



Project No. S1350-05-05
May 15, 2018

VIA ELECTRONIC MAIL

Karl Rose, PE
California State Parks
Northern Service Center
One Capitol Mall, Suite 410
Sacramento, California 95814

Subject: LIMITED GEOTECHNICAL INVESTIGATION
PIG POND DAM / BEAR HIDE LAKE DAM
PACHECO STATE PARK
MERCED COUNTY, CALIFORNIA

Dear Mr. Rose:

In accordance with your Work Order No. 90-204499-07 of Agreement No. C16E0090, we have performed a limited geotechnical investigation for the proposed repairs to two storm-damaged dams (Pig Pond Dam and Bear Hide Lake Dam) at Pacheco State Park in Merced County, California. The approximate project locations are shown on the Vicinity Map, Figure 1.

PURPOSE AND SCOPE

The purpose of our limited geotechnical investigation was to evaluate the subsurface conditions at the dam locations and provide geotechnical recommendations for potential repairs. We performed the following scope of services:

- Performed a geologic literature review to aid in evaluating the geologic conditions present at the sites.
- Performed a site reconnaissance to review project limits, determine exploration equipment access, and mark out exploratory excavation locations.
- Notified subscribing utility companies via Underground Service Alert (USA) a minimum of two working days (as required by law) prior to performing exploratory excavations at the site.
- Performed three exploratory borings (B1 through B3) at Pig Pond Dam with a 4x4 truck-mounted Mobile B-24 drill rig equipped with solid-flight augers. The borings were advanced to depths ranging between approximately 3 and 18 feet. The approximate boring locations are shown on the Site Plan - Pig Pond Dam, Figure 2.
- Performed three exploratory test pits with the use of hand tools (T1 through T3) and one hand-auger boring (HA1) at Bear Hide Lake Dam, which was inaccessible to an all-terrain drill rig. Because the site was inaccessible to an all-terrain drill rig and the dam breach erosion exposed the cross-section of the full height of the dam, we logged the sidewalls of the dam breach as an excavated test pit (T1). The test pits were advanced to depths between 2 and 16 feet. The hand-auger boring was advanced to a depth of 2 feet. The approximate test pit and hand-auger boring locations are shown on the Site Plan - Bear Hide Lake Dam, Figure 3.
- Obtained representative disturbed and relatively undisturbed soil samples from the exploratory borings and test pits.
- Logged the borings and test pits in accordance with the Unified Soil Classification System (USCS).

- Upon completion, backfilled the borings and test pits, with the exception of Test Pit T1, with soil cuttings.
- Performed laboratory tests on selected soil samples to evaluate pertinent geotechnical parameters.
- Prepared this letter report summarizing our findings, conclusions, and recommendations.

SITE AND PROJECT DESCRIPTION

The project consists of making repairs to two storm-damaged stock pond dams at Pacheco State Park in Merced County, California. Pacheco State Park was created in 1997 from land that was formerly part of a cattle ranch that had been in operation since the 1840's. We understand that cattle continue to graze within the park. The age and maintenance history of the dams is unknown. We understand that the impoundments are too small to be under the jurisdiction of the California Division of Safety of Dams (DSOD) or other regulatory agency. Site-specific topographic information is not available at this time.

The existing Pig Pond Dam is on the order of 15 feet high, about 100 feet long, and impounds a pond approximately one-half acre in surface area (Photo 1). The dam is constructed of undocumented earthen fill with embankment side slopes of approximately 1:1 (horizontal: vertical) on the dry side and 2:1 on the water side and a crest on the order of 8 feet (south end) to 15 feet (north end) wide. The dam crest exists at an approximate elevation of 1,400 feet above mean sea level (MSL). The dry side dam embankment slope is predominantly exposed soil with sparse, low weeds and brush while the water side dam embankment slope is exposed soil. The land side embankment and crest show significant erosion (near-breach) from storm activity that occurred in 2017 (Photo 2). The land side of the dam has abundant animal-burrows throughout the dam (Photos 3 and 4).

The existing Bear Hide Lake Dam is on the order of 16 feet high, about 120 feet long, and impounds a pond approximately one-half acre in surface area (Photos 5 and 6). The dam is constructed of undocumented earthen fill with embankment side slopes of approximately 3:1 on the dry side and on the water side with a crest on the order of 10 feet wide. The dam crest exists at an approximate elevation of 1,293 feet MSL. The dry side and water side dam embankment slopes are predominantly vegetated with grasses. The water side of the dam and crest show surficial disturbance from cattle trails (Photo 7). The crest and dry side of the dam show significant erosion (near-breach) from storm damage that occurred in 2017 (Photo 8).

Proposed repairs to the dams include re-grading the dams to restore them to their pre-storm-damaged configuration and to mitigate/remove the animal burrows in Pig Pond Dam. No preliminary plans of proposed improvements are available at this time.

SUBSURFACE CONDITIONS

Based on geologic mapping by the California Geological Survey (*Geologic Map of San Francisco-San Jose Quadrangle, California*, Wagner, Bortugno and McJunkin., 2005), the sites are underlain by Franciscan Complex (map symbol KJf).

The subsurface conditions encountered in our explorations consisted of the following:

Dam / Embankment Fill

We encountered dam embankment fill materials in Borings B1 and B2 and Test Pit T1 from the ground surface to depths of approximately 3, 15½ and 16 feet, respectively. The dam embankment fill materials generally consist of medium stiff to very stiff lean clay (CL) with sand, gravel and cobbles; very dense clayey gravel with sand (GC); and very dense clayey sand with gravel (SC).

Colluvium

In Boring HA1 and Test Pits T2 and T3, located outside of the dam embankments, we encountered colluvium consisting of stiff lean clay with sand, gravel and cobbles (CL) from the ground surface to the maximum depth explored of 2 feet. Colluvium is defined as eroded materials (soil) that are not subject to concentrated flows of water but are generally the result of gravitational forces in mountainous areas.

Metasedimentary Rock

Below the dam embankment fill and/or colluvium and at the ground surface in Boring B3, we encountered metasedimentary rock (shale) of the Franciscan Formation. As encountered in our explorations, the metasedimentary rock at the site is intensely weathered, thinly bedded, soft and intensely weathered. The degree of weathering generally decreases with depth and the hardness increases. We generally encountered drilling refusal in the metasedimentary bedrock at depths of about 2 feet below the bedrock surface with a B-24 drill rig with 4-inch-diameter solid-flight augers.

The soil conditions described herein are generalized. Geologic Cross-Sections for the site are presented as Figures 4 through 7. The attached Key to Logs, boring logs and test pit logs (Figures 8 through 15) detail soil type, color, moisture, consistency, and classification of the soil encountered at specific locations and elevations.

Groundwater

We did not encounter static groundwater in our explorations advanced to a maximum depth of 17½ feet on February 20, 2018. We did encounter apparent perched water in Boring HA1 near the contact between colluvium and bedrock on March 29, 2018, which was performed following several weeks of storm activity. Due to site topography and elevation, we anticipate that groundwater is relatively deep.

Depth to groundwater or wet soil conditions can vary significantly due to precipitation, localized stormwater runoff, level of water impounded in the pond, and seasonal fluctuations.

Laboratory Test Results

Laboratory tests were performed in accordance with generally accepted test methods of the ASTM. The types of the tests performed are listed below:

- Grain Size Distribution: ASTM D422
- Compaction Curve: ASTM D1557
- Consolidated-Undrained Triaxial Shear Strength: ASTM D4767
- Moisture Determination and Unit Weight: ASTM D2937
- Atterberg Limits: ASTM D4318
- Moisture-Density Relationship: ASTM D1557
- Expansion Index: ASTM D4829

Laboratory test results are presented on the boring and test pit logs (Figures 8 through 15) and on Figures 16 through 22.

CONCLUSIONS AND RECOMMENDATIONS

General

- No soil or geologic conditions were encountered during our investigation that would preclude the proposed repairs or improvements provided the recommendations contained in this report are incorporated into the design and construction.
- The dam embankments are generally comprised of medium stiff to stiff lean clay with sand, gravel and cobbles; very dense clayey gravel with sand; and very dense clayey sand with gravel. The dam embankments are underlain by intensely to moderately weathered metasedimentary rock.
- Topographic survey has not been performed at the sites and was not available for our use in this investigation. The topographic information included in this report is approximate and based on our field observations. We recommend that a site-specific topographic survey be performed for both sites and that the information be utilized as potential repair alternatives are considered for the project.
- It is apparent that burrowing animals are present in Pig Pond Dam and may also be present in Bear Hide Lake Dam. Based on our observations it is apparent that animal burrows contributed to the damage at Pig Pond Dam. We recommend repairing any existing burrows and implementing an animal-burrow control program to mitigate potential damage from future burrowing. Burrow repair is typically performed by grouting in or otherwise filling existing burrows. If grading/earthwork is proposed for the project, such activity will remove animal burrows within the extent of earthwork. Burrows extending beyond earthwork limits should be grouted or filled. Animal burrow control can be improved by providing dam slope conditions that discourage burrowing animals (embankment facing materials or similar), removing burrowing animals once they are noted in the dam (via poisoning/trapping, etc.), or other methods.
- It is apparent that cattle trails traverse the embankment side slopes and crests of both dams and the resulting surficial disturbance is abundant. The resulting surficial disturbance at Bear Hide Lake Dam appears to have lowered the crest of the dam to the elevation of the bottom of the spillway inlet and may have resulted in over-topping of the dam in the winter of 2017. We understand that cattle grazing continues within the park, therefore, we recommend implementing measures such as fencing to discourage livestock from walking on the dams.
- Potential alternatives for repairing the dams include (1) repairing the breaches with engineered fill or (2) removing and replacing the dams. Both alternatives should include engineered dam embankment side slopes of 2:1 or flatter, dam crest and spillway configurations that allow for adequate outflow at the spillways.
- Conclusions and recommendations provided in this report are based on our review of referenced literature, analysis of data obtained from our exploratory field exploration program, laboratory testing program, and our understanding of the proposed project at this time.
- We should be retained to review the project plans as they develop further, provide supplemental recommendations and engineering consultation as-needed, and perform geotechnical observation and testing services during construction. Specific recommendations for site grading, earthwork, and other improvements can be provided once the selected improvement method(s) have been selected and site specific topographic information is available.

Repair Alternatives

- Discussed below are two alternatives for repairs to the dams. We assume that it will be possible to drain the ponds for construction of any proposed repairs. We anticipate that the alternative selected, if any, will be based on desired level of improvement, cost to implement, duration of construction, impact/disturbance to the project vicinity, and regulator/permitting requirements.
 - **Alternative 1 - Dam Breach Erosion Repair** – The dam breach erosion at each dam may be repaired at the location of the dam breach by excavating into the dam embankment to remove loose and disturbed embankment material. The excavation should be stepped into the embankment to allow for keyed and benched placement of engineered fill to restore the dam embankment to its original configuration. The material excavated from the breached area may be replaced as engineered fill. Additional fill material required to restore the original dam configuration may be mined from the pond side of the dam or from a local borrow area. Prior to placing engineered fill, a keyway at least 5 feet wide, 2 feet deep and extending 5 feet longer than the repair area should be excavated at the base of the embankment slope to key the replacement fill into the foundational material (weathered bedrock). The replacement engineered fill should then be placed in lifts no thicker than 8 inches (loose thickness), moisture conditioned to approximately 2% over optimum moisture and compacted to 95% relative compaction per ASTM D1557 Test Procedure.
 - **Alternative 2 - Dam Replacement** – Due to the degree of animal burrowing in Pig Pond Dam and the depth of the dam breach erosion in Bear Hide Lake Dam, the existing dam sections may be removed and replaced using the existing embankment materials (and possibly excavated materials from the pond or excavated from a local borrow area) as engineered fill. The engineered fill should be moisture conditioned approximately 2% over optimum moisture and placed in lifts no thicker than 8 inches (loose thickness) and compacted to 95% relative compaction per ASTM D1557 Test Procedure to restore the dam to its original configuration. This will serve to reduce the permeability of the dam embankments, mitigate existing animal disturbance/burrows in the dams, and improve the structural section of the dam (reduce the possibility of future erosion of the dam sections and disturbance due to animal activities). This option would provide new, stronger embankment sections but would be more costly than Option 1.
- Rodent/burrowing animal control measures should be implemented to reduce the impacts of burrows to the dams. Ongoing regular dam slope maintenance activities should include repairing animal burrows or erosion areas.
- The dam faces should be maintained with short vegetation (grasses on the order of 6 inches in height) that allows for visual observation of the dam conditions throughout the year. Tall weeds, brushy vegetation, and trees should not be present on the dam face or immediately adjacent to the embankment toe.

LIMITATIONS

The recommendations of this report pertain only to the site investigated and are based upon the assumption that the soil conditions do not deviate from those disclosed in the investigation. If any variations or undesirable conditions are encountered during construction, or if the proposed construction will differ from that anticipated herein, we should be notified so that supplemental recommendations can be given. The evaluation or identification of the potential presence of hazardous materials or environmental contamination was not part of our scope of services.

This report is issued with the understanding that it is the responsibility of the owner or their representative to ensure that the information and recommendations contained herein are brought to the attention of the design team for the project and incorporated into the plans and specifications, and the necessary steps are taken to see that the contractor and subcontractors carry out such recommendations in the field. The recommendations contained in this report are preliminary until verified during construction by representatives of our firm. Changes in the conditions of a property can occur with the passage of time, whether they are due to natural processes or the works of man on this or adjacent properties. Additionally, changes in applicable or appropriate standards may occur, whether they result from legislation or the broadening of knowledge. Accordingly, the findings of this report may be invalidated partially or wholly by changes outside our control. Therefore, this report is subject to review and should not be relied upon after a period of three years.

The firm that performed the geotechnical investigation for the project, the Geotechnical Engineer of Record (GER), should be retained to provide testing and observation services during construction to provide continuity of geotechnical interpretation and to verify that the recommendations presented for geotechnical aspects of site development are incorporated during site grading, construction of improvements, and excavation of foundations. If another geotechnical firm is selected to perform the testing and observation services during construction operations, that firm should prepare a letter indicating their intent to assume the responsibilities of the GER and either acknowledgement of their concurrence with the recommendations presented in our report or revised recommendations based on their own analyses.

Our professional services were performed, our findings obtained, and our recommendations prepared in accordance with generally accepted geotechnical engineering principles and practices used in the site area at this time. No warranty is provided, either express or implied.

Please contact us if you have any questions concerning the contents of this report or if we may be of further service.

Sincerely,

GEOCON CONSULTANTS, INC.

Sean M. Dixon, PG
Senior Project Geologist

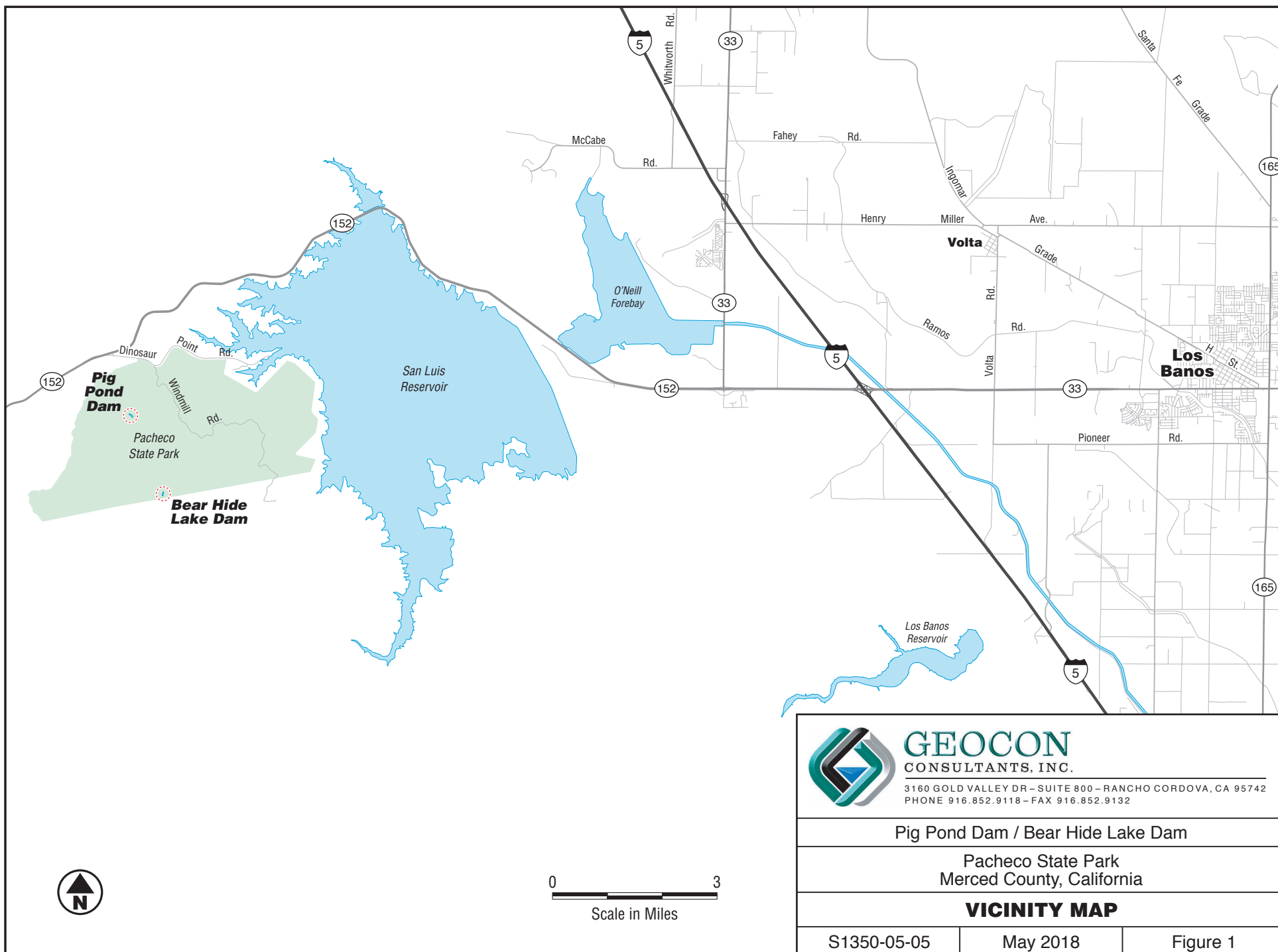


Jeremy J. Zorne, PE, GE
Senior Engineer



Attachments:

Figure 1, Vicinity Map
Figure 2, Site Plan – Pig Pond Dam
Figure 3, Site Plan – Bear Hide Lake Dam
Figure 4, Cross-Section A-A' – Pig Pond Dam
Figure 5, Cross-Section B-B' – Pig Pond Dam
Figure 6, Cross-Section C-C' – Bear Hide Lake Dam
Figure 7, Cross-Section D-D' – Bear Hide Lake Dam
Figure 8, Key to Logs
Figures 9 through 15, Boring and Test Pit Logs
Figures 16 through 22, Laboratory Results
Photos No. 1 through 8

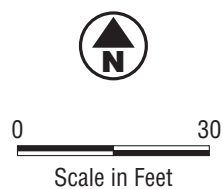


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Pig Pond Dam / Bear Hide Lake Dam		
Pacheco State Park Merced County, California		
VICINITY MAP		
S1350-05-05	May 2018	Figure 1



LEGEND:

- B3** ⊗ Approximate Boring Location
- A — A'** Approximate Cross-Section Location



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Pig Pond Dam / Bear Hide Lake Dam

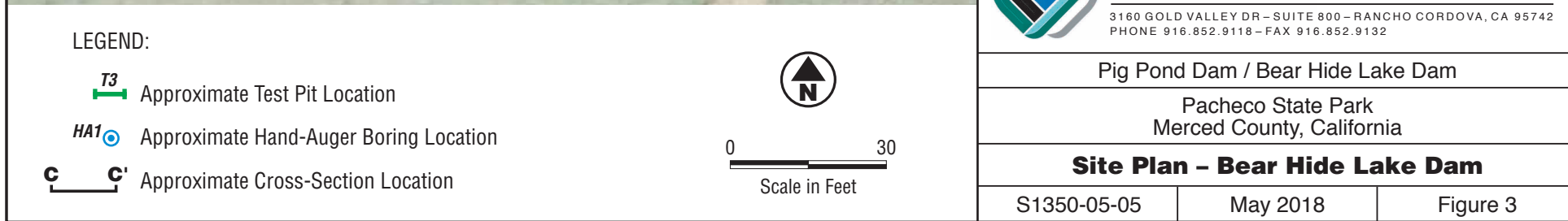
Pacheco State Park
Merced County, California

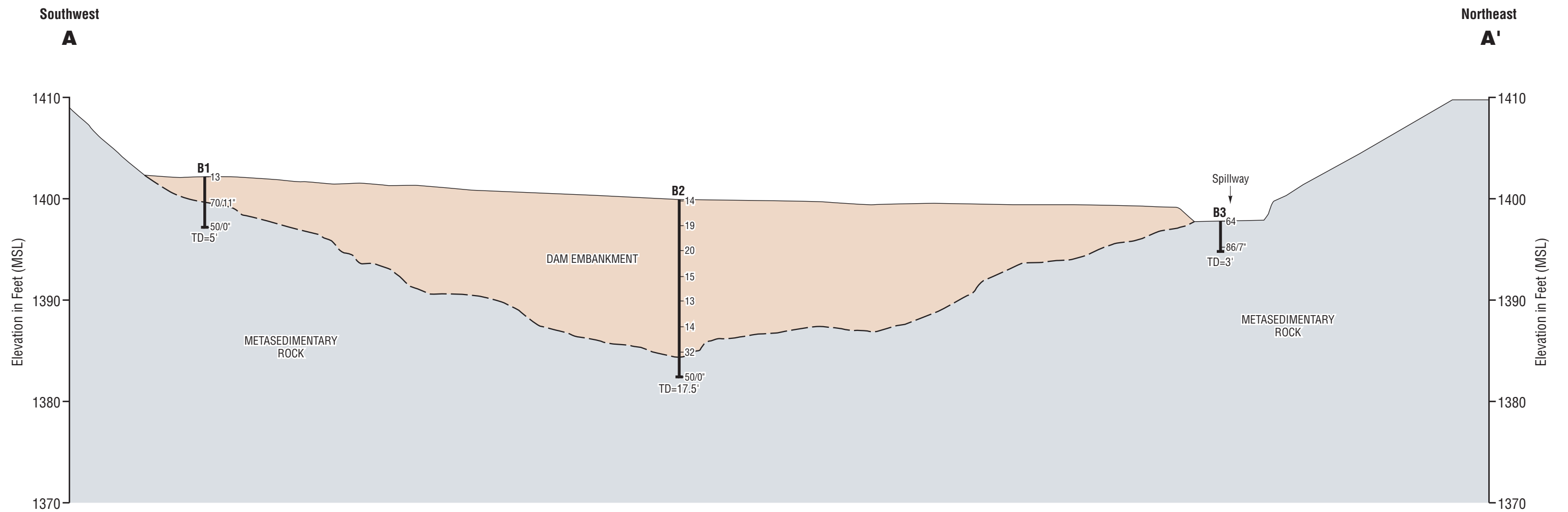
Site Plan - Pig Pond Dam

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Figure 2

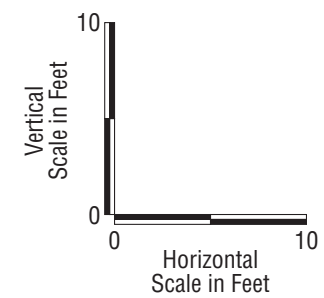




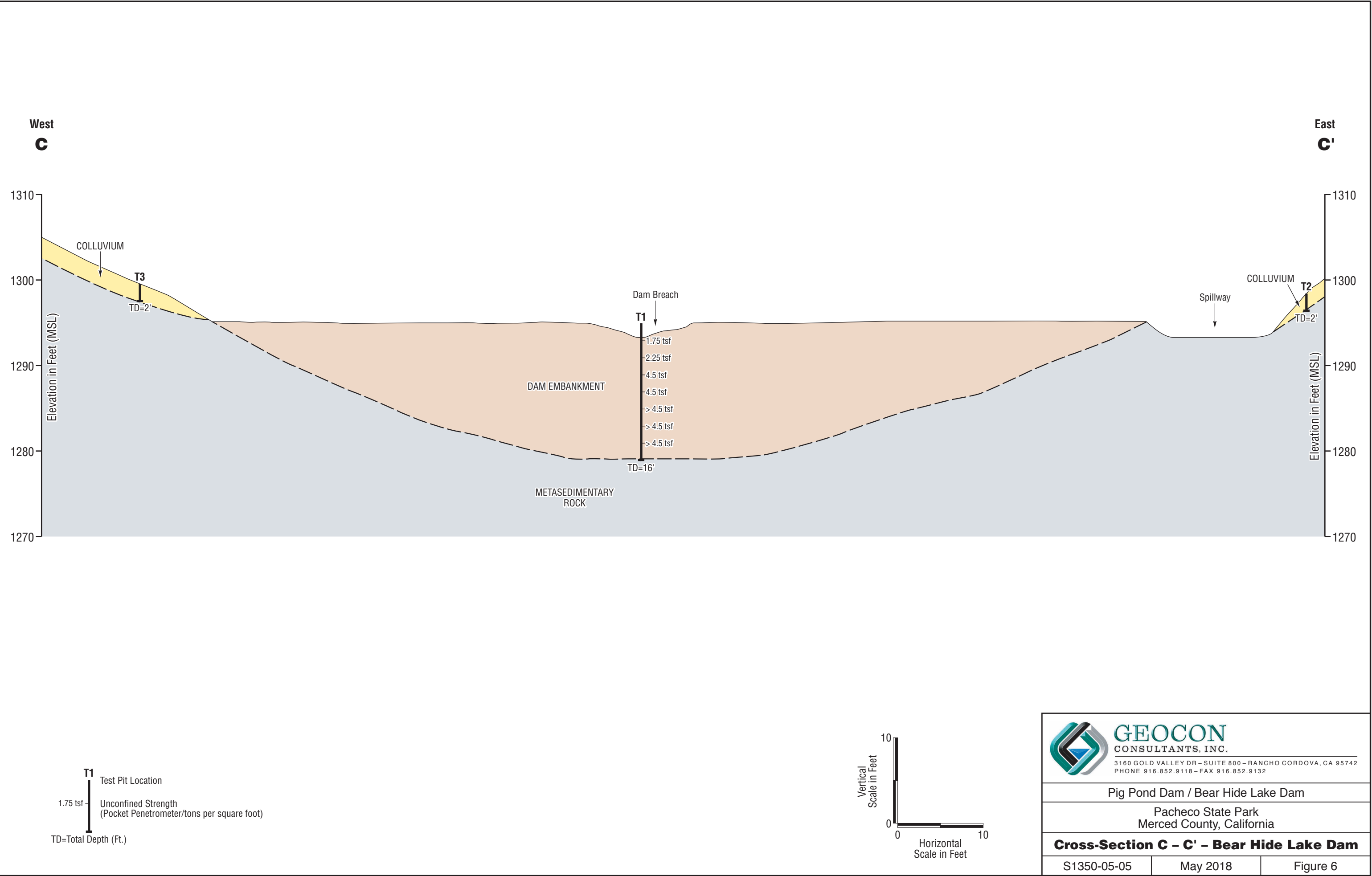
B2
Boring Location

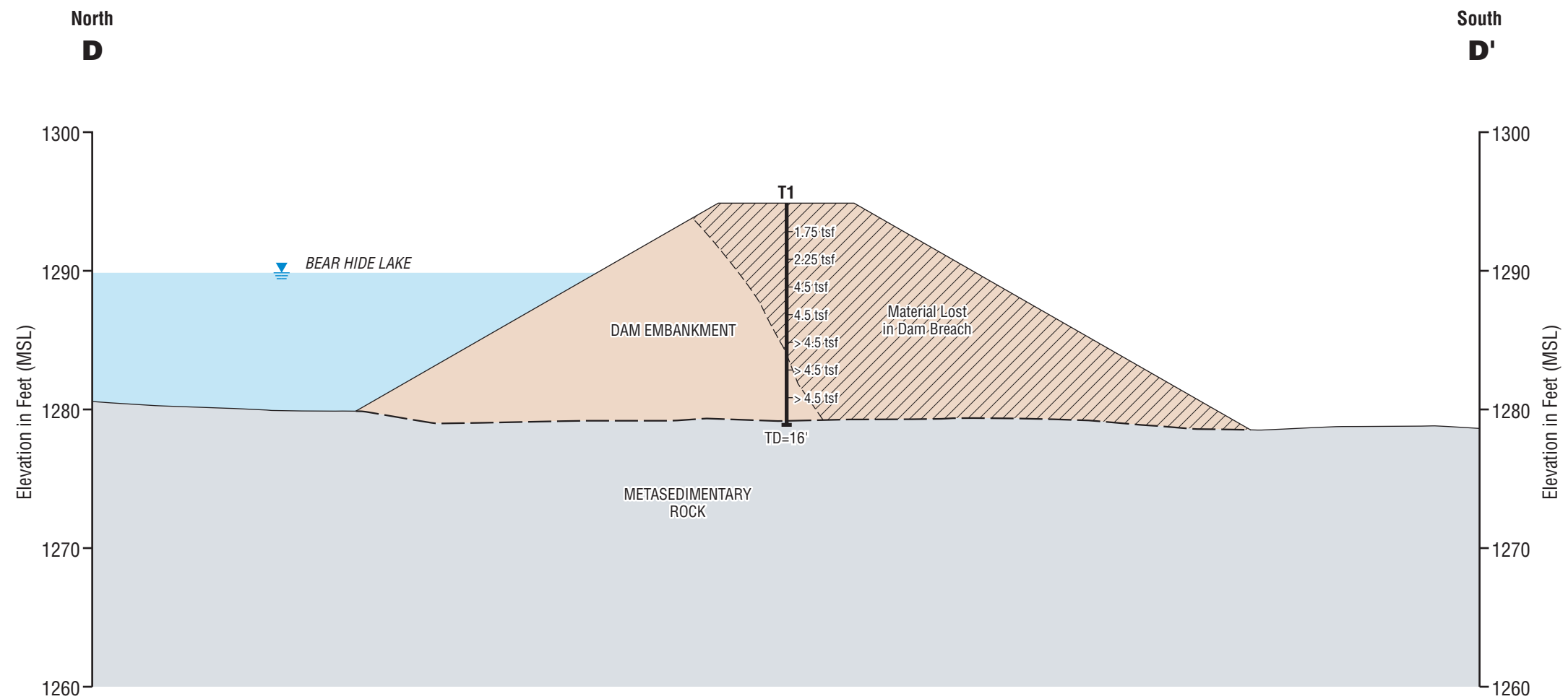
14
Blow Count,
California Modified Sampler

TD=Total Depth (Ft.)



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Pacheco State Park Merced County, California		
Cross-Section A - A' - Pig Pond Dam		
S1350-05-05	May 2018	Figure 4

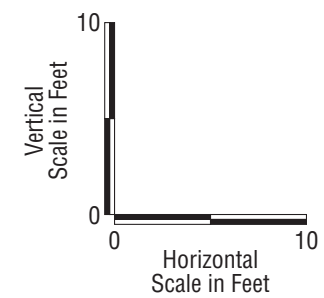




T1 Test Pit Location

1.75 tsf Unconfined Strength (Pocket Penetrometer/tons per square foot)

TD=Total Depth (Ft.)



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Pig Pond Dam / Bear Hide Lake Dam		
Pacheco State Park Merced County, California		
Cross-Section D - D' - Bear Hide Lake Dam		
S1350-05-05	May 2018	Figure 7

UNIFIED SOIL CLASSIFICATION

MAJOR DIVISIONS			TYPICAL NAMES	
COARSE-GRAINED SOILS MORE THAN HALF IS COARSER THAN NO. 200 SIEVE	GRAVELS MORE THAN HALF COARSE FRACTION IS LARGER THAN NO.4 SIEVE SIZE	CLEAN GRAVELS WITH LITTLE OR NO FINES	GW	WELL GRADED GRAVELS WITH OR WITHOUT SAND, LITTLE OR NO FINES
			GP	POORLY GRADED GRAVELS WITH OR WITHOUT SAND, LITTLE OR NO FINES
		GRAVELS WITH OVER 12% FINES	GM	SILTY GRAVELS, SILTY GRAVELS WITH SAND
			GC	CLAYEY GRAVELS, CLAYEY GRAVELS WITH SAND
	SANDS MORE THAN HALF COARSE FRACTION IS SMALLER THAN NO.4 SIEVE SIZE	CLEAN SANDS WITH LITTLE OR NO FINES	SW	WELL GRADED SANDS WITH OR WITHOUT GRAVEL, LITTLE OR NO FINES
			SP	POORLY GRADED SANDS WITH OR WITHOUT GRAVEL, LITTLE OR NO FINES
		SANDS WITH OVER 12% FINES	SM	SILTY SANDS WITH OR WITHOUT GRAVEL
			SC	CLAYEY SANDS WITH OR WITHOUT GRAVEL
	SILTS AND CLAYS LIQUID LIMIT 50% OR LESS		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTS WITH SANDS AND GRAVELS
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, CLAYS WITH SANDS AND GRAVELS, LEAN CLAYS
FINE-GRAINED SOILS MORE THAN HALF IS FINER THAN NO. 200 SIEVE	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50%		OL	ORGANIC SILTS OR CLAYS OF LOW PLASTICITY
			MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS, FINE SANDY OR SILTY SOILS, ELASTIC SILTS
			CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			OH	ORGANIC CLAYS OR CLAYS OF MEDIUM TO HIGH PLASTICITY
	HIGHLY ORGANIC SOILS		PT	PEAT AND OTHER HIGHLY ORGANIC SOILS

BEDDING SPACING DESCRIPTIONS

THICKNESS/SPACING	DESCRIPTOR
GREATER THAN 10 FEET	MASSIVE
3 TO 10 FEET	VERY THICKLY BEDDED
1 TO 3 FEET	THICKLY BEDDED
3 1/4-INCH TO 1 FOOT	MODERATELY BEDDED
1 1/4-INCH TO 3 1/4-INCH	THINLY BEDDED
1/4-INCH TO 1 1/4-INCH	VERY THINLY BEDDED
LESS THAN 1/4-INCH	LAMINATED

STRUCTURE DESCRIPTIONS

CRITERIA	DESCRIPTION
ALTERNATING LAYERS OF VARYING MATERIAL OR COLOR WITH LAYERS AT LEAST 1/4-INCH THICK	STRATIFIED
ALTERNATING LAYERS OF VARYING MATERIAL OR COLOR WITH LAYERS LESS THAN 1/4-INCH THICK	LAMINATED
BREAKS ALONG DEFINITE PLANES OF FRACTURE WITH LITTLE RESISTANCE TO FRACTURING	FISSURED
FRACTURE PLANES APPEAR POLISHED OR GLOSSY, SOMETIMES STRIATED	SLICKENSIDED
COHESIVE SOIL THAT CAN BE BROKEN DOWN INTO SMALLER ANGULAR LUMPS WHICH RESIST FURTHER BREAKDOWN	BLOCKY
INCLUSION OF SMALL POCKETS OF DIFFERENT SOIL, SUCH AS SMALL LENSES OF SAND SCATTERED THROUGH A MASS OF CLAY	LENSED
SAME COLOR AND MATERIAL THROUGHOUT	HOMOGENOUS

CEMENTATION/INDURATION DESCRIPTIONS

FIELD TEST	DESCRIPTION
CRUMBLES OR BREAKS WITH HANDLING OR LITTLE FINGER PRESSURE	WEAKLY CEMENTED/INDURATED
CRUMBLES OR BREAKS WITH CONSIDERABLE FINGER PRESSURE	MODERATELY CEMENTED/INDURATED
WILL NOT CRUMBLE OR BREAK WITH FINGER PRESSURE	STRONGLY CEMENTED/INDURATED

IGNEOUS/METAMORPHIC ROCK STRENGTH DESCRIPTIONS

FIELD TEST	DESCRIPTION
MATERIAL CRUMBLES WITH BARE HAND	WEAK
MATERIAL CRUMBLES UNDER BLOWS FROM GEOLOGY HAMMER	MODERATELY WEAK
1/4-INCH INDENTATIONS WITH SHARP END FROM GEOLOGY HAMMER	MODERATELY STRONG
HAND-HELD SPECIMEN CAN BE BROKEN WITH ONE BLOW FROM GEOLOGY HAMMER	STRONG
HAND-HELD SPECIMEN CAN BE BROKEN WITH COUPLE BLOWS FROM GEOLOGY HAMMER	VERY STRONG
HAND-HELD SPECIMEN CAN BE BROKEN WITH MANY BLOWS FROM GEOLOGY HAMMER	EXTREMELY STRONG

IGNEOUS/METAMORPHIC ROCK WEATHERING DESCRIPTIONS

DEGREE OF DECOMPOSITION	FIELD RECOGNITION	ENGINEERING PROPERTIES
SOIL	DISCOLORED, CHANGED TO SOIL, FABRIC DESTROYED	EASY TO DIG
COMPLETELY WEATHERED	DISCOLORED, CHANGED TO SOIL, FABRIC MAINLY PRESERVED	EXCAVATED BY HAND OR RIPPING (Saprolite)
HIGHLY WEATHERED	DISCOLORED, HIGHLY FRACTURED, FABRIC ALTERED AROUND FRACTURES	EXCAVATED BY HAND OR RIPPING, WITH SLIGHT DIFFICULTY
MODERATELY WEATHERED	DISCOLORED, FRACTURES, INTACT ROCK-NOTICEABLY WEAKER THAN FRESH ROCK	EXCAVATED WITH DIFFICULTY WITHOUT EXPLOSIVES
SLIGHTLY WEATHERED	MAY BE DISCOLORED, SOME FRACTURES, INTACT ROCK-NOT NOTICEABLY WEAKER THAN FRESH ROCK	REQUIRES EXPLOSIVES FOR EXCAVATION, WITH PERMEABLE JOINTS AND FRACTURES
FRESH	NO DISCOLORATION, OR LOSS OF STRENGTH	REQUIRES EXPLOSIVES

IGNEOUS/METAMORPHIC ROCK JOINT/FRACTURE DESCRIPTIONS

FIELD TEST	DESCRIPTION
NO OBSERVED FRACTURES	UNFRACTURED/UNJOINTED
MAJORITY OF JOINTS/FRACTURES SPACED AT 1 TO 3 FOOT INTERVALS	SLIGHTLY FRACTURED/JOINTED
MAJORITY OF JOINTS/FRACTURES SPACED AT 4-INCH TO 1 FOOT INTERVALS	MODERATELY FRACTURED/JOINTED
MAJORITY OF JOINTS/FRACTURES SPACED AT 1-INCH TO 4-INCH INTERVALS WITH SCATTERED FRAGMENTED INTERVALS	INTENSELY FRACTURED/JOINTED
MAJORITY OF JOINTS/FRACTURES SPACED AT LESS THAN 1-INCH INTERVALS; MOSTLY RECOVERED AS CHIPS AND FRAGMENTS	VERY INTENSELY FRACTURED/JOINTED

BORING/TRENCH LOG LEGEND

— No Recovery — Shelby Tube Sample — Bulk Sample — SPT Sample — Modified California Sample — Groundwater Level (At Completion) — Groundwater Level (Seepage)	PENETRATION RESISTANCE						
	SAND AND GRAVEL			SILT AND CLAY			COMPRESSION STRENGTH (tsf)
	RELATIVE DENSITY	BLOWS PER FOOT (SPT)*	BLOWS PER FOOT (MOD-CAL)*	CONSISTENCY	BLOWS PER FOOT (SPT)	BLOWS PER FOOT (MOD-CAL)*	
	VERY LOOSE	0 - 4	0 - 6	VERY SOFT	0 - 2	0 - 3	0 - 0.25
	LOOSE	5 - 10	7 - 16	SOFT	3 - 4	4 - 6	0.25 - 0.50
	MEDIUM DENSE	11 - 30	17 - 48	MEDIUM STIFF	5 - 8	7 - 13	0.50 - 1.0
	DENSE	31 - 50	49 - 79	STIFF	9 - 15	14 - 24	1.0 - 2.0
	VERY DENSE	OVER 50	OVER 79	VERY STIFF	16 - 30	25 - 48	2.0 - 4.0
				HARD	OVER 30	OVER 48	OVER 4.0
	*NUMBER OF BLOWS OF 140 LB HAMMER FALLING 30 INCHES TO DRIVE LAST 12 INCHES OF AN 18-INCH DRIVE						

MOISTURE DESCRIPTIONS

FIELD TEST	APPROX. DEGREE OF SATURATION, S (%)	DESCRIPTION
NO INDICATION OF MOISTURE; DRY TO THE TOUCH	S<25	DRY
SLIGHT INDICATION OF MOISTURE	25<S<50	DAMP
INDICATION OF MOISTURE; NO VISIBLE WATER	50<S<75	MOIST
MINOR VISIBLE FREE WATER	75<S<100	WET
VISIBLE FREE WATER	100	SATURATED

QUANTITY DESCRIPTIONS

APPROX. ESTIMATED PERCENT	DESCRIPTION
<5%	TRACE
5 - 10%	FEW
11 - 25%	LITTLE
26 - 50%	SOME
>50%	MOSTLY

GRAVEL/COBBLE/BOULDER DESCRIPTIONS

CRITERIA	DESCRIPTION
PASS THROUGH A 3-INCH SIEVE AND BE RETAINED ON A NO. 4 SIEVE (#4 TO 3")	GRAVEL
PASS A 12-INCH SQUARE OPENING AND BE RETAINED ON A 3-INCH SIEVE (3"-12")	COBBLE
WILL NOT PASS A 12-INCH SQUARE OPENING (>12")	BOULDER

LABORATORY TEST KEY

CP – COMPACTION CURVE (ASTM D1557)	R – R-VALUE (CTM 301)
CR – CORROSION ANALYSIS (CTM 422, 643, 417)	SE – SAND EQUIVALENT (CTM 217)
DS – DIRECT SHEAR (ASTM D3080)	TXCU – CONSOLIDATED UNDRAINED TRIAXIAL (ASTM D4767)
EI – EXPANSION INDEX (ASTM D4829)	TXUU – UNCONSOLIDATED UNDRAINED TRIAXIAL (ASTM D2850)
GSA – GRAIN SIZE ANALYSIS (ASTM D422)	UC – UNCONFINED COMPRESSIVE STRENGTH (ASTM D2166)
MC – MOISTURE CONTENT (ASTM D2216)	
PI – PLASTICITY INDEX (ASTM D4318)	



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KEY TO LOGS

Figure 8

DEPTH IN FEET	SAMPLE INTERVAL & RECOVERY	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	BORING B1			PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)	ADDITIONAL TESTS				
					ELEV. (MSL.)	DATE COMPLETED									
					ELEV. (MSL.)	N/A	DATE COMPLETED	2/20/18							
					ENG./GEO.	Sean Dixon	DRILLER	Cal Geotech							
					EQUIPMENT	Mobile Drill-All Terrain Rig with 4" SFA	HAMMER TYPE	Safety 140lb							
					MATERIAL DESCRIPTION										
0	B1-Bulk			CL	DAM EMBANKMENT										
1	B1-0.5				Medium stiff, moist, light brown, Lean CLAY with sand, gravel, and cobbles							13			CP
2	B1-1.0														
3	B1-3.0			CL-ML	METASEDIMENTARY ROCK (SHALE)							70/11"			PI
4	B1-3.5				Intensely weathered, thinly bedded, soft, intensely fractured, excavates as:										
5	NR				Hard, moist, light brown, SILTY CLAY with sand, gravel, and cobbles							50/0"			
					REFUSAL AT 5 FEET IN MODERATELY WEATHERED SHALE GROUNDWATER NOT ENCOUNTERED BACKFILLED WITH SOIL CUTTINGS										

Figure 9, Log of Boring, page 1 of 1

IN PROGRESS S1350-05-05 PACHECO SP DAMS.GPJ 05/11/18



SAMPLE SYMBOLS

□ ... SAMPLING UNSUCCESSFUL

▨ ... DISTURBED OR BAG SAMPLE

■ ... STANDARD PENETRATION TEST

▣ ... CHUNK SAMPLE

■ ... DRIVE SAMPLE (UNDISTURBED)

▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

DEPTH IN FEET	SAMPLE INTERVAL & RECOVERY	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	BORING B2		PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)	ADDITIONAL TESTS
					ELEV. (MSL.) <u>N/A</u>	DATE COMPLETED <u>2/20/18</u>				
					ENG./GEO.	DRILLER				
					<u>Sean Dixon</u>	<u>Cal Geotech</u>				
					EQUIPMENT	HAMMER TYPE				
					<u>Mobile Drill-All Terrain Rig with 4" SFA</u>	<u>Safety 140lb</u>				
MATERIAL DESCRIPTION										
0	B2-Bulk			CL	DAM EMBANKMENT Stiff, moist, light brown, Lean CLAY with sand, gravel, and cobbles		14			CP, EI
1	B2-0.5									
2	B2-1.0									
3	B2-3.0									
4	B2-3.5									
5										
6	B2-5.5									
7	B2-6.0									
8										
9	B2-8.0									
10	B2-8.5									
11										
12	B2-10.5									
13	B2-11.0									
14										
15										
16	B2-15.5		CL	METASEDIMENTARY ROCK (SHALE) Intensely weathered, thinly bedded, soft, intensely fractured, excavates as: Hard, moist, light brown, Lean CLAY with sand, gravel, and cobbles	32			CU		
17	B2-16.0									
	NK				REFUSAL AT 15 FEET IN MODERATELY WEATHERED SHALE GROUNDWATER NOT ENCOUNTERED BACKFILLED WITH NEAT CEMENT GROUT		50/0"			

Figure 10, Log of Boring, page 1 of 1

IN PROGRESS S1350-05-05 PACHECO SP DAMS.GPJ 05/11/18



SAMPLE SYMBOLS

□ ... SAMPLING UNSUCCESSFUL

▨ ... DISTURBED OR BAG SAMPLE

■ ... STANDARD PENETRATION TEST

■ ... CHUNK SAMPLE

■ ... DRIVE SAMPLE (UNDISTURBED)

▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.


DEPTH IN FEET	SAMPLE INTERVAL & RECOVERY	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	BORING B3 ELEV. (MSL.) <u>N/A</u> ENG./GEO. <u>Sean Dixon</u> EQUIPMENT <u>Mobile Drill-All Terrain Rig with 4" SFA</u> DATE COMPLETED <u>2/20/18</u> DRILLER <u>Cal Geotech</u> HAMMER TYPE <u>Safety 140lb</u>	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)	ADDITIONAL TESTS
0	B3-Bulk			CL	MATERIAL DESCRIPTION				
1	B3-0.5				METASEDIMENTARY ROCK (SHALE) Intensely weathered, thinly bedded, soft, intensely fractured, excavates as:	64			CP
2	B3-1.0				Hard, moist, light brown, Lean CLAY with sand, gravel, and cobbles				
3	B3-2.5					86/7"			
					REFUSAL AT 3 FEET IN MODERATELY WEATHERED SHALE GROUNDWATER NOT ENCOUNTERED BACKFILLED WITH SOIL CUTTINGS				

Figure 11, Log of Boring, page 1 of 1

IN PROGRESS S1350-05-05 PACHECO SP DAMS.GPJ 05/11/18



SAMPLE SYMBOLS

□ ... SAMPLING UNSUCCESSFUL

▣ ... DISTURBED OR BAG SAMPLE

■ ... STANDARD PENETRATION TEST

▣ ... CHUNK SAMPLE

■ ... DRIVE SAMPLE (UNDISTURBED)

▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.



DEPTH IN FEET	SAMPLE INTERVAL & RECOVERY	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	BORING HA1		PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)	ADDITIONAL TESTS
					ELEV. (MSL.) <u>N/A</u>	DATE COMPLETED <u>3/29/18</u>				
					ENG./GEO. <u>Sean Dixon</u>	DRILLER <u>Geocon</u>				
					EQUIPMENT <u>Hand Auger</u>	HAMMER TYPE <u>N/A</u>				
0					MATERIAL DESCRIPTION					
1	HA1-1.0			CL	COLLUVIUM Medium stiff, moist, light brown, Lean CLAY with sand, gravel, and cobbles					
2	HA1-2.0									
					REFUSAL AT 2.5 FEET IN INTENSELY WEATHERED SHALE SEEPAGE AT 1.0 FOOT BACKFILLED WITH SOIL CUTTINGS					

Figure 12, Log of Boring, page 1 of 1

IN PROGRESS S1350-05-05 PACHECO SP DAMS.GPJ 05/11/18



SAMPLE SYMBOLS

 ... SAMPLING UNSUCCESSFUL ... DISTURBED OR BAG SAMPLE ... STANDARD PENETRATION TEST ... CHUNK SAMPLE ... DRIVE SAMPLE (UNDISTURBED) ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

DEPTH IN FEET	SAMPLE INTERVAL & RECOVERY	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TEST PIT T1		PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)	ADDITIONAL TESTS
					ELEV. (MSL.) <u>N/A</u>	DATE COMPLETED <u>3/29/18</u>				
					ENG./GEO. <u>Sean Dixon</u>	DRILLER <u>Geocon</u>				
					EQUIPMENT <u>Hand Tools</u>	HAMMER TYPE <u>N/A</u>				
0					MATERIAL DESCRIPTION					
1				CL	DAM EMBANKMENT Medium stiff, moist, light brown, Lean CLAY with sand, gravel, and cobbles					
2	T1-2.0				- PP = 1.75 TSF					
3										
4	T1-4.0				- very stiff, PP = 2.25 TSF					PI
5				GC	Very dense, moist, light brown, Clayey GRAVEL with sand					
6	T1-6.0									GSA
7										
8	T1-8.0									
9										
10	T1-10.0									PI
11										
12	T1-12.0									
13				SC	Very dense, moist, light brown, Clayey SAND with gravel					
14	T1-14.0									GSA
15										
16	T1-16.0				TEST PIT TERMINATED AT 16 FEET GROUNDWATER NOT ENCOUNTERED					

Figure 13, Log of Test Pit, page 1 of 1

IN PROGRESS S1350-05-05 PACHECO SP DAMS.GPJ 05/11/18



SAMPLE SYMBOLS

□ ... SAMPLING UNSUCCESSFUL

▣ ... DISTURBED OR BAG SAMPLE

■ ... STANDARD PENETRATION TEST

▤ ... CHUNK SAMPLE

■ ... DRIVE SAMPLE (UNDISTURBED)

▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

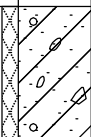
DEPTH IN FEET	SAMPLE INTERVAL & RECOVERY	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TEST PIT T2		PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)	ADDITIONAL TESTS
					ELEV. (MSL.) <u>N/A</u>	DATE COMPLETED <u>3/29/18</u>				
					ENG./GEO. <u>Sean Dixon</u>	DRILLER <u>Geocon</u>				
					EQUIPMENT <u>Hand Tools</u>	HAMMER TYPE <u>N/A</u>				
0	T2-Bulk			CL	MATERIAL DESCRIPTION					
1					COLLUVIUM Stiff, moist, light brown, Lean CLAY with sand, gravel, and cobbles					
2					TEST PIT TERMINATED AT 2 FEET REFUSAL IN INTENSELY WEATHERED SHALE GROUNDWATER NOT ENCOUNTERED BACKFILLED WITH SOIL CUTTINGS					

Figure 14, Log of Test Pit, page 1 of 1

IN PROGRESS S1350-05-05 PACHECO SP DAMS.GPJ 05/11/18

**SAMPLE SYMBOLS**

□ ... SAMPLING UNSUCCESSFUL

▣ ... DISTURBED OR BAG SAMPLE

■ ... STANDARD PENETRATION TEST

■ ... CHUNK SAMPLE

■ ... DRIVE SAMPLE (UNDISTURBED)

▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

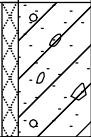
DEPTH IN FEET	SAMPLE INTERVAL & RECOVERY	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TEST PIT T3		PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)	ADDITIONAL TESTS
					ELEV. (MSL.) <u>N/A</u>	DATE COMPLETED <u>3/29/18</u>				
					ENG./GEO. <u>Sean Dixon</u>	DRILLER <u>Geocon</u>				
					EQUIPMENT <u>Hand Tools</u>	HAMMER TYPE <u>N/A</u>				
0	T3-Bulk			CL	MATERIAL DESCRIPTION					
1					COLLUVIUM Stiff, moist, light brown, Lean CLAY with sand, gravel, and cobbles					
2					TEST PIT TERMINATED AT 2 FEET REFUSAL IN INTENSELY WEATHERED SHALE GROUNDWATER NOT ENCOUNTERED BACKFILLED WITH SOIL CUTTINGS					

Figure 15, Log of Test Pit, page 1 of 1

IN PROGRESS S1350-05-05 PACHECO SP DAMS.GPJ 05/11/18



SAMPLE SYMBOLS

□ ... SAMPLING UNSUCCESSFUL

▣ ... DISTURBED OR BAG SAMPLE

■ ... STANDARD PENETRATION TEST

■ ... CHUNK SAMPLE

■ ... DRIVE SAMPLE (UNDISTURBED)

▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

Sample ID	Depth (feet)	Liquid Limit	Plastic Limit	Plasticity Index	Expansion Index	%<#200 Sieve	Water Content (%)	Dry Density (pcf)
B1&B3-Bulk	0-5				40			
B1-3	3	22	16	6				
B1-3.5	3.5						8.5	123.8
B1-3	3	27	18	9				
B2-3.5	3.5						13.6	114.1
B2-8	8					58.1		
B2-8.5	8.5						13.5	119.2
B2-11	11						17.8	108.7
B2-13	13					61.2		
B2-13.5	13.5						21.7	104.1
B2-16	16						17.9	111.8
B3-1	1						10.7	
Bear Hide Bulk 2	0-5				18			
HA1-1	1						29.9	
HA1-2	2						21.1	
T1-2	2						8.5	
T1-4	4	32	18	14			11.6	
T1-6	6					14.7	6.4	
T1-8	8						10.5	
T1-10	10	27	19	8			10.0	
T1-12	12						8.0	
T1-14	14					39.7	9.5	



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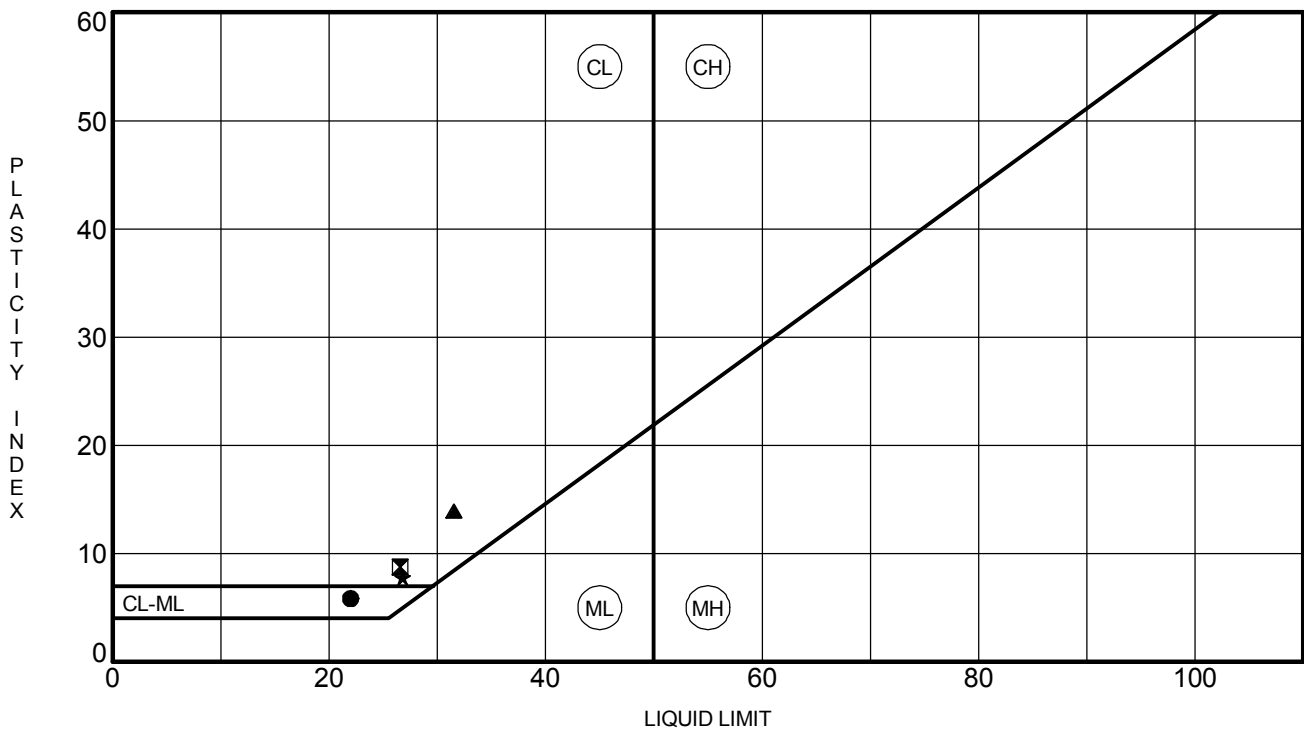
Summary of Laboratory Results

Project: Pacheco State Park Storm Damage

Location: Merced County, CA

Number: S1350-05-05

Figure: 16



	Sample No.	Liquid Limit	Plastic Limit	Plasticity Index	% Pass #200 Sieve	Unified Soil Classification Description	Preparation Method
●	B1-3	22	16	6		Silty CLAY (CL-ML)	dry
⊠	B2-3	27	18	9		Lean CLAY (CL)	dry
▲	T1-4	32	18	14		Lean CLAY (CL)	dry
★	T1-10	27	19	8		Lean CLAY (CL)	dry



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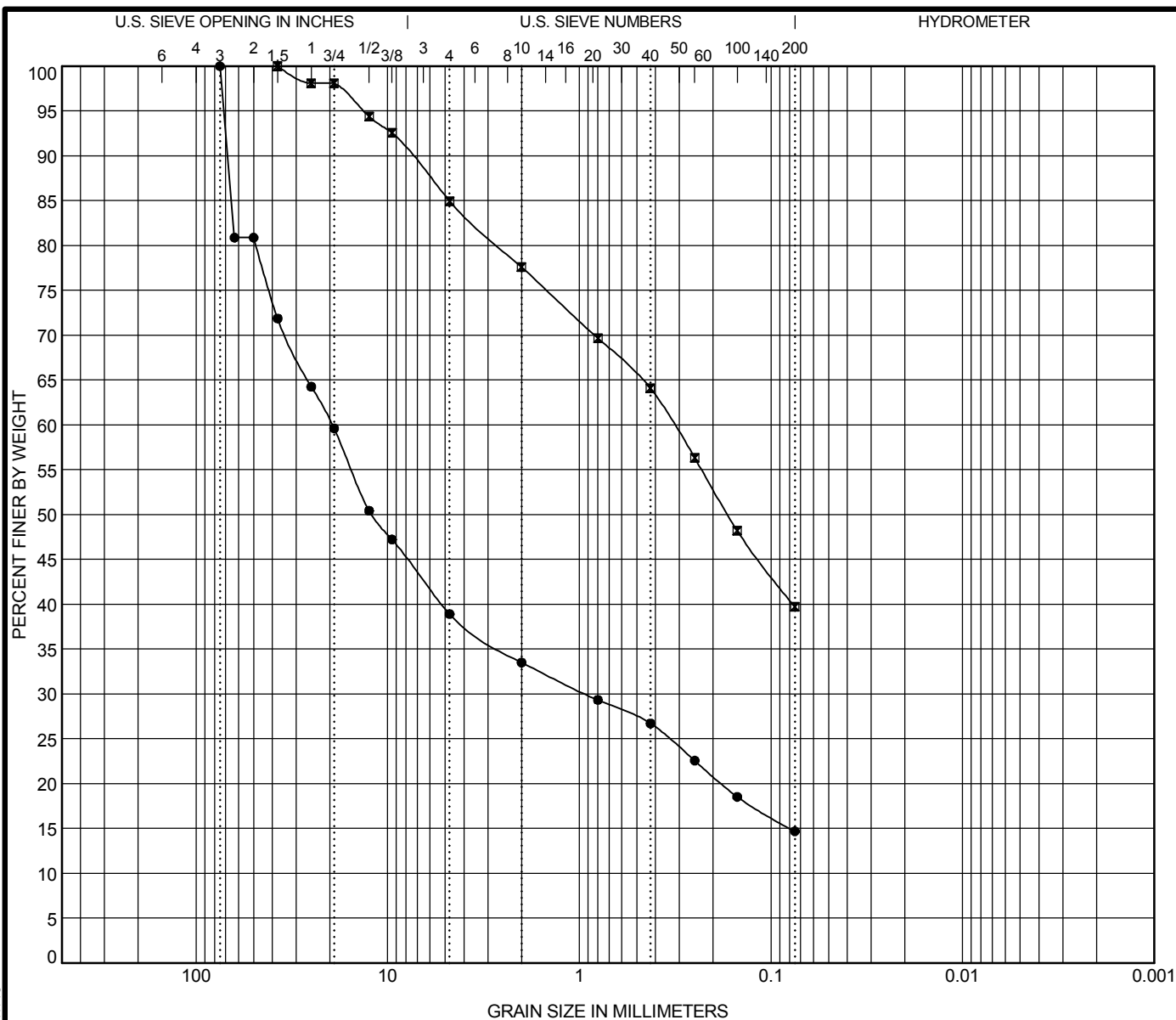
ATTERBERG LIMITS (ASTM D4318)

Project: Pacheco State Park Storm Damage

Location: Merced County, CA

Number: S1350-05-05

Figure: 17



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Sample No.		Classification					LL	PL	PI	Cc	Cu
●	T1-6	Clayey GRAVEL with sand (GC)									
☒	T1-14	Clayey SAND with gravel (SC)									
Sample No.		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay		
●	T1-6	75	19.425	0.925		61.1	24.2	14.7			
☒	T1-14	37.5	0.321			15.0	45.2	39.7			

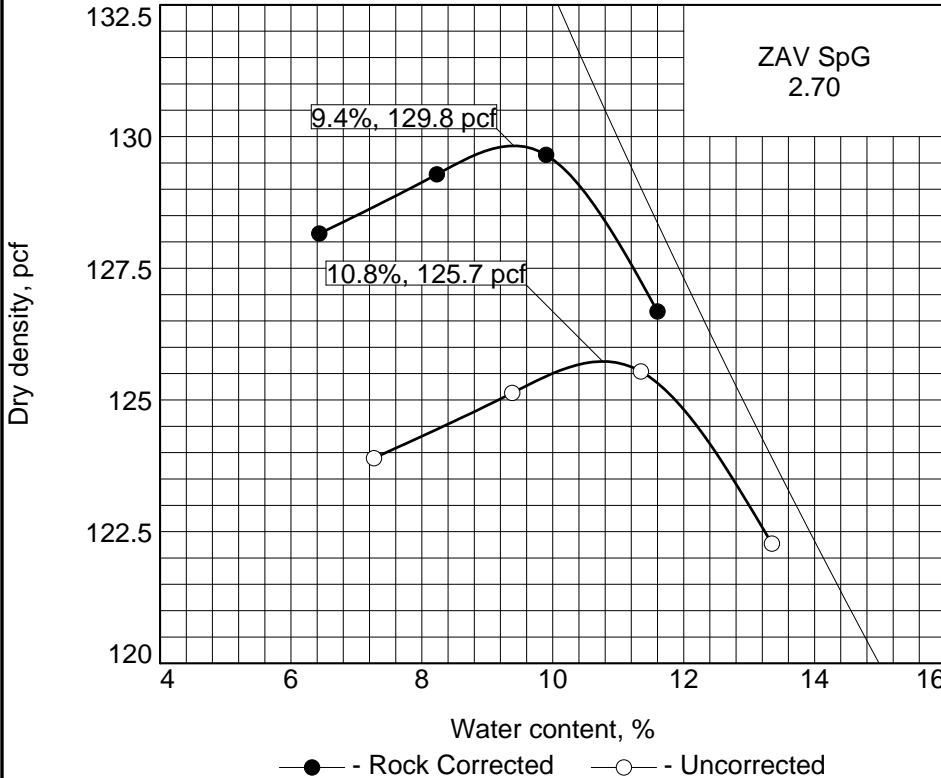


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GRAIN SIZE DISTRIBUTION (ASTM D422, D6913)
Project: Pacheco State Park Storm Damage
Location: Merced County, CA
Number: S1350-05-05
Figure: 18

COMPACTION TEST REPORT

Curve No.
B1&B3-Bulk



Test Specification:

ASTM 1557 Method A 2018
ASTM D4718-15 Oversize Corr. Applied to Each Test Point

Preparation Method

Hammer Wt. 10
Hammer Drop 18
Number of Layers 5
Blows per Layer 25
Mold Size 0.0333 cu. ft.

Test Performed on Material

Passing #4 Sieve

NM LL PI
Sp.G. (ASTM D 854) 2.7
%>#4 15 %<No.200

USCS AASHTO

Date Sampled

Date Tested 3/9/18

Tested By JH

TESTING DATA

	1	2	3	4	5	6
WM + WS	4015.0	4075.0	4119.0	4101.0		
WM	2007.6	2007.6	2007.6	2007.6		
WW + T #1	2216.0	2377.0	2330.0	2336.0		
WD + T #1	2080.3	2200.5	2115.3	2090.7		
TARE #1	213.0	319.0	223.0	253.0		
WW + T #2						
WD + T #2						
TARE #2						
MOISTURE	6.4	8.2	9.9	11.6		
DRY DENSITY	128.2	129.3	129.7	126.7		

ROCK CORRECTED TEST RESULTS

Maximum dry density = 129.8 pcf
Optimum moisture = 9.4 %

UNCORRECTED

125.7 pcf
10.8 %

Material Description

Very Light Brown silty Clay w/Gravel

Remarks:

Project No. S1350-05-05 Client:

Project: Pacheco SP Dams

○ Sample Number: B1+B3 Bulks

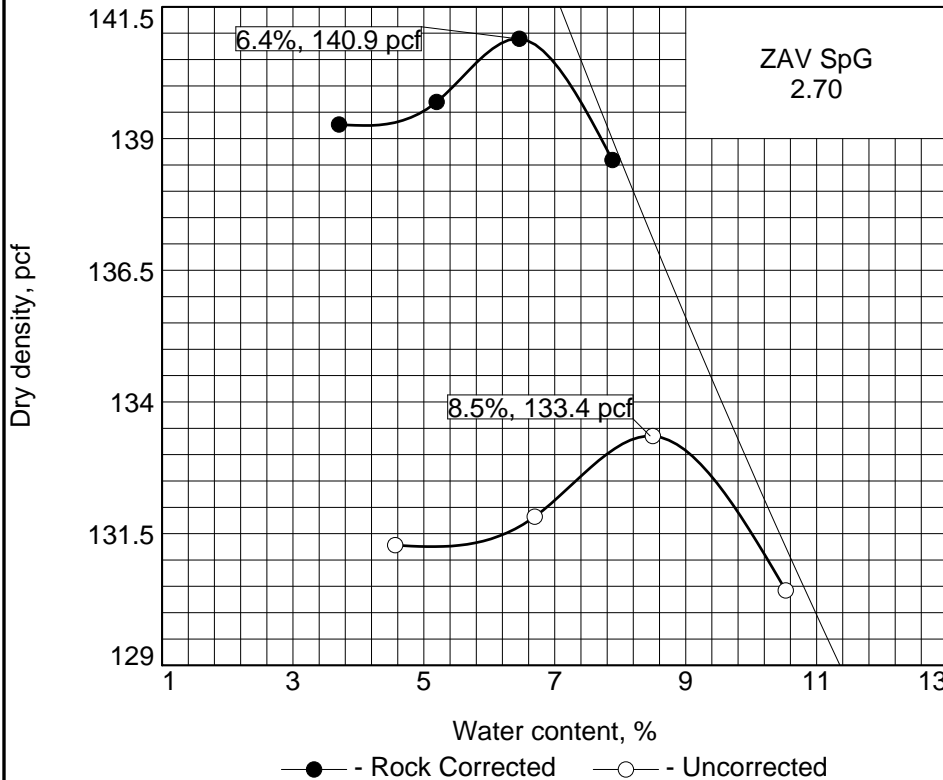
Checked by: MR

Title: Lab Manager

GEOCON CONSULTANTS, INC.

COMPACTION TEST REPORT

Curve No.
Bulk 2 Bear Hide



Test Specification:

ASTM 1557 Method B 2018
ASTM D4718-15 Oversize Corr. Applied to Each Test Point

Preparation Method

Hammer Wt. 10
Hammer Drop 18
Number of Layers 5
Blows per Layer 25
Mold Size 0.0333 cu. ft.

Test Performed on Material

Passing 3/8 in. Sieve

NM LL PI
Sp.G. (ASTM D 854) 2.7
%>3/8 in. 30 %<No.200

USCS AASHTO

Date Sampled

Date Tested 4/10/18

Tested By JA

TESTING DATA

	1	2	3	4	5	6
WM + WS	4163.0	4224.0	4216.0	4112.0		
WM	2038.6	2038.6	2038.6	2038.6		
WW + T #1	2579.0	2616.0	2668.0	2533.0		
WD + T #1	2446.0	2447.0	2461.0	2444.0		
TARE #1	459.0	458.0	495.0	493.0		
WW + T #2						
WD + T #2						
TARE #2						
MOISTURE	5.2	6.5	7.9	3.7		
DRY DENSITY	139.7	140.9	138.6	139.3		

ROCK CORRECTED TEST RESULTS

Maximum dry density = 140.9 pcf
Optimum moisture = 6.4 %

UNCORRECTED

133.4 pcf
8.5 %

Material Description

tan brown silty lean clay w/gravel

Remarks:

Project No. S1350-05-05 Client:

Project: Pacheco SP Dams

○ Sample Number: Bear Hide Lake Bulk1

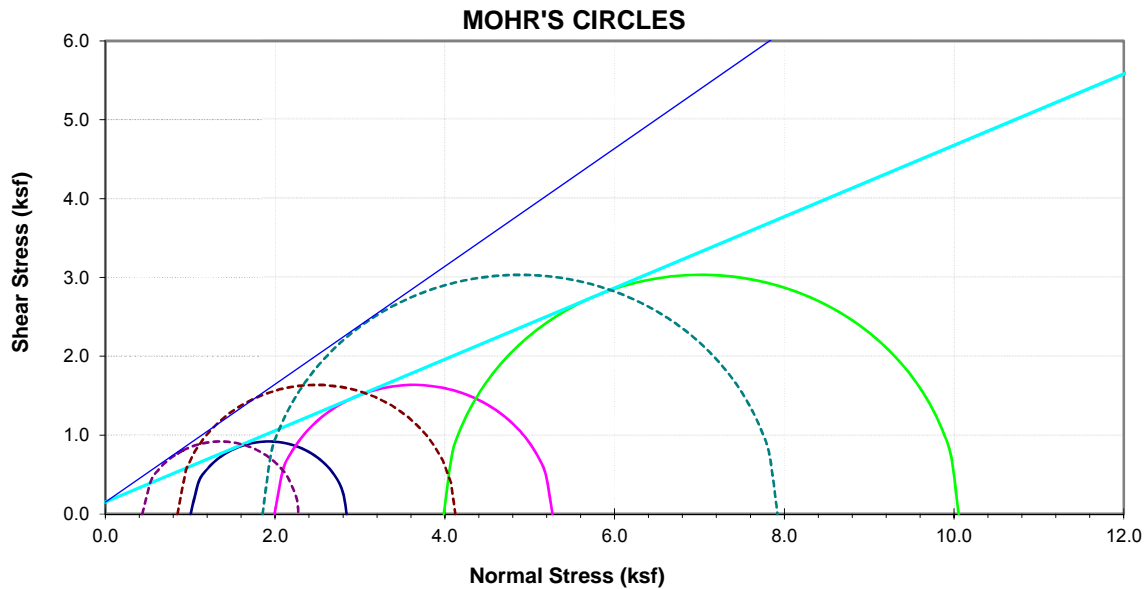
Checked by: MR

Title: Lab Manager


GEOCON CONSULTANTS, INC.

Consolidated Undrained Triaxial Compression - ICU Test ASTM D4767

Boring Number	B2
Sample Number	B2-8.5
Sample Description	Very dark gray lean CLAY

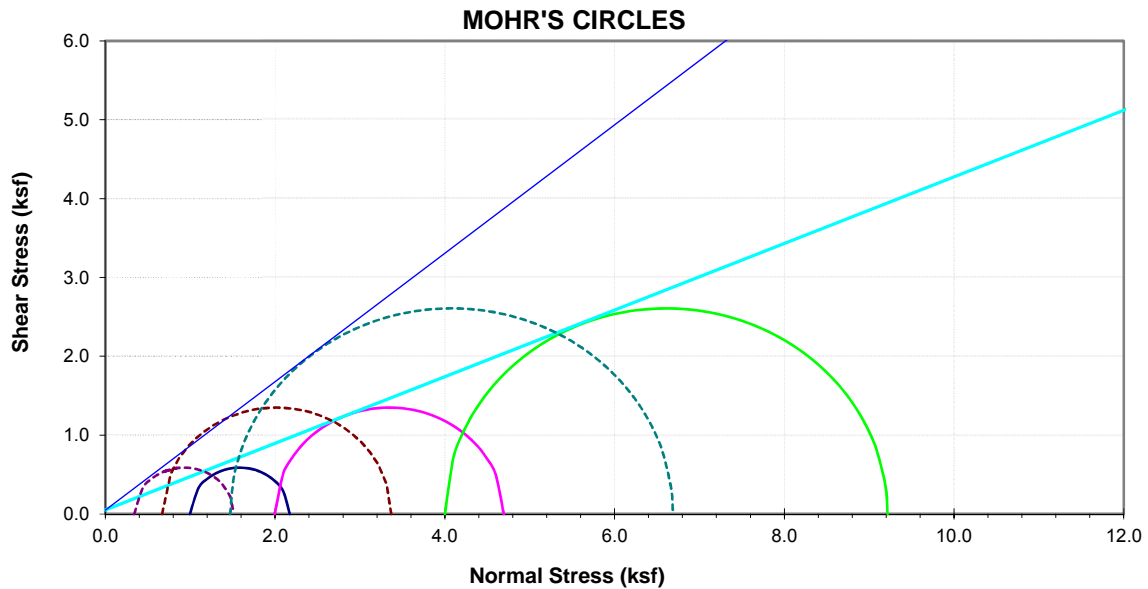


Test Results, At Maximum Principal Stress Ratio		Total	Effective	
	Friction Angle ϕ (degrees)	24.3	36.8	
	cohesion (psf)	150	150	
Initial Conditions at Start of Test		stage 1	stage 2	stage 3
Sample ID (psf), Initial Confining Pressure		1000	2000	4000
	Height (inch)	4.830	4.767	4.699
	Diameter (inch)	2.387	2.396	2.402
	Moisture Content (%)	13.5	--	--
	Dry Density (pcf)	119.2	--	--
	Saturation (%)	92.4	--	--
After Saturation				
	Dry Density (pcf)	119.1	--	--
After Consolidation				
	Dry Density (pcf)	119.9	--	--
Shear Test Conditions				
	Dry Density (pcf)	119.9	120.8	121.9
	Moisture Content (%)	--	--	11.8
	Saturation (%)	--	--	87.6
	Strain rate (%/hr)	3.07	3.04	3.06
	Cell pressure (psf)	9540	10660	12730
	Initial Back Pressure (psf)	8540	8660	8740
	Initial Effective Confining Pressure (psf)	1000	1990	3990
	Total Major Principal Stress At Failure (psf)	2840	5270	10050
	Effective Major Principal Stress At Failure (psf)	2270	4120	7920
	Pore Pressure At Failure (psf)	570	1140	2130
	Effective Minor Principal Stress At Failure (psf)	440	850	1850


 <p>Geocon Consultants, Inc. 3160 Gold Valley Drive, Suite 800 Rancho Cordova, California 95742 Telephone: (916) 852-9118 Fax: (916) 852-9132</p>	Triaxial Shear Strength - CU Test, ASTM D4767 with Pore Pressure Measurements (staged)		
	Project: Pacheco State Park Storm Damage		
	Location: Merced County, CA		
	Number: S1350-05-05 Figure: 21		

Consolidated Undrained Triaxial Compression - ICU Test ASTM D4767

Boring Number	B2
Sample Number	B2-16
Sample Description	Very dark gray lean CLAY

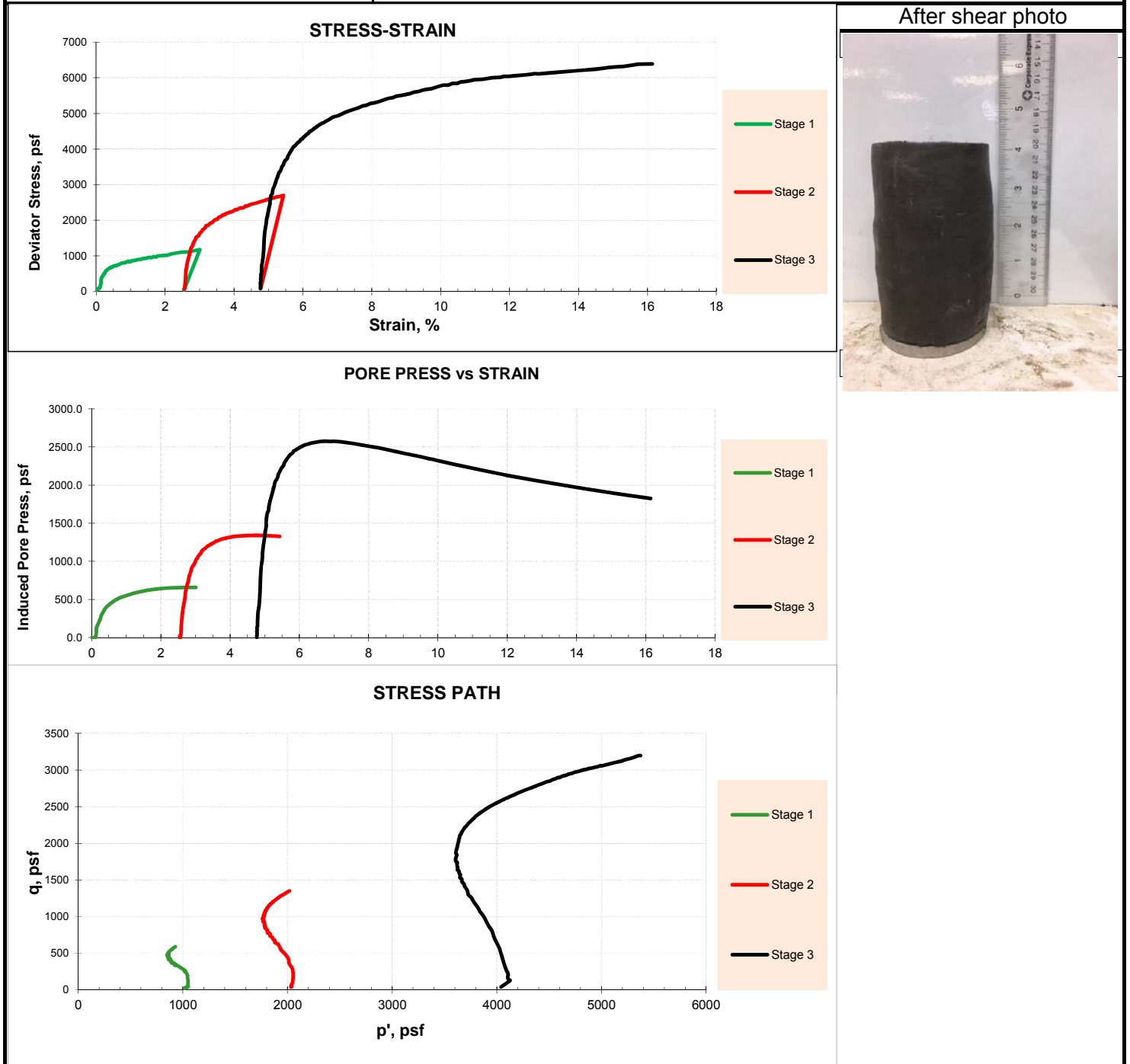


Test Results, At Maximum Principal Stress Ratio		Total	Effective	
Friction Angle ϕ (degrees)		22.9	39.2	
cohesion (psf)		50	50	
Initial Conditions at Start of Test		stage 1	stage 2	stage 3
Sample ID (psf), Initial Confining Pressure		1000	2000	4000
Height (inch)		4.871	4.764	4.632
Diameter (inch)		2.404	2.446	2.454
Moisture Content (%)		17.9	--	--
Dry Density (pcf)		111.8	--	--
Saturation (%)		99.3	--	--
After Saturation				
Dry Density (pcf)		110.2	--	--
After Consolidation				
Dry Density (pcf)		110.5	--	--
Shear Test Conditions				
Dry Density (pcf)		110.4	112.6	114.8
Moisture Content (%)		--	--	16.2
Saturation (%)		--	--	97.4
Strain rate (%/hr)		2.14	2.02	2.13
Cell pressure (psf)		9550	10660	12710
Initial Back Pressure (psf)		8560	8660	8710
Initial Effective Confining Pressure (psf)		1000	2000	4000
Total Major Principal Stress At Failure (psf)		2170	4690	9220
Effective Major Principal Stress At Failure (psf)		1510	3370	6690
Pore Pressure At Failure (psf)		660	1330	2530
Effective Minor Principal Stress At Failure (psf)		340	670	1470

 <p>Geocon Consultants, Inc. 3160 Gold Valley Drive, Suite 800 Rancho Cordova, California 95742 Telephone: (916) 852-9118 Fax: (916) 852-9132</p>	Triaxial Shear Strength - CU Test, ASTM D4767 with Pore Pressure Measurements (staged)		
	Project: Pacheco State Park Storm Damage		
	Location: Merced County, CA		
	Number: S1350-05-05		
	Figure: 22	page 1 of 2	

CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION - ICU TEST ASTM D4767

Boring Number	B2
Sample Number	B2-16
Sample Description	Very dark gray lean CLAY



Geocon Consultants, Inc.
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Triaxial Shear Strength - CU Test, ASTM D4767 with pore pressure measurements

Project: Pacheco State Park Storm Damage
Location: Merced, CA
Number: S1350-05-05
Figure: 22



Photo No. 1 Pig Pond Dam looking west



Photo No. 2 Pig Pond Dam looking east showing dam breach erosion in the foreground

PHOTOS NO. 1 & 2



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Pig Pond Dam / Bear Hide Lake Dam

Pacheco State Park
Merced County, California

GEOCON Project No. S1350-05-05

May 2018



Photo No. 3 Pig Pond Dam looking north showing animal burrows in the dry side of the dam



Photo No. 4 Animal burrows in the dry side of the dam

PHOTOS NO. 3 & 4



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Photo No. 5 Bear Hide Lake Dam looking east



Photo No. 6 Bear Hide Lake looking north

PHOTOS NO. 5 & 6



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Photo No. 7 Bear Hide Lake Dam showing dam breach and spillway



Photo No. 8 Bear Hide Lake Dam showing dam breach erosion

PHOTOS NO. 7 & 8



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