PRELIMINARY GEOTECHNICAL INVESTIGATION

Zanker Landfill Stormwater Control Structures
Zanker Materials Processing Facility
San Jose, California

Prepared for

Mr. Darrell Thompson
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Report Date

November 19, 2018

Project No. 029RC1-320690

Prepared by

ES ENGINEERING SERVICES

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1.0 INTRODUCTION

ES Engineering Services, LLC, (ES) has prepared this report of our preliminary geotechnical investigation performed for the proposed Stormwater Control Structures planned for the Zanker Materials Processing Facility in San Jose, California (Site). The location of the site is shown on the attached **Figure 1—Site Location Map**. The report was completed based on our proposal dated December 19, 2017, and our discussions with you. The project was delayed because of various site access issues.

2.0 PROPOSED PROJECT

The proposed project consists of the construction of two sedimentation basins referred to as the Southwest Basin and the Northwest Basin (**Figure 2—Site Map**).

The Southwest Basin will be formed by constructing a V-shaped embankment with each leg approximately 400 feet long with the terminus tying into the existing landfill permitted road embankment. The embankment will be approximately 10 feet high with 5:1 (horizontal:vertical) side slopes.

The Northwest Basin will be U-shaped with approximately 200 foot long sides and a 400 foot long bottom. The terminus of each leg will also tie into the existing landfill perimeter road embankment. The embankment for the Northwest Basin will also be approximately 10 feet high at a 5:1 (horizontal:vertical) slope ratio.

3.0 SITE DESCRIPTION

Our Site description is based on our observations during numerous visits to the facility and our field work conducted on September 6, 2018, and the plans provided by you.

Both sedimentation basins are located in low lying areas adjacent to the landfill.

4.0 SCOPE OF SERVICES

The geotechnical investigation for this project involved drilling test borings, laboratory testing, geologic and seismic evaluations, geotechnical analyses and report preparation. This report briefly outlines the testing procedures, presents available project information, describes the site and subsurface conditions, and presents the following:

- Project Description
- Site Description
- Geologic Setting
- Geologic hazards
- Seismicity

- Subsurface Soil and Groundwater Conditions
- General Earthwork Considerations
    - Subgrade Preparation
    - Compaction
    - Import Soil Specifications
    - Surface and Subsurface Drainage
- Seismic and Static Slope Stability;
- Embankment Settlement
- Construction Considerations
- Site Plan
- Boring Location Plan
- Boring Logs
- Laboratory Test Results

This report is geotechnical in nature and not intended to identify other site constraints such as environmental hazards, wetlands determinations and/or the potential presence of buried utilities. Recommendations included in this report are specific to development within the limits of the property and not intended for off-site development. Proposed development outside the limits of our investigation or any conceptual changes to site development, such as the use of alternative foundations or grade changes, could require additional subsurface exploration, laboratory tests and engineering analysis. This report should also be reviewed and amended once final plans have been completed.

5.0 GEOLOGY

5.1 Regional Geologic Setting

The description of the geologic setting of the site is adapted from the 1998 Joint Technical document.

The Site is located in the southern end of San Francisco Bay where the tidal mudflats that ring the bay margin meet the north-west trending Santa Clara Valley. The valley is a relatively flat plain that slopes toward the bay and is bordered by two coastal mountain ranges; the Diablo Range on the east and the Santa Cruz Mountains on the west.

Alluvial sediments were deposited throughout the valley by streams draining the adjacent mountain ranges. Fine-grained sediments were also deposited in the bay and along the bay margin in a tidal marsh environment subjected to seasonal flooding and high water levels. The fine grained sediments are called Bay Mud and consist of unconsolidated, water-saturated plastic clay and silty clay soils. The Bay Mud unit is up to 120 feet thick beneath the bay but pinches out at the margins where it is 10 to 20 feet thick. Holcene alluvial deposits interfinger with and occur below the bay mud. These

alluvial soils consist of from clay and silt to sand and gravel and range from 10 to 50 feet thick. Beneath the Holocene Alluvium is Pleistocene Alluvium and bedrock. The bedrock occurs at an approximate elevation of 600 feet Mean Sea Level.

The landfill is located at the contact between the Bay Mud and fine-grained Holocene Alluvium.

5.2 Faulting and Seismicity

Description of site seismicity has been adapted from the "Geotechnical Analysis, Final Closure, and Postclosure Maintenance Plan", prepared by CH2M, dated June 10, 2010.

The landfill site is located within a seismically-active area in California. Several active faults have been mapped within the general vicinity of the site, however the landfill is not located within an active earthquake fault zone as defined by the State of California.

Section 21750 of CCDR Title 27 specifies that the expected PGA associated with the maximum probably earthquake based on an average return period of 475 years be determined for Class III landfills. Based on the CH2M report, this would be a moment magnitude 6.7 earthquake occurring on the Hayward Fault. This maximum probable earthquake would result in a Peak Ground Acceleration of 0.57.

5.3 Seismically-induced Liquefaction:

Liquefaction, a loss of soil shear strength, is a phenomenon typically associated with loose, saturated low cohesive deposits subjected to earthquake shaking which can result in unacceptable settlements of foundations and other structural elements supported by these soils. Seismically-induced liquefaction is typically a concern within the upper 50 feet of soil materials.

Plastic (clayey) soils are also considered susceptible to seismically induced deformation during liquefaction. Deformation of saturate cohesive soils such as clays and plastic silts has been observed during earthquakes. This is particularly the case for sensitive clays deposited in a marine environment (Idriss and Boulanger 2008).

The referenced CH2MHill report addresses the liquefaction potential of the landfill site and also references previous studies at the site. The report concludes that there are sand lenses beneath the by mud that may be prone to settlement and lateral spreading. Although, it is anticipated that the surface deformation will likely be limited due to the relatively thin and discontinuous nature of the sand lenses.

Strain softening of the near surface clay soils is likely to occur and would probably result in some additional settlement. The resulting settlement is difficult to predict, but could be on the order of several inches over the entire site.

5.4 Ground Rupture

The Site is not located in an Alquist-Priolo Special studies zone for active faulting. The risk of ground rupture is considered nil.

5.5 Tsunami or Seiche

5.5.1 Landslide Induced Seiche / Tsunami:

There are no nearby slope areas that would fail and cause landslide-induced waves.

5.5.2 Earthquake Induced Seiche/Tsunami:

A review of the California Geological survey Tsunami Inundation Zone Maps for Santa Clara County indicates the Site is not located in an area susceptible to inundation by tsunami.

6.0 SUBSURFACE CONDITIONS

6.1 Field Exploration

Soil borings were completed on September 6, 2018, and consisted of drilling four borings to a depth of 20 feet (two in each basin area). Drilling was performed with a hollow-stem auger equipped. Each boring was filled with grout at the termination of drilling activities. The location of our test borings is shown on **Figure 3—Soil Boring Location Map—Los Esteros Road Basin** and **Figure 4 Soil Boring Location Map—Northeast Basin** in of this report.

Relatively undisturbed (Modified California split-spoon sampler in general accordance with ASTM D3550) and SPT samples (ASTM D1586) were obtained at approximate five-foot vertical intervals. The ring samples were collected and stored in sealable plastic sample containers to minimize disturbance. The standard penetration test (SPT) resistances (N-values) and California Modified sampler blow counts are included on the Boring Logs at standard testing intervals, to the boring termination depths. Bulk samples were also obtained of selected soils. All samples were delivered to Moore Twining Geotechnical Laboratories for testing.

The recovered soil was described in accordance with the Unified Soil Classification System under the supervision of our Geologist. Recorded lithologic descriptions are presented on the boring logs in **Appendix A—Soil Boring Logs.**

The stratification presented on the Boring Logs is based on a visual examination of the recovered soil samples and the interpretation of field logs by a geotechnical professional. The above subsurface information is of a generalized nature to highlight the major subsurface stratification features and material characteristics. The Boring Logs, included in **Appendix A**, should be reviewed for specific information at the

boring locations. These records include soil descriptions, stratification, penetration resistance, locations of the samples and laboratory test data. Variations may occur and should be expected between locations. The stratification that represents the approximate boundary between subsurface materials and the actual transition may be gradual. Lines of demarcation represent the approximate boundary between subsurface materials, and the transition may be gradual. Although the test borings are drilled and sampled by experienced professionals, it is sometimes difficult to record changes in stratification within narrow limits, especially at great depths. In the absence of foreign substances, it is also sometimes difficult to distinguish between fill and native granular soils.

6.2 Subsurface Soils

As indicated in the boring logs, the near surface soils beneath the site primarily consist of clayey soils. These soils exhibited low strength characteristic and were found to be compressible, especially in the upper 10 feet of the on-site soils.

6.3 Groundwater

Depth to groundwater is expected to vary considerably depending on tidal and rainfall conditions. At the time of our field work on September 6, 2018, the static groundwater elevation was recorded at approximately 6 to 8 feet below the existing ground surface.

6.4 Laboratory Testing

The soil samples obtained during the field exploration were transported to Blackburn Geotechnical in West Sacramento, California. Selected soil samples were laboratory tested to determine the material properties to be used in the geotechnical evaluation. A copy of the final laboratory report has been included as **Appendix B—Laboratory Testing Results**. Laboratory testing on selected samples included:

- Moisture Content
- Unit Weight
- Direct Shear
- Consolidation
- Maximum Dry Density / Optimum Moisture Content

7.0 STATIC AND SEISMIC SLOPE STABILITY

7.1 General

The stability of the existing fill slopes is dependent upon the strength characteristics of the soils used to construct the embankments as well as the underlying materials. It is our understanding that import material will be used for slope construction. Analysis was performed to evaluate overall stability from a static and pseudo-static standpoint and graphically presented in **Appendix C—Slope Stability Analysis**.

7.2 Static

Our static analysis of the slope was based on the assumed configuration of the slope. Based on our analysis, the existing slope was found to slope was found to have a Factor of Safety of 3.047 against gross failure.

7.3 Seismic

The seismic stability of the slope was analyzed using a horizontal seismic coefficient 0f 0.19 based on the PGA 0f 0.57g. The results of our analysis indicate that the slope exhibits a Factor of Safety of 1.430 against gross failure.

8.0 SETTLEMENT

Based on the maximum anticipated surcharge of 10 feet, the estimated settlement is 3 to 4 inches. Due to the low strength of the near surface soils and high groundwater elevations, regular maintenance of the embankment may be necessary over the life of the structures.

9.0 CONCLUSIONS

Based on the results of the fieldwork, laboratory evaluation and engineering analyses, the site can be adapted for the proposed structure and associated improvements provided the recommendations in this section are followed.

10.0 RECOMMENDATIONS

10.1 Earthwork

10.1.1.1 <u>General</u>

All earthwork should be performed in accordance with the California Building Code in effect at the time of project development. Excavation, trenching, shoring and other earthwork activities must be performed in accordance with all CAL-OSHA requirements.

It is recommended that contractors perform their own reconnaissance of the site. If the contractors have any questions regarding site conditions, site preparation, or recommendations in this report, they should contact ES for clarification.

10.1.1.2 Site Clearing

In areas to receive fill, existing vegetation, and disturbed native soils should be removed in their entirety and removed from the site.

10.1.1.3 Over-excavation

Organic laden soils within the upper 2 feet of the site should be removed prior to fill placement.

10.1.1.4 Excavation

It is anticipated that excavation of the on-site materials can be accomplished with conventional earthmoving equipment. Contractors should satisfy themselves as to the stability of excavation at the site.

Moreover, the on-site material may be prone to instability if they become saturated or if excavation extends close to the groundwater. Lightweight excavation equipment may be required to reduce subgrade pumping.

10.1.1.5 Water Management

Water management will be an important component of this project. The contractor must maintain site surface and subsurface drainage such that water is not allowed to pond and saturate on-site soils. The on-site clayey and silty soils are prone to instability and pumping at above optimum moisture conditions. The contractor is responsible for maintaining water conditions at the site.

10.1.1.6 Soil Subgrade Preparation

After over-excavation, the exposed soils are anticipated to be relatively soft. Accordingly, they should be stabilized by rolling 6 to 8 inch slab rock or other materials into the subgrade until stabilized. Several feet of material may be required to accomplish this task.

10.1.1.7 Fill Soils

On-site materials are not considered suitable for use as compacted fill. Import soils used as properly compacted fill should be free of organic matter and conform to the following requirements:

TABLE 1
Import Fill Soil Requirements

Sieve Size	% Passing (by dry weight)
6-inch	100
3/4-inch	70 – 100
No. 4	50 – 100
No. 200	15 – 40

Liquid Limit = 40 maximum
Plasticity Index = 15 maximum

The Earthwork Contractor shall ensure that all proposed fill materials are approved by the Geotechnical Engineer prior to use. Representative samples shall be made available for testing 10 working days prior to hauling to allow for material quality tests.

10.1.1.8 Fill Placement

All properly compacted fill should be uniformly moisture conditioned to near optimum and compacted to at least 90 percent relative compaction, based on the maximum dry density determined by ASTM D1557.

10.2 Construction Considerations

Note that the upper soils are sensitive to disturbances caused by construction traffic and to changes in moisture content. During wet weather periods, increases in the moisture content of the soil can cause significant reduction in the soil strength and support capabilities. Furthermore, perched groundwater conditions can develop during periods of heavy rainfall as a result of less permeable layers impeding infiltration. In these instances, overlying subgrade soils may become unstable and require remedial measures. It will, therefore, be advantageous to perform earthwork and foundation construction activities during dry weather.

10.3 Additional Geotechnical Engineering Services

This report is geotechnical in nature and not intended to identify other site constraints such as environmental hazards, wetlands determinations and/or the potential presence

of buried utilities. We can assist in evaluating these considerations should further information be requested. Moreover, this office should be retained to provide grading observation and testing as well as associated special inspection during all phases of construction.

All plans and specifications for projects should be reviewed for conformance with this geotechnical report and approved by the Geotechnical Engineer prior to submission to the building department for review.

The recommendations presented in this report are based on the assumption that sufficient field inspection and construction review will be provided during all phases of construction. A pre-job conference should be scheduled to include, but not be limited to, the Owner, Architect, Civil Engineer, General Contractor, Earthwork and Materials Sub-Contractors, Building Official and Geotechnical Engineer. The recommendations presented in this report should be reviewed by all parties to discuss applicable specifications and testing requirements. At this time, any applicable material quality and mix design reports should be submitted for approval by the Geotechnical Engineer.

ES has prepared this report based on certain assumptions concerning subsurface conditions at the Property. ES should also provide on-site observations and testing during site preparations and grading, excavation, fill placement, foundation installation and paving. These observations will allow us to document that the soil conditions are as anticipated, and that the Contractor's work is in conformance with the intent of our recommendations and the approved plans and specifications. Our conclusions and recommendations may be invalidated, partially or in whole, by changes outside our control and by subsequent acts occurring on the site after field reconnaissance. This report may be subject to review and revision at any time. Opinions about the condition of the Property do not constitute a warranty of any kind.

10.4 Plan Review

ES requests an opportunity to review and comment on all final plans, revisions and reviews. A review of grading and foundation plans by ES is recommended as a means to check that the evaluations made in preparation of this report are correct and that earthwork and foundation recommendations have been properly interpreted and implemented.

10.5 Observations and Testing During Construction

It is recommended that ES be retained to provide construction quality assurance (CQA) that which may also include observation and testing services during site preparation, site grading, waterproofing, utility trench construction, foundation excavation, and paving. This is to observe compliance with the design concepts, specifications and

recommendations, and to allow for possible changes in the event that subsurface conditions differ from those anticipated prior to the start of construction. The frequency of compaction tests should be in accordance with local codes and requirements.

11.0 REPORT LIMITATIONS

The proposed professional services have been performed, findings obtained, and recommendations prepared in accordance with generally accepted geotechnical engineering principles and practices at the time of this report. ES is not responsible for the conclusions, opinions, or recommendations made by others based on this data. No other warranties are implied or expressed.

The scope of exploration was intended to evaluate soil conditions within the influence of the proposed embankments. The analyses and recommendations submitted in this report are based upon the data obtained from the soil borings performed at the locations indicated. If any subsoil variations become evident during the course of this project, a re-evaluation of the recommendations contained in this report will be necessary after we have had an opportunity to observe the characteristics of the conditions encountered. The applicability of the report should also be reviewed in the event significant changes occur in the design, nature, or location of the proposed structure.

Services that investigate or detect the presence of moisture, mold, or other biological contaminants in or around any structure, or any service that was designed or intended to prevent or lower the risk of the occurrence of the amplification of the same, were not provided. Mold is ubiquitous to the environment with mold amplification occurring when building materials are impacted by moisture. Site conditions are outside of ES's control, and mold amplification will likely occur, or continue to occur, in the presence of moisture. As such, ES cannot be held responsible for the occurrence or recurrence of mold amplification.

12.0 CLOSURE

Our professional services were performed using the degree of care and skill ordinarily exercised under similar circumstances, by geotechnical engineers practicing in this or similar localities. No warranties, either expressed or implied, are intended or made. We prepared this report as an aid in design of the proposed project and it is not intended as a bidding document. Any contractor reviewing this report must draw his or her own conclusions regarding surface and subsurface site conditions and specific construction techniques to be used on this project.

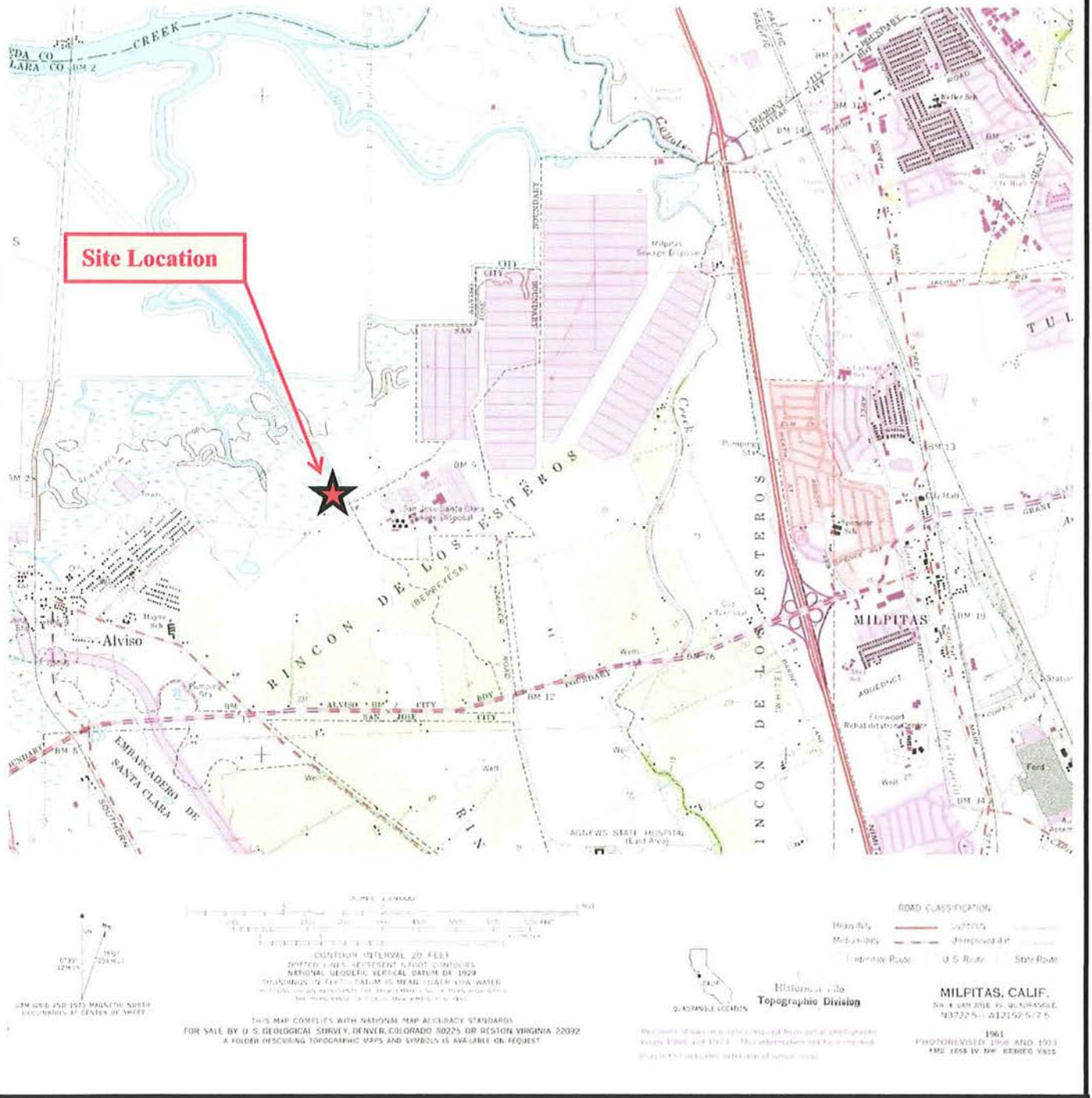
The opportunity to be of service to you on this project is sincerely appreciated. If you have any questions, please call Dean Stanphill at 775-560-3911.

Respectfully submitted,

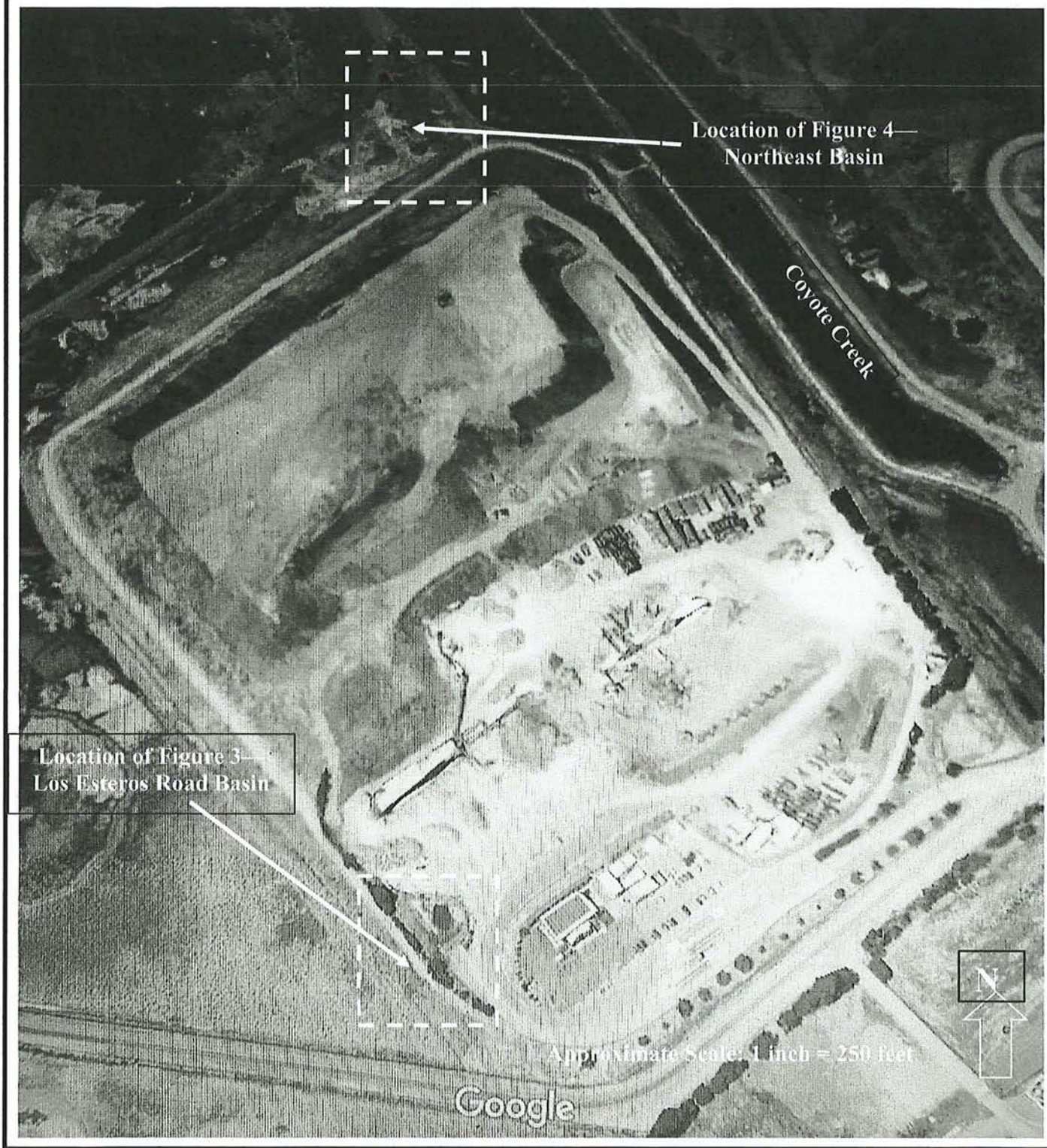
ES Engineering Services, LLC

Dean Stanphill, PE, GE
Senior Manager

FIGURES

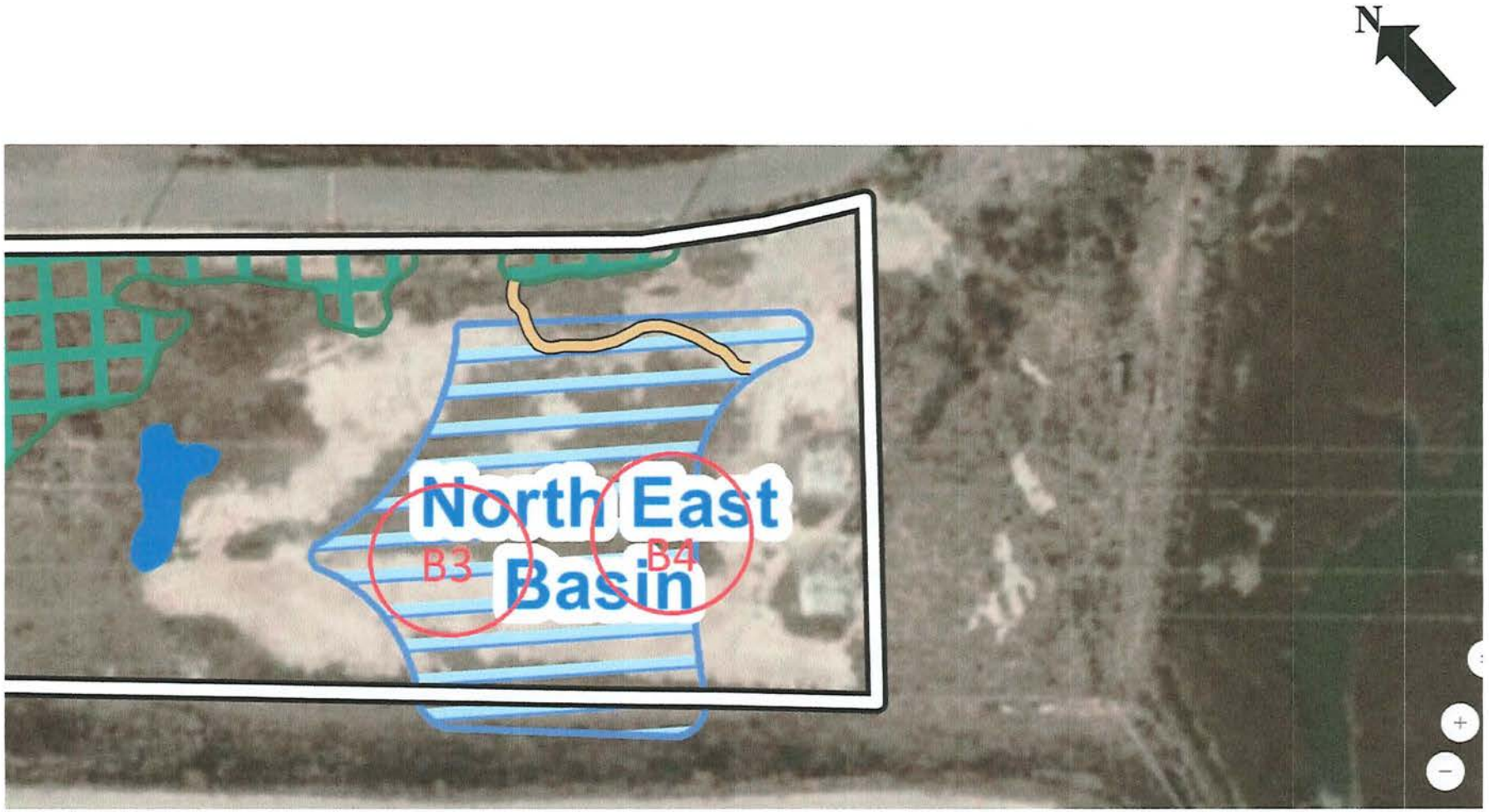


ES ENGINEERING SERVICES, LLC. 520 EDISON WAY RENO, NEVADA 89502 (775) 560-3911	CLIENT: **APTIM, Inc.** **Sacramento, CA 95834**	PROJECT NUMBER: 029RC1-320690	FIGURE 1: VICINITY MAP
	PROJECT LOCATION: **Zanker Materials Processing Facility**	DATE: November 2018	



ES ENGINEERING SERVICES, LLC. 520 EDISON WAY RENO, NEVADA 89502 (775) 560-3911	CLIENT: **APTIM, Inc.** **Sacramento, CA 95834**	PROJECT NUMBER: 029RC1-320690	FIGURE 2: SITE MAP
	PROJECT LOCATION: **Zanker Materials Processing Facility**	DATE: November 2018	

ES ENGINEERING ES ENGINEERING SERVICES, LLC. 520 EDISON WAY RENO, NEVADA 89502 (775) 560-3911	CLIENT: **APTIM, Inc.** **Sacramento, CA 95834**	PROJECT NUMBER: 029RC1-320690	**FIGURE 3: SOIL BORING LOCATION MAP—LOS ESTEROS ROAD BASIN**
	PROJECT LOCATION: **Zanker Materials Processing Facility** **San Jose, California**	DATE: **November 2018**	



ES ENGINEERING ES ENGINEERING SERVICES, LLC. 520 EDISON WAY RENO, NEVADA 89502 (775) 560-3911	CLIENT: **APTIM, Inc.** **Sacramento, CA 95834**	PROJECT NUMBER: 029RC1-320690	**FIGURE 4: SOIL BORING LOCATION MAP—NORTH EAST BASIN**
	PROJECT LOCATION: **Zanker Materials Processing Facility** **San Jose, California**	DATE: **November 2018**	

APPENDIX A

SOIL BORING LOGS

WELL CONSTRUCTION		ANALYSES Dry Density (pcf)	ANALYSES Moist (%)	Blow Count	Depth (feet)	SAMPLE Interval	SAMPLE Number	U.S.C.S. Designation	SOIL DESCRIPTION
					0			CL	CLAY: dark brown, stiff, moist, organic
		109.8	17	13			1		
	Direct Shear	112.3	15	24	5		2		@4 feet – brown, very moist
	Consolidation	101.1	21	9	10		3		@ 9 feet - same
	Proctor	111.3	15	31	15		4		@14 feet – grey, very stiff
	Consolidation	111.0	16	26	20		5		Total Depth = 20 Feet Groundwater = 8 Feet
					25				
					30				
					35				
					40				
					45				
					50				

RIM ELEVATION (feet):
GROUND SURFACE ELEVATION:
TOTAL DEPTH (feet): 20
DATE DRILLED: September 6, 2018

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520 Edison Way, Reno, Nevada 89502
California Contractor's License #709413 714-632-9969

PROJECT NUMBER 029RC1--320690

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ENVIRON GINT - BLANK.GPJ GCE.GDT 8/6/12

ZANKER PONDS ES ENGINEERING SERVICES	ANALYSES Dry Density pcf	ANALYSES Moist %	Blow Count	Depth (feet)	SAMPLE Interval	SAMPLE Number	U.S.C.S. Designation	SOIL DESCRIPTION
				0			CL	SILTY CLAY: brown, stiff, slightly moist, organic
SPT			11			B-2-1		@3 feet – same
				5				
SPT			4			B-2-2		@7 feet – very moist
				10				
SPT			5			B-2-3		@12 feet – tan, stiff, very moist
				15				
SPT			16			B-2-4		
				20				Total Depth = 20 Feet Groundwater = 8 Feet
				25				
				30				
				35				
				40				
				45				
				50				

RIM ELEVATION (feet):
GROUND SURFACE ELEVATION:
TOTAL DEPTH (feet): 20
DATE DRILLED: September 6, 2018

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ENVIRON GINT - BLANK.GPJ GCE.GDT 8/6/12

ZANKER PONDS ES ENGINEERING SERVICES	ANALYSES Dry Density pcf	ANALYSES Moist %	Blow Count	Depth (feet)	SAMPLE Interval	SAMPLE Number	U.S.C.S. Designation	SOIL DESCRIPTION
				0			CL	SILTY CLAY: dark brown, stiff, moist, organic
	90.3	31	13			B3-1		@2 feet – slightly moist, organic
Consolidation	104.5	16	20	5		B3-2		@4 feet – brown, very moist
Consolidation	93.4	26	6	10		B3-3		@ 9 feet – CLAY, dark brown, very moist, stiff
Consolidation Proctor	105.5	20	21	15		B3-4		@14 feet – tan, very stiff
	113.3	17	8	20		B3-5		@19 feet - same
								Total Depth = 20 Feet Groundwater = 6 Feet
				25				
				30				
				35				
				40				
				45				
				50				

RIM ELEVATION (feet):
GROUND SURFACE ELEVATION:
TOTAL DEPTH (feet): 20
DATE DRILLED: September 6, 2018

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520 Edison Way, Reno, Nevada 89502
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ENVIRON GINT - BLANK.GPJ GCE.GDT 8/6/12

ZANKER PONDS ES ENGINEERING SERVICES		ANALYSES Dry Density pcf	ANALYSES Moist %	Blow Count	Depth (feet)	SAMPLE Interval	SAMPLE Number	U.S.C.S. Designation	SOIL DESCRIPTION
					0			CL	SILTY CLAY: dark brown, stiff, slightly moist, organic
	SPT			4			B-4-1		
					5				@3 feet – same
	SPT			4			B-4-2		
					10				@7 feet – very moist
	SPT			3			B-4-3		@12 feet – tan, stiff, very moist to wet
					15				
	SPT			12			B-4-4		@17 feet – SILTY SANDY CLAY, fine sand, wet, stiff
					20				
									Total Depth = 20 Feet Groundwater = 6 Feet
					25				
					30				
					35				
					40				
					45				
					50				

RIM ELEVATION (feet):
GROUND SURFACE ELEVATION:
TOTAL DEPTH (feet): 20
DATE DRILLED: September 6, 2018

ES ENGINEERING SERVICES, LLC
520 Edison Way, Reno, Nevada 89502
California Contractor's License #709413 714-632-9969

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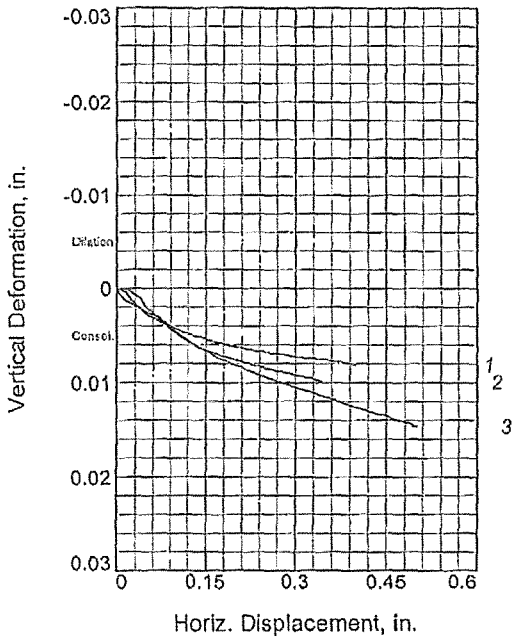
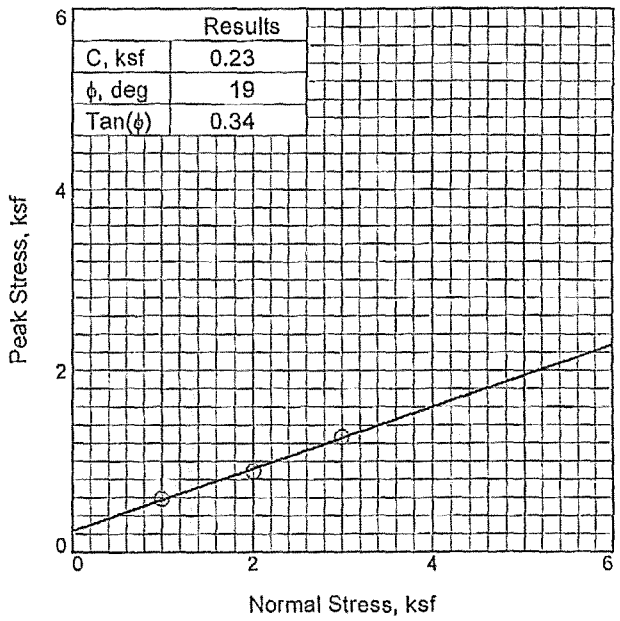
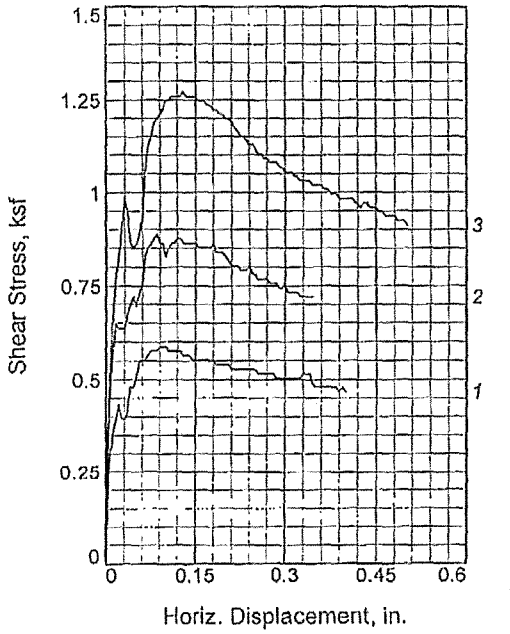
APPENDIX B

LABORATORY TEST RESULTS







Sample No.		1	2	3
Initial	Water Content, %	14.6	14.7	14.3
	Dry Density, pcf	109.2	112.2	112.2
	Saturation, %	75.2	81.9	79.8
	Void Ratio	0.5151	0.4747	0.4747
	Diameter, in.	2.42	2.42	2.42
	Height, in.	1.00	1.00	1.00
At Test	Water Content, %	18.0	16.1	15.2
	Dry Density, pcf	111.3	115.0	116.9
	Saturation, %	97.8	97.5	97.0
	Void Ratio	0.4869	0.4387	0.4150
	Diameter, in.	2.42	2.42	2.42
	Height, in.	0.98	0.98	0.96
Normal Stress, ksf		1.00	2.00	3.00
Peak Stress, ksf		0.59	0.89	1.27
Displacement, in.		0.09	0.09	0.13
Residual Stress, ksf				
Displacement, in.				
Strain at peak, %		3.7	3.5	5.4

Sample Type:
Description:

Specific Gravity= 2.65
Remarks:

Figure _____

Client: ES Engineering Services LLC

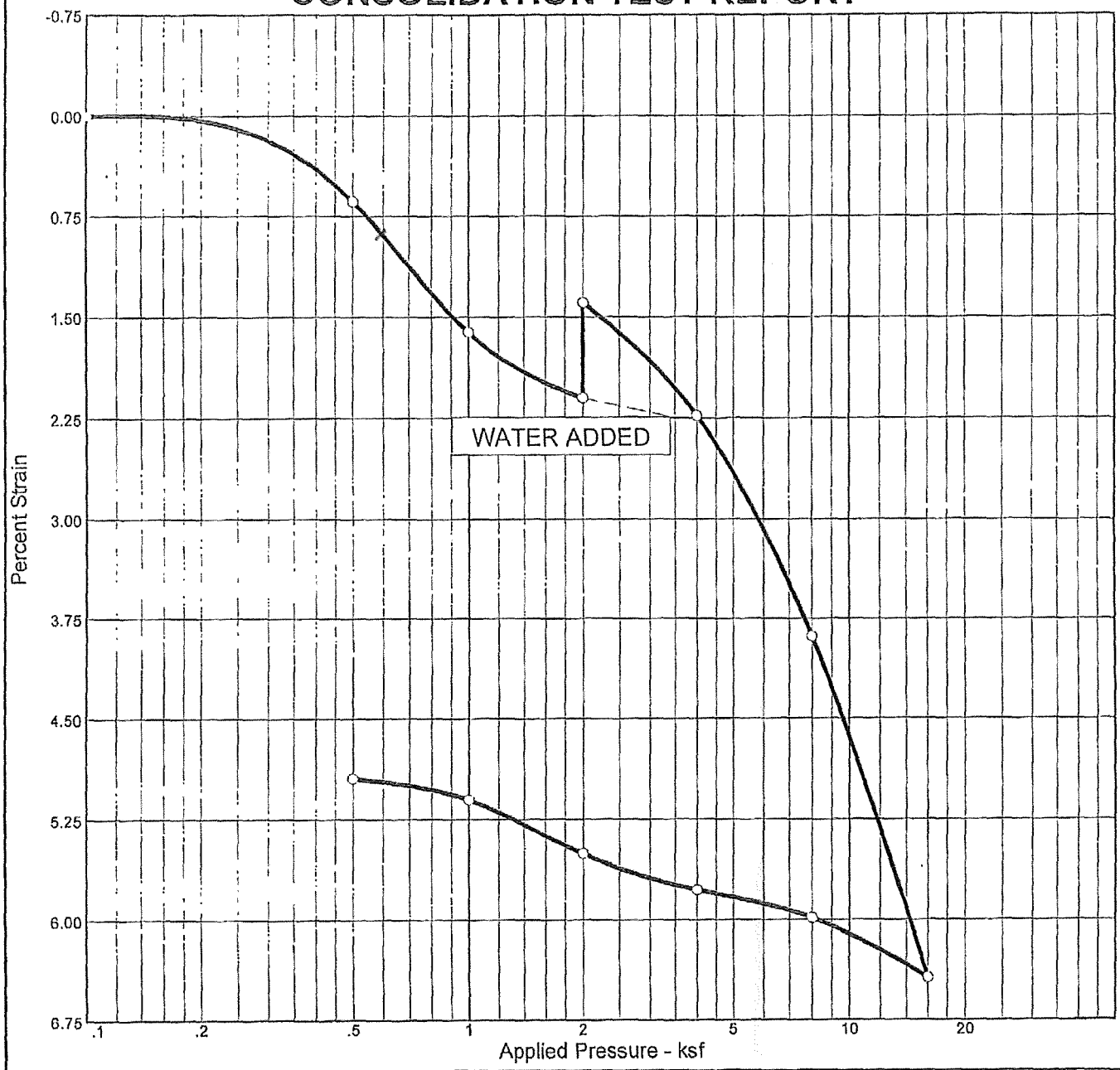
Project: Zanker Landfill

Sample Number: B-1 **Depth:** 4'

Proj. No.: TLP #: 18-1060 **Date Sampled:** 9/6/18

DIRECT SHEAR TEST REPORT
Moore Twining Associates, Inc.
Fresno, CA

CONSOLIDATION TEST REPORT



Natural Sat.	Natural Moist.	Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (ksf)	P_c (ksf)	C_c	C_s	Swell Press. (ksf)	Swell %	e_o
96.6 %	19.8 %	107.2			2.65		5.86	0.13	0.02	3.69	0.7	0.543

MATERIAL DESCRIPTION	USCS	AASHTO

Project No. TLP #: 18- Client: ES Engineering Services LLC

Project: Zanker Landfill

Source: Sample No.: B-1 Elev./Depth: 19'

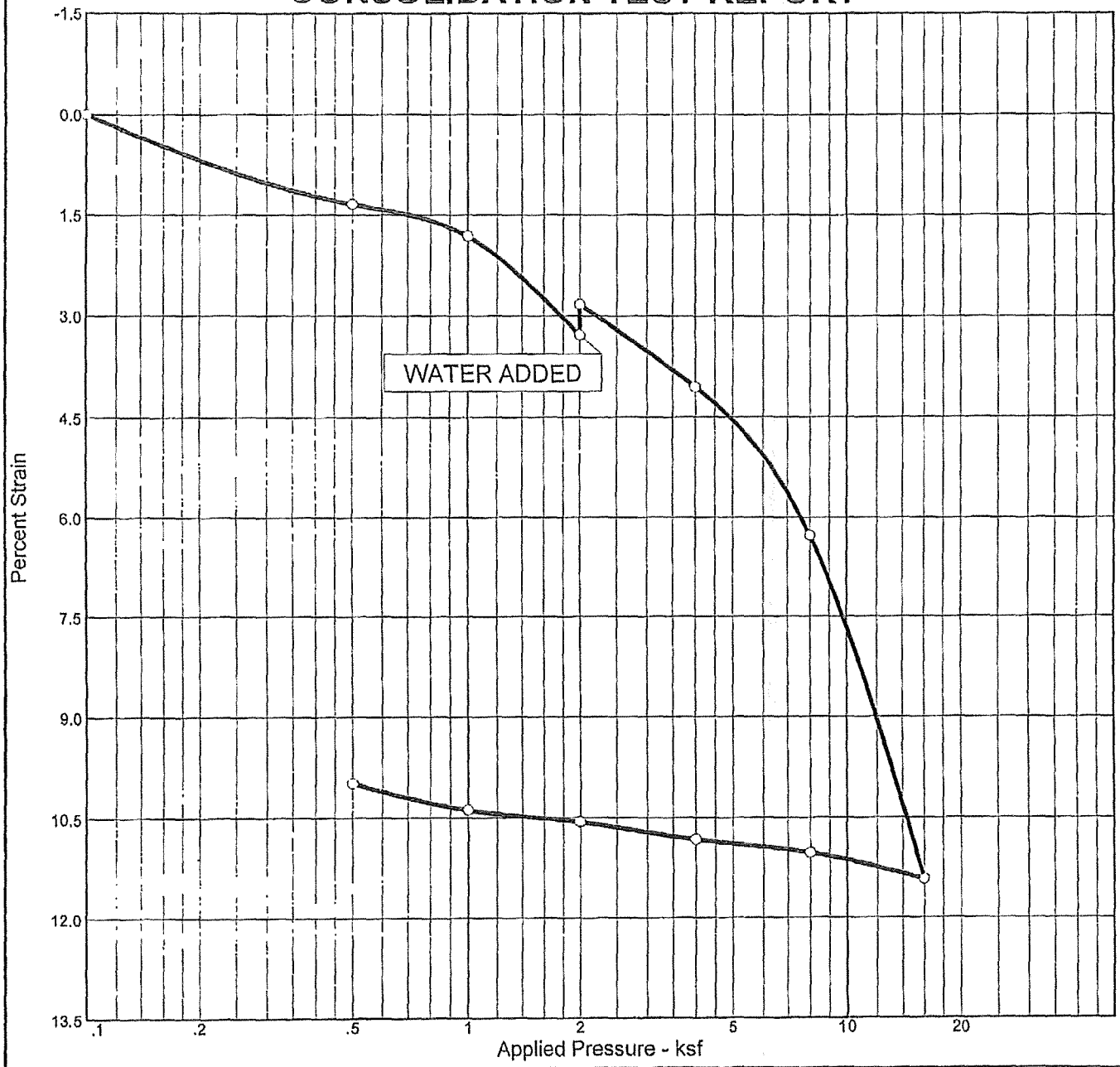
Moore Twining Associates, Inc.

Fresno, CA

Remarks:

Figure

CONSOLIDATION TEST REPORT



Natural Sat.	Natural Moist.	Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (ksf)	P_c (ksf)	C_c	C_s	Swell Press. (ksf)	Swell %	e_o
97.2 %	24.8 %	98.7			2.65		5.45	0.30	0.02	2.62	0.5	0.677

MATERIAL DESCRIPTION	USCS	AASHTO

Project No. TLP #: 18- Client: ES Engineering Services LLC

Project: Zanker Landfill

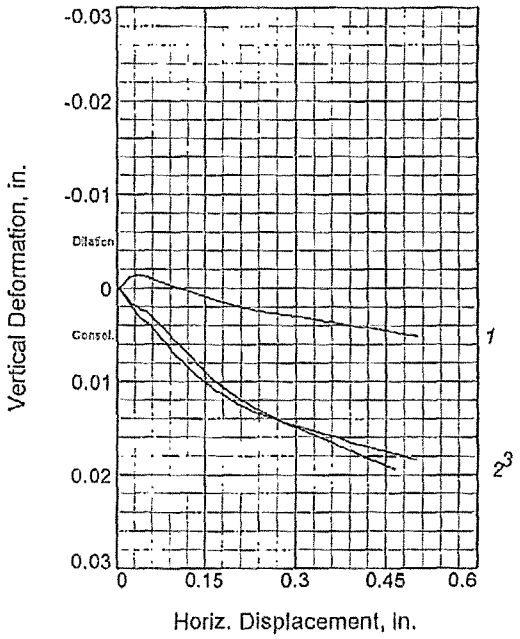
Source: Sample No.: B-1 Elev./Depth: 9'

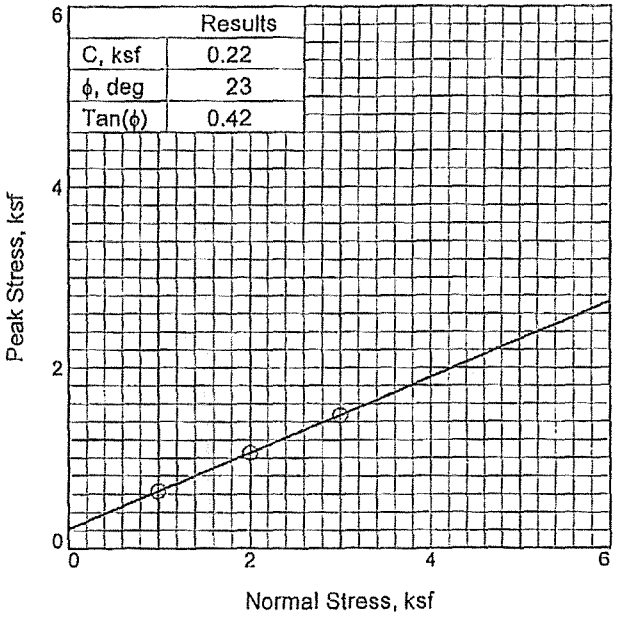
Moore Twining Associates, Inc.

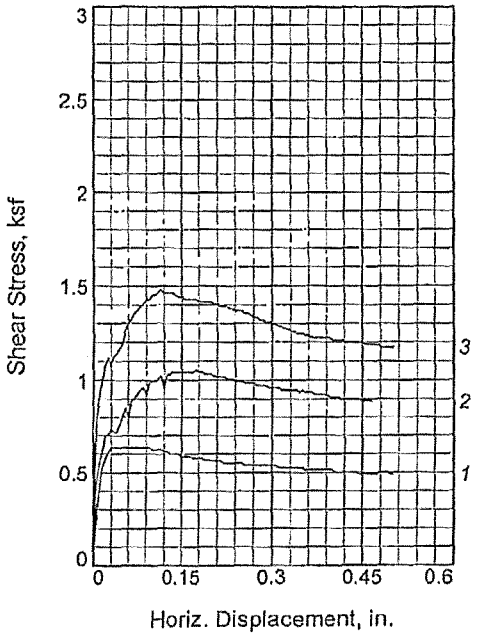
Fresno, CA

Remarks:

Figure







Sample No.		1	2	3
Initial	Water Content, %	32.1	30.1	29.9
	Dry Density, pcf	85.8	90.7	88.3
	Saturation, %	91.5	97.0	90.7
	Void Ratio	0.9291	0.8231	0.8746
	Diameter, in.	2.42	2.42	2.42
	Height, in.	1.00	1.00	1.00
At Test	Water Content, %	32.0	29.1	29.3
	Dry Density, pcf	87.5	93.1	91.4
	Saturation, %	95.1	99.3	95.8
	Void Ratio	0.8913	0.7766	0.8097
	Diameter, in.	2.42	2.42	2.42
	Height, in.	0.98	0.97	0.97
Normal Stress, ksf		1.00	2.00	3.00
Peak Stress, ksf		0.64	1.06	1.48
Displacement, in.		0.03	0.17	0.12
Residual Stress, ksf				
Displacement, in.				
Strain at peak, %		1.2	7.2	4.8

Sample Type:
Description:

Specific Gravity= 2.65
Remarks:

Figure _____

Client: ES Engineering Services LLC

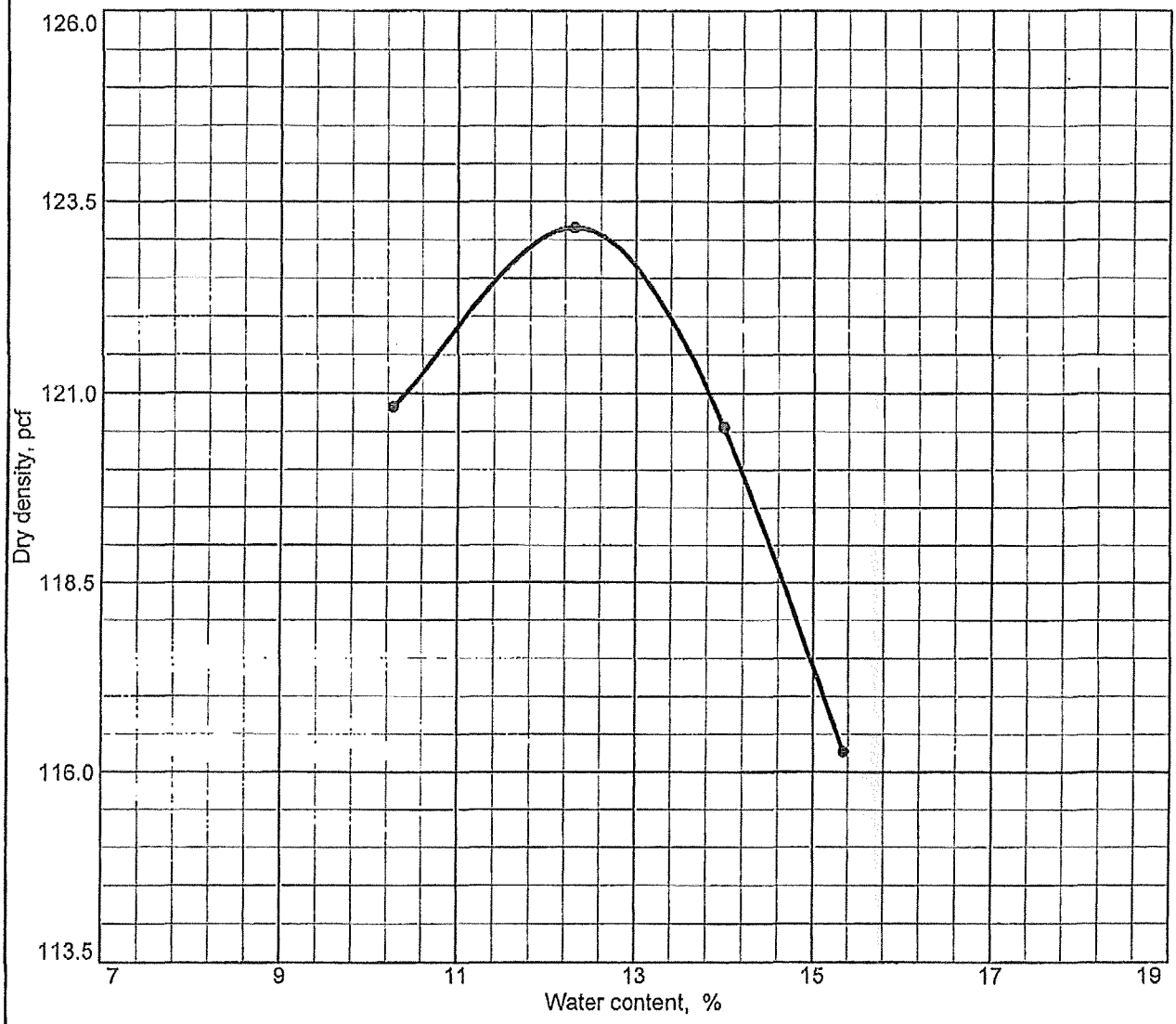
Project: Zanker Landfill

Sample Number: B-3 **Depth:** 2'

Proj. No.: TLP #: 18-1060 **Date Sampled:** 9/6/18

DIRECT SHEAR TEST REPORT
Moore Twining Associates, Inc.
Fresno, CA

COMPACTION TEST REPORT



Test specification: ASTM D 1557-12 Method A Modified

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > No.4	% < No.200
	USCS	AASHTO						
12-17'							0.0	

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 123.2 pcf Optimum moisture = 12.3 %	

Project No. TLP #: 18- **Client:** ES Engineering Services LLC

Project: Zanker Landfill

Remarks:

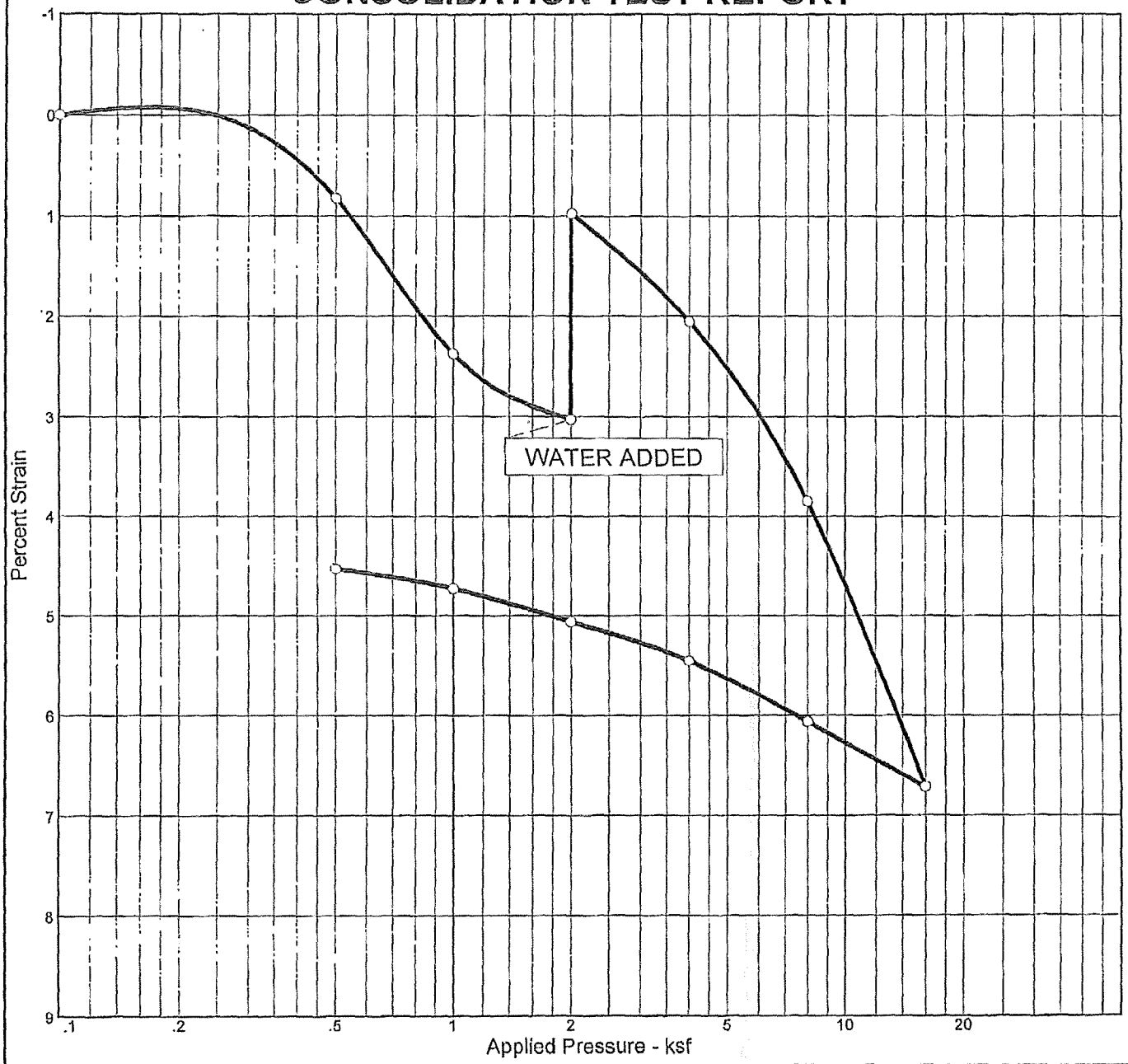
Source: Sample No.: B-1 Elev./Depth: 12-17'

Moore Twining Associates, Inc.

Fresno, CA

Figure

CONSOLIDATION TEST REPORT



Natural Sat.	Natural Moist.	Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (ksf)	P_c (ksf)	C_c	C_s	Swell Press. (ksf)	Swell %	e_o
99.1 %	21.9 %	104.4			2.65		18.01	0.15	0.02	12.25	2.0	0.584

MATERIAL DESCRIPTION	USCS	AASHTO

Project No. TLP #: 18- **Client:** ES Engineering Services LLC

Project: Zanker Landfill

Source: **Sample No.:** B-3 **Elev./Depth:** 4'

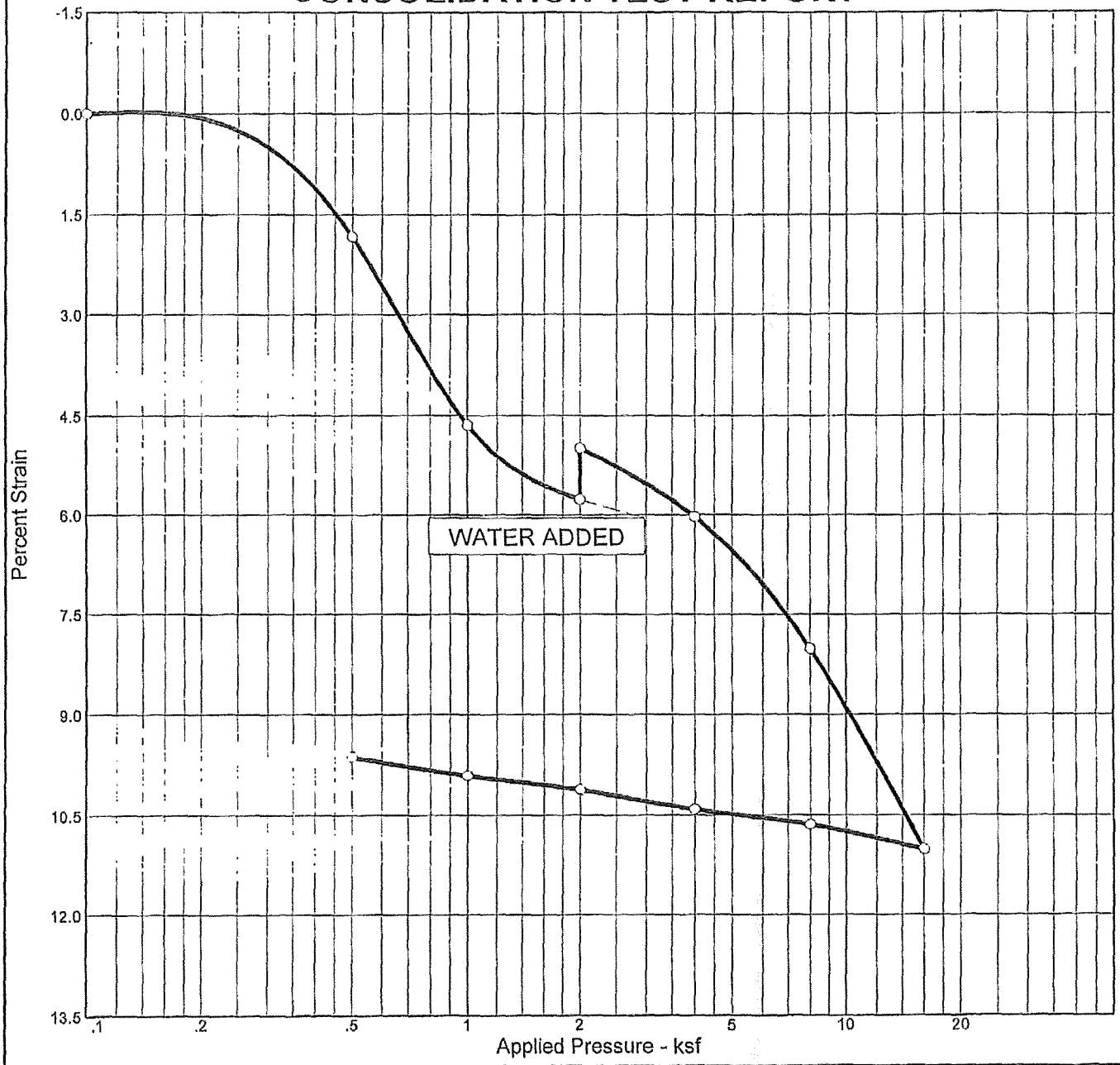
Moore Twining Associates, Inc.

Fresno, CA

Remarks:

Figure

CONSOLIDATION TEST REPORT



Natural Sat.	Natural Moist.	Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (ksf)	P_c (ksf)	C_c	C_s	Swell Press. (ksf)	Swell %	e_o
102.3 %	27.6 %	96.5			2.65		14.42	0.17	0.02	6.97	0.8	0.715

MATERIAL DESCRIPTION	USCS	AASHTO

Project No. TLP #: 18- Client: ES Engineering Services LLC

Project: Zanker Landfill

Source: Sample No.: B-3 Elev./Depth: 14'

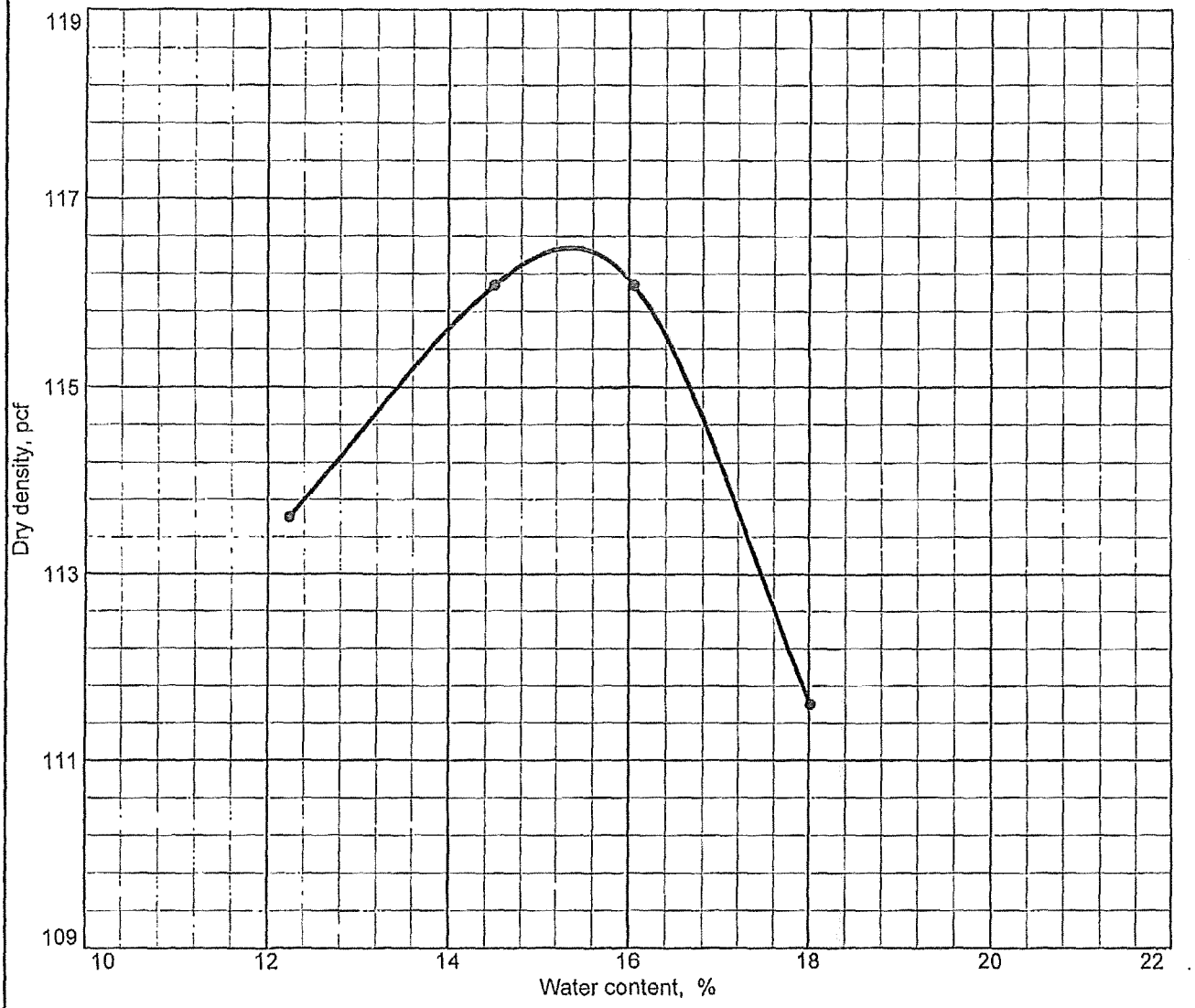
Moore Twining Associates, Inc.

Fresno, CA

Remarks:

Figure

COMPACTION TEST REPORT



Test specification: ASTM D 1557-12 Method A Modified

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > No.4	% < No.200
	USCS	AASHTO						
12-17'								

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 116.5 pcf Optimum moisture = 15.4 %	

Project No. TLP #: 18- Client: ES Engineering Services LLC
Project: Zanker Landfill

Source: Sample No.: B-4 Elev./Depth: 12-17'

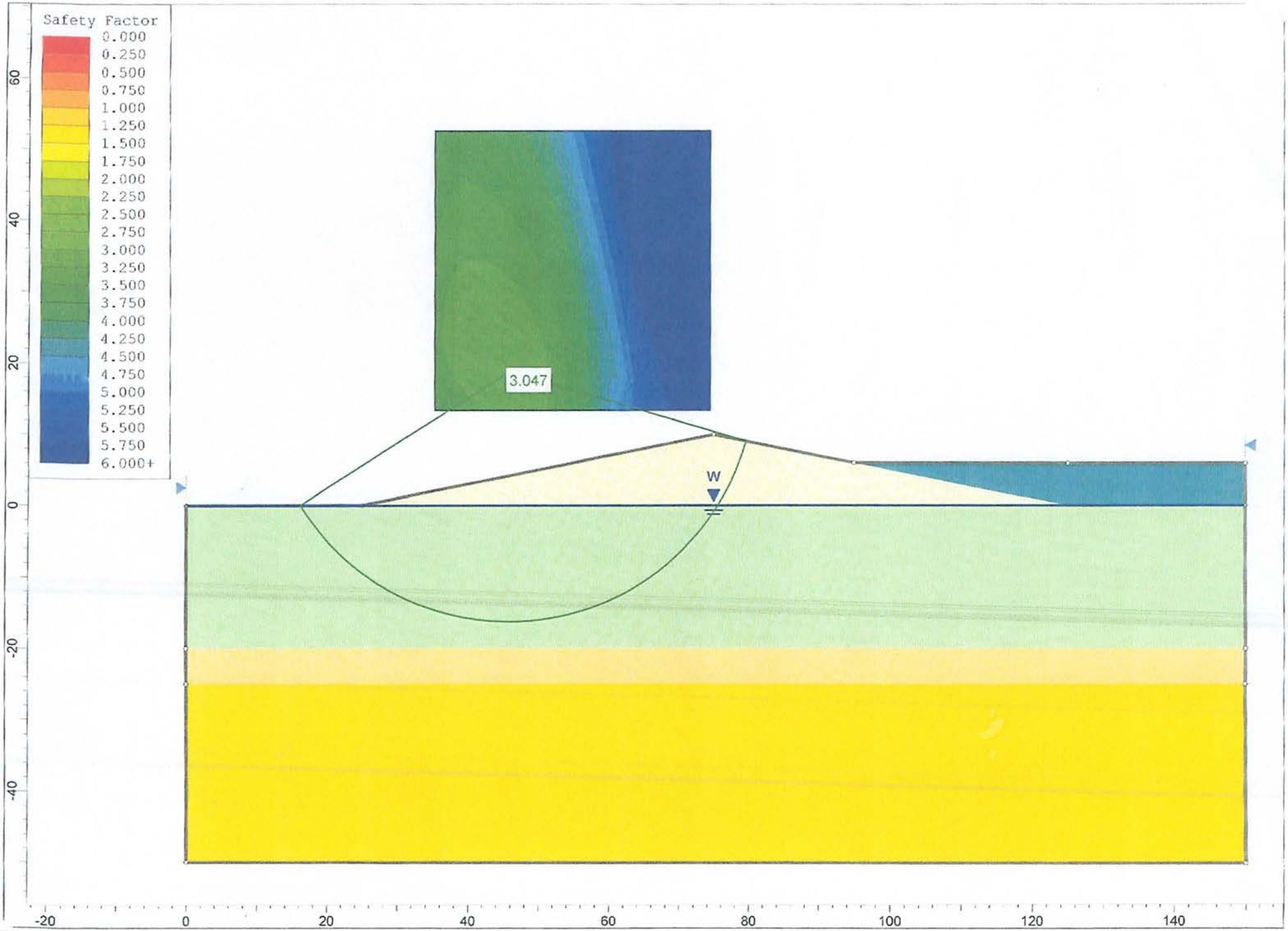
Remarks:

Moore Twining Associates, Inc.
Fresno, CA

Figure

Appendix C

SLOPE STABILITY ANALYSIS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0.000
0.250
0.500
0.750
1.000
1.250
1.500
1.750
2.000
2.250
2.500
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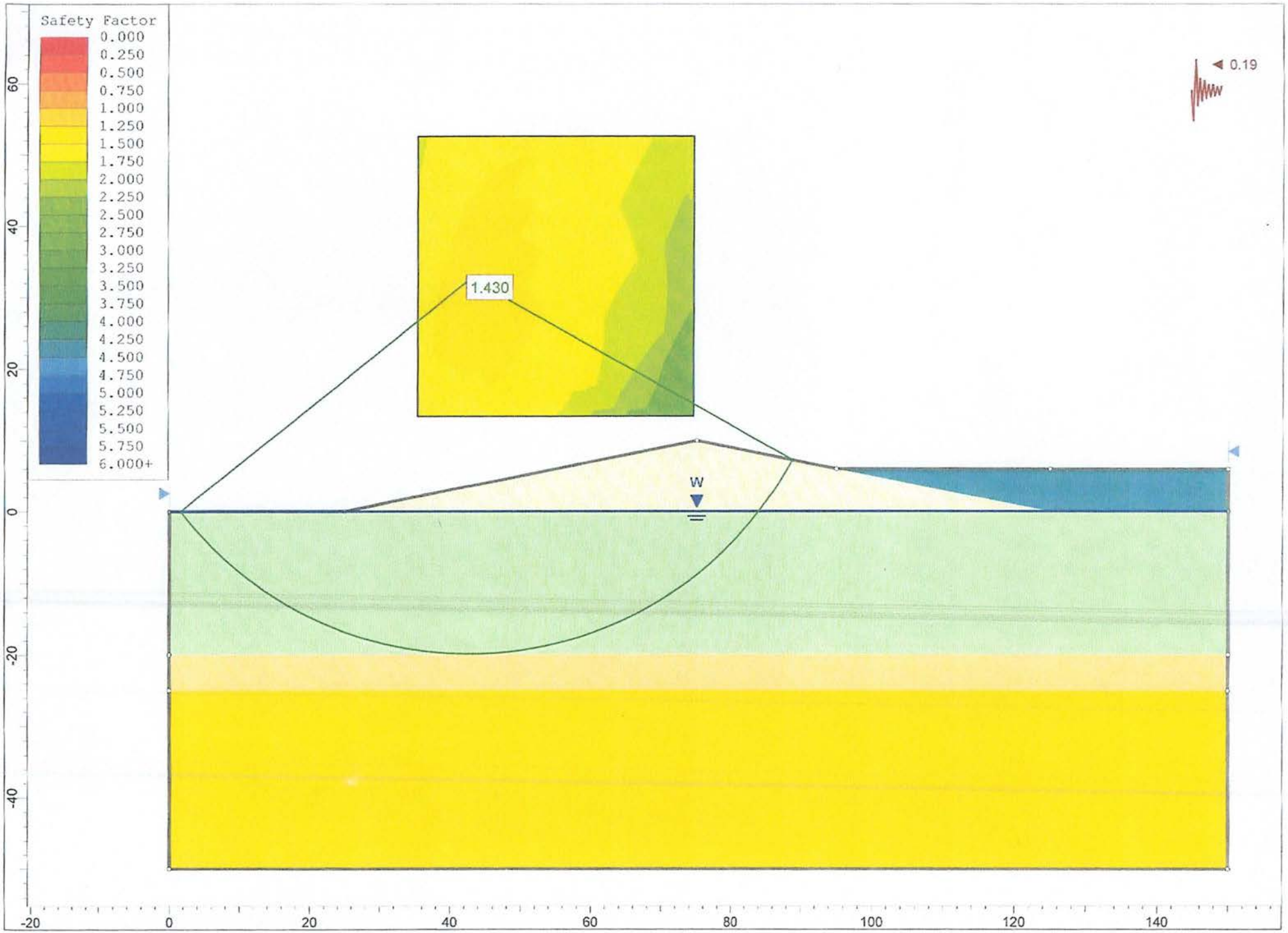
3.000
3.250
3.500
3.750
4.000
4.250
4.500
4.750
5.000
5.250
5.500
5.750
6.000+
3.047
W
60
40
20
0
-20
-40
-20
0
20
40
60
80
100
120
140


Safety Factor
0.000
0.250
0.500
0.750
1.000
1.250
1.500
1.750
2.000
2.250
2.500
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3.000
3.250
3.500
3.750
4.000
4.250
4.500
4.750
5.000
5.250
5.500
5.750
6.000+
0.19
1.430
W
60
40
20
0
-20
-40
-20
0
20
40
60
80
100
120
140