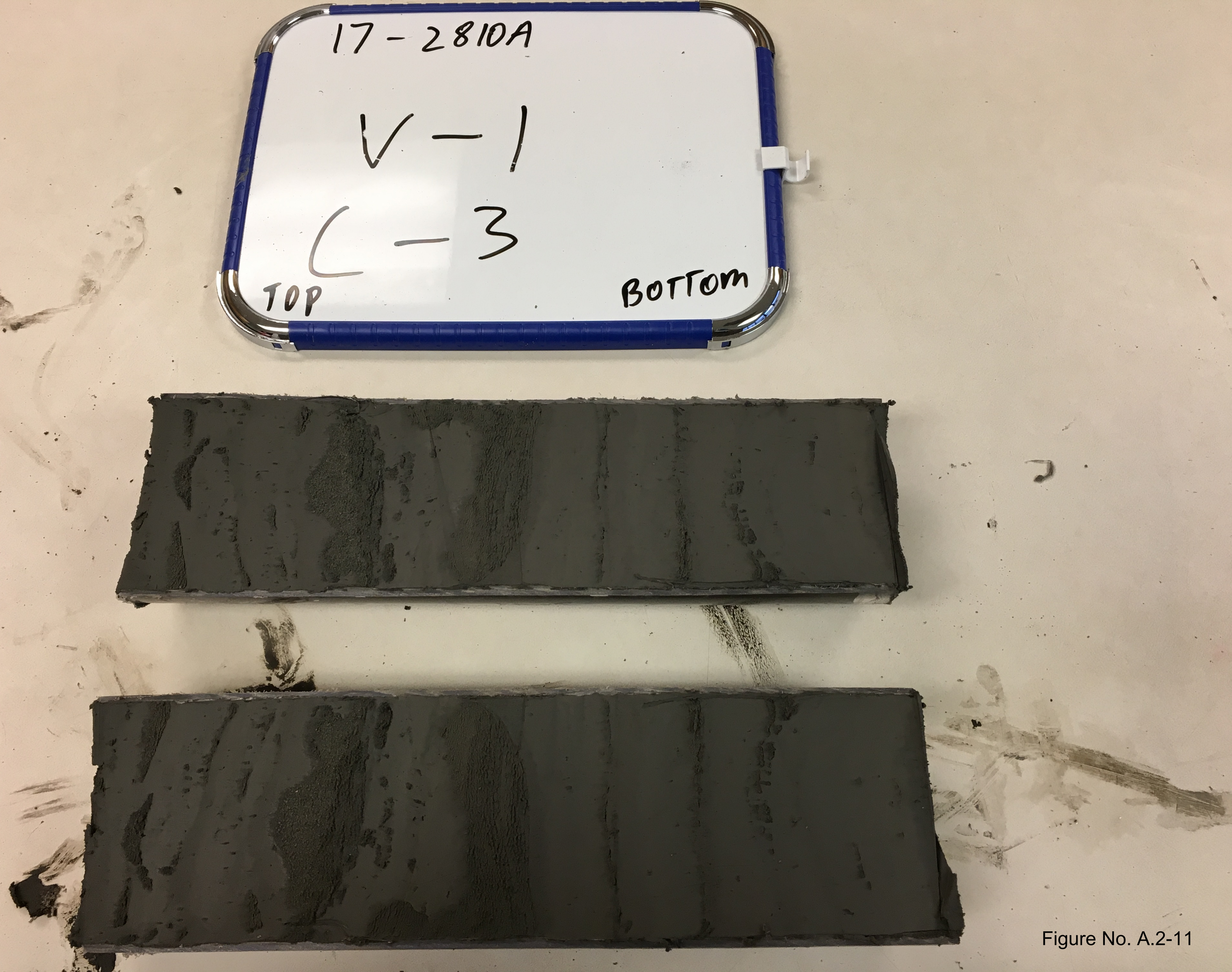

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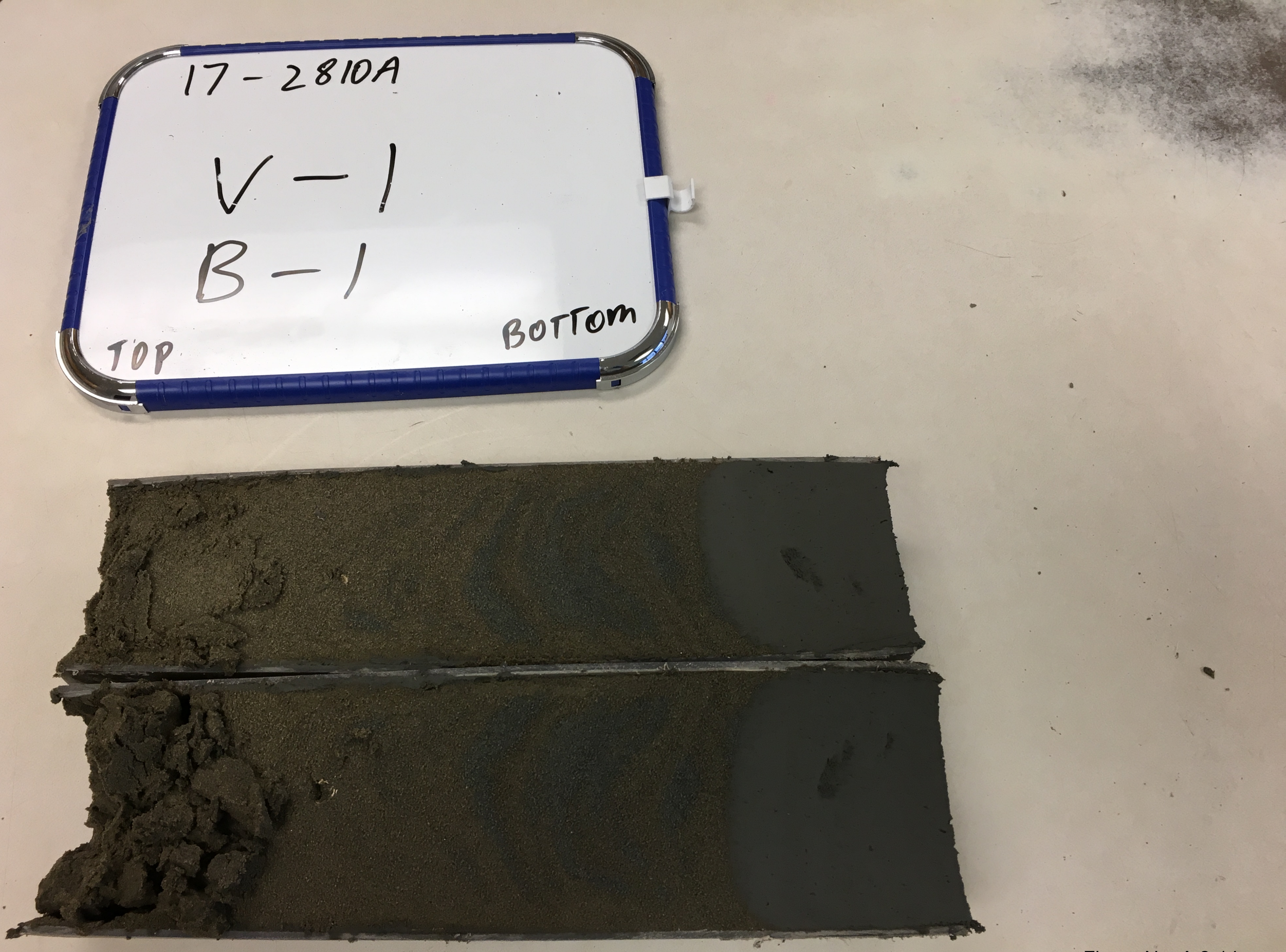
Figure No. A.2-13



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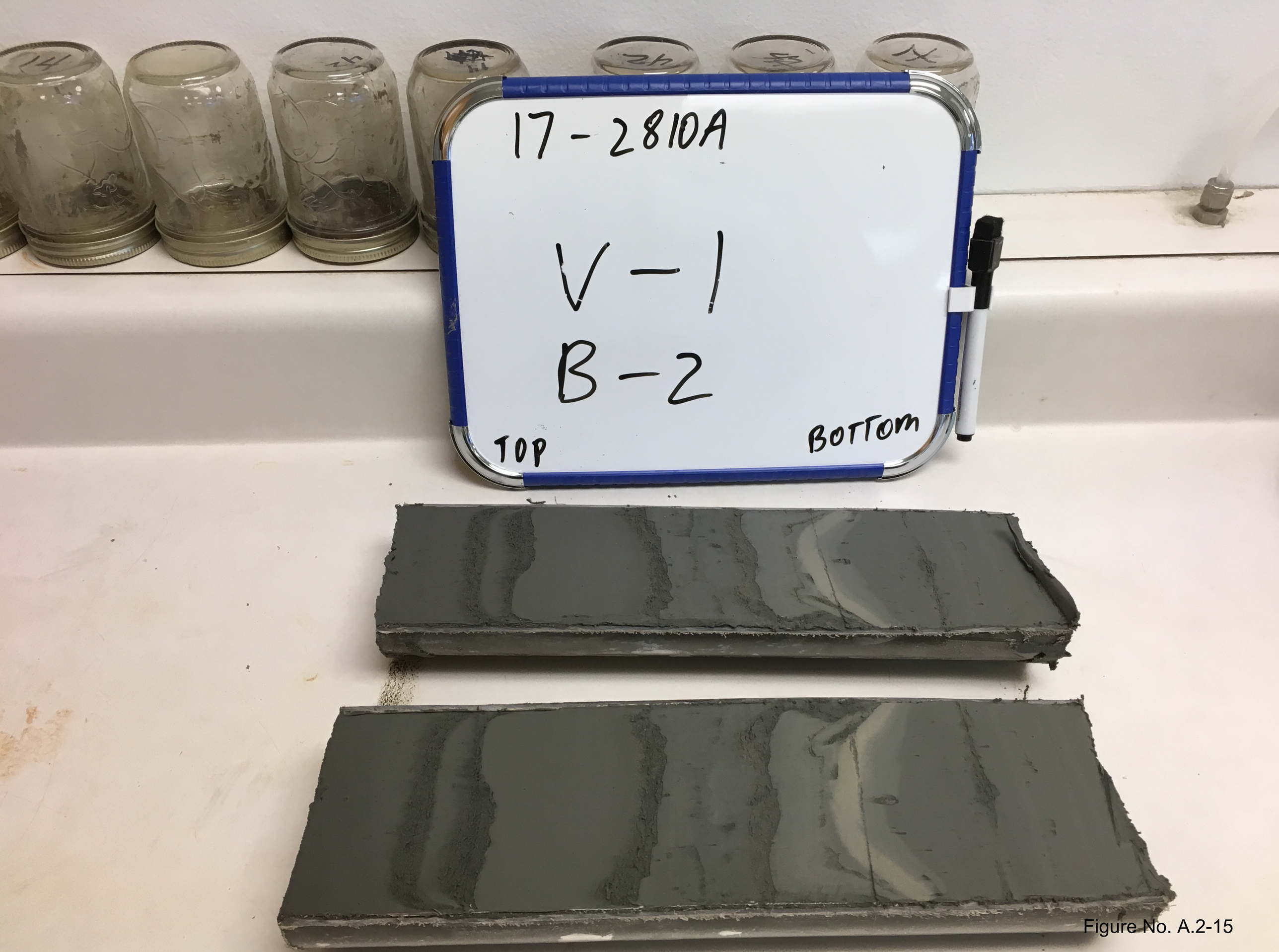

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Figure No. A.2-16

Figure No. A.2-17

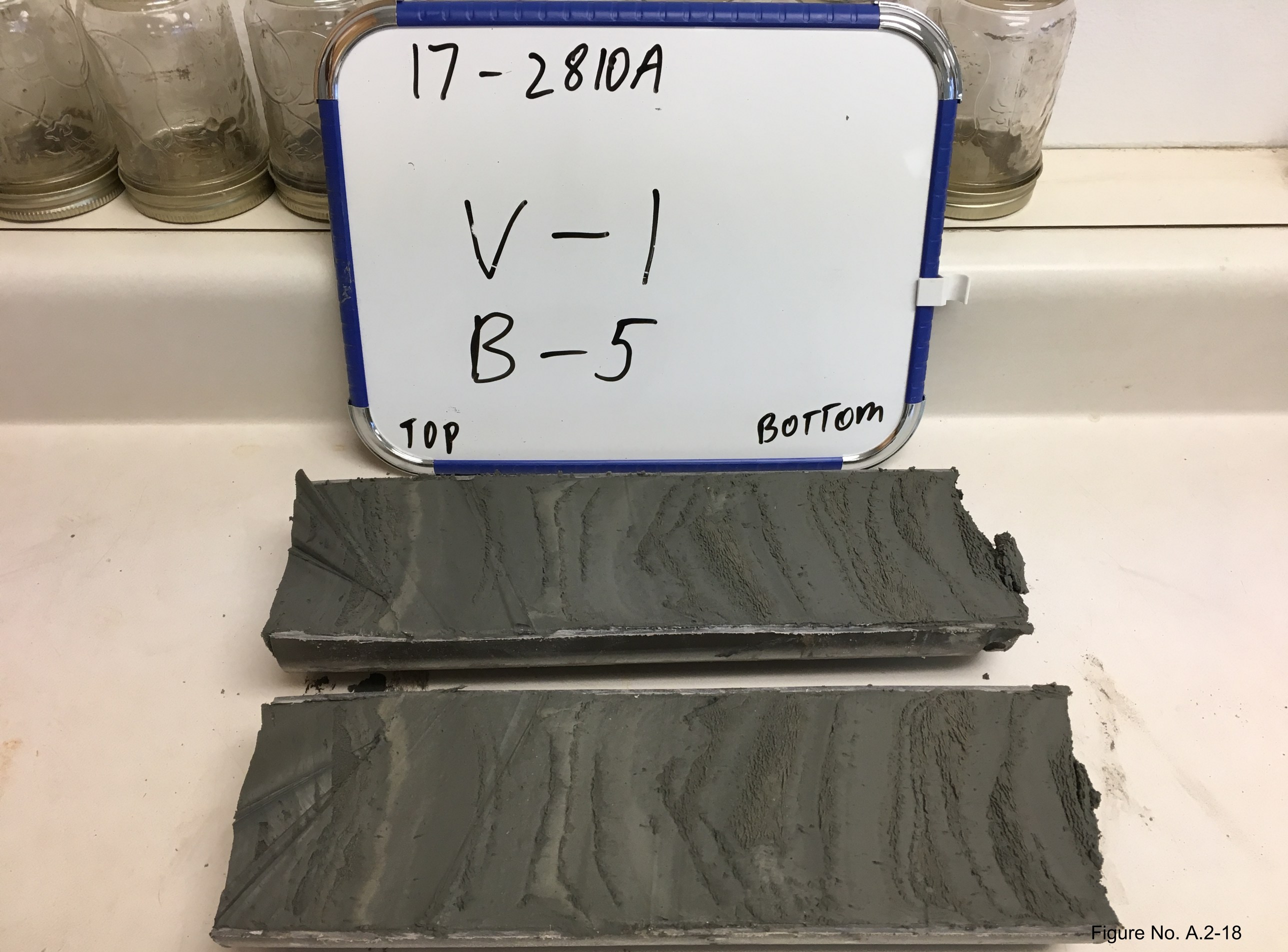

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Figure No. A.2-19

Figure No. A.2-20

Figure No. A.2-21

Figure No. A.2-22

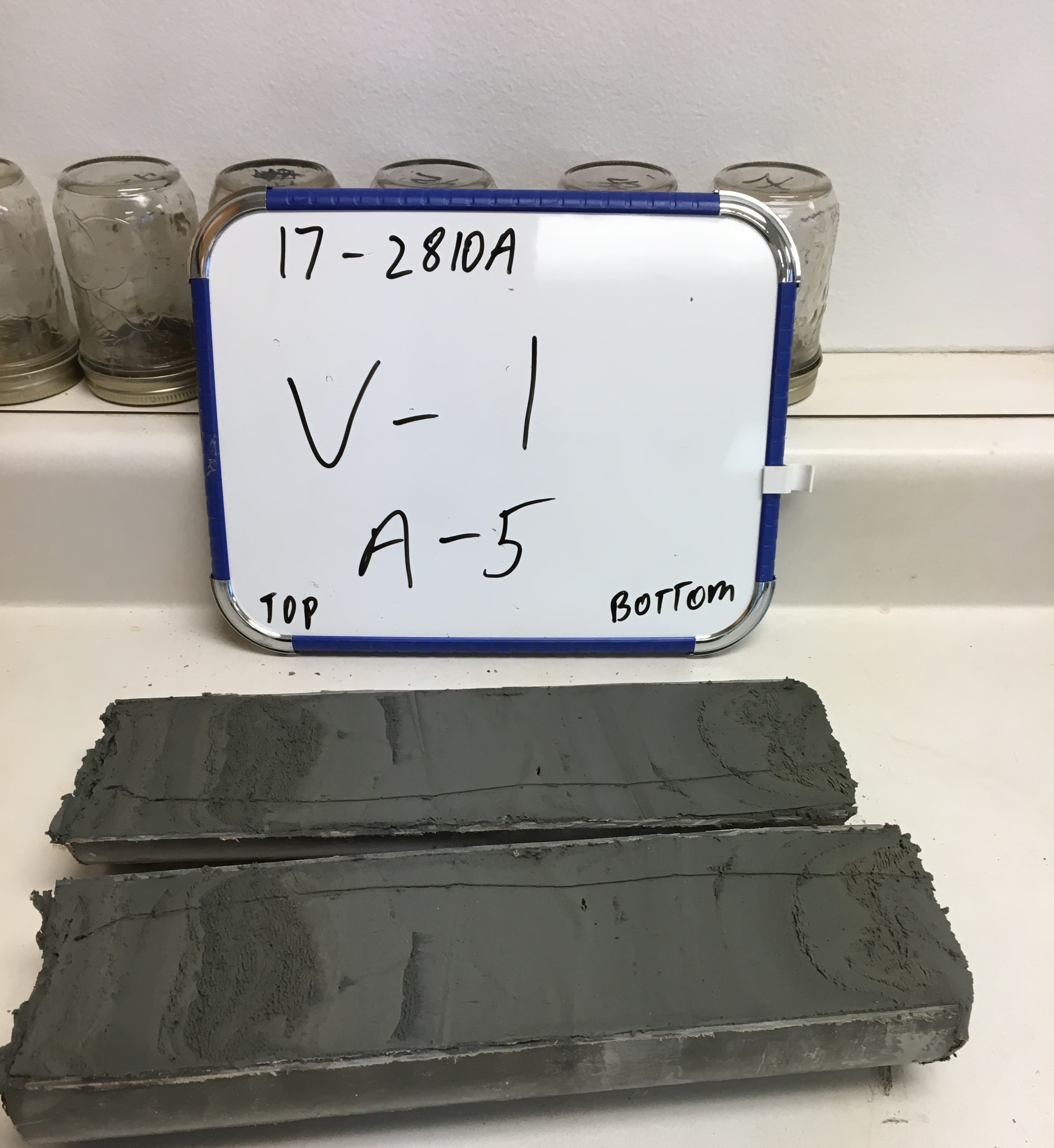


Figure No. A.2-23

Figure No. A.2-24

Figure No. A.2-25

Figure No. A.2-26

Figure No. A.2-27

Figure No. A.2-28

Figure No. A.2-29

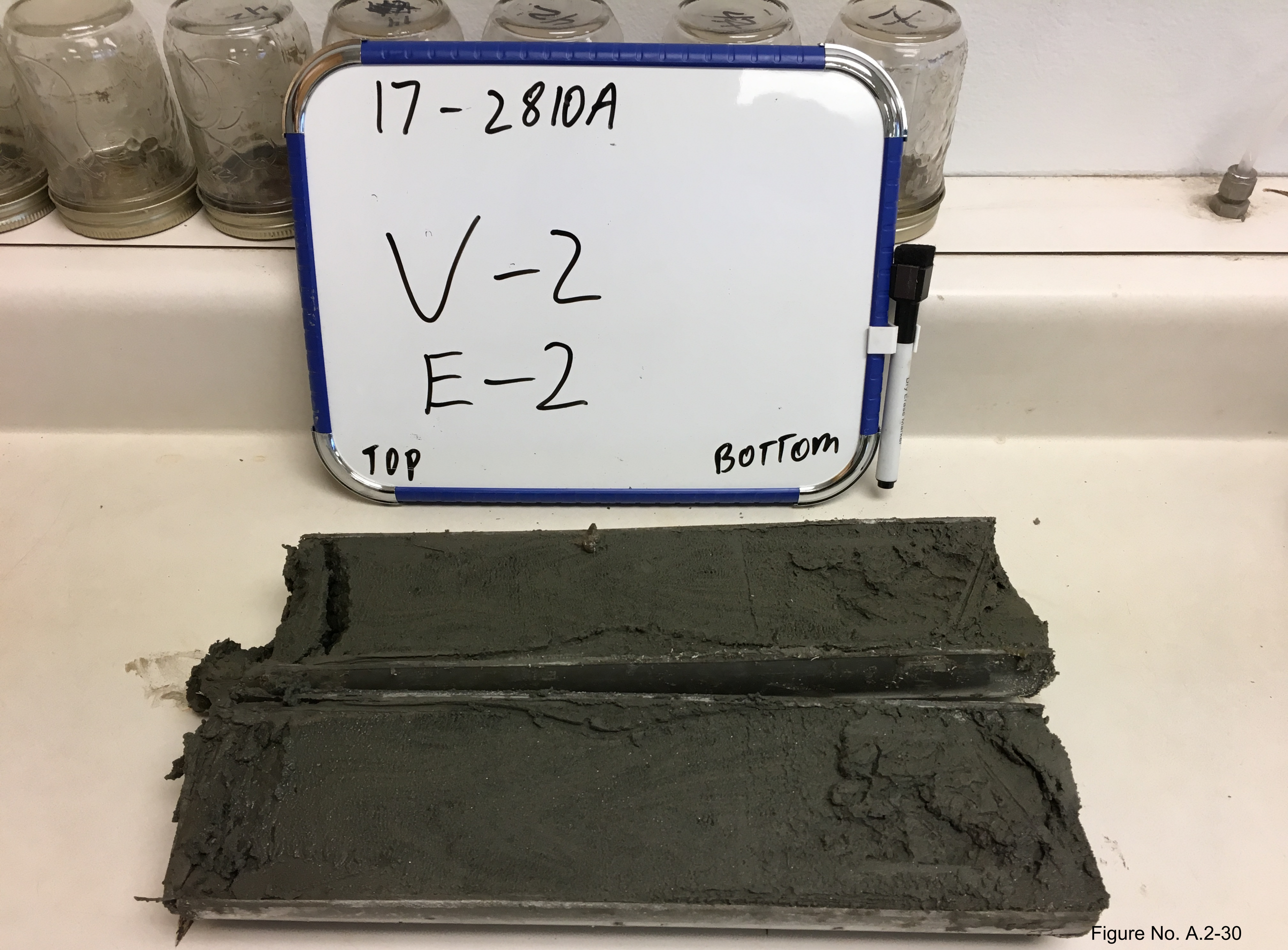
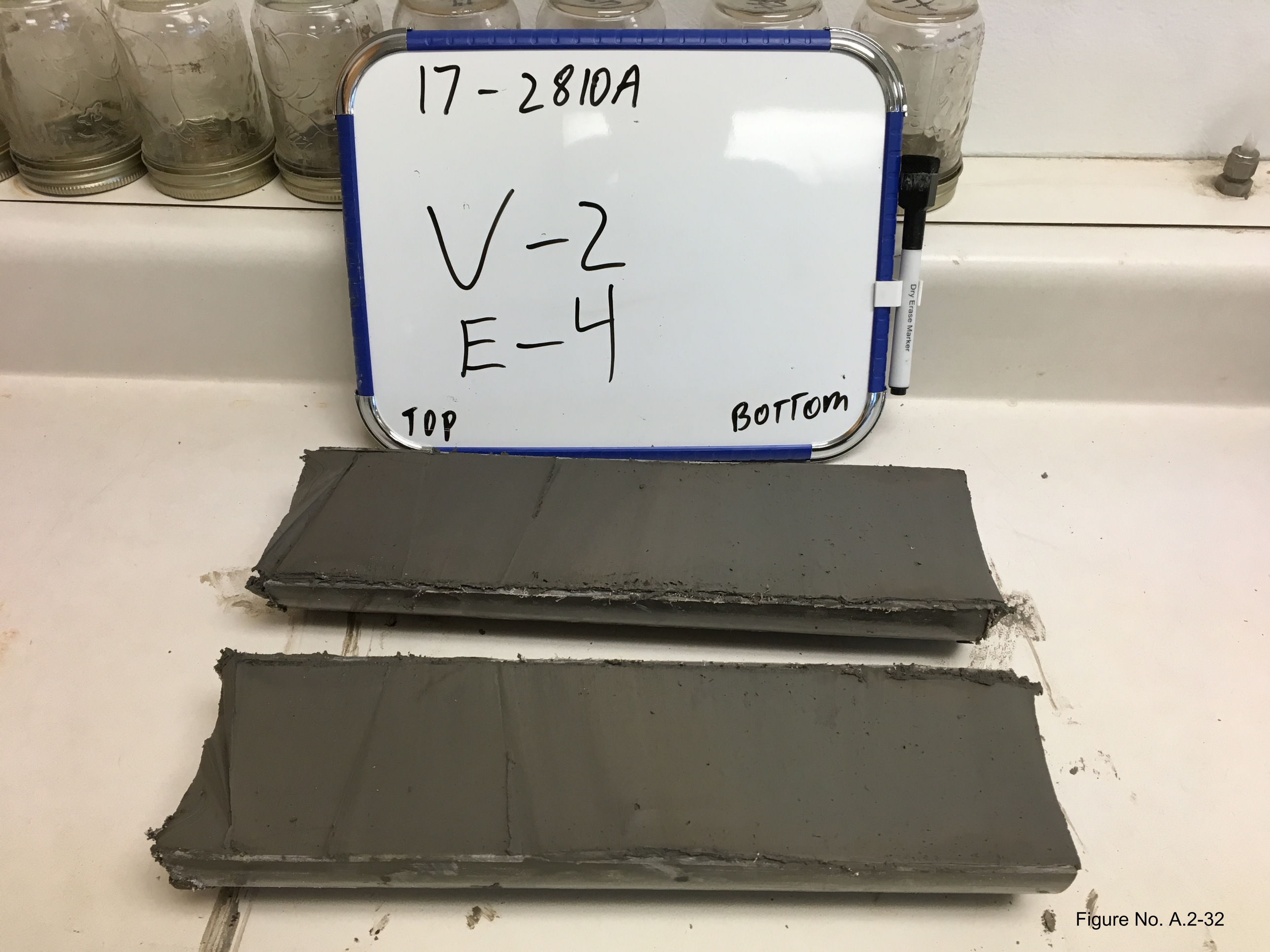


Figure No. A.2-30

Figure No. A.2-31



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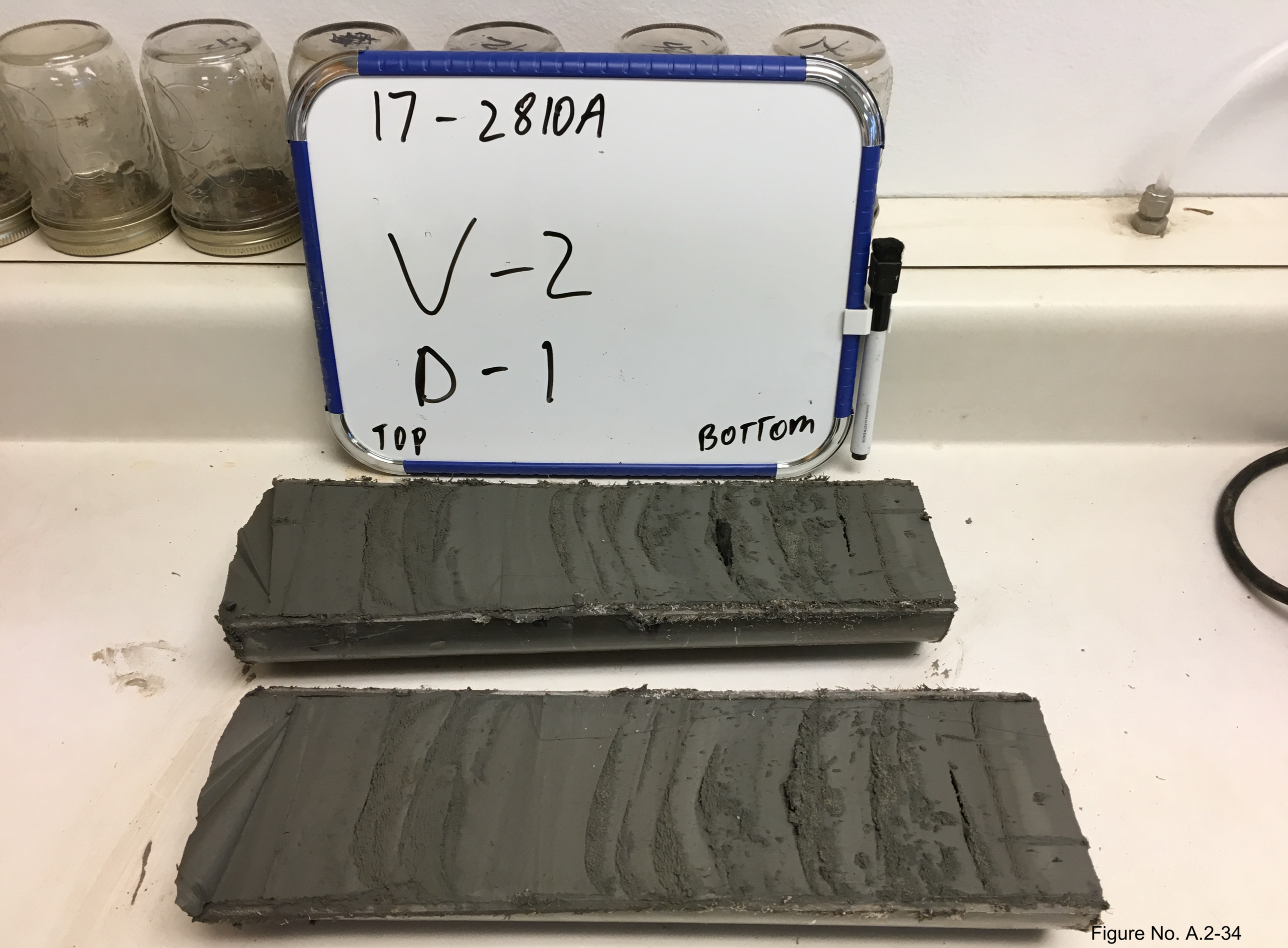

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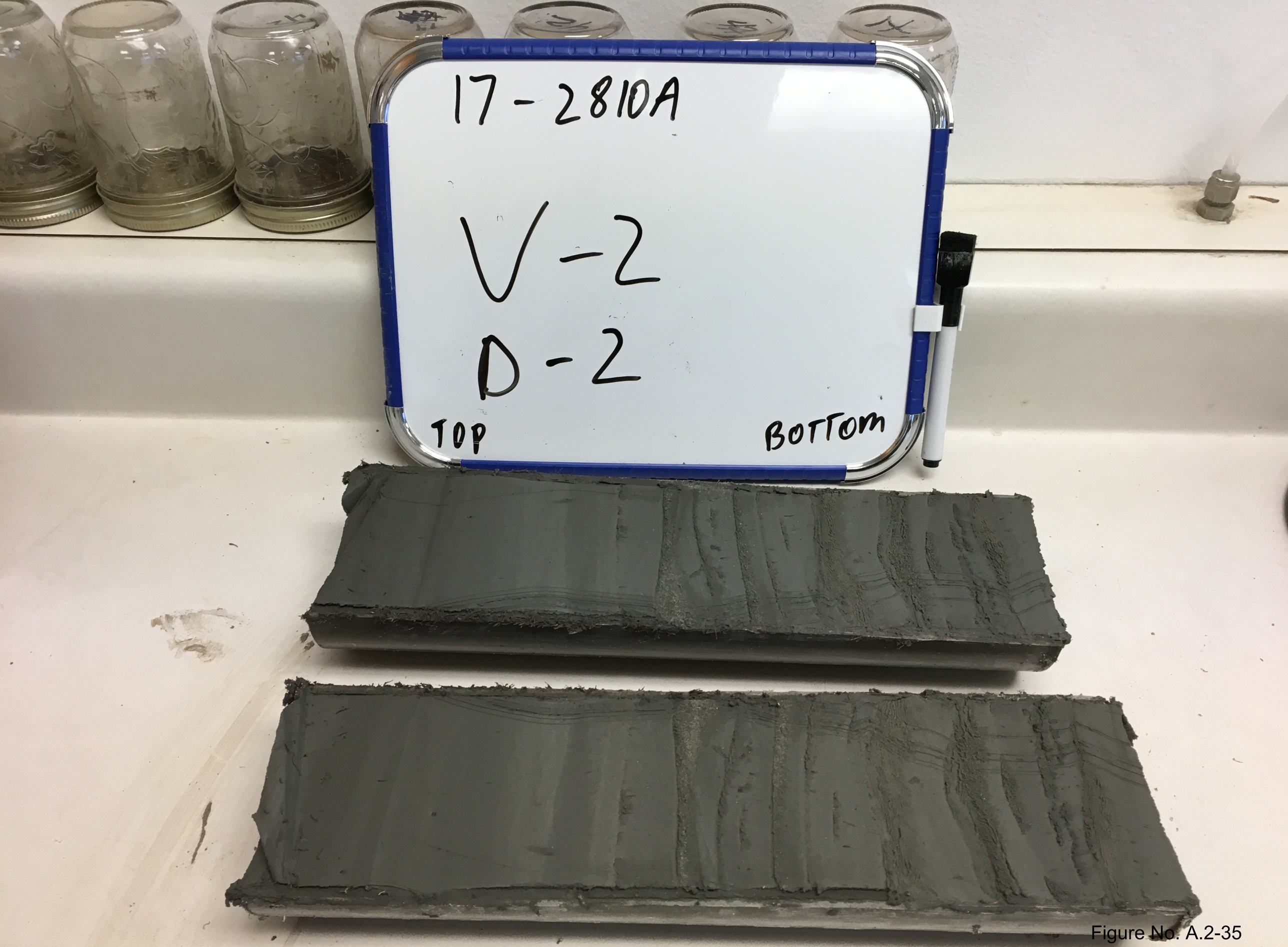

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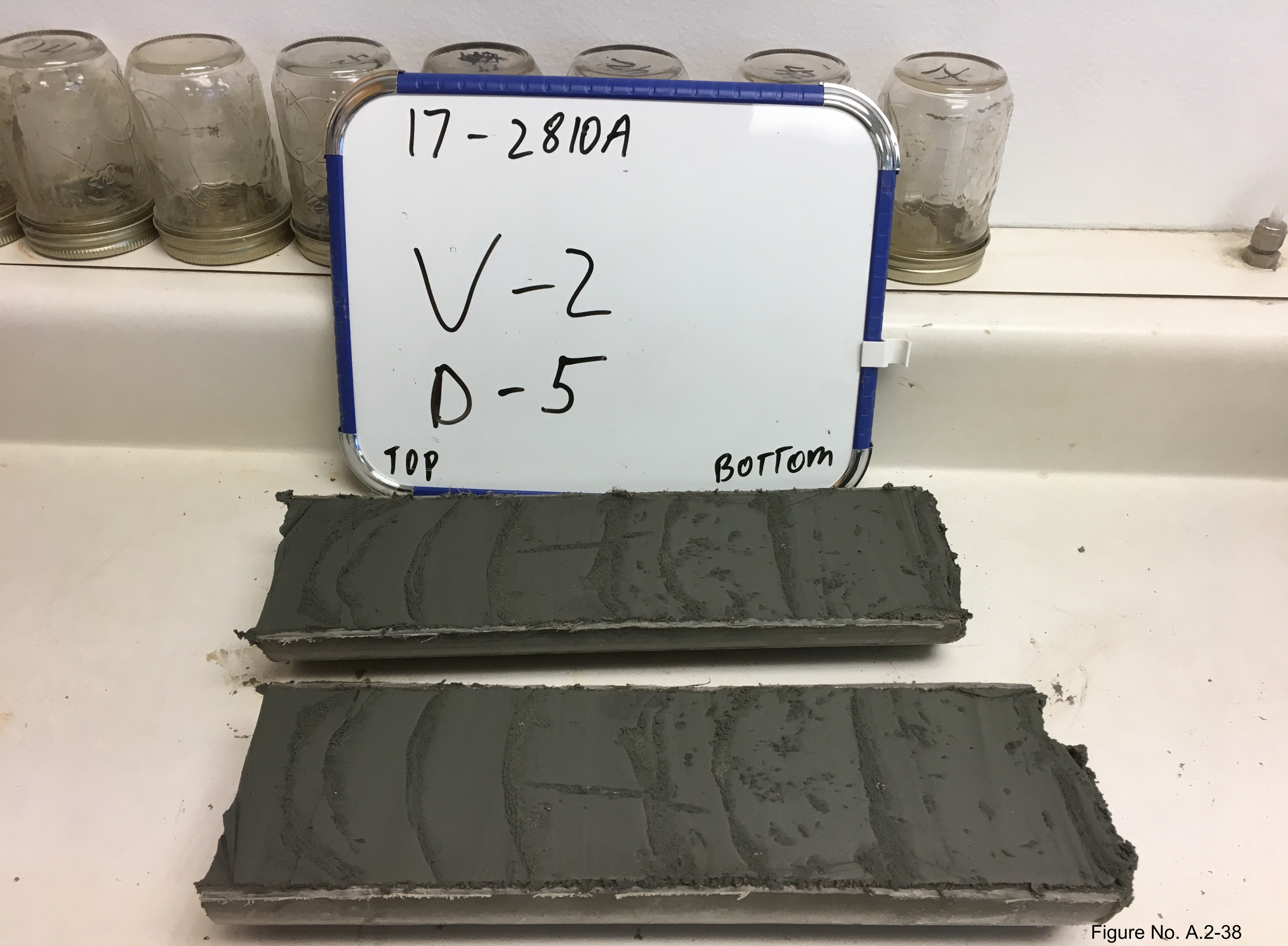
Figure No. A.2-36

Figure No. A.2-37



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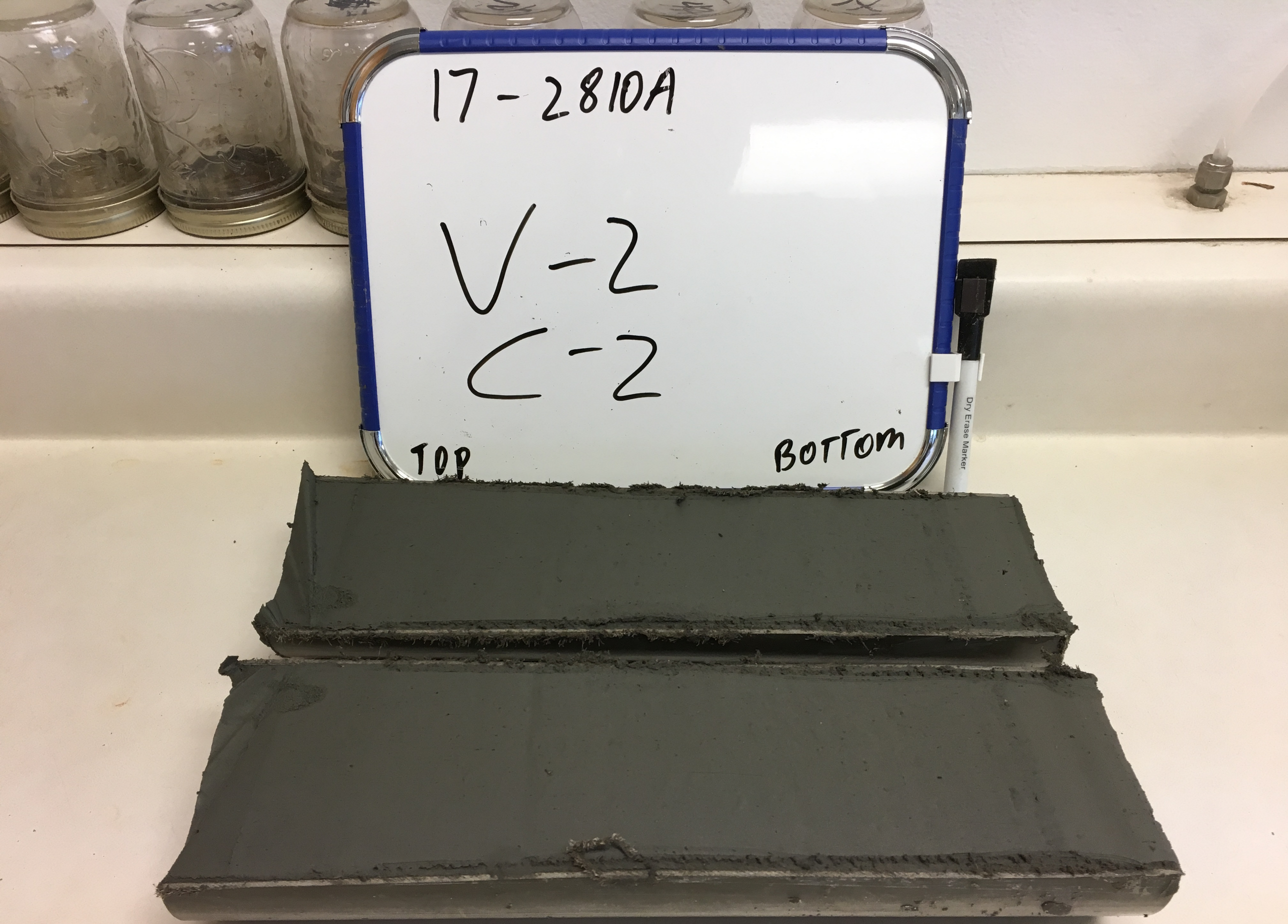

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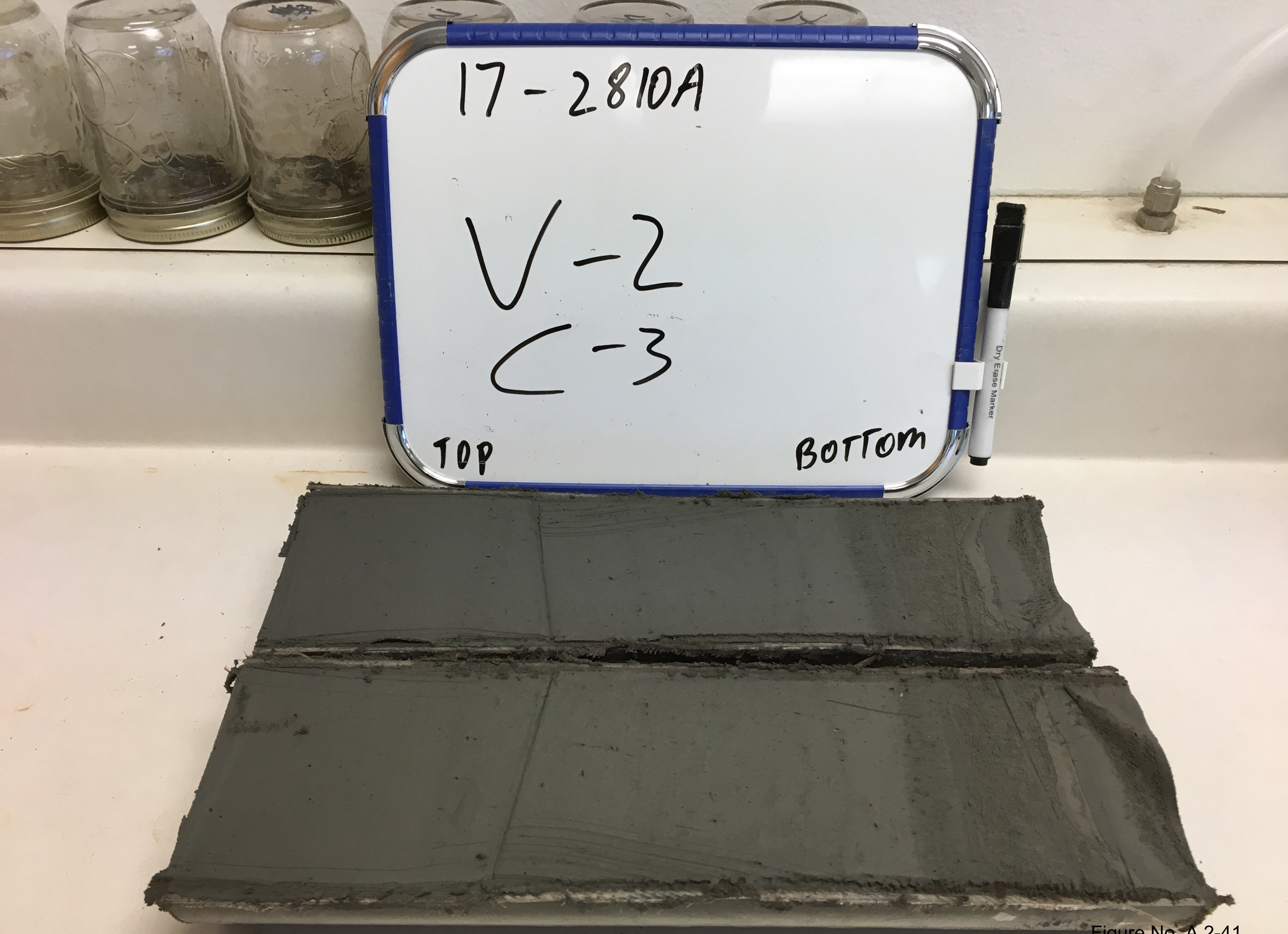

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Figure No. A.2-42

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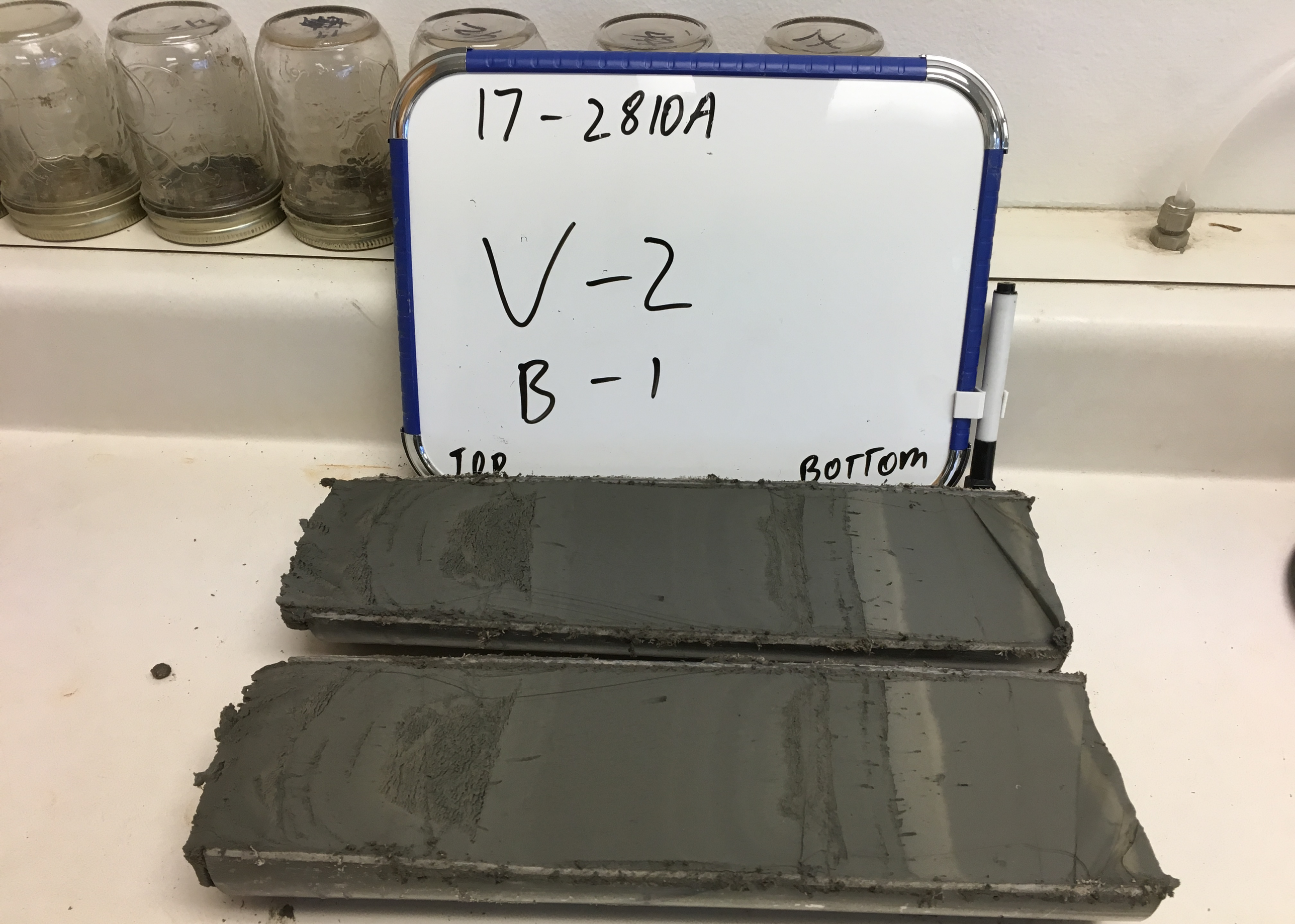

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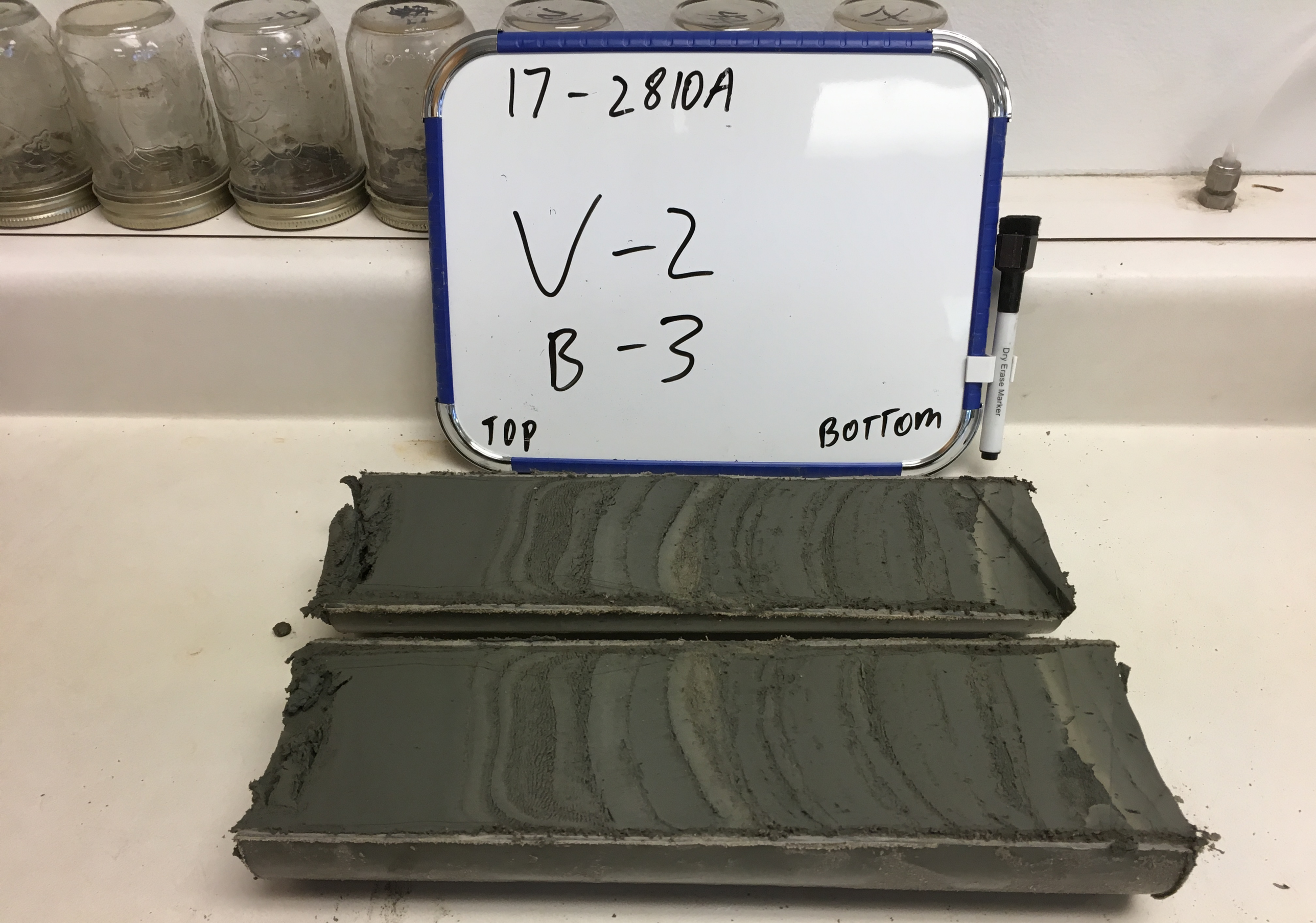
Figure No. A.2-45



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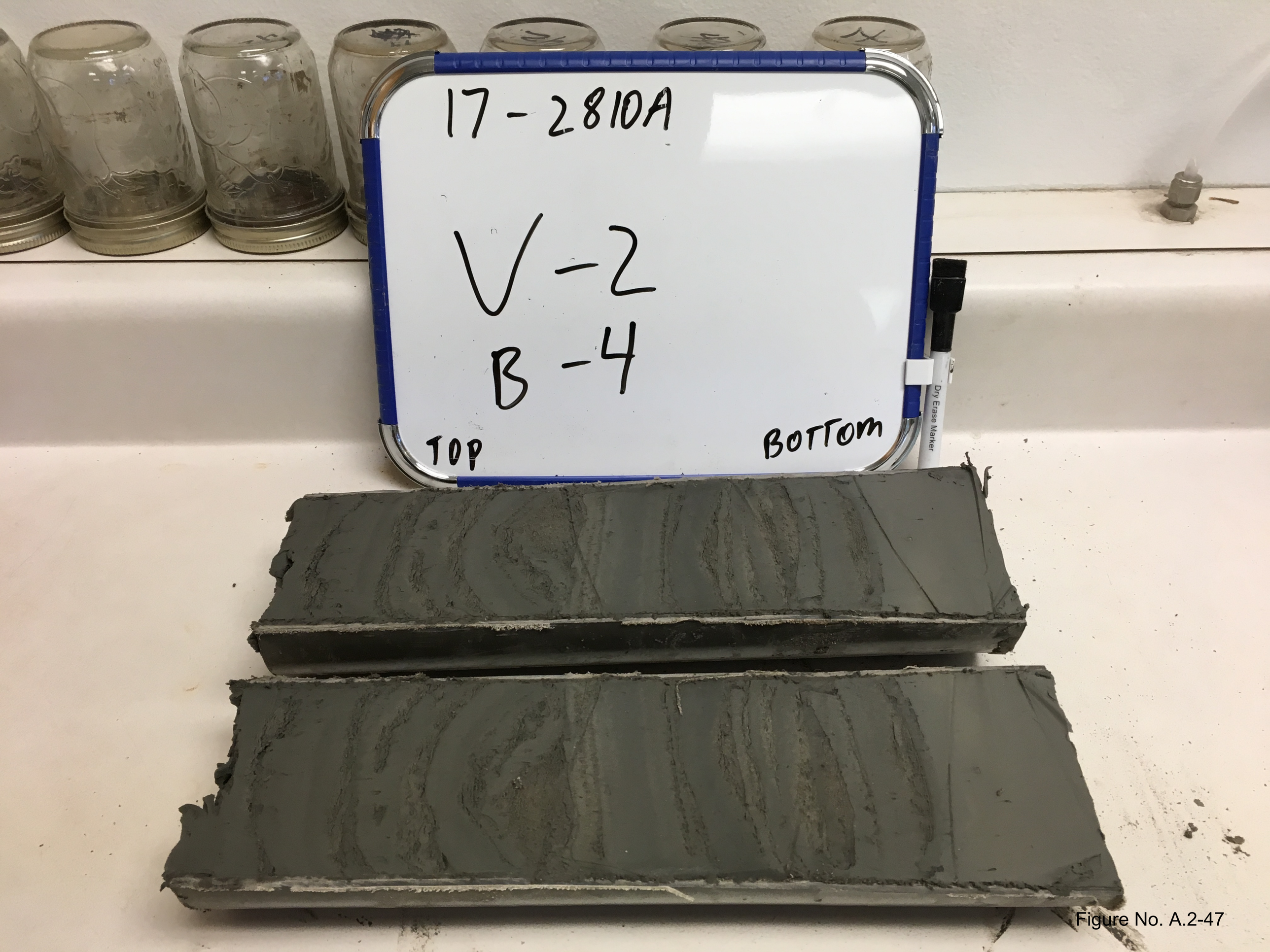

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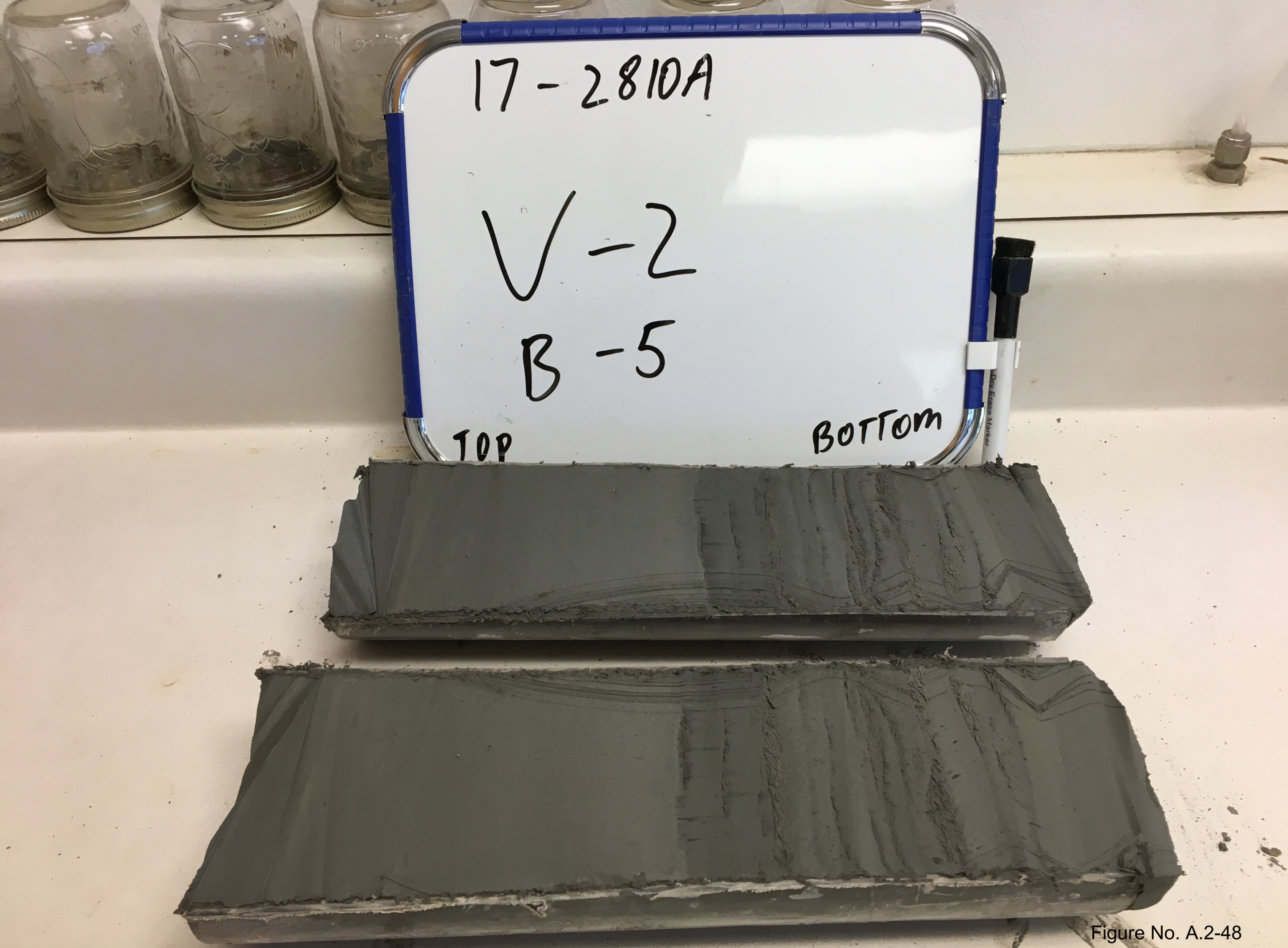

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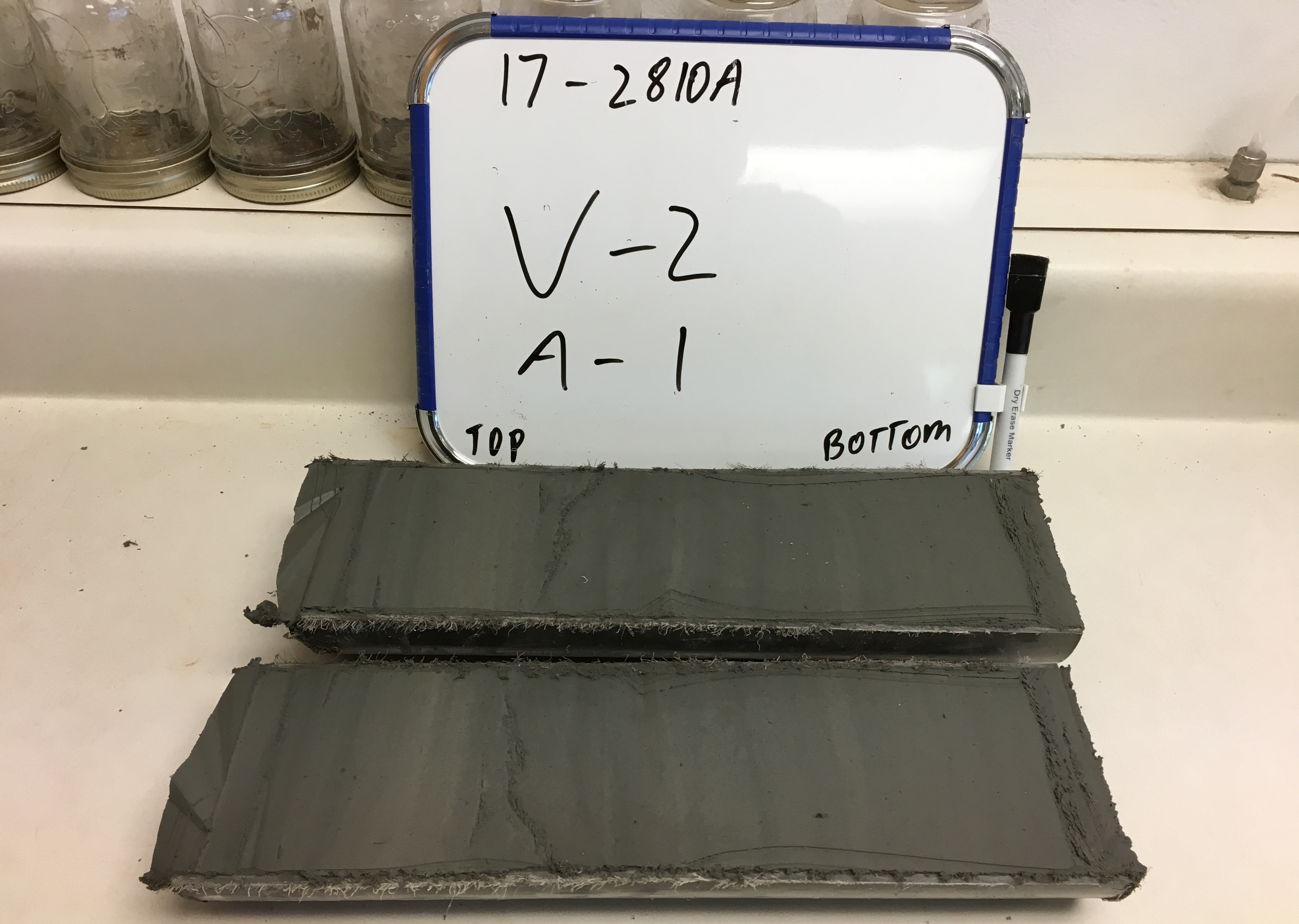

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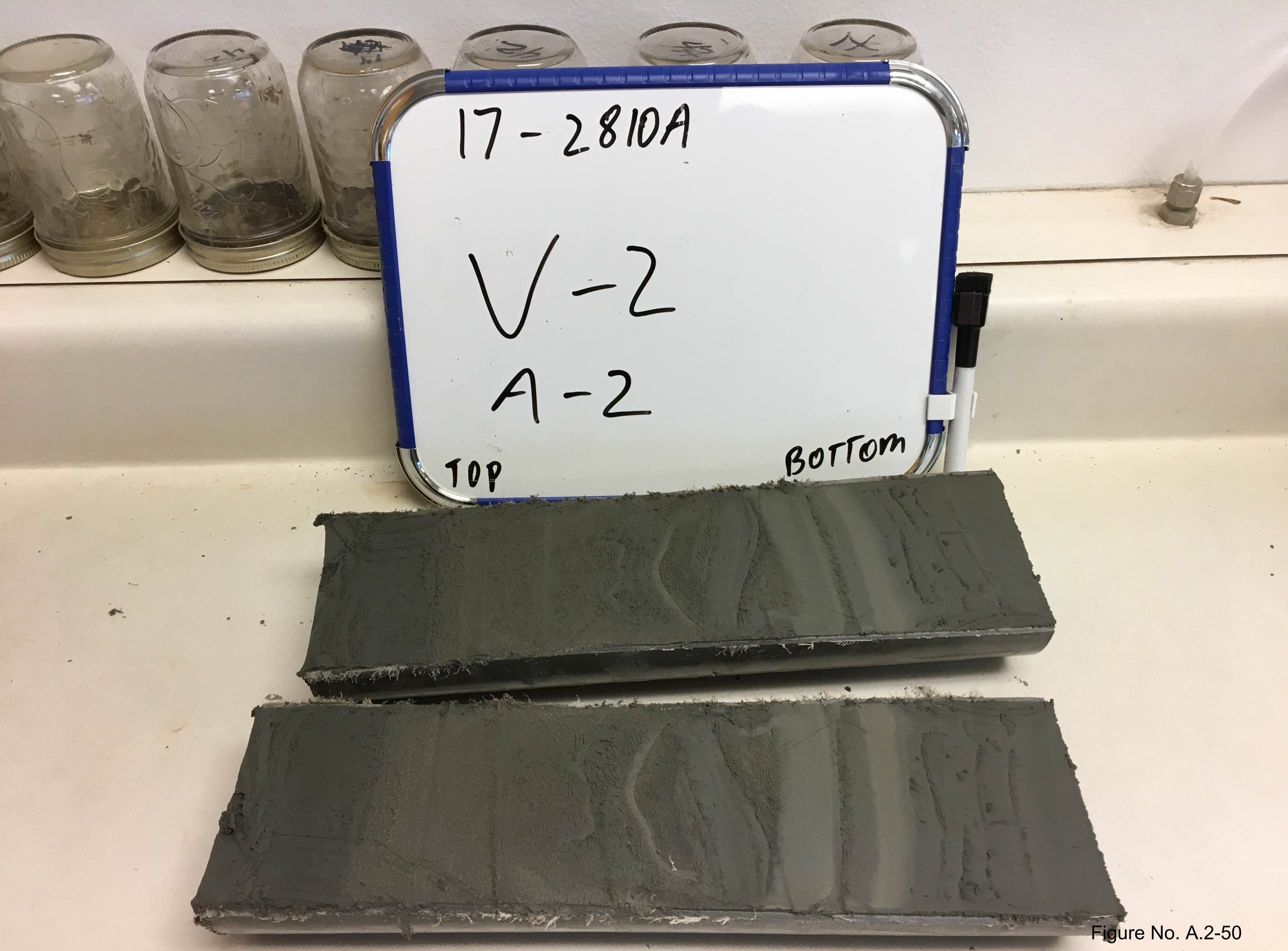

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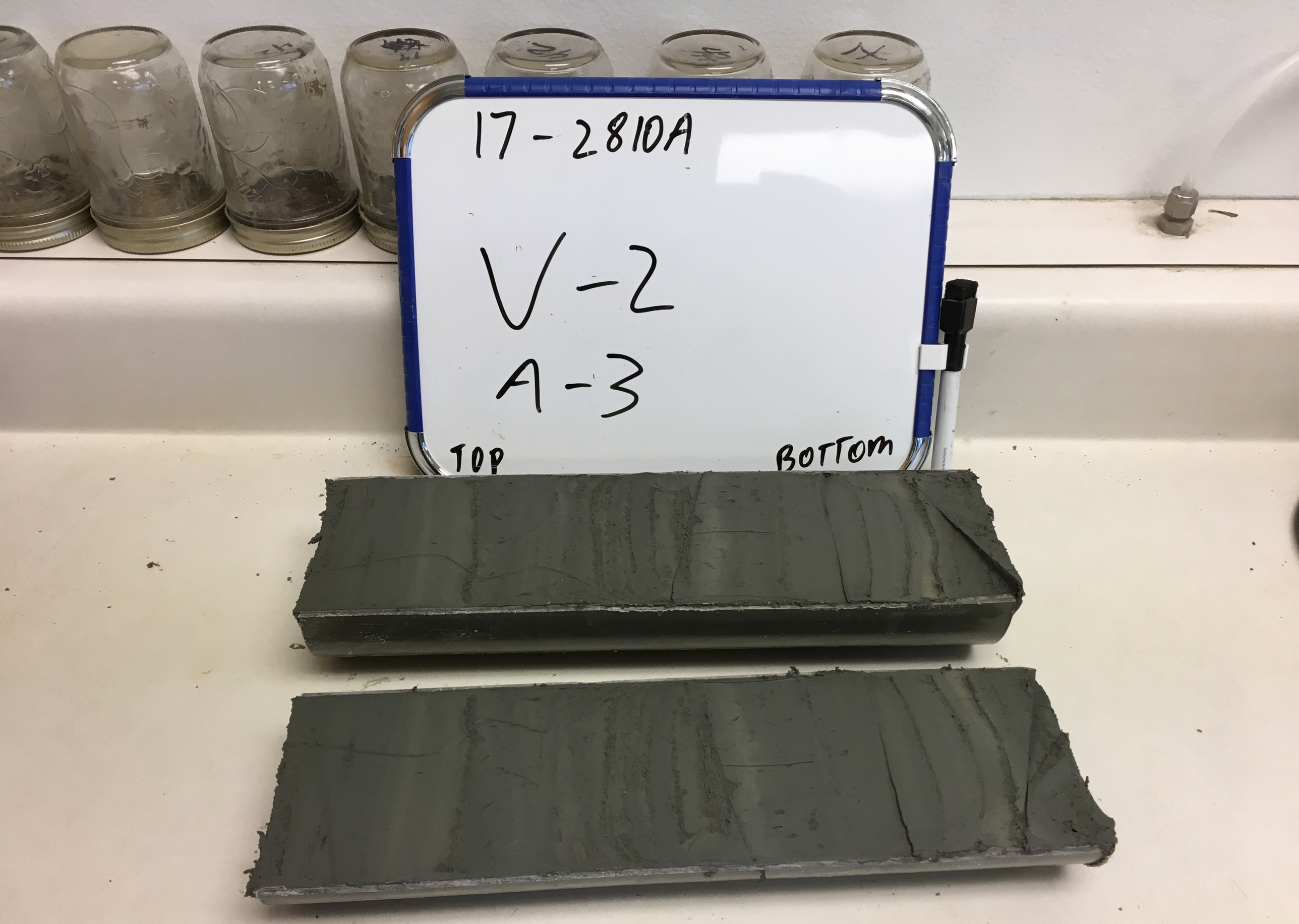

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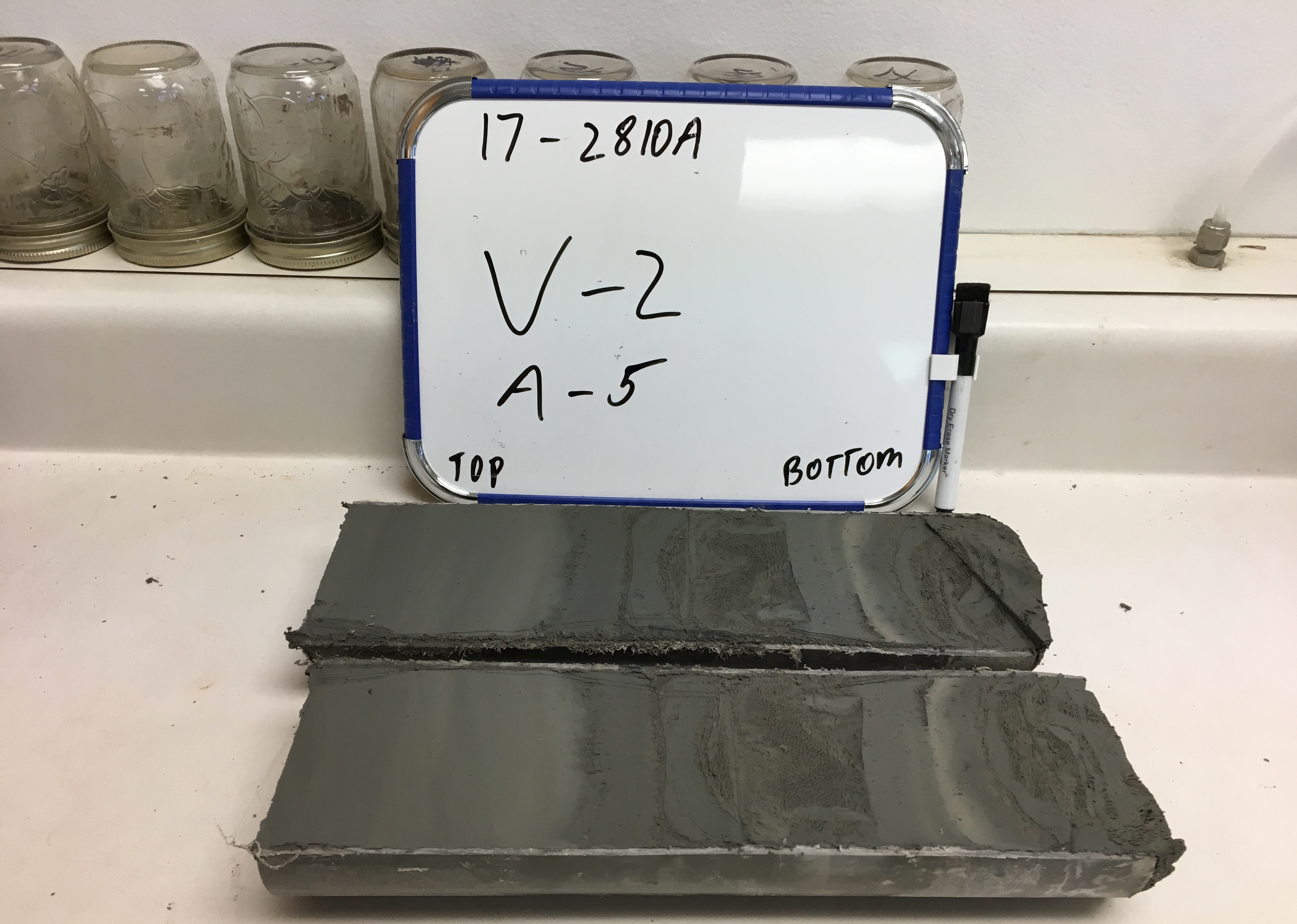

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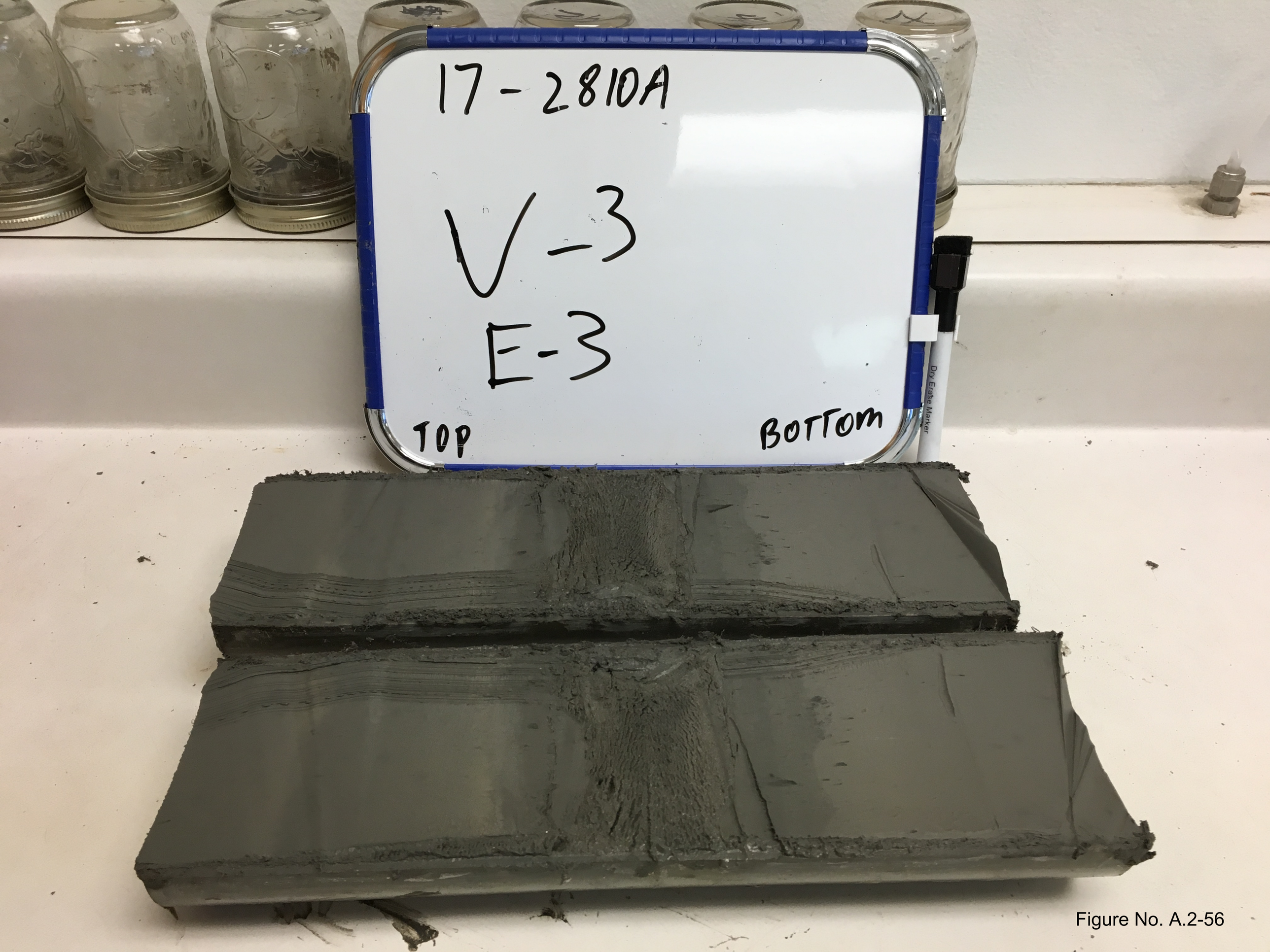
Figure No. A.2-54

Figure No. A.2-55



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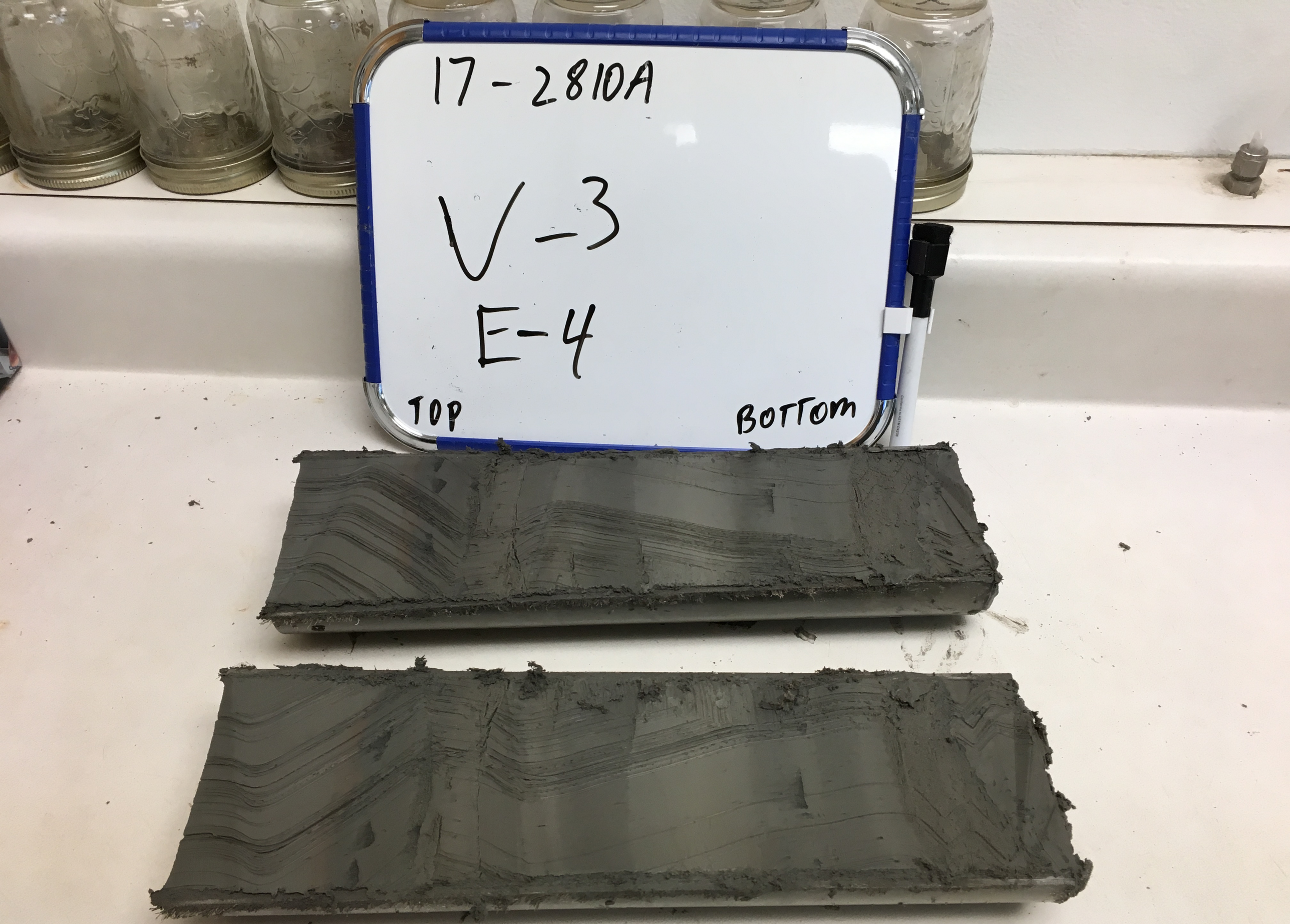

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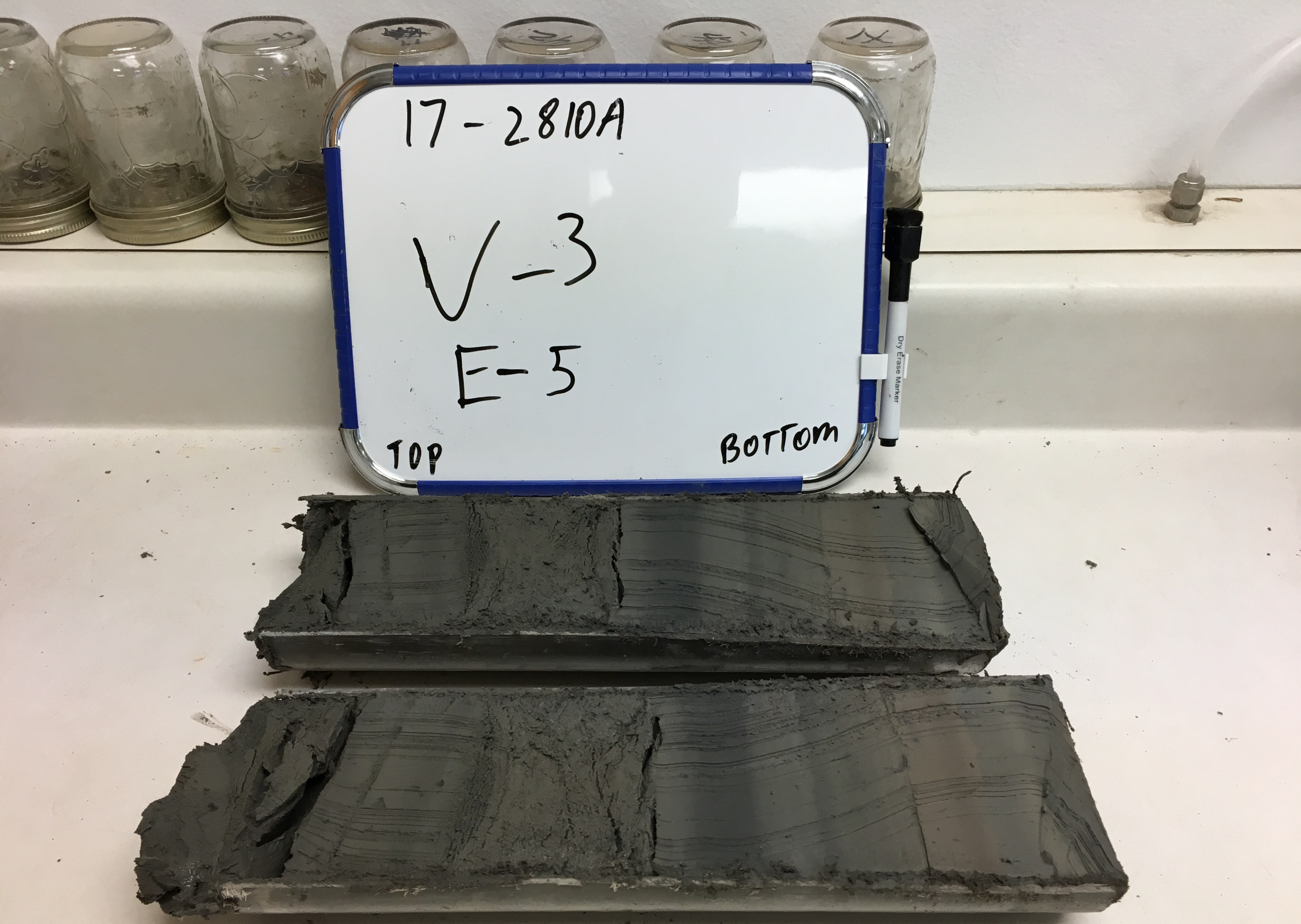

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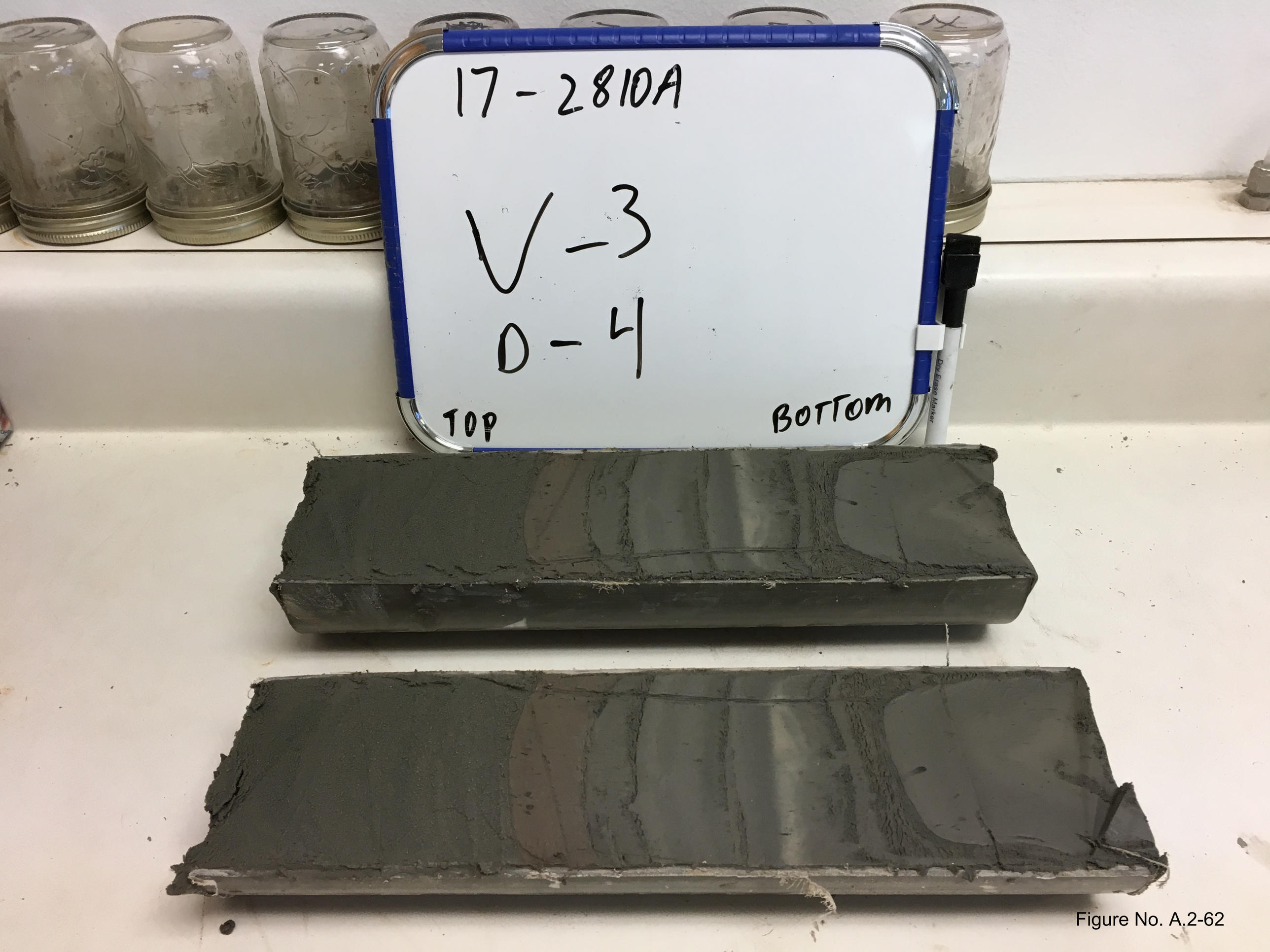
Figure No. A.2-61



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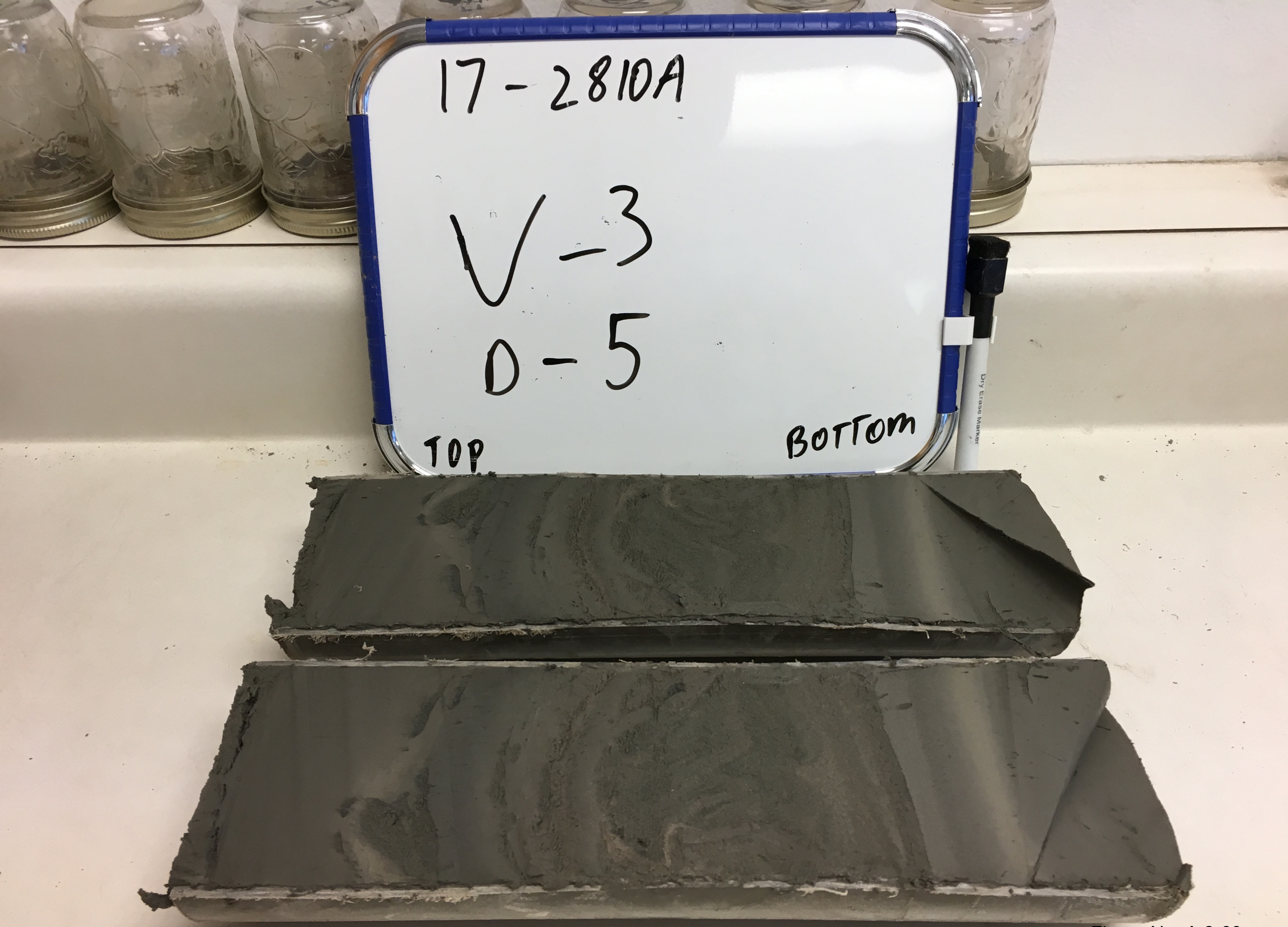

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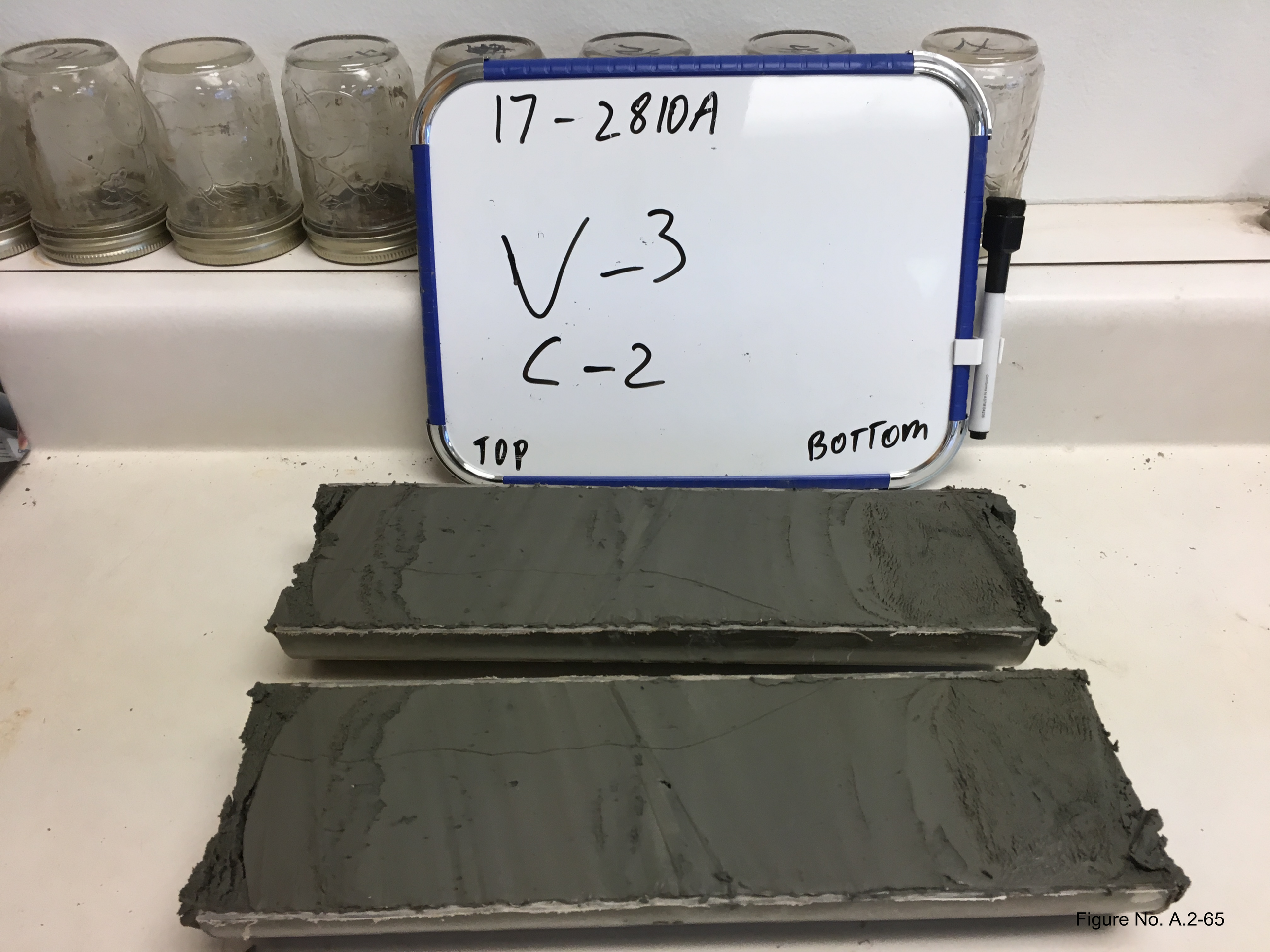
Figure No. A.2-64



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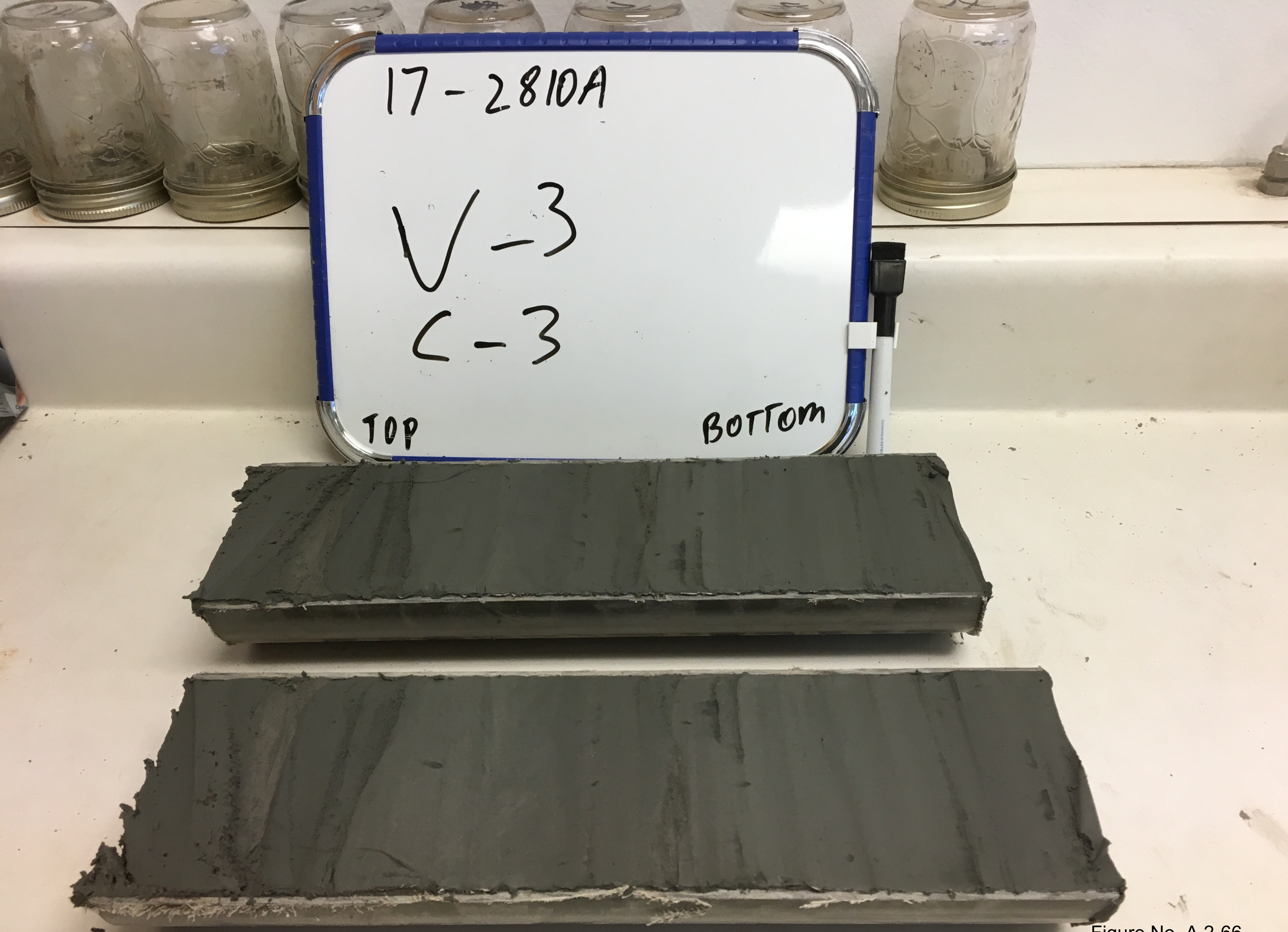

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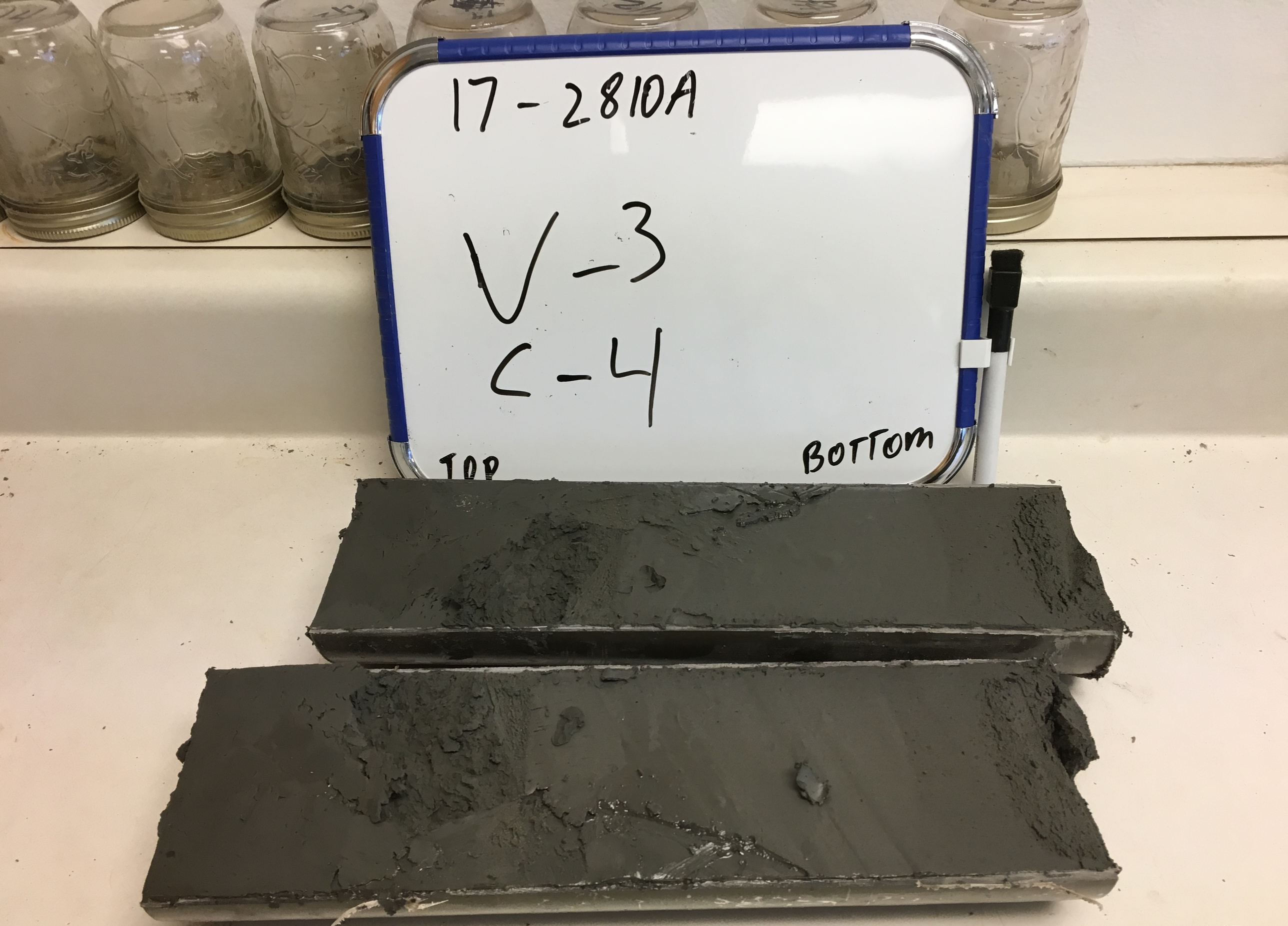


Figure No. A.2-67

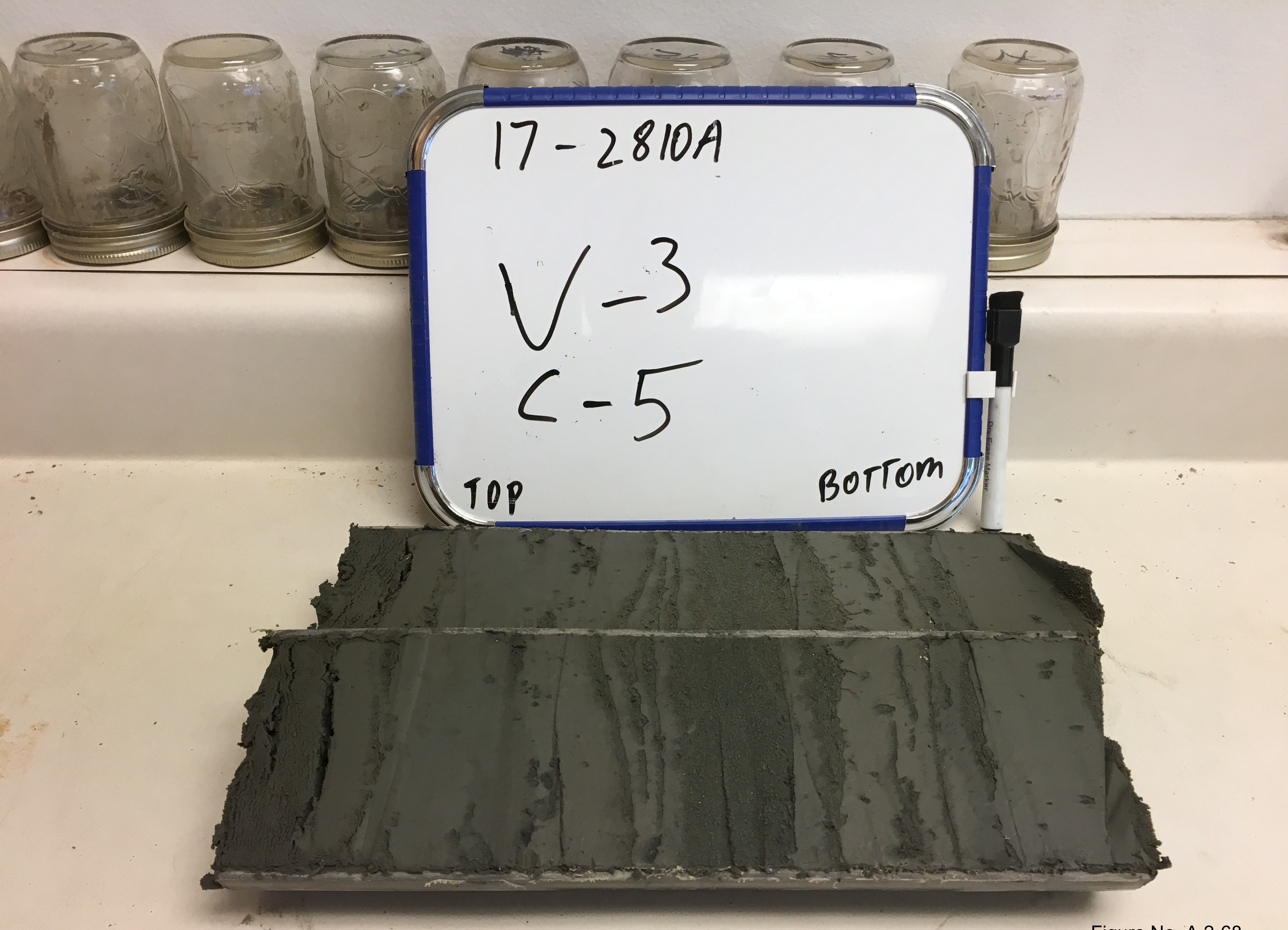


Figure No. A.2-68

Figure No. A.2-69

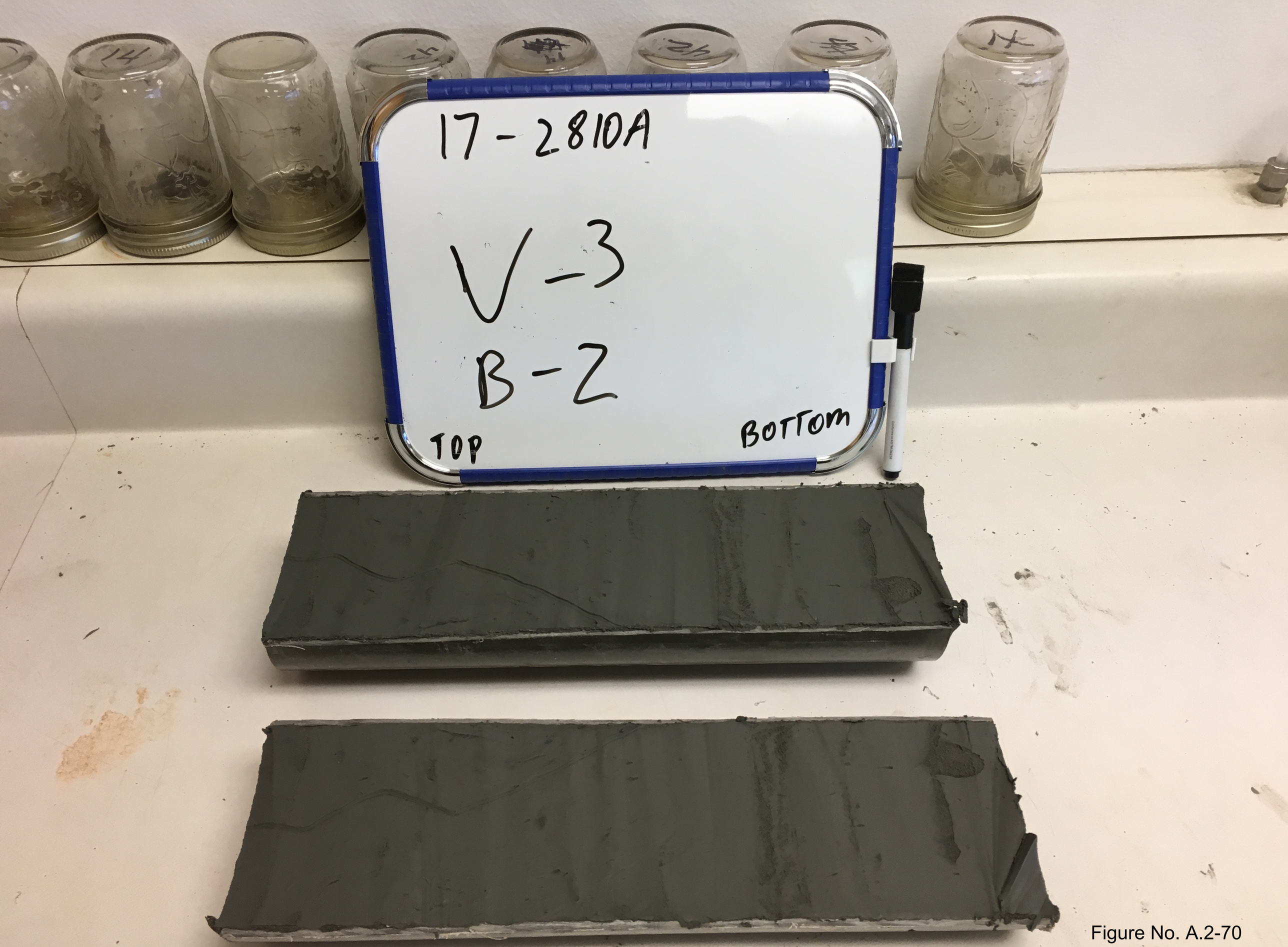


Figure No. A.2-70

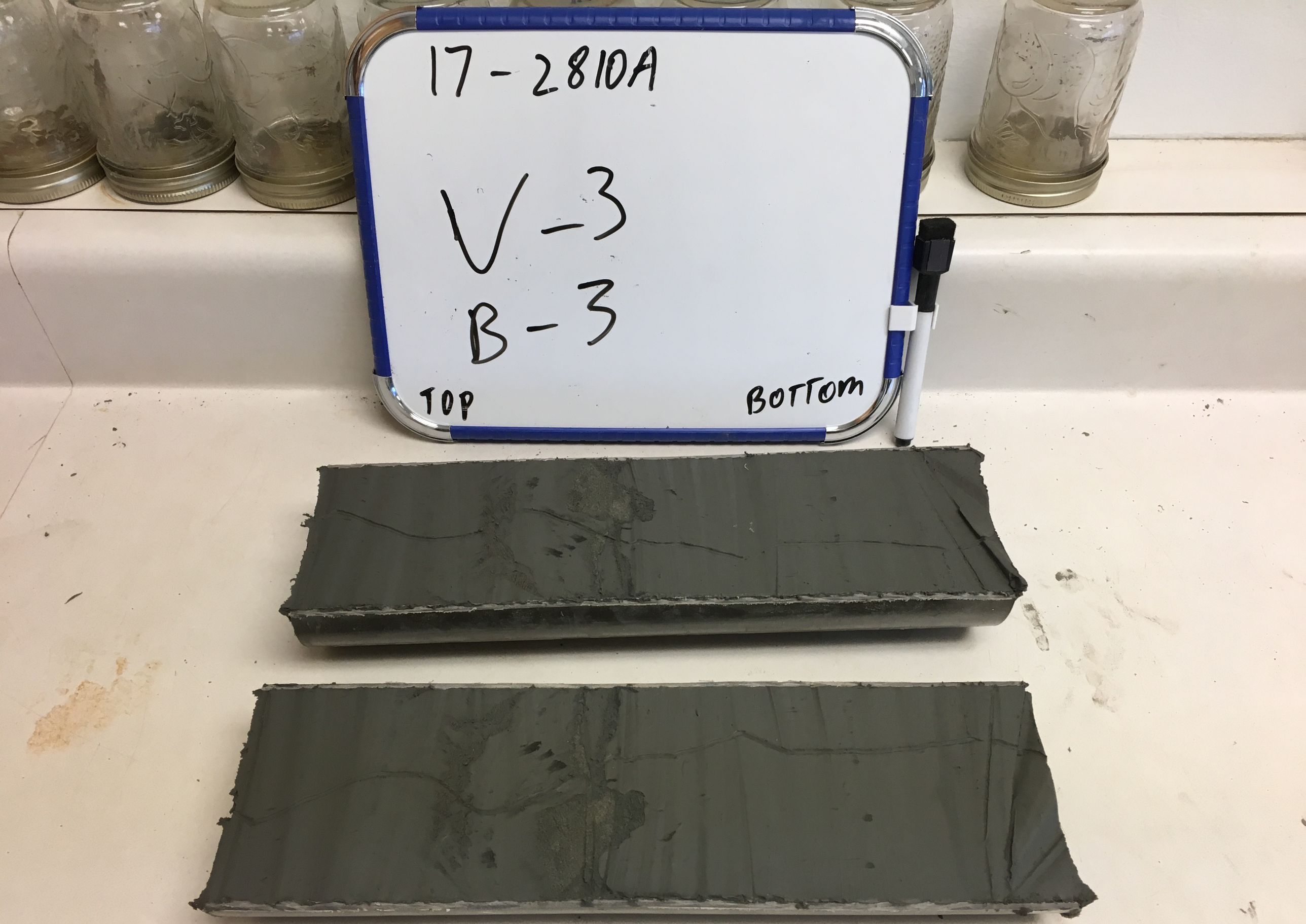


Figure No. A.2-71

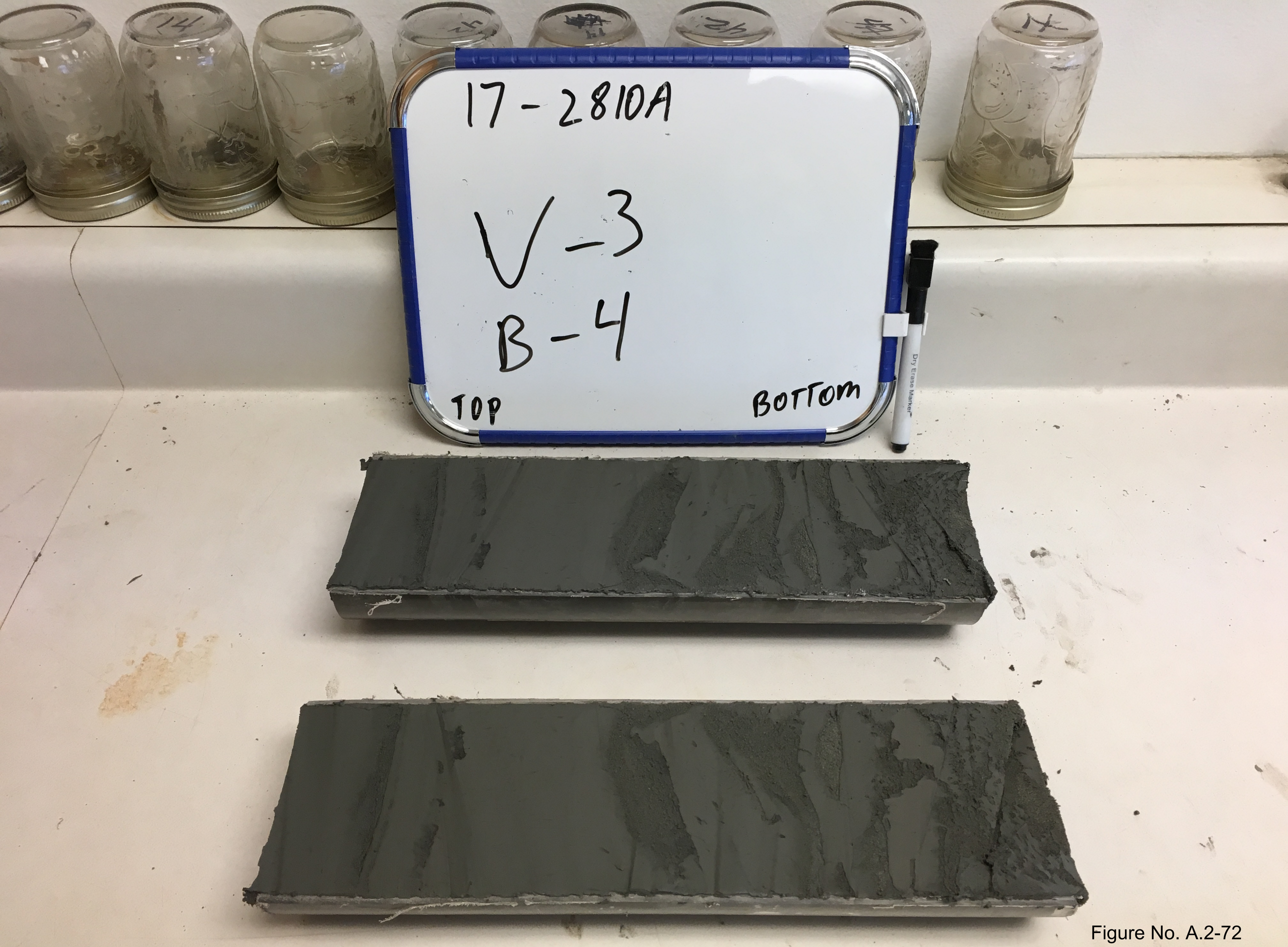


Figure No. A.2-72

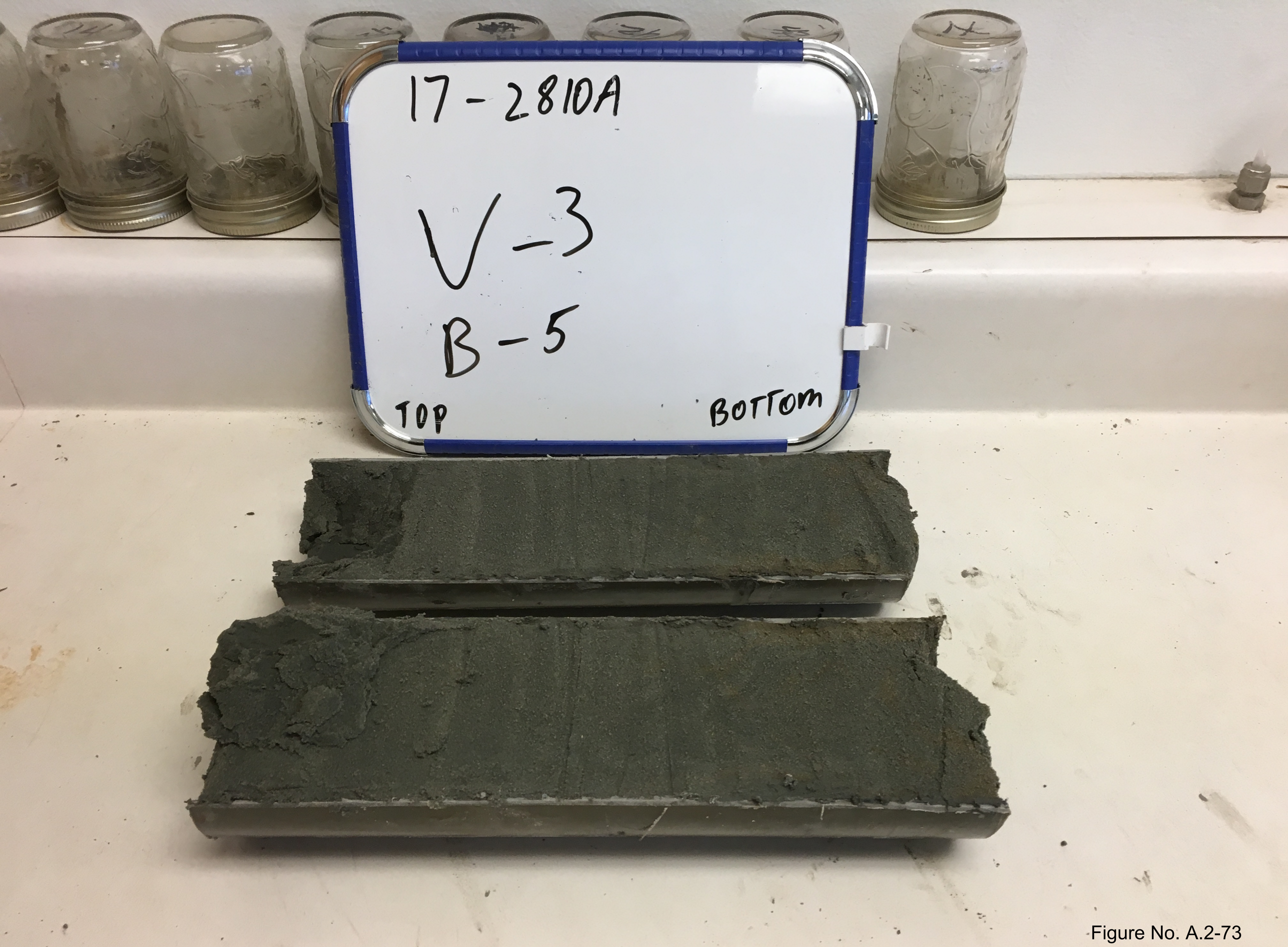


Figure No. A.2-73

Figure No. A.2-74

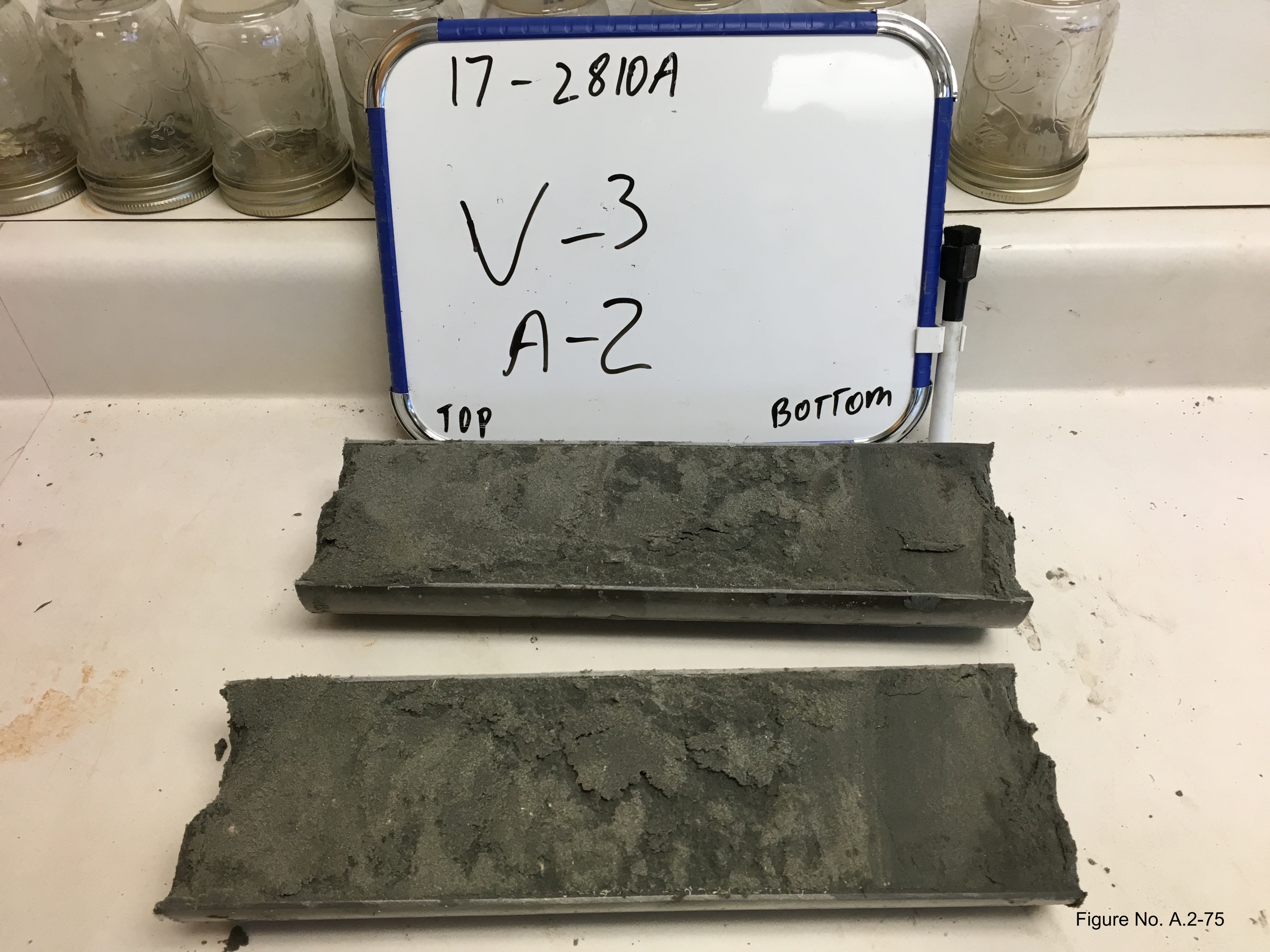


Figure No. A.2-75

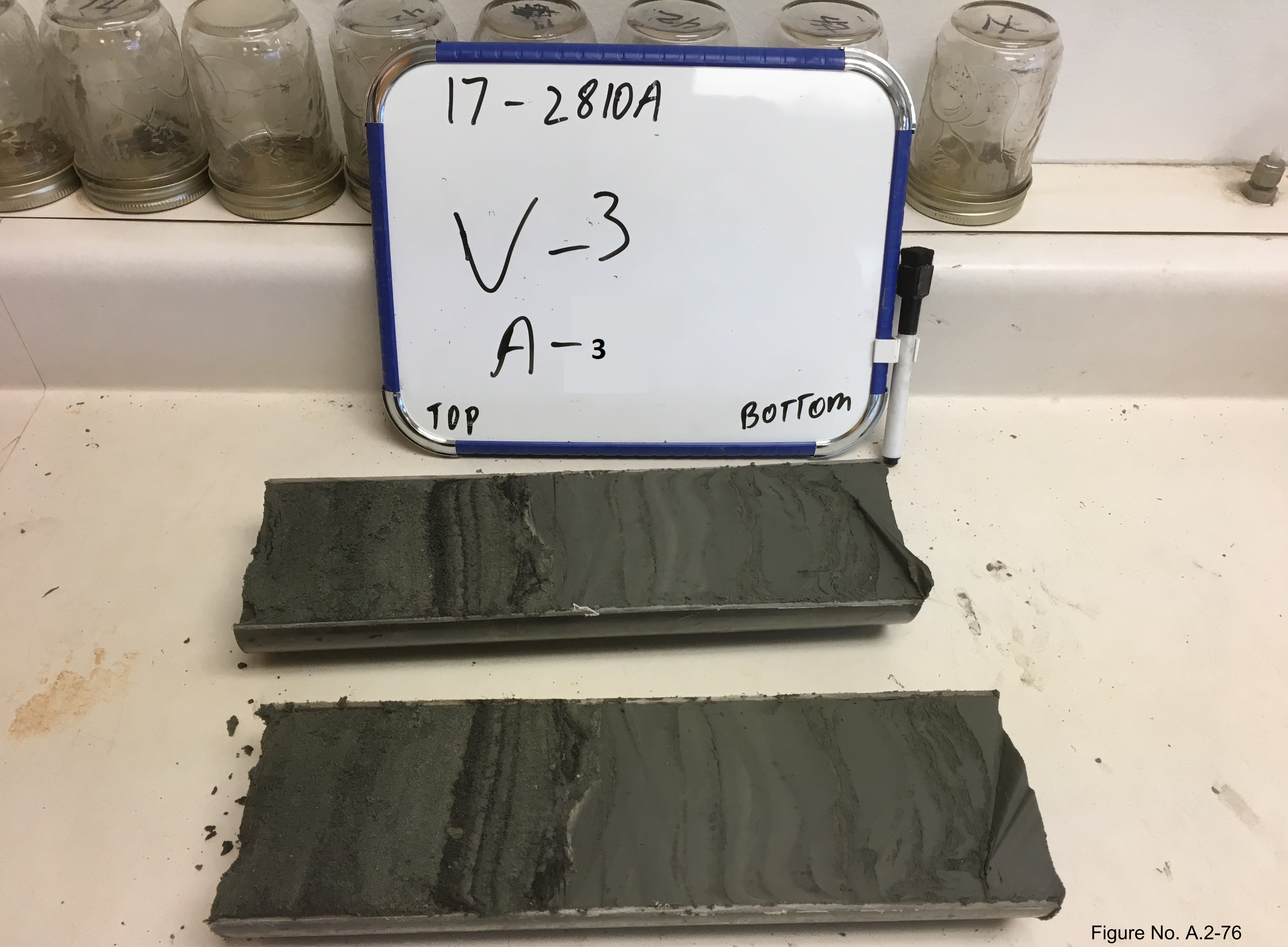
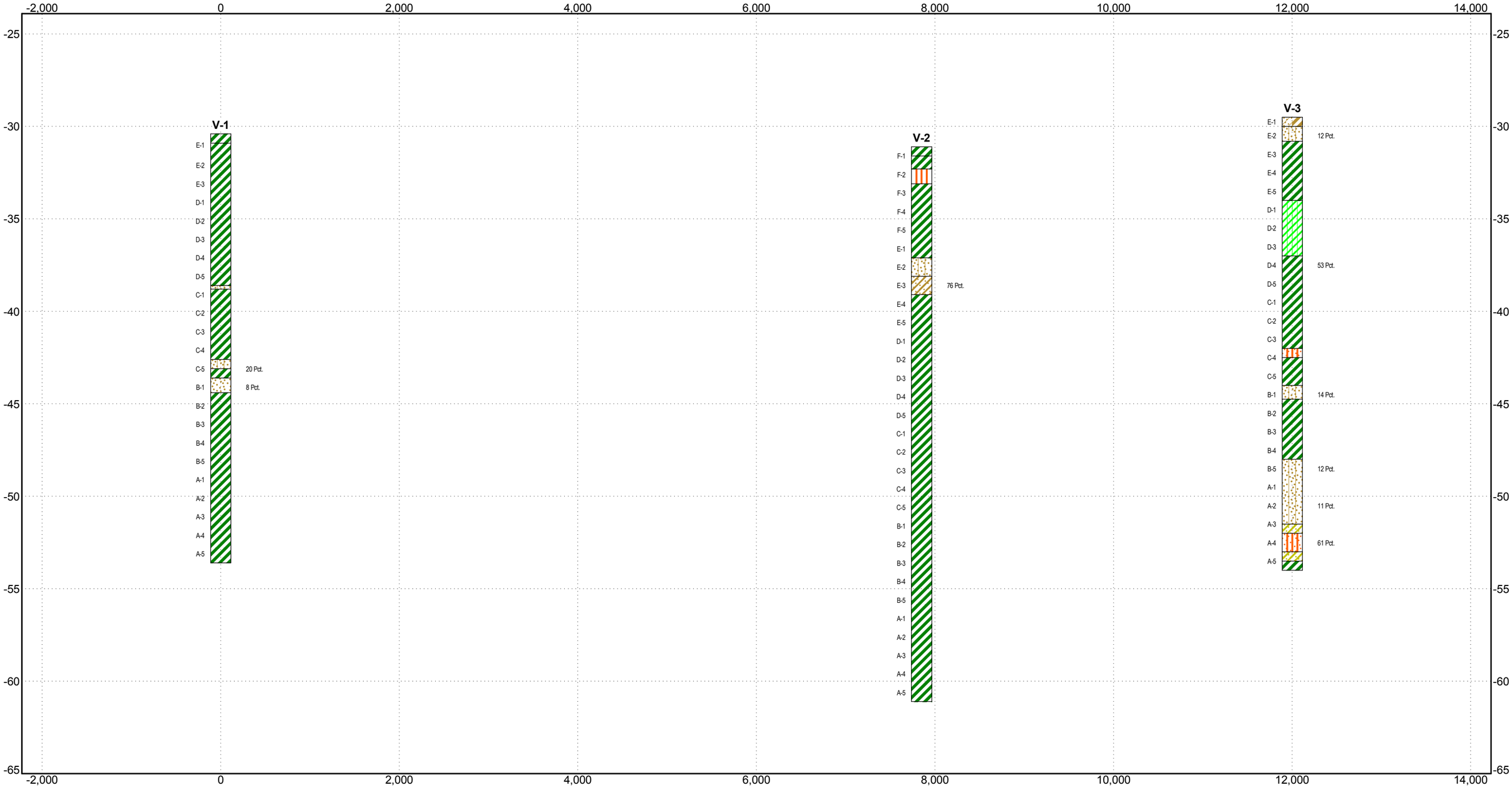


Figure No. A.2-76

Figure No. A.2-77

Figure No. A.2-78



Su = Undrained Shear Strength
C = Confining Pressure
Pct. = Percent Passing the #200 Sieve

Ground Water Level Data

Borings Performed in Open Ocean

LITHOLOGY GRAPHICS

- USCS High Plasticity Clay
- USCS Clayey Sand
- USCS Low Plasticity Clay
- USCS Low Plasticity Sandy Clay
- USCS Silt
- USCS Sandy Silt
- USCS Silty Sand
- USCS Poorly-graded Sand

Caminada HL BB MC Offshore
Lafourche and Jefferson Parishes, LA

Coastal Protection and Restoration Authority (CPRA)

Figure No. A.3

Project Number: 17-2810A

Appendix B. LABORATORY DATA PLOTS

B.1 Vibracore Data Summary

B.2 Plasticity Chart

B.3 Hydrometer Test Data

B.4 Settling Column Test Results

B.5 Slurry Consolidation Test Results

B.6 Slurry Consolidation Test Summary

B.7 Comparison of Settling Column and Slurry Consolidation Test

Vibracore V-1 Data Summary

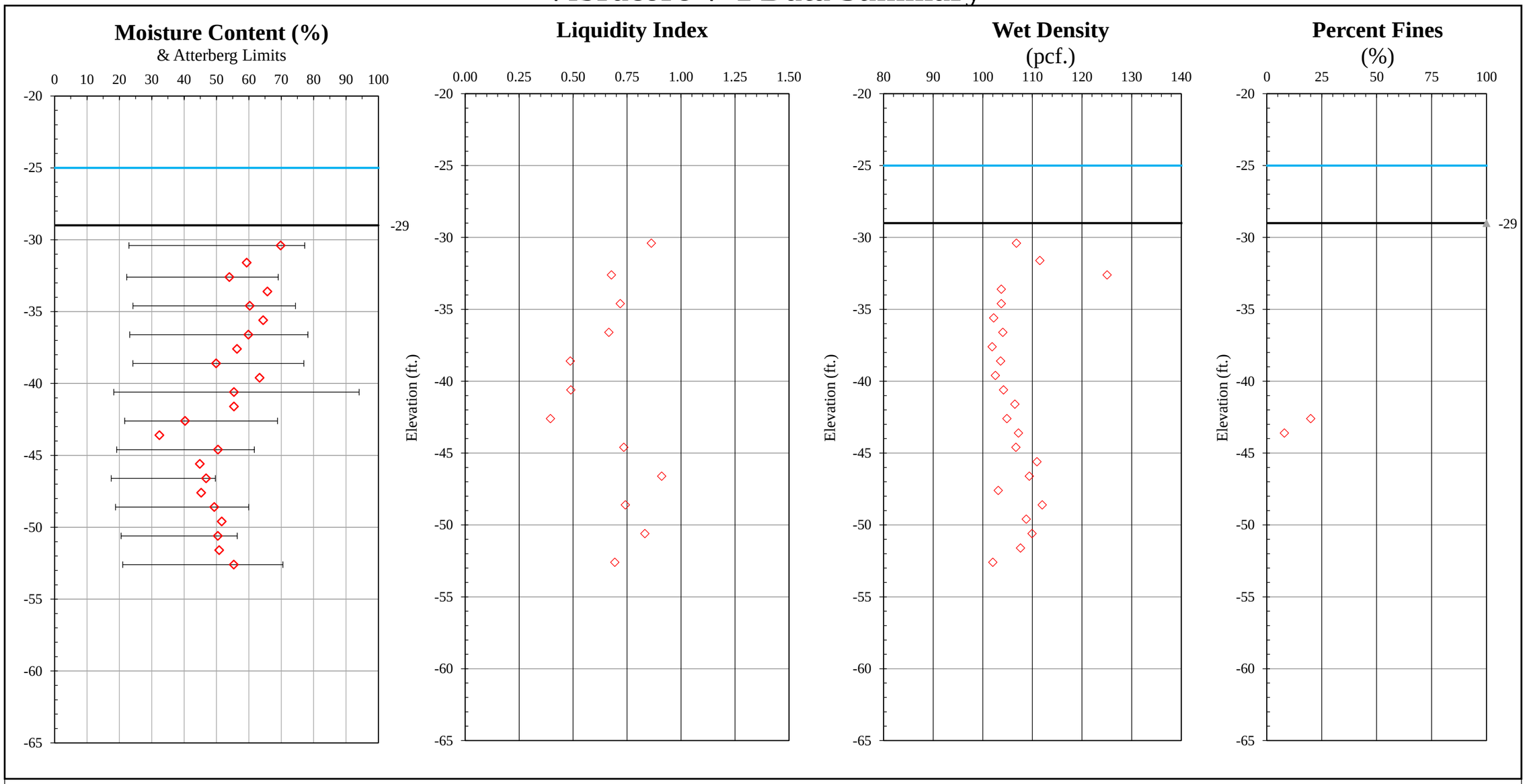


Figure No. B.1-1

17-2810A

Caminada H.L. B.B. Marsh Creation Increment II (BA-193) Offshore Borrow Investigation

Ardaman & Associates, Inc.

Vibracore V-2 Data Summary

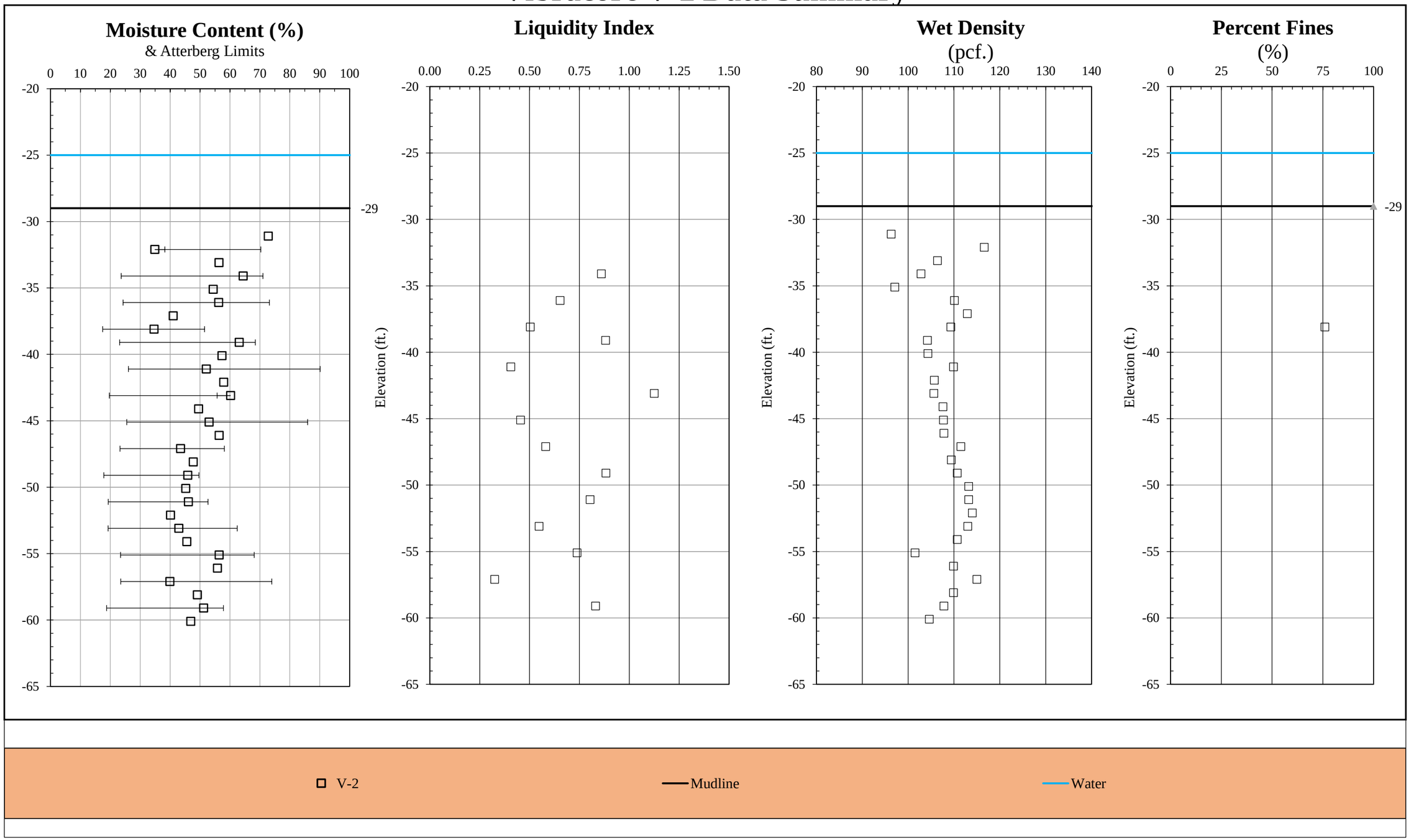


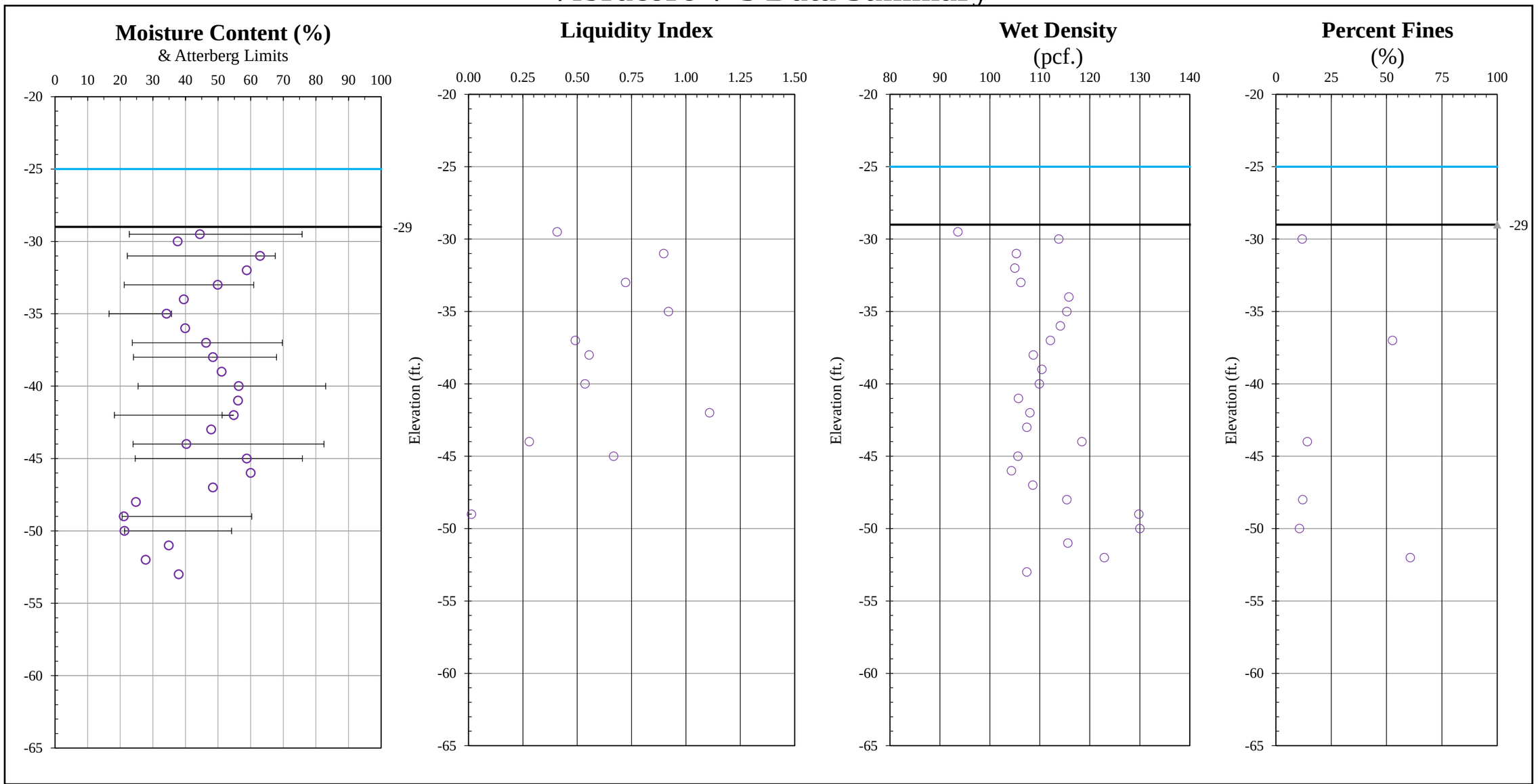
Figure No. B.1-2

17-2810A

Caminada H.L. B.B. Marsh Creation Increment II (BA-193) Offshore Borrow Investigation

Ardaman & Associates, Inc.

Vibracore V-3 Data Summary

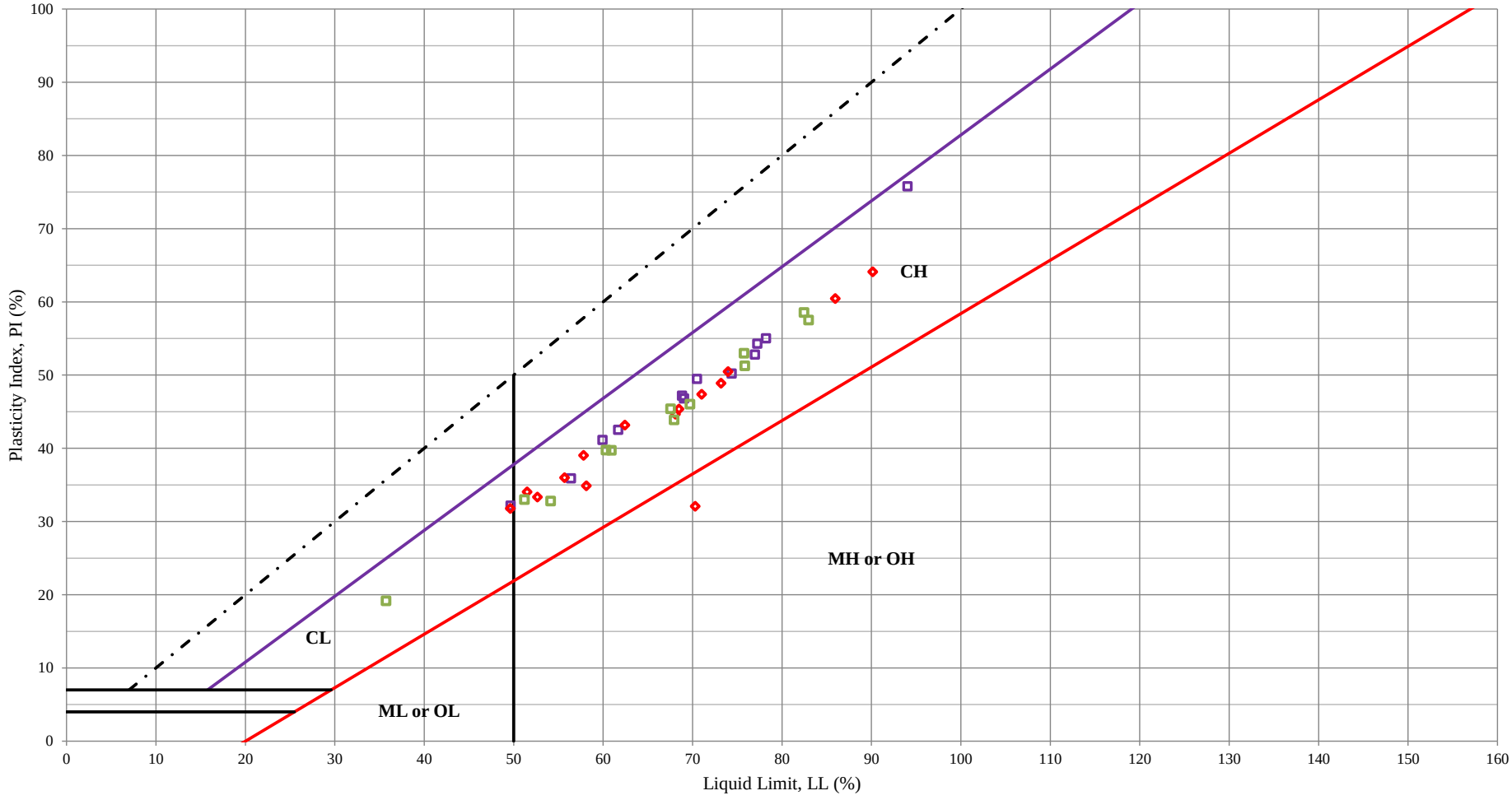


Ardaman & Associates, Inc.

Figure No. B.1-3

17-2810A

Caminada H.L. B.B. Marsh Creation Increment II (BA-193) Offshore Borrow Investigation



U-Line A-Line V-1 V-2 V-3

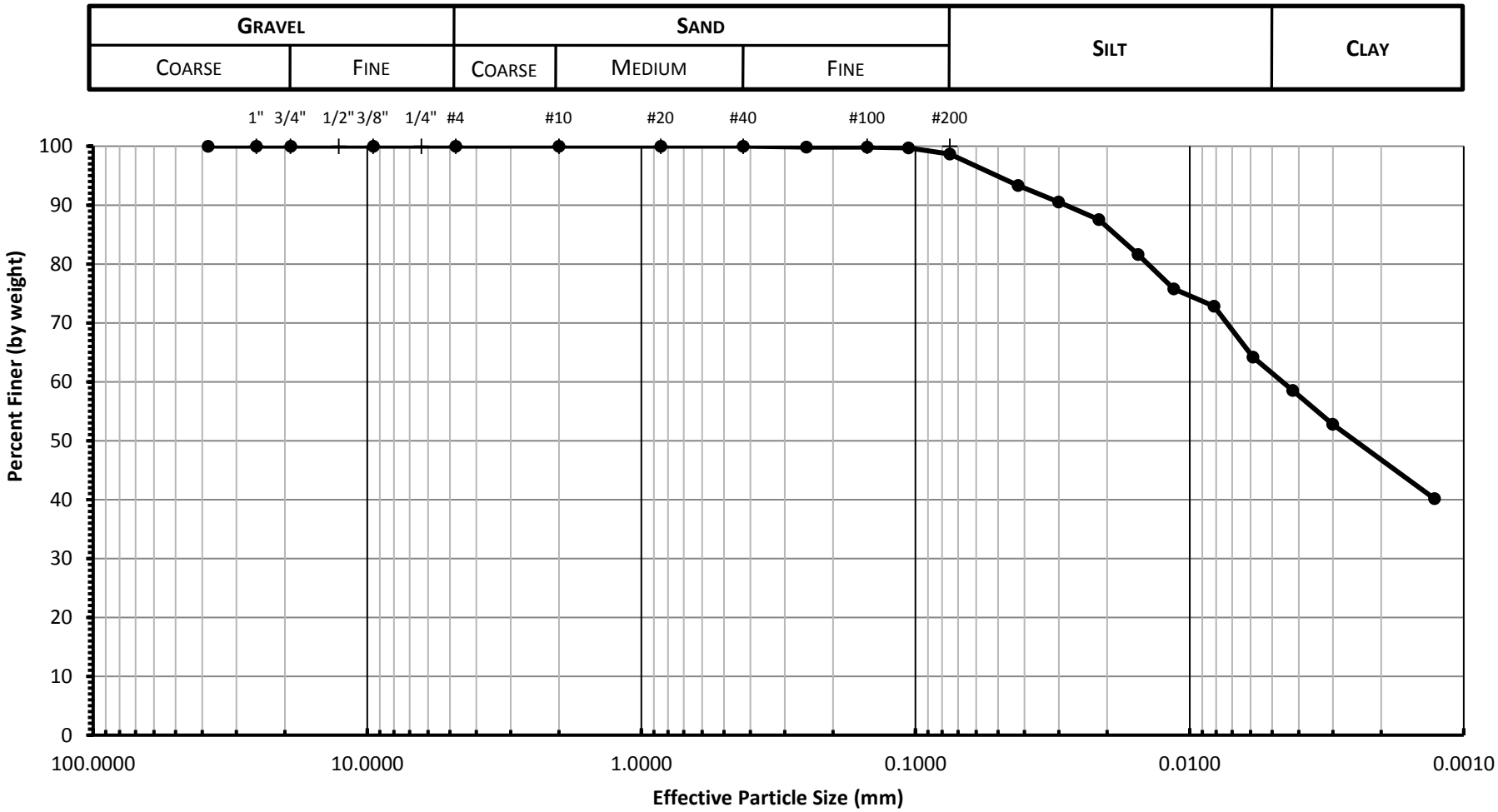
Ardaman & Associates, Inc.

Caminada H.L. B.B Marsh Creation (BA-193)
Offshore Borrow Investigation

Draw By:	Date:
G.S.	11/29/2017
File No.	Figure No.
17-2810A	B.2

Client: CPRA
Project: Caminada Offshore
AAI Project No.17-2810A

PARTICLE SIZE ANALYSIS
(ASTM D422)

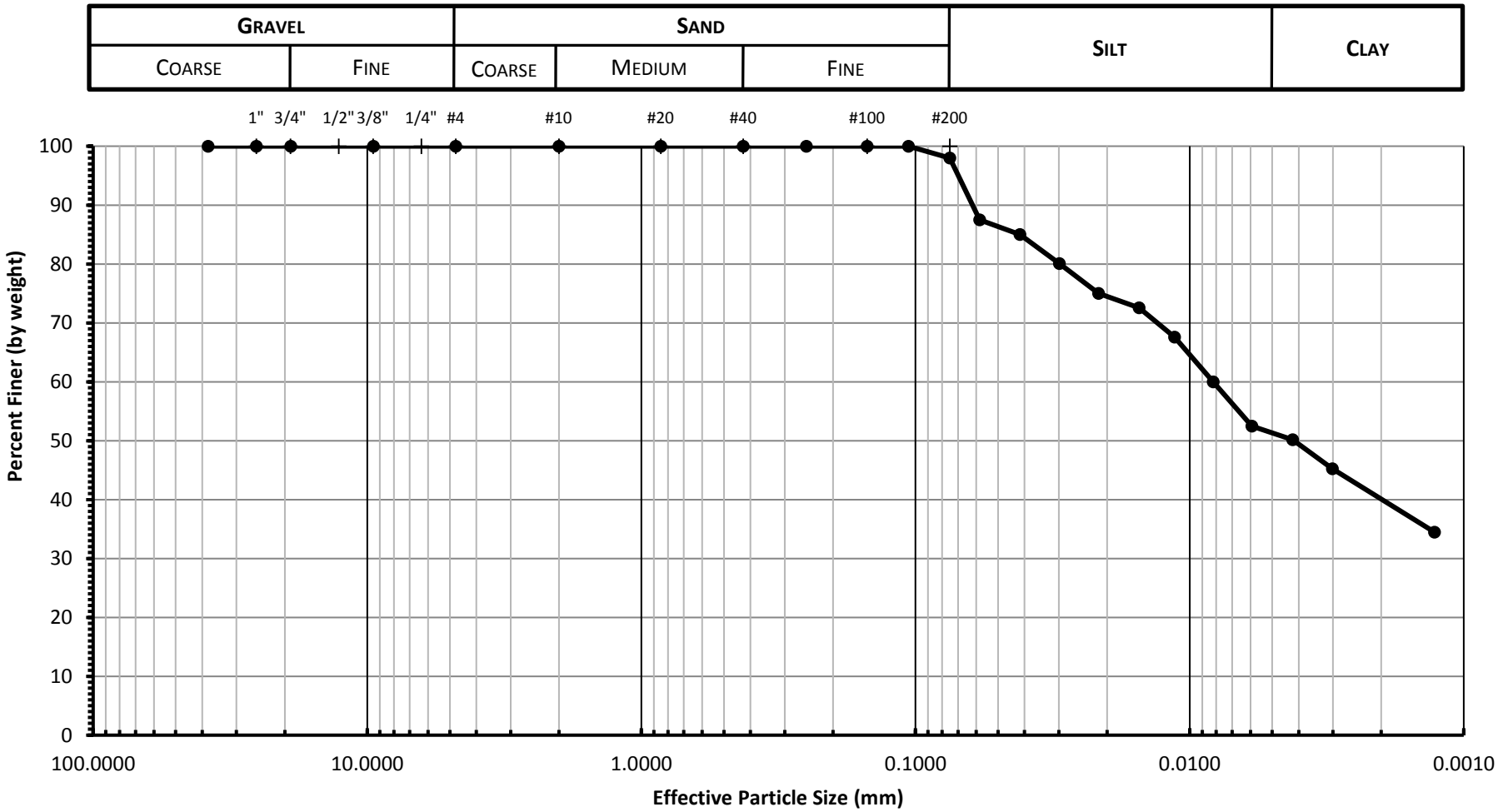


SAMPLE IDENTIFICATION		VISUAL IDENTIFICATION	% GRAVEL	% SAND	% SILT	% CLAY
COMPOSITE #1	DEPTH (FT)		0.0	1.3	37.5	61.2

Figure No. B.3-1

Client: CPRA
Project: Caminada Offshore
AAI Project No.17-2810A

PARTICLE SIZE ANALYSIS
(ASTM D422)

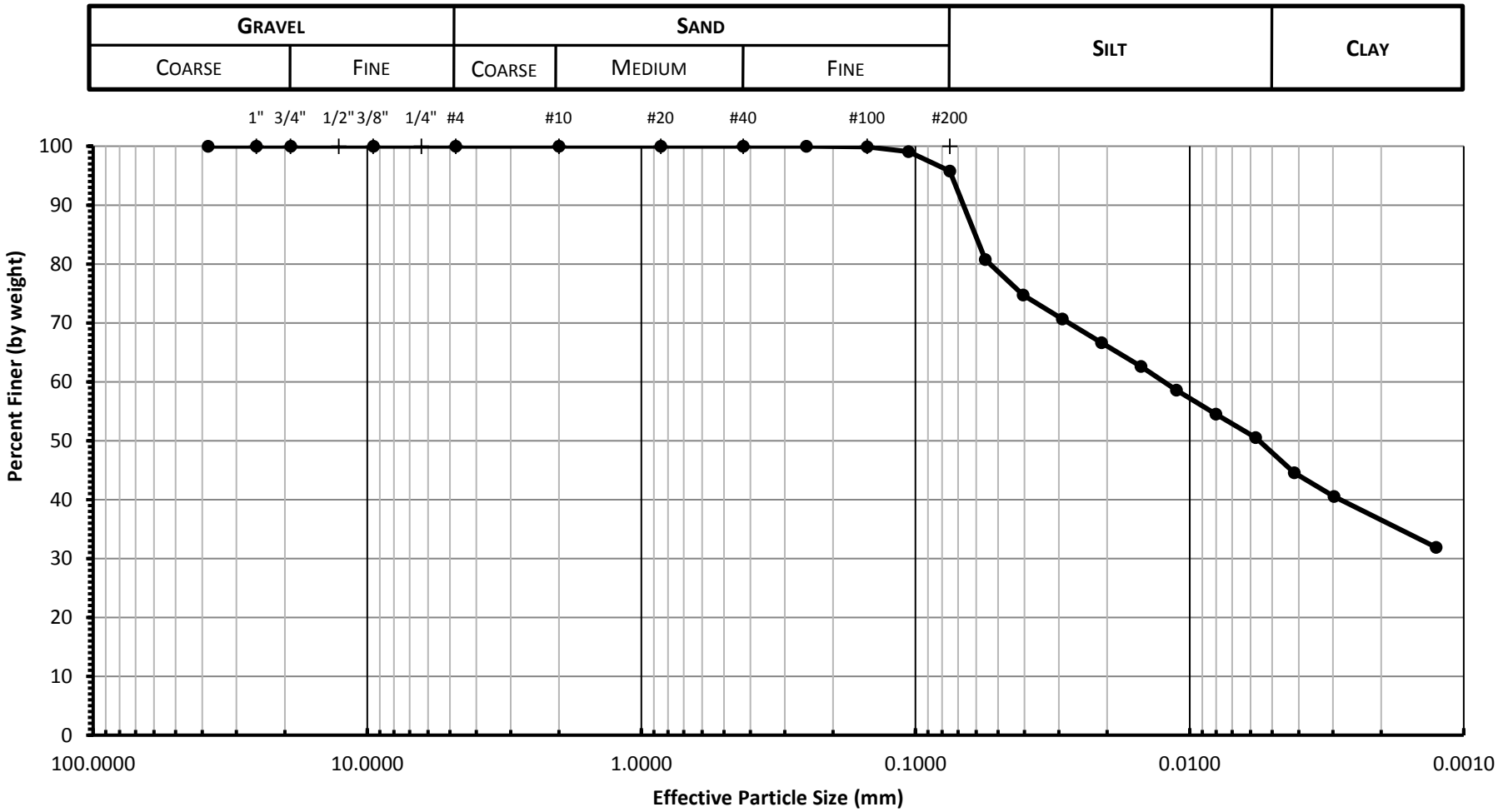


SAMPLE IDENTIFICATION		VISUAL IDENTIFICATION	% GRAVEL	% SAND	% SILT	% CLAY
COMPOSITE #2	DEPTH (FT)		0.0	2.0	46.8	51.2

Figure No. B.3-2

Client: CPRA
Project: Caminada Offshore
AAI Project No.17-2810A

PARTICLE SIZE ANALYSIS
(ASTM D422)



SAMPLE IDENTIFICATION		VISUAL IDENTIFICATION	% GRAVEL	% SAND	% SILT	% CLAY
COMPOSITE #3	DEPTH (FT)		0.0	4.2	48.1	47.7

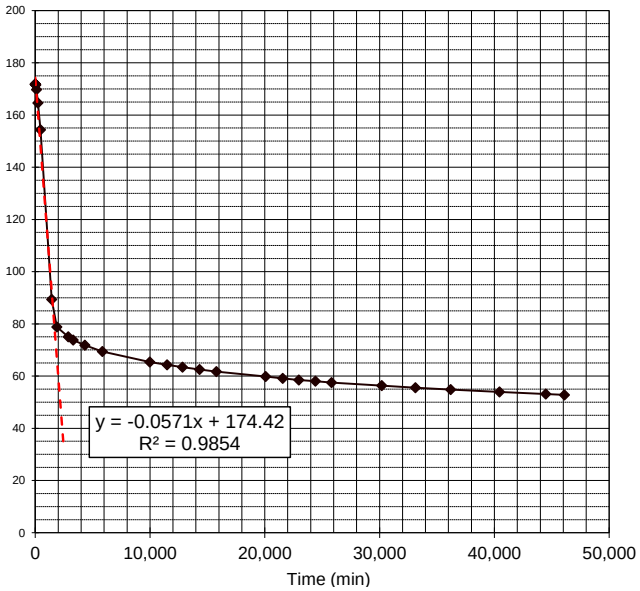
Figure No. B.3-3

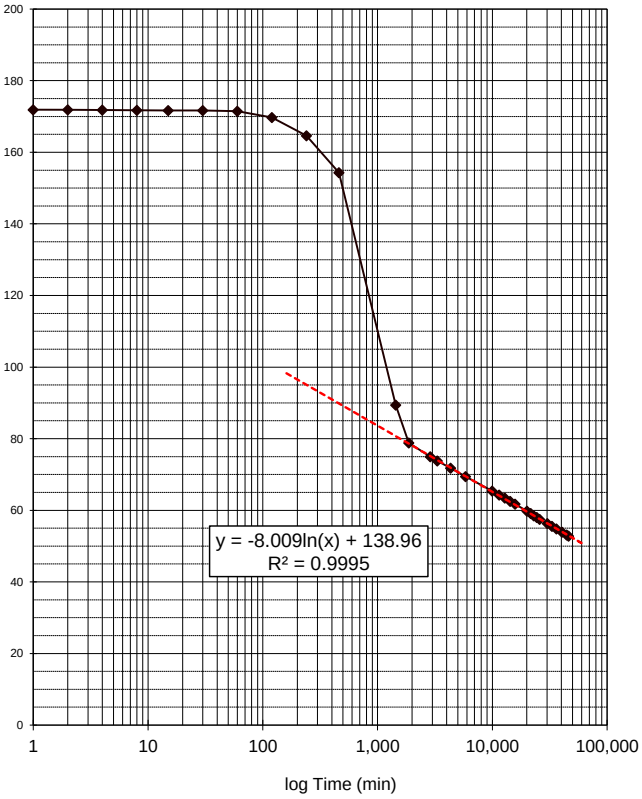
ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
SETTLING TEST DATA

PROJECT:	Caminada Offshore Borrow	Sample ID:	Composite V-1
FILE NUMBER:	16-84-2810A	Depth:	☐ ft ☐ m
Engineer:	RJW		
Cyliner Number:	97		
		Sample description:	
Target solids content, %:	12		
Date sample set-up:	9/19/17		

Start Time: 9:12
Start Date: 9/25/17

Clock Time	Time (min)	Top Down Settling Ht. (cm)	Bottom up Settling Ht. (cm)
9/25/2017 9:12	0		
	0.1		
	0.25		
	0.5		
	0.75		
9/25/2017 9:13	1	171.9	
9/25/2017 9:14	2	171.9	
9/25/2017 9:16	4	171.8	
9/25/2017 9:20	8	171.8	
9/25/2017 9:27	15	171.7	
9/25/2017 9:42	30	171.7	
9/25/2017 10:12	60	171.5	
9/25/2017 11:12	120	169.7	
9/25/2017 13:12	240	164.6	
9/25/2017 16:52	460	154.3	
9/26/2017 9:12	1440	89.4	
9/26/2017 16:27	1875	78.8	
9/27/2017 9:12	2880	75.0	
9/27/2017 16:30	3318	73.8	
9/28/2017 9:12	4320	71.8	
9/29/2017 10:47	5855	69.5	
10/2/2017 7:36	9984	65.4	
10/3/2017 8:45	11493	64.3	
10/4/2017 7:12	12840	63.4	
10/5/2017 7:52	14320	62.5	
10/6/2017 8:25	15793	61.7	
10/9/2017 7:39	20067	59.8	
10/10/2017 8:33	21561	59.1	
10/11/2017 7:49	22957	58.5	
10/12/2017 7:55	24403	58.0	
10/13/2017 7:34	25822	57.5	
10/16/2017 8:24	30192	56.3	
10/18/2017 9:17	33125	55.5	
10/20/2017 12:35	36203	54.8	
10/23/2017 11:20	40448	53.9	
10/26/2017 6:27	44475	53.1	
10/27/2017 9:29	46097	52.8	





Diameter of cylinder, cm	20.258
Initial Ht, cm	172
Final ht, cm	44.9
Total WDS, g	7181.7
Specific gravity	2.71
Total Vs, cm^3	

FINAL CONDITIONS

S_f (%)	33.4
e_f	5.408
γd_f (pcf)	26.4
MC_f (%)	199.6

Figure No. B.4-1

ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
SETTLING TEST DATA

PROJECT: Caminada Offshore Borrow
FILE NUMBER: 16-84-2810A
Engineer: RJW
Cyliner Number: 97

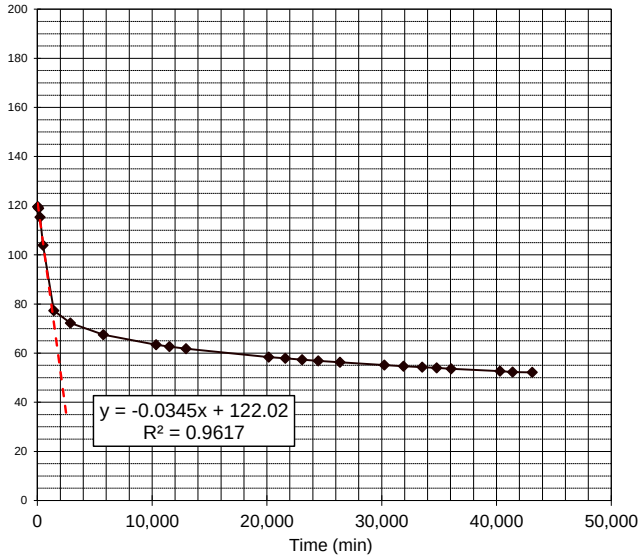
Target solids content, %: 16
Date sample set-up: 11/9/17

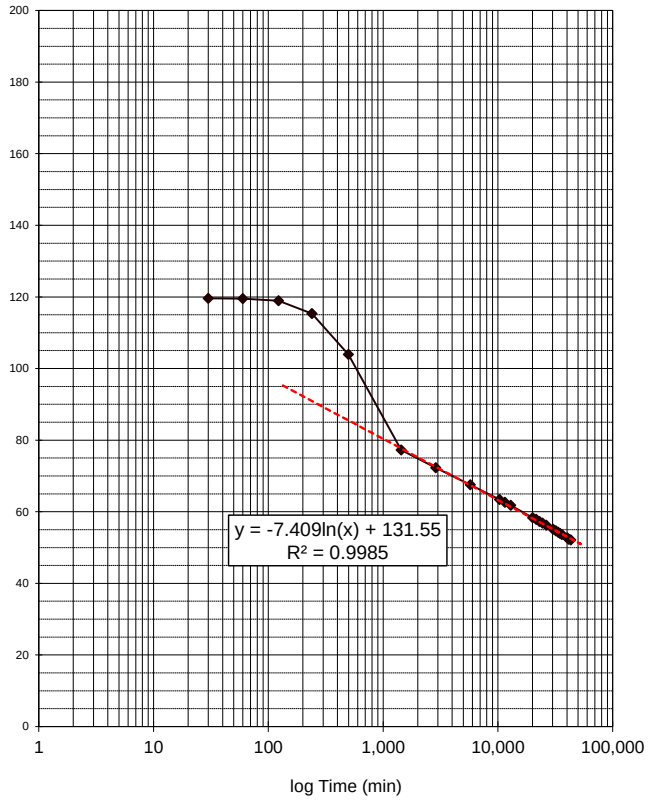
Sample ID: Composite V-1
Depth: ☐ ft ☐ m

Sample description:

Start Time: 8:21
Start Date: 11/13/17

Clock Time	Time (min)	Top Down Settling Ht. (cm)	Bottom up Settling Ht. (cm)
11/13/2017 8:21	0		
	0.1		
	0.25		
	0.5		
	0.75		
11/13/2017 8:22	1		
11/13/2017 8:23	2		
11/13/2017 8:25	4		
11/13/2017 8:29	8		
11/13/2017 8:36	15		
11/13/2017 8:51	30	119.6	
11/13/2017 9:21	60	119.5	
11/13/2017 10:24	123	118.9	
11/13/2017 12:21	240	115.4	
11/13/2017 16:39	498	103.9	
11/14/2017 8:21	1440	77.3	
11/15/2017 8:21	2880	72.3	
11/17/2017 8:09	5748	67.5	
11/20/2017 12:49	10348	63.4	
11/21/2017 8:19	11518	62.7	
11/22/2017 8:11	12950	61.8	
11/27/2017 8:11	20150	58.4	
11/28/2017 8:30	21609	57.9	
11/29/2017 8:41	23060	57.3	
11/30/2017 8:13	24472	56.9	
12/1/2017 15:55	26374	56.3	
12/4/2017 8:05	30224	55.1	
12/5/2017 12:00	31899	54.7	
12/6/2017 15:13	33532	54.3	
12/7/2017 12:09	34788	54.0	
12/8/2017 9:06	36045	53.7	
12/11/2017 8:03	40302	52.7	
12/12/2017 2:32	41411	52.3	
12/13/2017 7:02	43121	52.2	





Diameter of cylinder, cm	20.258
Initial Ht, cm	120
Final ht, cm	52.15
Total WDS, g	6927.1
Specific gravity	2.71
Total Vs, cm^3	2556.125

FINAL CONDITIONS

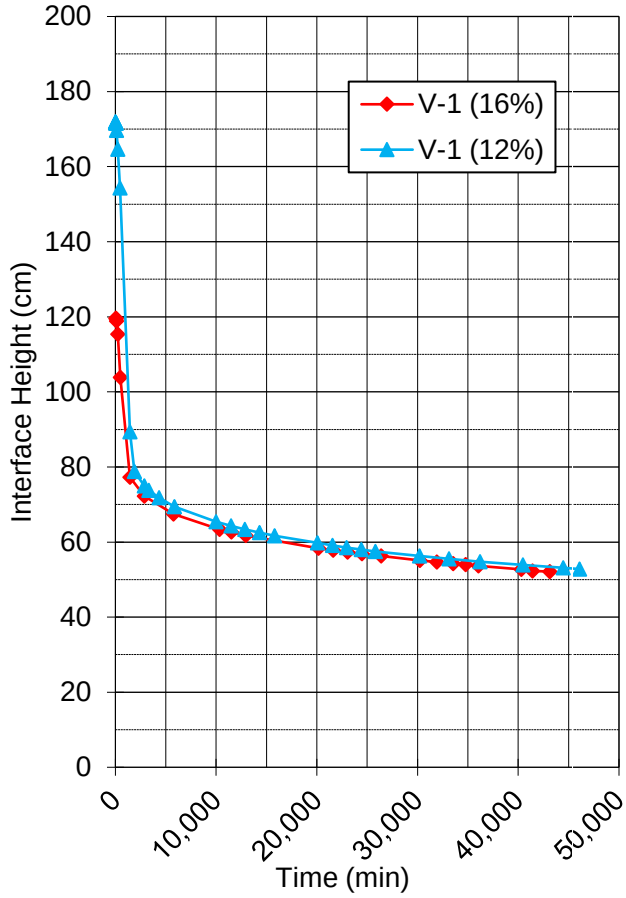
S_f (%)	32.7
e_f	5.58
γd_f (pcf)	25.7
MC_f (%)	206

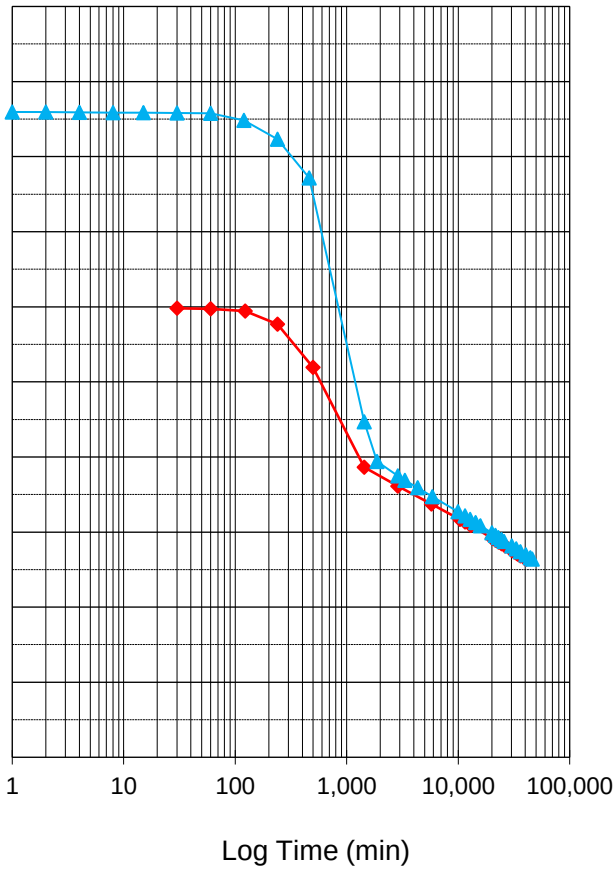
Figure No. B.4-2

Ardaman & Associates, Inc. Geotechnical Testing Laboratory

Settling Test Data - Composite V-1

Project:	Caminada Offshore Borrow
File Number:	16-84-2810A
Engineer:	RJW





Initial Solids Concentration:	12%	16%
Diameter of Cylinder, cm:	20.26	20.26
Initial Height, cm:	172	120
Final Height, cm:	44.9	52.15
Total WDS, g:	7182	6927
Specific Gravity:	2.71	2.71
Total Vs, cm^3:	2650	2556

Final Conditions:

Initial Solids Concentration:	12%	16%
S_f (%):	33.4	32.7
e_f:	5.41	5.58
γd_f (pcf):	26.4	25.7
MC_f (%):	199.6	206
γw_f (pcf):	79.1	78.6

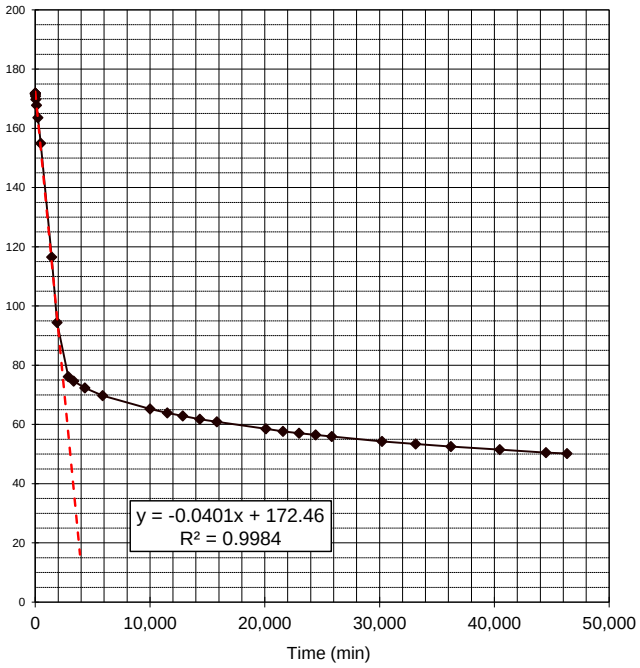
Figure No. B.4-3

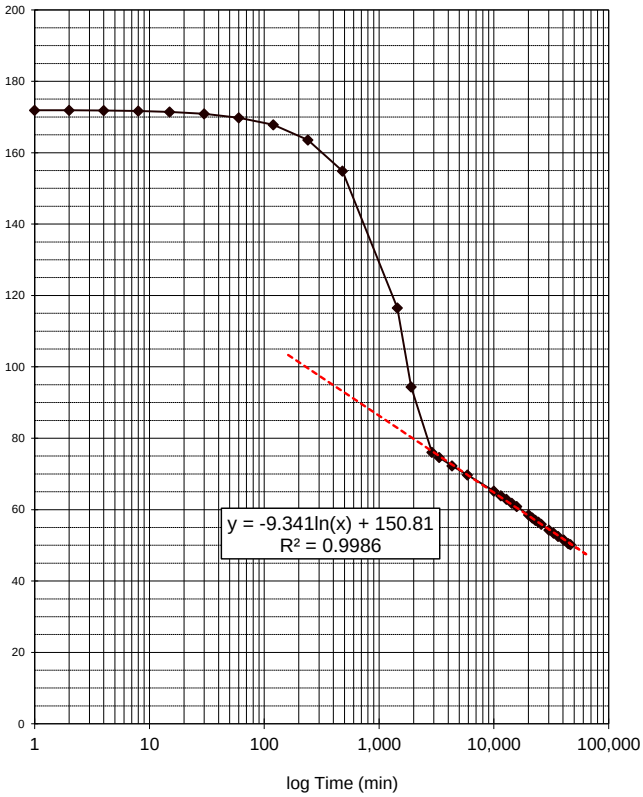
ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
SETTLING TEST DATA

PROJECT:	Caminada Offshore Borrow	Sample ID:	Composite V-2
FILE NUMBER:	16-84-2810A	Depth:	☐ ft ☐ m
Engineer:	RJW		
Cyliner Number:	98		
		Sample description:	
Target solids content, %:	12		
Date sample set-up:	9/20/17		

Start Time: 8:51
Start Date: 9/25/17

Clock Time	Time (min)	Top Down Settling Ht. (cm)	Bottom up Settling Ht. (cm)
9/25/2017 8:51	0		
	0.1		
	0.25		
	0.5		
	0.75		
9/25/2017 8:52	1	171.9	
9/25/2017 8:53	2	171.9	
9/25/2017 8:55	4	171.8	
9/25/2017 8:59	8	171.7	
9/25/2017 9:06	15	171.4	
9/25/2017 9:21	30	170.9	
9/25/2017 9:51	60	169.8	
9/25/2017 10:51	120	167.8	
9/25/2017 12:51	240	163.6	
9/25/2017 16:51	480	154.9	
9/26/2017 8:51	1440	116.5	
9/26/2017 16:31	1900	94.4	
9/27/2017 8:51	2880	76.1	
9/27/2017 16:31	3340	74.6	
9/28/2017 8:51	4320	72.3	
9/29/2017 10:47	5876	69.7	
10/2/2017 7:37	10006	65.2	
10/3/2017 8:45	11514	63.9	
10/4/2017 7:12	12861	62.9	
10/5/2017 7:52	14341	61.8	
10/6/2017 8:25	15814	60.9	
10/9/2017 7:40	20089	58.5	
10/10/2017 8:33	21582	57.7	
10/11/2017 7:49	22978	57	
10/12/2017 7:55	24424	56.5	
10/13/2017 7:34	25843	55.9	
10/16/2017 8:24	30213	54.3	
10/18/2017 9:17	33146	53.4	
10/20/2017 12:36	36225	52.5	
10/23/2017 11:21	40470	51.5	
10/26/2017 6:28	44497	50.5	
10/27/2017 12:59	46328	50.2	





Diameter of cylinder, cm	20.323
Initial Ht, cm	172
Final ht, cm	50.2
Total WDS, g	7253.86
Specific gravity	2.79

FINAL CONDITIONS

S_f (%)	34.7
e_f	5.26
γd_f (pcf)	27.8
MC_f (%)	188.2

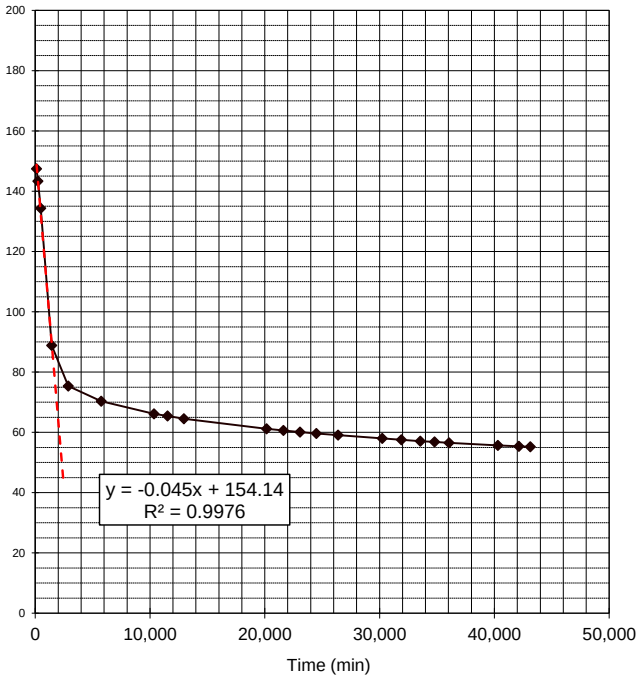
Figure No. B.4-4

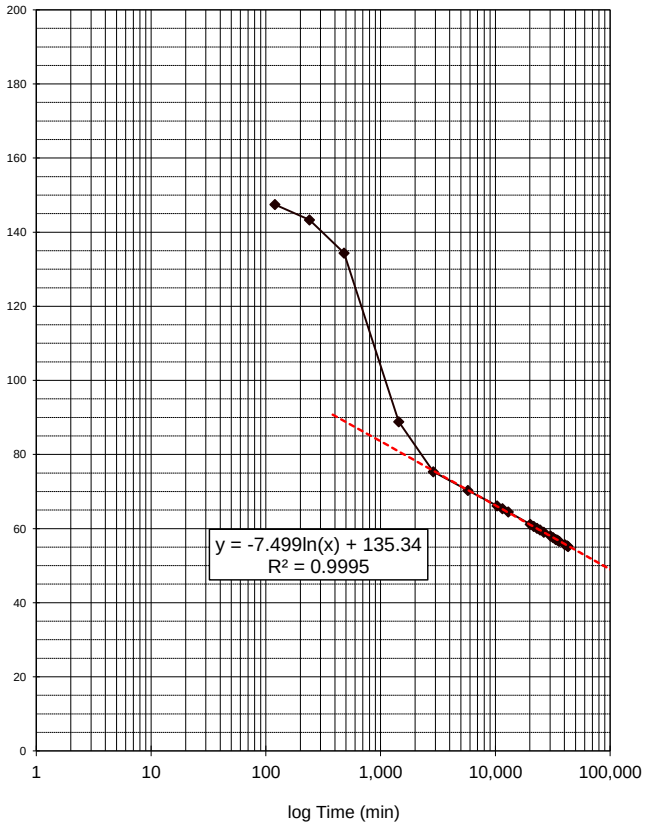
ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
SETTLING TEST DATA

PROJECT:	Caminada Offshore Borrow	Sample ID:	Composite V-2
FILE NUMBER:	16-84-2810A	Depth:	☐ ft ☐ m
Engineer:	RJW		
Cyliner Number:	98		
		Sample description:	
Target solids content, %:	16		
Date sample set-up:	11/9/17		

Start Time: 8:10
Start Date: 11/13/17

Clock Time	Time (min)	Top Down Settling Ht. (cm)	Bottom up Settling Ht. (cm)
11/13/2017 8:10	0		
	0.1		
	0.25		
	0.5		
	0.75		
11/13/2017 8:11	1		
11/13/2017 8:12	2		
11/13/2017 8:14	4		
11/13/2017 8:18	8		
11/13/2017 8:25	15		
11/13/2017 8:40	30		
11/13/2017 9:10	60		
11/13/2017 10:10	120	147.5	
11/13/2017 12:10	240	143.3	
11/13/2017 16:10	480	134.4	5.8
11/14/2017 8:10	1440	88.9	5.8
11/15/2017 8:10	2880	75.4	5.8
11/17/2017 8:10	5760	70.3	5.8
11/20/2017 12:48	10358	66.2	5.8
11/21/2017 8:17	11527	65.4	5.8
11/22/2017 8:09	12959	64.5	5.8
11/27/2017 8:10	20160	61.2	5.8
11/28/2017 8:30	21620	60.6	5.8
11/29/2017 8:40	23070	60.1	5.8
11/30/2017 8:15	24485	59.7	5.8
12/1/2017 15:55	26385	59.1	5.8
12/4/2017 8:07	30237	58.0	5.8
12/5/2017 12:01	31911	57.6	5.8
12/6/2017 15:13	33543	57.1	5.8
12/7/2017 12:10	34800	56.9	5.8
12/8/2017 9:07	36057	56.6	5.8
12/11/2017 8:02	40312	55.7	5.8
12/12/2017 14:32	42142	55.4	5.8
12/13/2017 7:02	43132	55.2	5.8





Diameter of cylinder, cm	20.258
Initial Ht, cm	172
Final ht, cm	55.2
Total WDS, g	8615.22
Specific gravity	2.79
Total Vs, cm^3	

FINAL CONDITIONS

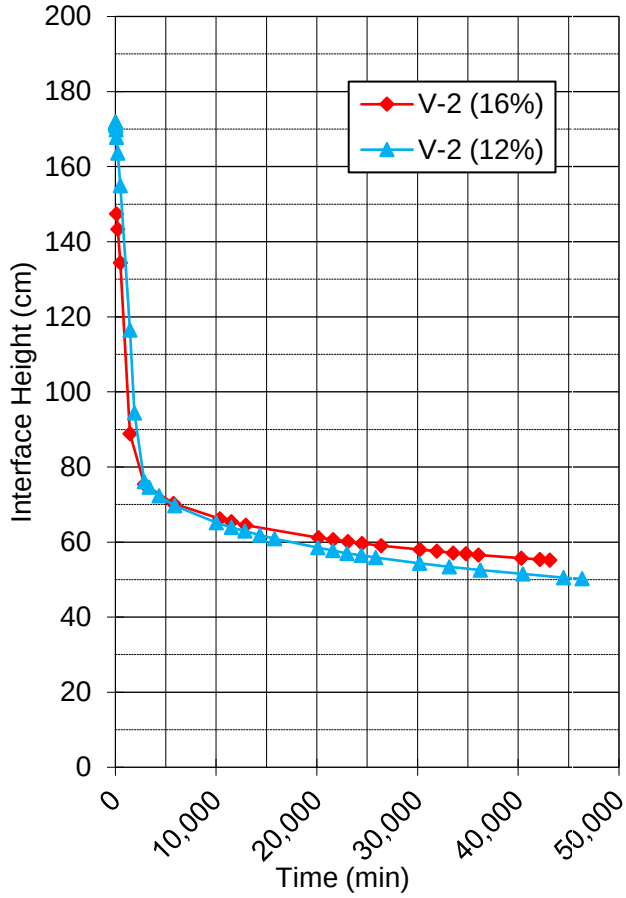
S_f (%)	36.9
e_f	4.76
γd_f (pcf)	30.23
MC_f (%)	170.7

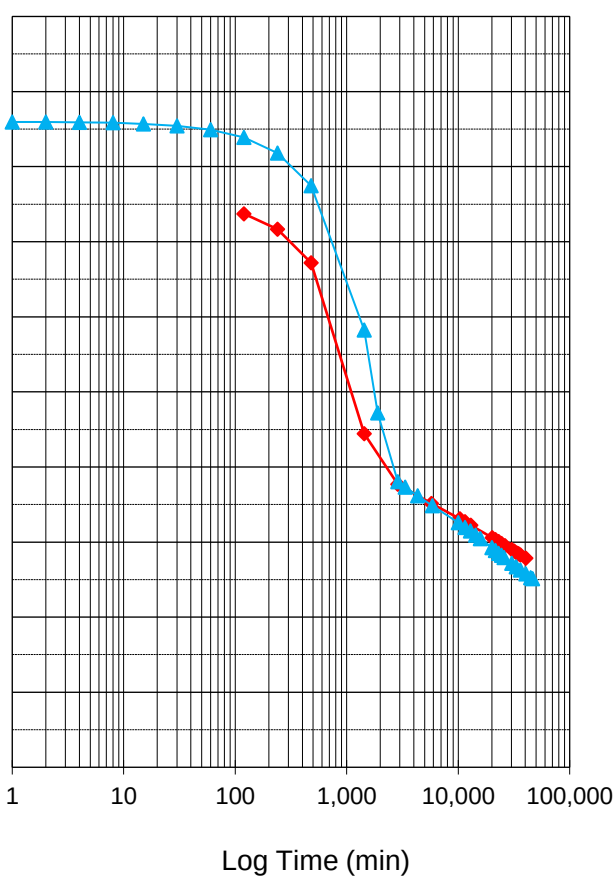
Figure No. B.4-5

Ardaman & Associates, Inc. Geotechnical Testing Laboratory

Settling Test Data - Composite V-2

Project:	Caminada Offshore Borrow
File Number:	16-84-2810A
Engineer:	RJW





Initial Solids Concentration:	12%	16%
Diameter of Cylinder, cm:	20.32	20.26
Initial Height, cm:	172	172
Final Height, cm:	50.2	55.2
Total WDS, g:	7254	8615
Specific Gravity:	2.79	2.79
Total Vs, cm^3:	2600	3088

Final Conditions:

Initial Solids Concentration:	12%	16%
S_f (%):	34.7	36.9
e_f:	5.26	4.76
γd_f (pcf):	27.8	30.2
MC_f (%):	188.2	170.7
γw_f (pcf):	80.1	81.8

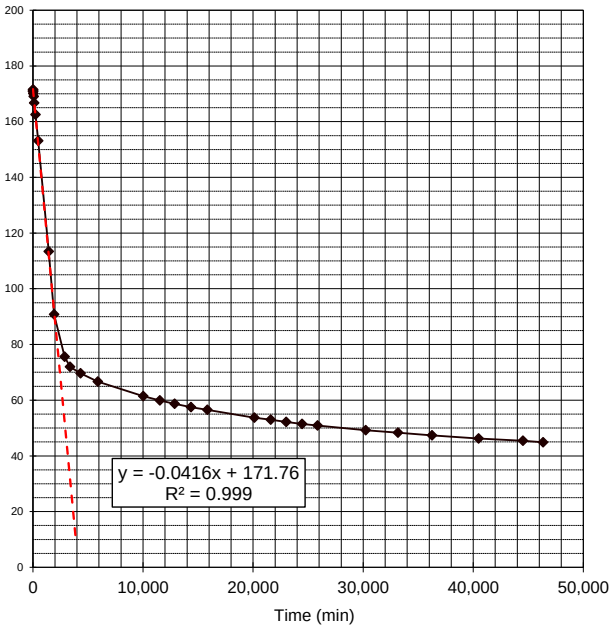
Figure No. B.4-6

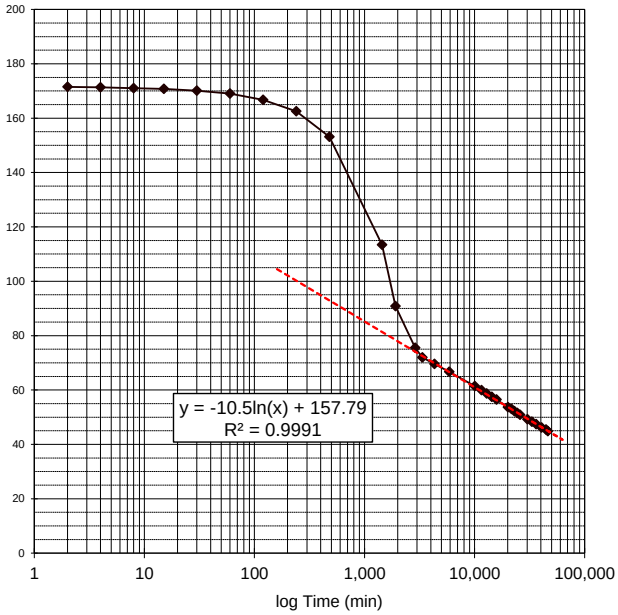
ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
SETTLING TEST DATA

PROJECT:	Caminada Offshore Borrow	Sample ID:	Composite V-3
FILE NUMBER:	16-84-2810A	Depth:	☐ ft ☐ m
Engineer:	RJW		
Cyliner Number:	94		
		Sample description:	
Target solids content, %:	12		
Date sample set-up:	9/20/17		

Start Time: 8:34
Start Date: 9/25/17

Clock Time	Time (min)	Top Down Settling Ht. (cm)	Bottom up Settling Ht. (cm)
9/25/2017 8:34	0		
	0.1		
	0.25		
	0.5		
	0.75		
9/25/2017 8:35	1		
9/25/2017 8:36	2	171.5	
9/25/2017 8:38	4	171.3	
9/25/2017 8:42	8	171.0	
9/25/2017 8:49	15	170.8	
9/25/2017 9:04	30	170.1	
9/25/2017 9:34	60	169.0	
9/25/2017 10:34	120	166.7	
9/25/2017 12:34	240	162.5	
9/25/2017 16:34	480	153.1	
9/26/2017 8:34	1440	113.4	
9/26/2017 16:26	1912	90.8	
9/27/2017 8:34	2880	75.6	
9/27/2017 16:32	3358	72.0	
9/28/2017 8:34	4320	69.6	
9/29/2017 10:47	5893	66.7	
10/2/2017 7:37	10023	61.4	
10/3/2017 8:44	11530	59.9	
10/4/2017 7:13	12879	58.7	
10/5/2017 7:53	14359	57.5	
10/6/2017 8:26	15832	56.5	
10/9/2017 7:40	20106	53.7	
10/10/2017 8:34	21600	53.0	
10/11/2017 7:50	22996	52.2	
10/12/2017 7:55	24441	51.5	
10/13/2017 7:34	25860	50.9	
10/16/2017 8:24	30230	49.2	
10/18/2017 9:17	33163	48.3	
10/20/2017 12:36	36242	47.4	
10/23/2017 11:21	40487	46.2	
10/26/2017 6:28	44514	45.4	
10/27/2017 12:58	46344	44.9	





Diameter of cylinder, cm	20.258
Initial Ht, cm	172
Final ht, cm	44.9
Total WDS, g	7181.7
Specific gravity	2.59
Total Vs, cm^3	

FINAL CONDITIONS

S_f (%)	38.0
e_f	4.22
γd_f (pcf)	31.0
MC_f (%)	162.9

Figure No. B.4-7

ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
SETTLING TEST DATA

PROJECT: Caminada Offshore Borrow
FILE NUMBER: 16-84-2810A
Engineer: RJW
Cyliner Number: 94

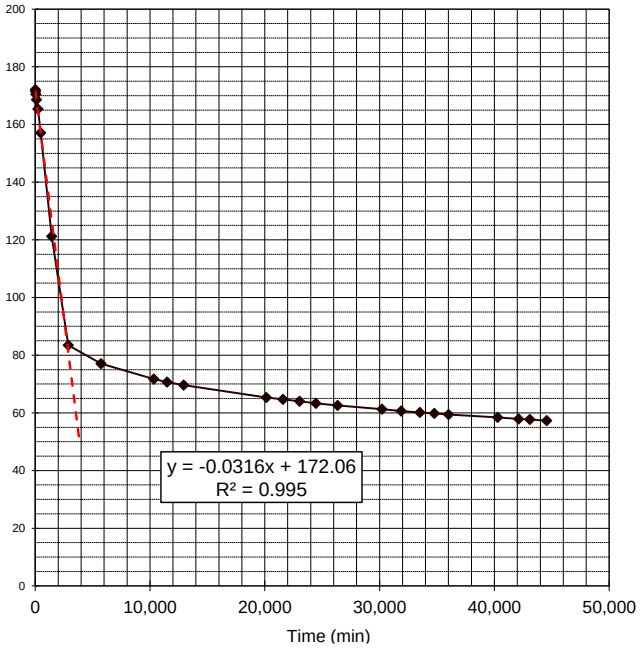
Target solids content, %: 16
Date sample set-up: 11/9/17

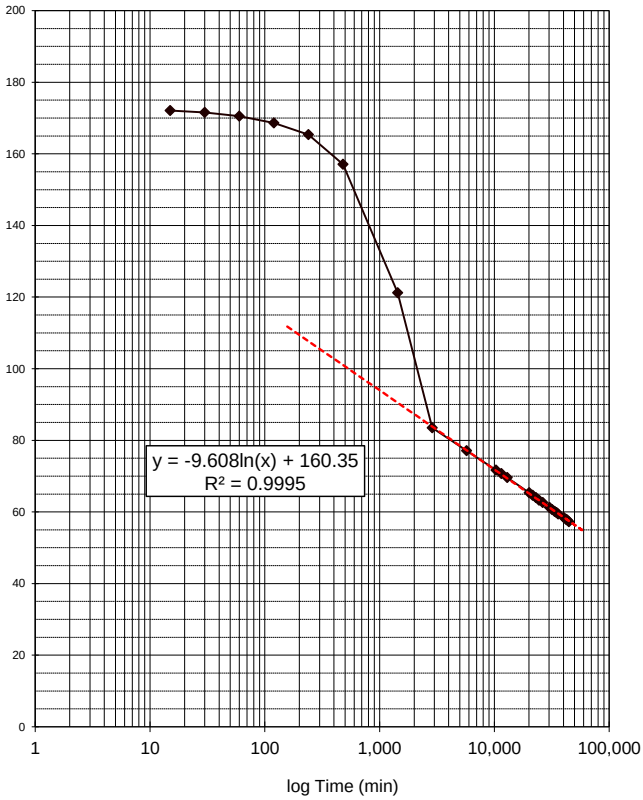
Sample ID: Composite V-3
Depth: ☐ ft ☐ m

Sample description:

Start Time: 8:44
Start Date: 11/13/17

Clock Time	Time (min)	Top Down Settling Ht. (cm)	Bottom up Settling Ht. (cm)
11/13/2017 8:44	0		
	0.1		
	0.25		
	0.5		
	0.75		
11/13/2017 8:45	1		
11/13/2017 8:46	2		
11/13/2017 8:48	4		
11/13/2017 8:52	8		
11/13/2017 8:59	15	172.1	
11/13/2017 9:14	30	171.6	2.1
11/13/2017 9:44	60	170.5	5.5
11/13/2017 10:44	120	168.7	9.8
11/13/2017 12:44	240	165.4	9.8
11/13/2017 16:44	480	157.1	9.8
11/14/2017 8:44	1440	121.2	9.8
11/15/2017 8:44	2880	83.5	9.8
11/17/2017 8:08	5724	77.1	9.8
11/20/2017 12:49	10325	71.7	9.8
11/21/2017 8:20	11496	70.7	9.8
11/22/2017 8:17	12933	69.6	9.8
11/27/2017 8:12	20128	65.4	9.8
11/28/2017 8:31	21587	64.7	9.8
11/29/2017 8:38	23034	64.0	9.8
11/30/2017 8:12	24448	63.3	9.8
12/1/2017 15:54	26350	62.6	9.8
12/4/2017 8:08	30204	61.3	9.8
12/5/2017 12:00	31876	60.7	9.8
12/6/2017 15:10	33506	60.2	9.8
12/7/2017 12:09	34765	59.9	9.8
12/8/2017 9:06	36022	59.5	9.8
12/11/2017 8:03	40279	58.5	9.8
12/12/2017 14:33	42109	57.9	9.8
12/13/2017 7:03	43099	57.7	9.8
12/14/2017 7:20	44556	57.3	9.8





Diameter of cylinder, cm	20.258
Initial Ht, cm	172
Final ht, cm	57.7
Total WDS, g	9893.53
Specific gravity	2.59
Total Vs, cm^3	

FINAL CONDITIONS

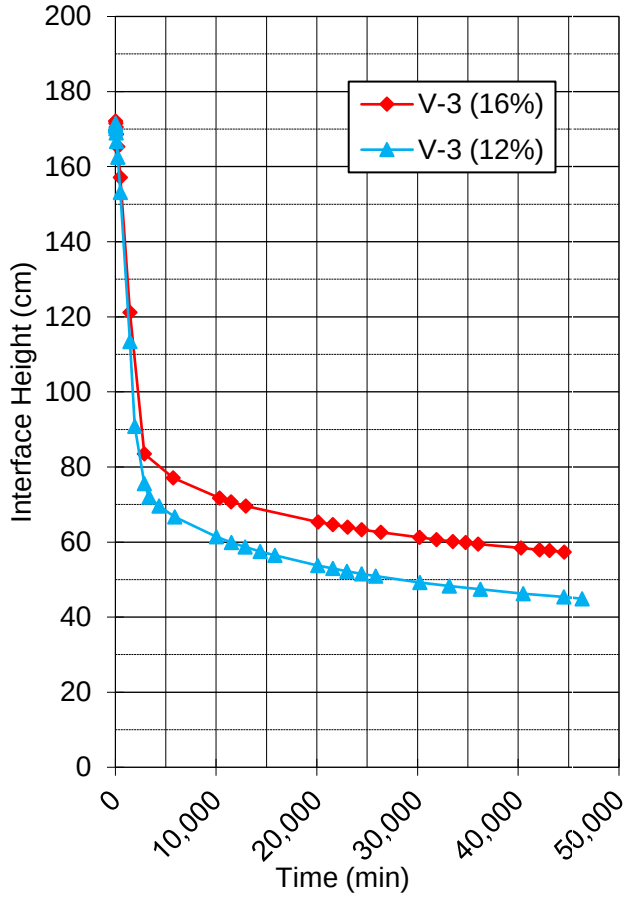
S_f (%)	40.1
e_f	3.87
γd_f (pcf)	33.2
MC_f (%)	149.4

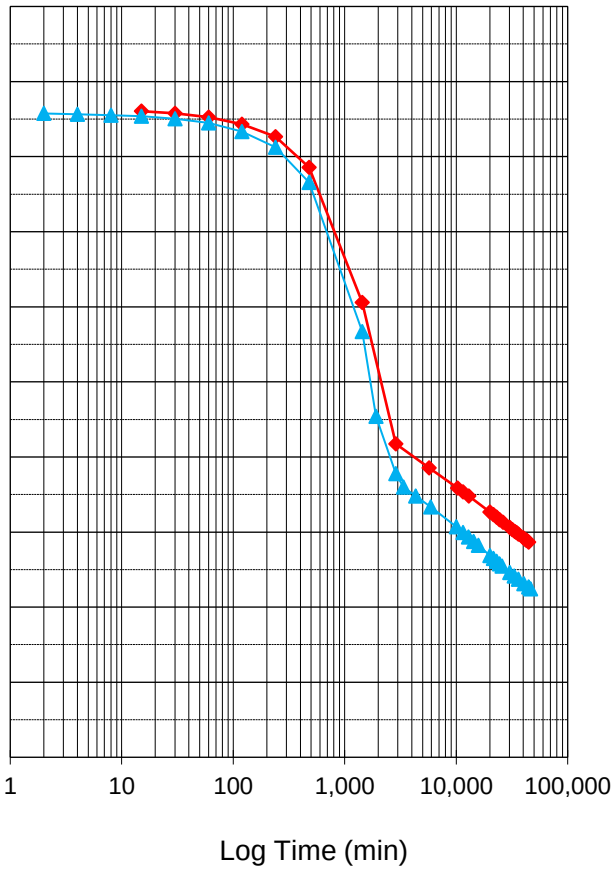
Figure No. B.4-8

Ardaman & Associates, Inc. Geotechnical Testing Laboratory

Settling Test Data - Composite V-3

Project:	Caminada Offshore Borrow
File Number:	16-84-2810A
Engineer:	RJW

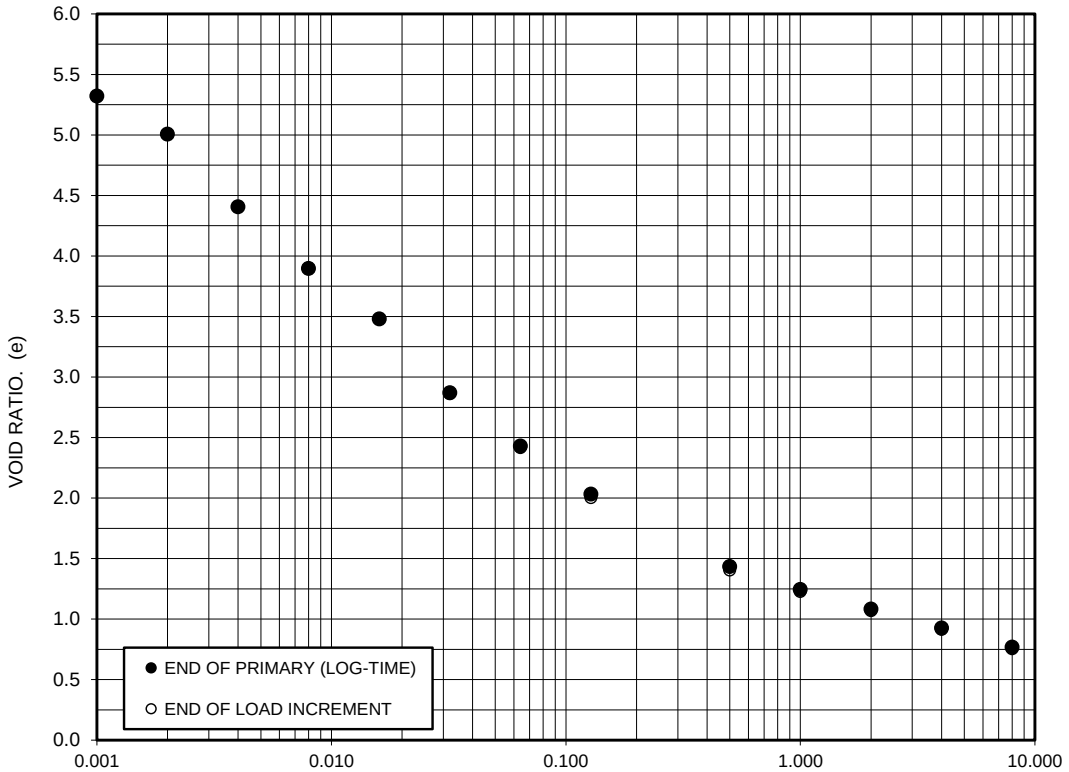


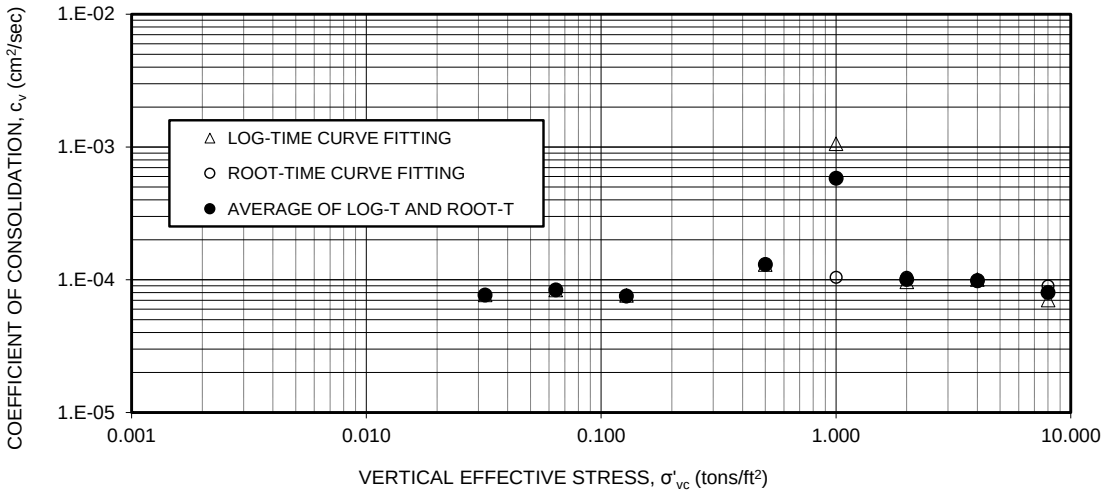


Initial Solids Concentration:	12%	16%
Diameter of Cylinder, cm:	20.26	20.26
Initial Height, cm:	172	172
Final Height, cm:	44.9	57.7
Total WDS, g:	7182	9894
Specific Gravity:	2.59	2.59
Total Vs, cm^3:	2773	3820

Final Conditions:

Initial Solids Concentration:	12%	16%
S_f (%):	38.0	40.1
e_f:	4.22	3.87
γd_f (pcf):	31.0	33.2
MC_f (%):	162.9	149.4
γw_f (pcf):	81.5	82.8





SAMPLE DATA

BORING NO.:	V-1
SAMPLE DEPTH (ft):	Composite (0-10 ft.)
DESCRIPTION:	Gray Clay CH

SPECIMEN CONDITIONS

	INITIAL	FINAL
MOISTURE CONTENT (%):	221.061	32.885
DRY DENSITY (lb/ft^3):	24.1	96.3
VOID RATIO:	6.006	0.756
TOTAL DENSITY (lb/ft^3):	77.5	127.9
SATURATION (%):	99.68	117.79

INDEX PROPERTIES

LIQUID LIMIT (%):	74
PLASTIC LIMIT (%):	22
PLASTICITY INDEX (%):	52
SPECIFIC GRAVITY:	2.708
-200 (%):	98.7

INCREMENTAL CONSOLIDATION TEST RESULTS

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

CAMINADA BORROW
COASTAL RESTORATION & PROTECTION AUTHORITY

DRAWN BY: RW	CHECKED BY:	DATE: 11-29-17
FILE NO.: 17-84-2810A	APPROVED BY:	FIGURE:

Figure No. B.5-1

ARDAMAN & ASSOCIATES, INC
GEOTECHNICAL TESTING LABORATORY
ONE-DIMENSIONAL INCREMENTAL LOADING CONSOLIDATION TEST SUMMARY SHEET

Effective Stress (tsf)	Dial Readings (inch)			Time, t_{90} or t_{50} (second)	Time-Deformation Method [L=Log t] [S=Sq Root t]	Coefficient of Consolidation, c_v (cm^2/sec)	Average Effective Stress (tsf)	Height (inch)		Void Ratio		Strain (%)		Coefficient of Volume Compressibility, m_v (cm^2/kg)	Average Void Ratio for k_v	Hydraulic Conductivity, k_v (cm/sec)	Secondary Compression	
	Initial	End of Primary (EOP)	End of Increment (EOI)					EOP	EOI	EOP	EOI	EOP	EOI				Cα (%)	Cαe
0.00	0.0000	0.0000	0.0000	---	---	---	---	5.7100	5.7100	-----	-----	-----	-----	-----	-----	-----	-----	-----
0.001	0.0246	0.5815	0.5815	---	---	---	0.001	5.1531	5.1531	5.322	5.322	9.75	9.75	-----	-----	-----	-----	-----
0.002	0.5815	0.8384	0.8384	---	---	---	0.002	4.8962	4.8962	5.007	5.007	14.25	14.25	51.069	5.16	-----	-----	-----
0.004	0.8384	1.3268	1.3268	---	---	---	0.003	4.4078	4.4078	4.408	4.408	22.81	22.81	51.086	4.71	-----	-----	-----
0.008	1.3268	1.7422	1.7422	---	---	---	0.006	3.9924	3.9924	3.898	3.898	30.08	30.08	24.132	4.15	-----	-----	-----
0.016	1.7422	2.0830	2.0830	---	---	---	0.012	3.6516	3.6516	3.480	3.480	36.05	36.05	10.929	3.69	-----	-----	-----
0.032	2.0830	2.5800	2.5856	48000	L	7.7E-05	0.024	3.1546	3.1490	2.870	2.863	44.75	44.85	8.713	3.18	6.7E-07	-----	-----
0.064	2.5856	2.9380	2.9495	33600	L	8.4E-05	0.048	2.7966	2.7851	2.431	2.417	51.02	51.22	3.582	2.65	3.0E-07	-----	-----
0.128	2.9495	3.2630	3.2866	28800	L	7.6E-05	0.096	2.4716	2.4480	2.032	2.003	56.71	57.13	1.801	2.22	1.4E-07	-----	-----
0.500	3.2866	3.7500	3.7732	12000	L	1.3E-04	0.314	1.9846	1.9614	1.435	1.406	65.24	65.65	0.521	1.72	6.8E-08	-----	-----
1.000	3.7732	3.9050	3.9177	1080	L	1.1E-03	0.750	1.8296	1.8169	1.245	1.229	67.96	68.18	0.138	1.33	1.5E-07	-----	-----
2.000	3.9177	4.0370	4.0479	10200	L	9.6E-05	1.500	1.6976	1.6867	1.083	1.069	70.27	70.46	0.067	1.16	6.5E-09	-----	-----
4.000	4.0479	4.1640	4.1729	8400	L	1.0E-04	3.000	1.5706	1.5617	0.927	0.916	72.49	72.65	0.035	1.00	3.5E-09	-----	-----
8.000	4.1729	4.2930	4.3033	10200	L	7.0E-05	6.000	1.4416	1.4313	0.769	0.756	74.75	74.93	0.020	0.84	1.4E-09	-----	-----

Project Name: **Caninada Offshore**
File Number: **17-84-2810A**
Boring: **V-1**
Sample: **Composite**
Depth: **0-10**

Parameter	Initial Specimen Conditions	Final Specimen Conditions
Height (inch)	5.7100	1.4313
w_c (%)	221.061	32.885
γ_t (pcf)	77.5	127.9
γ_d (pcf)	24.1	96.3
Saturation (%)	99.680	117.787
Void ratio, e	6.006	0.756

Specific Gravity	2.708
Ring Diameter (inch)	3.9430
Ring Mass (gram)	0.00
Height of Solids (inch)	0.8151
Mass of Dry Soil (gram)	441.66

Checked By: _____
Date: _____

Figure No. B.5-2

ARDAMAN & ASSOCIATES, INC
GEOTECHNICAL TESTING LABORATORY
ONE-DIMENSIONAL INCREMENTAL LOADING CONSOLIDATION TEST SUMMARY SHEET

Effective Stress (tsf)	Dial Readings (inch)			Time, t_{90} or t_{50} (second)	Time-Deformation Method [L=Log t] [S=Sq Root t]	Coefficient of Consolidation, c_v (cm^2/sec)	Average Effective Stress (tsf)	Height (inch)		Void Ratio		Strain (%)		Coefficient of Volume Compressibility, m_v (cm^2/kg)	Average Void Ratio for k_v	Hydraulic Conductivity, k_v (cm/sec)	Secondary Compression	
	Initial	End of Primary (EOP)	End of Increment (EOI)					EOP	EOI	EOP	EOI	EOP	EOI				Cα (%)	Cαe
0.00	0.0000	0.0000	0.0000	---	---	---	---	5.7100	5.7100	-----	-----	-----	-----	-----	-----	-----	-----	-----
0.001	0.0246	0.5815	0.5815	---	---	---	0.001	5.1531	5.1531	5.322	5.322	9.75	9.75	-----	-----	-----	-----	-----
0.002	0.5815	0.8384	0.8384	---	---	---	0.002	4.8962	4.8962	5.007	5.007	14.25	14.25	51.069	5.16	-----	-----	-----
0.004	0.8384	1.3268	1.3268	---	---	---	0.003	4.4078	4.4078	4.408	4.408	22.81	22.81	51.086	4.71	-----	-----	-----
0.008	1.3268	1.7422	1.7422	---	---	---	0.006	3.9924	3.9924	3.898	3.898	30.08	30.08	24.132	4.15	-----	-----	-----
0.016	1.7422	2.0830	2.0830	---	---	---	0.012	3.6516	3.6516	3.480	3.480	36.05	36.05	10.929	3.69	-----	-----	-----
0.032	2.0830	2.5856	2.5856	---	---	---	0.024	3.1490	3.1490	2.863	2.863	44.85	44.85	8.811	3.17	-----	-----	-----
0.064	2.5856	2.9495	2.9495	---	---	---	0.048	2.7851	2.7851	2.417	2.417	51.22	51.22	3.699	2.64	-----	-----	-----
0.128	2.9495	3.2678	3.2866	126960	S	7.4E-05	0.096	2.4668	2.4480	2.026	2.003	56.80	57.13	1.829	2.22	1.4E-07	-----	-----
0.500	3.2866	3.7732	3.7732	--	S	--	0.314	1.9614	1.9614	1.406	1.406	65.65	65.65	0.547	1.70	--	-----	-----
1.000	3.7732	3.9096	3.9177	47040	S	1.0E-04	0.750	1.8250	1.8169	1.239	1.229	68.04	68.18	0.142	1.32	1.5E-08	-----	-----
2.000	3.9177	4.0347	4.0479	40560	S	1.0E-04	1.500	1.6999	1.6867	1.086	1.069	70.23	70.46	0.066	1.16	6.9E-09	-----	-----
4.000	4.0479	4.1700	4.1729	37500	S	9.6E-05	3.000	1.5646	1.5617	0.920	0.916	72.60	72.65	0.037	0.99	3.6E-09	-----	-----
8.000	4.1729	4.2841	4.3033	34560	S	9.0E-05	6.000	1.4505	1.4313	0.780	0.756	74.60	74.93	0.018	0.85	1.6E-09	-----	-----

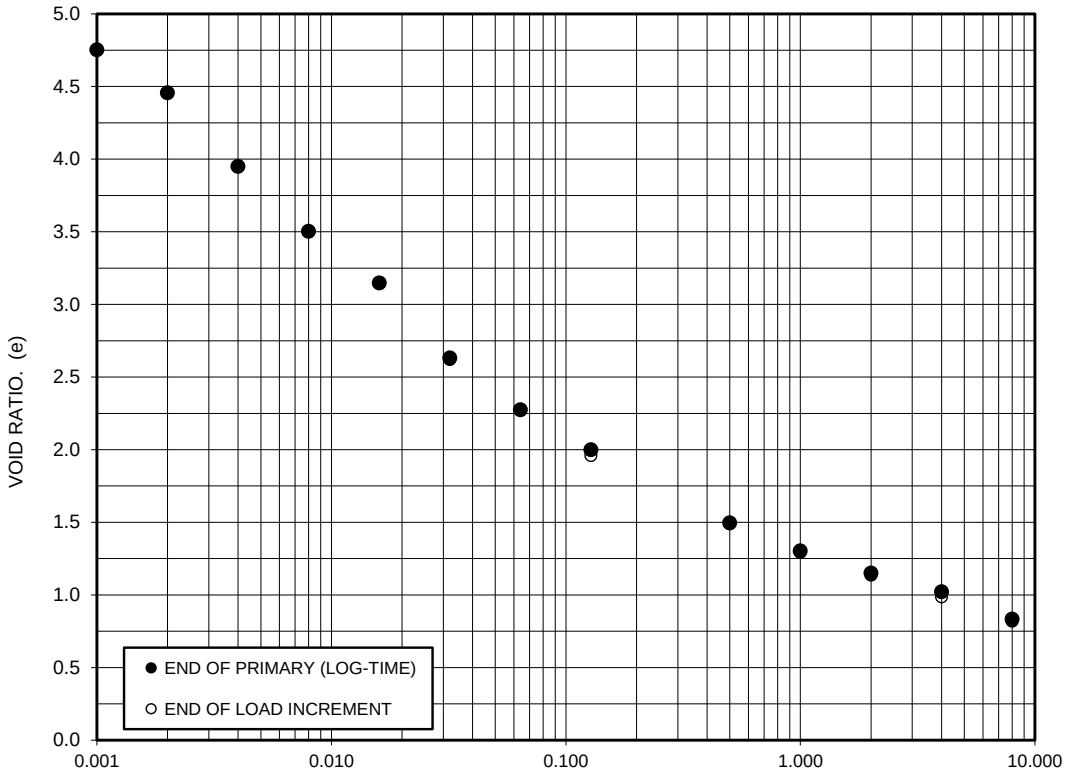
Project Name: **Caninada Offshore**
File Number: **17-84-2810A**
Boring: **V-1**
Sample: **Composite**
Depth: **0-10**

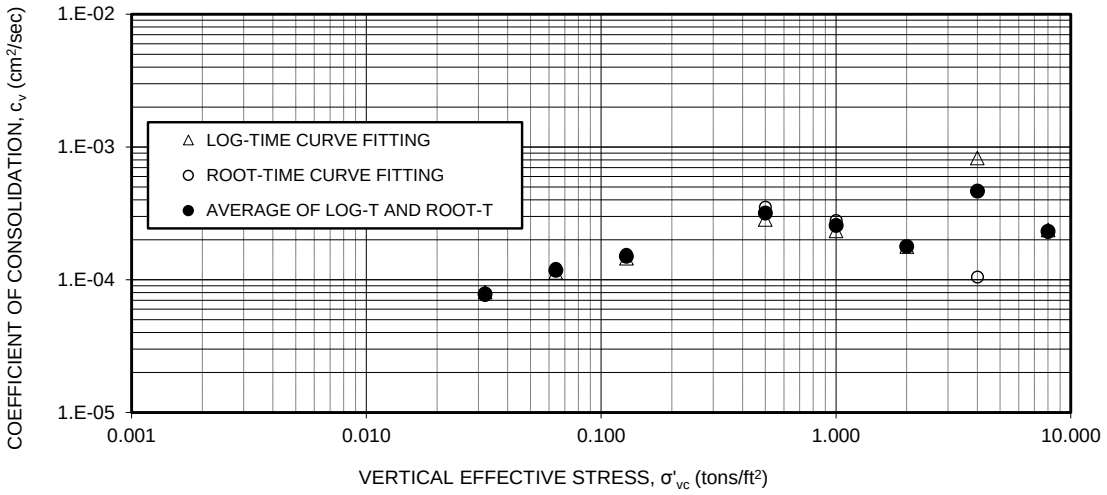
Parameter	Initial Specimen Conditions	Final Specimen Conditions
Height (inch)	5.7100	1.4313
w_c (%)	221.061	32.885
γ_t (pcf)	77.5	127.9
γ_d (pcf)	24.1	96.3
Saturation (%)	99.680	117.787
Void ratio, e	6.006	0.756

Specific Gravity	2.708
Ring Diameter (inch)	3.9430
Ring Mass (gram)	0.00
Height of Solids (inch)	0.8151
Mass of Dry Soil (gram)	441.66

Checked By: _____
Date: _____

Figure No. B.5-3





SAMPLE DATA	
BORING NO.:	V-2
SAMPLE DEPTH (ft):	Composite (0-10ft)
DESCRIPTION:	Gray Clay CH

SPECIMEN CONDITIONS	INITIAL	FINAL
MOISTURE CONTENT (%):	201.377	29.888
DRY DENSITY (lb/ft^3):	26.2	95.7
VOID RATIO:	5.645	0.819
TOTAL DENSITY (lb/ft^3):	79.0	124.3
SATURATION (%):	99.50	101.79

INDEX PROPERTIES	
LIQUID LIMIT (%):	62
PLASTIC LIMIT (%):	21
PLASTICITY INDEX (%):	41
SPECIFIC GRAVITY:	2.789
-200 (%):	98

INCREMENTAL CONSOLIDATION TEST RESULTS

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

CAMINADA BORROW
COASTAL RESTORATION & PROTECTION AUTHORITY

DRAWN BY: RJB	CHECKED BY:	DATE: 11-29-17
FILE NO.: 17-84-2810A	APPROVED BY:	FIGURE:

Figure No. B.5-4

ARDAMAN & ASSOCIATES, INC
GEOTECHNICAL TESTING LABORATORY
ONE-DIMENSIONAL INCREMENTAL LOADING CONSOLIDATION TEST SUMMARY SHEET

Effective Stress (tsf)	Dial Readings (inch)			Time, t_{90} or t_{50} (second)	Time-Deformation Method [L=Log t] [S=Sq Root t]	Coefficient of Consolidation, c_v (cm^2/sec)	Average Effective Stress (tsf)	Height (inch)		Void Ratio		Strain (%)		Coefficient of Volume Compressibility, m_v (cm^2/kg)	Average Void Ratio for k_v	Hydraulic Conductivity, k_v (cm/sec)	Secondary Compression	
	Initial	End of Primary (EOP)	End of Increment (EOI)					EOP	EOI	EOP	EOI	EOP	EOI				Cα (%)	Cαe
0.00	0.0000	0.0000	0.0000	---	---	---	---	5.2000	5.2000	-----	-----	-----	-----	-----	-----	-----	-----	-----
0.001	0.0029	0.7009	0.7009	---	---	---	0.001	4.5020	4.5020	4.753	4.753	13.42	13.42	-----	-----	-----	-----	-----
0.002	0.7009	0.9319	0.9319	---	---	---	0.002	4.2710	4.2710	4.458	4.458	17.87	17.87	52.556	4.61	-----	-----	-----
0.004	0.9319	1.3291	1.3291	---	---	---	0.003	3.8738	3.8738	3.950	3.950	25.50	25.50	47.628	4.20	-----	-----	-----
0.008	1.3291	1.6783	1.6783	---	---	---	0.006	3.5246	3.5246	3.504	3.504	32.22	32.22	23.083	3.73	-----	-----	-----
0.016	1.6783	1.9568	1.9568	---	---	---	0.012	3.2461	3.2461	3.148	3.148	37.58	37.58	10.117	3.33	-----	-----	-----
0.032	1.9568	2.3600	2.3696	36600	L	8.0E-05	0.024	2.8429	2.8333	2.633	2.620	45.33	45.51	7.952	2.89	6.4E-07	-----	-----
0.064	2.3696	2.6400	2.6400	20400	L	1.1E-04	0.048	2.5629	2.5629	2.275	2.275	50.71	50.71	3.055	2.45	3.5E-07	-----	-----
0.128	2.6400	2.8550	2.8864	13200	L	1.5E-04	0.096	2.3479	2.3165	2.000	1.960	54.85	55.45	1.343	2.14	1.9E-07	-----	-----
0.500	2.8864	3.2498	3.2540	5100	L	2.8E-04	0.314	1.9531	1.9489	1.496	1.490	62.44	62.52	0.432	1.73	1.2E-07	-----	-----
1.000	3.2540	3.4000	3.4092	4800	L	2.3E-04	0.750	1.8029	1.7937	1.304	1.292	65.33	65.51	0.153	1.40	3.6E-08	-----	-----
2.000	3.4092	3.5200	3.5315	5400	L	1.8E-04	1.500	1.6829	1.6714	1.150	1.136	67.64	67.86	0.063	1.22	1.1E-08	-----	-----
4.000	3.5315	3.6200	3.6480	1020	L	8.2E-04	3.000	1.5829	1.5549	1.023	0.987	69.56	70.10	0.027	1.08	2.2E-08	-----	-----
8.000	3.6480	3.7680	3.7795	3000	L	2.4E-04	6.000	1.4349	1.4234	0.834	0.819	72.41	72.63	0.020	0.91	4.7E-09	-----	-----

Project Name: **Caninada Offshore**
File Number: **17-84-2810A**
Boring: **V-2**
Sample: **Composite**
Depth: **0-10**

Parameter	Initial Specimen Conditions	Final Specimen Conditions
Height (inch)	5.2000	1.4234
w_c (%)	201.377	29.888
γ_t (pcf)	79.0	124.3
γ_d (pcf)	26.2	95.7
Saturation (%)	99.50	101.79
Void ratio, e	5.645	0.819

Specific Gravity	2.789
Ring Diameter (inch)	3.9740
Ring Mass (gram)	0.00
Height of Solids (inch)	0.7826
Mass of Dry Soil (gram)	443.63

Checked By: _____
Date: _____

Figure No. B.5-5

ARDAMAN & ASSOCIATES, INC
GEOTECHNICAL TESTING LABORATORY
ONE-DIMENSIONAL INCREMENTAL LOADING CONSOLIDATION TEST SUMMARY SHEET

Effective Stress (tsf)	Dial Readings (inch)			Time, t_{90} or t_{50} (second)	Time-Deformation Method [L=Log t] [S=Sq Root t]	Coefficient of Consolidation, c_v (cm^2/sec)	Average Effective Stress (tsf)	Height (inch)		Void Ratio		Strain (%)		Coefficient of Volume Compressibility, m_v (cm^2/kg)	Average Void Ratio for k_v	Hydraulic Conductivity, k_v (cm/sec)	Secondary Compression	
	Initial	End of Primary (EOP)	End of Increment (EOI)					EOP	EOI	EOP	EOI	EOP	EOI				Cα (%)	Cαe
0.00	0.0000	0.0000	0.0000	---	---	---	---	5.2000	5.2000	-----	-----	-----	-----	-----	-----	-----	-----	-----
0.001	0.0029	0.7009	0.7009	---	---	---	0.001	4.5020	4.5020	4.753	4.753	13.42	13.42	-----	-----	-----	-----	-----
0.002	0.7009	0.9319	0.9319	---	---	---	0.002	4.2710	4.2710	4.458	4.458	17.87	17.87	52.556	4.61	-----	-----	-----
0.004	0.9319	1.3291	1.3291	---	---	---	0.003	3.8738	3.8738	3.950	3.950	25.50	25.50	47.628	4.20	-----	-----	-----
0.008	1.3291	1.6783	1.6783	---	---	---	0.006	3.5246	3.5246	3.504	3.504	32.22	32.22	23.083	3.73	-----	-----	-----
0.016	1.6783	1.9568	1.9568	---	---	---	0.012	3.2461	3.2461	3.148	3.148	37.58	37.58	10.117	3.33	-----	-----	-----
0.032	1.9568	2.3696	2.3696	166637	S	7.6E-05	0.024	2.8333	2.8333	2.620	2.620	45.51	45.51	8.141	2.88	-----	-----	-----
0.064	2.3696	2.6330	2.6400	82140	S	1.2E-04	0.048	2.5699	2.5629	2.284	2.275	50.58	50.71	2.976	2.45	-----	-----	-----
0.128	2.6400	2.8840	2.8864	52570	S	1.6E-04	0.096	2.3189	2.3165	1.963	1.960	55.41	55.45	1.524	2.12	2.4E-07	-----	-----
0.500	2.8864	3.2260	3.2540	17957	S	3.5E-04	0.314	1.9769	1.9489	1.526	1.490	61.98	62.52	0.404	1.74	1.4E-07	-----	-----
1.000	3.2540	3.3940	3.4092	17340	S	2.8E-04	0.750	1.8089	1.7937	1.311	1.292	65.21	65.51	0.147	1.40	4.1E-08	-----	-----
2.000	3.4092	3.5200	3.5315	---	---	---	1.500	1.6829	1.6714	1.150	1.136	67.64	67.86	0.063	1.22	-----	-----	-----
4.000	3.5315	3.6200	3.6480	34560	S	1.0E-04	3.000	1.5829	1.5549	1.023	0.987	69.56	70.10	0.027	1.08	2.8E-09	-----	-----
8.000	3.6480	3.7680	3.7795	13500	S	2.3E-04	6.000	1.4349	1.4234	0.834	0.819	72.41	72.63	0.020	0.91	4.5E-09	-----	-----

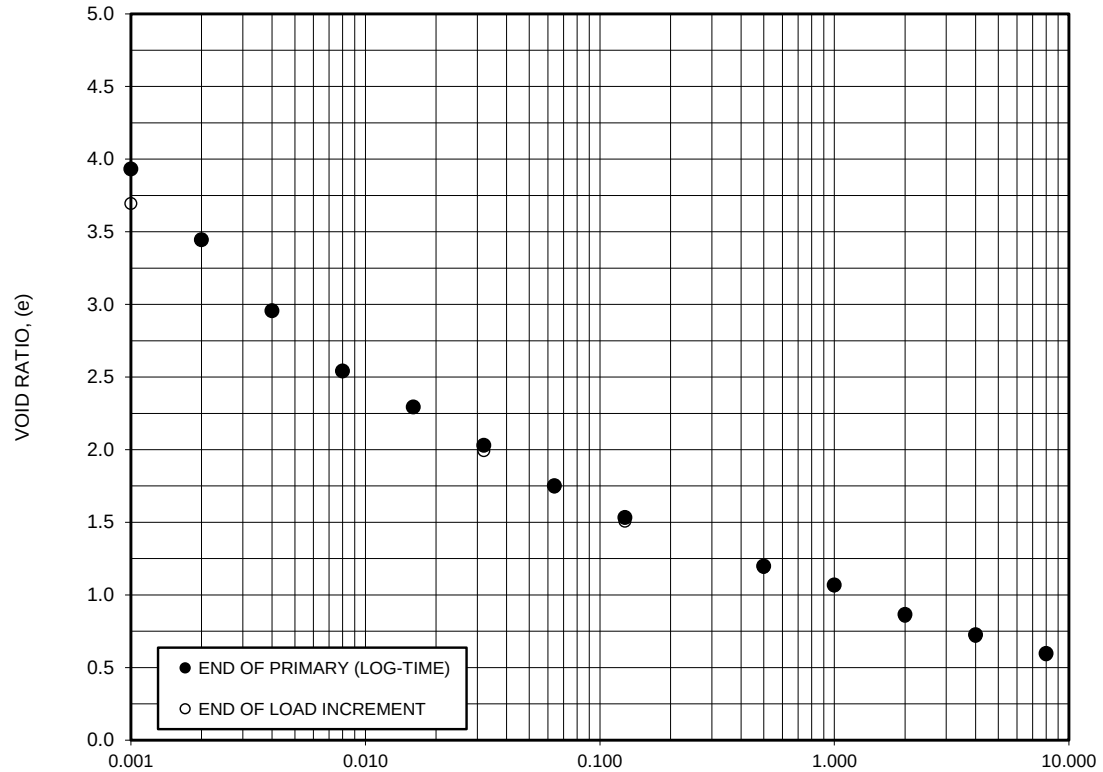
Project Name: **Caninada Offshore**
File Number: **17-84-2810A**
Boring: **V-2**
Sample: **Composite**
Depth: **0-10**

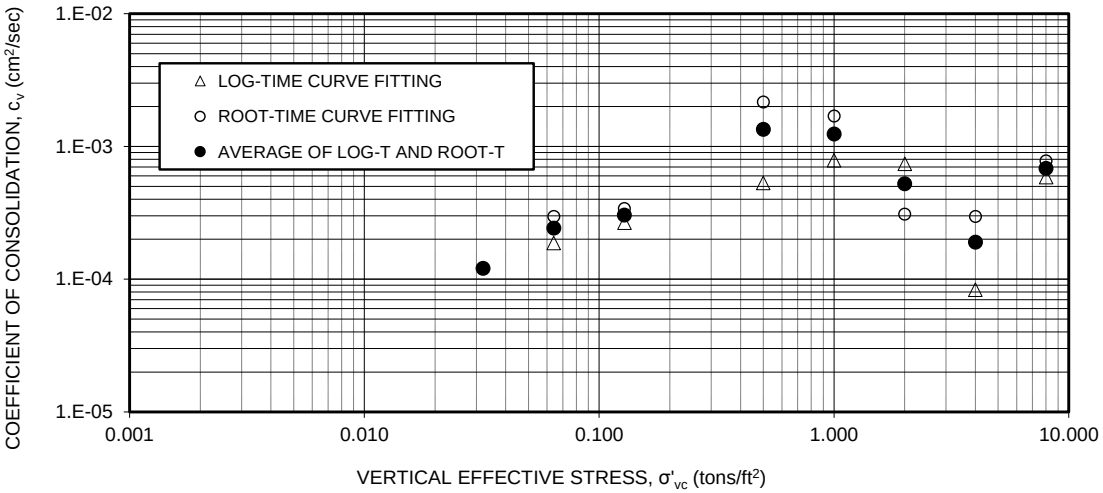
Parameter	Initial Specimen Conditions	Final Specimen Conditions
Height (inch)	5.2000	1.4234
w_c (%)	201.377	29.888
γ_t (pcf)	79.0	124.3
γ_d (pcf)	26.2	95.7
Saturation (%)	99.50	101.79
Void ratio, e	5.645	0.819

Specific Gravity	2.789
Ring Diameter (inch)	3.9740
Ring Mass (gram)	0.00
Height of Solids (inch)	0.7826
Mass of Dry Soil (gram)	443.63

Checked By: _____
Date: _____

Figure No. B.5-6





SAMPLE DATA

BORING NO.:	V-3
SAMPLE DEPTH (ft):	Composite (0-10 ft.)
DESCRIPTION:	Gray Clay CH

INDEX PROPERTIES

LIQUID LIMIT (%):	50
PLASTIC LIMIT (%):	16
PLASTICITY INDEX (%):	34
SPECIFIC GRAVITY:	2.587
-200 (%):	96.1

SPECIMEN CONDITIONS	INITIAL	FINAL
MOISTURE CONTENT (%):	164.154	29.894
DRY DENSITY (lb/ft^3):	30.9	101.7
VOID RATIO:	4.226	0.588
TOTAL DENSITY (lb/ft^3):	81.6	132.1
SATURATION (%):	100.48	131.51

INCREMENTAL CONSOLIDATION TEST RESULTS

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

CAMINADA BORROW
COASTAL RESTORATION & PROTECTION AUTHORITY

DRAWN BY: RW	CHECKED BY:	DATE: 11-29-17
FILE NO.: 17-84-2810A	APPROVED BY:	FIGURE:

ARDAMAN & ASSOCIATES, INC
GEOTECHNICAL TESTING LABORATORY
ONE-DIMENSIONAL INCREMENTAL LOADING CONSOLIDATION TEST SUMMARY SHEET

Effective Stress (tsf)	Dial Readings (inch)			Time, t_{90} or t_{50} (second)	Time-Deformation Method [L=Log t] [S=Sq Root t]	Coefficient of Consolidation, c_v (cm^2/sec)	Average Effective Stress (tsf)	Height (inch)		Void Ratio		Strain (%)		Coefficient of Volume Compressibility, m_v (cm^2/kg)	Average Void Ratio for k_v	Hydraulic Conductivity, k_v (cm/sec)	Secondary Compression	
	Initial	End of Primary (EOP)	End of Increment (EOI)					EOP	EOI	EOP	EOI	EOP	EOI				Cα (%)	Cαe
0.00	0.0000	0.0000	0.0000	---	---	---	---	4.3310	4.3310	-----	-----	-----	-----	-----	-----	-----	-----	-----
0.001	0.0200	0.2630	0.4609	---	---	---	0.001	4.0880	3.8901	3.933	3.694	5.61	10.18	-----	-----	-----	-----	-----
0.002	0.4609	0.6668	0.6668	---	---	---	0.002	3.6842	3.6842	3.446	3.446	14.93	14.93	54.214	3.57	-----	-----	-----
0.004	0.6668	1.0720	1.0720	---	---	---	0.003	3.2790	3.2790	2.957	2.957	24.29	24.29	56.327	3.20	-----	-----	-----
0.008	1.0720	1.4157	1.4157	---	---	---	0.006	2.9353	2.9353	2.542	2.542	32.23	32.23	26.841	2.75	-----	-----	-----
0.016	1.4157	1.6214	1.6214	---	---	---	0.012	2.7296	2.7296	2.294	2.294	36.98	36.98	8.972	2.42	-----	-----	-----
0.032	1.6214	1.8400	1.8703	--	--	---	0.024	2.5110	2.4807	2.030	1.994	42.02	42.72	5.127	2.16	-----	-----	-----
0.064	1.8703	2.0700	2.0789	9600	L	1.9E-04	0.048	2.2810	2.2721	1.753	1.742	47.33	47.54	2.577	1.87	4.8E-07	-----	-----
0.128	2.0789	2.2520	2.2727	5700	L	2.7E-04	0.096	2.0990	2.0783	1.533	1.508	51.54	52.01	1.219	1.64	3.2E-07	-----	-----
0.500	2.2727	2.5290	2.5366	2280	L	5.3E-04	0.314	1.8220	1.8144	1.199	1.189	57.93	58.11	0.340	1.35	1.8E-07	-----	-----
1.000	2.5366	2.6360	2.6417	1260	L	7.9E-04	0.750	1.7150	1.7093	1.070	1.063	60.40	60.53	0.112	1.13	8.8E-08	-----	-----
2.000	2.6417	2.8050	2.8148	1140	L	7.4E-04	1.500	1.5460	1.5362	0.866	0.854	64.30	64.53	0.098	0.96	7.2E-08	-----	-----
4.000	2.8148	2.9200	2.9293	8400	L	8.3E-05	3.000	1.4310	1.4217	0.727	0.716	66.96	67.17	0.035	0.79	2.9E-09	-----	-----
8.000	2.9293	3.0270	3.0350	1020	L	5.9E-04	6.000	1.3240	1.3160	0.598	0.588	69.43	69.61	0.018	0.66	1.0E-08	-----	-----

Project Name: **Caninada Offshore**
File Number: **17-84-2810A**
Boring: **0**
Sample: **V-3**
Depth: **0**

Parameter	Initial Specimen Conditions	Final Specimen Conditions
Height (inch)	4.3310	1.3160
w_c (%)	164.154	29.894
γ_t (pcf)	81.6	132.1
γ_d (pcf)	30.9	101.7
Saturation (%)	100.48	131.51
Void ratio, e	4.226	0.588

Description: 0

Specific Gravity	2.587
Ring Diameter (inch)	3.9860
Ring Mass (gram)	0.00
Height of Solids (inch)	0.8287
Mass of Dry Soil (gram)	438.38

Checked By: _____
Date: _____

Figure No. B.5-8

ARDAMAN & ASSOCIATES, INC
GEOTECHNICAL TESTING LABORATORY
ONE-DIMENSIONAL INCREMENTAL LOADING CONSOLIDATION TEST SUMMARY SHEET

Effective Stress (tsf)	Dial Readings (inch)			Time, t_{90} or t_{50} (second)	Time-Deformation Method [L=Log t] [S=Sq Root t]	Coefficient of Consolidation, c_v (cm^2/sec)	Average Effective Stress (tsf)	Height (inch)		Void Ratio		Strain (%)		Coefficient of Volume Compressibility, m_v (cm^2/kg)	Average Void Ratio for k_v	Hydraulic Conductivity, k_v (cm/sec)	Secondary Compression	
	Initial	End of Primary (EOP)	End of Increment (EOI)					EOP	EOI	EOP	EOI	EOP	EOI				Cα (%)	Cαe
0.00	0.0000	0.0000	0.0000	---	---	---	---	4.3310	4.3310	-----	-----	-----	-----	-----	-----	-----	-----	-----
0.001	0.0200	0.2630	0.4609	59997	S	4.0E-04	0.001	4.0880	3.8901	3.933	3.694	5.61	10.18	-----	-----	-----	-----	-----
0.002	0.4609	0.6668	0.6668	---	---	---	0.002	3.6842	3.6842	3.446	3.446	14.93	14.93	54.214	3.57	-----	-----	-----
0.004	0.6668	1.0720	1.0720	---	---	---	0.003	3.2790	3.2790	2.957	2.957	24.29	24.29	56.327	3.20	-----	-----	-----
0.008	1.0720	1.4157	1.4157	---	---	---	0.006	2.9353	2.9353	2.542	2.542	32.23	32.23	26.841	2.75	-----	-----	-----
0.016	1.4157	1.6214	1.6214	---	---	---	0.012	2.7296	2.7296	2.294	2.294	36.98	36.98	8.972	2.42	-----	-----	-----
0.032	1.6214	1.8400	1.8703	77760	S	1.2E-04	0.024	2.5110	2.4807	2.030	1.994	42.02	42.72	5.127	2.16	6.2E-07	-----	-----
0.064	1.8703	2.0420	2.0789	26460	S	3.0E-04	0.048	2.3090	2.2721	1.786	1.742	46.69	47.54	2.215	1.89	6.6E-07	-----	-----
0.128	2.0789	2.2200	2.2727	19440	S	3.4E-04	0.096	2.1310	2.0783	1.572	1.508	50.80	52.01	0.994	1.66	3.4E-07	-----	-----
0.500	2.2727	2.4200	2.5366	2550	S	2.2E-03	0.314	1.9310	1.8144	1.330	1.189	55.41	58.11	0.195	1.42	4.2E-07	-----	-----
1.000	2.5366	2.6100	2.6417	2550	S	1.7E-03	0.750	1.7410	1.7093	1.101	1.063	59.80	60.53	0.083	1.15	1.4E-07	-----	-----
2.000	2.6417	2.8000	2.8148	11760	S	3.1E-04	1.500	1.5510	1.5362	0.872	0.854	64.19	64.53	0.095	0.97	2.9E-08	-----	-----
4.000	2.8148	2.9200	2.9293	10140	S	3.0E-04	3.000	1.4310	1.4217	0.727	0.716	66.96	67.17	0.035	0.79	1.0E-08	-----	-----
8.000	2.9293	3.0025	3.0350	3375	S	7.8E-04	6.000	1.3485	1.3160	0.627	0.588	68.86	69.61	0.013	0.67	1.0E-08	-----	-----

Project Name: **Caninada Offshore**
File Number: **17-84-2810A**
Boring: **0**
Sample: **V-3**
Depth: **0**

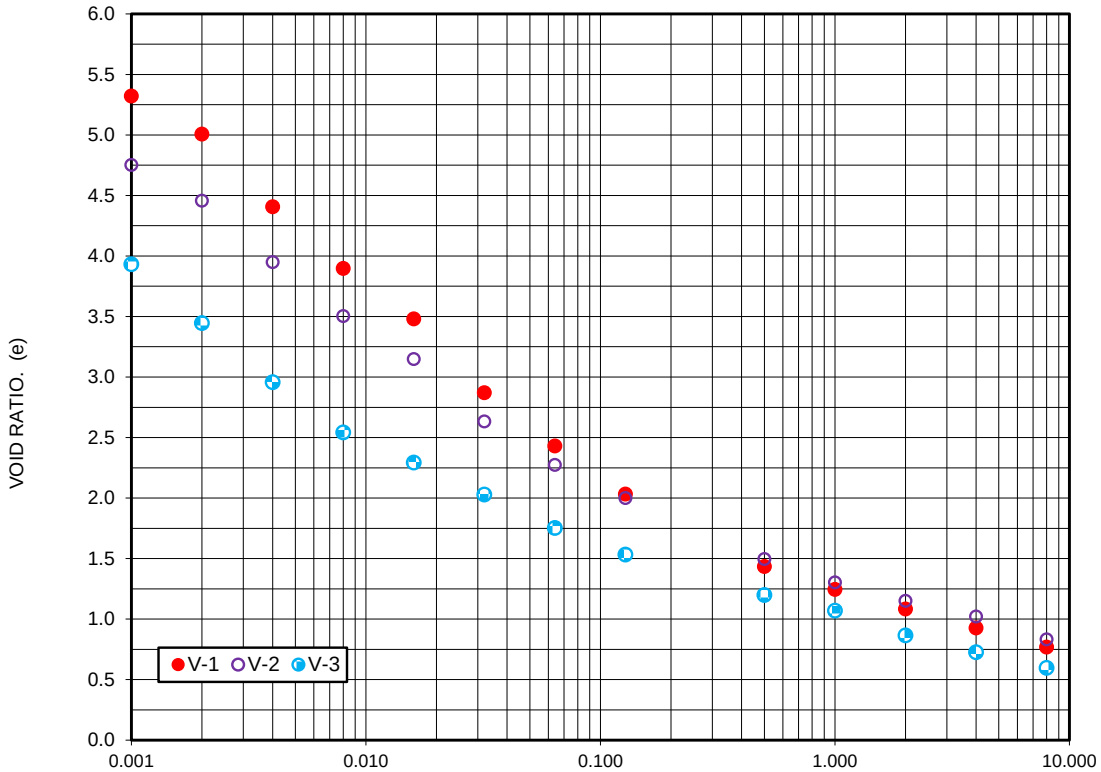
Parameter	Initial Specimen Conditions	Final Specimen Conditions
Height (inch)	4.3310	1.3160
w_c (%)	164.154	29.894
γ_t (pcf)	81.6	132.1
γ_d (pcf)	30.9	101.7
Saturation (%)	100.48	131.51
Void ratio, e	4.226	0.588

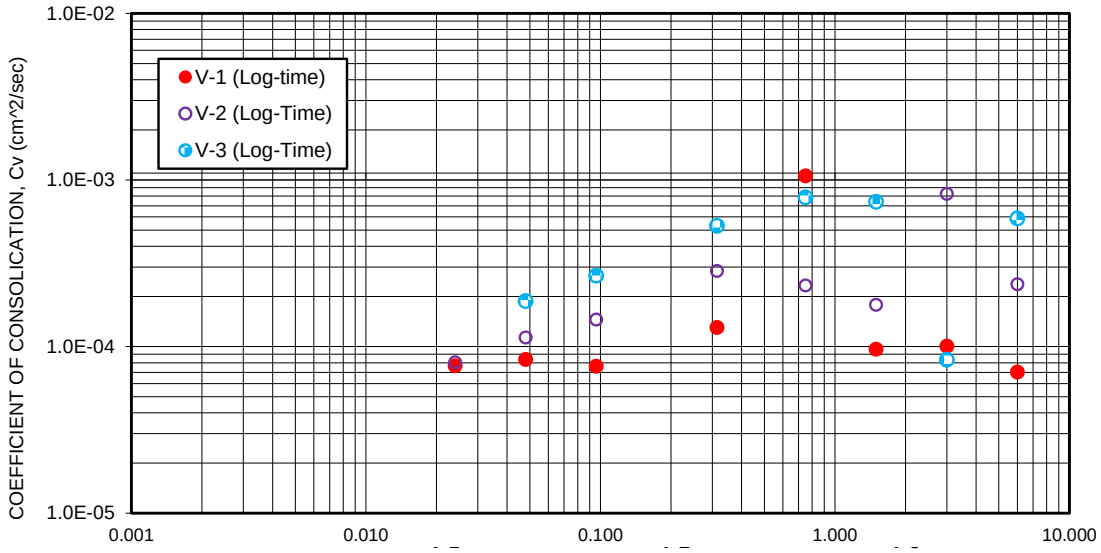
Description: 0

Specific Gravity	2.587
Ring Diameter (inch)	3.9860
Ring Mass (gram)	0.00
Height of Solids (inch)	0.8287
Mass of Dry Soil (gram)	438.38

Checked By: _____
Date: _____

Figure No. B.5-9





SPECIMEN CONDITIONS:	INITIAL	FINAL	INITIAL	FINAL	INITIAL	FINAL
MOISTURE CONTENT (%):	221.061	32.885	201.377	29.888	164.154	29.894
DRY DENSITY (lb/ft^3):	24.1	96.3	26.2	95.7	30.9	101.7
VOID RATIO:	6.006	0.756	5.645	0.819	4.226	0.588
TOTAL DENSITY (lb/ft^3):	77.5	127.9	79.0	124.3	81.6	132.1

INDEX PROPERTIES:	V-1	V-2	V-3
LIQUID LIMIT (%):	74	62	50
PLASTIC LIMIT (%):	22	21	16
PLASTICITY INDEX (%):	52	41	34
SPECIFIC GRAVITY:	2.708	2.789	2.590
-200 (%):	98.7	98	96.1

INCREMENTAL CONSOLIDATION TEST RESULTS

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

CAMINADA BORROW
COASTAL RESTORATION & PROTECTION AUTHORITY

DRAWN BY: RW	CHECKED BY:	DATE: 11-29-17
FILE NO.: 17-84-2810A	APPROVED BY:	FIGURE:

Caminada Marsh Creation - Settling Column Results
Void Ratio Versus Depth

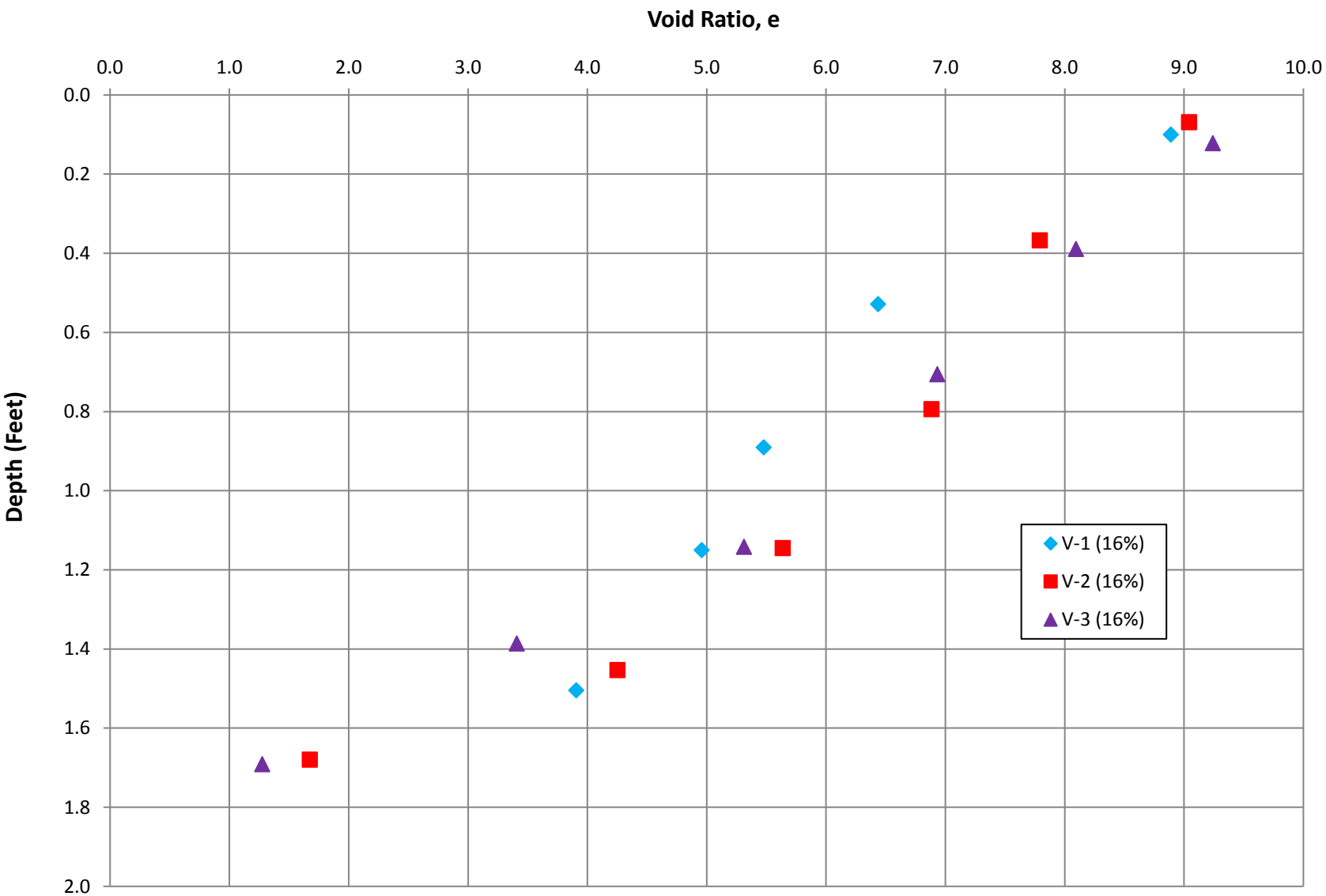


Figure No. B.7-1

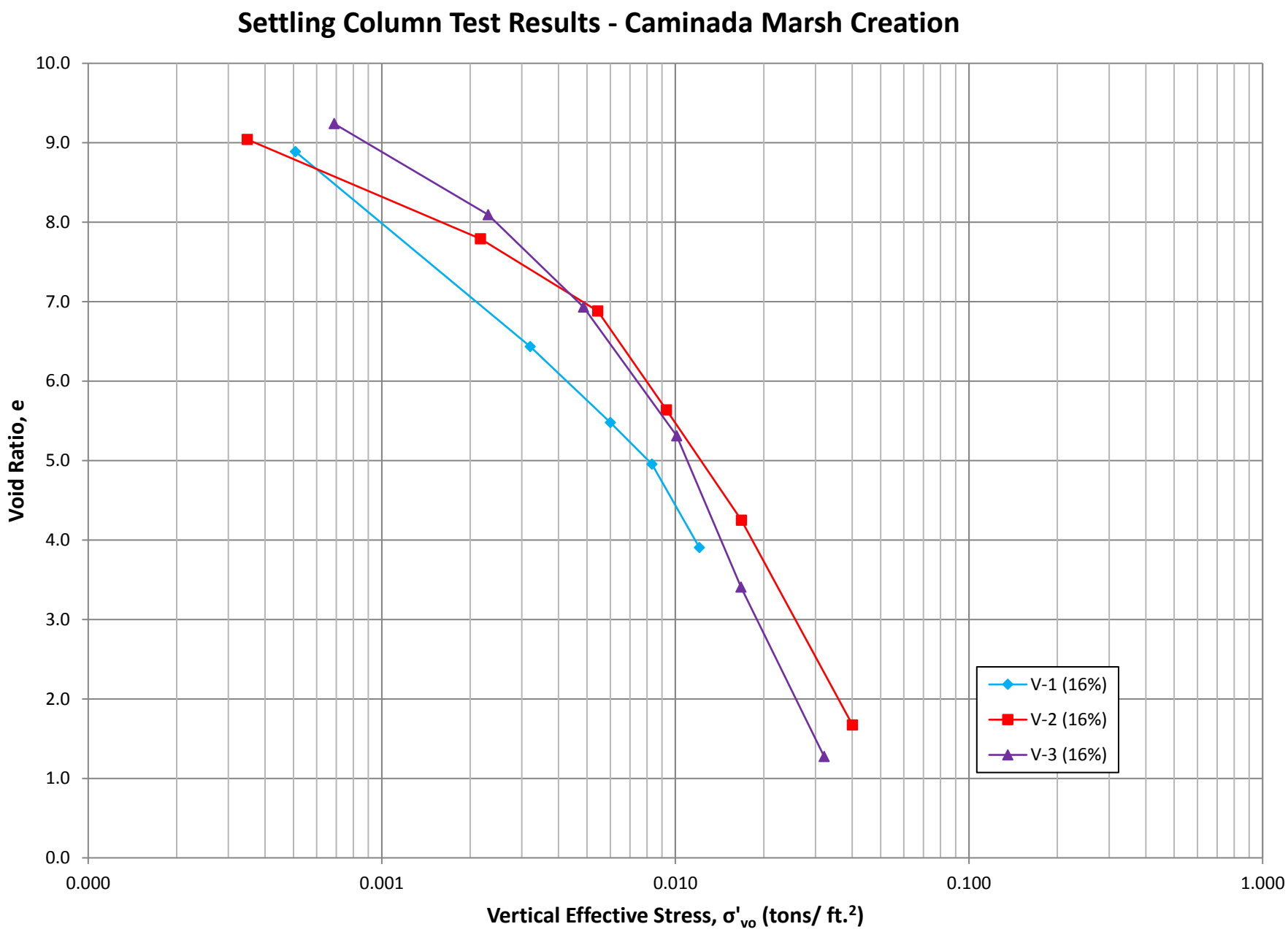


Figure No. B.7-2

Settling Column & Slurry Consolidation Test Results - Caminada Marsh Creation

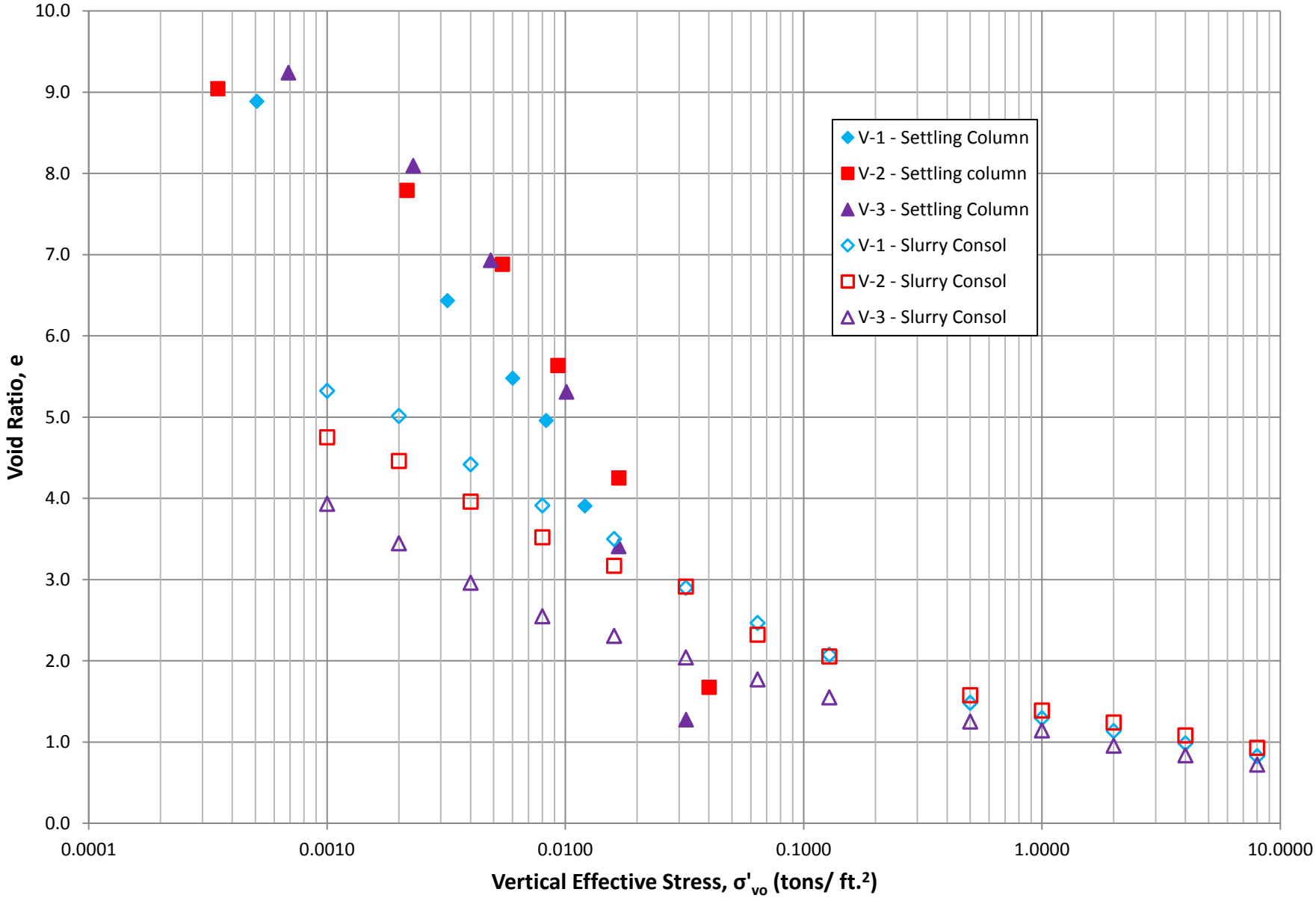


Figure No. B.7-3

Appendix C. T. B. SMITH MAGNETOMETER & HAZARD SURVEY

C.1 T.B. Smith Hazard Survey dated July 5, 2017

LAFOURCHE PARISH, LOUISIANA

"TE23-SM-01"
ELEV = 7.30' NAVD88 (GEOID12A)

X = 3,645,688.81'	NAD 83
Y = 224,296.37'	
LAT = 29° 06' 42.2851"	NAD 83
LONG = 90° 11' 26.9637"	

LOUISIANA COORDINATE SYSTEM (SOUTH ZONE) (1983 DATUM)

2,2297 ±

PROPOSED BORROW AREA VIBRACORES

VIBRACORE I.D.	COORDINATES (NAD 83)		COORDINATES (NAD 83)		WATER DEPTH	BOTTOM ELEVATION
	EASTING	NORTHING	LATITUDE	LONGITUDE		
V1	3,667,900	226,253	29° 6' 59.39"	90° 7' 16.36"	31.5'	-30.4'
V2	3,674,768	230,140	29° 7' 37.15"	90° 5' 58.47"	32.2'	-31.1'
V3	3,677,532	233,412	29° 8' 9.24"	90° 5' 26.91"	30.6'	-29.5'

TOP OF WATER (6/27/17): 1.1' (NAVD 88)

GULF OF MEXICO

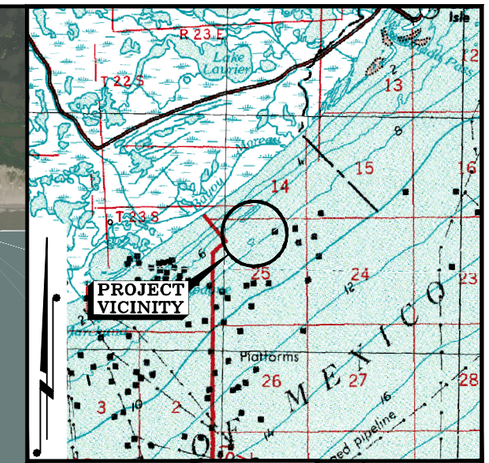
48" LOOP,LLC. CRUDE OIL PIPELINE
30" LOOP,LLC. PIPELINE
4" LOOP,LLC. OIL PIPELINE
6" XTO ENERGY, INC. PIPELINE (ABANDONED)
6" MICHIGAN WISCONSIN PIPELINE
6" CHEVRON USA, INC. PIPELINE
6" BURLINGTON PIPELINE
6" MICHIGAN WISCONSIN PIPELINE
6" CHEVRON USA, INC. PIPELINE
6" CHEVRON EMC PIPELINE (ABANDONED)

8600' SUA; S. L. 1482
002 SL 1482
004
010 VUP2;SL 1482
BM 1
BAY MARCHAND AREA
GRAND ISLE AREA
BM2 8300 RA SU;SL 1365
BM2 7600 RA SU;SL 1365
031
086
010
SL 1486
014 S.L. 1486
007 S.L. 1486
022 SL 1486
006 SL 3523
005 SL 3523
001 SL 3523
STATE 004D
007 SL 3768
LAFOURCHE
JEFFERSON
GI 14
GI 15
GI 25
GI 24

V1
V2
V3

APPROXIMATE LIMITS OF BORROW AREA

Approximate Parish Boundary



VICINITY MAP
SCALE: 1" = 4 MILES

LEGEND

	BENCHMARK
	EXISTING PIPELINE DATA PER DNR
V1	PROPOSED VIBRACORE LOCATION
031 BM2 7600 RA SU;SL 1365	EXISTING WELL LOCATION PER DNR

NOTES:

1. HYDROGRAPHIC SURVEY WAS PERFORMED JUNE 27, 2017 BY T. BAKER SMITH, LLC (TBS).
2. SURVEY PERFORMED USING AUTOMATED HYDROGRAPHIC SURVEY SYSTEM CONSISTING OF DUAL FREQUENCY FATHOMETER, PROTON MAGNETOMETER, RTK GPS & COMPUTER BASED DATA COLLECTION / NAVIGATION SYSTEM.
3. TBS FIELD CREW RAN TRACKLINES AT APPROXIMATELY 25' OFFSETS FROM PROPOSED VIBRACORE LOCATIONS PROVIDED BY ARDAMAN & ASSOCIATES, INC. NO ANOMALIES WERE DETECTED DURING THESE INVESTIGATIONS.
4. ALL GRID COORDINATES ARE EXPRESSED IN LOUISIANA STATE PLANE, SOUTH ZONE, NAD 83, IN US SURVEY FEET. GEOGRAPHIC COORDINATES ARE NAD 83.
5. THE VERTICAL DATUM FOR ALL ELEVATIONS IS NAVD 88 (GEOID 12A), IN U.S. SURVEY FEET.
6. THE REFERENCE BENCHMARK FOR THIS SURVEY IS "TE23-SM-01".
7. BACKGROUND IMAGERY SOURCED FROM 2015 DOQQ AERIAL PHOTOGRAPHY.
8. LOCATION OF PIPELINES REFERENCED FROM DNR AND WERE NOT LOCATED DURING THIS SURVEY.
9. WHILE REASONABLE EFFORTS ARE MADE TO LOCATE ALL PIPELINES, METAL OBJECTS OR OTHER SUBSURFACE OBSTRUCTIONS IN THE SURVEYED AREA, THE EQUIPMENT USED AND THE CHARACTERISTICS OF PIPELINES THEMSELVES MAKE IT IMPOSSIBLE TO GUARANTEE TOTAL SUCCESS. ACCORDINGLY, IT IS INCUMBENT UPON THE OWNERS, OPERATORS AND/OR CONTRACTORS CONDUCTING OPERATIONS INCLUDING DREDGING AND EXCAVATION TO CONDUCT THEIR OPERATIONS WITH EXTREME CAUTION AND RECOGNIZE THAT HAZARDS IN ADDITION TO THOSE DETECTED AND MARKED BY TBS MAY EXIST.

I CERTIFY THAT THE HYDROGRAPHIC SURVEY DEPICTED ON THIS PLAT WAS PERFORMED ON THE GROUND UNDER MY SUPERVISION IN ACCORDANCE WITH GENERALLY ACCEPTED SURVEY PRACTICES. THIS SURVEY DOES NOT MEET THE STANDARDS OF PRACTICE FOR BOUNDARY SURVEYS AS SET FORTH BY THE LOUISIANA PROFESSIONAL ENGINEERING AND LAND SURVEYING BOARD.

APPROVED: Evan M. Chiasson
EVAN M. CHIASSON, P.L.S.
LA. LAND SURVEYOR REG. NO. 5139

STATE OF LOUISIANA
EVAN M. CHIASSON
License No. 5139
PROFESSIONAL LAND SURVEYOR

CPRA

TBS T. BAKER SMITH
A CENTURY OF SOLUTIONS
412 South Van Ave, Houma, LA 70363
(985)868-1050 - tbsmith.com

SCALE: 1" = 2000'
2000' 1000' 0' 2000'

REV. NO:	00	REV. DATE:	--/--/--	REV. BY:	---

REVISION DESCRIPTION:
--

DRAWN BY:	ARV	APPROVED BY:	KAK
DATE:	07/05/2017	JOB NO:	2017.0585
DRAWING NAME:	2017.0585H01.DWG		

PROJECTION: LA SOUTH ZONE 1702
GEO. DATUM: NAD83 | VERT. DATUM: NAVD88
GRID UNITS: US SURVEY FEET

SHEET NO: 1 OF 1

HAZARD SURVEY

ARDAMAN & ASSOCIATES, LLC

MAGNETOMETER SURVEY FOR PROPOSED VIBRACORE LOCATIONS
CAMINADA HEADLANDS BACK BARRIER
OFFSHORE BORROW AREA PROJECT (BA-193) FOR
COASTAL PROTECTION AND RESTORATION AUTHORITY
LOCATED IN GRAND ISLE AREA, BLOCK GI 14 & GI 25

7/6/2017 - P:\Y-2017\2017.0585\DWG\2017.0585H01.DWG

Figure No. C.1

Appendix D. OCEAN SURVEYS, INC. – OPERATIONS REPORT

D.1 OSI Operations Report dated July 24, 2017

OCEAN SURVEYS, INC.

Specialists in Marine & Freshwater Site Surveys

www.oceansurveys.com

OSI

NATIONWIDE * WORLDWIDE

Figure No. D.1-1

MARINE AND FRESHWATER
SURVEY SERVICES

OCEAN SURVEYS, INC.
129 MILL ROCK ROAD EAST
OLD SAYBROOK, CT 06475
TEL. (860) 388-4631 FAX (860) 388-5879
www.oceansurveys.com

July 24, 2017

Ardaman & Associates, Inc.
1305 Distibutors Row, Suite I
Jefferson, LA 70123

Attention: Rob Rousset

SUBJECT: OPERATIONS REPORT (OSI REPORT NO. 17ES020)
VIBRATORY CORE SEDIMENT SAMPLING SERVICES FOR
CPRA PROJECT BA-193
CAMINADA HEADLANDS BACK BARRIER OFFSHORE BORROW AREA
GULF OF MEXICO, LOUISIANA

Dear Mr. Rousett:

Ocean Surveys, Inc. (OSI) is pleased to submit this operations report documenting geotechnical sampling investigations performed during the period 9-11 July 2017. These investigations were performed in a designated offshore borrow area as part of the State of Louisiana's Coastal Protection and Restoration Authority's (CPRA) Caminada Headlands Back Barrier Offshore Borrow Area Project in the Gulf of Mexico (BA-193). OSI completed the tasks documented herein working as a subcontractor to Ardaman & Associates, Inc. (Ardaman) under Work Order No. WO-17-103 (dated 15 June 2017). Figure 1 illustrates the approximate location of the proposed offshore borrow area.

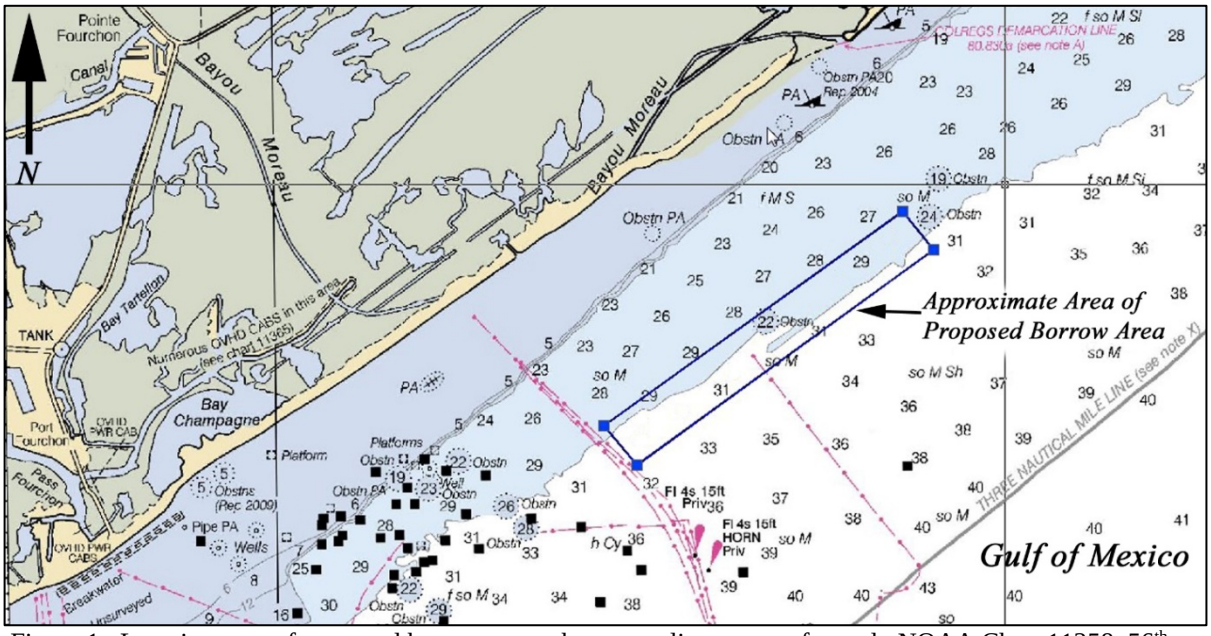


Figure 1. Location map of proposed borrow area where sampling was performed. NOAA Chart 11358, 56th Ed in background.

Summary of Pre-sampling Activities

Prior to OSI mobilization, T. Baker Smith (TBS) under a separate contract to Ardaman performed a magnetometer clearance survey of the proposed sampling stations to ensure they were free of potential obstructions that could be impacted by the OSI geotechnical investigation. The results of their survey are included in their entirety in Attachment 1. Following conclusion of the field survey, TBS surveyors staked each location with a cane pole for future reference by the OSI sampling crew.

Summary of Geotechnical Investigation

OSI Field operations were conducted from the *Dewitt Elevator*, a self-propelled Class 72 liftboat owned and operated by Elevating Boats, LLC (EBI) in Houma, LA. The liftboat, with 1,000 square foot open deck area, is equipped with a 10-ton crane with 65-foot boom. To acquire the cores, the OSI crew installed a pneumatic vibratory corer onboard the vessel. Figure 2 provides a photograph of the liftboat and shows illustrations of the vibratory corer utilized during the investigation.

Coring was accomplished by a two-man OSI scientific and technical crew. The OSI crew was supported by a two-man EBI liftboat crew (captain and mate). Ardaman provided an onboard representative during the geotechnical investigation to provide oversite.

The following instruments were installed onboard the vessel to complete the investigation (see Attachment 2 for operating procedures):

- *Trimble SPS Differential Global Positioning System*
- *HYPACK Navigation and Data Logging Software*
- *OSI Model 1500 Pneumatic Vibratory Corer equipped with a 31.5' long 4" ID core barrel*

Before departure to the project site, a project safety meeting was held onboard the liftboat. Discussions included potential hazards that exist from the vessel and equipment configuration, as well as the planned operations. Once on-site the liftboat was navigated to the proposed core locations previously cleared and marked by the TBS survey crew. Once on station the vessel was jacked-up into position to begin coring operations. Core samples were acquired with an OSI Model 1500 pneumatic vibratory corer equipped with a 31.5-foot long 4" ID core barrel. The core barrel was fitted with a check valve, cutter head, core catcher and a 3.5" Lexan liner in which a continuous sediment core was recovered.

The crane was used to lower the coring rig over the side of the vessel and to the bottom. All cores were attempted to a penetration depth of 30 feet below the bottom or to refusal. Once the coring attempt was complete, the rig was recovered and lifted back onboard the boat. The core Lexan liner was then extracted from the core barrel, capped, and labelled for orientation.

Figure 2. (upper) EBI liftboat. (lower) OSI vibratory corer deployed via crane and tended by OSI crew from the deck of the liftboat.

A total of three cores were acquired during the course of the investigation at the three proposed sample stations (V1, V2 & V3). All cores were cut in approximate five-foot sections and stored until the vessel returned to Houma, where the cores were transferred to the Ardaman representative for transport to the laboratory. A Vibratory Coring Log is provided in Attachment 3.

The following table provides a chronology of the field investigation, including vessel mobilization/demobilization.

Chronology of Field Investigation

Task	Dates	Description
Crew arrives on site and prepares for vessel mobilization	7/8/2017	OSI crew arrives in Houma, LA,
Vessel mobilization and begin transit to proposed borrow site	7/9/2017	Mobilize *Dewitt Elevator* liftboat. Conduct safety meeting and departs dock to begin transit to site. Spud down for night in offshore East Timbalier.
Perform geotechnical sampling investigation in proposed offshore borrow site	7/10/2017	Vessel transits to the proposed borrow site and acquires the three 30-foot length vibratory cores (V1, V2 & V3). At conclusion of sampling day vessel transits to area east of Belle Pass and spuds down for overnight.
Transit to EBI yard, demobilize vessel and offload cores	7/11/2017	Transit to EBI yard Houma, LA. Once at yard crew begins demobilization of vessel and transfer of cores to Ardaman representative.
Demobilization complete crew departs	7/12/2017	On-site demobilization complete, crew departs Houma, LA.

We appreciate the opportunity to support Ardaman and CPRA on this project and look forward to continuing this working relationship in the future. If you have any questions regarding any aspect of this sampling investigation, or if we can be of service in any other capacity, please do not hesitate to call.

Sincerely,

OCEAN SURVEYS, INC.

John D. Sullivan
Manager Geophysical Surveys

JDS/lf
Attachments

ATTACHMENT 1

TBS MAGNETOMETER CLEARANCE SURVEY OF PROPOSED BORROW AREA SAMPLE SITES

LAFOURCHE PARISH, LOUISIANA

"TE23-SM-01"
ELEV = 7.30' NAVD88 (GEOID12A)

X = 3,645,688.81'	NAD 83
Y = 224,296.37'	
LAT = 29° 06' 42.2851"	NAD 83
LONG = 90° 11' 26.9637"	

LOUISIANA COORDINATE SYSTEM (SOUTH ZONE) (1983 DATUM)

2,2297 ±

PROPOSED BORROW AREA VIBRACORES

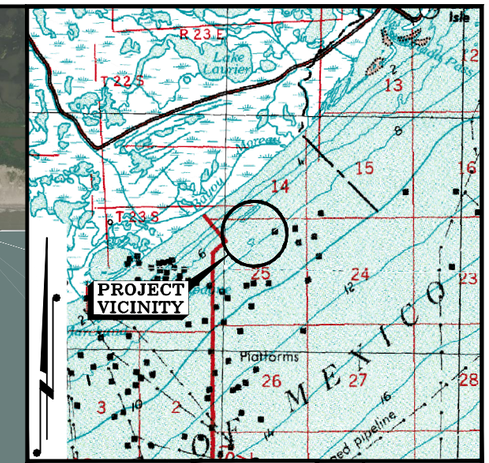
VIBRACORE I.D.	COORDINATES (NAD 83)		COORDINATES (NAD 83)		WATER DEPTH	BOTTOM ELEVATION
	EASTING	NORTHING	LATITUDE	LONGITUDE		
V1	3,667,900	226,253	29° 6' 59.39"	90° 7' 16.36"	31.5'	-30.4'
V2	3,674,768	230,140	29° 7' 37.15"	90° 5' 58.47"	32.2'	-31.1'
V3	3,677,532	233,412	29° 8' 9.24"	90° 5' 26.91"	30.6'	-29.5'

TOP OF WATER (6/27/17): 1.1' (NAVD 88)

GULF OF MEXICO

48" LOOP,LLC. CRUDE OIL PIPELINE
30" LOOP,LLC. PIPELINE
4" LOOP,LLC. OIL PIPELINE
6" XTO ENERGY, INC. PIPELINE (ABANDONED)
6" MICHIGAN WISCONSIN PIPELINE
6" CHEVRON USA, INC. PIPELINE
6" BURLINGTON PIPELINE
6" MICHIGAN WISCONSIN PIPELINE
6" CHEVRON USA, INC. PIPELINE
6" CHEVRON EMC PIPELINE (ABANDONED)

8600' SUA; S. L. 1482
002 SL 1482
004
010 VUP2;SL 1482
BM 1
BAY MARCHAND AREA
GRAND ISLE AREA
BM2 8300 RA SU;SL 1365
BM2 7600 RA SU;SL 1365
031
086
010
014 S.L. 1486
007 S.L. 1486
022 SL 1486
006 SL 3523
005 SL 3523
001
007 SL 3768
LAFOURCHE
JEFFERSON
GI 14
GI 15
GI 24
GI 25
V1
V2
V3
APPROXIMATE LIMITS OF BORROW AREA
Approximate Parish Boundary



VICINITY MAP
SCALE: 1" = 4 MILES

LEGEND

	BENCHMARK
	EXISTING PIPELINE DATA PER DNR
V1	PROPOSED VIBRACORE LOCATION
031 BM2 7600 RA SU;SL 1365	EXISTING WELL LOCATION PER DNR

NOTES:

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APPROVED: Evan M. Chiasson
EVAN M. CHIASSON, P.L.S.
LA. LAND SURVEYOR REG. NO. 5139

STATE OF LOUISIANA
EVAN M. CHIASSON
License No. 5139
PROFESSIONAL
LAND SURVEYOR

CPRA

TBS T. BAKER SMITH
A CENTURY OF SOLUTIONS
412 South Van Ave, Houma, LA 70363
(985)868-1050 - tbsmith.com

SCALE: 1" = 2000'
2000' 1000' 0' 2000'

REV. NO:	REV. DATE:	REV. BY:
00	--/--/--	---

REVISION DESCRIPTION:
--

DRAWN BY:	ARV	APPROVED BY:	KAK
DATE:	07/05/2017	JOB NO:	2017.0585
DRAWING NAME:	2017.0585H01.DWG		

PROJECTION: LA SOUTH ZONE 1702
GEO. DATUM: NAD83 | VERT. DATUM: NAVD88
GRID UNITS: US SURVEY FEET

SHEET NO: 1 OF 1

HAZARD SURVEY

ARDAMAN & ASSOCIATES, LLC

MAGNETOMETER SURVEY FOR PROPOSED VIBRACORE LOCATIONS
CAMINADA HEADLANDS BACK BARRIER
OFFSHORE BORROW AREA PROJECT (BA-193) FOR
COASTAL PROTECTION AND RESTORATION AUTHORITY
LOCATED IN GRAND ISLE AREA, BLOCK GI 14 & GI 25

Figure No. D.1-7

7/6/2017 - P:\Y-2017\2017.0585\DWG\2017.0585H01.DWG

ATTACHMENT 2

EQUIPMENT OPERATIONS AND PROCEDURES

- Trimble Differential Global Positioning System
- HYPACK Navigation and Data Logging System
- OSI Model 1500 Pneumatic Vibratory Corer

Trimble SPS361 Modular GPS Heading Receiver

A Trimble SPS361 modular global satellite positioning system (GPS) heading receiver provides reliable, high-precision positioning and navigation for a wide variety of operations and environments. A feature of this system is its integration of a standard 12-channel GPS receiver with a U.S. Coast Guard beacon receiver "all in one" package. Both antennas are combined in a single housing and the receiver electronics are similarly contained within one topside control box. This system also includes a second GPS antenna used to calculate heading. The complete system includes the topside control unit, 2 GPS volute antennae and cable, RS232 output and input data cables, and a 12-volt DC power cable. The proprietary MSK beacon receiver used in the system has been designed to provide enhanced signal reception at large distances from the reference station and under inclement weather conditions. The low noise MSK receiver is also an automatic, dual-channel system providing seamless switching between multiple beacons when necessary. The SPS361 outputs one position per second to the HYPACK navigation computer. The manufacturer reports sub-meter accuracy of the system under suitable operating conditions.

HYPACK Navigation Software

Survey vessel trackline control and position fixes were obtained by utilizing a PC-based navigation system utilizing HYPACK software interfaced with the GPS positioning system. The navigation system consists of a Pentium notebook computer with a customized version of HYPACK software and a color, external VGA monitor for the helmsman. Geodetic coordinate information from the DGPS positioning system was updated regularly and input to the navigation computer which processes the geodetic position data into State Plane Coordinates used to guide the survey vessel to the desired sampling location. Digitized shoreline and the locations of existing structures, buoys, and control points can also be displayed on the monitor in relation to the vessel position. The navigation system using HYPACK software thus provides an accurate visual representation of survey vessel location in real time, combined with highly efficient data-logging capability and post-survey data processing and plotting routines.

OSI Model 1500 Vibratory Corer

An OSI Model 1500 vibratory corer was used to obtain continuous core samples of unconsolidated sediments within the sampling area. The vibracore rig used for this study utilized a standard 4-inch diameter steel core barrel, a clear Lexan liner, a cutter head or shoe, a core catcher, and a pneumatically driven vibratory head attached to the upper end of the core barrel. The vibracore unit requires an air compressor to power the piston inside the head of the corer, which is the driving force of the system. A large stable platform is necessary to lay down the vibracore rig when not in use and provide support for the large crane and hydraulic winch required to operate the rig.

Once securely on station, the entire coring rig is lowered over the side or stern of the coring vessel via the crane, winch, and connecting cable. The rig is lowered down through the water column to the bottom. Once in contact with the bottom, the vibratory head is activated and the winch cable is slackened. The pneumatically powered vibratory head drives the core barrel into the underlying sediments while inducing only minor deformation in the sedimentary structures. The pneumatic head achieves its vibratory motion by means of a reciprocating air-driven piston, powered by means of a flexible hose connected to a large-capacity air compressor located onboard the coring vessel.

Following penetration of the core barrel to the desired depth, the entire rig is lifted back onboard the vessel. Once on deck, the liner containing the core is removed, cut into manageable sections, the ends capped and sealed, and the core sections marked for orientation, identification, and post-survey analysis. Only the accessible part of the core (top and bottom open ends) is examined to provide the initial sediment description prior to splitting and sampling.

ATTACHMENT 3

VIBRATORY CORE SUMMARY TABLE

CAMINADA HEADLANDS BACK BARRIER OFFSHORE BORROW AREA PROJECT (BA-193)
Vibratory Core Summary Table

Sample Station	Date	Local Time	Penetration (feet)	Recovery (feet)	Core Sections	Comments
V1	7/10/17	9:02	29.0	23.2	5	Wood debris in cutter shore. Sample accepted by onboard representative.
V2	7/10/17	11:45	30.0	29.9	6	Sample accepted by onboard representative.
V3	7/10/17	14:52	29.0	24.6	5	Sample accepted by onboard representative.

Appendix E. PREVIOUS BORROW AREA INVESTIGATIONS DATA

E.1 Pertinent pages from previous borrow area investigations

DENOTES LOCATIONS OF UNDISTURBED SOIL BORINGS PERFORMED BY GEOENGINEERS, INC. BETWEEN 13 AND 16 JULY 2010

DENOTES LOCATIONS OF VIBRACORE BORINGS PERFORMED BY OCEAN SURVEYS, INC. BETWEEN 10 AND 12 FEBRUARY 2015

NOT TO SCALE

EUSTIS ENGINEERING SERVICES, L.L.C.

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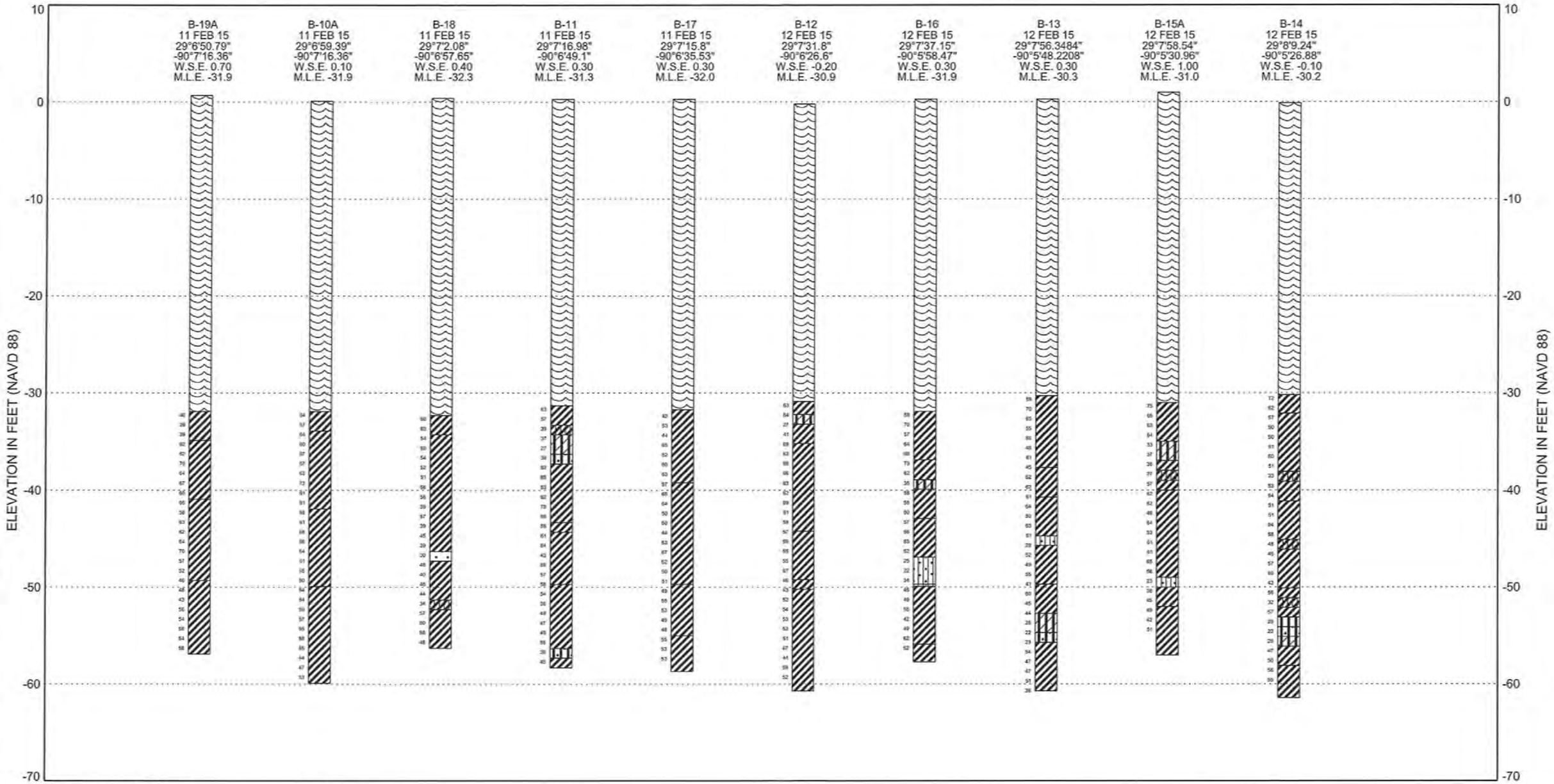
LAFAYETTE • BATON ROUGE • NEW ORLEANS • GULFPORT

BORING AND VIBRACORE LOCATION PLAN

STATE OF LOUISIANA
COASTAL PROTECTION AND RESTORATION AUTHORITY
CAMINADA HEADLANDS BACK BARRIER
MARSH CREATION PROJECT (BA-171)
LAFOURCHE PARISH, LOUISIANA

DRAWN BY: J.L.S.	PLOT DATE: 30 JULY 15	CADD FILE: LOCATION PLAN.DGN
CHECKED BY: R.S.M.	JOB NO.: 22729	FIGURE 2

Figure No. E.1



BORING MATERIAL GRAPHICS

- CLAY
- SILTY CLAY
- SAND
- SILTY SAND
- SILT
- SANDY SILT
- CLAYEY SILT
- WATER

LEGEND:

W.S.E. = WATER SURFACE ELEVATION

M.L.E. = MUDLINE ELEVATION

NOTE:

NUMBERS TO THE LEFT OF THE BORING LOGS REPRESENT WATER CONTENT IN PERCENT.

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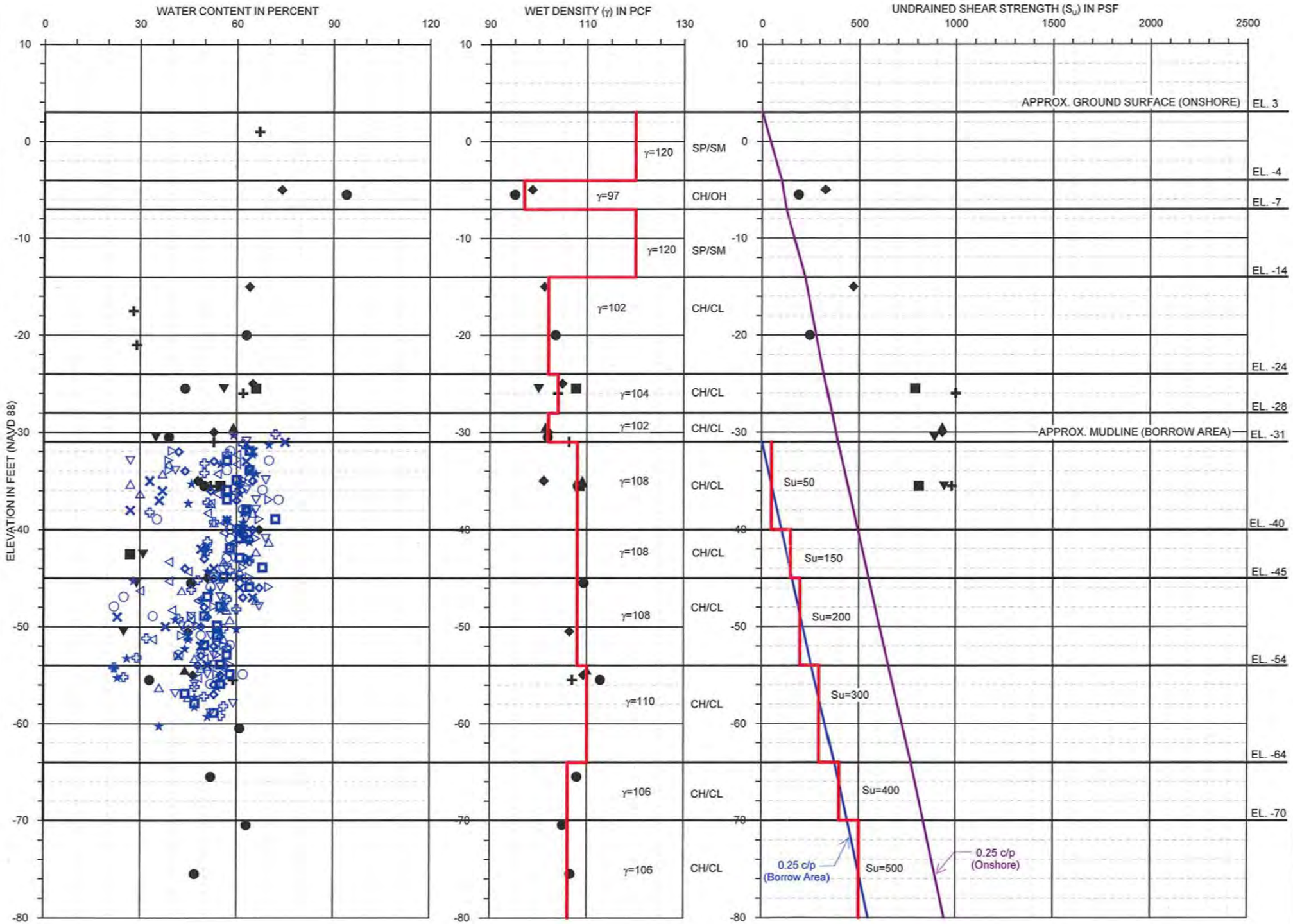
SUBSOIL PROFILE - PROPOSED BORROW AREA

STATE OF LOUISIANA
COASTAL PROTECTION AND RESTORATION AUTHORITY
CAMINADA HEADLANDS BACK BARRIER
MARSH CREATION PROJECT (BA-171)
LAFOURCHE PARISH, LOUISIANA

DRAWN BY: J.L.S.	PLOT DATE: 30 JULY 15	CADD FILE: PROFILE.DGN
CHECKED BY: R.S.M.	JOB NO.: 22729	FIGURE 3

Figure No. E.2



LEGEND

- B-10A (Vibracore)
- B-11 (Vibracore)
- B-12 (Vibracore)
- B-13 (Vibracore)
- B-14 (Vibracore)
- B-15A (Vibracore)
- B-16 (Vibracore)
- B-17 (Vibracore)
- B-18 (Vibracore)
- B-19A (Vibracore)
- B-8 (GeoEngineers 2010)
- B-9 (GeoEngineers 2010)
- B-10 (GeoEngineers 2010)
- B-11 (GeoEngineers 2010)
- B-12 (GeoEngineers 2010)
- B-13 (GeoEngineers 2010)
- Design Line
- 0.25 c/p (Borrow Area)
- 0.25 c/p (Onshore)

NOTES:

1. THESE SOIL PARAMETERS CANNOT FULLY ANTICIPATE ALL PARAMETERS WHICH MAY INFLUENCE SELECTION OF DESIGN VALUES FOR SPECIFIC ANALYSES. FOR THIS REASON, THE USER SHOULD ASSESS THE APPLICABILITY OF THESE VALUES IN ANY DESIGN ANALYSES OR CONTACT EUSTIS ENGINEERING FOR CONSULTATION.
2. SHEAR STRENGTH DATA PLOTTED ON THIS FIGURE REPRESENT THE RESULTS OF THE UNCONFINED COMPRESSION TESTING PERFORMED BY GEOENGINEERS.

EUSTIS ENGINEERING SERVICES, L.L.C.
WWW.EUSTISENG.COM
LAFAYETTE • BATON ROUGE • NEW ORLEANS • GULFPORT

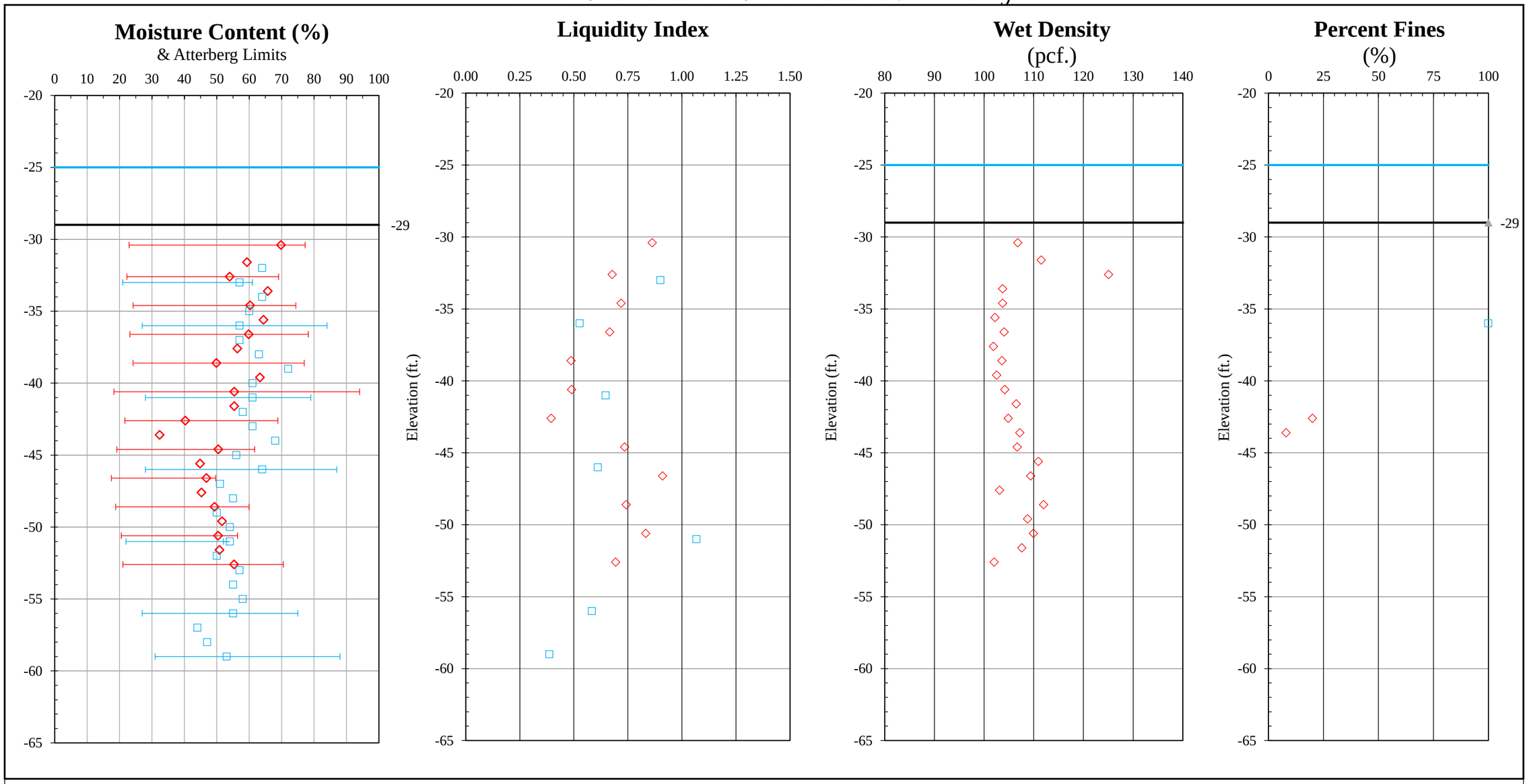
SOIL PARAMETERS
BORROW AREA (OFFSHORE)

STATE OF LOUISIANA
COASTAL PROTECTION AND RESTORATION AUTHORITY
CAMINADA HEADLANDS BACK BARRIER
MARSH CREATION PROJECT (BA-171)
LAFOURCHE PARISH, LOUISIANA

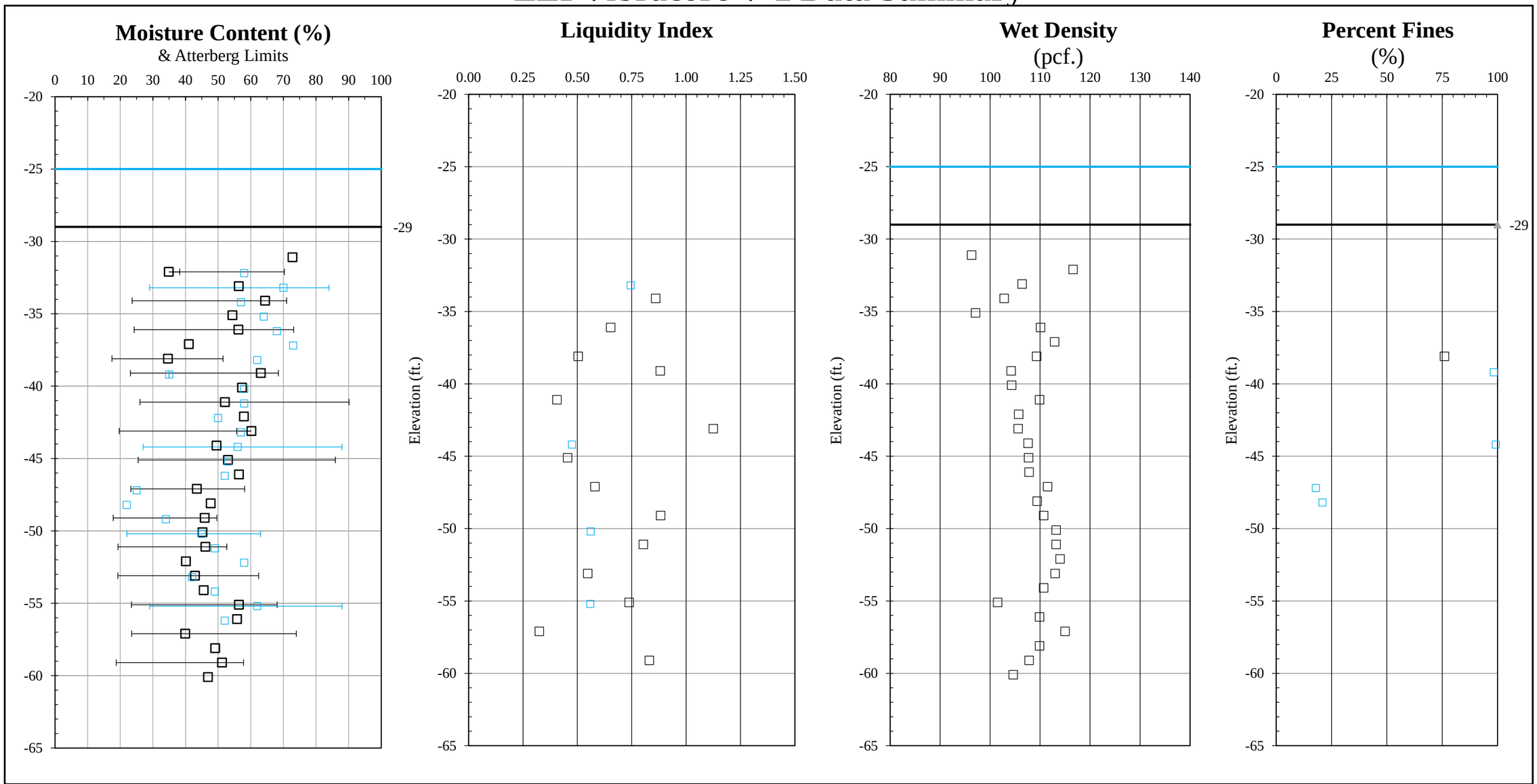
DRAWN BY: R.S.M.	24 JUNE 2015	FILE: SOIL PARAMETERS.GRF
CHECKED BY: J.J.H.	JOB NO. [illegible]	FIGURE 4

Figure No. E-3

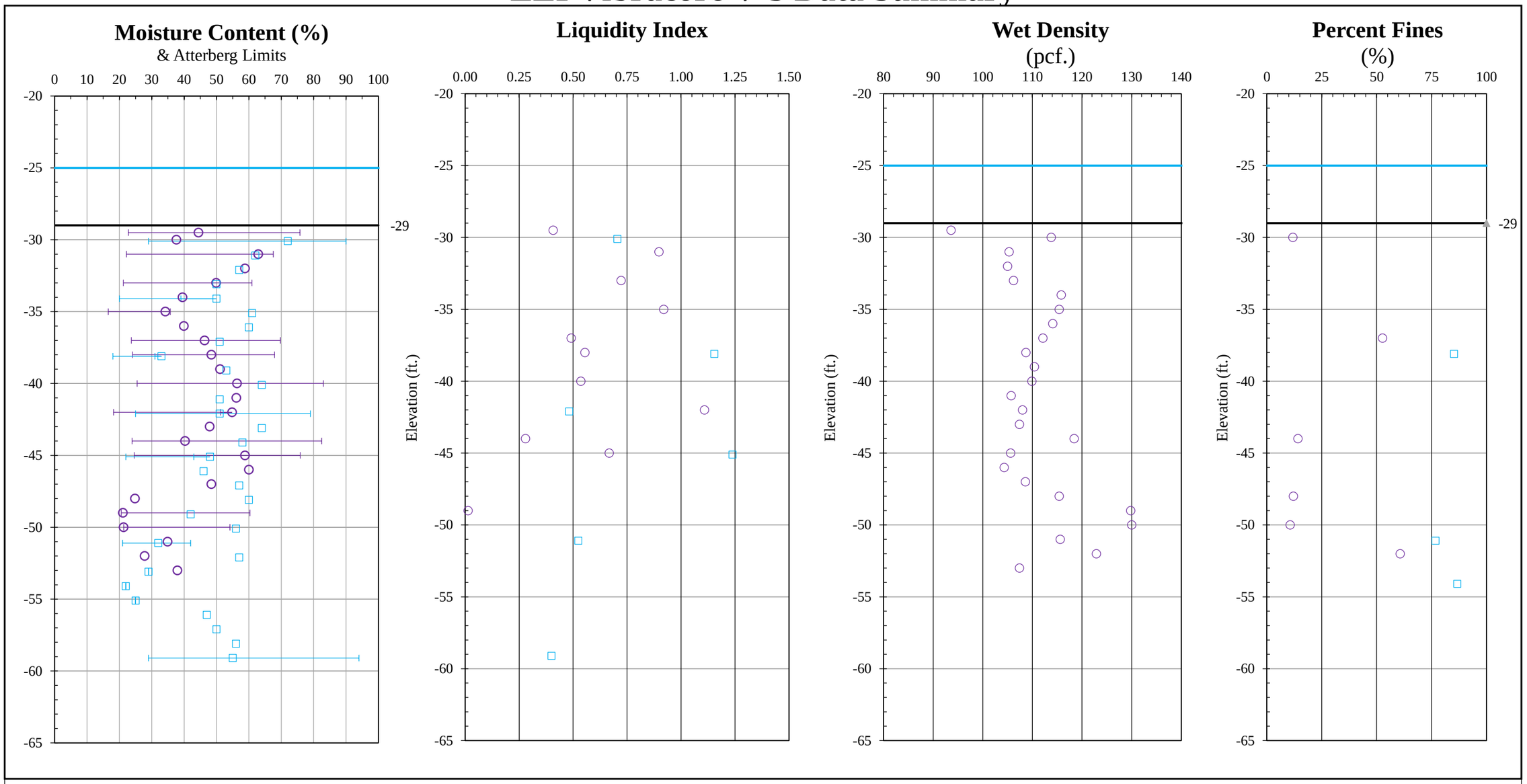
EEI Vibracore V-1 Data Summary



EEI Vibracore V-2 Data Summary



EEI Vibracore V-3 Data Summary



CAMINADA HEADLANDS BACK BARRIER MARSH CREATION PROJECT (BA-171)
Vibratory Core Summary Table

Sample Station	Easting[1]	Northing[1]	Latitude	Longitude	Date	Julian Date	Time UTC	Time Local	Water Depth[2]	Pen.	Recovery	Core Sections	Comments
B19	3667821	225378	29 06 50.74	90 07 17.35	2/10/15	41	23:10	17:10	32.8	28.0	22.3	5	Start 18:06, Stop 18:10. No refusal - Roding - Retry
B19a	3667819	225383	29 06 50.79	90 07 17.38	2/11/15	42	13:15	7:15	32.6	30.0	25.7	5	Start 07:26, Stop 07:30. No refusal - Roding
B10	3667901	226249	29 06 59.35	90 07 16.34	2/11/15	42	15:15	9:15	31.7	30.0	23.8	5	Start 09:36, Stop 09:41. No refusal - Retry
B10a	3667900	226253	29 06 59.39	90 07 16.36	2/11/15	42	17:15	11:15	32.0	30.5	28.4	5	Start 11:21, Stop 11:24. No refusal, increase rate of pen.
B18	3669557	226542	29 07 02.08	90 06 57.65	2/11/15	42	18:50	12:50	32.7	30.0	24.7	5	Start 13:06, Stop 13:10. No refusal - Retry
B18a	3669556	226537	29 07 02.03	90 06 57.66	2/11/15	42	20:15	14:15	32.7	31.0	21.4	4	Start 14:09, Stop 14:14. No refusal - Retry
B11	3670299	228055	29 07 16.98	90 06 49.10	2/11/15	42	21:30	15:30	31.6	30.0	27.3	5	Start 15:55, Stop 15:59. No refusal, decrease pen. rate
B17	3671504	227949	29 07 15.80	90 06 35.53	2/11/15	42	23:15	17:15	32.3	31.0	27.0	5	Start 17:24, Stop 17:27. No refusal
B12	3672279	229573	29 07 31.80	90 06 26.60	2/12/15	43	13:20	7:20	30.7	31.0	29.6	6	Start 07:46, Stop 07:50, No refusal, wood in A BTM from deck
B13	3675656	232089	29 07 56.35	90 05 48.22	2/12/15	43	15:15	9:15	30.6	32.0	31.0	6	Start 09:34, Stop 09:42. No refusal, no material in chk valve
B14	3677532	233412	29 08 09.24	90 05 26.91	2/12/15	43	17:15	11:15	30.1	30.5	31.1	6	Start 11:31, Stop 11:38, No refusal, fine sed in chk valve, retry
B14a	3677536	233414	29 08 09.26	90 05 26.87	2/12/15	43	18:41	12:41	30.6	27.0	27.9	5	Start 12:05, Stop 12:10. No refusal,
B15	3677183	232323	29 07 58.50	90 05 30.98	2/12/15	43	20:15	14:15	31.4	28.0	25.0	5	Start 14:41, Stop 14:46. No refusal - Retry
B15a	3677184	232327	29 07 58.54	90 05 30.96	2/12/15	43	22:30	16:30	32.0	30.0	26.0	5	Start 16:26, Stop 16:34. No refusal
B16	3674767	230140	29 07 37.15	90 05 58.47	2/12/15	43	23:30	17:30	32.2	31.0	25.3	5	Start 18:02, Stop 18:09, No refusal

Notes:

[1] Coordinates are in feet referenced to the Louisiana South State Plane Coordinate System (LA-1702), NAD83, US Survey Feet.
[2] Water depths are in feet.

LEGEND AND NOTES FOR LOG OF BORING AND TEST RESULTS

PP — Pocket penetrometer: Resistance in tons per square foot

SPT — Standard Penetration Test: Number of blows of a 140-lb hammer dropped 30 inches required to drive 2-in. O.D., 1.4-in. I.D. sampler a distance of 1 foot into the soil after first seating it 6 inches

SPLR — Type of Sampling: Shelby, SPT, Auger, Vibracore, No sample

SYMBOL — Clay, Silt, Sand, Peat/Humus, Shells, Stone/Gravel

Predominant type shown heavy; Modifying type shown light

USC — Unified Soil Classification

DENSITY — Unit weight in pounds per cubic foot

SHEAR TESTS

TYPE

- UC — Unconfined compression shear
- OB — Unconsolidated undrained triaxial compression shear on one specimen confined at the approximate overburden pressure
- UU — Unconsolidated undrained triaxial compression shear
- CU — Consolidated undrained triaxial compression shear
- DS — Direct shear

- Ø — Angle of internal friction in degrees
- c — Cohesion in pounds per square foot

ATTERBERG LIMITS

- LL — Liquid Limit
- PL — Plastic Limit
- PI — Plasticity Index

OTHER TESTS

- CON — Consolidation
- PD — Particle size distribution (sieve and/or hydrometer)
- k — Coefficient of permeability in centimeters per second
- SP — Swelling pressure in pounds per square foot

Other laboratory test results reported on separate figures

GENERAL NOTES

(1) If a ground water depth is shown on the boring log, these observations were made at the time of drilling and were measured below the existing ground surface. These observations are shown on the boring logs. However, ground water levels may vary due to seasonal fluctuations and other factors. If important to construction, the depth to ground water should be determined by those persons responsible for construction immediately prior to beginning work.

(2) While the individual logs of borings are considered to be representative of subsurface conditions at their respective locations on the dates shown, it is not warranted that they are representative of subsurface conditions at other locations and times.

EUSTIS ENGINEERING

State of Louisiana
Caminada Headlands Back Barrier
Marsh Creation Project (BA-171)
Lafourche Parish, Louisiana
Project No: 22729

Date: 02/11/2015

LOG OF BORING AND TEST RESULTS

B-10A

Latitude: 29.11650
Longitude: -90.12121

Water Depth: See Text
Total Depth: 60.0 ft

Scale in Feet	PP	SPT	SPLR	Symbol	Visual Classification	USC	Sample Number	Depth in Feet	Water Content Percent	Density Dry	Density Wet	Shear Tests Type	Shear Tests ϕ	Shear Tests C	Atterberg Limits LL	Atterberg Limits PL	Atterberg Limits PI		Other Tests
0					32' Water		NS	0											
5																			
10																			
15																			
20																			
25																			
30																			
					Very soft to soft clay w/silty clay pockets, trace of silt pockets, trace of organic matter, & trace of shell fragments	CH	E-1	32	64						61	21	40		
							E-2	33	57										
							E-3	34	64										
35					Soft gray clay w/silt lenses & trace of silty clay	CH	E-4	35	60										
							E-5	36	57						84	27	57		-#200 = 99.9%, PD
					w/trace of silt lenses		E-6	37	57										
							E-7	38	63										
							E-8	39	72										
40							D-1	40	61										
							D-2	41	61						79	28	51		
							D-3	42	58										
					Medium stiff gray clay w/trace of silt pockets & trace of silty sand layers	CH	D-4	43	61										
							D-5	44	68										
45							C-1	45	56										
							C-2	46	64						87	28	59		
					w/trace of sandy silt pockets & lenses, & trace of shell fragments		C-3	47	51										
							C-4	48	55										
					w/silt lenses & sandy silt lenses & layers		C-5	49	50										
50																			

NOTES: Mudline @ el -31.9

EUSTIS GINT LIBRARY090314.GLB EE STANDARD BORING LOG 22729.GPJ EE STANDARD DATATEMPLATE.GDT 6/11/15

Figure No. E.9

EUSTIS ENGINEERING

State of Louisiana
Caminada Headlands Back Barrier
Marsh Creation Project (BA-171)
Lafourche Parish, Louisiana
Project No: 22729

Date: 02/11/2015

LOG OF BORING AND TEST RESULTS

B-10A

Latitude: 29.11650
Longitude: -90.12121

Water Depth: See Text
Total Depth: 60.0 ft

Scale in Feet	PP	SPT	SPLR	Symbol	Visual Classification	USC	Sample Number	Depth in Feet	Water Content Percent	Density Dry	Density Wet	Shear Tests Type	Shear Tests ϕ	Shear Tests C	Atterberg Limits LL	Atterberg Limits PL	Atterberg Limits PI		Other Tests
50					Stiff gray clay w/silt lenses, trace of sandy silt lenses, & trace of shell fragments	CH	B-1	50	54										
							B-2	51	54						52	22	30		
					w/silt lenses & layers, & trace of shell fragments		B-3	52	50										
							B-4	53	57										
							B-5	54	55										
55							A-1	55	58										
							A-2	56	55						75	24	51		
							A-3	57	44										
							A-4	58	47										
60							A-5	59	53						88	31	57		
65																			
70																			
75																			
80																			
85																			
90																			
95																			
100																			

NOTES: Mudline @ el -31.9

EUSTIS GINT LIBRARY090314.GLB EE STANDARD BORING LOG 22729.GPJ EE STANDARD DATATEMPLATE.GDT 6/11/15

Figure No. E.10

EUSTIS ENGINEERING

State of Louisiana
Caminada Headlands Back Barrier
Marsh Creation Project (BA-171)
Lafourche Parish, Louisiana
Project No: 22729
Date: 02/12/2015

LOG OF BORING AND TEST RESULTS

B-16

Latitude: 29.12699
Longitude: -90.09958

Water Depth: See Text
Total Depth: 58.0 ft

Scale in Feet	PP	SPT	SPLR	Symbol	Visual Classification	USC	Sample Number	Depth in Feet	Water Content Percent	Density Dry	Density Wet	Shear Tests Type	Shear Tests ϕ	Shear Tests C	Atterberg Limits LL	Atterberg Limits PL	Atterberg Limits PI		Other Tests
0					32.2' Water		NS	0											
5																			
10																			
15																			
20																			
25																			
30																			
35					Soft gray clay w/silty clay layers & lenses, trace of organic matter, trace of shell fragments, & trace of silt pockets	CH	E-1	32.2	58										
							E-2	33.2	70						84	29	55		
							E-3	34.2	57										
							E-4	35.2	64										
							E-5	36.2	68										
					Medium stiff gray clay w/silt lenses & layers	CH	D-1	37.2	73										
							D-2	38.2	62										
40					Loose gray clayey silt w/trace of clay pockets, hint of fine sand, roots, & organic matter	ML	D-3	39.2	35						NP	NP	NP		-#200 = 98.3%, PD
							D-4	40.2	58										
					Medium stiff gray clay w/trace of silt lenses & trace of silty sand	CH	D-5	41.2	58										
							C-1	42.2	50										
							C-2	43.2	57										
45					Stiff gray clay w/silty sand lenses & layers, sandy silt lenses & layers, & trace of shell fragments	CH	C-3	44.2	56						88	27	61		-#200 = 99.2%, PD
							C-4	45.2	53										
							C-5	46.2	52										
							B-1	47.2	25										-#200 = 17.9%
					Loose gray silty sand w/clay layers & trace of shell fragments	SM	B-2	48.2	22										
50							B-3	49.2	34										-#200 = 20.9%

NOTES: Mudline @ el 31.9

EUSTIS GINT LIBRARY090314.GLB EE STANDARD BORING LOG 22729.GPJ EE STANDARD DATATEMPLATE.GDT 6/11/15

Figure No. E.11

EUSTIS ENGINEERING

State of Louisiana
Caminada Headlands Back Barrier
Marsh Creation Project (BA-171)
Lafourche Parish, Louisiana
Project No: 22729

Date: 02/12/2015

LOG OF BORING AND TEST RESULTS

B-16

Latitude: 29.12699
Longitude: -90.09958

Water Depth: See Text
Total Depth: 58.0 ft

Scale in Feet	PP	SPT	S P L R	Symbol	Visual Classification	USC	Sample Number	Depth in Feet	Water Content Percent	Density Dry	Density Wet	Shear Tests Type	Shear Tests ϕ	Shear Tests C	Atterberg Limits LL	Atterberg Limits PL	Atterberg Limits PI		Other Tests
50					Loose gray silty sand w/clay layers & trace of shell fragments	SM	B-4	50.2	45						63	22	41		
					Stiff gray clay w/silt pockets, lenses, & layers, & trace of shell fragments	CH	B-5	51.2	49										
							A-1	52.2	58										
							A-2	53.2	42										
							A-3	54.2	49										
55							A-4	55.2	62						88	29	59		
							A-5	56.2	52										
					Medium stiff gray clay w/silt lenses	CH													
60																			
65																			
70																			
75																			
80																			
85																			
90																			
95																			
100																			

NOTES: Mudline @ el 31.9

EUSTIS GINT LIBRARY090314.GLB EE STANDARD BORING LOG 22729.GPJ EE STANDARD DATATEMPLATE.GDT 6/11/15

Figure No. E.12

EUSTIS ENGINEERING

State of Louisiana
Caminada Headlands Back Barrier
Marsh Creation Project (BA-171)
Lafourche Parish, Louisiana
Project No: 22729
Date: 02/12/2015

LOG OF BORING AND TEST RESULTS

B-14

Latitude: 29.13590
Longitude: -90.09080

Water Depth: See Text
Total Depth: 61.3 ft

Scale in Feet	PP	SPT	SPLR	Symbol	Visual Classification	USC	Sample Number	Depth in Feet	Water Content Percent	Density Dry	Density Wet	Shear Tests Type	Shear Tests ϕ	Shear Tests C	Atterberg Limits LL	Atterberg Limits PL	Atterberg Limits PI		Other Tests
0					30.1' Water		NS	0											
5																			
10																			
15																			
20																			
25																			
30					Very soft gray clay w/trace of silt pockets & lenses, & organic matter	CH	F-1	30.1	72						90	29	61		
							F-2	31.1	62										
					Soft gray clay w/trace of silt pockets, lenses, & layers, & silty clay layers	CH	F-3	32.1	57										
							F-4	33.1	50										
35							F-5	34.1	50						39	20	19		
							E-1	35.1	61										
							E-2	36.1	60										
							E-3	37.1	51										
					Very soft gray silty clay w/fine sand & trace of clay layers	CL	E-4	38.1	33						31	18	13		-#200 = 85.2%, PD
40							E-5	39.1	53										
					Soft gray clay w/silt lenses & layers, & silty clay lenses	CH	D-1	40.1	64										
							D-2	41.1	51										
					Medium stiff gray clay w/trace of silt lenses	CH	D-3	42.1	51						79	25	54		
							D-4	43.1	64										
							D-5	44.1	58										
45					Soft gray silty clay w/few clay layers	CL	C-1	45.1	48						43	22	21		
					Medium stiff to stiff gray clay w/sandy silt lenses & layers, trace of silt pockets & lenses, & trace of shell fragments	CH	C-2	46.1	46										
							C-3	47.1	57										
							C-4	48.1	60										
50							C-5	49.1	42										

NOTES: Mudline @ el -30.2

EUSTIS GINT LIBRARY090314.GLB EE STANDARD BORING LOG 22729.GPJ EE STANDARD DATATEMPLATE.GDT 6/11/15

Figure No. E.13

EUSTIS ENGINEERING

State of Louisiana
Caminada Headlands Back Barrier
Marsh Creation Project (BA-171)
Lafourche Parish, Louisiana
Project No: 22729
Date: 02/12/2015

LOG OF BORING AND TEST RESULTS

B-14

Latitude: 29.13590
Longitude: -90.09080

Water Depth: See Text
Total Depth: 61.3 ft

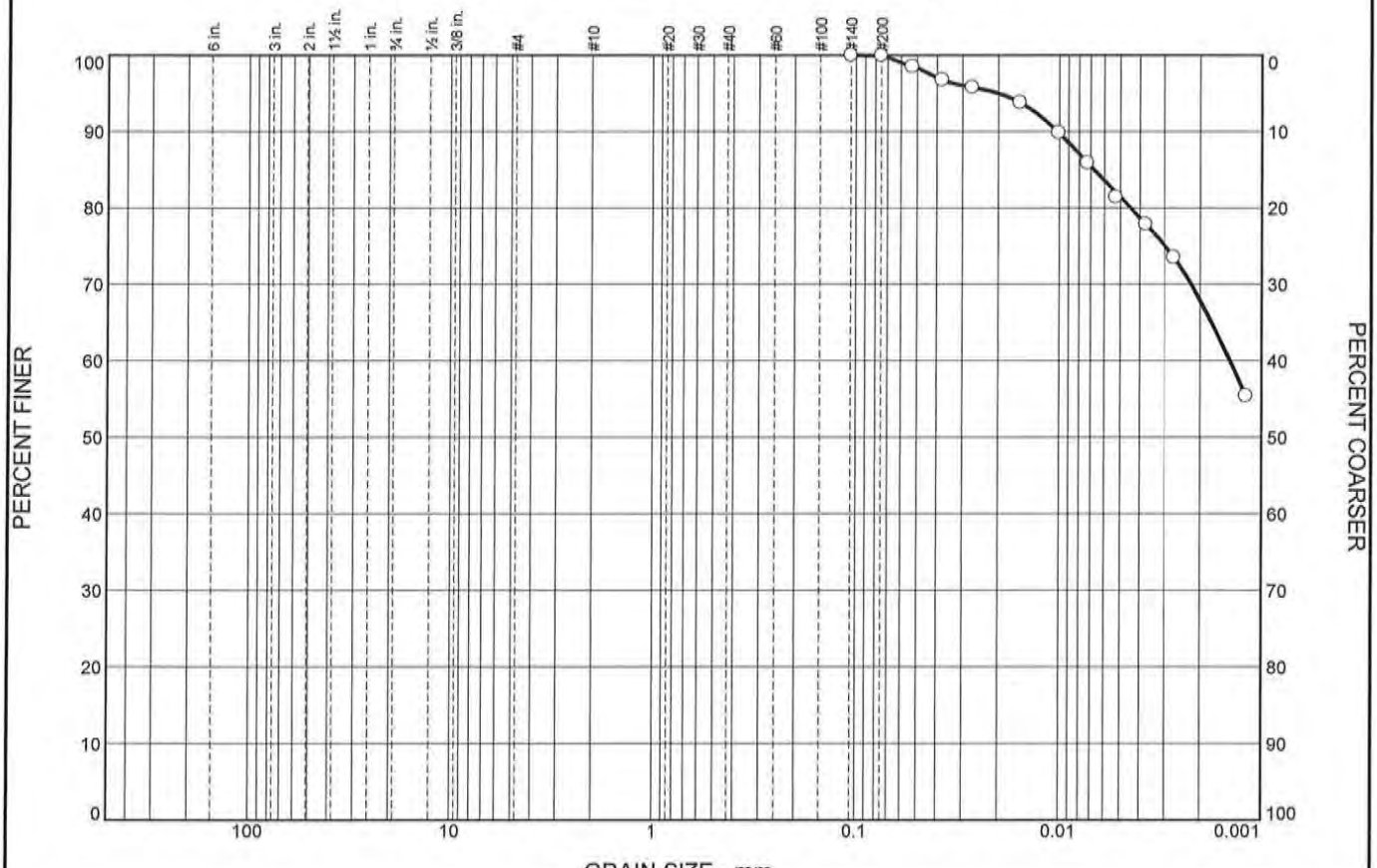
Scale in Feet	PP	SPT	SPLR	Symbol	Visual Classification	USC	Sample Number	Depth in Feet	Water Content Percent	Density Dry	Density Wet	Shear Tests Type	Shear Tests ϕ	Shear Tests C	Atterberg Limits LL	Atterberg Limits PL	Atterberg Limits PI		Other Tests
50					Soft gray clay w/sandy silt lenses & layers, & trace of shell fragments	CH	B-1	50.1	56										
						CL	B-2	51.1	32						43	21	22		-#200 = 76.8%, PD
					Soft gray silty clay w/few clay layers, sandy silt lenses & pockets, & trace of shell fragments	CH	B-3	52.1	57										
						ML	B-4	53.1	29						NP	NP	NP		
55					Stiff gray clay w/trace of silt lenses & trace of shell fragments	ML	B-5	54.1	22						NP	NP	NP		-#200 = 86.7%, PD
						ML	A-1	55.1	25						NP	NP	NP		
					Loose gray silt w/few silty clay layers & trace of shell fragments	CH	A-2	56.1	47										
						CH	A-3	57.1	50										
					Loose gray sandy silt w/few clay	CH	A-4	58.1	56										
60					Loose gray clayey silt w/trace of clay pockets		A-5	59.1	55						94	29	65		
					Soft to medium stiff gray clay w/silt lenses & layers														
65					Stiff gray clay w/trace of organic matter & trace of silt lenses & pockets														
70																			
75																			
80																			
85																			
90																			
95																			
100																			

NOTES: Mudline @ el -30.2

EUSTIS GINT LIBRARY090314.GLB EE STANDARD BORING LOG 22729.GPJ EE STANDARD DATATEMPLATE.GDT 6/11/15

Figure No. E.14

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	0.0	0.1	18.5	81.4

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	84	27	0.0067	0.0014						

Material Description	USCS	AASHTO
○ Soft Gray Clay W/ Traces of Silt Lenses and Layer	CH	

Project No. 22729 **Client:** CPRA

Project: CAMINADA HEADLANDS BACK BARRIER MARSH CREATION PROJECT (BA-171) LAFOURCHE PARISH, LOUISIANA

○ **Source of Sample:** B10A **Depth:** 36 **Sample Number:** E-5

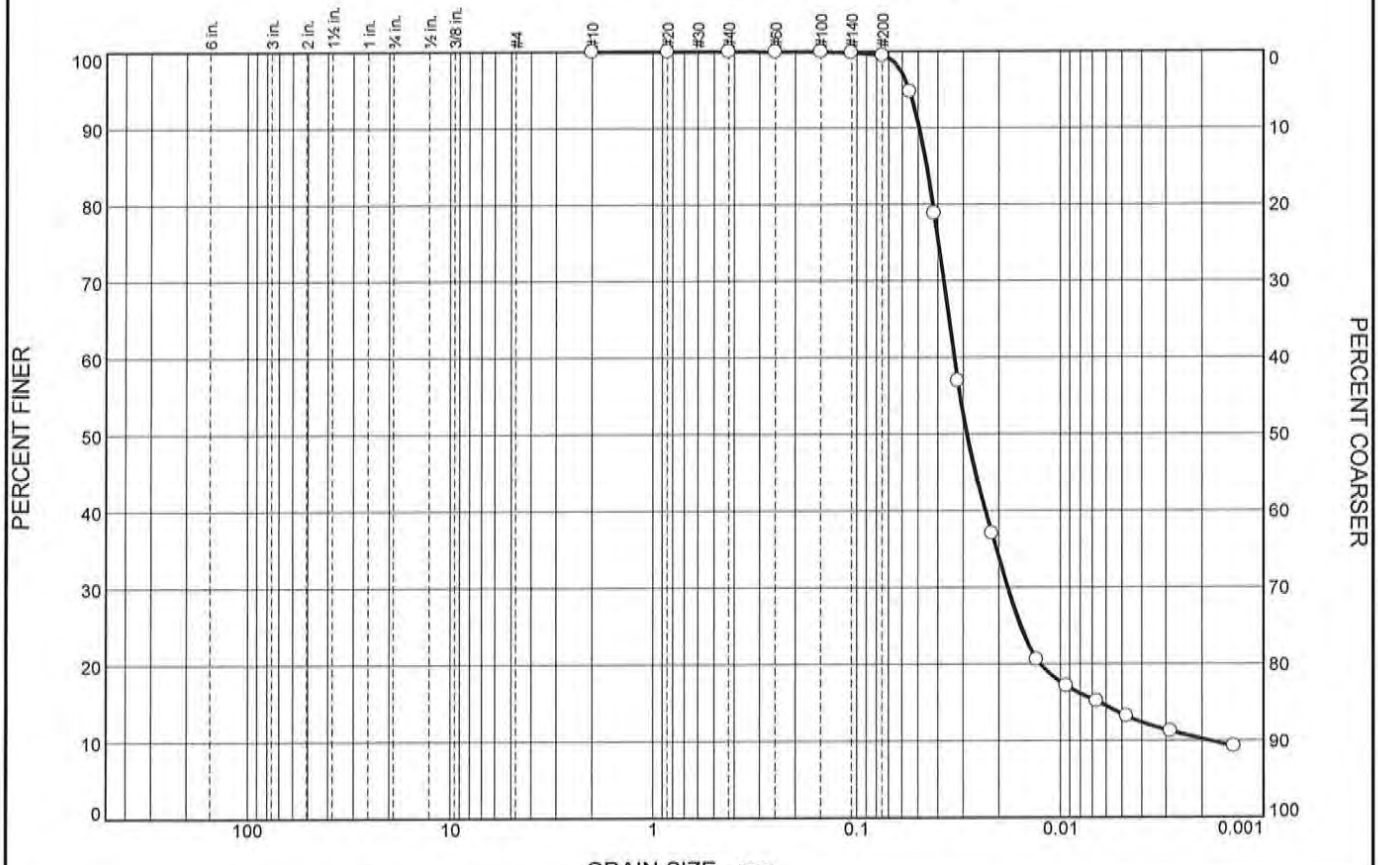
Remarks:
○Specific Gravity was Estimated

EUSTIS
Metairie, Louisiana
Lafayette, Louisiana
Gulfport, Mississippi

Figure

Tested By: AS **Checked By:** CD

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	0.0	0.5	86.0	13.5

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	32	26	0.0454	0.0333	0.0288	0.0181	0.0065	0.0019	5.30	17.98

Material Description	USCS	AASHTO
○ Loose Gray Clayey Silt W/ Traces of Clay Len and Sandy Silt Pockets	ML	

Project No. 22729 **Client:** CPRA

Project: CAMINADA HEADLANDS BACK BARRIER MARSH CREATION PROJECT (BA-171) LAFOURCHE PARISH, LOUISIANA

○ **Source of Sample:** B11 **Depth:** 35.6 **Sample Number:** E-5

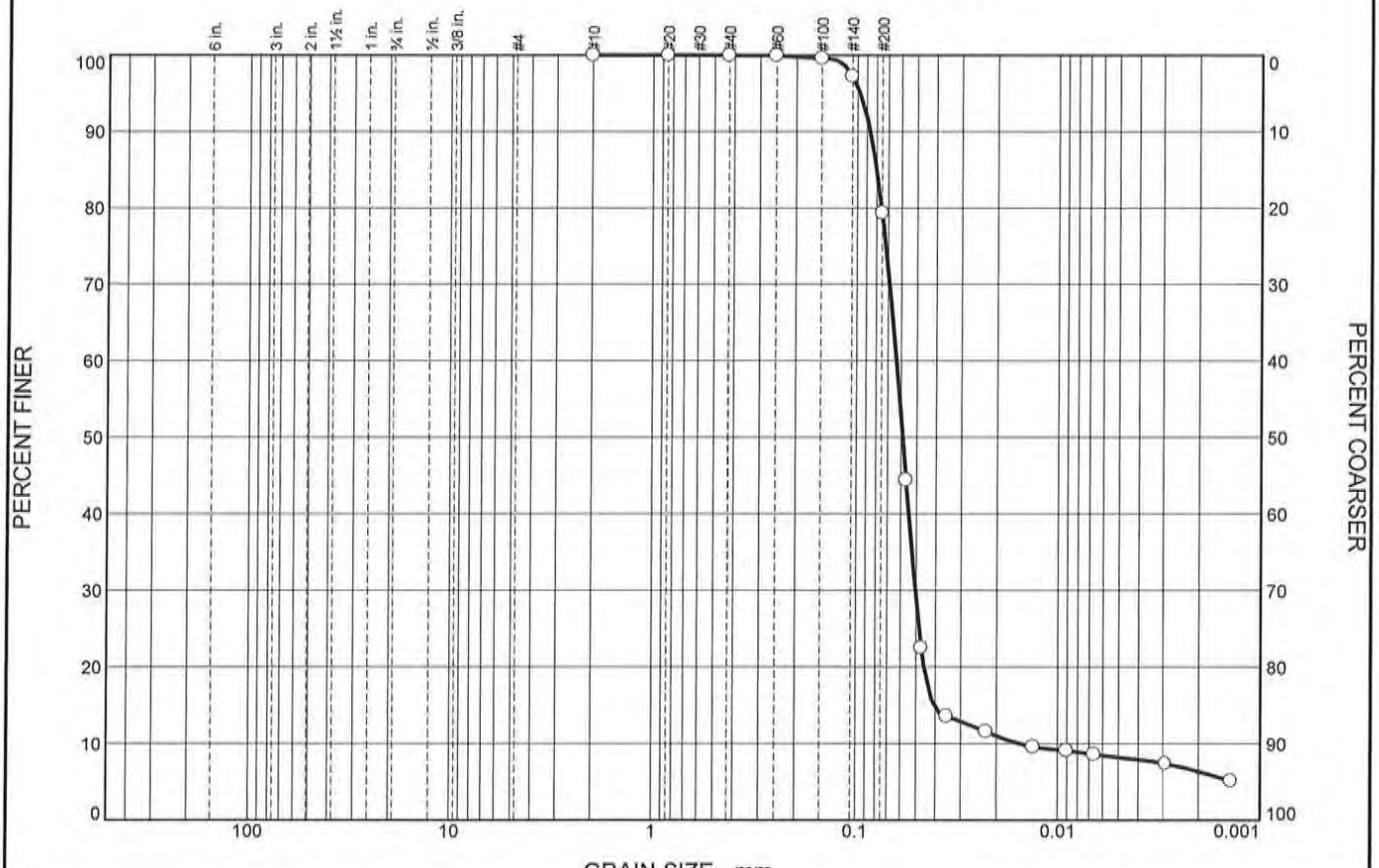
Remarks:
○Specific Gravity was Estimated

EUSTIS
Metairie, Louisiana
Lafayette, Louisiana
Gulfport, Mississippi

Figure

Tested By: AS **Checked By:** CD

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	0.0	20.7	71.1	8.2

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.0802	0.0634	0.0589	0.0507	0.0407	0.0155	2.62	4.10

Material Description	USCS	AASHTO
○ Loose Gray Sandy Silt W/ Trace of Clay Layer	ML	

Project No. 22729 **Client:** CPRA

Project: CAMINADA HEADLANDS BACK BARRIER MARSH CREATION PROJECT (BA-171) LAFOURCHE PARISH, LOUISIANA

○ **Source of Sample:** B11 **Depth:** 56.6 **Sample Number:** A-4

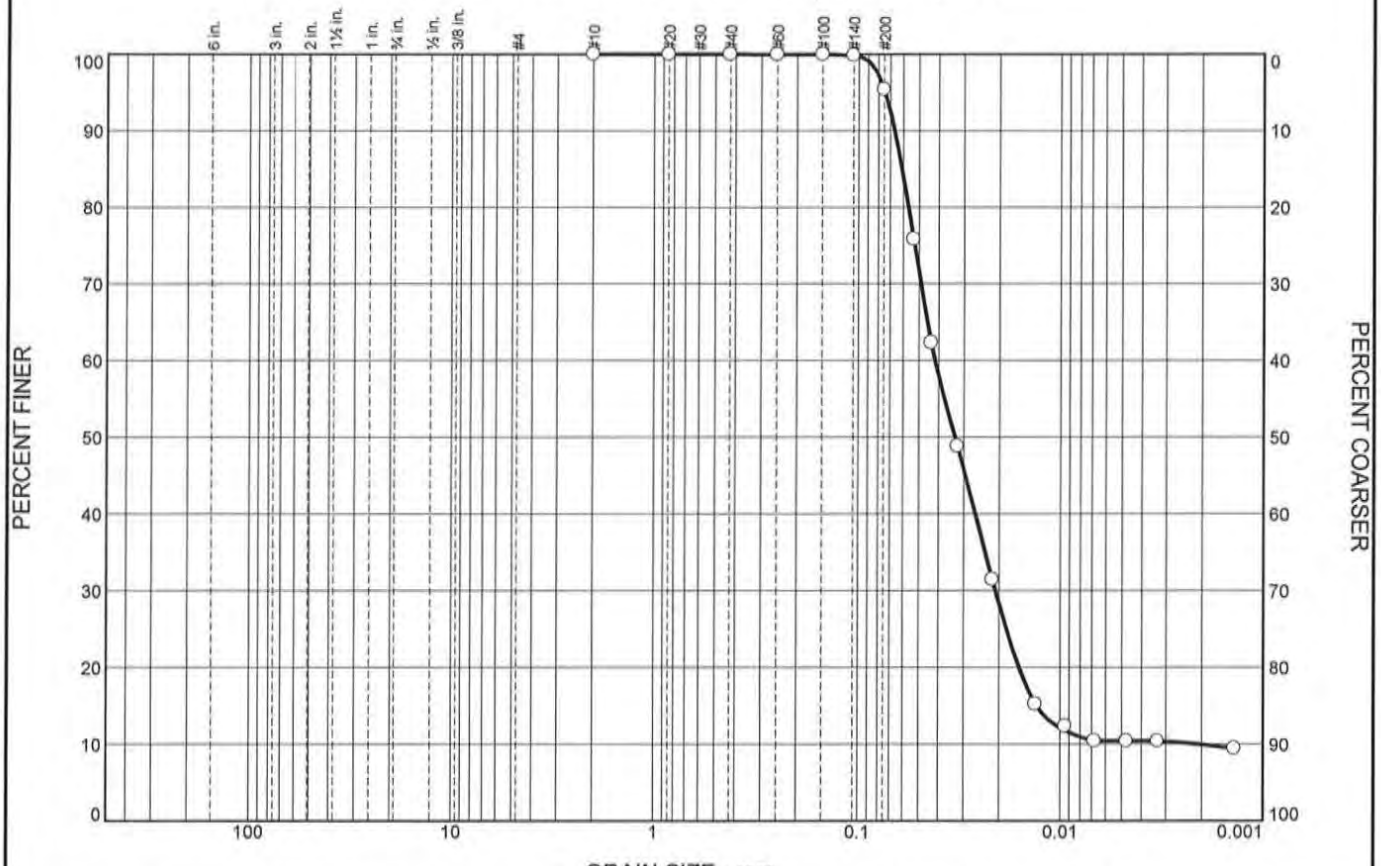
Remarks:
○Specific Gravity was Estimated

EUSTIS
Metairie, Louisiana
Lafayette, Louisiana
Gulfport, Mississippi

Figure

Tested By: AS **Checked By:** CD

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	0.0	4.6	85.0	10.4

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	NP	NP	0.0610	0.0417	0.0332	0.0209	0.0131	0.0021	4.94	19.76

Material Description	USCS	AASHTO
○ Loose Gray Clayey Silt W/ Traces of Sand Pockets and Shell Fragments	ML	A-4(0)

Project No. 22729 **Client:** CPRA

Project: CAMINADA HEADLANDS BACK BARRIER MARSH CREATION PROJECT (BA-171) LAFOURCHE PARISH, LOUISIANA

○ **Source of Sample:** B12 **Depth:** 32.7 **Sample Number:** F-3

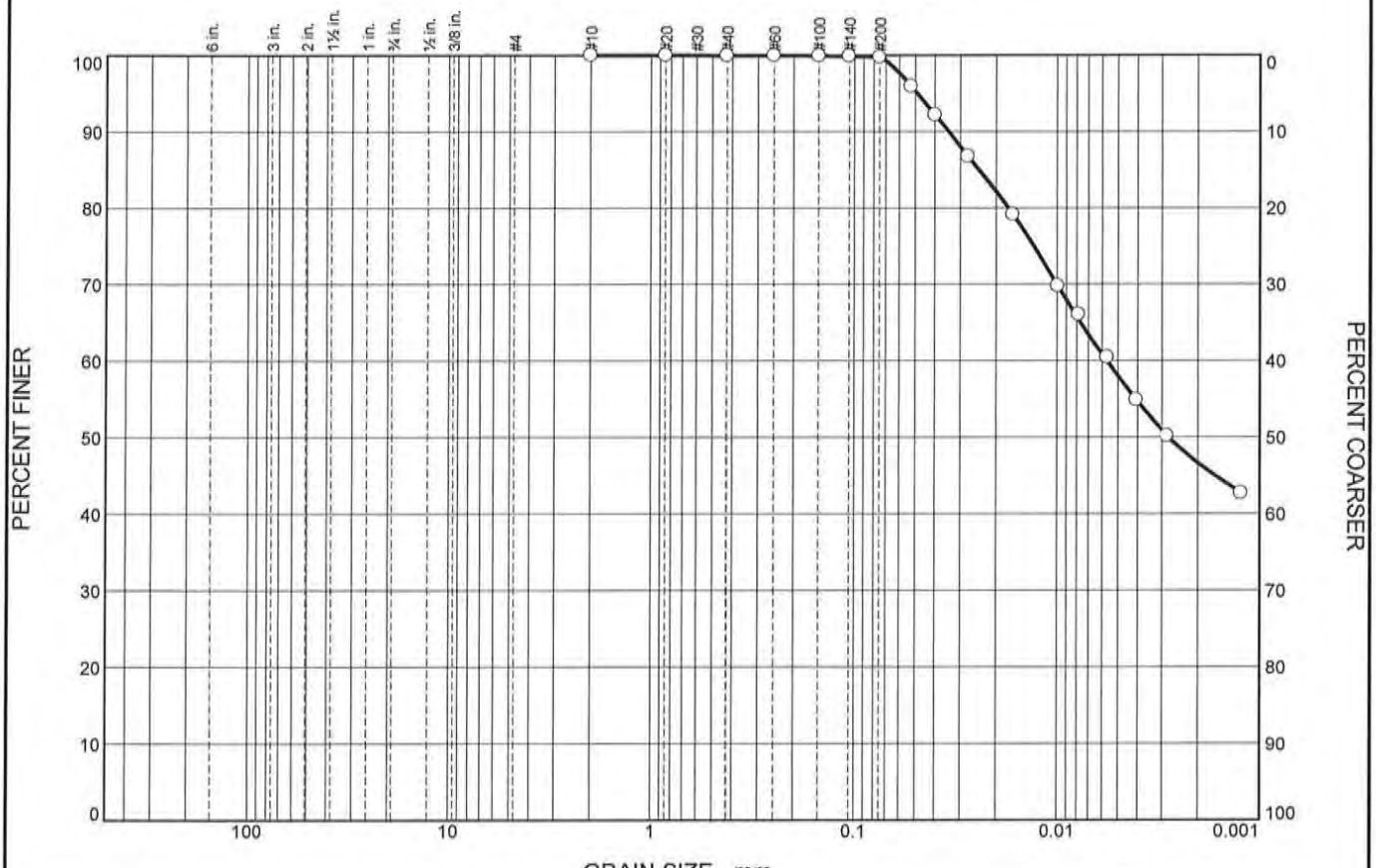
Remarks:
○Specific Gravity was Estimated

EUSTIS
Metairie, Louisiana
Lafayette, Louisiana
Gulfport, Mississippi

Figure

Tested By: JL & KE **Checked By:** CD

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	0.0	0.3	41.7	58.0

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	68	24	0.0244	0.0057	0.0028					

Material Description	USCS	AASHTO
○ Medium Stiff Gray Clay W/ Few Silt Lenses, Smidgens of Concretions, Sand and Organic Matter	CH	A-7-6(51)

Project No. 22729 **Client:** CPRA

Project: CAMINADA HEADLANDS BACK BARRIER MARSH CREATION PROJECT (BA-171) LAFOURCHE PARISH, LOUISIANA

○ **Source of Sample:** B12 **Depth:** 57.7 **Sample Number:** A-4

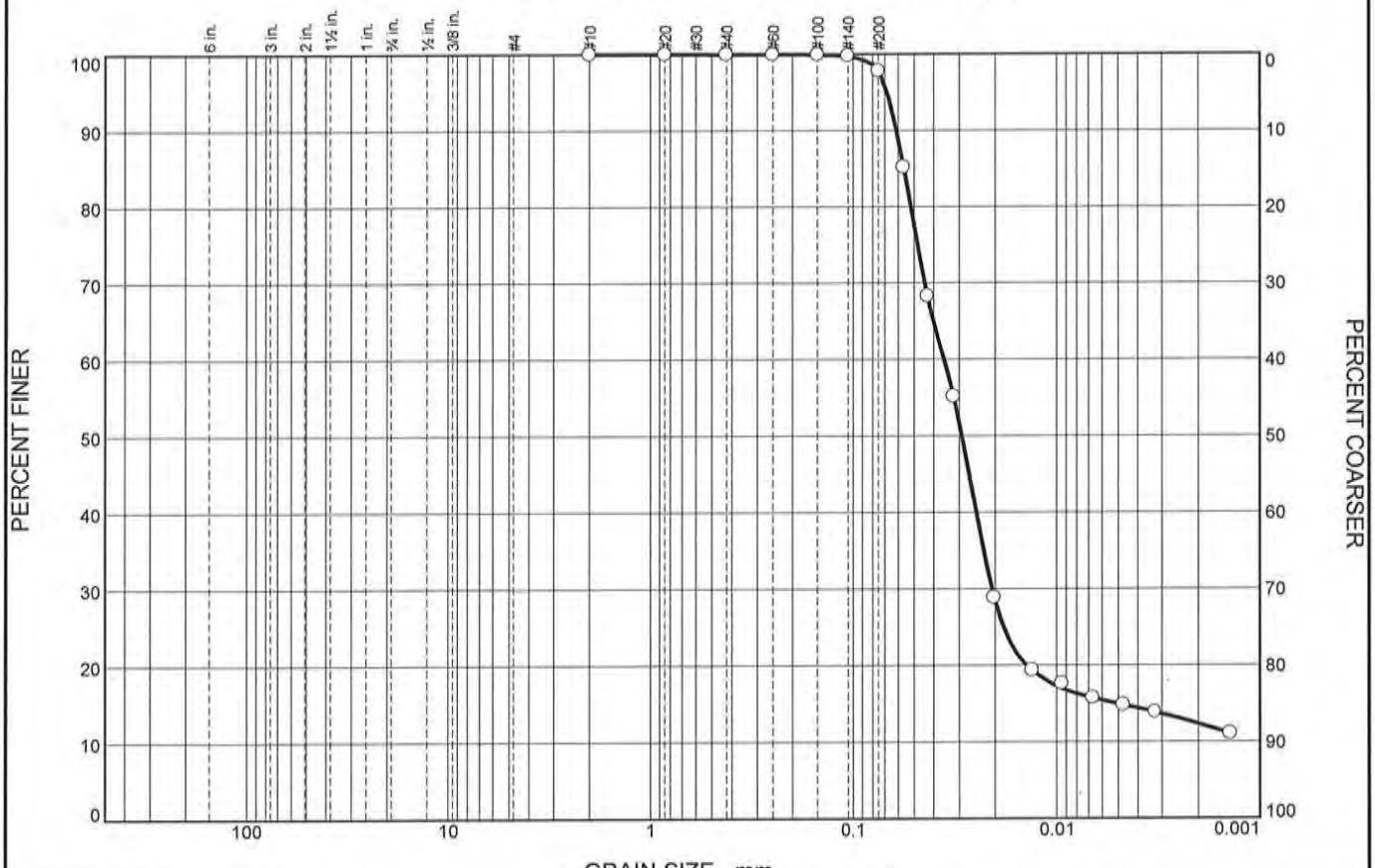
Remarks:
○Specific Gravity was Estimated

EUSTIS
Metairie, Louisiana
Lafayette, Louisiana
Gulfport, Mississippi

Figure

Tested By: JL & KE **Checked By:** CD

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	0.0	2.2	82.8	15.0

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.0562	0.0357	0.0291	0.0207	0.0051			

Material Description	USCS	AASHTO
○ Loose Gray Clayey Silt W/ Trace of Shell Fragments	ML	

Project No. 22729 **Client:** CPRA

Project: CAMINADA HEADLANDS BACK BARRIER MARSH CREATION PROJECT (BA-171)
LAFOURCHE PARISH, LOUISIANA

○ **Source of Sample:** B13 **Depth:** 54.6 **Sample Number:** B-5

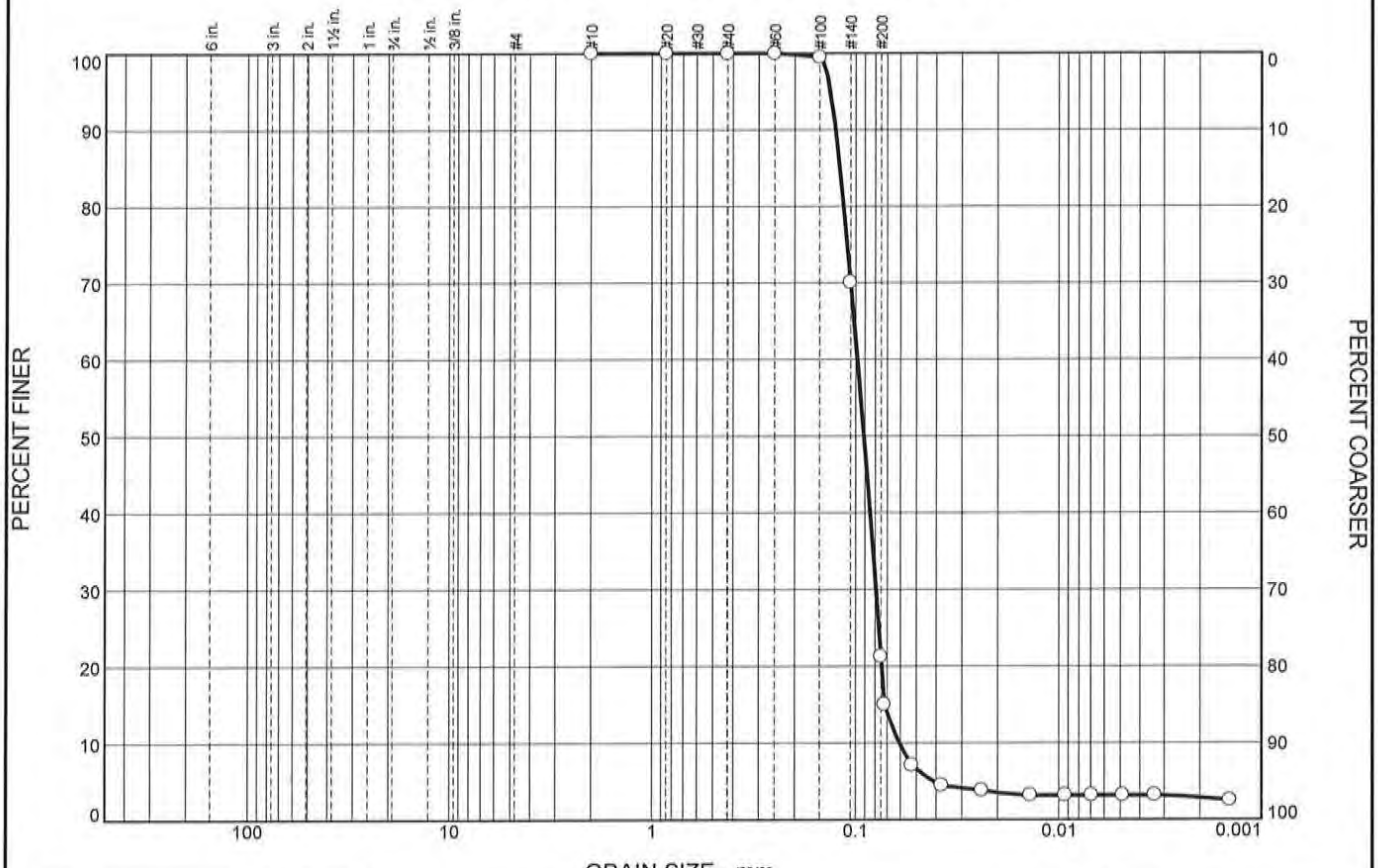
Remarks:
○Specific Gravity was Estimated

EUSTIS
Metairie, Louisiana
Lafayette, Louisiana
Gulfport, Mississippi

Figure

Tested By: JL & KE **Checked By:** CD

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	0.0	78.8	18.1	3.1

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	NP	NP	0.1196	0.0981	0.0911	0.0793	0.0721	0.0606	1.06	1.62

Material Description	USCS	AASHTO
○ Loose Gray Silty Sand W/ Traces of Shell Fragments and Clay Pockets	SM	

Project No. 22729 **Client:** CPRA

Project: CAMINADA HEADLANDS BACK BARRIER MARSH CREATION PROJECT (BA-171) LAFOURCHE PARISH, LOUISIANA

○ **Source of Sample:** B13 **Depth:** 45.6 **Sample Number:** C-1

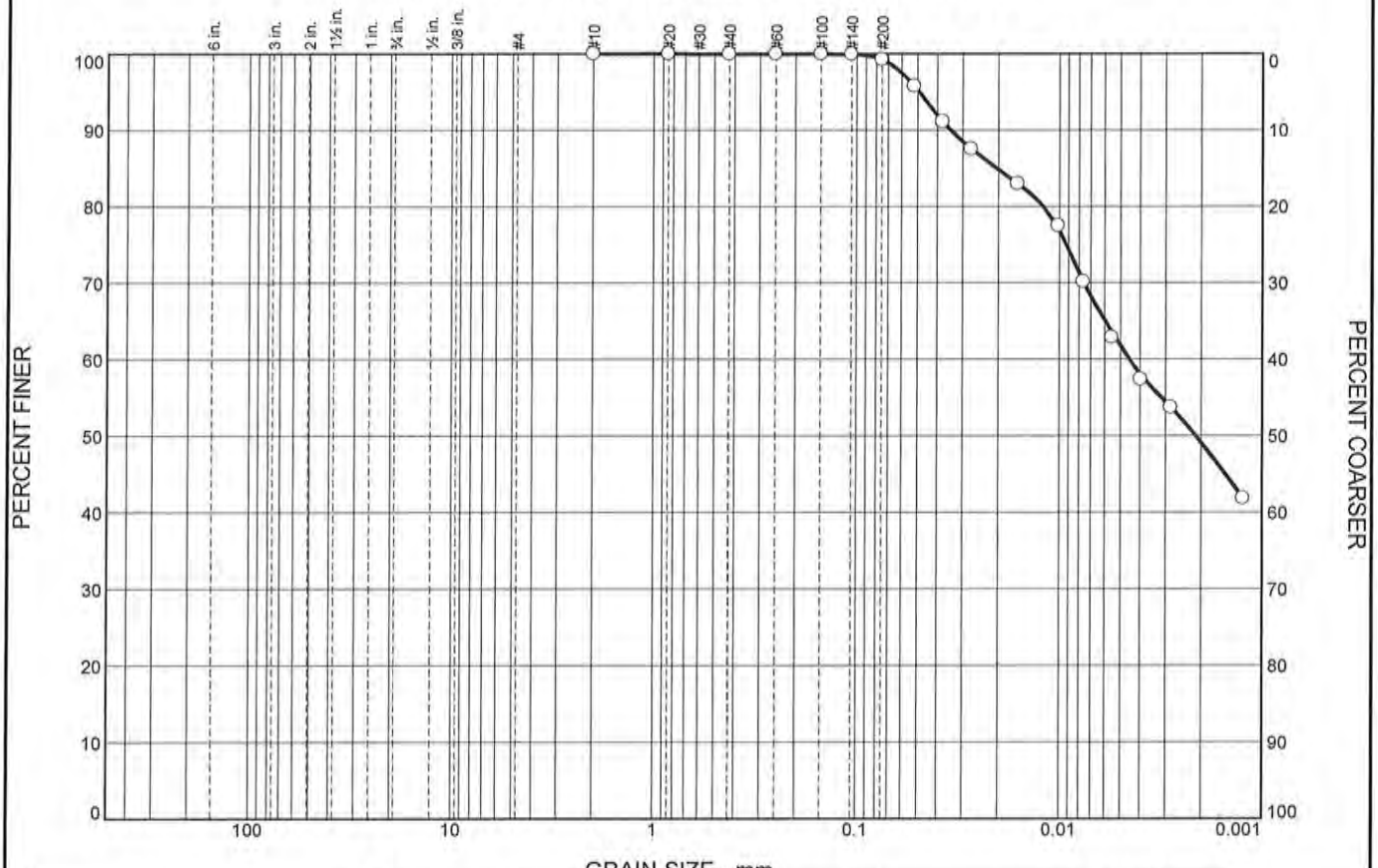
Remarks:
○Specific Gravity was Estimated

EUSTIS
Metairie, Louisiana
Lafayette, Louisiana
Gulfport, Mississippi

Figure

Tested By: JL & KE **Checked By:** CD

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	0.0	0.8	37.4	61.8

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	76	24	0.0205	0.0045	0.0021					

Material Description	USCS	AASHTO
○ Soft Gray Clay W/ Silt Layer, Trace of Organic Matter	CH	

Project No. 22729 **Client:** CPRA

Project: CAMINADA HEADLANDS BACK BARRIER MARSH CREATION PROJECT (BA-171) LAFOURCHE PARISH, LOUISIANA

○ **Source of Sample:** B13 **Depth:** 35.6 **Sample Number:** E-1

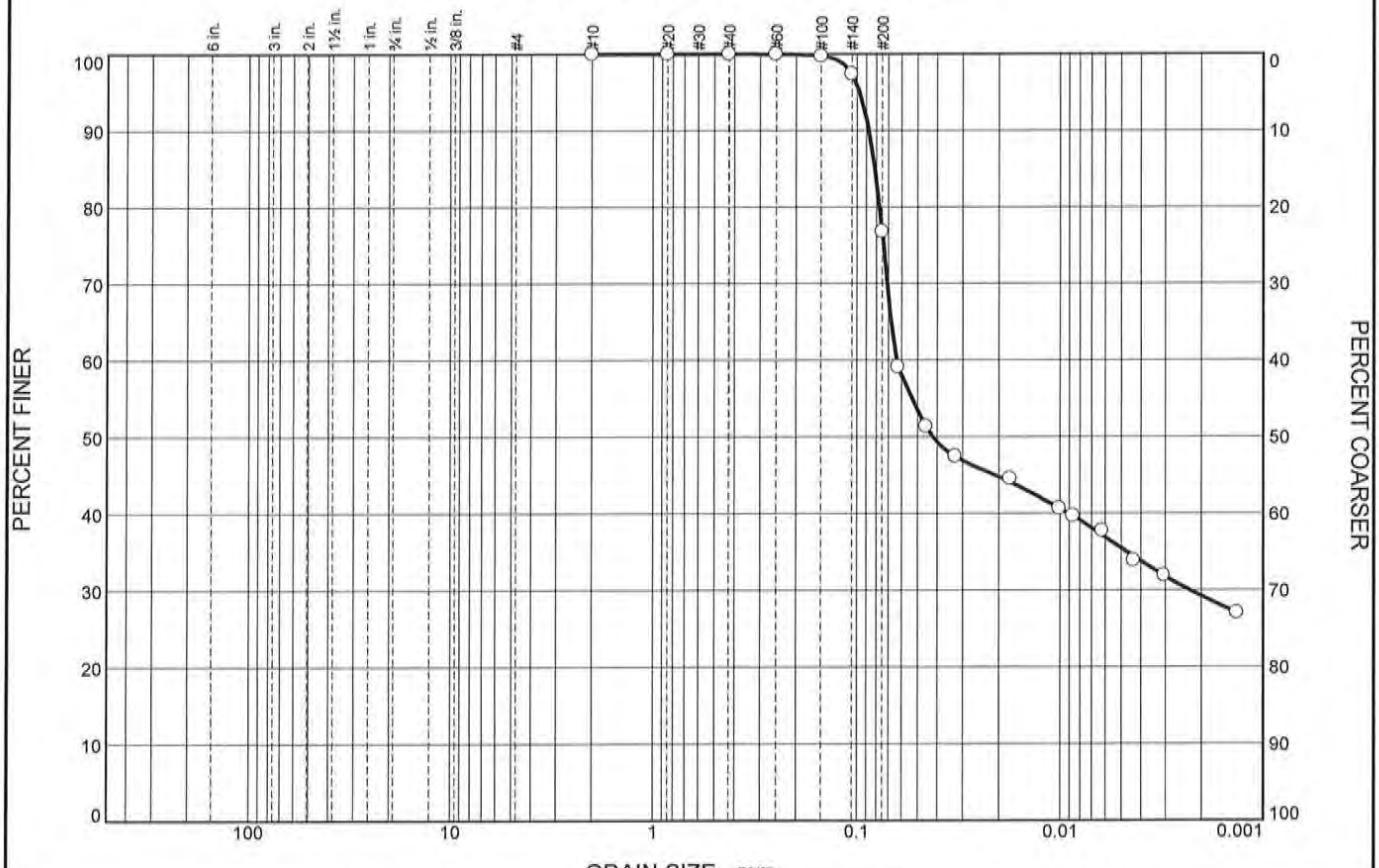
Remarks:
○Specific Gravity was Estimated

EUSTIS
Metairie, Louisiana
Lafayette, Louisiana
Gulfport, Mississippi

Figure

Tested By: JL & KE **Checked By:** CD

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	0.0	23.2	41.3	35.5

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	43	21	0.0816	0.0639	0.0422	0.0023				

Material Description	USCS	AASHTO
○ Soft Gray Silty Clay W/ Few Clay Layer, Sandy Silt Lenses and Pockets, Trace Shell Fragments	CL	A-7-6(16)

Project No. 22729 **Client:** CPRA

Project: CAMINADA HEADLANDS BACK BARRIER MARSH CREATION PROJECT (BA-171) LAFOURCHE PARISH, LOUISIANA

○ **Source of Sample:** B14 **Depth:** 51.1 **Sample Number:** B-2

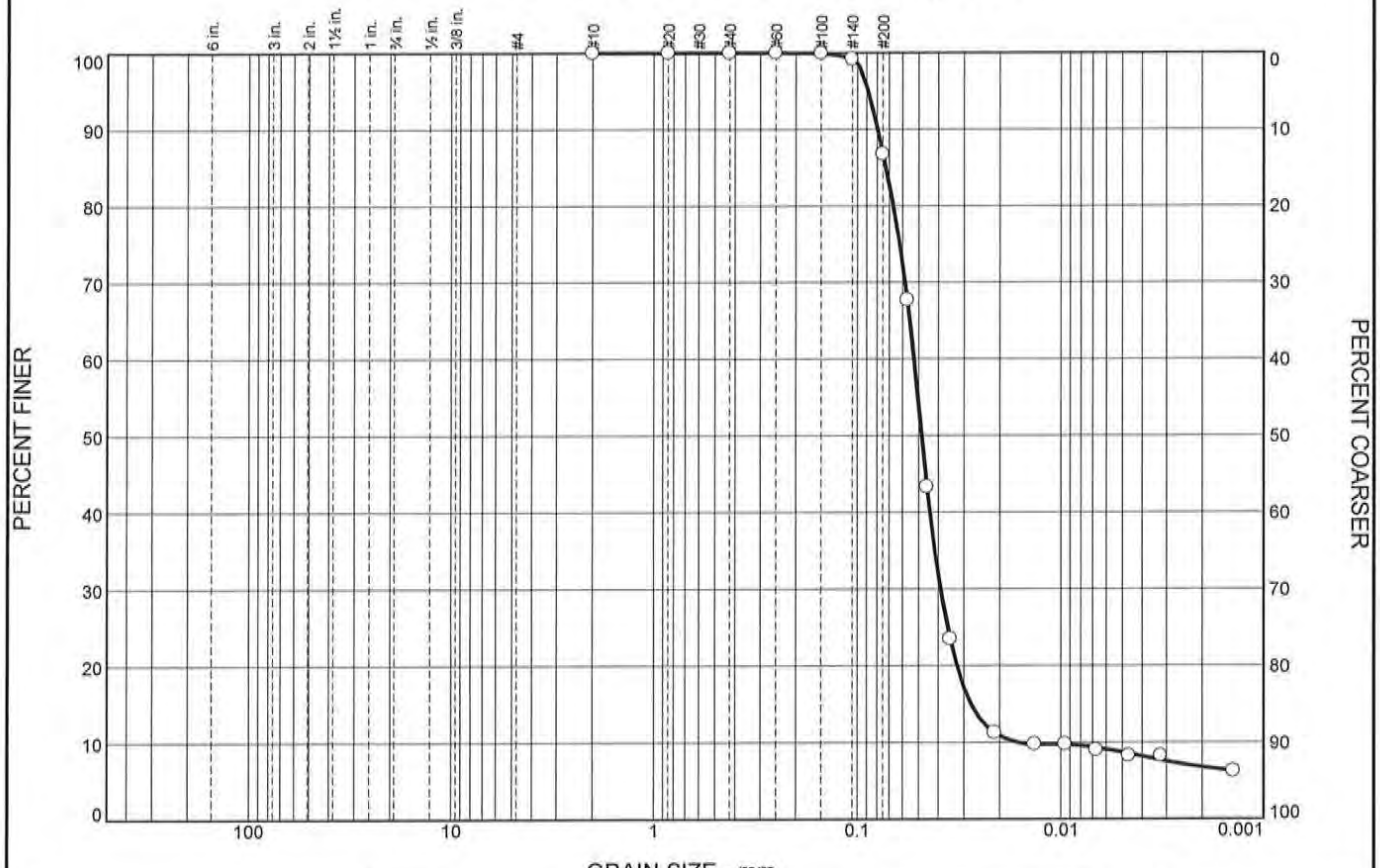
Remarks:
○Specific Gravity was Estimated

EUSTIS
Metairie, Louisiana
Lafayette, Louisiana
Gulfport, Mississippi

Figure

Tested By: JL & KE **Checked By:** CD

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	0.0	13.3	78.0	8.7

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	NP	NP	0.0727	0.0529	0.0485	0.0390	0.0277	0.0162	1.77	3.26

Material Description	USCS	AASHTO
○ Loose Gray and Tan Sandy Silt W/ Few Clay	ML	A-4(0)

Project No. 22729 **Client:** CPRA

Project: CAMINADA HEADLANDS BACK BARRIER MARSH CREATION PROJECT (BA-171) LAFOURCHE PARISH, LOUISIANA

○ **Source of Sample:** B14 **Depth:** 54.1 **Sample Number:** B-5

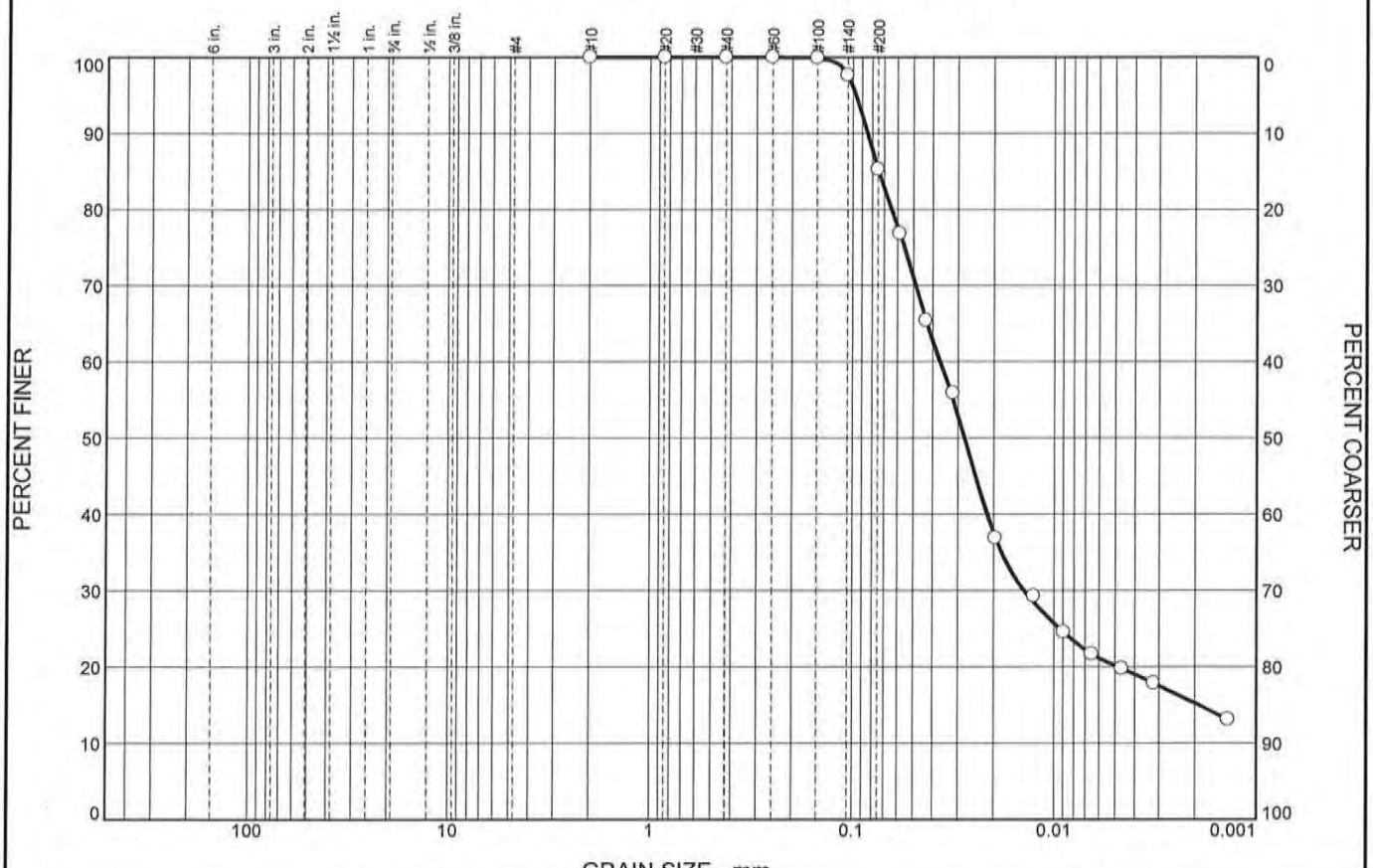
Remarks:
○Specific Gravity was Estimated

EUSTIS
Metairie, Louisiana
Lafayette, Louisiana
Gulfport, Mississippi

Figure

Tested By: JL & KE **Checked By:** CD

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	0.0	14.8	65.0	20.2

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	31	18	0.0745	0.0369	0.0279	0.0141	0.0019			

Material Description	USCS	AASHTO
○ Very Soft Gray Silty Clay W/ Fine Sand, Trace of Clay Layer	CL	A-6(10)

Project No. 22729 **Client:** CPRA

Project: CAMINADA HEADLANDS BACK BARRIER MARSH CREATION PROJECT (BA-171) LAFOURCHE PARISH, LOUISIANA

○ **Source of Sample:** B14 **Depth:** 38.1 **Sample Number:** E-4

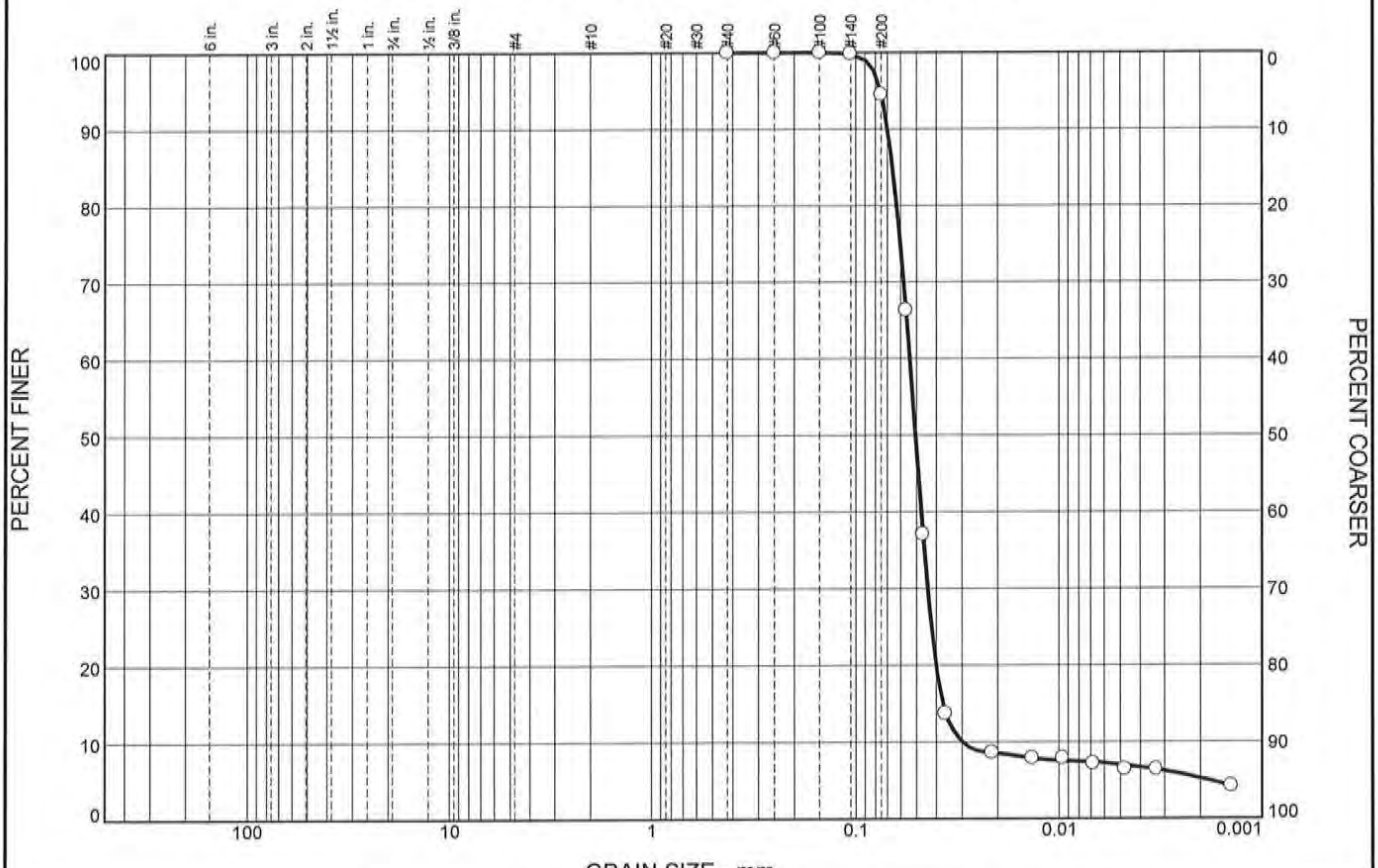
Remarks:
○Specific Gravity was Estimated

EUSTIS
Metairie, Louisiana
Lafayette, Louisiana
Gulfport, Mississippi

Figure

Tested By: JL & KE **Checked By:** CD

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	0.0	5.5	87.5	7.0

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	NP	NP	0.0659	0.0541	0.0507	0.0441	0.0373	0.0299	1.21	1.81

Material Description	USCS	AASHTO
○ Loose Gray Clayey Silt W/ Clay Layer, Few Sand Pockets	ML	

Project No. 22729 **Client:** CPRA

Project: CAMINADA HEADLANDS BACK BARRIER MARSH CREATION PROJECT (BA-171) LAFOURCHE PARISH, LOUISIANA

○ **Source of Sample:** B15A **Depth:** 36 **Sample Number:** D-1

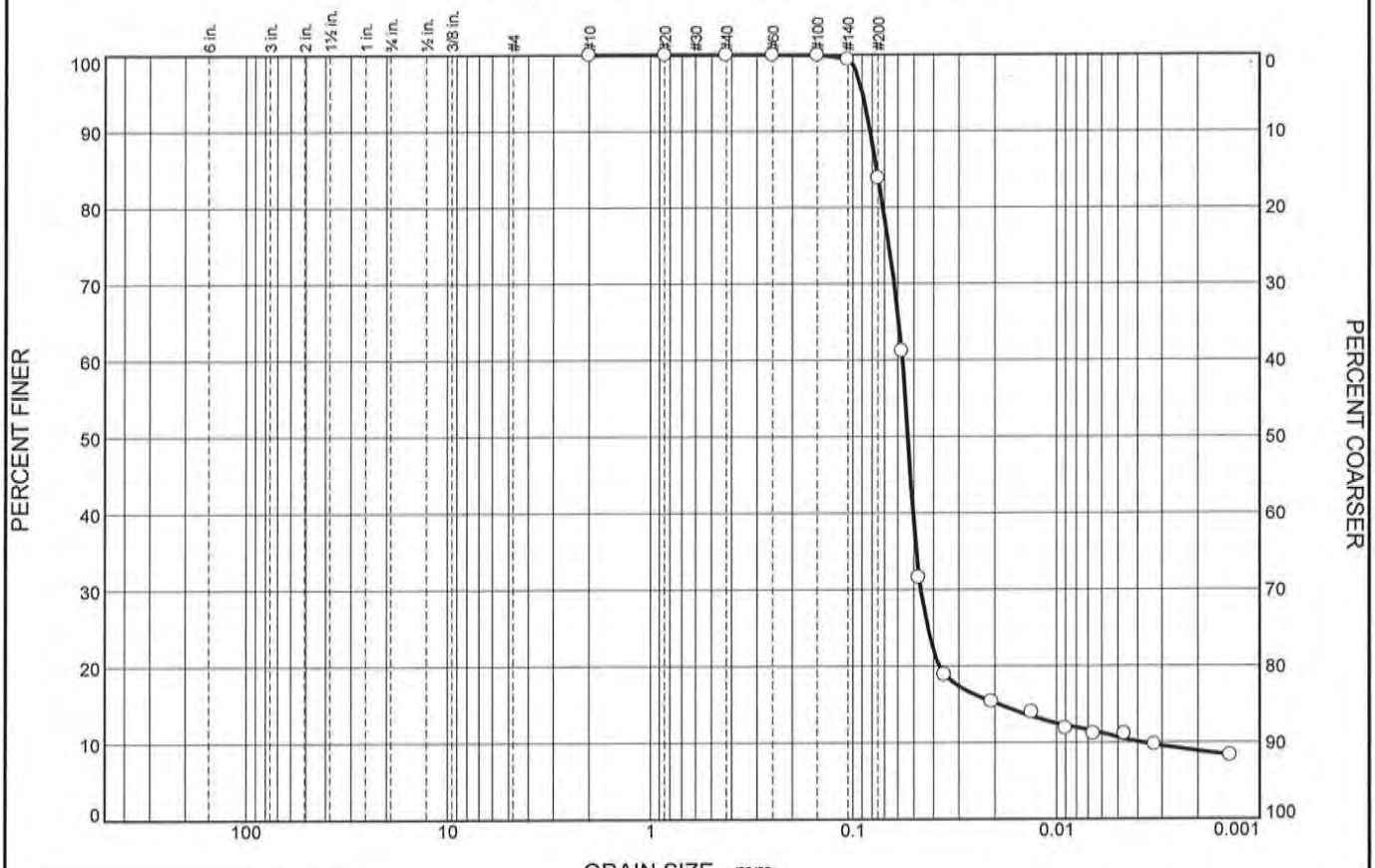
Remarks:
○Specific Gravity was Estimated

EUSTIS
Metairie, Louisiana
Lafayette, Louisiana
Gulfport, Mississippi

Figure

Tested By: JL & KE **Checked By:** CD

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	0.0	16.2	73.1	10.7

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	26	21	0.0762	0.0569	0.0537	0.0464	0.0191	0.0038	9.96	14.99

Material Description	USCS	AASHTO
○ Soft Brown and Gray Silty Clay W/ Fine Sand	CL-ML	

Project No. 22729 **Client:** CPRA

Project: CAMINADA HEADLANDS BACK BARRIER MARSH CREATION PROJECT (BA-171)
LAFOURCHE PARISH, LOUISIANA

○ **Source of Sample:** B15A **Depth:** 39 **Sample Number:** D-4

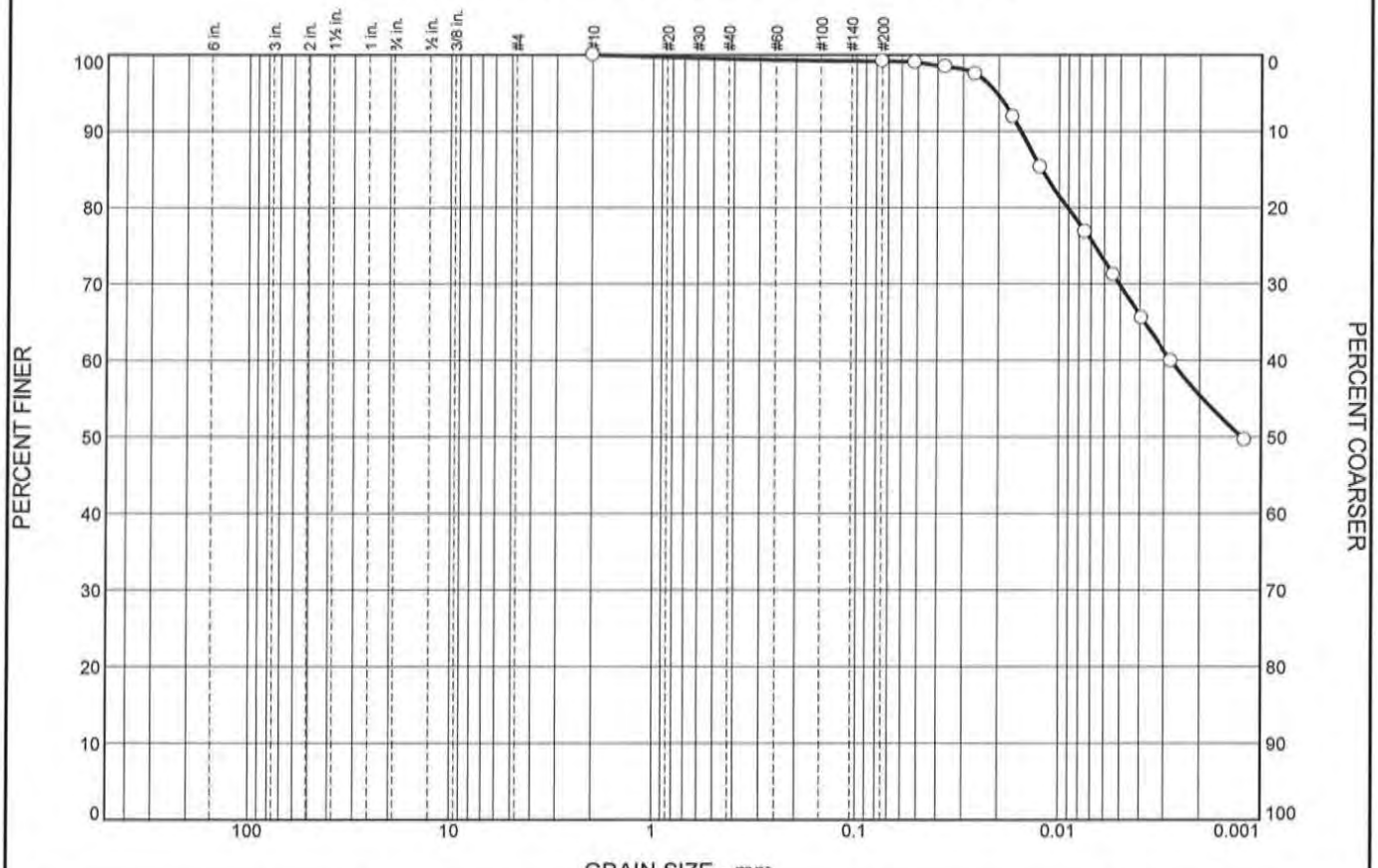
Remarks:
○Specific Gravity was Estimated

EUSTIS
Metairie, Louisiana
Lafayette, Louisiana
Gulfport, Mississippi

Figure

Tested By: JL & KE **Checked By:** CD

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	0.5	0.3	29.4	69.8

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	88	27	0.0122	0.0028	0.0012					

Material Description	USCS	AASHTO
○ Stiff Gray Clay W/ Traces of Silt Pockets and Lenses, Smidgen of Sand	CH	

Project No. 22729 **Client:** CPRA

Project: CAMINADA HEADLANDS BACK BARRIER MARSH CREATION PROJECT (BA-171) LAFOURCHE PARISH, LOUISIANA

○ **Source of Sample:** B16 **Depth:** 44.2 **Sample Number:** C-3

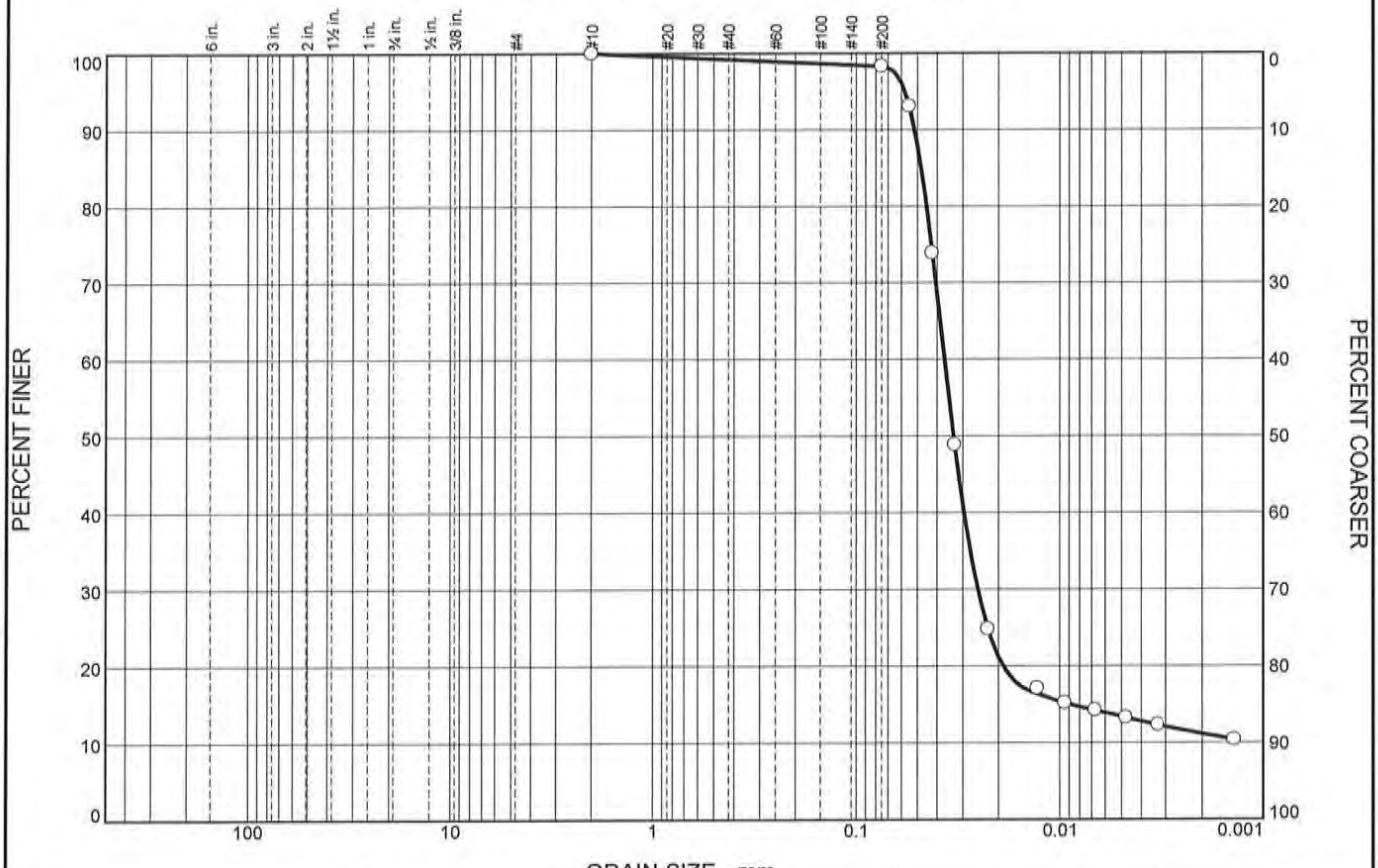
Remarks:
○Specific Gravity was Estimated

EUSTIS
Metairie, Louisiana
Lafayette, Louisiana
Gulfport, Mississippi

Figure

Tested By: JL & SM **Checked By:** CD

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	0.8	0.9	84.9	13.4

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	NP	NP	0.0481	0.0369	0.0333	0.0252	0.0089			

Material Description	USCS	AASHTO
○ Loose Gray Clayey Silt W/ Traces of Clay Pockets, Hint of Fine Sand, Smidgens of Roots and Organic Matter	ML	

Project No. 22729 **Client:** CPRA

Project: CAMINADA HEADLANDS BACK BARRIER MARSH CREATION PROJECT (BA-171) LAFOURCHE PARISH, LOUISIANA

○ **Source of Sample:** B16 **Depth:** 39.2 **Sample Number:** D-3

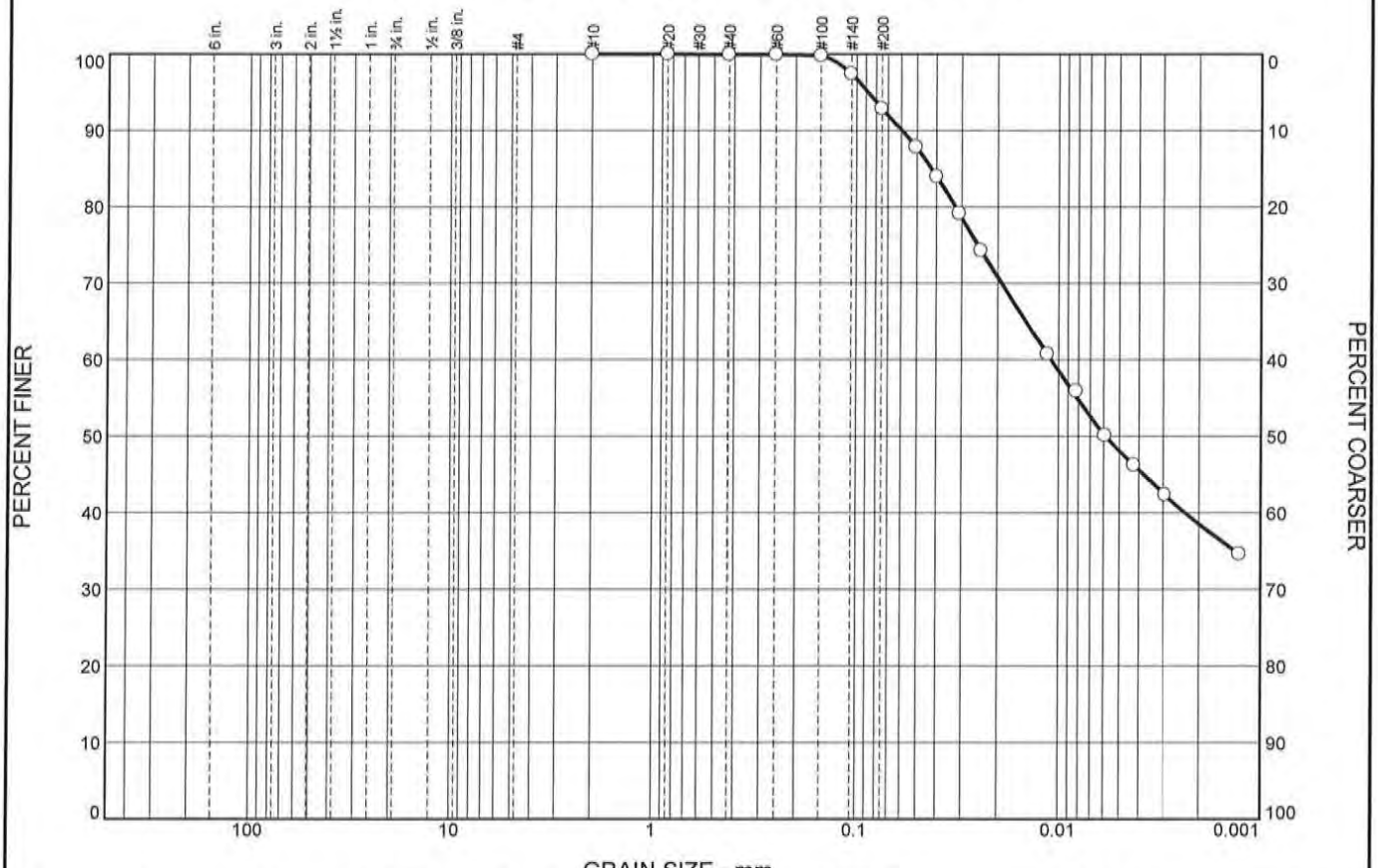
Remarks:
○Specific Gravity was Estimated

EUSTIS
Metairie, Louisiana
Lafayette, Louisiana
Gulfport, Mississippi

Figure

Tested By: JL & SM **Checked By:** CD

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	0.0	7.2	44.7	48.1

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	92	23	0.0425	0.0109	0.0059					

Material Description	USCS	AASHTO
○ Medium Stiff Gray Clay W/ Some Sandy Silt Lenses and Pockets	CH	

Project No. 22729 **Client:** CPRA

Project: CAMINADA HEADLANDS BACK BARRIER MARSH CREATION PROJECT (BA-171) LAFOURCHE PARISH, LOUISIANA

○ **Source of Sample:** B17 **Depth:** 42.3 **Sample Number:** D-5

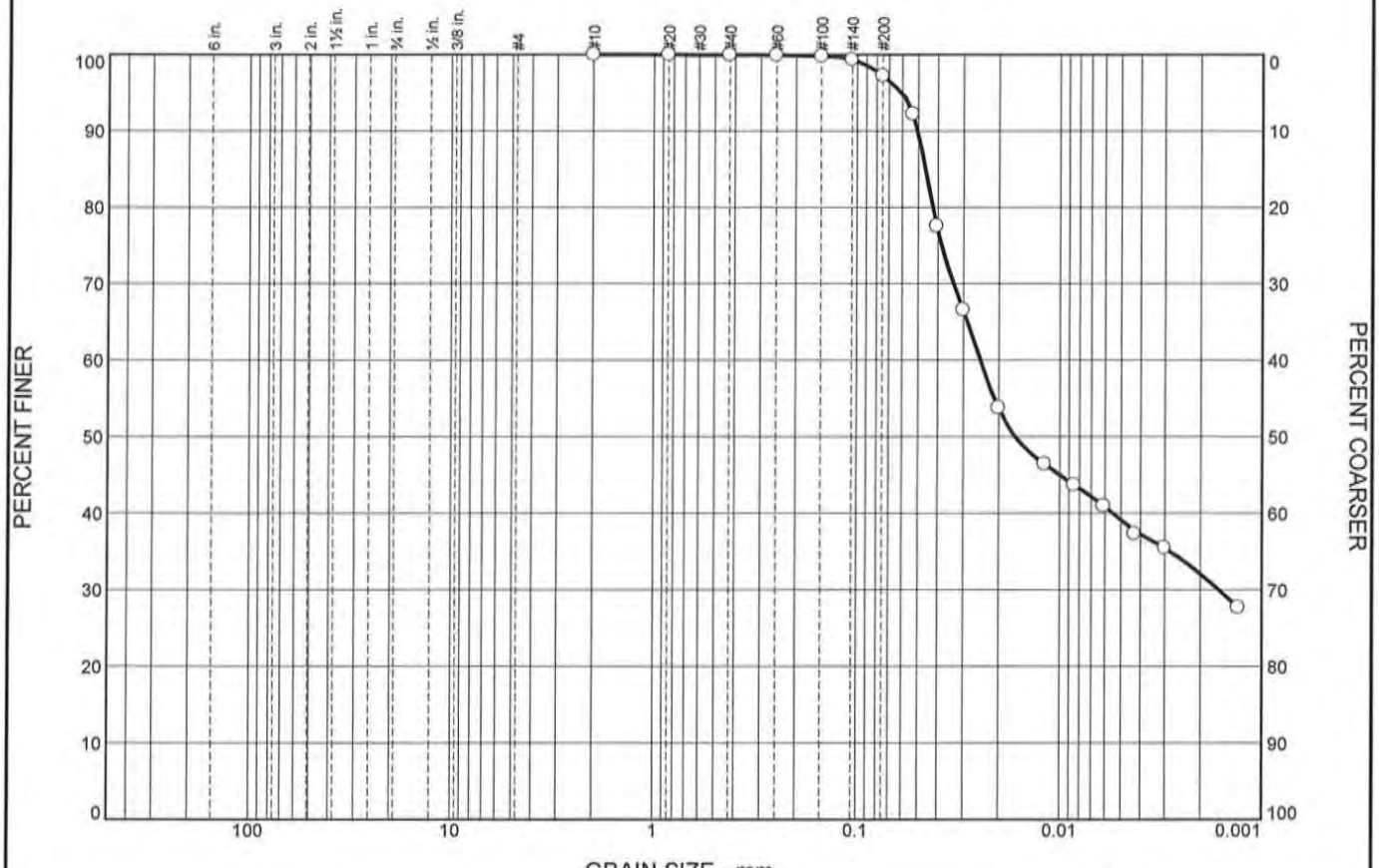
Remarks:
○Specific Gravity was Estimated

EUSTIS
Metairie, Louisiana
Lafayette, Louisiana
Gulfport, Mississippi

Figure

Tested By: JL **Checked By:** CD

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	0.1	2.7	58.1	39.1

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	44	22	0.0462	0.0247	0.0166	0.0016				

Material Description	USCS	AASHTO
○ Medium Stiff Gray Silty Clay W/ Silt Layer, Trace of Sand and Mica	CL	

Project No. 22729 **Client:** CPRA

Project: CAMINADA HEADLANDS BACK BARRIER MARSH CREATION PROJECT (BA-171) LAFOURCHE PARISH, LOUISIANA

○ **Source of Sample:** B-18 **Depth:** 51.7 **Sample Number:** A-1

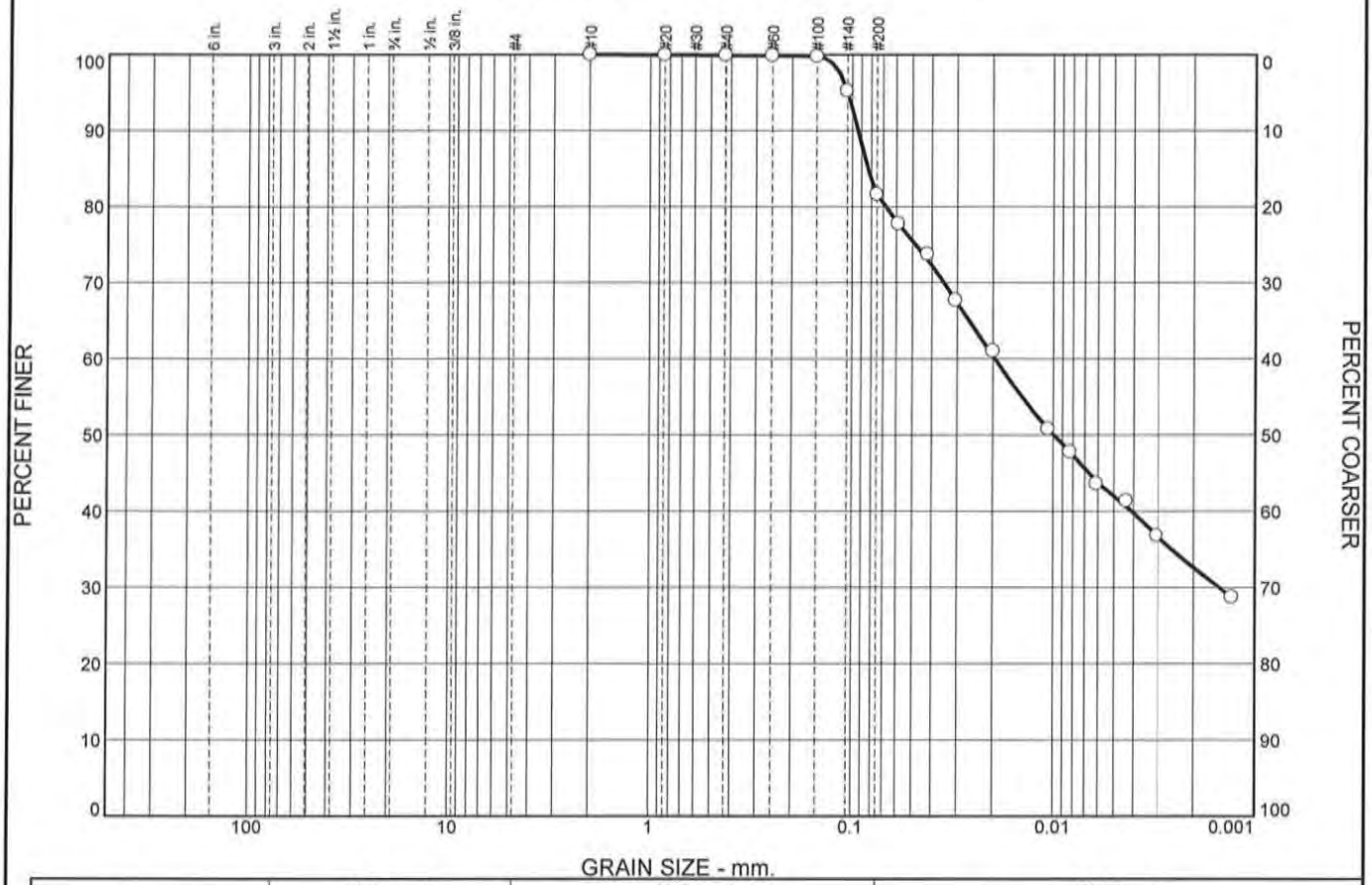
Remarks:
○Specific Gravity was Estimated

EUSTIS
Metairie, Louisiana
Lafayette, Louisiana
Gulfport, Mississippi

Figure

Tested By: JL **Checked By:** CD

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	0.1	18.3	39.7	41.9

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	67	24	0.0836	0.0195	0.0099	0.0015				

Material Description	USCS	AASHTO
○ Medium Stiff Gray Clay W/ Few Silt Pockets and Lenses (Flocculated)	CH	A-7-6(38)

Project No. 22729 **Client:** CPRA

Project: CAMINADA HEADLANDS BACK BARRIER MARSH CREATION PROJECT (BA-171) LAFOURCHE PARISH, LOUISIANA

○ **Source of Sample:** B-19A **Depth:** 54.6 **Sample Number:** A-3

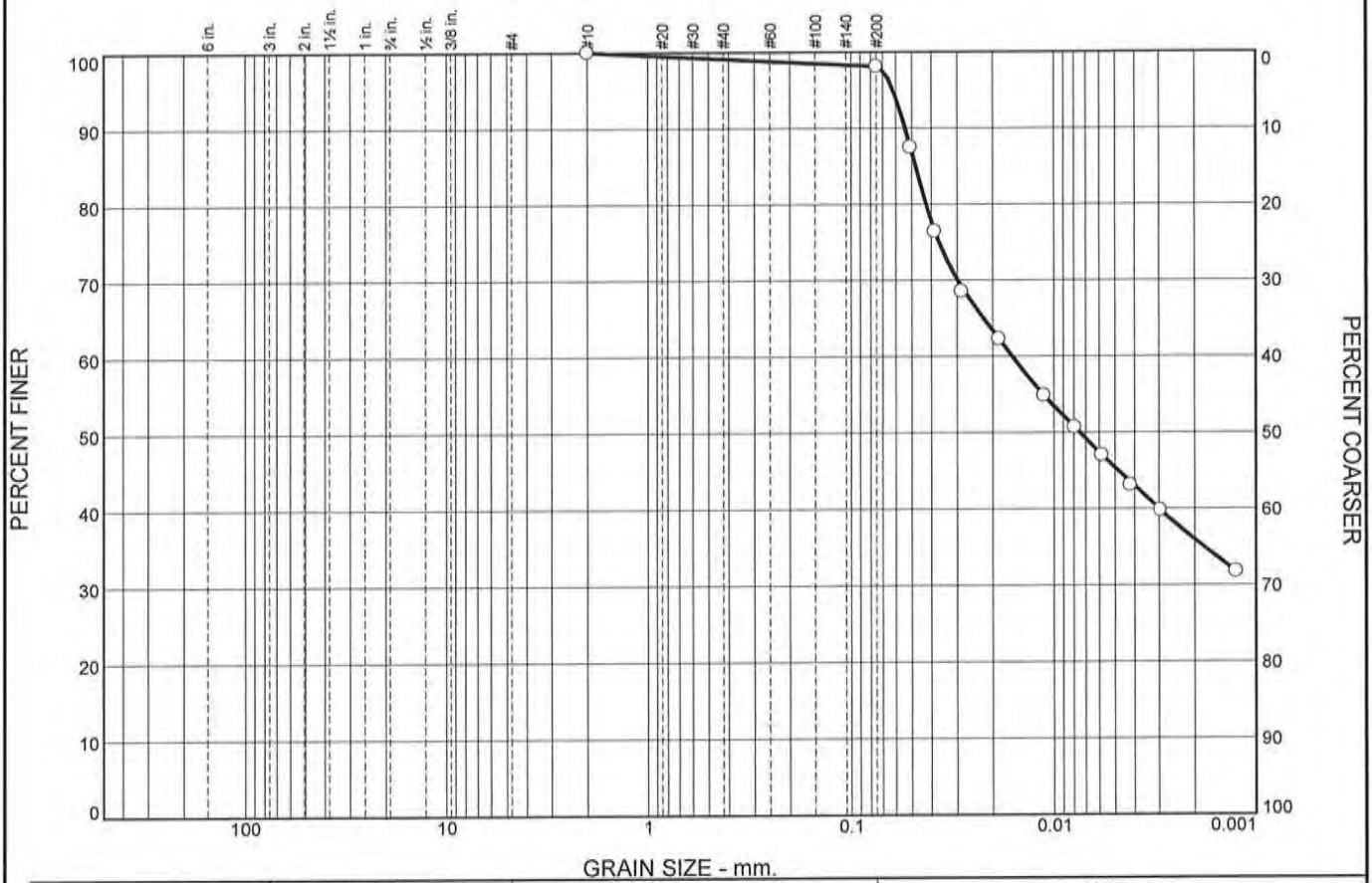
Remarks:
○Specific Gravity was Estimated

EUSTIS
Metairie, Louisiana
Lafayette, Louisiana
Gulfport, Mississippi

Figure

Tested By: CD NAM **Checked By:** CD

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	0.9	1.0	52.7	45.4

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	45	18	0.0480	0.0160	0.0075					

Material Description	USCS	AASHTO
○ Soft Gray Silty Clay W/ Few Sandy Silt Lenses	CL	

Project No. 22729 **Client:** CPRA

Project: CAMINADA HEADLANDS BACK BARRIER MARSH CREATION PROJECT (BA-171) LAFOURCHE PARISH, LOUISIANA

○ **Source of Sample:** B-19A **Depth:** 33.6 **Sample Number:** E-2

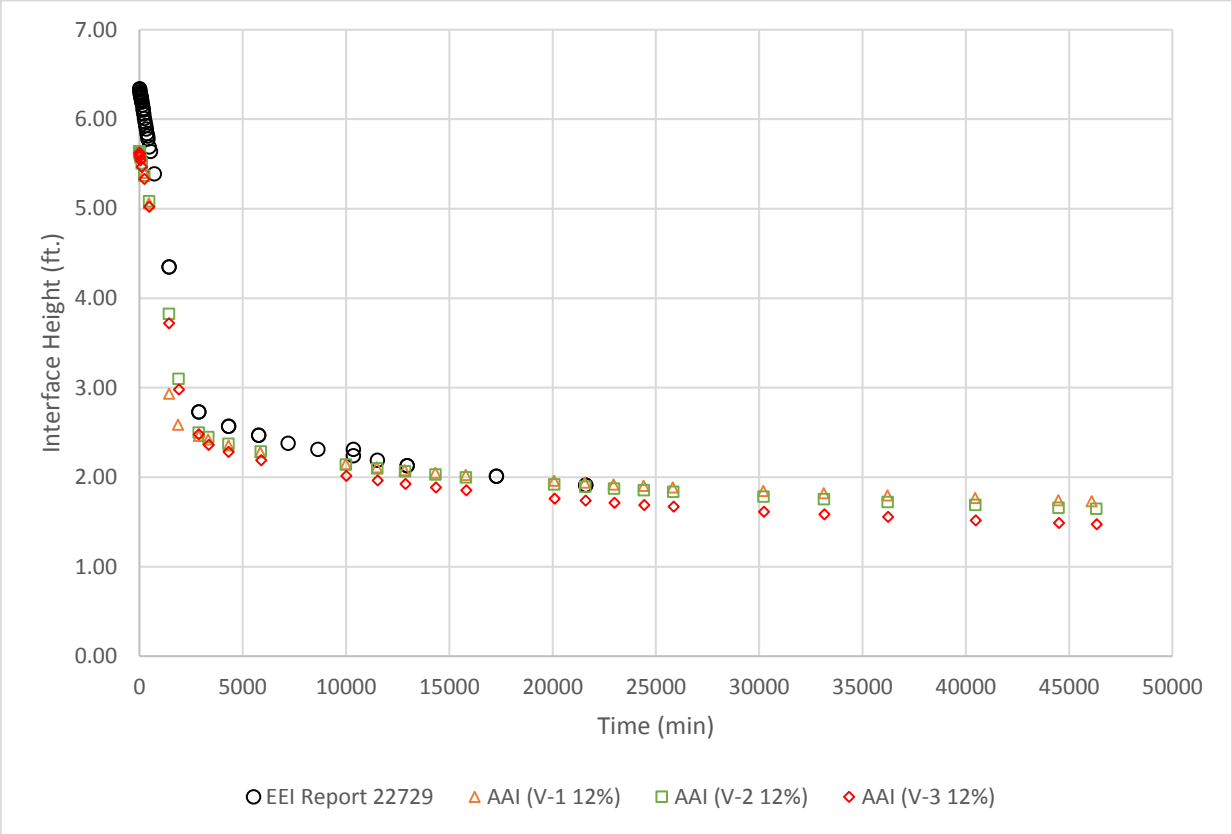
Remarks:
○Specific Gravity was Estimated

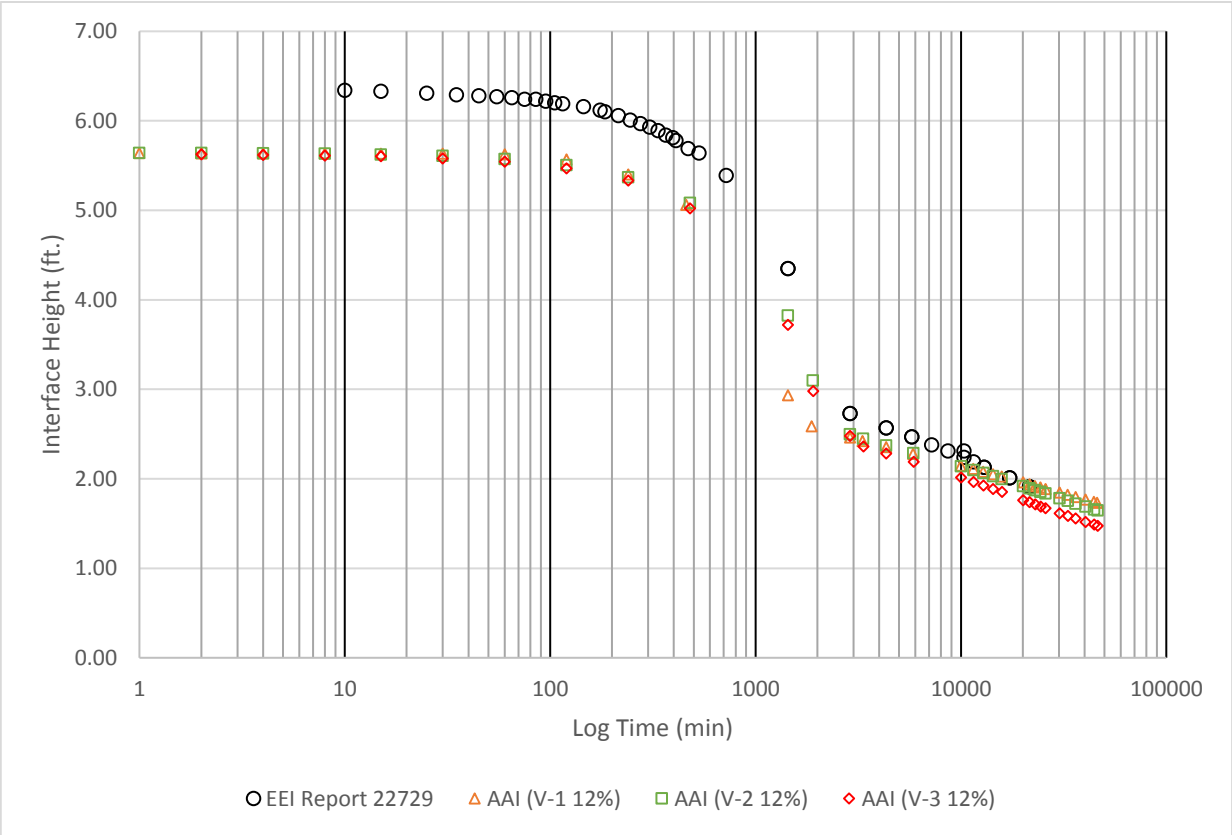
EUSTIS
Metairie, Louisiana
Lafayette, Louisiana
Gulfport, Mississippi

Figure

Tested By: JL & SM **Checked By:** CD

Summary of Settling Column Results





LOUISIANA, STATE OF
COASTAL PROTECTION AND RESTORATION AUTHORITY
CAMINADA HEADLANDS BACK BARRIER MARSH CREATION PROJECT (BA-171)
LAFOURCHE PARISH, LOUISIANA
EUSTIS ENGINEERING PROJECT NO. 22729

SELF-WEIGHT CONSOLIDATION TEST RESULTS
SAMPLE NO. SC-1
TRIAL NO. 1

INDEX TEST RESULTS

SPECIFIC GRAVITY	SALINITY (PPT)	SAND CONTENT (%)			FINES CONTENT (%)			ORGANIC CONTENT (%)	NATURAL WATER CONTENT (%)
		COARSE	MEDIUM	FINE	SILT	CLAY	< 0.0012 mm		
2.693	N/D	0.0	0.1	4.7	34.5	60.7	42.8	4.108	41.93

SELF-WEIGHT CONSOLIDATION TEST RESULTS

START DATE AND TIME	END DATE AND TIME	TOTAL ELAPSED TIME D:H:M	INITIAL SLURRY CONCENTRATION (G/L)	INITIAL SLURRY HEIGHT (IN.)	FINAL SOIL HEIGHT (IN.)	FINAL WATER DEPTH (IN.)	WATER TEMPERATURE (°C)			DENSITY OF WATER BASED ON FINAL TEMPERATURE (PCF)
							LOWER LIMIT	UPPER LIMIT	FINAL	
5/13/2015 11:15	5/28/2015 08:00	14:20:45	115.9	8.47	2.40	4.97	22.8	23.8	22.8	62.28

STRATUM NO.	DEPTH TO TOP OF STRATUM BELOW MUDLINE (IN.)	DEPTH TO BOTTOM OF STRATUM BELOW MUDLINE (IN.)	SAMPLE VOLUME (CU. IN.) V_T	WEIGHT OF SOLIDS (GRAMS) W_S	WEIGHT OF WATER (GRAMS) W_W	MOISTURE CONTENT (%) ω	TOTAL UNIT WEIGHT (PCF) γ_T	EFFECTIVE UNIT WEIGHT (PCF) γ'	DRY UNIT WEIGHT (PCF) γ_D	VOLUME OF SOLIDS (CU. IN.) V_S	VOLUME OF WATER (CU. IN.) V_W	VOLUME OF AIR (CU. IN.) V_A	VOLUME OF VOIDS (CU. IN.) V_V	VOID RATIO e	POROSITY (%) n	DEGREE OF SATURATION (%) S	EFFECTIVE STRESS AT MID STRATUM (PSF) σ'
1	0	0.42	12.07	44.81	180.23	402.21	71.03	8.75	14.14	1.02	10.74	0.00	11.02	10.55	91.34	100.00	0.16
2	0.42	0.91	13.99	64.60	204.06	315.88	73.18	10.90	17.60	1.47	12.48	0.04	12.52	8.53	89.51	99.71	0.54
3	0.91	1.41	14.06	75.92	197.82	260.56	74.17	11.89	20.57	1.72	12.10	0.24	12.34	7.15	87.74	98.09	1.01
4	1.41	1.91	14.07	88.77	195.50	220.23	76.97	14.70	24.04	2.02	11.96	0.09	12.05	5.98	85.67	99.22	1.55
5	1.91	2.40	14.05	95.56	189.36	198.16	77.24	14.96	25.91	2.17	11.58	0.30	11.88	5.47	84.55	97.48	2.17

LOUISIANA, STATE OF
COASTAL PROTECTION AND RESTORATION AUTHORITY
CAMINADA HEADLANDS BACK BARRIER MARSH CREATION PROJECT (BA-171)
LAFOURCHE PARISH, LOUISIANA
EUSTIS ENGINEERING PROJECT NO. 22729

SELF-WEIGHT CONSOLIDATION TEST RESULTS
SAMPLE NO. SC-1
TRIAL NO. 2

INDEX TEST RESULTS

SPECIFIC GRAVITY	SALINITY (PPT)	SAND CONTENT (%)			FINES CONTENT (%)			ORGANIC CONTENT (%)	NATURAL WATER CONTENT (%)
		COARSE	MEDIUM	FINE	SILT	CLAY	< 0.0012 mm		
2.693	N/D	0.0	0.1	4.7	34.5	60.7	42.8	4.108	41.93

SELF-WEIGHT CONSOLIDATION TEST RESULTS

START DATE AND TIME	END DATE AND TIME	TOTAL ELAPSED TIME D:H:M	INITIAL SLURRY CONCENTRATION (G/L)	INITIAL SLURRY HEIGHT (IN.)	FINAL SOIL HEIGHT (IN.)	FINAL WATER DEPTH (IN.)	WATER TEMPERATURE (°C)			DENSITY OF WATER BASED ON FINAL TEMPERATURE (PCF)
							LOWER LIMIT	UPPER LIMIT	FINAL	
5/29/2015 10:38	6/4/2015 07:30	5:20:52	115.9	8.60	2.55	5.67	22.2	23.4	23.2	62.27

STRATUM NO.	DEPTH TO TOP OF STRATUM BELOW MUDLINE (IN.)	DEPTH TO BOTTOM OF STRATUM BELOW MUDLINE (IN.)	SAMPLE VOLUME (CU. IN.) V_T	WEIGHT OF SOLIDS (GRAMS) W_S	WEIGHT OF WATER (GRAMS) W_W	MOISTURE CONTENT (%) ω	TOTAL UNIT WEIGHT (PCF) γ_T	EFFECTIVE UNIT WEIGHT (PCF) γ'	DRY UNIT WEIGHT (PCF) γ_D	VOLUME OF SOLIDS (CU. IN.) V_S	VOLUME OF WATER (CU. IN.) V_W	VOLUME OF AIR (CU. IN.) V_A	VOLUME OF VOIDS (CU. IN.) V_V	VOID RATIO e	POROSITY (%) n	DEGREE OF SATURATION (%) S	EFFECTIVE STRESS AT MID STRATUM (PSF) σ'
1	0	0.06	1.82	5.01	27.91	557.00	68.86	6.59	10.48	0.11	1.75	0.00	1.71	15.00	93.75	100.00	0.02
2	0.06	0.56	13.97	48.17	209.20	434.30	70.18	7.91	13.13	1.09	12.80	0.08	12.88	11.77	92.17	99.39	0.20
3	0.56	1.06	13.99	65.01	204.54	314.63	73.42	11.15	17.71	1.48	12.51	0.00	12.51	8.47	89.47	100.00	0.59
4	1.06	1.55	14.06	76.14	200.47	263.29	74.94	12.67	20.63	1.73	12.26	0.07	12.33	7.13	87.70	99.46	1.08
5	1.56	2.05	14.07	88.73	195.98	220.87	77.09	14.82	24.03	2.02	11.99	0.06	12.05	5.98	85.67	99.47	1.65
	2.05	2.55	106.58	106.58	189.88	178.16	80.37	18.10	28.89	2.42	11.62	0.02	11.63	4.80	82.77	99.87	2.33

LOUISIANA, STATE OF
COASTAL PROTECTION AND RESTORATION AUTHORITY
CAMINADA HEADLANDS BACK BARRIER MARSH CREATION PROJECT (BA-171)
LAFOURCHE PARISH, LOUISIANA
EUSTIS ENGINEERING PROJECT NO. 22729

SELF-WEIGHT CONSOLIDATION TEST RESULTS
SAMPLE NO. SC-1
TRIAL NO. 3

INDEX TEST RESULTS

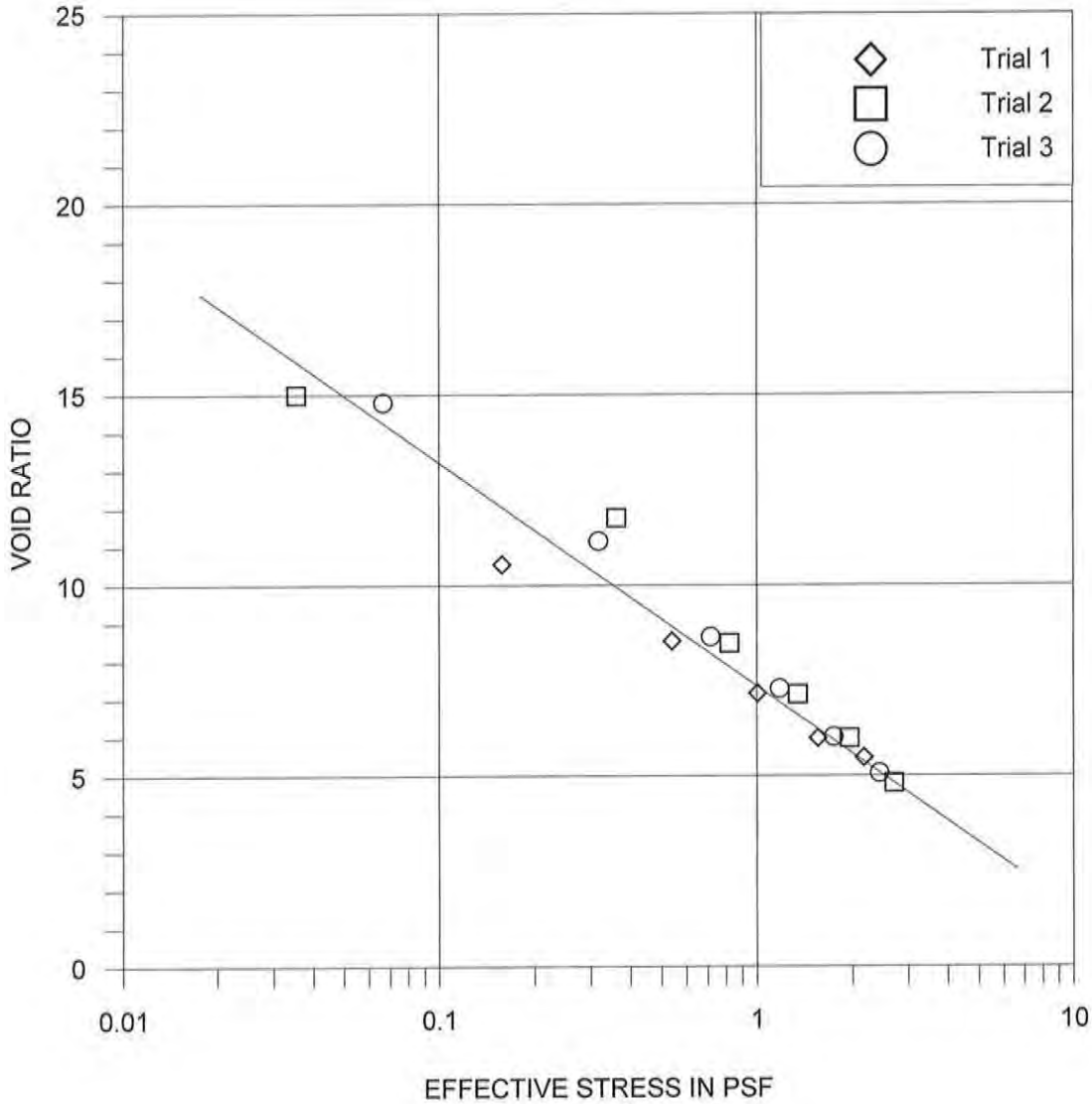
SPECIFIC GRAVITY	SALINITY (PPT)	SAND CONTENT (%)			FINES CONTENT (%)			ORGANIC CONTENT (%)	NATURAL WATER CONTENT (%)
		COARSE	MEDIUM	FINE	SILT	CLAY	< 0.0012 mm		
2.693	N/D	0.0	0.1	4.7	34.5	60.7	42.8	4.108	41.93

SELF-WEIGHT CONSOLIDATION TEST RESULTS

START DATE AND TIME	END DATE AND TIME	TOTAL ELAPSED TIME D:H:M	INITIAL SLURRY CONCENTRATION (G/L)	INITIAL SLURRY HEIGHT (IN.)	FINAL SOIL HEIGHT (IN.)	FINAL WATER DEPTH (IN.)	WATER TEMPERATURE (°C)			DENSITY OF WATER BASED ON FINAL TEMPERATURE (PCF)
							LOWER LIMIT	UPPER LIMIT	FINAL	
6/5/2015 10:05	6/9/2015 16:24	4:6:19	115.9	8.68	2.72	5.72	23.5	23.8	23.5	62.27

STRATUM NO.	DEPTH TO TOP OF STRATUM BELOW MUDLINE (IN.)	DEPTH TO BOTTOM OF STRATUM BELOW MUDLINE (IN.)	SAMPLE VOLUME (CU. IN.) V_T	WEIGHT OF SOLIDS (GRAMS) W_S	WEIGHT OF WATER (GRAMS) W_W	MOISTURE CONTENT (%) ω	TOTAL UNIT WEIGHT (PCF) γ_T	EFFECTIVE UNIT WEIGHT (PCF) γ'	DRY UNIT WEIGHT (PCF) γ_D	VOLUME OF SOLIDS (CU. IN.) V_S	VOLUME OF WATER (CU. IN.) V_W	VOLUME OF AIR (CU. IN.) V_A	VOLUME OF VOIDS (CU. IN.) V_V	VOID RATIO e	POROSITY (%) n	DEGREE OF SATURATION (%) S	EFFECTIVE STRESS AT MID STRATUM (PSF) σ'
1	0	0.24	6.76	18.84	103.54	549.57	68.94	6.67	10.61	0.43	6.33	0.00	6.33	14.80	93.67	100.00	0.07
2	0.24	0.73	13.97	50.81	210.46	414.21	71.24	8.98	13.85	1.15	12.88	0.00	12.88	11.15	92.16	100.00	0.32
3	0.73	1.23	13.99	63.86	202.94	317.79	72.67	10.41	17.39	1.45	12.42	0.12	12.54	8.64	89.63	99.05	0.72
4	1.23	1.73	14.06	74.75	200.65	268.43	74.62	12.35	20.25	1.70	12.28	0.09	12.36	7.28	87.92	99.30	1.18
5	1.73	2.22	14.07	88.38	197.30	223.24	77.36	15.09	23.93	2.01	12.07	0.00	12.07	6.01	85.80	100.00	1.75
6	2.23	2.72	14.05	102.80	193.23	187.97	80.25	17.98	27.87	2.34	11.82	0.00	11.82	5.06	84.13	100.00	2.44

SELF-WEIGHT CONSOLIDATION TEST RESULTS
VOID RATIO VS. EFFECTIVE STRESS
SAMPLE SC-1
TRIALS 1 THROUGH 3



Fit Results

Fit 3: Log
Equation Y = -2.547790057 * ln(X) + 7.348446487
Number of data points used = 17
Average ln(X) = -0.566995
Average Y = 8.79303
Residual sum of squares = 36.3181
Regression sum of squares = 219.634
Coef of determination, R-squared = 0.858106
Residual mean square, sigma-hat-sq'd = 2.4212

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SELF-WEIGHT CONSOLIDATION TEST RESULTS
VOID RATIO VS. EFFECTIVE STRESS
SAMPLE SC-1

STATE OF LOUISIANA
COASTAL PROTECTION AND RESTORATION AUTHORITY
CAMINADA HEADLANDS BACK BARRIER MARSH
CREATION PROJECT (BA-171)
LAFOURCHE PARISH, LOUISIANA

DRAWN BY: J.F.M.	23 JUNE 2015	FILE: E_VS_EF_ST.GRF
CHECKED BY: K.R.D.	JOB NO.: 22739	APPENDIX IV

Figure No. E.38

Appendix F. BENCH-SCALE SETTLING COLUMN TEST PICTURES

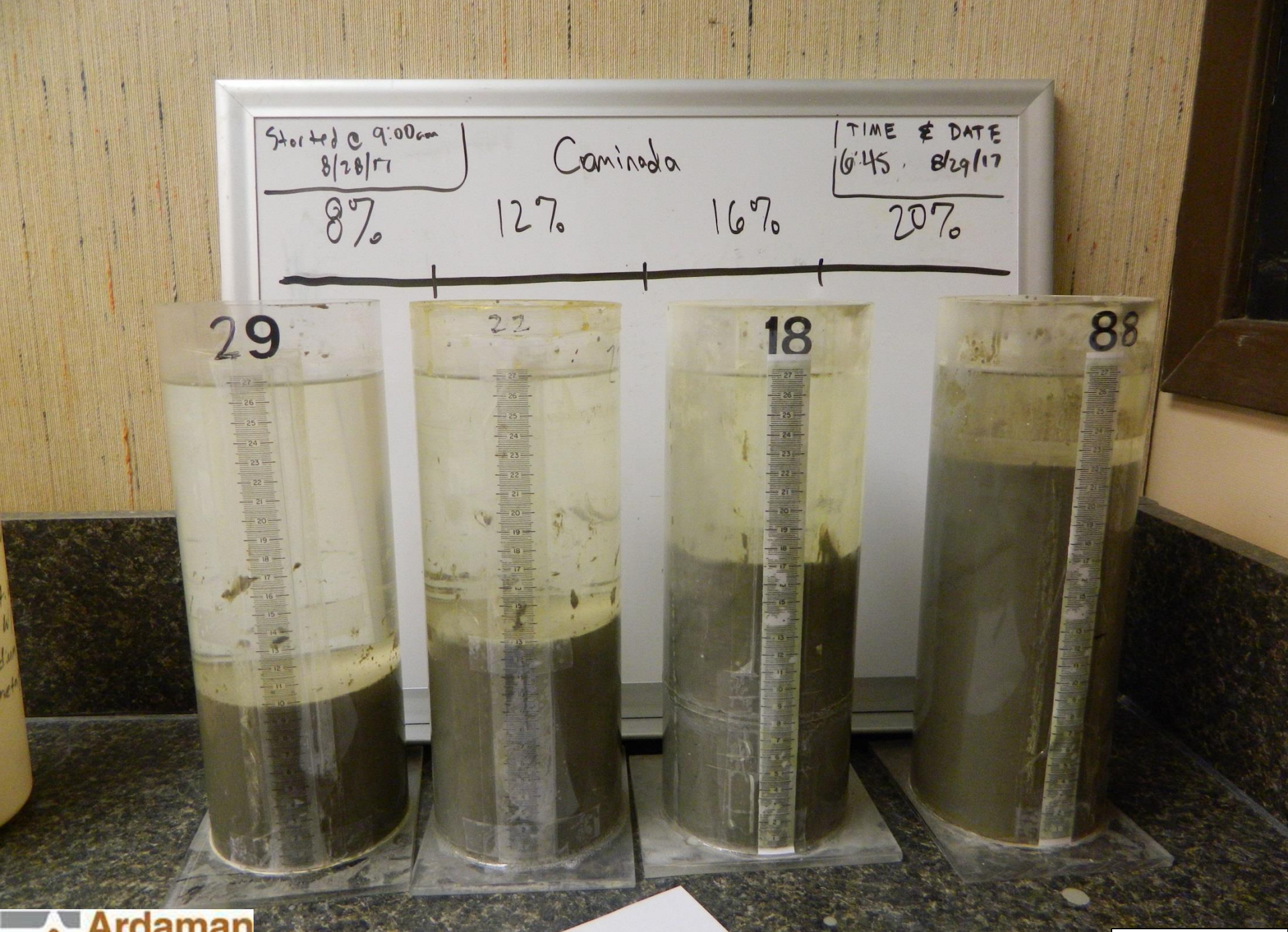
F.1 Pictures of the settling column test in progress

Ardaman & Associates, Inc.

Figure No. F.1

Ardaman & Associates, Inc.

Figure No. F.2

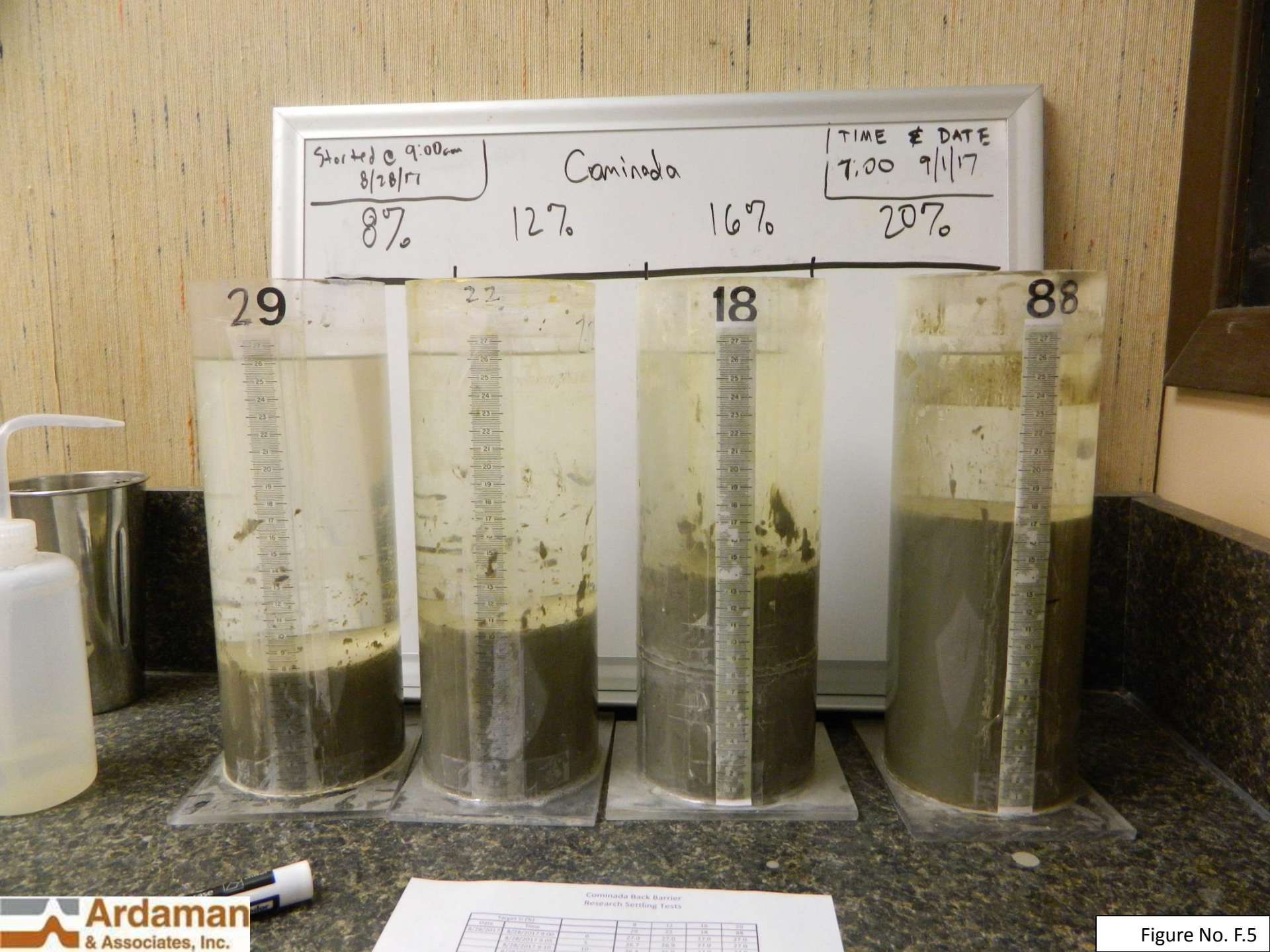


Ardaman & Associates, Inc.

Figure No. F.3

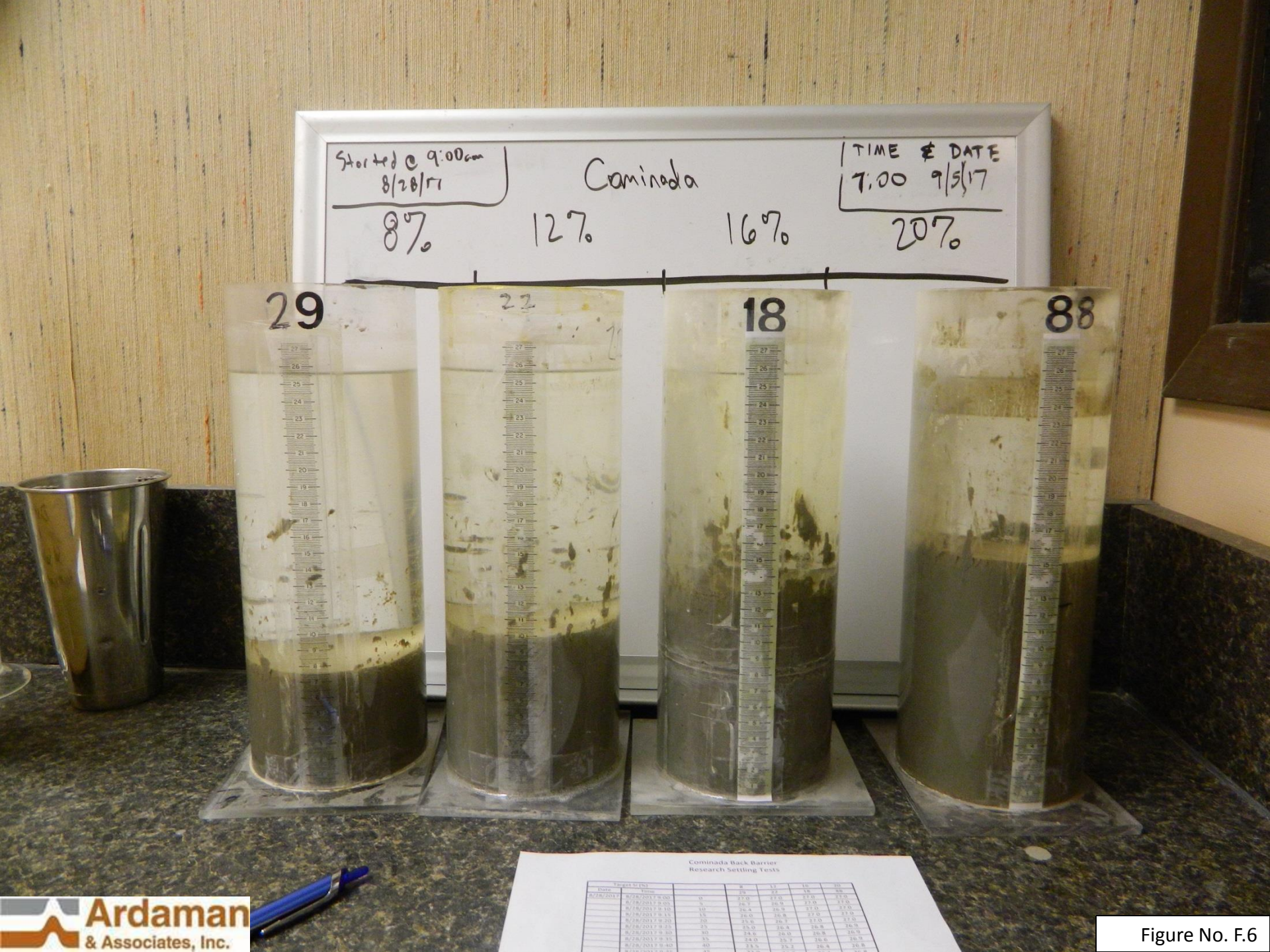
Ardaman & Associates, Inc.

Figure No. F.4



Ardaman & Associates, Inc.

Figure No. F.5



Ardaman & Associates, Inc.

Figure No. F.6