Appendix G
Geology, Soils, and Paleontology

ESA

Appendix G.1
Geotechnical Analyses and Peer Reviews

SIERRA GEOTECHNICAL SERVICES, INC.

GEOTECHNICAL • GEOLOGY • HYDROGEOLOGY • MATERIALS TESTING • INSPECTION

Freeman Associates LLC
994 San Antonio Road
Palo Alto CA 94303

September 12, 2016

Attention: Mr. Verne Freeman

Subject: **REVISED GEOTECHNICAL SLOPE STABILITY ANALYSIS REPORT**
Sargent Ranch Quarry Site
Sargent, Santa Clara County, California

Reference: **GEOTECHNICAL SLOPE STABILITY ANALYSIS REPORT**
Sargent Ranch Quarry Site
Sargent, Santa Clara County, California
SGSI Project No. 3.31274; Dated December 10, 2015

Dear Mr. Freeman:

SGSI is pleased to submit this revised report summarizing our geotechnical slope stability analysis study for the proposed Sargent Ranch Quarry Site. We understand that that order of phase excavation has changed since the above referenced report was issued and as a result, we have changed the numerology herein to align with the project plans. The changes are nomenclatural only and do not have a gross impact on previous work. Our study was focused on adverse slope stability impacts both during operations and following reclamation and providing mitigation measures for incorporation in the design of the Reclamation Plan.

This report presents our findings, conclusions, and recommendations for quarry slope stability and potential site geologic hazards as they affect the proposed project. The proposed four phase project includes the development of open pits for the production of construction aggregates.

We appreciate the opportunity to be of service to you. Should you have any questions regarding this report, please do not hesitate to contact us.

Respectfully,

SIERRA GEOTECHNICAL SERVICES, INC.

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SIERRA GEOTECHNICAL SERVICES, INC.

REVISED GEOTECHNICAL SLOPE STABILITY ANALYIS REPORT

FOR

PROPOSED SARGENT RANCH QUARRY SITE
SARGENT, CALIFORNIA

SEPTEMBER 12, 2016
PROJECT NO. 3.31274

Prepared By:

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SIERRA GEOTECHNICAL SERVICES, INC.

TABLE OF CONTENTS

PAGE

LIST OF ATTACHMENTS

APPENDICES

1.0 PURPOSE AND SCOPE OF SERVICES

This report has been revised to coincide with the project plans due to numerical phase changes in the anticipated excavations. Phases 1 and 2 (formerly Phases 4 and 3, respectively) will now be located at the southern end of the property. Phases 3 and 4 (formerly Phases 1 and 2, respectively) as well as the plant facilities are to be located to the north. Aggregate transport will be via a conveyor belt and access between the phases will be via a small maintenance road, both on the western side of the Sargent Valley.

This report presents the result of our slope stability evaluation for the stability of the anticipated cut slopes and for final reclamation of slopes at the future Sargent Ranch Quarry site. It is our understanding that the project will include extraction of roughly 38.2 million cubic yards of material, for use in construction aggregates, in four phases over an approximate 30 year period.

Our evaluation and analysis had the primary objectives:

- Compilation and Review of Available Data – including available published and unpublished data concerning site geology and seismic setting. In addition grading and reclamation plans and cross sections prepared by Triad/Holmes Associates, dated 10/2015 were also reviewed.

- Perform a subsurface investigation which included geotechnical borings and test pits to better define the geologic orientations of the subsurface deposits. The collected data, coupled with the above referenced report, were used to develop a subsurface geologic model used in the analysis of the existing slope stability.

- Data analysis and a slope stability evaluation using GSTABL7 software.

- Preparation of this written report presenting the results of our findings, conclusions, recommendations, and construction considerations for the proposed development.

2.0 SITE DESCRIPTION AND PROPOSED PROJECT

The project site is located to the west of Highway 101, approximately 6 miles south of Gilroy, in Sargent, Santa Clara County, California (36.9169°;-121.5647°). The approximate location of the project site is depicted on the Regional and Vicinity Maps, Figures 1 and 2, respectively.

Site topography consists of gently rolling to moderately steep hillsides with moderate to well incised drainages. Relief at the project site ranges from approximately 800 feet mean sea level (MSL) along the higher ridge crests to less than 150 feet MSL along the eastern portions of site. Average overall slope angles are typically around 15˚ in the proposed development areas. Vegetation includes a light to moderate growth of grasses, shrubs, and some riparian habitat in drainage areas. The site is bisected by the south-flowing Sargent Creek. There are currently no structures in the proposed development areas.

The proposed project will consist of surface mining excavations, overburden stockpiling, crushing and processing facilities, access roads, administrative offices and equipment storage areas. Disturbance is estimated at approximately 200 acres. The mining quarries will be excavated in four phases. Phases 1 and 2 will be located at the southern end of the property and Phases 3 and 4 as well as the plant facilities will be located to the north. Aggregate transport will be via a conveyor belt and access between the phases will be via a small maintenance road, both on the western side of the Sargent Valley.

We anticipate operations will take place over an approximate 30 year time interval. The proposed mine limits as well as the processing plant site and stockpile areas are shown on the site Geologic Map (Figure 3). The applicant proposes to mine the site for aggregates as open pit, to bottom elevations and cubic yardage as follows in the below Table I.

TABLE I

Phase	**Max Bottom of Quarry and Total Cut (ft/yds^3)**
Phase 1	250’/ 3.6 mil yds^3
Phase 2	250’/ 5.0 mil yds^3
Phase 3	200’/ 16.3 mil yds^3
Phase 4	200’/ 13.3 mil yds^3

The grading plan includes slope cuts of greater than 2:1 (H:V) with 20 foot wide benches every 30 foot vertical for excavation, and final reclamation slopes of 3:1 for all phases. Drainage during excavation will be directed away from pit areas via brow ditches and culverts and will be discharged into existing drainage areas.

For final reclamation, wedge fills will be placed over cut slopes to achieve the final geometry. Fill materials will be generated from overburden soils, produced during excavation, which will be stockpiled in areas as per plan. Pit bottoms will be fine graded to achieve a 1% gradient for drainage, which will be directed toward retention basins.

3.0 FIELD AND LABORATORY WORK

Subsurface Investigation, 2015: A comprehensive subsurface field investigation consisting of 43 test pits, and 11 thirty-inch diameter borings was performed between June and August, 2015. A geologist from our office logged the excavations as they were advanced. Approximate locations of the exploratory excavations are shown on the Subsurface Geotechnical Map (Figure 3). Logs of the subsurface conditions encountered are provided in Appendix A. Geotechnical laboratory testing of representative soil samples collected from the excavations was performed. Testing included Atterberg limits, direct shear, expansion potential, gradation, and maximum density. The results of the laboratory tests performed are presented in Appendix B.

Test pits TP-1 through TP-31 were located in Phases 3 and 4. Test Pits TP-32 through TP-38 were located in Phase 1, and Test Pits TP-39 through TP-43 were located in Phase 2. The test pits were on the order of 4 to 8.5 feet in depth. Soils types, bedding attitudes, faulting/fractures, and other features are noted on the logs. Groundwater was not encountered in any of the pits. In TP-17 a minor tar seep was noted. No other signs or indications of hydrocarbons were observed in any other pits or borings.

Borings BH-1 through BH-7 were located within Phases 3 and 4. BH-9 and BH-10 were located in Phase 2, and BH-8 and BH-11 were located in Phase 1. Soils types, bedding attitudes, faulting/fractures, and other features are noted on the logs. Perched groundwater conditions were noted in Phase 3/4 boreholes BH-1 through BH-4, and BH-6 through BH-7. Groundwater was not encountered in Phases 1 and 2. Section 5.0 below includes a comprehensive discussion of groundwater.

3.1 Previous Work

SGSI performed a field reconnaissance/mapping study in October 2014 which consisted of geologic observations, mapping of surface expressed geologic features such as joints, contacts, faults, bedding attitudes etc.., and limited surface sampling of soil materials from previous borings for laboratory testing. Results of

the field mapping are included on Figure 3. Geotechnical laboratory testing of soil samples for preliminary characterization included Atterberg limits, gradation, shear strength, and LA Abrasion. Results of the laboratory testing are included in Appendix B.

SGS was also provided with logs of three borings (SRB07-1, SRBO7-2, and SRBO7-3) drilled in 2007. The location of the borings is shown on Figure 3. Logs of the borings are included in Appendix A. In-situ soil samples were not obtained during drilling. All borings were located in the north area of the site in the vicinity of Phases 3 and 4. Borings contained interbedded granular deposits along with fine silts and clay. Perched water was noted at the bottom of excavation SRBO7-2 at approximately 129 feet MSL.

4.0 GEOLOGY

Site Geology: Per the Geologic Map of Monterey 30'x 60' Quadrangle, and the Map of the Southernmost Geology of Santa Clara County (Figures 4 and 5), Tertiary marine and nonmarine sediments are prevalent throughout the site. The marine and non-marine units, denoted as Tscm and Tscn respectively, were mapped by Dibble and Brabb (1978) as Pliocene age and included as part of the Etchegoin Formation. The Etchegoin consists of siltstone, sandstone, and conglomerate. The sediments making up these rocks were deposited in shallow-marine, marginal marine and non-marine environments.

Geologic deposits more specifically consist of conglomerate, sandstone, and siltstones (Graymer, 1997). The sediments contain inter-bedded pebble and cobble conglomerates; coarse- to fine-grained lithic, mica-lithic, and quartz-lithic sandstones; and brown siltstone and silty claystones. Clasts in the conglomerate are well rounded to sub-rounded, and contain: greenstone, greywacke, white weathered siliceous mudstone, laminated chert, red chert and meta-chert, laminated fine-grained white quartz sandstone, and serpentine.

The site geologic units encountered during our study included marine and non-marine units noted above, as well as Topsoil/Colluvium, Alluvium, and Landslide deposits. A brief description of the units follows.

4.1 Topsoil/Colluvium (Unmapped)

Modern unconsolidated topsoil/colluvial materials were observed outside of the drainages along the slope faces, and atop the ridges. These deposits were also observed as the overlying deposits within all the test pits and borings. In general, these deposits consisted of a dark brown to yellowish-brown, and black, damp to moist, loose to medium dense silty to clayey (Unified Soil Classification Symbols: SM, and SC-SM), very fine to coarse sand, with minor gravels and cobbles. Average thickness of this deposit was approximately 3-feet. These soils exhibit weak shear strengths and where situated on slopes that are steeper than 2:1 will be unstable when saturated (see Section 8.0).

4.2 Alluvium (Qal)

Modern unconsolidated alluvial deposits were observed along Sargent Creek and its tributary drainages. These deposits appeared to be comprised of a poorly-sorted mixture of cobbles, gravels, sand, silt and clays. Alluvium was not encountered in the excavations. We expect the alluvium deposits to range from a few inches thick in the upper reaches of the watershed areas where erosion has cut the channels, to multiple feet thick where the channels widen and deepen as they approach the flatter terrain of the Pajaro River Valley.

4.3 Non Marine and Marine Deposits (Tscn and Tscm)

Tscn- non-marine deposits consisting of fine to coarse sands, silts and clays, with rounded gravels and cobbles were observed in the test pits and borings. In general, these deposits consisted of a yellowish-brown to brown, and reddish-brown to orange, moist, dense silty to clayey (Unified Soil Classification Symbols: SM, SC-SM, ML-SM, SM-CL, and SM-GM), very fine to coarse sand, sandy silt, and sandy clays with minor to abundant gravels and cobbles up to 8" diameter. These deposits were massive, cross bedded, and interbedded. Clasts varied from granitic and greywacke, predominantly in the southern and central portions of the site, to mudstone and shale in the north.

Tscm - marine deposits were observed and mapped during our work for the above referenced report, but were not observed during the subsurface investigation. Differentiation of the two units is made only based on the presence of fossils.

Marine fossils were observed to the west of Sargent Creek, predominantly along the upper benches/knobs.

5.0 GROUNDWATER

A static groundwater table was not encountered. Groundwater seepage, which appears to be perched, was recorded in Borings BH-1 to BH-4, and BH-6 to BH-7 which are located at the north end of the site in Phases 3 and 4. Groundwater was not encountered to the south in Phases 1 and 2. Depth to water varied from 258' MSL to 166' MSL and the overall gradient of flow, except where displaced by faulting, is to the east. Groundwater seepage was low to moderate in volume and primarily observed at the contact between the granular soils and the underlying clay deposits

Deeper and possibly static groundwater was encountered in boring log SRB07-2 at 112 feet MSL (Appendix A). Static groundwater therefore is likely near 100' MSL and will not be a factor as the bottom of the pit excavations are somewhat higher (approximately 130 - 250 feet MSL).

Groundwater seepage was considered within the slope stability analysis and indicates that the factor of safety against sliding is reduced by approximately 15%. It must be noted that depth to groundwater data for the site area is limited and that levels will fluctuate as a direct result of variable topography, sediment permeability, proximity to faults, and precipitation variances. During excavation of the quarry pits, groundwater seepage will likely be encountered and should be mitigated for. This may include dewatering by use of horizontal drains, deep cutoff trenches, or gabion buttresses.

6.0 LANDSLIDES

Landslides were observed in the field during our reconnaissance/mapping and explorations. Several surficial to moderately deep seated (backscarps of up to 40 feet in height) sized landslides were mapped in multiple areas across the property (Figure 3). These landslides appear to be relatively recent, and are identified on the basis of geomorphic features such as eroded scarps and irregular topography. The majority of the slides appear to be surficial translational and originate at the contact with the Topsoil/Colluvium and the underlying tertiary deposits along the sideslopes of incised drainages. In a few areas however, the landslides did extend below the surficial deposits into the underlying bedrock. Closer examination of the back scarps revealed that the

slides appeared to originate along fault planes and fractures in the underlying deposits. The possibility also exists that the failure planes may have occurred along the interbedded silts and clays which occur at depth throughout the site. Some of the deeper slides noted near future Phases 3, 4, and 2 appear to follow the direction of bedding in these areas and are rotational in nature.

The presence of landslides could be problematic for the slope angles associated with the quarry excavations. While the vast majorities of slides are shallow/surficial and will be removed during excavation, some basal surfaces were observed to be deep seated and may daylight onto cut slope faces. In addition, landslide debris above top-of-slope cuts may be encountered and the slides re-activated by the excavations that will take place. Monitoring during excavation will be needed to identify the extent and nature of the slides and to provide appropriate mitigation recommendations.

7.0 FAULTING

The project site area is located in an extremely tectonically active area between the San Andreas Fault located approximately 2 miles to the south, and the Sargent fault which runs through the northern portion of the site (Figure 4). The Sargent fault has evidence of Holocene offset along much of its length (McLaughlin, 1974, Hart, 1988). Previous estimates of fault movement inferred from geomorphic expression are right-lateral reverse-oblique with the southwest side up.

During this investigation multiple areas of faulting were observed in the test pits and borings (Appendix A). Faults/fractures were observed in the Tscn and terminated at the basal contact with the overlying Topsoil/Colluvium. Locations of faults as observed via aerial photograph as well as those encountered in the excavations are noted on Figure 3 as well as the Geologic Cross Sections (Appendix C).

8.0 SLOPE STABILITY

A slope stability evaluation was performed for the proposed 3:1 reclamation slopes as well as the proposed overburden stockpiles. Geologic cross sections were prepared for representation of the slope conditions forming the geometric configurations for the individual analyses. Cross Sections are included in Appendix C, and their locations are indicated on Figure 3. Utilizing field and laboratory data nineteen slope conditions were evaluated and the calculations are included in Appendix D and results in Tables II and III.

Groundwater levels were approximated at an elevation the northern pits of 190' and 255' MSL. Slope angles and bench configurations were taken from the Triad-Holmes Grading and Reclamation Plans. Calculations were performed using the program GSTABL7. The program performs a two dimensional limit equilibrium analyses to compute the factor of safety for a layered slope using the simplified Bishop slip circle and Janbu block slide methods. Slopes are required by code to have a minimum factor of safety of 1.5.

Soil and bedrock strengths were developed using a combination of laboratory data (direct shear tests), back-calculated failure strengths in existing landslides, and experience with similar materials. The data developed are shown here in Table II.

TABLE II- Summary of Soil Strength

Description	Test Method	Unit Weight (pcf)	Ø	C
Tscn	Cross Bedded By Lab Test	110	32°	300 psf
Clay Bedding Planes	By Back-Calculation	110	12°	375 psf to 675 psf
Topsoil 0 – 3'	By Back-Calculation	110	12°	150 psf
Stockpile materials	Assumed	110	12°	Phase 1 (older) 675 psf Phase 2 (newer) 375 psf

The site geology, particularly near areas that are faulted is highly complex and variable. There are faults that affect bedding partially down the cut face and there are folds that change bedding. As a result it is difficult to accurately identify the orientations of the deposits from the data presently available. Calculated slope stabilities, as shown in the Table III, were therefore computed assuming different geologic scenarios. For example analyses were run assuming daylighted (clay layers exposed in the cut) orientations of bedding, and orientations which crossed the slope face.

TABLE III- Summary of Calculations (STABL7)

Location	Phase	Type Failure	Factor of Safety	Comments
1. Section A-A'	3/4	Cross Bedded	2.08	West facing Slopes
2a. Section B-B'	3/4	Daylight	0.76	Would be stable at 4:1
2b. Section B-B'	3/4	Cross Bedded	1.73	Verify during ex
3a. Section C-C'	3/4	Daylight	0.81	Bedding parallel to slope
3b. Section C-C'	3/4	Cross Bedded	1.85	Verify during ex
3c. Section C-C'	3/4	Cross Bedded	1.26	0.15g pseudo
3d. Section C-C'	3/4	Daylight	0.81	Water at 190' (5' head)
3e. Section C-C'	3/4	Cross Bedded	1.85	Water at 190' (5' head)
3f. Section C-C'	3/4	Daylight	0.95	Water at 255' (5' head)
4a. Section E-E'	3/4	Daylight	0.69	Planar Failure
4b. Section E-E'	3/4	Daylight	0.61	Circular Failure
4c. Section E–E'	3/4	Cross Bedded	1.52	Circular Mode
5. Section L-L'	1	Back-Calculated	1.00	Verify during ex
6. Section G-G'	3/4	Back-Calculated	1.00	Verify during ex
7. Topsoil (0 –3')	All	Surficial (3:1) Surficial (2:1)	1.84 1.00	Clay
8a. Section Q-Q'	1	Cross Bedded	2.13	Verify during ex
8b. Section Q-Q'	1	Cross Bedded	1.34	0.15g pseudo
9a. Civil Section A-A'	3/4	Overburden	1.45	Verify lab strength
9b. Civil Section A-A'	3/4	Overburden	0.95	0.15g pseudo

As expected, areas that have bedding dipping between 0° to 17° that are daylighted, have a factor of safety of 0.61 to 0.81 which indicates these slopes may fail at 3:1 orientations. Areas with cuts that are cross bedded show a factor of safety of 1.5 to 2.1. The analysis was also run assuming perched groundwater conditions (5' head) for a Section C-C' (worst case cut), which will be assumed representative for any scenario where seepage is present. Again, where clay was daylighted, the factor of safety was less than 1.0.

Seismic stability calculations were also performed for two of the highest worst-case cuts (Sections C-C' and Q-Q'). A pseudo-static analysis was performed using 0.15g horizontal and 0.15g vertical simultaneously. The test results showed a seismic factor of safety of 1.26 to 1.34. The required seismic factor of safety is 1.1.

The natural topsoil areas steeper than 2:1 are unstable for shallow failure (under three feet deep) when saturated. Most of the cuts though are deeper so this will be only a localized condition.

For the overburden and topsoil stockpile areas adjacent Phases 3 and 4 (Civil Section A-A') we assume the material will be a combination of clays, silt, and sand, with minor amount of gravels and cobbles. We assume that minimal compactive effort will be used in placing the stockpile. Due to the setback distance shown on the plan, the stockpiles will not have a negative impact on the Phase 3 mining limit backcut. However, based on our analysis of the stability of the stockpiles themselves, the factor of safety will be 1.45, static and 0.95 seismic against sliding. As a result, we recommend that the Phase 4 stockpile be setback from the top edge of Phase 3, on its east face, at least an additional 20 feet (total 35').

9.0 CONCLUSIONS AND RECOMMENDATIONS

The Sargent Ranch Quarry site is presently undeveloped open space and it is understood that the end use will be the same. Thus, slope stability will not represent a hazard to structures or human occupancy. The pits and stockpile areas will have no impact on adjacent properties, or watersheds due to their relative locations. In addition, the reclamation plan shows no direct impact to, or alteration of any watersheds. Also, drainage as shown on the plans appears to be retained within the pits which would remove the potential for offsite transport. It is our opinion that the primary slope stability issue is in compliance with SMARA.

However, based on our investigation and analysis, minor to moderate failure of pit walls could occur both during excavation and at final reclaimed orientations. The site geology is complex. The lithology as well as the highly sheared and deformed character of the sediments near the faults, will affect the overall mass strength of the bedrock materials creating localized conditions susceptible to potential slope instabilities.

Generally speaking, where clay beds will daylight out of the slope face and in combination with water seepage, the slopes will be susceptible to failure in the 3:1 orientation. Where clay beds do not daylight out of slope, the slope should be grossly stable. Small scale, shallow wedge failures, may also occur as a result of the nature of the site soils. These small scale features will not represent a significant slope stability impact. The overburden stockpile area will be gross stability based upon the configuration as shown in the plans. However, the seismic factor of safety was lower than required, and therefore the Phase 4 stockpile should be relocated an additional 20' from the top of slope.

Based upon the limited geometric data available with respect to the complexities of the site we recommended that the following, as well as general recommendation in Appendix E, be implemented during construction to ensure that slopes will be grossly stable both during construction and for reclamation. The recommendations presented are based upon a review of the project plans, our field work, and engineering and geologic analyses of the collected data as well as our professional opinion and judgment. In the event that significant changes are made to the proposed site excavation or reclamation, the conclusions and recommendations contained herein shall not be considered valid unless the changes are reviewed and the recommendations of this report are evaluated or modified in writing by our office.

- Observation and inspection during excavation of the pits is highly recommended. Geologic inspections by a California Certified Engineering Geologist are considered essential to identify field conditions that differ from those anticipated, and to adjust design to actual field conditions.

- Localized layback, earth buttresses, and/or stabilization fills of individual slopes may be needed to accommodate for unfavorable bedding.

- Raveling of slope materials can be anticipated, but can mitigated by staging and temporary safety measures. Berms and fencing can be used to reduce pedestrian access. Waste pile buttress fills or backfill can be used to contain and or mitigate surficial and/or minor translational failures.

- Remedial grading to remove in-place clayey topsoil/colluvium below the proposed stockpiles was not noted in the project plans. The in-place topsoil/colluvium is not suitable to support stockpiled fill on sloping ground and should be removed prior to fill placement.

- Localized erosion and small scale failures are likely unless "inactive" slopes are vegetated or otherwise protected. In addition, a drainage catchment ditch should be maintained at the toe of the stockpiles to prevent direct discharge of sheet flow or debris.

- Groundwater seepage will likely be encountered during excavation and should be mitigated for. This may include dewatering by use of horizontal drains, deep cutoff trenches, or gabion buttresses.

10.0 LIMITATIONS

This document has been prepared for the sole use and benefit of our client. The conclusions of this document pertain only to the site(s) investigated. It should be understood that the consulting provided and the contents of this document may not be perfect. Any errors or omissions noted by any party reviewing this document and/or any other geologic or geotechnical aspects of the project should be reported to this office in a timely fashion. The client is the only party intended by this office to directly receive this advice. Unauthorized use of or reliance on this document constitutes an agreement to defend and indemnify Sierra Geotechnical Services Incorporated from and against any liability, which may arise as a result of such use or reliance, regardless of any fault, negligence, or strict liability of Sierra Geotechnical Services Incorporated.

Conclusions presented herein are based upon the evaluation of technical information gathered, experience, and professional judgment. Other consultants could arrive at different conclusions and recommendations. Final decisions on matters presented are the responsibility of the client and/or the governing agencies. No warranties in any respect are made as to the performance of the project.

Please also note that our evaluation was limited to assessment of the geologic aspects of the project, and did not include evaluation of structural issues, environmental concerns or the presence of hazardous materials. Our study did not have the benefit of the performance of subsurface exploration across the site area.

11.0 REFERENCES

Bryant, W.A., 1980, SE segments of Sargent and Castro faults: California Division of Mines and Geology Fault Evaluation Report FER-96, microfiche copy in Division of Mines and Geology Open-File Report 90-11, 19 p., scale 1:24,000.

Bryant, W.A., Smith, D.P., and Hart, E.W., 1981, Sargent, San Andreas, and Calaveras fault zones—Evidence for recency in the Watsonville East, Chittenden, and San Felipe quadrangles, California: California Division of Mines and Geology Open-File Report OFR 81-7SF, scale 1:24,000.

McLaughlin, R.J., Langenheim, V.E., Jachens, R.C., Jayko, A.S., Stanley, R.G., and Valin, Z.C., 1997, Neogene transpressional range-front deformation, southwestern Silicon Valley, San Francisco Bay region, California [abs.]: EOS, Transactions of the American Geophysical Union, 1997 Annual Fall Meeting, v. 78, no. 46, p. F436.

Nolan, J.M., Zinn, E.N., and Weber, G.E., 1995, Paleoseismic study of the southern Sargent fault, Santa Clara and San Benito Counties, California: Unpublished U.S. Geological NEHRP Final Technical Report 1434-94-G-2466, 23 p.

SIERRA GEOTECHNICAL SERVICES INC.

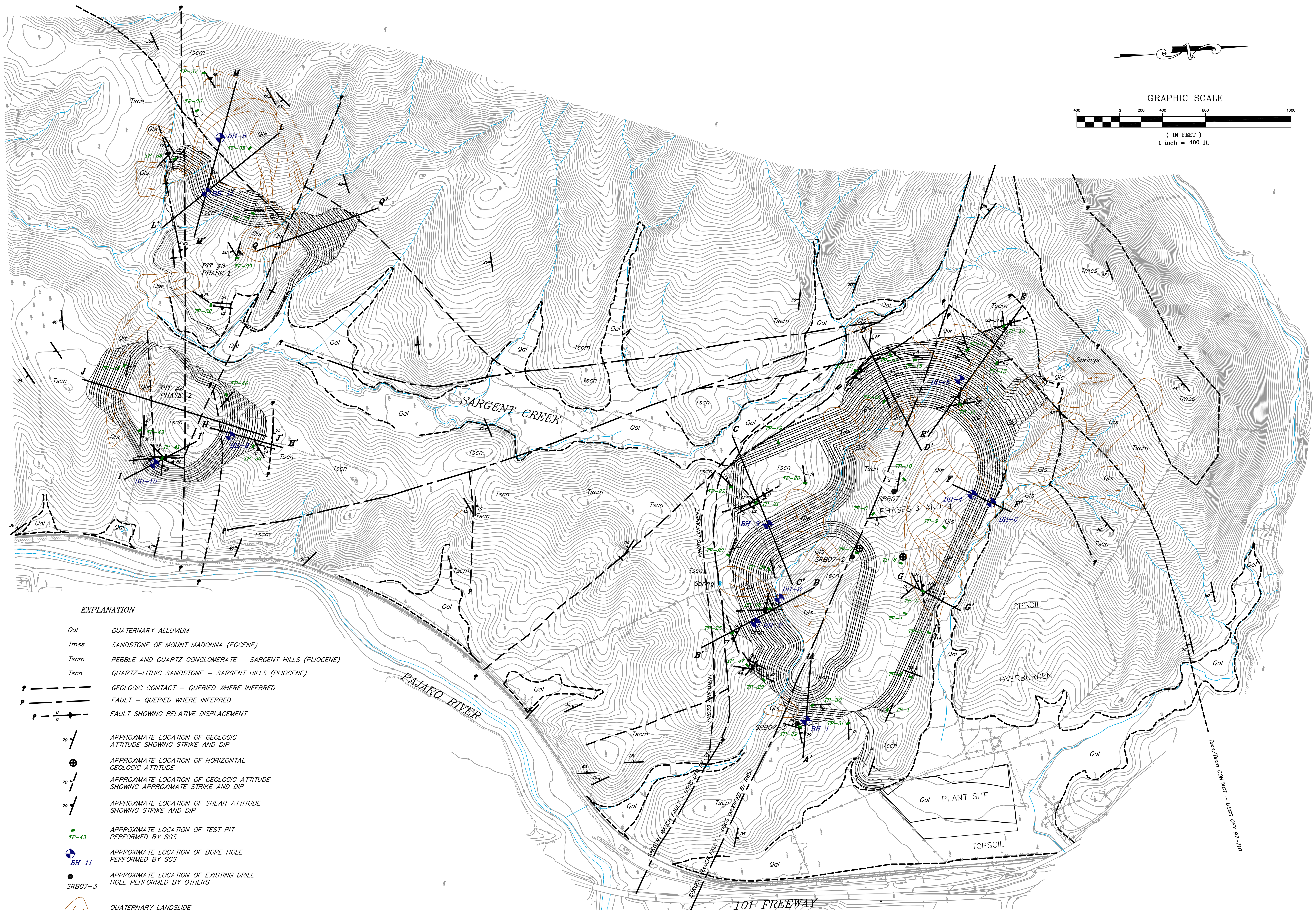
SGSI

PROJECT: REGIONAL MAP SARGENT RANCH	
COORD: 36.9169; −121.5647	DATE: 9/2016
DRAWING: FIGURE 1.DWG	DRAWN BY: JAA
JOB NO.: 3.31274	FIGURE: FIGURE 1

COURTESY OF GOOGLE EARTH

SIERRA GEOTECHNICAL SERVICES INC.

PROJECT: *VICINITY MAP* *SARGENT RANCH*	
COORD: *36.9169; −121.5647*	DATE: *9/2016*
DRAWING: *FIGURE 2.DWG*	DRAWN BY: *JAA*
JOB NO.: *3.31274*	FIGURE: *FIGURE 2*



EXPLANATION

Qal	QUATERNARY ALLUVIUM
Tmss	SANDSTONE OF MOUNT MADONNA (EOCENE)
Tscm	PEBBLE AND QUARTZ CONGLOMERATE - SARGENT HILLS (PLIOCENE)
Tscn	QUARTZ-LITHIC SANDSTONE - SARGENT HILLS (PLIOCENE)
	GEOLOGIC CONTACT - QUERIED WHERE INFERRED
	FAULT - QUERIED WHERE INFERRED
U / D	FAULT SHOWING RELATIVE DISPLACEMENT
70	APPROXIMATE LOCATION OF GEOLOGIC ATTITUDE SHOWING STRIKE AND DIP
⊕	APPROXIMATE LOCATION OF HORIZONTAL GEOLOGIC ATTITUDE
70	APPROXIMATE LOCATION OF GEOLOGIC ATTITUDE SHOWING APPROXIMATE STRIKE AND DIP
70	APPROXIMATE LOCATION OF SHEAR ATTITUDE SHOWING STRIKE AND DIP
TP-43	APPROXIMATE LOCATION OF TEST PIT PERFORMED BY SGS
BH-11	APPROXIMATE LOCATION OF BORE HOLE PERFORMED BY SGS
SRB07-3	APPROXIMATE LOCATION OF EXISTING DRILL HOLE PERFORMED BY OTHERS
Qls	QUATERNARY LANDSLIDE DASHED WHERE QUERIED

SARGENT RANCH
GEOLOGIC MAP
SARGENT RANCH LLC

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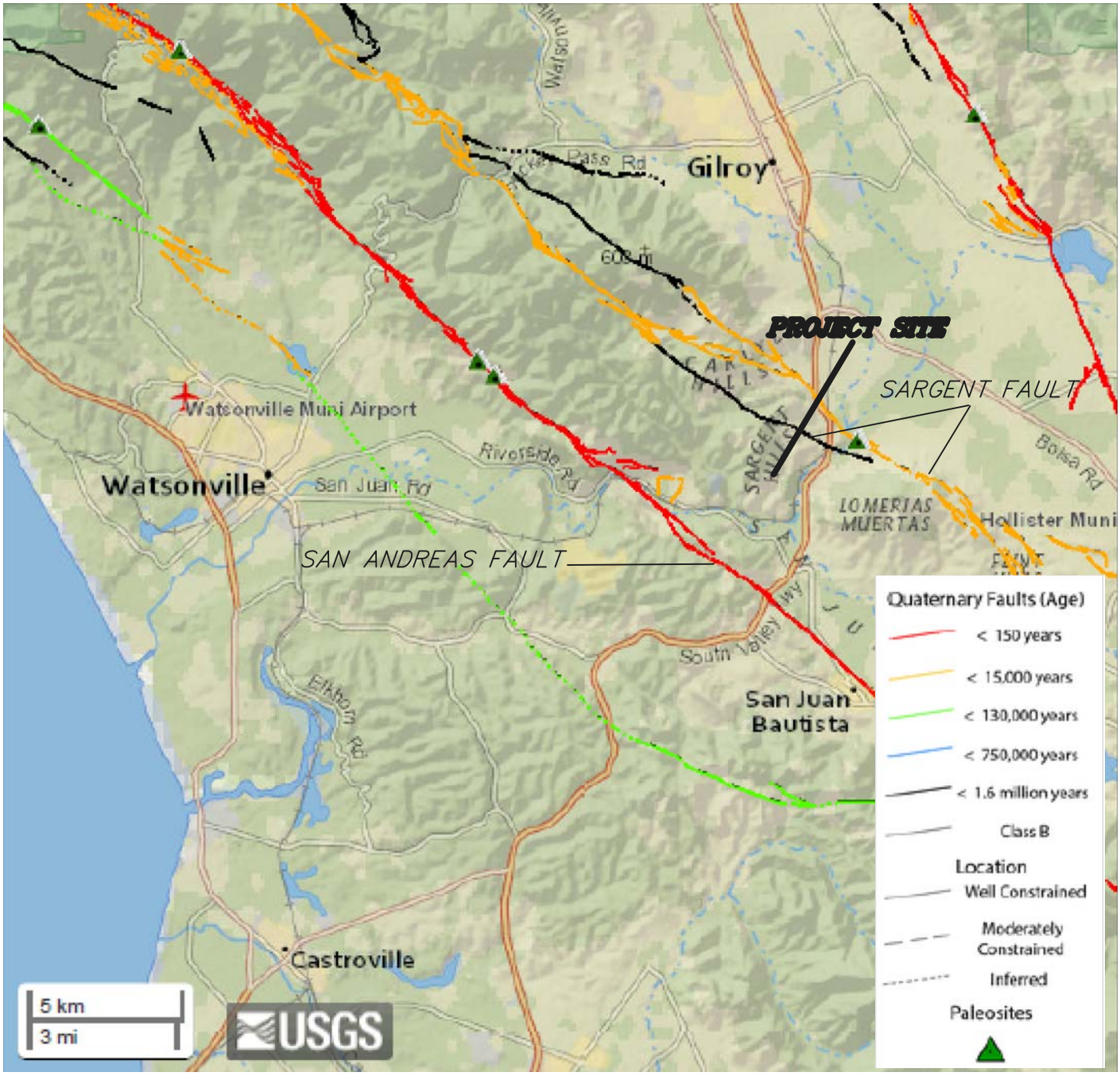
REVISIONS	BY

DATE 9/2016
SCALE 1"=400'
DRAWN DD
JOB NO. 3.31274
DWG GEOLOGY.DWG
SHEET FIGURE 3
OF 4 SHEETS



NOT TO SCALE

PROJECT: REGIONAL FAULT MAP SARGENT RANCH	
COORD: 36.9169; −121.5647	DATE: 9/2016
DRAWING: FIGURE .DWG	DRAWN BY: JAA
JOB NO.: 3.31274	FIGURE: FIGURE 4

SIERRA GEOTECHNICAL SERVICES INC.
SGSI

APPENDIX A

EXPLORATORY BORING

AND

TEST PIT LOGS

SIERRA GEOTECHNICAL SERVICES

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Caltrans Lab No. 214; AMRL Lab No. 2460; CCRL Lab No. 2081; DSA LEA Lab No. 189

SGS SIERRA GEOTECHNICAL SERVICES, INC.

BORING NO: BH-1
JOB NO: 3.31274

GEOTECHNICAL BORING LOG

PROJECT: Sargent Ranch
START DATE: 8/20/15
LOCATION: Phase 3 - East side
CLIENT: Freeman Associates
START TIME: 09:27
DRILLER: TriValley
DRILLING METHOD: Bucket Auger - 30 inch
RIG: Caldwell
END DATE: 8/20/15
LOGGED BY: JA/RWS
GROUNDWATER DEPTH: 86.5 ft.
GROUND ELEVATION: 280 ft.
TOTAL DEPTH: 97 ft.
END TIME: 19:10

DEPTH	GRAPHIC LOG (S / N)	BLOW COUNT	SAMPLE NO	U.S.C.S.	FIELD DESCRIPTIONS
				sc-sm	0-3' - Topsoil; Dark brown, clayey, silty vf sand and vf sandy clay. Moist, loose to mod. dense.
4					Olive gray and orange brown (FeO stained), silty vf sand and vf sandy silt. Moist, dense.
					6'3" to 7'3" - One foot thick bed of yellow brown, vf sand. Basal contact: N78E 30NW.
8					
					10' to 11'3" - Unconformity. Contact; nearly level on south east, to ~60* north.
12					Light red brown and light olive brown, FeO stained beds, silty vf-m sand with tr. gravel, some concretions, laminated to bedded and x-bedded, liquifaction features, poss. folding, micaceous.
16					
20					21' - Bedding: N44E 40NW
					22' - Bedding: N69E 5NW on c sand & gravel lens.
24					25' - Trace gravel to 1" diameter.
28					28' - Light red brown, orange brown, light gray, Interbedded and x-bedded f-c sand. Beds are 3"-6" thick. Moderately dense, firm. X-bedding? N70W 58SE.
32					
36					
					39' - ~10% c sand and gravel to 1/2" diameter, rounded to well rounded, mod. dense, firm
40			14/12		39.5' - Contact: N72E 18NW. Concretions at contact. Dusky yellow brown (black) clay and dark gray silty clay, bedded, v stiff, v plastic, internally sheared.
					41'-41.5' - Ring and bulk samples BH-1 41'-41.5' Bluish gray silty clay.
44					42' - Bedding: N77E 18NW. Thin bed of gray clay.
					44' - Olive gray silty clay, bedded, v stiff, v plastic.
48					
52					

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GEOTECHNICAL BORING LOG

BORING NO: BH-1

JOB NO: 3.31274

DEPTH	GRAPHIC LOG (S — N)	BLOW COUNT	SAMPLE NO	U.S.C.S.	FIELD DESCRIPTIONS
56			12/12		54' - Black silty clay, v stiff, v plastic. Ring sample BH-1 54'-55'.
60					61' - Contact: 66E 16 NW. Dark greenish gray, silty vf sand, v stiff, v moist. Carbonate concretions and stringers at contact.
64					64' - Contact: Light olive brown, vf sandy silt, v stiff, sl plastic, v moist. Channeled.
68					67' - Contact: N49E 25NW. Dark yellow orange, interbedded and x-bedded, f-c sand, gravelly sand, silty vf sand and silty f-m sand.
72					71' - Contact: N74W 30NE. Dark green gray, vf sandy silt with clay. V stiff, sl plastic.
76					
80					78' - Increase silt content.
84					
88					86.5' - Slight Ground Water seepage along joints. Affected silt/clay is highly plastic. Joints: N25W 90, N34W 90, N43W 83SW.
92					90' - Grades into Dark gray to dark greenish gray, silty vf sand. Dense, wet, non-plastic.
96					97' - Total Depth
100					
104					
108					
112					

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SGS SIERRA GEOTECHNICAL SERVICES, INC.

BORING NO: BH-2
JOB NO: 3.31274

GEOTECHNICAL BORING LOG

PROJECT: Sargent Ranch
START DATE: 8/21/15
LOCATION: Phase 3 - South side
CLIENT: Freeman Associates
START TIME: 08:05
DRILLER: TriValley
DRILLING METHOD: Bucket Auger - 30 inch
RIG: Caldwell
END DATE: 8/21/15
LOGGED BY: JA/RWS
GROUNDWATER DEPTH: 79 ft.
GROUND ELEVATION: 245 ft.
TOTAL DEPTH: 99 ft.
END TIME: 16:00

DEPTH	GRAPHIC LOG (S – N)	BLOW COUNT	SAMPLE NO	U.S.C.S.	FIELD DESCRIPTIONS
0					0-6' - Topsoil/colluvium: Dark brown, silty vf-m sand with clay.
4					
8					6'-8' - Contact: Topsoil contact dips from 6 ft. on north side of boring to 8 ft. on south side of boring. Light yellow brown, silty vf sand, dense, moist. 8' - Bedding or Joint: N82E 7NW. Dark brown soil and root lined, 1/4 to 1/2 inch thick. 9' - Fault: N53E 50SE. 1/16 to 1/4 inch thick, light brown gouge. No visable offset.
12					
16					14'4" - Contact: N82E 8NW: Root lined. light yellow brown/tan, vf sandy silt with light brown to light orange brown, silty f-m sand in liquifaction features (eroded sand volcanoes). Thin FeO staining along and across bedding. 16'2" - Contact: N17E 3NW. Light brown to light orange brown, silty f-m sand with trace c sand.
20					19' - Bedding: N49W 14NE. 21' - Bedding: N87W 11NE. Top of interbeds of dark orange brown, silty f-c sand with gravel to 3/4 inch diameter.
24					22.5' - Bedding: N81W 23NE. Top of x-bedding.
28					27' - Joints: N19W 90 and N39W 84SW. Top of joints at bedding plane. Sediments are loose between joints.
32					
36					
40					39' - Joint: N36E 90. 40' - Bulk sample. BH-2 40ft.
44					43' - Joint: N6E 90. Sediments still loose.
48					47' - Bedding: N58E 23NW. One inch thick gravel bed. Sediments are loose and caving.
52					

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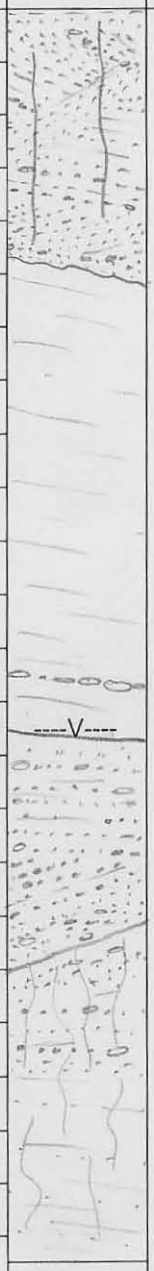
GEOTECHNICAL BORING LOG

BORING NO: BH-2

JOB NO: 3.31274

DEPTH	GRAPHIC LOG	BLOW COUNT	SAMPLE NO	U.S.C.S.	FIELD DESCRIPTIONS
56					56'7"-57'3" - FeO stained band. Sediments are soft and caving around joints.
60					61.5' - Contact: N66W 11NE. Undulatory. Blue gray, clayey silt. Top 1/2 to 2 inches is bleached. Very plastic, wet. Sand above contact is FeO cemented.
64					
68					
72					72' - Interbeds of one ft. thick, blue gray, clayey, vf sandy silt, sl plastic, and clayey silt, mod. plastic.
76					75' to 77' - Olive black, clayey, vf sandy silt. 77' - CaCO3 nodules to 3 inches long, along contact, v hard. Blue gray, clayey, vf sandy silt and clayey silt.
80	----V----				79' - Groundwater seepage from Fault: N25W 9NE, slicks plunge 74NE. 1/8 inch thick dark brown, gouge. 79'8" - Dark blue gray, clayey silt. 83' - Blue gray, silty, vf sandy gravel to 1 inch diameter. Seeping water.
84					
88					86.5' - Fault: N81E 18SE. Blocky jointing below. Caving.
92					92' - Blue gray, clayey, silty vf sand. Dense, spoils are producing fumes.
96					Note: Basal plane of slide may be located below TD, due to loose sediments and blocky jointing. Need to evaluate during grading.
100					99' - Total Depth
104					
108					
112					

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SGS SIERRA GEOTECHNICAL SERVICES, INC

BORING NO: BH-3			
JOB NO: 3.31274			
GEOTECHNICAL BORING LOG	PROJECT: Sargent Ranch		START DATE: 8/21/15
LOCATION: Phase 3 South Side	CLIENT: Freeman Associates		START TIME: 16:45
DRILLER: TriValley	DRILLING METHOD: Bucket Auger - 30 inch	RIG: Caldwell	END DATE: 8/22/15
LOGGED BY: JA/RWS	GROUNDWATER DEPTH: 93 ft.	GROUND ELEVATION: 360 ft. / TOTAL DEPTH: 99 ft.	END TIME: 15:00

DEPTH	GRAPHIC LOG (S — N)	BLOW COUNT	SAMPLE NO	U.S.C.S.	FIELD DESCRIPTIONS
					0-5' - Topsoil: Dark brown, silty, vf-m sand with clay. Dense.
4					5' - Light brown to light yellow brown, vf sandy silty with silty vf sand. Moist, dense.
8					9' - Transition to silty, vf sand.
					11'10" - Contact: Silt. FeO concretions at contact. Bedding dips 6SE.
12					12'9" - Vf sandy silt.
					13'1" - Contact: N2W 10NE. Light to medium brown, silty, vf-f sand. Loose.
16					
20					
					23' - M-c sand. x-bedded.
24					25' - Light red brown and light orange brown silty, vf-m sand with thin interbedded gravels.
28					28' - Contact: N55W 18NE. C sand to f sand contact.
32					
36					36' - Light reddish brown, increased sand, less color changes.
40					41'7" - Contact: N54W 23NE. Olive brown, silty clay.
44					45' - Contact: N8E 70SE. Dark blue gray, silty clay.
					45.5' - Infilled fracture, FeO stained.
48					50' - Contact: N69E 60SE.
52					

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GEOTECHNICAL BORING LOG

BORING NO: BH-3

JOB NO: 3.31274

DEPTH	GRAPHIC LOG (S – N)	BLOW COUNT	SAMPLE NO	U.S.C.S.	FIELD DESCRIPTIONS
56					
60					59' - Slide Plane: N30W 35SW. Slicks plunging downdip. N15E 51SE, N34W 29SW with slicks.
64	----V----				63' - Groundwater seepage, minor. Wood fragments.
68					
72					
76					
80					
84					
88					
92					93' - Transition to clayey, silty f-c sand with small gravel. Moderate groundwater seepage.
96					
100					99' - Total Depth
104					
108					
112					

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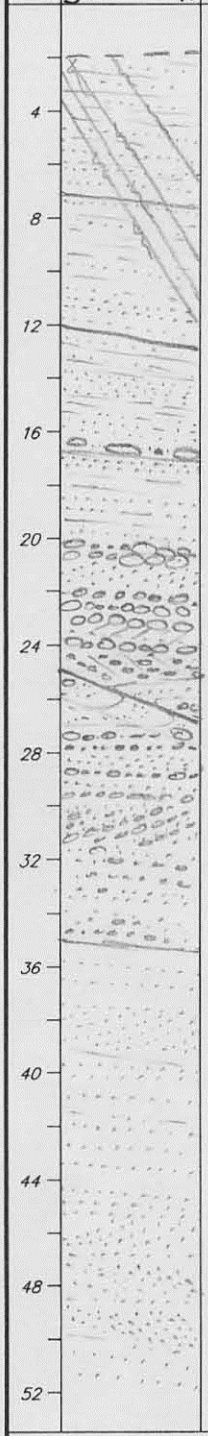
GEOTECHNICAL BORING LOG	PROJECT: Sargent Ranch		BORING NO: BH-4
			JOB NO: 3.31274
LOCATION: Phase 4 - North edge	CLIENT: Freeman Associates		START DATE: 8/22/15
			START TIME: 15:44
DRILLER: TriValley	DRILLING METHOD: Bucket Auger - 30 inch	RIG: Caldwell	END DATE: 8/23/15
LOGGED BY: RWS	GROUNDWATER DEPTH: 94.5 ft.	GROUND ELEVATION: 350 ft. / TOTAL DEPTH: 103 ft.	END TIME: 15:46



FIELD DESCRIPTIONS

0-2' - Topsoil.
2' - Very pale orange, silty,vf sand.
2.5' - Joints: N34W 72 NE. Several parallel joints, root lined.

5' - Top of multiple 2" to 4" thick laminated beds, bracketed by orange brown FeO seams. Mod. orange brown, FeO stained, f-m sand with trace c sand.
7.5' - Bedding: N19W 10NE. Thin, Dark brown, FeO cemented seam at top and bottom of 2 inch vf sand bed. Laminated, interbedded, Light olive brown, vf sandy silt, sl plastic and very pale orange, silty, vf sand.
9' - Joint: N38W 88NE.
10'8" - Interbedded f-c sands and silty sands.
12' - Bedding: N83E 10NW. 6 inch bed of silty vf-f sand. Interbedded sands.

16.5' - FeO concretions around silt clasts to 8 inches diameter.
17' - Bedding: N79W 4NE. F-c sand interbed.

~20' - Dark orange brown, sandy cobbles with f-c sand interbeds. Interbeds are x-bedded to massive.
22' - Bulk Sample: BH-4 22 ft.

26' - Fault: N25E 41NW. Mid-section of thin fault, down on the west side ~8-10". Small drag folds in silty sand and sand interbeds.
Gray with FeO streaks, gravelly sand and sandy gravel, with cobbles, clean.

35' - Contact: N84W 4NE. Gray, m sand with f-c sand. Clean.

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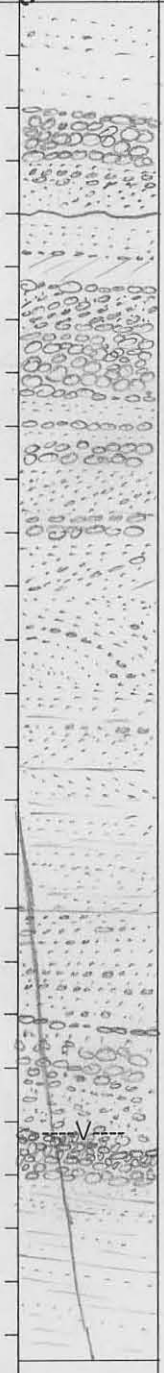
GEOTECHNICAL BORING LOG

BORING NO. BH-4

JOB NO. 3.31274

DEPTH	GRAPHIC LOG (S – N)	BLOW COUNT	SAMPLE NO	U.S.C.S.	FIELD DESCRIPTIONS
56					56.5' - Dark orange brown, FeO cemented cobbles with sand and gravel. Clast supported, hard. Interbedded and x-bedded sand and gravel. 60' - Irregular horizontal contact. Olive gray, f sand. 61.5' - With gravel. 62' - Bedding: N31E 4NW. 6 inch thick, olive gray, f sand. X-bedded. 62.5' - Mottled, dark orange brown and olive gray, sandy, gravelly cobbles. FeO cemented, dense, clast supported.
60					
64					
68					67'4" - Interbedded sand and gravel.
72					
76					
80					82' - Orange brown and olive gray, f-c sand. Clean, dense, thinly bedded and x-bedded. - Joint: N25W 88NE.
84					
88					86' - Contact: N19W 7NE. Dark orange brown, interbedded sand and and gravel.
92					90' - Contact: N45W 8NE. Irregular, FeO cemented gravel. Dense.
96					94.5' - Contact: ~N30E 11NW, irregular. Groundwater seepage at top of brown, clayey, FeO cemented gravel. Hard, well cemented. 96.5' - Contact: Blue gray, clayey gravel. 97.5' - Blue gray, vf sandy clay, vf sandy silt and silty vf sand. Dense, interbedded. 99' - Contact: N45W 11NE. Dark brown, clayey silt. Dense.
100					100' - Olive brown, vf sandy silt and silty vf sand. Dense.
104					103' - Total Depth
108					
112					

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SGS SIERRA GEOTECHNICAL SERVICES, INC.

BORING NO: BH-5
JOB NO: 3.31274

GEOTECHNICAL BORING LOG

PROJECT: Sargent Ranch
START DATE: 8/23/15

LOCATION: Phase 4 - West End
CLIENT: Freeman Associates
START TIME: 16:08

DRILLER: TriValley
DRILLING METHOD: Bucket Auger - 30 inch
RIG: Caldwell
END DATE: 8/24/15

LOGGED BY: RWS
GROUNDWATER DEPTH: Not Reached
GROUND ELEVATION: 480 ft.
TOTAL DEPTH: 100 ft.
END TIME: 15:49

DEPTH	GRAPHIC LOG (S – N)	BLOW COUNT	SAMPLE NO	U.S.C.S.	FIELD DESCRIPTIONS
					0-3' - Topsoil.
					3' - Light olive gray, vf sandy silt. Dense, irregular blocky jointing.
4					4' - 4 inch thick bed of orange brown f sand. Truncated by fault at 5.5 ft..
					5.5' - Fault: N22W 34SW. 1/4 inch brown clay gouge, unknown offset. Joint: N78E 49 NW. No visable offset, sl jumbled adjacent to plane, root lined, MnO stained. Med. olive brown with light olive brown, vf sandy silt and clay.
8					7' - Fault: N73W 53NE. 1-3 inch thick, jumbled, mottled, Dark brown, orange brown, olive gray clay gouge, root lined, down on north side 2 inches.
					7.5' - Fault: N74E 76SE. Slicks N84E 14. 1/16 to 1/8 inch gouge. Truncates fault at 7 ft. Joint: N75E 84SE. Offset by fault at 7 ft. ~down on north side 2 inches.
12					9.5' - Shear: N60W 78NE. Prominent of many shears in all directions.
					10' - Shear: N17W 26SW. Cuts shear at 9.5 ft.
					11'9" - Shear: N24W 45SW. Slicks S83W 18.
16					14' - Multiple Shears: N41W 67SW. Fine sand entrained in clay gouge, FeO lined.
					14.5' - Shear: N37E 53 NW. v thin to 1/4 inch clay gouge, offsets shears at 14 ft. Med. olive brown, silty vf sand.
					16' - Joint: N76W 90.
20					17'4" - Shear: N54W 64NE. Thin, dark brown gouge. Truncates joints above and below.
					18' - Joint: N63W 90.
					18'4" - Fault: E-W 22S. 1/8 to 1/2 inch brown clay gouge, carbon rich.
24					19'8" - Bedding: N86W 7SW. one inch thick, orange brown, f sand bed, undulatory, carbon rich. Truncated by fault at 18'4".
					22.5' - Fault: N75E 25NW. Thin, orange brown, silty, vf sandy gouge. Average bedding: N38E 18SE. Interbedded, silt and f sand, displaced by multiple faults down on east side 1-3 inches each fault.
28					28' - Mod. olive brown, silty clay and clayey silt with interbeds of clayey, silty vf sand.
					32.5' - Fault: N48W 43NE.
32					33' - Fault: N71W 55NE.
					34' - Fault: N34W 90. Slicks are horizontal.
36					34.5' - Fault: N52E 11SE. Slicks dip to south.
					37' - Shears: N74W 68SW, N59W 90, N72W 90 with slicks 9S, FeO stained. Nearly vertical clayey silt and clay, mod. to very plastic, highly contorted, very stiff.
40 F	F				40' - Fault: N74E 3SE. FeO stained.
	F				41' - Fault: N51W 72NE. 1 to 1.5 inch thick gouge. CaCO3 lined fault up to 1.5 inches thick. Offset by shear above. Small joints and faults below fault at 40 ft. and above ~44 ft. distort bedding.
44	F				~44' - Fault: N24E 46SE, Joint: N39W 77NE.
	F				46.5' - Fault 11E 43SE. 1/2 inch thick blue gray clay gouge (dragged in from below). Bedding is ~horizontal. Mod. olive brown, vf sandy silt.
48					49'10" - Fault: N4W 68NE. Truncated by fault at 50.5 ft.
					Nearly vertical jointing between ~44 ft. and 50.5 ft.
					50.5' - Fault: N6E 68SE. Slicks S10E 43.
52					52' - Light olive brown, silty vf-f sand.

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GEOTECHNICAL BORING LOG

BORING NO: BH-5

JOB NO: 3.31274

DEPTH	GRAPHIC LOG (S — N)	BLOW COUNT	SAMPLE NO	U.S.C.S.	FIELD DESCRIPTIONS
56					54.5' - Fault: N22W 51NE. Drag folded bedding, down on north 3 inches. Light olive brown, silty vf-f sand. 56'8" - Fault: N30W 63 NE. down on north 3 inches.
60					59.5' - CaCO3 seam. 1/2 to 2 inches thick, offset by fault, crossed by sand stringers from below. 61.5' - Sand bed, 2 inches thick, down 8 inches on north side. 63' 2" - Fault: N82W 59NE. 1/2 to 2 inch wide, orange brown, FeO lined, vertical and irregular, f-m sand stringers, rising off fault through olive brown silt and vf-f sand with silt. Light gray and orange brown, f-c sand with gravel to 1/2 inch diameter, x-bedded, loose, 66' - Bedding: Horizontal. Interbeddeds of vf sandy silt. 68' - Fault: N74W 81NE. Down 5 inches on north side.
64					
68					
72					73' - Fault: N46W 72NE. Down 2 ft. on north side, 1/4 - 1/2 inch thick clay gouge. Drag folds. 76'3" - Laminated sands.
76					
80					79.5' - Bedding: N36E 7SE. vf-f sandy, clayey silt, Light olive gray top, light orange brown to brown at base, laminated.
84					83.5' - Bedding: N53W 16SW. Light gray and olive brown, f-c sand, interbedded, x-bedded, ave. foresets trend N40E. 84.5' - Orange brown (FeO stained), light olive gray, light grey, light orange brown, f-c sand and gravelly sand with cobbles to 3 inches diameter, interbedded and x-bedded, dense.
88					
92					91' - Bedding: N64W 6SW. Light gray, f-m sand bed, 3-4 inches thick.
96					
100					100' - Total Depth
104					
108					
112					

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SGS SIERRA GEOTECHNICAL SERVICES, INC.

BORING NO: BH-6
JOB NO: 3.31274

GEOTECHNICAL BORING LOG

PROJECT: Sargent Ranch
START DATE: 8/24/15
LOCATION: Phase 4 - North Side
CLIENT: Freeman Associates
START TIME: 16:55
DRILLER: TriValley
DRILLING METHOD: Bucket Auger - 30 inch
RIG: Caldwell
END DATE: 8/25/15
LOGGED BY: RWS
GROUNDWATER DEPTH: 42.5 ft.
GROUND ELEVATION: 295 ft.
TOTAL DEPTH: 70 ft.
END TIME: 14:30

DEPTH	GRAPHIC LOG (S – N)	BLOW COUNT	SAMPLE NO	U.S.C.S.	FIELD DESCRIPTIONS
4					0-15' - Topsoil/Colluvium: Mottled, dark brown, mod. brown, mod. orange brown, and light orange gray, clayey, vf-c sand with gravel and cobbles to 5 inches diameter. Massive, sl plastic, sticky, dense. Clasts are clay coated. Resembles artificial fill.
8					
12					
16					15' - Grades into vf-c sandy gravel and cobbles with clay. Massive, matrix supported, sl plastic, sticky, dense. Clasts are clay coated. 16' - Increased cobbles, up to 10 inches diameter, matrix supported, FeO staining in seams and as coating on clasts.
20					20' - Mod. orange brown, vf-c sandy gravel and cobbles with less clay, mod. sticky. Massive to slightly graded upwards. ~23' - Groundwater level rose to here after logging.
24					
28					26.5' - Contact: Horizontal, undulatory. Dark orange brown, f-c sand and gravel, sticky, sl plastic, v moist, x-bedded. 29.5' - Fault: N76W 37NE, 3/8 inch thick, clayey sand, gouge. 31.5' - Bedding: N2E 11SE. X-bedded.
32					32.5' - Fault/shear: N58E 10 SE, slicks S35W on thin clay seam, 1/4 to 1/2 inch thick. Mostly sand lined, root lined, v plastic.
36					34.5' - Bedding?: N44E 10NW. Possible thin bed of silt. 37'5" - Fault: N63W 42NE.
40					
44					42.5' - Wet. FeO stained, sandy gravel, x-bedded. Caving. 45' - Caved to 4 ft. beyond boring diameter. Sandy gravel and gravelly sand with cobbles, x-bedded.
48					47' - Groundwater level. All lithology below this point is from bucket spoils. 49' - Gray yellow, dark yellow orange, v pale orange, vf sand with silt.
52					~52' - Blue gray, clayey, sandy, gravel with light brown and dark blue gray mottling.

CODES:

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SGS

GEOTECHNICAL BORING LOG

BORING NO: BH-6

JOB NO: 3.31274

DEPTH	GRAPHIC LOG (S – N)	BLOW COUNT	SAMPLE NO	U.S.C.S.	FIELD DESCRIPTIONS
56					Blue gray, clayey, sandy, gravel with light brown and dark blue gray mottling.
60					61.5' - Dark olive gray to olive black clay. V plastic, v stiff.
64					63' - Olive gray and olive brown, vf-f sand with trace silt.
68					66' - Dark yellow brown, f sand with trace silt.
72					68' - Dark orange brown and olive brown, gravelly f-m sand with f-c sand, interbedded.
76					70' - Total Depth
80					
84					
88					
92					
96					
100					
104					
108					
112					

CODES:

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SGS SIERRA GEOTECHNICAL SERVICES, INC.

BORING NO: BH-7
JOB NO: 3.31274

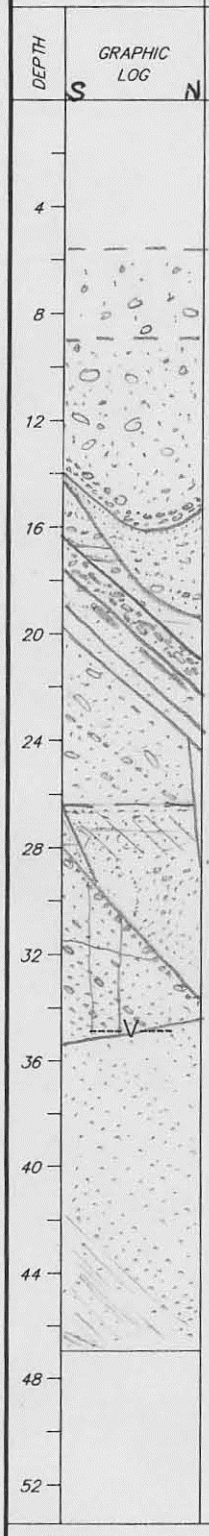
GEOTECHNICAL BORING LOG

PROJECT: Sargent Ranch
START DATE: 8/25/15

LOCATION: Phase 3 - South side
CLIENT: Freeman Associates
START TIME: 15:00

DRILLER: TriValley
DRILLING METHOD: Bucket Auger - 30 inch
RIG: Caldwell
END DATE: 8/26/15

LOGGED BY: RWS
GROUNDWATER DEPTH: 35 ft.
GROUND ELEVATION: 293 ft.
TOTAL DEPTH: 47 ft.
END TIME: 10:24



BLOW COUNT | SAMPLE NO | U.S.C.S.

FIELD DESCRIPTIONS

0-7.5' - Topsoil.

7.5'-9' - Gradational contact: From Dark brown topsoil to mod. brown clayey, f-m sand with trace gravel. Mod. plastic.

9' - Mottled light olive gray, olive gray with orange brown FeO stains around clasts, f-m sand with c sand and gravel, clasts of silty vf sand to 6 inches diameter. Jumbled together similar to artificial fill.

14'-16' - Fault contact: N62E 45NW. Down on northeast side >2 ft. Silty sand clasts and gravels drag folded into fault alignment across 1 ft. wide zone. Light orange brown to dark orange brown (FeO stained) f-m sand with trace silt and occasional gravel and cobbles to 6 inches diameter. Sand beds are contorted to: N88E 57-70NW. Several sand beds are speckled throughout with oil stains up to 1/4 inch diameter, in beds up to 6 inches thick.

19'4" - Fault: N88W 55NE. Down on northeast side several feet. 1/8 inch thick gouge.

20'10" - Fault contact. Bedding: N66W 43NE. Lith. east side; as above with a 1 ft. thick olive brown, clayey silt vf sand. West side; orange brown FeO stained, f-c sandy gravel with cobbles up to 3 inches diameter. Displacement >4 ft.

22' - Faults: N56E 49NW: Parallel, down on west.

23' - Light orange brown f-m sand with trace silt, oil sand blobs up to 2 ft. long x 4" thick.

23'10" - Fault: as above at 22 ft..

24' - Fault: as above at 22 ft. Contact: FeO stained, orange brown and olive gray, silty f-c sandy gravel with cobbles to 6 inches diameter. Dense.

26' 3" - Contact: ~N-S 2 E. Faulted, light olive gray, clayey f-c sand with ~3" thick FeO stained base, v plastic. Liquifaction features in sand beds.

26'9"-27.5' - Shears: N69E 44NW. Multiple, weakens BH walls. Bedding: E-W 49N, gravel lined.

28' - Fault or joint: N15E 86NW.

29' - Fault: N30E 77NW. No gouge, clay dragged into fault, down on SE 10 inches. X-bedded.

31.5' - Top of cave in. Multiple joints and faults causing caving.

33.5' - Fault/bedding contact: E-W 49N. Orange brown, f-c sand with gravel, loose.

35' - Fault: N9W 47SW. Orange brown, f-c sand, loose. Groundwater seepage. Caving.

~37' - Bottom of cavern, ~15 ft. wide. All lithology below this point from bucket spoils.

40' - Med. olive brown, f-m sand, loose, wet.

45' - Light olive gray, silty vf-f sand, laminated, dense.

46.5' - Gray, olive gray and blue gray, clays.

47' - Total Depth. Due to caving.

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BORING NO: BH-8
JOB NO: 3.31274

GEOTECHNICAL BORING LOG

PROJECT: Sargent Ranch
START DATE: 8/26/15
LOCATION: Phase 1 - West end
CLIENT: Freeman Associates
START TIME: 12:05
DRILLER: TriValley
DRILLING METHOD: Bucket Auger - 30 inch
RIG: Caldwell
END DATE: 8/27/15
LOGGED BY: RWS
GROUNDWATER DEPTH: Not Reached
GROUND ELEVATION: 410 ft.
TOTAL DEPTH: 99.5 ft.
END TIME: 12:30

DEPTH	GRAPHIC LOG (S – N)	BLOW COUNT	SAMPLE NO	U.S.C.S.	FIELD DESCRIPTIONS
					0-5' - Topsoil.
4					5' - Dark yellow orange, f-m sand with clay, mod. plastic, moist.
8					8' - Variegated, light to olive dark brown, dark yellow orange, silty vf sand, dense, Soft, white, CaCO3 stringers along shears. Multiple, multi-directional, small shears throughout. Bedding is highly contorted and sheared to Total Depth.
12					13' - Variegated, light to medium olive gray with dark orange brown (FeO) stringers, vf sandy silt, sl plastic, moist.
16					18' - Multiple faults and shears: N80W 66NE. Undulatory.
20					
24					
28					
32					
36					34' - Shear: N48W 90 with horizontal slicks, and Shear/joint: N75E 79SE. Multi-directional small interconnected shears to 39 ft. depth.
40					37' - Shears: N79E 90, N72W 90, N70E 77NW. Dark olive gray and med. orange brown, clay with blue gray clay in fractures and shears to 1/8 inch thick. 39' - Top of blue gray clay, plastic, moist. Shears: N20W 29NE. N60E 49SE. Wood fragments, very dark brown, hard. 43' - Fault: N-S 31E. 1/4 - 1/2 inch black gouge, multiple shears above and below.
44					49'-50' - Large piece of wood, 3x14 inches, very dark brown, hard. 50' - Shear: N31W 69NE. Crosses fault zone with no visible displacement. Large pieces of wood and fragments of fossil shells in bucket spoils. Region of multiple shears. Mottled light and dark blue gray, clay, v plastic. 50'-51' - Fault: N31W 22NE. 6 inch zone of thin black clay gouge lined faults. V. plastic. 51' - Fault/shear: N21W 63NE. 52 - Shear: N20W 51NE. Dark blue gray,clay.
48					
52					

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SGS GEOTECHNICAL BORING LOG

BORING NO: BH-8
JOB NO: 3.31274

DEPTH	GRAPHIC LOG (S / N)	BLOW COUNT	SAMPLE NO	U.S.C.S.	FIELD DESCRIPTIONS
56					52.5' - Fault: N30W 31NE. 1/2 to 1 inch thick, black, clay gouge, root lined. 53.5' - Fault: N3W 41NE. 1/4 inch black. clay gouge. Shear: N26E 69SE. 55'8" - Fault: N-S 46E. Slicks down dip. Contact: Light blue gray clayey, silty vf sand, mod plastic above fault and silty, vf sandy clay below fault.
60					57.5' - Shears: N12E 60SE, slicks 47S. N3E 57NW, horizontal slicks. Mod. blue gray, clayey, v fine, sandy silt. 58.5' - Main shear: N28W 63NE. FeO stained. 60.5' - Shear: N32W 44NE. Main shear among innumerable small shears.
64					64' - Shear: N31E 90. Vertical slicks. Blue gray, clay. With multi directional small shears adjacent to the main shear. Multi directional small shears, most are curved and with steep dips.
68					70' - Shear: N49E 64SE. No gouge. Contact: Mottled, light blue gray with olive gray, clay.
72			BH-8 70 to 72 ft.		71' - Shear: N53E 56NW. Bulk Sample: BH-8 70 to 72ft. 72' - Shear: N70W 22NE. Dominant shear. 72.5' - Shear: N16W 90. Undulatory. 74' - Fault: N80W 36NE 1/4 inch black, clay gouge. Shear: N48W 12NE. Wood fragments.
76			BH-8 75 to 80 ft.		75.5' - Fault: N63W 39NE. v thin and MnO stained. Bulk Sample: BH-8 75 to 80 ft. Multiple shears: N20W 90, slicks 59S. N1E 63SE, slicks 46S. Others - horizontal slicks. 77.5' - Faults: N68E 21NW. Parallel. 1/16 inch thick, black, clay gouge. 79.5' - Fault: N62W 19NE, slicks N41W 3-5, crenulated. 1/2 inch thick, black clay zone with polished MnO on all sheared surfaces.
80					80' - Shears: N23E 71NW. N22E 32SE, minor. Slicks are multi directional, horizontal to ~30S. All shears are crenulated and undulatory. 82.5' - Shears: N70W 59NE, slicks N39W 41. N11E 28NE, horizontal slicks, N84W 63NE slicks N56W 56.
84					85'-86' - Faults: N66W 47NE, slicks N8E 34. N88W 55NE, slicks 47NW. N62W 31NE, slicks down dip. All with 1/8 inch thick, black, clay gouge, MnO stained, polished. 87.5' - Fault: N16E 33SE. 1/2 inch black, clay gouge. Slicks due east. Gradational contact; dark blue gray, clay, v plastic.
88					88' - Shears: N86W 69NE and N64E 90. Undulatory. Many smaller shears.
92					91' - Shears: N18E 26SE and N10W 25NE. Both slicks S26E 14.
96					94' - Shear: N22W 90, slicks 64S.
100					98' - Top of Slough 99.5' - Total Depth
104					
108					
112					

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SIERRA GEOTECHNICAL SERVICES, INC.

BORING NO: BH-9
JOB NO: 3.31274

GEOTECHNICAL BORING LOG

PROJECT: Sargent Ranch
START DATE: 8/27/15

LOCATION: Phase 2 - North side
CLIENT: Freeman Associates
START TIME: 13:32

DRILLER: TriValley
DRILLING METHOD: Bucket Auger - 30 inch
RIG: Caldwell
END DATE: 8/28/15

LOGGED BY: RWS
GROUNDWATER DEPTH: Not Reached
GROUND ELEVATION: 417 ft.
TOTAL DEPTH: 100 ft.
END TIME: 12:03

DEPTH	GRAPHIC LOG (S — N)	BLOW COUNT	SAMPLE NO	U.S.C.S.	FIELD DESCRIPTIONS
					0-2' - Topsoil.
					2' - Light gray orange, silty, vf sand, with gravel and cobbles to 4 inches diameter. Dense, moist.
4					4' - Fault or joint: N78W 80NE. CaCO3 and root lined.
					2'-9' - Contact: N50W 90, undulatory bedding. South side; light orange brown and light orange gray, interbedded, v-m sand and silty sand. North side; silty, vf sand with gravel. Sandstone clasts to 4 inches diameter aligned at contact, hard.
8					Lith: Mod. orange brown, vf sandy silt and clay, with clayey, silty vf sand, dense, sl plastic.
					9' - Contact exits BH on south side, dip now 70S. Lithology on north side; olive brown, silty, vf sandy clay, sheared, grades to clayey sand on north side of BH.
12					
					14' - Bedding: N62W 83SW. Light gray orange, silty, vf sand. Dense, blocky, sl plastic.
16					16' - Joints?: N57E 57NW and N70W 56NE, thin FeO stained lines. Multiple interconnecting.
					Increase gravel content.
20					21' - Joint: N10E 79SE. FeO stained, 1/8 inch thick.
					23' - Joints: N2W 83SW, N32E 46 NW, N15E 82SE, N7W 89NE. FeO lined.
					Bedding as above at 14 ft.
24					24.5' - Gravel bed exits BH.
					Lithology: Olive gray and light orange brown vf-f sand with silt and trace gravel.
					Non-plastic, FeO stringers and stains.
28					30' - Joint: N10W 65SW. FeO lined.
					31' - Mottled orange brown, olive gray, olive brown, gravelly sand with trace clay, sl plastic, matrix supported.
32					32' - Joints: N80W 71SW, N64W 80SW.
					35' - Joint: N80E 85SE.
36					
					40' - Bedding: ~N64W 75SW. Exit sand beds from BH. Gravelly sand with cobbles.
40					
44					
					48' - Becoming clast supported, increase cobbles to 60%. Cobbles are mostly sandstone clasts, hard, well rounded, some chert, clay coated, plastic, to 8 inches diameter. ~20% is quartz, granite and metamorphics.
48					
52					

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GEOTECHNICAL BORING LOG

BORING NO: BH-9
JOB NO: 3.31274

DEPTH	GRAPHIC LOG (S N)	BLOW COUNT	SAMPLE NO	U.S.C.S.	FIELD DESCRIPTIONS
56					
60					
64					65'4" - Fault: N-S 61W, slicks down dip. 1/2 to 3/4 inch thick, dark olive gray, clay, v plastic, wet (no seepage), 4 inch thick zone of aligned clasts, pulverized.
68					69' - Greenish gray and blue gray, clayey, sand and gravel with cobbles. Gradually more bluish with depth to 72ft. Clast supported
72					72'2" - Contact: ~N30E 65NW, very irregular. Dark blue gray, sandy gravel and cobbles with clay, clast supported, sl plastic.
76					75'8" - 3 inch piece of v dark brown wood, hard. 77' - Becoming greenish.
80					Dark greenish gray, gravel and cobbles, clast supported.
84					83' - Fault: N29W 80SW. Dark blue gray, clay gouge, 1/4 inch thick. Aligned cobbles. Light greenish gray, clayey, gravelly sand with cobbles to 4 inches diameter, matrix supported, mod. plastic, massive. Still mostly sandstone clasts, well rounded, hard. 85' - Becomes dark greenish gray and clast supported with depth, clasts become aligned.
88					88' - Fault: N83W 87SW. 6inch zone of aligned clasts, alignment increases closer to fault. Multiple shears at contact in dark greenish gray clay stringers to 1/8 inch thick. Blue green on south side of fault, olive brown and light orange brown on north side. Bedding appears to parallel fault.
92					95' - Lose track of fault.
96					
100					100' - Total Depth
104					
108					
112					

CODES:

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SGS SIERRA GEOTECHNICAL SERVICES, INC.

BORING NO: BH-10
JOB NO: 3.31274

GEOTECHNICAL BORING LOG

PROJECT: Sargent Ranch			START DATE: 8/28/15
LOCATION: Phase 2 - East side	CLIENT: Freeman Associates		START TIME: 12:10
DRILLER: TriValley	DRILLING METHOD: Bucket Auger - 30 inch	RIG: Caldwell	END DATE: 8/29/15
LOGGED BY: RWS	GROUNDWATER DEPTH: Not Reached	GROUND ELEVATION: 340 ft. / TOTAL DEPTH: 99 ft.	END TIME: 10:30

DEPTH	GRAPHIC LOG	BLOW COUNT	SAMPLE NO	U.S.C.S.	FIELD DESCRIPTIONS
					0-2' - Topsoil. Light olive gray and light gray, interbedded, f-m sand with f-c sand and trace gravel to 1/2 inch diameter. X-bedded. 6' - Faults: N11E86SE, down on east side 1 ft., 1/8 inch thick, light brown, sandy gouge. Multiple x-faults with minor offset. Bedding: N89W 39NE. 12' - Fault: N13E 31SE, cuts main nearly vertical faults, down 3 inches on the east side. 14.5' - Fault exits BH. 16'2" - Bedding: N76E 49NW. Top of cobble bed, light gray, light olive gray, with black, MnO stains, f-m sandy cobbles with c-sand and gravel, 60% cobbles to 3 inches diameter, clast supported. With interbeds of cobblely, gravelly sand, matrix supported. Lith: Granite, diorite, gneiss, quartz, jasper. 24' - Bottom of cobble bed. Light gray, f-c sand, x-bedded. 26' - Bedding: N85E 39NW. F-c sandy gravel with cobbles to 3 inches diameter, matrix supported and gravelly, f-c sand. FeO staining along bedding. Increase in granite and grano-diorite clasts. 32' - Base of cobble bed. F-c sand as above. 34' - F-c sandy cobbles with gravel, Lith: as above. 35' - F-c sand with gravel interbeds in f-c sand. 41'3" - F-c sandy gravel with cobbles, FeO stained, some sandstone clasts to 6 inches. 42'3" - 5 inch thick bed as above with mod. olive gray, silt and sandstone clasts to 6 inches diameter, well rounded, hard.

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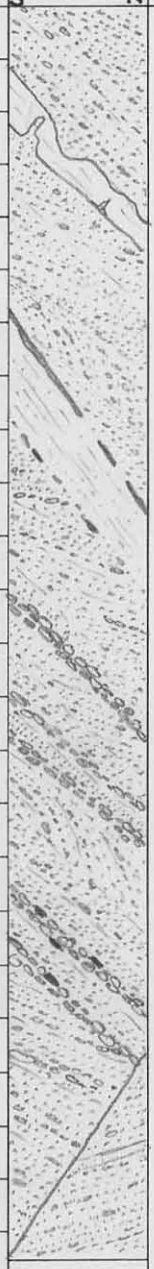
GEOTECHNICAL BORING LOG

BORING NO: BH-10
JOB NO: 3.31274

DEPTH	GRAPHIC LOG (S / N)	BLOW COUNT	SAMPLE NO	U.S.C.S.	FIELD DESCRIPTIONS
56					54'5" - Contact: N87W 49NE. Mod. olive gray, clay, sheared, mod. plastic, with clayey, vf sand and silty sand, volcano features and v irregular contacts. channeling. 56.5' - Contact: N74W 44NE. Bottom contact with sand volcano features. Light gray, light olive gray, mottled with dark blue gray, interbedded, f-c sand and gravelly, f-c sand with trace gravel, x-bedded, minor FeO staining along some beds.
60					
64					63.5 - Contact: N88W 56NE. 1.5 inch thick oil sand bed, discontinuous. Top of mod. olive gray, vf-f sand, dense.
68					67.5' - Light gray and light olive gray, f-c sand with gravel and trace cobbles interbedded with f-c sand. Minor FeO staining along bedding, x-bedded. Oil sand blebs up to 2 inches diameter at contact.
72					74' - 2 inch thick cobble bed.
76					
80					78' - 2 inch thick cobble bed. 79' - 2 inch thick cobble bed.
84					85' - 2 inch thick cobble bed. N88W 42NE. With oil sand blebs.
88					87' - 2 inch thick cobble bed. With oil sand blebs. Sand beds typically grade upwards within several inches then restart in new bed.
92					91.5' - Fault: N12E 71SE. 1/2 to 1 inch thick, light brown, sandy gouge. Down on southeast side at least 5 ft., past BH floor.
96					95' - Bedding: N25E ~35SE. Orange brown, FeO stained and partially cemented f-c sand and f-c sandy gravel, interbedded. 98' - Slough. 99' - Total Depth
100					
104					
108					
112					

CODES:

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SGS SIERRA GEOTECHNICAL SERVICES, INC

BORING NO: BH-11
JOB NO: 3.31274

GEOTECHNICAL BORING LOG

PROJECT: Sargent Ranch
START DATE: 8/29/15

LOCATION: Phase 1 - West center
CLIENT: Freeman Associates
START TIME: 11:26

DRILLER: TriValley
DRILLING METHOD: Bucket Auger - 30 inch
RIG: Caldwell
END DATE: 8/29/15

LOGGED BY: RWS
GROUNDWATER DEPTH: Not Reached
GROUND ELEVATION: 371 ft.
TOTAL DEPTH: 85 ft.
END TIME: 19:20

DEPTH	GRAPHIC LOG	BLOW COUNT	SAMPLE NO	U.S.C.S.	FIELD DESCRIPTIONS
					0-4' - Topsoil.
4					4'-5' - Large burrow.
					5' 2" - Light gray, f sand, with small shell fragments, loose.
					6.5' - Bedding: N65E 17NW. on 1 inch, light orange brown, silty vf sand bed.
8					Interbedded, light gray and light olive gray, f-c sand with gravel.
					9' - Contact: N70E 20NW. Top of gravels. Light gray, med. gray and light olive gray, interbedded and x-bedded, f-c sand, gravelly sand and sandy gravel with cobbles to 10 inches diameter. Beds are graded upwards. Lith: granite, quartz, gneiss, granodiorite, jasper and metamorphics. Caving of gravel and cobbles to 6 ft. diameter.
12					12' - Fault: N64E 64NW. Down on southeast side.
16					17.5' - Bedding? Fault?: N27E 30NW, Crossing bed of med. gray f sand, 3-5 inches thick.
					18' - Bedding: N64E 42NW. Gravel bed.
20					20' - Fault: N76E 72NW. No gouge.
					21.5' - Contact/Bedding: N65E 34NW. Irregular, 6 inch thick gravelly cobble bed in gravelly sand, graded upward.
24					23.5' - Fault: N79E 60NW, slicks 56NW. Minor parallel shears: N55W 40NE, FeO stained. Possible bedding plane/contact shear. Mod. olive gray, silty, vf sandy clay.
					25' - Grades into; Light olive brown, clayey, vf sand, mod. plastic, dense.
28					28' - Variegated and mottled, Blue gray, olive brown, olive gray, light brown, silty, vf sandy clay with random cobbles. Plastic, stiff, with minor shears.
					30' - Multiple random shears.
32					30'4" - Shear: N67E 70NW. Slicks down dip, undulatory.
					31' - Grades to light orange brown, vf-f sand with trace silt.
					32' - Shear: N78W 56NE. FeO stained.
36					39' - Contact: ~N75W 56NE, very irregular, 1/16 to 1/8 inch CaCO3 lined. Variegated and mottled, Blue gray, olive brown, olive gray, light brown, silty, vf sandy clay with random cobbles. Plastic, stiff, with minor shears. Graded up from clayey, vf sand at fault contact below.
40					~40' - Fault Contact: (see 47.5 ft.) Light olive gray, silty vf-f sand with random cobbles to 8 inches diameter.
44					46' - Contact: N86E 65NW. Sandy gravel with lense of silty, vf-f sand.
					47.5' - Fault: N89W 71NE, slicks 58W. 3/4 inch thick, clay gouge, v plastic.
48					48.5' - Contact: Wedge of silty, vf-f sand.
					51' - Contact: N72W 76NE. Sandy gravel and cobbles.
52					

CODES:

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GEOTECHNICAL BORING LOG

BORING NO: BH-11

JOB NO: 3.31274

DEPTH	GRAPHIC LOG	BLOW COUNT	SAMPLE NO	U.S.C.S.	FIELD DESCRIPTIONS
56					~51'~60' - Sandy gravel with a one inch thick bed of clayey gravel. Dips 79NW. Wedge of Silty vf-f sand. Sandy gravel and cobbles.
60					
64					65.5' - Contact: N87W 47NE. Light olive gray, light gray, and light orange brown, f sand. Interbedded and x-bedded. Top of cave in.
68					68' - Joints: N84W 73SW, multiple, parallel. Causing caving of the BH to ~10 ft. wide and down to ~80 ft.
72					
76					
80					~80' - Contact 82' - Gray green, vf sandy clay, sheared, stiff, moist.
84					85' - Total Depth
88					
92					
96					
100					
104					
108					
112					

CODES:

BH-1		TD 97 ft.	
Description	**Attitude**	**Depth bgs**	**Notes**
Bedding	N78E 30NW	7.25 ft.	
Bedding	N44E 40NW	21 ft.	
Bedding	N69E 5NW	22 ft.	
Bedding	N70W 58SE	28 ft.	
Contact	N72E 18NW	39.5 ft.	
Bedding	N77E 18NW	42 ft.	
Contact	N66E 16NW	61 ft.	
Contact	N49E 25NW	67 ft.	
Contact	N74W 30NE	71 ft.	
Ground Water		86.5 ft.	
Joint	N25W 90	86.5 ft.	
Joint	N34W 90	86.5 ft.	
Joint	N43W 83SW	86.5 ft.	

BH-2		TD 99 ft.	
Description	**Attitude**	**Depth bgs**	**Notes**
Bedding/Joint	N82E 7NW	8 ft.	
Fault	N53E 50SE	9 ft.	
Contact	N82E 8NW	14.3 ft.	
Contact	N17E 3NW	16.2 ft.	
Bedding	N49W 14NE	19 ft.	
Bedding	N87W 11NE	21 ft.	
Bedding	N81W 23 NE	22.5 ft.	
Joints	N19W 90	27 ft.	
Joint	N39W 84SW	27 ft.	
Joint	N36E 90	39 ft.	
Joint	N6E 90	43 ft.	
Bedding	N58E 23 NW	47 ft.	
Contact	N66W 11NE	61.5 ft.	
Fault	N25W 9NE	79 ft.	Slicks; N74E
Ground Water		79 ft.	
Fault	N81E 18SE	86.5 ft.	
Joints	Blocky	-86.5 ft.	

BH-3		TD 99 ft.	
Description	**Attitude**	**Depth bgs**	**Fault Notes**
Contact	Dips 6SE	11.8 ft.	
Contact	N2W 10NE	13.1 ft.	
Contact	N55W 18NE	28 ft.	
Contact	N54W 23NE	41.6 ft.	
Contact	N8E 70 SE	45 ft.	
Contact	N69E 60SE	50 ft.	
Fault	N30W 35SW	59 ft.	Slicks; S60W
Fault	N34W 29SW	59 ft.	
Bedding	N15E 51SE	59 ft.	
Ground Water		63 ft.	

BH-4		TD 103 ft.	
Description	**Attitude**	**Depth bgs**	**Notes**
Joints	N34W 72NE	2.5 ft.	
Bedding	N19W 10NE	7.5 ft.	
Joint	N38W 88NE	9 ft.	
Bedding	N83E 10NW	12 ft.	
Bedding	N79W 4NE	17 ft.	
Fault	N25E 41NW	26 ft.	
Contact	N84W 4NE	35 ft.	
Contact	Horizontal	60 ft.	
Bedding	N31E 4NW	62 ft.	
Joint	N25W 88NE	82 ft.	
Contact	N19W 7NE	86 ft.	
Contact	N45W 8NE	90 ft.	
Contact	N30E 11NW	94.5 ft.	
Ground Water		94.5 ft.	
Contact	N45W 11 NE	99 ft.	

BH-5		TD 100 ft.	
Description	**Attitude**	**Depth bgs**	**Notes**
Fault	N22W 34SW	5.5 ft.	
Fault	N73W 53NE	7 ft.	Dn on N, 2in.
Fault	N74E 76SE	7.5 ft.	Slicks; N84E 14, Dn on N, 2 in.
Joint	N75E 84SE	7.5 ft.	
Shear	N60W 78NE	9.5 ft.	
Shear	N17W 26SW	10 ft.	
Shear	N24W 45SW	11.75 ft.	Slicks; S83W 18
Shears	N41W 67SW	14 ft.	
Shear	N37E 53NW	14.5 ft.	
Joint	N76W 90	16 ft.	
Shear	N54W 64NE	17.3 ft.	
Joint	N63W 90	18 ft.	
Fault	E-W 22S	18.3 ft.	
Bedding	N86W 7SW	19.7 ft.	
Faults	N75E 25NW	22.5 ft.	Dn on S, 1-3in.
Bedding	N38E 18SE	22.5 ft.	
Fault	N48W43NE	32.5 ft.	
Fault	N71W 55NE	33 ft.	
Fault	N34W 90	34 ft.	Slicks; Horiz.
Fault	N52E 11SE	34.5 ft.	Slicks; Dip to S.
Shears	N74W 68SW	37 ft.	
Shears	N59W 90	37 ft.	
Shears	N72W 90	37 ft.	Slicks; 9S
Fault	N74E 3SE	40 ft.	
Fault	N51W 72 NE	41 ft.	
Fault	N24E 46SE	44 ft.	
Joint	N39W 77NE	44 ft.	
Fault	N11E 43SE	46.5 ft.	
Bedding	Horizontal	46.5 ft.	
Fault	N4W 68NE	49.9 ft.	
Joints	Vertical	44 ft. to 50 ft.	
Fault	N6E 68SE	50.5 ft.	Slicks; S10E 43
Fault	N22W 51NE	54.5 ft.	Dn on N, 3in.
Fault	N30W 63NE	56.7 ft.	Dn on N, 3in.
Fault	N82W 59NE	63.1 ft.	
Bedding	Horizontal	66 ft.	
Fault	N74W 81NE	68 ft.	Dn on N, 5in.
Fault	N46W 72NE	73 ft.	Dn on N, 2ft.
Bedding	N36E 7SE	79.5 ft.	
Bedding	N53W 16SW	83.5 ft.	
Bedding	N64W 6SW	91 ft.	

BH-6		TD 70 ft.	
Description	**Attitude**	**Depth bgs**	**Notes**
Contact	Horizontal	26.5 ft.	
Fault	N76W 37NE	29.5 ft.	
Bedding	N2E 11SE	31.5 ft.	
Fault	N58E 10SE	32.5 ft.	Slicks; S35W
Bedding	N44E 10NW	34.5 ft.	
Fault	N63W 42NE	37.5 ft.	
Ground Water		47 ft.	

BH-7		TD 47 ft.	
Description	**Attitude**	**Depth bgs**	**Notes**
Fault	N632E 45NW	14 ft.	Dn on S, >2ft.
Bedding	N88E 57-70NW	14 ft.	
Fault	N88W 55NE	19.3 ft.	Dn on N, >3ft.
Fault/Contact	N66W 43NE	20.9 ft.	Disp. >4 ft.
Faults	N56E 49NW	22 ft.	Dn on N.
Fault	N56E 49NW	23.9 ft.	
Fault	N56E 49NW	24 ft.	
Contact	N-S 2E	26.25 ft.	
Shears	N69E 44NW	26.8 to 27.5 ft.	
Bedding	E-W 49N	27 ft.	
Fault	N15E 86NW	28 ft.	
Fault	N30E 77NW	29 ft.	Dn on S, 10in.
Fault/Contact	E-W 49N	33.5 ft.	
Fault	N9W 47SW	35 ft.	
Ground Water		35ft.	

BH-8		TD 99.5 ft.	
Description	**Attitude**	**Depth bgs**	**Notes**
Faults/Shears	N80W 66NE	8 to 39 ft.	
Shear	N48W 90	34 ft.	Slicks; Horiz.
Shear/Joint	N75E 79SE	34 ft.	
Shears	N79E 90	37 ft.	
Shear	N72W 90	37 ft.	
Shear	N70E 77NW	37 ft.	
Shear	N20W 29NE	39 ft.	
Shear	N60E 49SE	39 ft.	
Fault	N-S 31E	43 ft.	
Shear	N31W 69NE	50 ft.	
Fault	N21W 63NE	51 ft.	
Shear	N20W 51NE	52 ft.	
Fault	N30W 31NE	52.5 ft.	
Fault	N3W 41NE	53.5 ft	
Shear	N26E 69SE	53.5 ft	
Fault/Contact	N-S 46E	55.7 ft.	Slicks; Dn dip
Shears	N12E 60SE	57.5 ft.	Slicks; 47S
Shears	N3E 57NW	57.5 ft.	Slicks; Horiz.
Fault/Shear	N28W 63NE	58.5 ft.	
Shears	N32W 44NE	60.5 ft.	
Shear	N31E 90	64 ft.	Slicks; Vert.
Shear/Contact	N49E 64SE	70 ft.	
Shear	N53E 56NW	71 ft.	
Shear	N70W 22NE	72 ft.	
Shear	N16W 90	72.5 ft.	
Fault	N80W 36NE	74 ft.	
Shear	N48W 12 NE	74 ft.	
Fault	N63W 39NE	75.5 ft.	
Shears	N20W 90	75.5 ft.	Slicks; 59S
Shears	N1E 63NE	75.5 ft.	Slicks; 46S
Faults	N68E 21NW	77.5 ft.	Parallel
Fault	N62W 19NE	79.5 ft.	Slicks; N41W 3-5
Shears	N23E 71NW	80 ft.	
Shears	N22E 32SE	80 ft.	
Shears	N70W 59NE	82.5 ft.	Slicks; N39W 41
Shears	N11E 28NE	82.5 ft.	Slicks; Horiz.
Shears	N84W 63NE	82.5 ft.	Slicks; N56W 56
Fault	N66W 47NE	85 to 86 ft.	Slicks; N8E 34
Fault	N88W 55NE	85 to 86 ft.	Slicks; 47NW
Fault	N62W 31NE	85 to 86 ft.	Slicks; Dn dip
Fault	N16E 33SE	87.5 ft.	Slicks; E
Shears	N86W 69NE	88 ft.	
Shears	N64E 90	88 ft.	
Shear	N18E 26SE	91 ft.	Slicks; S26E 14
Shear	N10W 25NE	91 ft.	Slicks; S26E 14
Shear	N22W 90	94 ft.	Slicks; 64S

BH-9		TD 100 ft.	
Description	**Attitude**	**Depth bgs**	**Notes**
Fault	N78W 80NE	4 ft.	
Contact	N50W 90	2 to 9 ft.	
Bedding	N62W 83SW	14 ft.	
Joint	N57E 57NW	16 ft.	
Joint	N70W 56NE	16 ft.	
Joint	N10E 79SE	21 ft.	
Joint	N2W 83SW	23 ft.	
Joint	N32E 46NW	23 ft.	
Joint	N15E 82 SE	23 ft.	
Joint	N7W 89NE	23 ft.	
Bedding	N62W 83SW	23 ft.	
Joint	N10W 65SW	30 ft.	
Joint	N80W 71SW	32 ft.	
Joint	N64W 80SW	32 ft.	
Joint	N80E 85SE	35 ft.	
Bedding	N64W 75SW	40 ft.	
Fault	N-S 61W	65.3 ft.	Slicks; Dn dip
Contact	N30E 65NW	72.1 ft.	
Fault	N29W 80SW	83 ft.	
Fault	N83W 87SW	88 ft.	

BH-10		TD 99 ft.	
Description	**Attitude**	**Depth bgs**	**Notes**
Faults	N11E 86SE	6 ft.	Dn on S, 1ft.
Bedding	N89W 39NE	6 ft.	
Fault	N13E 31SE	12 ft.	Dn on S, 3in.
Bedding/Contact	N76E 49NW	16.2 ft.	
Bedding	N85E 39NW	26 ft.	
Contact	N87W 49NE	54.5 ft.	
Contact	N74W 44NE	56.5 ft.	
Contact	N88W 56NE	63.5 ft.	
Bedding	N88W 42NE	85 ft.	
Fault	N12E 71SE	91.5 ft.	
Bedding	N25E 35SE	95 ft.	

BH-11		TD 85 ft.	
Description	**Attitude**	**Depth bgs**	**Notes**
Bedding	N65E 17NW	6.5 ft.	
Contact	N70E 20NW	9 ft.	
Fault	N64E 64NW	12 ft.	Dn on S,
Bedding	N64E 42NW	18 ft.	
Fault	N76E 72NW	20 ft.	
Bedding/Contact	N65E 34NW	21.5 ft.	
Fault/Contact	N79E 60NW	23.5 ft.	Slicks; 56NW
Shears	N55W 40NE	23.5 ft.	
Shear	N67E 70NW	30.3 ft.	Slicks; Dn dip
Shear	N78W 56NE	32 ft.	
Contact	N75W 56NE	39 ft.	
Contact	N86E 65NW	46 ft.	
Fault/Contact	N89W 71NE	36 to 47.5 ft.	Slicks; 58W
Contact	N72W 76NE	51 ft.	
Bedding	79NW	51 to 60 ft.	
Contact	N87W 47NE	65.5 ft.	
Joints	N84W 73SW	68 ft.	

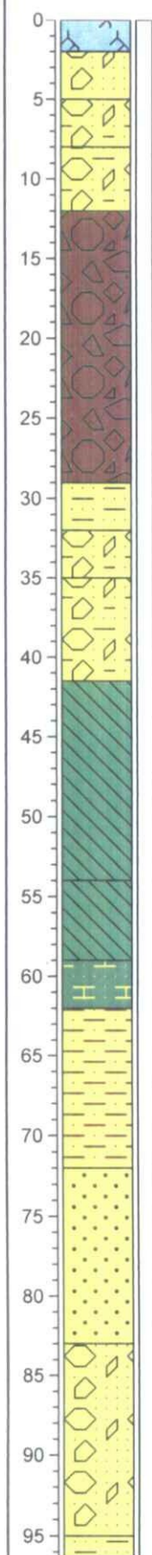
SAND AND GRAVEL LOG

PROJECT NAME: Sargent Ranch **HOLE #:** SRB07-1 **GEOLOGIST:** TMF **DATE:** 06/6/2007

LOCATION: **BRANCH:** Monterey Bay **PROJECT CONTACT:** Kashawagi **STATE:** CA **COUNTY:** Santa Clara **SECTION:**
UTM ZONE: 10 **DATUM:** NAD83 **EASTING:** 628215 **NORTHING:** 4087578 **ELEVATION:** 490'

DRILLING INFORMATION: **CONTRACTOR:** Great West Drilling **DRILLER:** Benson **DRILL RIG TYPE:** Becker
DRILLING METHOD: Air Hammer **HOLE SIZE [OD/ID]:** 6"/4"

HOLE INFORMATION: **TOTAL DEPTH:** 360' **ANGLE:** -90 **BEARING:**
PLUG TYPE: N/A **DEPTH:** N/A **WATER LEVEL DEPTH:** N/A



Depth (ft.)	Lithologic Description	Field Notes (Testing Data, Other Observations)
0	(0) OB	
5	(2) silty sand with 20% 1x4, angular, well graded	
10	(5) clayey sand and 1x4, clay clasts and coating on rock	
15	(8) clayey/silty sand, medium grained, 10% rock	
20	(12) dirty sand and gravel, 30% rock, sub rounded, dirty	
30	(29) silty sand, red	
35	(32) silty sand and rock, 30-40% gravel, fine sand	
40	(35) clayey silty sand, coarser, 30% rock	
45	(42) clay	
55	(54) blue gray clay	
60	(59) silty clay	
65	(62) silt	
75	(72) clean sand, well graded, angular no rock	
85	(83) clean coarse sand with pea gravel and 1x4 30-50%	
95	(95) silty sand, some rock	

SAND AND GRAVEL LOG

PROJECT NAME: Sargent Ranch **HOLE #:** SRB07-1 **GEOLOGIST:** TMF **DATE:** 06/6/2007

LOCATION: **BRANCH:** Monterey Bay **PROJECT CONTACT:** Kashawagi **STATE:** CA **COUNTY:** Santa Clara **SECTION:**
UTM ZONE: 10 **DATUM:** NAD83 **EASTING:** 628215 **NORTHING:** 4087578 **ELEVATION:** 490'

DRILLING INFORMATION: **CONTRACTOR:** Great West Drilling **DRILLER:** Benson **DRILL RIG TYPE:** Becker
DRILLING METHOD: Air Hammer **HOLE SIZE [OD/ID]:** 6"/4"

HOLE INFORMATION: **TOTAL DEPTH:** 360' **ANGLE:** -90 **BEARING:**
PLUG TYPE: N/A **DEPTH:** N/A **WATER LEVEL DEPTH:** N/A

Depth (ft.)	Graphic Log	Sample Interval	Sample ID	USCS	Lithologic Description	Field Notes (Testing Data, Other Observations)
100					(98) clean sand and some rock, <10%	
105						
110						
115						
120					(116) gravel with silt coating little sand	
125					(120) rock, little fines, hard, angular, 1" pieces, blue, crystalline?	
130						
135					(130) clay, very hard, some supported gravel	
140						
145					(140) sandy clay	
150					(145) clay coated pea gravel and little sand, gravel is angular, clay is very hard	
155					(152) silty clay	
160					(153) silty sand with rock, pea gravel and 1x4, dirty silt coated	
165					(154) dirty sand and gravel but with 2" sub rounded cobbles of very hard rock	
170					(163) silty clay with minor entrappped gravel, dark brown	
175					(171) reddish silty sand	
180					(172) reddish brown clay	
185					(173) fine red silty sand	
190					(176) grayish silty clay	
					(177) red silt	
					(180) blue clay	
					(187) reddish silty sand	

SAND AND GRAVEL LOG

PROJECT NAME: Sargent Ranch **HOLE #:** SRB07-1 **GEOLOGIST:** TMF **DATE:** 06/6/2007

LOCATION: **BRANCH:** Monterey Bay **PROJECT CONTACT:** Kashawagi **STATE:** CA **COUNTY:** Santa Clara **SECTION:**
UTM ZONE: 10 **DATUM:** NAD83 **EASTING:** 628215 **NORTHING:** 4087578 **ELEVATION:** 490'

DRILLING INFORMATION: **CONTRACTOR:** Great West Drilling **DRILLER:** Benson **DRILL RIG TYPE:** Becker
DRILLING METHOD: Air Hammer **HOLE SIZE [OD/ID]:** 6"/4"

HOLE INFORMATION: **TOTAL DEPTH:** 360' **ANGLE:** -90 **BEARING:**
PLUG TYPE: N/A **DEPTH:** N/A **WATER LEVEL DEPTH:** N/A

Depth (ft.)	Graphic Log	Sample Interval	Sample ID	USCS	Lithologic Description	Field Notes (Testing Data, Other Observations)
195					(191) gray silt and clay, hard	
200						
205					(202) black sand and gravel	
210					(205) silty black sand	
215					(213) brown silt	
220					(214) silt and gravel, hard, dark blue/gray, 90% rock, hard and angular	
225					(220) silt and gravel, dirty, angular	
230					(225) clean silty sand no rock, well graded, sub rounded	
235					(234) clay with silt, blue gray and tan	
240					(240) dirty silty sand and gravel, hard dark blue, angular	
245					(247) blue gray clay	
250					(250) dark blue silt, about 256 started to coarsen up with more sand and <10% pea gravel, some silt cemented sand clasts	
255						
260					(260) blue silt with occasional coarse layers, 265 silty clay clasts	
265						
270					(270) silty clay, getting harder	
275						
280					(280) blue clay	using water
285						

SAND AND GRAVEL LOG

PROJECT NAME: Sargent Ranch **HOLE #:** SRB07-1 **GEOLOGIST:** TMF **DATE:** 06/6/2007

LOCATION: **BRANCH:** Monterey Bay **PROJECT CONTACT:** Kashawagi **STATE:** CA **COUNTY:** Santa Clara **SECTION:**
UTM ZONE: 10 **DATUM:** NAD83 **EASTING:** 628215 **NORTHING:** 4087578 **ELEVATION:** 490'

DRILLING INFORMATION: **CONTRACTOR:** Great West Drilling **DRILLER:** Benson **DRILL RIG TYPE:** Becker
DRILLING METHOD: Air Hammer **HOLE SIZE [OD/ID]:** 6"/4"

HOLE INFORMATION: **TOTAL DEPTH:** 360' **ANGLE:** -90 **BEARING:**
PLUG TYPE: N/A **DEPTH:** N/A **WATER LEVEL DEPTH:** N/A

Depth	Graphic Log	Sample Interval	Sample ID	USCS	Lithologic Description	Field Notes (Testing Data, Other Observations)
290					(290) blue clay	
295						
300					(300) blue clay	
305						
310					(310) blue clay	
315						
320					(320) clay	
325						
330					(330) clay	
335					(335) clay supported rock fragments, all sizes including sand, chert, metaseds, greenish clay	
340					(340) same except more clay and small layer of all gravel, angular, basalt?	
345						
350					(350) clay	
355						
360						

SAND AND GRAVEL LOG

PROJECT NAME: Sargent Ranch **HOLE #:** SRB07-2 **GEOLOGIST:** TMF **DATE:** 06/09/2007

LOCATION: **BRANCH:** Monterey Bay **PROJECT CONTACT:** Kashawagi **STATE:** CA **COUNTY:** Santa Clara **SECTION:**
UTM ZONE: 10 **DATUM:** NAD83 **EASTING:** 628421 **NORTHING:** 4087463 **ELEVATION:** 362'

DRILLING INFORMATION: **CONTRACTOR:** Great West Drilling **DRILLER:** Benson **DRILL RIG TYPE:** Becker
DRILLING METHOD: Air Hammer **HOLE SIZE [OD/ID]:** 6"/4"

HOLE INFORMATION: **TOTAL DEPTH:** 250' **ANGLE:** -90 **BEARING:**
PLUG TYPE: N/A **DEPTH:** N/A **WATER LEVEL DEPTH:** N/A

Depth (ft.)	Graphic Log	Sample Interval	Sample ID	USCS	Lithologic Description	Field Notes (Testing Data, Other Observations)
0					(0) topsoil	
5					(2) silt and gravel, 1x4	
10					(6) dirty sand and gravel, mostly pea gravel some 1/2" rock	
15					(12) clean sand and gravel, some clay coating on rock	
20					(17) more coarse sand less rock only pea gravel orangish gold in color	
25						
30					(30) same	
35						
40					(40) same	
45					(45) dirty sand and gravel, more gravel, some silty clay clasts, rock is hard and sub rounded and breaks on angular clasts	
50						
55						
60					(60) dirty sand and gravel	
65					(62) clay with sand and gravel	
70					(65) silty sand and gravel with clay clasts	
75						
80					(75) clay with silty sand	
85					(79) clayey sand and gravel	
90					(82) blue clay	
95					(86) silt	
100					(96) blue silty clay	
105					(102) brown clay using water more silty	
110						

SAND AND GRAVEL LOG

PROJECT NAME: Sargent Ranch **HOLE #:** SRB07-2 **GEOLOGIST:** TMF **DATE:** 06/09/2007

LOCATION: **BRANCH:** Monterey Bay **PROJECT CONTACT:** Kashawagi **STATE:** CA **COUNTY:** Santa Clara **SECTION:**
UTM ZONE: 10 **DATUM:** NAD83 **EASTING:** 628421 **NORTHING:** 4087463 **ELEVATION:** 362'

DRILLING INFORMATION: **CONTRACTOR:** Great West Drilling **DRILLER:** Benson **DRILL RIG TYPE:** Becker
DRILLING METHOD: Air Hammer **HOLE SIZE [OD/ID]:** 6"/4"

HOLE INFORMATION: **TOTAL DEPTH:** 250' **ANGLE:** -90 **BEARING:**
PLUG TYPE: N/A **DEPTH:** N/A **WATER LEVEL DEPTH:** N/A

Depth (ft.)	Graphic Log	Sample Interval	Sample ID	USCS	Lithologic Description	Field Notes (Testing Data, Other Observations)
110						
115					(111) silty sand, cemented clasts of sand and pea gravel that are silty coated	
120						
125						
130						
135						
140						
145						
150						
155						
160						
165						
170					(168) blue silty clay, hard, comes out in fragments	
175						
180					(178) black silt some cemeneted	
185					(184) blue silt and gravel	
190					(185) blue clayey silt brown, silty sand layers	
195						
200						
205						
210					(211) blue silt	
215					(213) brown silt	
					(216) silty sand	

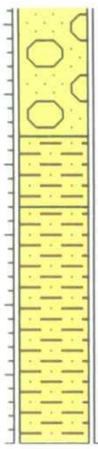
SAND AND GRAVEL LOG

PROJECT NAME: Sargent Ranch **HOLE #:** SRB07-2 **GEOLOGIST:** TMF **DATE:** 06/09/2007

LOCATION: **BRANCH:** Monterey Bay **PROJECT CONTACT:** Kashawagi **STATE:** CA **COUNTY:** Santa Clara **SECTION:**
UTM ZONE: 10 **DATUM:** NAD83 **EASTING:** 628421 **NORTHING:** 4087463 **ELEVATION:** 362'

DRILLING INFORMATION: **CONTRACTOR:** Great West Drilling **DRILLER:** Benson **DRILL RIG TYPE:** Becker
DRILLING METHOD: Air Hammer **HOLE SIZE [OD/ID]:** 6"/4"

HOLE INFORMATION: **TOTAL DEPTH:** 250' **ANGLE:** -90 **BEARING:**
PLUG TYPE: N/A **DEPTH:** N/A **WATER LEVEL DEPTH:** N/A

Depth (ft.)	Graphic Log	Sample Interval	Sample ID	USCS	Lithologic Description	Field Notes (Testing Data, Other Observations)
220					(217) silty sand and pea gravel	
225						
230					(228) blue silt	
235					(233) brown silty sand, perched water	
240						
245						
250						

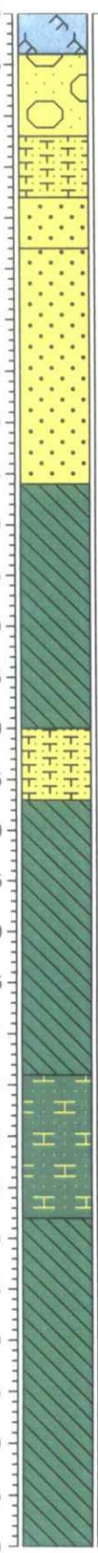
SAND AND GRAVEL LOG

PROJECT NAME: Sargent Ranch **HOLE #:** SRB07-3 **GEOLOGIST:** TMF **DATE:** 06/12/2007

LOCATION: **BRANCH:** Monterey Bay **PROJECT CONTACT:** Kashawagi **STATE:** CA **COUNTY:** Santa Clara **SECTION:**
UTM ZONE: 10 **DATUM:** NAD83 **EASTING:** 628902 **NORTHING:** 4087279 **ELEVATION:** 270'

DRILLING INFORMATION: **CONTRACTOR:** Great West Drilling **DRILLER:** Benson **DRILL RIG TYPE:** Becker
DRILLING METHOD: Air Hammer **HOLE SIZE [OD/ID]:** 6"/4"

HOLE INFORMATION: **TOTAL DEPTH:** 150' **ANGLE:** -90 **BEARING:**
PLUG TYPE: N/A **DEPTH:** N/A **WATER LEVEL DEPTH:** N/A

Depth (ft.)	Graphic Log	Sample Interval	Sample ID	USCS	Lithologic Description	Field Notes (Testing Data, Other Observations)
0					(0) OB	
5					(4) sand and rock, clay clasts	
10						
15					(12) silty sand	
20					(18) coarse sand with fines	
25					(23) sand and <10% rock	
30						
35						
40						
45						
50					(46) blue clay	
55						
60						
65						
70					(70) silty sand	
75						
80					(77) hard clay	
85						
90						
95						
100						
105					(104) silty clay	
110						
115						
120					(118) clay	
125						
130						
135						
140						
145						
150						

SIERRA GEOTECHNICAL SERVICES, INC.

TEST PIT LOGS

JOB NO: 3.31274 **PROJECT:** Sargent Ranch
DATE: 6/15/2015 **LOGGED BY:** RS
LOCATION: Phase 3/4, East Side (See Map)

TEST PIT	DEPTH (FT)	U.S.C.S. GROUP SYMBOL	SAMPLE DEPTH	PERCENT MOISTURE	DRY DENSITY (pcf)	DESCRIPTION
1	0 – 2.5	SC-SM				**TOPSOIL/COLLUVIUM** Dark brown, damp to moist, loose to medium dense, silty to clayey, very fine SAND, trace gravels.
	2.5 - 5	SM				**Non Marine Sediments -Tscn** Yellowish-brown to light reddish brown, moist, dense, silty, very fine SAND. Bed N63°W, 3°NE.
	5 - 8	SM				Yellowish-brown, with trace gravels. Cross bedding noted. ---------- *Total Depth 8-feet. No groundwater encountered.*

LOCATION: Phase 3/4, Northeast Side (See Map)

TEST PIT	DEPTH (FT)	U.S.C.S. GROUP SYMBOL	SAMPLE DEPTH	PERCENT MOISTURE	DRY DENSITY (pcf)	DESCRIPTION
2	0 – 2	SC-SM				**TOPSOIL/COLLUVIUM** Dark brown to black, damp to moist, loose to medium dense, silty to clayey, very fine SAND, trace gravels.
	2 - 4	SM				Gradational contact – Yellowish-brown to grayish-orange, dense, silty to clayey, very fine SAND, with rounded cobbles to 4" diameter.
	4 – 6	SM				**Tscn** Yellowish-brown to light reddish brown, moist, dense, silty, very fine SAND. N63°W, 3°NE.
	6 – 8.5	ML-SM				Very fine sandy gravels to 2" diameter overlying very fine sandy SILT, with trace Clay. Sharp contact at 7 feet, N24°E, 13°NW. ---------- *Total Depth 8.5-feet. No groundwater encountered.*

SIERRA GEOTECHNICAL SERVICES, INC.

TEST PIT LOGS

JOB NO: 3.31274 **PROJECT:** Sargent Ranch
DATE: 6/15/2015 **LOGGED BY:** RS
LOCATION: Phase 3/4, Northeast Side (See Map)

TEST PIT	DEPTH (FT)	U.S.C.S. GROUP SYMBOL	SAMPLE DEPTH	PERCENT MOISTURE	DRY DENSITY (pcf)	DESCRIPTION
3	0 – 3	SC-SM				**TOPSOIL/COLLUVIUM** Dark brown, damp to moist, loose to medium dense, silty to clayey, very fine to medium SAND. Bioturbated.
	3 - 5	SM				**Tscn** Yellowish-brown to light reddish brown, moist, dense, silty, very fine to coarse SAND. Bedding 14° NE. --- *Total Depth 5-feet. No groundwater encountered.*

LOCATION: Phase 3/4, Northeast Side (See Map)

TEST PIT	DEPTH (FT)	U.S.C.S. GROUP SYMBOL	SAMPLE DEPTH	PERCENT MOISTURE	DRY DENSITY (pcf)	DESCRIPTION
4	0 – 3.5	SC-SM				**TOPSOIL/COLLUVIUM** Dark brown, damp to moist, loose to medium dense, silty to clayey, very fine SAND, with trace gravels.
	3.5 - 7	SM				**Tscn** Olive-brown, moist, firm, silty to clayey, very fine to coarse SAND with trace rounded gravels to 1" diameter. --- *Total Depth 7-feet. No groundwater encountered.*

SIERRA GEOTECHNICAL SERVICES, INC.

TEST PIT LOGS

JOB NO: 3.31274 **PROJECT:** Sargent Ranch
DATE: 6/15/2015 **LOGGED BY:** RS
LOCATION: Phase 3/3, Northeast Side (See Map)

TEST PIT	DEPTH (FT)	U.S.C.S. GROUP SYMBOL	SAMPLE DEPTH	PERCENT MOISTURE	DRY DENSITY (pcf)	DESCRIPTION
5	0 – 3	SC-SM				**TOPSOIL/COLLUVIUM** Dark to medium brown, damp to moist, loose to medium dense, silty to clayey, very fine SAND with fine to coarse sandy gravels.
	3 – 8.5	SM				**Tscn** Brown to yellowish-brown, moist, dense, silty, very fine SAND. @ 43" possible slide plane N35°W, 4°NE. Light olive to light gray sine to medium SAND, with cross beds – N37°W, 19°SW and N69°E, 37°NW. --- *Total Depth 8.5-feet. No groundwater encountered.*

LOCATION: Phase 3/4, North Central (See Map)

TEST PIT	DEPTH (FT)	U.S.C.S. GROUP SYMBOL	SAMPLE DEPTH	PERCENT MOISTURE	DRY DENSITY (pcf)	DESCRIPTION
6	0 – 3.5'	SC-SM				**TOPSOIL/COLLUVIUM** Dark brown, damp to moist, loose to medium dense, silty to clayey, very fine SAND, with trace gravels and cobbles to 6" diameter. Carbonate staining between 2-3.5'.
	3.5 - 7	SM				**Tscn** Brown. moist, dense, silty, very fine SAND, with trace clay, and interbeds of very fine sandy gravel. Cobbles to 4"diameter. Horizontal bedding. --- *Total Depth 7-feet. No groundwater encountered.*

SIERRA GEOTECHNICAL SERVICES, INC.

TEST PIT LOGS

JOB NO: 3.31274 **PROJECT:** Sargent Ranch
DATE: 6/16/2015 **LOGGED BY:** RS
LOCATION: Phase 3/3, North Central (See Map)

TEST PIT	DEPTH (FT)	U.S.C.S. GROUP SYMBOL	SAMPLE DEPTH	PERCENT MOISTURE	DRY DENSITY (pcf)	DESCRIPTION
7	0 – 34"	SC-SM				**TOPSOIL/COLLUVIUM** Dark brown to light reddish brown, damp to moist, loose to medium dense, silty to clayey, very fine SAND with fine to coarse sandy gravels. Minor cobbles to 6" diameter.
	34" – 8.5	SM				**Tscn** Yellowish-brown, moist, dense, silty, very fine SAND with thin interbeds of light olive gray silt, and sandy gravels. Increase of gravels and cobbles up to 60% of deposit. Horizontal bedding. --- *Total Depth 8.5-feet. No groundwater encountered.*

LOCATION: Phase 3/4, North Central (See Map)

TEST PIT	DEPTH (FT)	U.S.C.S. GROUP SYMBOL	SAMPLE DEPTH	PERCENT MOISTURE	DRY DENSITY (pcf)	DESCRIPTION
8	0 – 33"	SC-SM				**TOPSOIL/COLLUVIUM** Dark brown, damp to moist, loose to medium dense, silty to clayey, very fine SAND, with trace white mudstone clasts.
	3.5 - 7	ML-SM				**Tscn** Dark gray to yellowish-brown. moist, dense, silty, very fine SAND, with interbeds of sandy and clayey SILT. Iron and Manganese staining. N-S, 13°E at 58". --- *Total Depth 7-feet. No groundwater encountered.*

SIERRA GEOTECHNICAL SERVICES, INC.

TEST PIT LOGS

JOB NO: 3.31274 **PROJECT:** Sargent Ranch
DATE: 6/16/2015 **LOGGED BY:** RS
LOCATION: Phase 3/4, North Central (See Map)

TEST PIT	DEPTH (FT)	U.S.C.S. GROUP SYMBOL	SAMPLE DEPTH	PERCENT MOISTURE	DRY DENSITY (pcf)	DESCRIPTION
9	0 – 15"	SC-SM				**TOPSOIL/LANDSLIDE DEPOSITS** Dark brown to light reddish brown, damp to moist, loose to medium dense, silty to clayey, very fine SAND with fine to coarse sandy gravels. Minor cobbles to 6" diameter.
	15" – 5	SM				**Landslide Deposits (Qls)** Medium brown to reddish-brown, moist, medium dense, fine to coarse sandy gravels and cobbles. Iron and Manganese staining. Apparent dip 12° NE. No bedding. --- *Total Depth 5-feet. No groundwater encountered.*

LOCATION: Phase 3/4, North Central (See Map)

TEST PIT	DEPTH (FT)	U.S.C.S. GROUP SYMBOL	SAMPLE DEPTH	PERCENT MOISTURE	DRY DENSITY (pcf)	DESCRIPTION
10	0 – 18"	SM				**TOPSOIL/COLLUVIUM** Dark brown to dark yellowish-brown, moist, loose to medium dense, silty, very fine to coarse SAND, with gravels and cobbles to 6" diameter.
	18" – 6.5'	ML-SM				**Tscn** Medium brown to dark orange-brown, moist, dense, silty, very fine SAND, with gravels and cobbles to 6" diameter. Minor clay. At 6' approximate 4" thick sand bed, very fine to coarse. N76°W, 2S°W. --- *Total Depth 6.5 feet. No groundwater encountered.*

SIERRA GEOTECHNICAL SERVICES, INC.

TEST PIT LOGS

JOB NO: 3.31274 **PROJECT:** Sargent Ranch
DATE: 6/16/2015 **LOGGED BY:** RS
LOCATION: Phase 3/4, West (See Map)

TEST PIT	DEPTH (FT)	U.S.C.S. GROUP SYMBOL	SAMPLE DEPTH	PERCENT MOISTURE	DRY DENSITY (pcf)	DESCRIPTION
11	0 – 2	SC-SM				**TOPSOIL/COLLUVIUM** Dark yellowish brown, moist, loose to medium dense, silty to very fine to coarse SAND with fine to coarse sandy gravels. Minor cobbles to 6" diameter.
	2 – 6.5	SM				**Tscn** Dark reddish-brown to yellowish gray, moist, medium dense, silty, very fine to coarse SAND, trace clay, moderate gravels and cobbles, iron stringers. Multiple fractures, clay infill. Average attitude - N40°W, 40-50°SW. --- *Total Depth 6.5-feet. No groundwater encountered.*

LOCATION: Phase 3/4, West (See Map)

TEST PIT	DEPTH (FT)	U.S.C.S. GROUP SYMBOL	SAMPLE DEPTH	PERCENT MOISTURE	DRY DENSITY (pcf)	DESCRIPTION
12	0 – 18"	SM				**TOPSOIL/COLLUVIUM** Dark brown, moist, loose to medium dense, silty, very fine to coarse SAND, with gravels and cobbles to 5" diameter. Clasts are mudstone/shale.
	18" – 7	SM				**Tscn** Dark orange-brown to gray, moist, dense, silty, very fine to coarse SAND, with gravels and cobbles to 6" diameter (mudstone). Minor clay. Iron and manganese staining throughout. 30% clasts. Faulting/fracturing (?) along south side of trench noted (N15°W, 90°) from bottom to base of contact with topsoil. --- *Total Depth 7-feet. No groundwater encountered.*

SIERRA GEOTECHNICAL SERVICES, INC.

TEST PIT LOGS

JOB NO: 3.31274 **PROJECT:** Sargent Ranch
DATE: 6/16/2015 **LOGGED BY:** RS
LOCATION: Phase 3/4, West (See Map)

TEST PIT	DEPTH (FT)	U.S.C.S. GROUP SYMBOL	SAMPLE DEPTH	PERCENT MOISTURE	DRY DENSITY (pcf)	DESCRIPTION
13	0 – 32"	SC-SM				**TOPSOIL/COLLUVIUM** Dark brown to dark yellowish-brown, damp to moist, loose to medium dense, silty to clayey, very fine SAND with fine to coarse sandy gravels. Minor cobbles to 1" diameter.
	32" – 7	SC-SM				**Tscn** Dark yellowish-brown, moist, medium dense to dense, very fine to coarse silty to clayey SAND. Gravels and cobbles to 3" diameter. 20% clasts. N12°W, 7°NE, thin sand interbed at approximately 6'. --- *Total Depth 7-feet. No groundwater encountered.*

LOCATION: Phase 3/4, West (See Map)

TEST PIT	DEPTH (FT)	U.S.C.S. GROUP SYMBOL	SAMPLE DEPTH	PERCENT MOISTURE	DRY DENSITY (pcf)	DESCRIPTION
14	0 – 24"	SM				**TOPSOIL/COLLUVIUM** Dark yellowish-brown, moist, loose to medium dense, silty, very fine to coarse SAND, with trace gravels and cobbles to 2.5" diameter.
	24" – 7	SM				**Qls** Gray to light reddish-brown, moist, dense, silty, very fine to coarse SAND, with trace gravels and cobbles to 2" diameter. Few, thin interbeds of silty to clayey fine sand. N52°E 12°SE. At 6.5' slide plane – N75°E, 20°SE. Calcium carbonate lined. --- *Total Depth 7-feet. No groundwater encountered.*

SIERRA GEOTECHNICAL SERVICES, INC.

TEST PIT LOGS

JOB NO: 3.31274 **PROJECT:** Sargent Ranch
DATE: 6/17/2015 **LOGGED BY:** RS
LOCATION: Phase 3/4, Southwest (See Map)

TEST PIT	DEPTH (FT)	U.S.C.S. GROUP SYMBOL	SAMPLE DEPTH	PERCENT MOISTURE	DRY DENSITY (pcf)	DESCRIPTION
15	0 – 16”	SC-SM				**TOPSOIL/COLLUVIUM** Dark yellowish-brown, damp to moist, loose to medium dense, silty to clayey, very fine SAND with fine to coarse sandy gravels. Minor cobbles to 3” diameter.
	16” – 8	SM				**Tscn** Mottled grayish-brown to medium brown, moist, medium dense to dense, very fine to coarse silty to clayey SAND. Gravels and cobbles to 2” diameter. 40-45% clasts. N19°E, 8°NW. --- *Total Depth 8-feet. No groundwater encountered.*

LOCATION: Phase 3/4, Southwest (See Map)

TEST PIT	DEPTH (FT)	U.S.C.S. GROUP SYMBOL	SAMPLE DEPTH	PERCENT MOISTURE	DRY DENSITY (pcf)	DESCRIPTION
16	0 – 42”	SM				**TOPSOIL/COLLUVIUM** Dark yellowish-brown, moist, loose to medium dense, silty, very fine to coarse SAND, with trace gravels and cobbles to 2” diameter.
	42” – 6.5’	SM				**Tscn** Dark brown to dark yellowish-brown, moist, dense, silty, very fine to coarse SAND, with trace gravels and cobbles to 1” diameter. Few, thin interbeds of silty to clayey fine sand. N41°E, 9°NW. --- *Total Depth 7-feet. No groundwater encountered.*

SIERRA GEOTECHNICAL SERVICES, INC.

TEST PIT LOGS

JOB NO: 3.31274 **PROJECT:** Sargent Ranch
DATE: 6/17/2015 **LOGGED BY:** RS
LOCATION: Phase 3/4, Southwest (See Map)

TEST PIT	DEPTH (FT)	U.S.C.S. GROUP SYMBOL	SAMPLE DEPTH	PERCENT MOISTURE	DRY DENSITY (pcf)	DESCRIPTION
17	0 – 12"	SC-SM				**TOPSOIL/COLLUVIUM** Dark yellowish-brown, damp to moist, loose to medium dense, silty to clayey, very fine SAND with fine to coarse sandy gravels. Minor cobbles to 3" diameter.
	16" – 8	SM				**Tscn - Faulted** Mottled grayish-brown to medium brown, moist, medium dense to dense, very fine to coarse silty to clayey SAND. Multiple carbonate stringers, iron stains, shears. Few tar blebs. Fault/fractures – N38°W, 44°NE; N57°W, 28°NE. --- *Total Depth 8-feet. No groundwater encountered.*

LOCATION: Phase 3/4, Southwest (See Map)

TEST PIT	DEPTH (FT)	U.S.C.S. GROUP SYMBOL	SAMPLE DEPTH	PERCENT MOISTURE	DRY DENSITY (pcf)	DESCRIPTION
18	0 – 15"	SM				**TOPSOIL/COLLUVIUM** Dark Grayish-brown, moist, loose, silty, very fine to coarse SAND, with trace gravels and cobbles to 3" diameter.
	42" – 6.5'	SM				**Tscn** Dark yellowish-brown to medium brown, moist, medium dense, silty, very fine to coarse SAND, with trace gravels and cobbles to 6" diameter. Few, thin interbeds of fine sand and gravels. N67°E, 32°NW. --- *Total Depth 6.5-feet. No groundwater encountered.*

SIERRA GEOTECHNICAL SERVICES, INC.

TEST PIT LOGS

JOB NO: 3.31274 **PROJECT:** Sargent Ranch
DATE: 6/17/2015 **LOGGED BY:** RS
LOCATION: Phase 3/4, Southwest (See Map)

TEST PIT	DEPTH (FT)	U.S.C.S. GROUP SYMBOL	SAMPLE DEPTH	PERCENT MOISTURE	DRY DENSITY (pcf)	DESCRIPTION
19	0 – 22"	SC-SM				**TOPSOIL/COLLUVIUM** Dark brown, damp to moist, loose to medium dense, silty to clayey, very fine SAND with fine to coarse sandy gravels. Minor cobbles to 3" diameter.
	22" – 7.5	SM				**Tscn** Grayish-brown to orange brown, moist, dense, very fine to coarse silty to clayey SAND with abundant rounded gravels and cobbles to 6" diameter. 80% clasts. From 84-90", yellowish-brown, frim. very fine to coarse sandy CLAY lense. --- *Total Depth 7.5-feet. No groundwater encountered.*

LOCATION: Phase 3/4, South (See Map)

TEST PIT	DEPTH (FT)	U.S.C.S. GROUP SYMBOL	SAMPLE DEPTH	PERCENT MOISTURE	DRY DENSITY (pcf)	DESCRIPTION
20	0 – 20"	SM				**TOPSOIL/COLLUVIUM** Dark grayish-brown, moist, loose to medium dense, silty, very fine to coarse SAND, with gravels and cobbles to 4" diameter.
	42" – 6.5'	SM				**Tscn** Dark yellowish-brown to medium brown, moist, dense, silty, very fine to coarse SAND, with abundant rounded gravels and cobbles to 5" diameter. 50% clasts. Apparent dip based on line of clasts - 16°N. --- *Total Depth 6.5-feet. No groundwater encountered.*

SIERRA GEOTECHNICAL SERVICES, INC.

TEST PIT LOGS

JOB NO: 3.31274 **PROJECT:** Sargent Ranch
DATE: 6/17/2015 **LOGGED BY:** RS
LOCATION: Phase 3/4, South (See Map)

TEST PIT	DEPTH (FT)	U.S.C.S. GROUP SYMBOL	SAMPLE DEPTH	PERCENT MOISTURE	DRY DENSITY (pcf)	DESCRIPTION
21	0 – 36"	SC-SM				**TOPSOIL/COLLUVIUM** Dark brown to reddish-brown, damp to moist, loose to medium dense, silty to clayey, very fine SAND with fine to coarse sandy gravels. Minor cobbles to 2" diameter.
	36" – 7.5	SM				**Tscn** Grayish-brown to orange brown, moist, dense, very fine to coarse silty SAND with trace clay, and few gravels. Multiple Faults/fractures on east wall – N22°W, 82°NE; N16°W, 90°; east side down 3.5'. Minor folding observed. Fractures penetrate to approximately 20" below surface. --- *Total Depth 7.5-feet. No groundwater encountered.*

LOCATION: Phase 3/4, South (See Map)

TEST PIT	DEPTH (FT)	U.S.C.S. GROUP SYMBOL	SAMPLE DEPTH	PERCENT MOISTURE	DRY DENSITY (pcf)	DESCRIPTION
22	0 – 36"	SM				**TOPSOIL/COLLUVIUM** Dark brown to black, moist, loose to medium dense, silty, very fine to coarse SAND, with gravels and cobbles to 1" diameter.
	36" – 8	CL-SM				**Tscn** Olive gray to yellowish-brown to medium brown, moist, dense, silty, very fine to coarse SAND with thin interbeds of fine to medium sandy CLAY. Iron stained stringers. Multiple shears below 5' – N24°E, 85°SE; N42°E 90°. --- *Total Depth 8-feet. No groundwater encountered.*

SIERRA GEOTECHNICAL SERVICES, INC.

TEST PIT LOGS

JOB NO: 3.31274 **PROJECT:** Sargent Ranch
DATE: 6/17/2015 **LOGGED BY:** RS
LOCATION: Phase 3/4, Southwest (See Map)

TEST PIT	DEPTH (FT)	U.S.C.S. GROUP SYMBOL	SAMPLE DEPTH	PERCENT MOISTURE	DRY DENSITY (pcf)	DESCRIPTION
23	0 – 19"	SC-SM				**TOPSOIL/COLLUVIUM** Dark brown, damp to moist, loose to medium dense, silty to clayey, very fine SAND with fine to coarse sandy gravels. Moderate cobbles to 6" diameter.
	19" – 7.75	SM				**Tscn** Grayish-brown to orange brown, moist, dense, very fine to coarse silty SAND with abundant rounded gravels and cobbles to 6" diameter. Trace clay, 60% clasts. @ 88" undulating contact (channel?) with gray to yellow very fine sandy silt. --- *Total Depth 7.75-feet. No groundwater encountered.*

LOCATION: Phase 3/4, South (See Map)

TEST PIT	DEPTH (FT)	U.S.C.S. GROUP SYMBOL	SAMPLE DEPTH	PERCENT MOISTURE	DRY DENSITY (pcf)	DESCRIPTION
24	0 – 24"	SC-SM				**TOPSOIL/COLLUVIUM** Dark grayish-brown, moist, loose to medium dense, silty to clayey, very fine to coarse SAND, with gravels and cobbles to 4" diameter.
	42" – 7.25'	SM				**Tscn** Medium yellowish-brown to light brown, moist, dense, silty, very fine to coarse SAND, with interbeds of sandy silt, and trace clay. Few rounded mudstone clasts to 10" diameter. Cross bedding observed, --- *Total Depth 6.5-feet. No groundwater encountered.*

SIERRA GEOTECHNICAL SERVICES, INC.

TEST PIT LOGS

JOB NO: 3.31274 **PROJECT:** Sargent Ranch
DATE: 6/18/2015 **LOGGED BY:** RS
LOCATION: Phase 3/4, Southeast (See Map)

TEST PIT	DEPTH (FT)	U.S.C.S. GROUP SYMBOL	SAMPLE DEPTH	PERCENT MOISTURE	DRY DENSITY (pcf)	DESCRIPTION
25	0 – 36"	SM				**TOPSOIL/COLLUVIUM** Dark yellowish-brown, moist, loose to medium dense, silty to, very fine to medium SAND, with gravels.
	22" – 7.5	SM				**Tscn** Light brown to yellowish-brown, moist, dense, very fine to coarse silty SAND with trace clay and moderate rounded gravels to 2" diameter. Bedding N69°E, 26°NW. Angular unconformity at Topsoil/Tscn contact. N75°W, 11°SW. --- *Total Depth 7.5-feet. No groundwater encountered.*

LOCATION: Phase 3/4, Southeast (See Map)

TEST PIT	DEPTH (FT)	U.S.C.S. GROUP SYMBOL	SAMPLE DEPTH	PERCENT MOISTURE	DRY DENSITY (pcf)	DESCRIPTION
26	0 – 32"	SC-SM				**TOPSOIL/COLLUVIUM** Dark brown to yellowish-brown, moist, loose to medium dense, silty to clayey, very fine to coarse SAND, with gravels to 1" diameter.
	42" – 6.5'	SM				**Tscn** Dark yellowish-brown to olive gray, moist, dense, silty, very fine to coarse SAND. Multiple fractures/faults with offset to NW and SE which stop at basal contact with Topsoil. Minor folding noted at 5'. --- *Total Depth 6.5-feet. No groundwater encountered.*

SIERRA GEOTECHNICAL SERVICES, INC.

TEST PIT LOGS

JOB NO: 3.31274 **PROJECT:** Sargent Ranch
DATE: 6/18/2015 **LOGGED BY:** RS
LOCATION: Phase 3/4, Southeast (See Map)

TEST PIT	DEPTH (FT)	U.S.C.S. GROUP SYMBOL	SAMPLE DEPTH	PERCENT MOISTURE	DRY DENSITY (pcf)	DESCRIPTION
27	0 – 22”	SC-SM				**TOPSOIL/COLLUVIUM** Dark brown to dark olive brown, damp to moist, loose to medium dense, silty to clayey, very fine SAND with trace gravels.
	22” – 6	SM				**Tscn** Yellowish-brown, moist, dense, very fine to coarse silty to SAND with few rounded gravels. Abundant fractures, no offset noted. At 45” bedding N60°E, 33°NW. --- *Total Depth 6-feet. No groundwater encountered.*

LOCATION: Phase 3/4, Southeast (See Map)

TEST PIT	DEPTH (FT)	U.S.C.S. GROUP SYMBOL	SAMPLE DEPTH	PERCENT MOISTURE	DRY DENSITY (pcf)	DESCRIPTION
28	0 – 44”	SC-SM				**TOPSOIL/COLLUVIUM** Dark brown to dark olive brown, damp to moist, loose to medium dense, silty to clayey, very fine SAND with trace gravels
	44” – 7.5’	SC- SM				**Tscn** Dark yellowish-brown to medium brown, moist, dense, silty to clayey, very fine SAND, Massive, few carbonate stringers to depth. --- *Total Depth 7.5-feet. No groundwater encountered.*

SIERRA GEOTECHNICAL SERVICES, INC.

TEST PIT LOGS

JOB NO: 3.31274 **PROJECT:** Sargent Ranch
DATE: 6/18/2015 **LOGGED BY:** RS
LOCATION: Phase 3/4, East (See Map)

TEST PIT	DEPTH (FT)	U.S.C.S. GROUP SYMBOL	SAMPLE DEPTH	PERCENT MOISTURE	DRY DENSITY (pcf)	DESCRIPTION
29	0 – 44”	SC-SM				**TOPSOIL/COLLUVIUM** Light olive brown, moist, loose to medium dense, silty to clayey, very fine SAND with trace gravels. Bioturbation observed,
	44” – 7	SM				**Tscn** Light grayish-brown to light brown, moist, dense, silty, very fine SAND with trace medium to coarse sand. Crossbedded, iron staining and concretions. Bedding varied from N19°E, 38°NW to N80°E, 29°NW. --- *Total Depth 7-feet. No groundwater encountered.*

LOCATION: Phase 3/4, East (See Map)

TEST PIT	DEPTH (FT)	U.S.C.S. GROUP SYMBOL	SAMPLE DEPTH	PERCENT MOISTURE	DRY DENSITY (pcf)	DESCRIPTION
30	0 – 32”	SM				**TOPSOIL/COLLUVIUM** Dark brown to black, moist, loose to medium dense, silty, very fine to coarse SAND, with gravels and cobbles to 5” diameter. 20% clasts.
	32” – 8.5’	SM				**Tscn** Medium yellowish-brown, moist, dense, silty, very fine to coarse SAND, with trace to few rounded gravels. At 59” – 6” thick sand bed N3°E, 6°SE. --- *Total Depth 8.5-feet. No groundwater encountered.*

SIERRA GEOTECHNICAL SERVICES, INC.

TEST PIT LOGS

JOB NO: 3.31274 **PROJECT:** Sargent Ranch
DATE: 6/18/2015 **LOGGED BY:** RS
LOCATION: Phase 3/4, East (See Map)

TEST PIT	DEPTH (FT)	U.S.C.S. GROUP SYMBOL	SAMPLE DEPTH	PERCENT MOISTURE	DRY DENSITY (pcf)	DESCRIPTION
31	0 – 24"	SM				**TOPSOIL/COLLUVIUM** Dark brown, damp to moist, loose to medium dense, silty, very fine to coarse SAND with minor gravels and cobbles to 3" diameter.
	24" – 6	SM				**Tscn** Medium yellowish-brown, moist, medium dense to dense, interbedded silty, very fine to coarse SAND and sandy gravels to 1.5" diameter. Iron staining, trace clay. Undulatory bedding at 36" N87°W, 9°NE. --- *Total Depth 6-feet. No groundwater encountered.*

LOCATION: Phase 1, East (See Map)

TEST PIT	DEPTH (FT)	U.S.C.S. GROUP SYMBOL	SAMPLE DEPTH	PERCENT MOISTURE	DRY DENSITY (pcf)	DESCRIPTION
32	0 – 20"	SC-SM				**TOPSOIL/COLLUVIUM** Dark grayish-brown to black, moist, loose to medium dense, silty, very fine to coarse SAND, with trace clay, and gravels and cobbles to 1" diameter. Carbonate staining at 20".
	22" – 67"	SM-CL				**Tscn** Light to medium olive brown, moist, medium dense, very fine to coarse silty SAND and sandy clay. Clay is plastic. Multiple joint sets throughout N21°E, 29°NW to N40°E, 21°NW.
	67" - 7	SM				At 67" – Light olive brown, silty, very fine SAND --- *Total Depth 7-feet. No groundwater encountered..*

SIERRA GEOTECHNICAL SERVICES, INC.

TEST PIT LOGS

JOB NO: 3.31274 **PROJECT:** Sargent Ranch
DATE: 6/19/2015 **LOGGED BY:** RS
LOCATION: Phase 1, East Central (See Map)

TEST PIT	DEPTH (FT)	U.S.C.S. GROUP SYMBOL	SAMPLE DEPTH	PERCENT MOISTURE	DRY DENSITY (pcf)	DESCRIPTION
33	0 – 28"	SC-SM				**TOPSOIL/COLLUVIUM** Dark yellowish-brown, moist, loose to medium dense, silty to clayey, very fine to coarse SAND with gravels. Minor cobbles to 4" diameter.
	28" – 6.5	SM				**Tscn** Medium yellowish-brown to light grayish-brown, moist, dense, silty, very fine to coarse SAND with trace clay, abundant rounded gravels and cobbles to 4" diameter. Channeling noted. Bedding at 60" N64°E, 20°SE. Fault/fracture crosscuts bedding and extends from base of trench to basal surface of Topsoil. N69°W, 39°NE. 3" downward displacement on north side. --- *Total Depth 6.5-feet. No groundwater encountered.*

LOCATION: Phase 1, West (See Map)

TEST PIT	DEPTH (FT)	U.S.C.S. GROUP SYMBOL	SAMPLE DEPTH	PERCENT MOISTURE	DRY DENSITY (pcf)	DESCRIPTION
34	0 – 19"	SM				**TOPSOIL/COLLUVIUM** Dark brown to black, moist, loose to medium dense, silty, very fine to coarse SAND, with gravels and cobbles to 6" diameter.
	19" – 4	SM				**Tscn** Medium yellowish-brown to light grayish-brown, moist, dense, interbedded silty, very fine to coarse SAND and rounded sandy gravels and cobbles to 4" diameter. 40% clasts. Bedding at 32" N6°E, 3°NW. --- *Total Depth 4-feet. No groundwater encountered.*

SIERRA GEOTECHNICAL SERVICES, INC.

TEST PIT LOGS

JOB NO: 3.31274 **PROJECT:** Sargent Ranch
DATE: 6/19/2015 **LOGGED BY:** RS
LOCATION: Phase 1, West (See Map)

TEST PIT	DEPTH (FT)	U.S.C.S. GROUP SYMBOL	SAMPLE DEPTH	PERCENT MOISTURE	DRY DENSITY (pcf)	DESCRIPTION
35	0 – 51"	SC-SM				**TOPSOIL/COLLUVIUM** Olive black to dark brown, moist, loose to medium dense, silty to clayey, very fine to coarse SAND with gravels. Minor cobbles to 4" diameter. Carbonate at basal contact.
	51" – 8	SM				**Tscn** Olive brown, moist, dense, very fine to coarse silty to clayey SAND with moderate rounded gravels and cobbles to 4" diameter. 20% clasts. --- *Total Depth 8-feet. No groundwater encountered.*

LOCATION: Phase 1, Southwest (See Map)

TEST PIT	DEPTH (FT)	U.S.C.S. GROUP SYMBOL	SAMPLE DEPTH	PERCENT MOISTURE	DRY DENSITY (pcf)	DESCRIPTION
36	0 – 30"	SC-CL				**TOPSOIL/COLLUVIUM** Dark grayish-brown, moist, medium dense, silty to clayey, very fine to coarse SAND, and sandy clay with gravels. Carbonate at basal surface. Bioturbation throughout.
	30" – 49"	SC-SM				**Qls** Medium yellowish-brown, moist, dense, silty to clayey, very fine to coarse SAND, with moderate rounded gravels and cobbles to 8" diameter. 20% clasts. Carbonate in upper 8".
	49" – 5.5	SC				Clayey SAND, with gravels to 2" diameter. --- *Total Depth 5.5-feet. No groundwater encountered.*

SIERRA GEOTECHNICAL SERVICES, INC.

TEST PIT LOGS

JOB NO: 3.31274 **PROJECT:** Sargent Ranch
DATE: 6/19/2015 **LOGGED BY:** RS
LOCATION: Phase 1, Southwest (See Map)

TEST PIT	DEPTH (FT)	U.S.C.S. GROUP SYMBOL	SAMPLE DEPTH	PERCENT MOISTURE	DRY DENSITY (pcf)	DESCRIPTION
37	0 – 39"	SM				**TOPSOIL/COLLUVIUM** Dark yellowish-brown, damp to moist, loose to medium dense, silty, very fine to coarse SAND with gravels. 20% gravels.
	39" – 6.5	SC-SM				**Tscn** Brown, moist, dense, silty to clayey, very fine to coarse SAND with abundant rounded gravels to 3" diameter. 25% clasts. Minor jointing – N61°E, 66°NW. --- *Total Depth 6.5-feet. No groundwater encountered.*

LOCATION: Phase 1, South (See Map)

TEST PIT	DEPTH (FT)	U.S.C.S. GROUP SYMBOL	SAMPLE DEPTH	PERCENT MOISTURE	DRY DENSITY (pcf)	DESCRIPTION
38	0 – 38"	SM				**TOPSOIL/COLLUVIUM** Dark grayish-brown, moist, dense, silty, very fine to coarse SAND, with gravels and cobbles to 8" diameter.
	42" – 60"	SC-SM				**Tscn** Medium olive brown, moist, dense, silty to clayey, very fine to coarse SAND, with abundant rounded gravels and cobbles to 6" diameter. 30% clasts.
	60" – 6.5					60% clasts. --- *Total Depth 6.5-feet. No groundwater encountered.*

SIERRA GEOTECHNICAL SERVICES, INC.

TEST PIT LOGS

JOB NO: 3.31274 **PROJECT:** Sargent Ranch
DATE: 6/20/2015 **LOGGED BY:** RS
LOCATION: Phase 2, North (See Map)

TEST PIT	DEPTH (FT)	U.S.C.S. GROUP SYMBOL	SAMPLE DEPTH	PERCENT MOISTURE	DRY DENSITY (pcf)	DESCRIPTION
39	0 – 40”	SC-SM				**TOPSOIL/COLLUVIUM** Dark brown to black, damp to moist, loose to medium dense, silty to clayey, very fine to coarse SAND with minor gravels. Carbonate staining at basal surface.
	40” – 6	SC-SM				**Tscn** Light olive gray, moist, dense, silty to clayey, very fine to coarse SAND. Iron staining throughout. Apparent dip 14°E. --- *Total Depth 6-feet. No groundwater encountered.*

LOCATION: Phase 2, Northwest (See Map)

TEST PIT	DEPTH (FT)	U.S.C.S. GROUP SYMBOL	SAMPLE DEPTH	PERCENT MOISTURE	DRY DENSITY (pcf)	DESCRIPTION
40	0 – 43”	SM				**TOPSOIL/COLLUVIUM** Dark grayish-brown, moist, dense, silty, very fine to coarse SAND, with gravels and cobbles to 4” diameter.
	43” – 6’	SM-GM				**Tscn** Yellowish-gray, moist, dense, silty, interbedded very fine to coarse SAND, with abundant rounded gravels. At 43” – bedding N46°W,90° --- *Total Depth 6-feet. No groundwater encountered.*

SIERRA GEOTECHNICAL SERVICES, INC.

TEST PIT LOGS

JOB NO: 3.31274 **PROJECT:** Sargent Ranch
DATE: 6/20/2015 **LOGGED BY:** RS
LOCATION: Phase 2, East (See Map)

TEST PIT	DEPTH (FT)	U.S.C.S. GROUP SYMBOL	SAMPLE DEPTH	PERCENT MOISTURE	DRY DENSITY (pcf)	DESCRIPTION
41	0 – 38"	SC-SM				**TOPSOIL/COLLUVIUM** Dark brown to olive brown, damp to moist, loose to medium dense, silty to clayey, very fine to coarse SAND with few gravels. Bioturabted.
	38" – 6.5	ML-SM				**Tscn (faulted?)** Yellowish-gray to light gray, moist, dense, interbedded silty, very fine to coarse SAND and sandy SILT, with abundant rounded gravels and cobbles to 3" diameter. Iron staining, 10% clasts. Faults/fractures from bottom of trench up to base of topsoil/colluvium contact- N6°E,90°;N14°E,73°NW;N29°E,82°NW --- *Total Depth 6.5 feet. No groundwater encountered.*

LOCATION: Phase 2, South/Southwest (See Map)

TEST PIT	DEPTH (FT)	U.S.C.S. GROUP SYMBOL	SAMPLE DEPTH	PERCENT MOISTURE	DRY DENSITY (pcf)	DESCRIPTION
42	0 – 36"	SM				**TOPSOIL/COLLUVIUM** Dark yellowish-brown, damp to moist, loose to medium dense, silty, very fine to coarse SAND with few gravels.
	36" – 7	SM				**Tscn** Dark yellowish-brown, moist, dense, silty, very fine to coarse SAND, with few gravels. Silt increases with depth. At 73" silt lense - N71°W, 4°NE --- *Total Depth 7-feet. No groundwater encountered.*

SIERRA GEOTECHNICAL SERVICES, INC.

TEST PIT LOGS

JOB NO: 3.31274 **PROJECT:** Sargent Ranch
DATE: 6/20/2015 **LOGGED BY:** RS
LOCATION: Phase 2, Southeast (See Map)

TEST PIT	DEPTH (FT)	U.S.C.S. GROUP SYMBOL	SAMPLE DEPTH	PERCENT MOISTURE	DRY DENSITY (pcf)	DESCRIPTION
43	0 – 29”	SC-SM				**TOPSOIL/COLLUVIUM** Dark brown, damp to moist, loose ot medium dense, silty, very fine to coarse SAND with rounded gravels to 3” diameter.
	22” – 7.5	SM				**Tscn** Dark yellowish-brown to olive gray, moist, dense, very fine to coarse silty SAND with abundant rounded gravels. Iron staining, 30% gravels. At 46”- bedding N86°W, 47°NE. ---------- *Total Depth 7.5 feet. No groundwater encountered.*

APPENDIX B

LABORATORY TESTING

Laboratory tests were performed on the representative test samples to provide a basis for development of design parameters. Soil materials were visually classified in the field according to the Unified Soil Classification System (USCS). Laboratory tests were performed in general accordance with the American Society of Testing and Materials (ASTM) procedures. The results of our laboratory testing are presented herein. USCS classifications are presented on the boring logs (Appendix A).Selected samples were tested for the following parameters:

Atterberg Limits
Tests were performed on a selected representative fine-grained soil sample to evaluate the liquid limit, plastic limit, and plasticity index in general accordance with ASTM D 4318. These test results were utilized to evaluate the soil classification in accordance with USCS.

Expansion Potential
The expansion potential of selected samples was evaluated by the Expansion Index Test per ASTM D4829.

Direct Shear Test
A remolded direct shear test was performed in general accordance with ASTM D 3080 to evaluate the shear strength characteristics of the selected materials.

Gradation Analysis
Gradation analysis tests were performed on a selected representative soil sample in general accordance with ASTM D 422. These test results were utilized in evaluating the soil classifications in accordance with the USCS.

LA Abrasion
A resistance to degradation of small-size coarse aggregate by abrasion and impact test in the Los Angeles machine was performed in accordance with ASTM C131.

Proctor Density Tests
The maximum dry density and optimum moisture content of selected representative soil samples were evaluated using the Modified Proctor method in accordance with ASTM D 1557.

Sand Equivalent
The sand equivalent of selected representative soil samples were evaluated in accordance per ASTM D4829

SIERRA GEOTECHNICAL SERVICES, INC.

ENVIRONMENTAL GEOTECHNICAL GEOLOGY HYDROGEOLOGY MATERIALS

ATTERBERG LIMITS REPORT

PER ASTM TEST METHOD D4318

JOB NUMBER: 3.31274 SAMPLE DATE: 8/2015

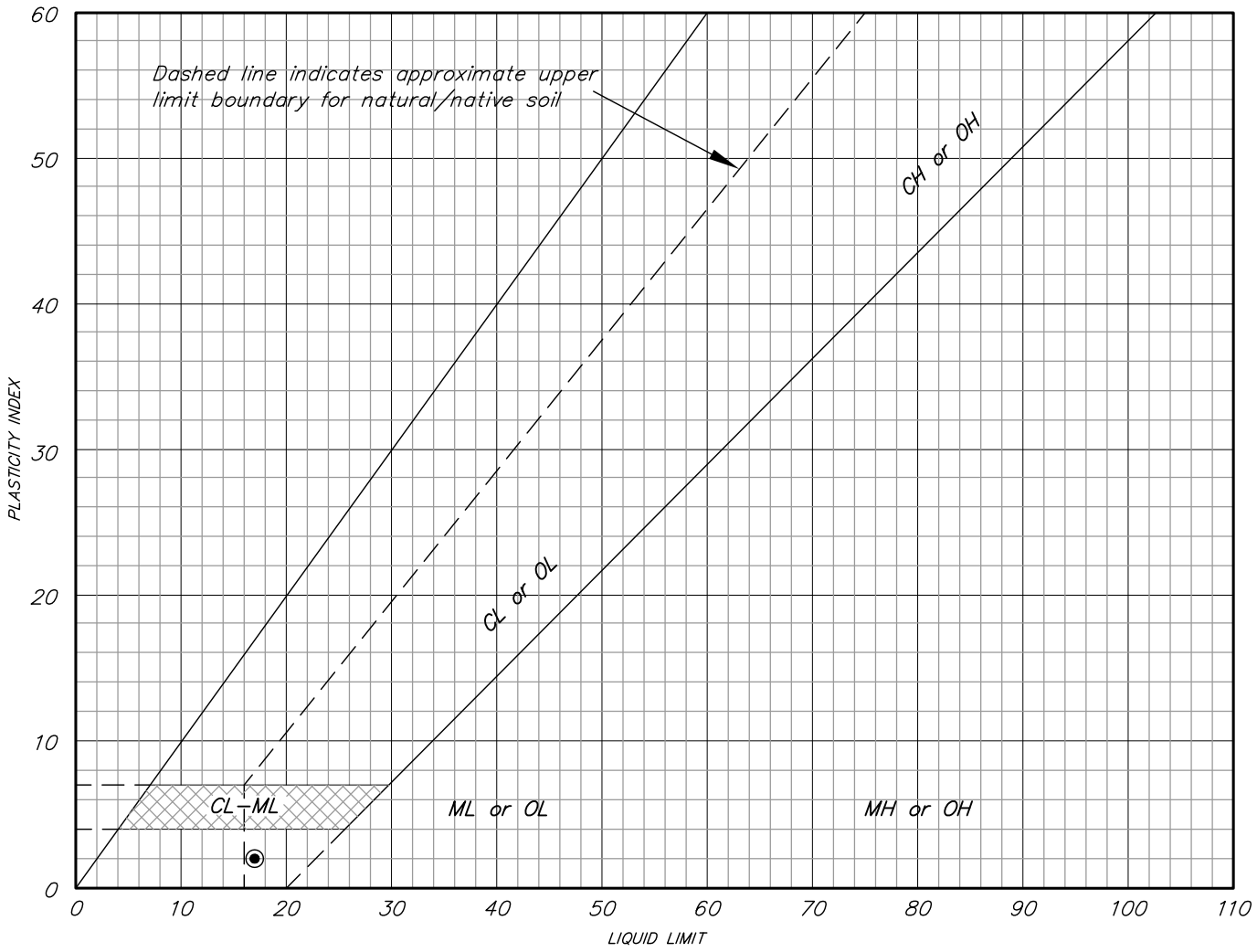
CLIENT: SARGENT RANCH LLC

PROJECT: SARGENT RANCH

SAMPLED BY: JA TESTED BY: CC TESTED ON: 9/15/15

EXCAVATION: BH-1

SAMPLING INTERVAL: 54-55'



MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
◉ Dark brown clay	19	17	2			CL

REMARKS:

Brian Young, Certified Laboratory Manager

AASHTO R18

Atterberg.dwg

SIERRA GEOTECHNICAL SERVICES, INC.

ENVIRONMENTAL GEOTECHNICAL GEOLOGY HYDROGEOLOGY MATERIALS

ATTERBERG LIMITS REPORT

PER ASTM TEST METHOD D4318

JOB NUMBER: 3.31274 SAMPLE DATE: 8/2015

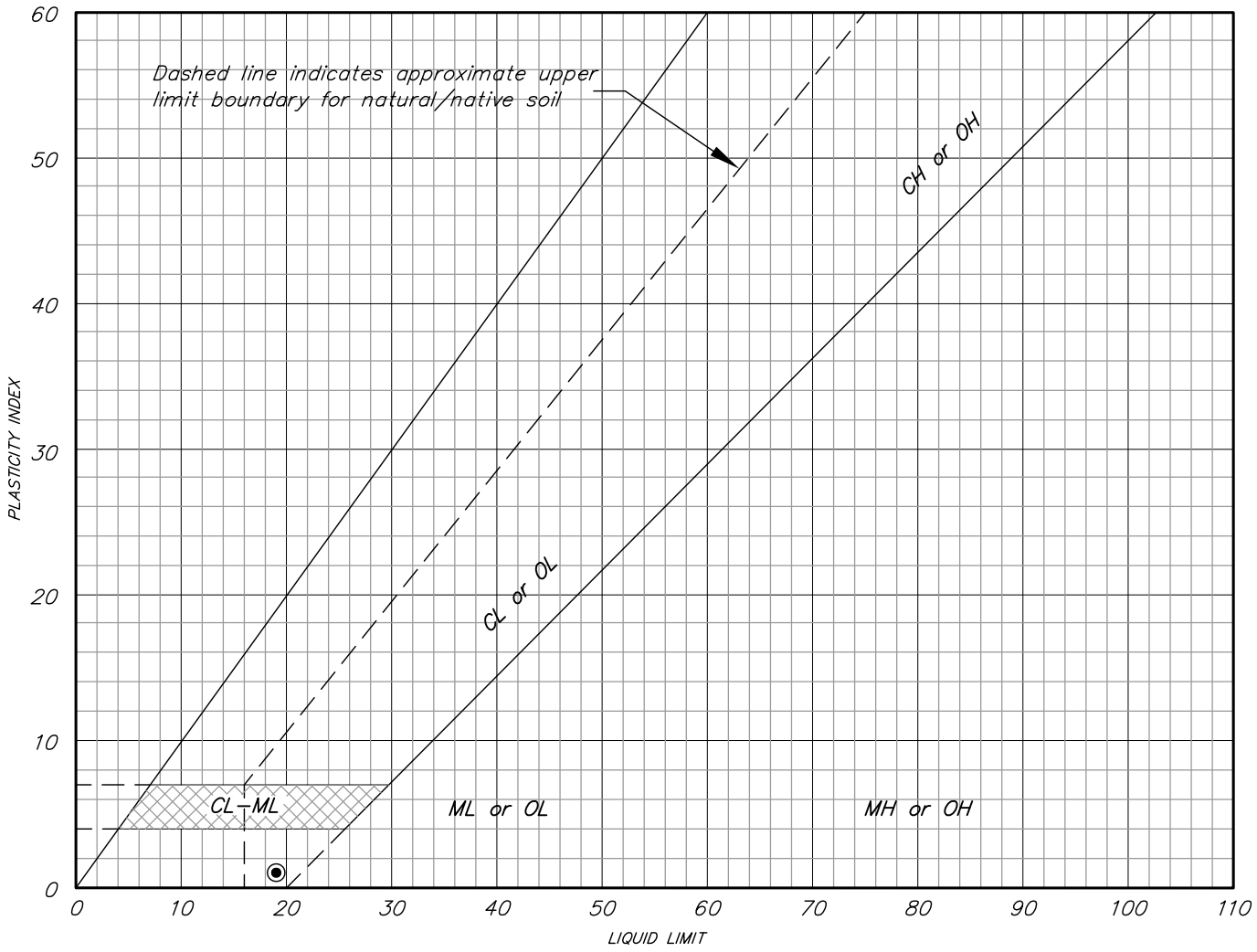
CLIENT: SARGENT RANCH LLC

PROJECT: SARGENT RANCH

SAMPLED BY: JA TESTED BY: CC TESTED ON: 9/15/15

EXCAVATION: BH-8

SAMPLING INTERVAL: 70-72'



MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
◉ Dark brown clay	20	19	1			CL

REMARKS:

Brian Young, Certified Laboratory Manager

AASHTO R18

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Caltrans Lab #214 AMRL Lab #2460 CCRL Lab #2081 DSA LEA Lab #189

EXPANSION INDEX TEST (ASTM 4829)

Project Name								Project No.	
Sargent Ranch								3.31274	
Client								Material	
Sargent Ranch LLC								Clay	
Source				Soil Description				Delivered By	Sample Date
BH-1								JA	8/7/2015
Test No	Test Date	Test Time	Test Pit No	Boring No	Depth	Specific Gr (Gs)		Tested By	Report Date
1	10/28/15				41-41.5'			BY	11/13/15

TIME DEFORMATION MEASUREMENTS	
Elapsed Time	**Raw Deformation (inches)**
0.00	0.0000
0.10	0.0000
0.25	0.0000
1	0.0001
2	0.0001
4	0.0002
8	0.0003
15	0.0004
30	0.0006
60	0.0007
120	0.0008
240	0.0009
480	0.0010
1440	0.0015

Calculations	Results
D_1 = initial dial reading (mm)	0.0000
D_2 = final dial reading (mm)	0.0381
ΔH = change in height, $D_2 - D_1$	0.0381
H_1 = initial height (mm)	25.4
EI = $\Delta H / H_1 \times 1000$	1.5

Expansion Index Key	
0-20	= Very Low
21-50	= Low
51-90	= Medium
91-130	= High
>130	= Very High

Brian Young, Certified Laboratory Manager

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Caltrans Lab #214 AMRL Lab #2460 CCRL Lab #2081 DSA LEA Lab #189

EXPANSION INDEX TEST (ASTM 4829)

Project Name								Project No.	
Sargent Ranch								3.31274	
Client								Material	
Sargent Ranch LLC								Clay	
Source				Soil Description				Delivered By	Sample Date
BH-1								JA	8/7/2015
Test No	Test Date	Test Time	Test Pit No	Boring No	Depth	Specific Gr (Gs)		Tested By	Report Date
2	10/29/15				54-55'			BY	11/13/15

TIME DEFORMATION MEASUREMENTS	
Elapsed Time	**Raw Deformation (inches)**
0.00	0.0000
0.10	0.0099
0.25	0.0099
1	0.0098
2	0.0097
4	0.0096
8	0.0092
15	0.0090
30	0.0082
60	0.0079
120	0.0077
240	0.0075
480	0.0074
1440	0.0074

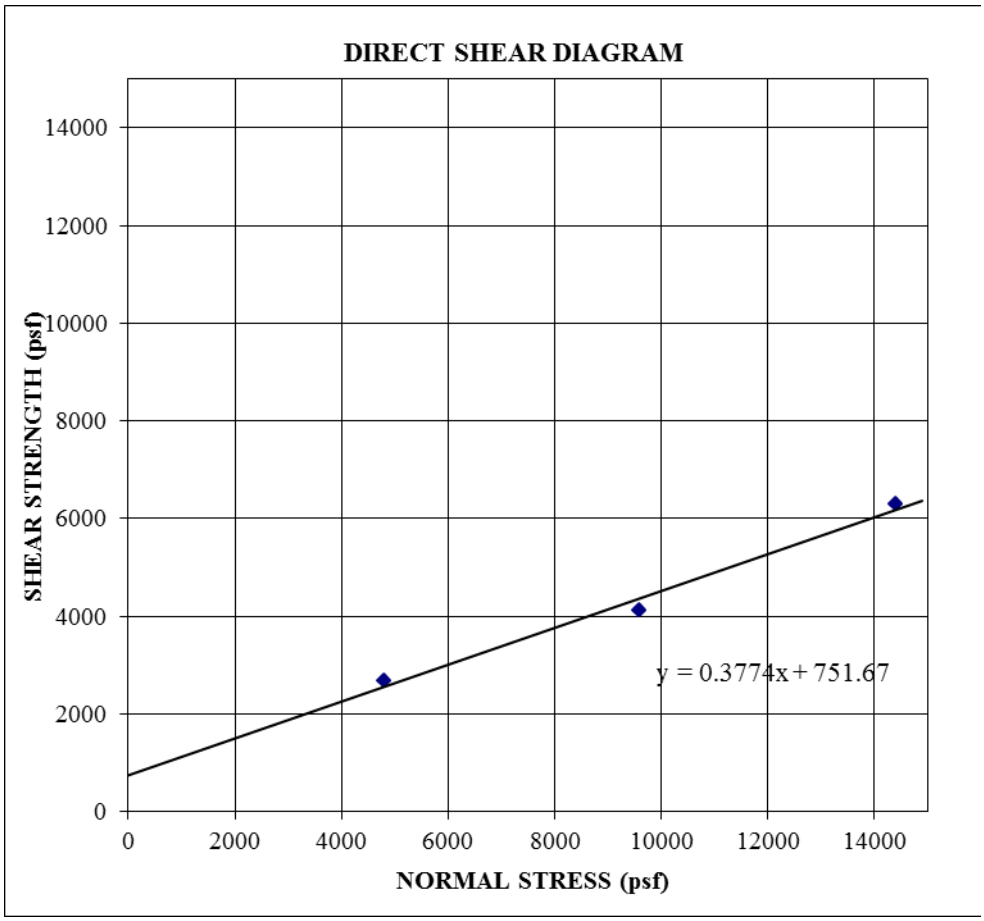
Calculations	Results
D_1 = initial dial reading (mm)	0.0000
D_2 = final dial reading (mm)	-0.1880
ΔH = change in height, $D_2 - D_1$	-0.1880
H_1 = initial height (mm)	25.4
EI = $\Delta H / H_1 \times 1000$	-7.4

Expansion Index Key	
0-20	= Very Low
21-50	= Low
51-90	= Medium
91-130	= High
>130	= Very High

Brian Young, Certified Laboratory Manager

SIERRA GEOTECHNICAL SERVICES, INC.

SIERRA GEOTECHNICAL SERVICES INC.
P.O. BOX 5024, MAMMOTH LAKES, CALIFORNIA 93546



Boring No: BH-1

Sample Depth: 54-55'feet

Friction Angle: 21 degrees

Cohesion: 751 psf

Strain Rate 0.002 in/min

Gray Clay (CL)

Date Tested: 10/16/2015

PROJECT: SARGENT RANCH

3.31274

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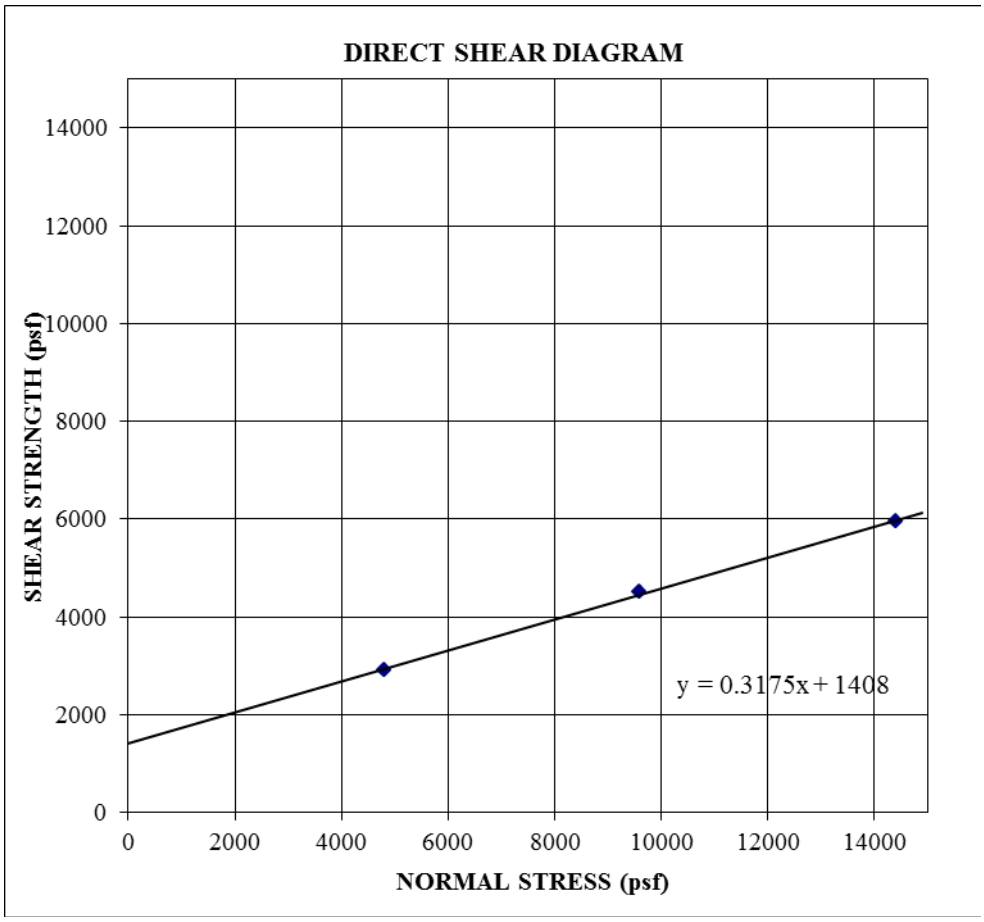


Boring No: BH-8

Sample Depth: 70-72 feet

Friction Angle: 18 degrees

Cohesion: 1408 psf

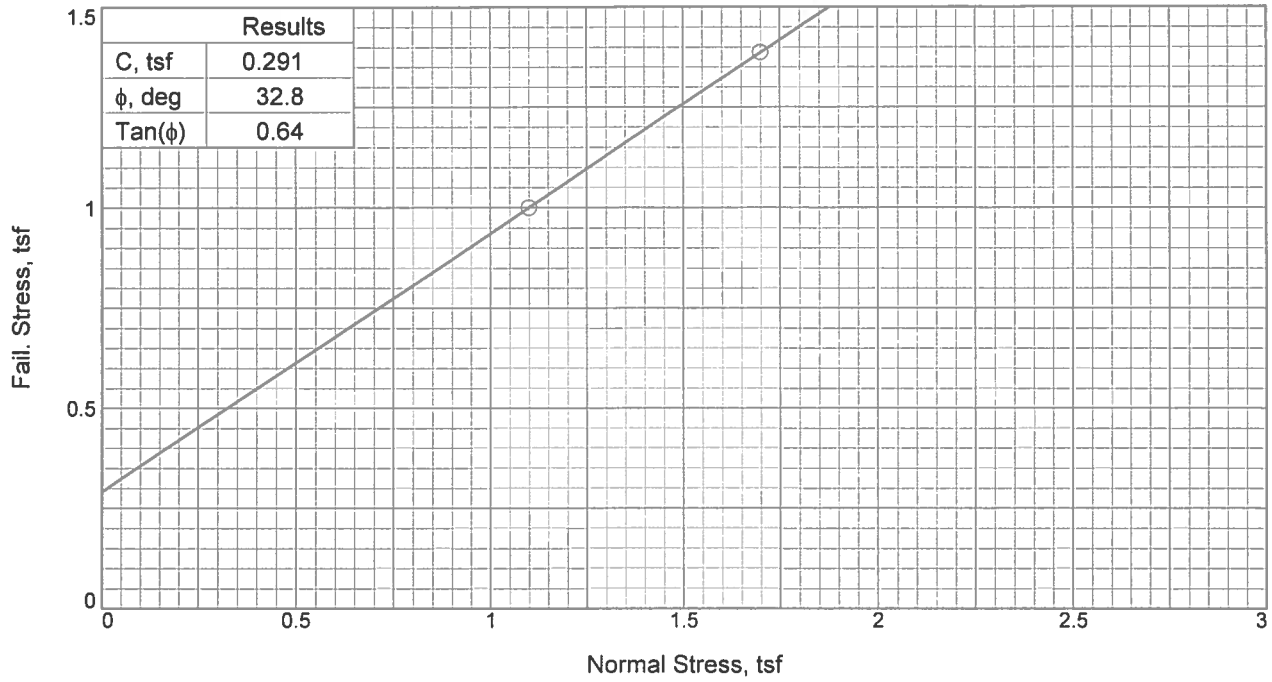
Strain Rate 0.002 in/min

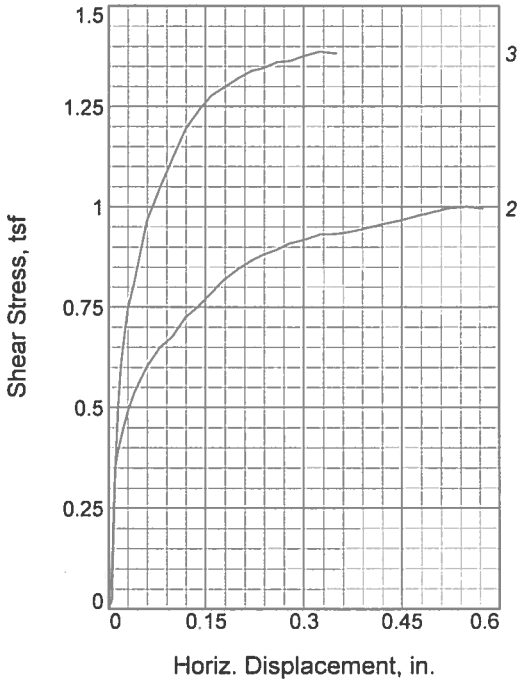
Gray Clay (CL)

Date Tested: 10/16/2015

PROJECT: SARGENT RANCH

3.30632





Sample No.		1	2	3
Initial	Water Content, %	N/A	13.0	13.6
	Dry Density, pcf	N/A	96.2	95.2
	Saturation, %	N/A	47.9	48.8
	Void Ratio	N/A	0.7189	0.7369
	Diameter, in.		2.42	2.42
	Height, in.		1.00	1.00
At Test	Water Content, %	N/A	24.2	23.1
	Dry Density, pcf		96.2	95.2
	Saturation, %		89.2	83.2
	Void Ratio		0.7189	0.7369
	Diameter, in.		2.42	2.42
	Height, in.		1.00	1.00
Normal Stress, tsf		0.800	1.100	1.700
Fail. Stress, tsf			1.000	1.387
Displacement, in.			0.55	0.33
Ult. Stress, tsf				
Displacement, in.				
Strain rate, in./min.		0.05	0.02	0.02

Sample Type:
Description: Gray clay (CL)

LL= 34 **PL=** 15 **PI=** 19
Specific Gravity=
Remarks:

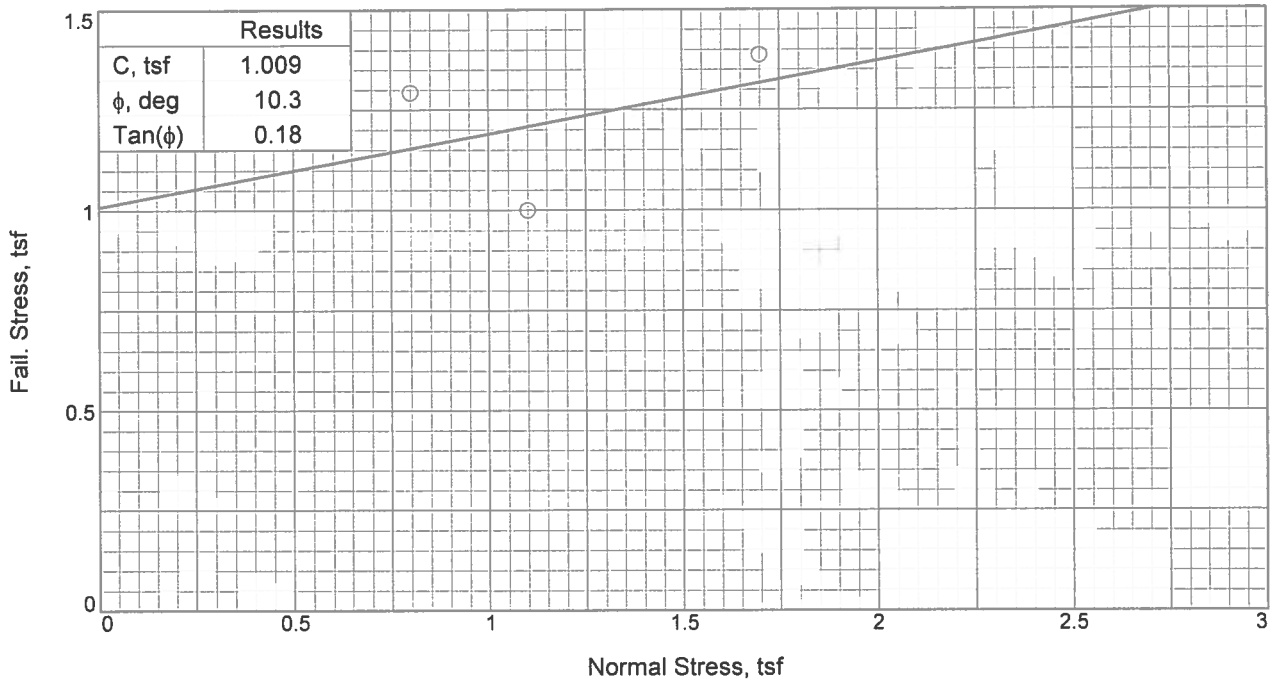
Plate _____

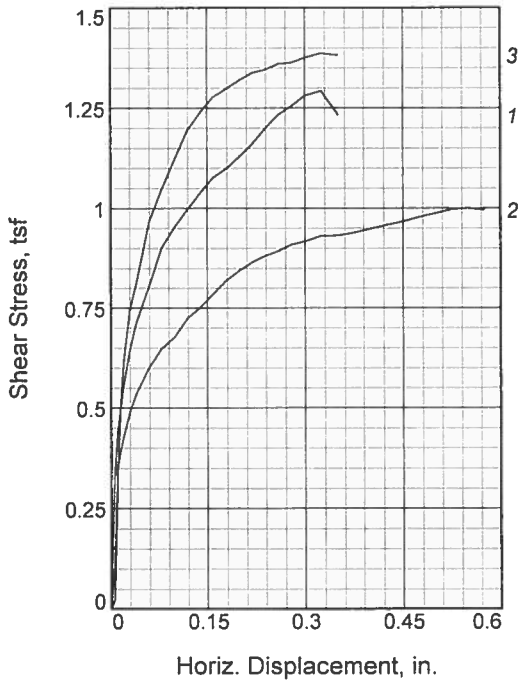
Client: Sierra Geotechnical Services Inc.

Project: Sierra Geotechnical Services
Misc. Laboratory Testing
Source of Sample: Sargent Ranch Job #3.31274
Sample Number: 14-286
Proj. No.: 4437.07I **Date Sampled:** 11-18-14

DIRECT SHEAR TEST REPORT

PEZONELLA ASSOCIATES, INC.





Sample No.		1	2	3
Initial	Water Content, %	13.2	13.0	13.6
	Dry Density, pcf	100.7	96.2	95.2
	Saturation, %	54.3	47.9	48.8
	Void Ratio	0.6426	0.7189	0.7369
	Diameter, in.	2.42	2.42	2.42
	Height, in.	1.00	1.00	1.00
At Test	Water Content, %	23.2	24.2	23.1
	Dry Density, pcf	100.7	96.2	95.2
	Saturation, %	95.6	89.2	83.2
	Void Ratio	0.6426	0.7189	0.7369
	Diameter, in.	2.42	2.42	2.42
	Height, in.	1.00	1.00	1.00
Normal Stress, tsf		0.800	1.100	1.700
Fail. Stress, tsf		1.293	1.000	1.387
Displacement, in.		0.33	0.55	0.33
Ult. Stress, tsf				
Displacement, in.				
Strain rate, in./min.		0.05	0.02	0.02

Sample Type:
Description: Gray clay (CL)

LL= 34 **PL=** 15 **PI=** 19
Specific Gravity= 2.65
Remarks:

Plate _____

Client: Sierra Geotechnical Services Inc.

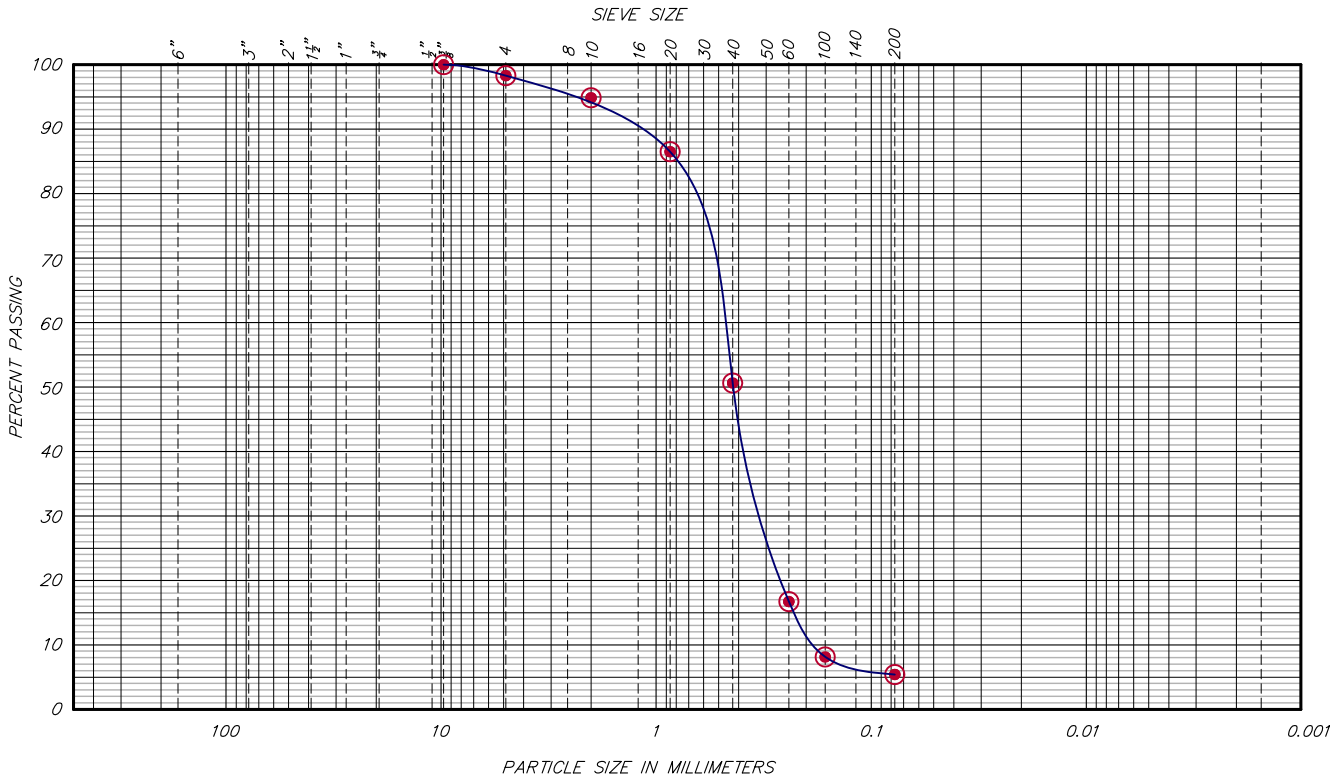
Project: Sierra Geotechnical Services
Misc. Laboratory Testing
Source of Sample: Sargent Ranch Job #3.31274
Sample Number: 14-286
Proj. No.: 4437.07I **Date Sampled:** 11-18-14

DIRECT SHEAR TEST REPORT

PEZONELLA ASSOCIATES, INC.

PARTICLE SIZE DISTRIBUTION REPORT

PER ASTM TEST METHOD D6913



% >3"	% GRAVEL		% SAND			% FINES	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	1.7	3.4	44.2	45.3	5.4	n/a

SIEVE SIZE	PERCENT RETAINED	PERCENT PASSING	SPECIFIED PERCENT	PASS? (Yes or No)
2"				
1–1/2"				
1"				
3/4"				
1/2"				
3/8"	0	100		
No. 4	1.7	98.3		
No. 8	--	--		
No. 10	5.1	94.9		
No. 16	--	--		
No. 20	13.5	86.5		
No. 30	--	--		
No. 40	49.3	50.7		
No. 50	--	--		
No. 60	83.3	16.7		
No. 100	91.9	8.1		
No. 140	--	--		
No. 200	94.6	5.4		

SOIL DESCRIPTION

Poorly Graded Sand with Fines

ATTERBERG LIMITS

PL = 0 LL = 0 PI = NP

COEFFICIENTS

D_{85} = n/a D_{60} = 0.440 D_{50} = n/a

D_{30} = 0.232 D_{15} = n/a D_{10} = 0.180

C_U = 2.444 C_C = 0.680

CLASSIFICATION

USCS = SP/SM AASHTO = n/a

REMARKS

Specific Gravity (per ASTM D854) = n/a

SIERRA GEOTECHNICAL SERVICES, INC.

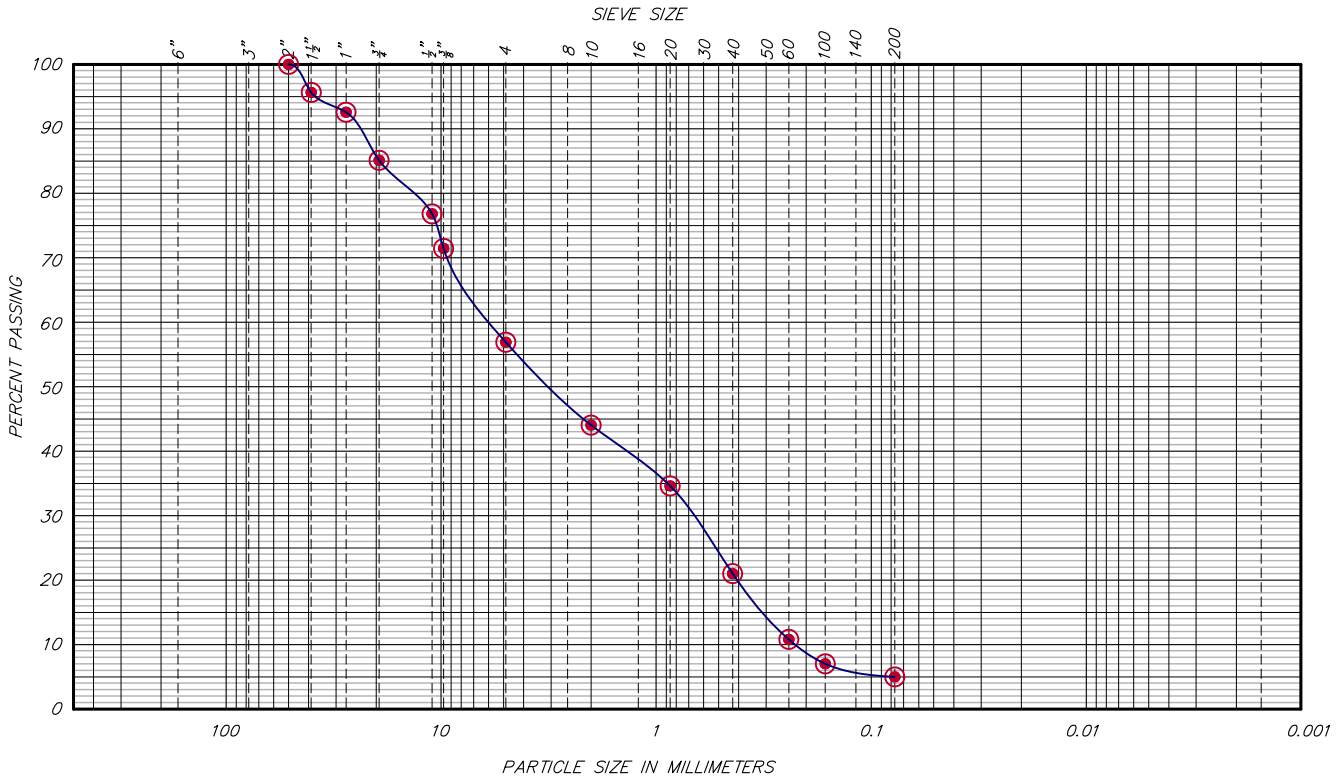
ENVIRONMENTAL GEOTECHNICAL GEOLOGY GROUNDWATER MINING MATERIALS
873 NORTH MAIN STREET, SUITE 150, BISHOP, CALIFORNIA 93514
549 OLD MAMMOTH ROAD, SUTIE 222, MAMMOTH LAKES, CALIFORNIA 93546
www.sgsi.us

AASHTO R18

PROJECT: Sargent Ranch	CLIENT: Sargent Ranch LLC
SAMPLE DEPTH: 40'	LOCATION: BH–2
DATE: 9/11/2015	TESTED BY: CC
JOB NO.: 3.31274	LAB SUPERVISOR: DD

PARTICLE SIZE DISTRIBUTION REPORT

PER ASTM TEST METHOD D6913



% >3"	% GRAVEL		% SAND			% FINES	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	14.9	28.2	12.9	23.0	16.0	5.0	n/a

SIEVE SIZE	PERCENT RETAINED	PERCENT PASSING	SPECIFIED PERCENT	PASS? (Yes or No)
2"	0	100.0		
1-1/2"	4.3	95.7		
1"	7.4	92.6		
3/4"	14.9	85.1		
1/2"	23.2	76.8		
3/8"	28.6	71.4		
No. 4	43.1	56.9		
No. 8	--	--		
No. 10	56.0	44.0		
No. 16	--	--		
No. 20	65.4	35.6		
No. 30	--	--		
No. 40	79.0	21.0		
No. 50	--	--		
No. 60	89.2	10.8		
No. 100	93.0	7.0		
No. 140	--	--		
No. 200	95.0	5.0		

SOIL DESCRIPTION

Poorly Graded Sand with Gravel and Fines

ATTERBERG LIMITS

PL = 0 LL = 0 PI = NP

COEFFICIENTS

D_{85} = n/a D_{60} = 1.600 D_{50} = n/a

D_{30} = 0.164 D_{15} = n/a D_{10} = 0.122

C_U = 13.1 C_C = 0.138

CLASSIFICATION

USCS = SP/SM AASHTO = n/a

REMARKS

Specific Gravity (per ASTM D854) = n/a

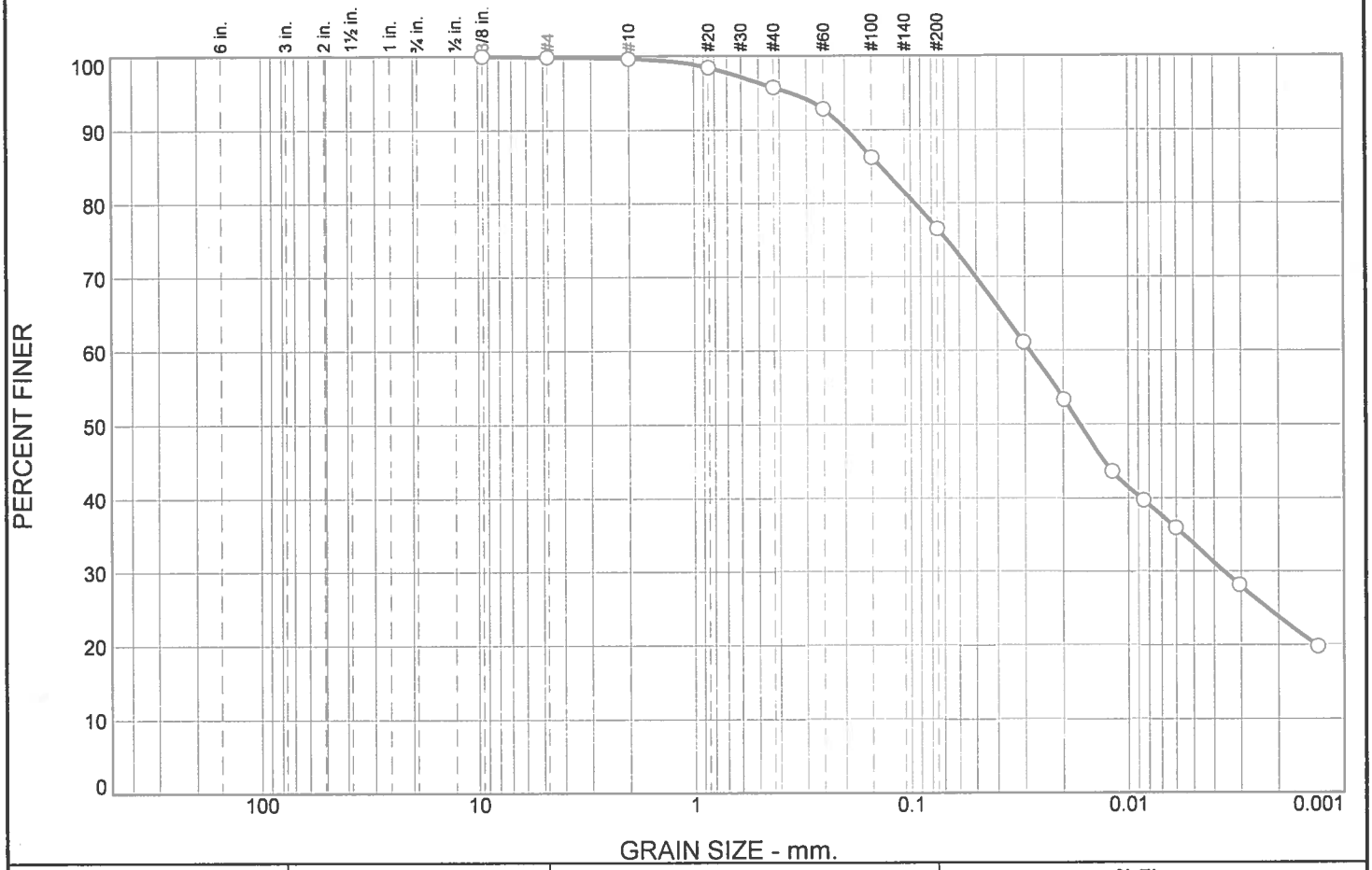
SIERRA GEOTECHNICAL SERVICES, INC.

ENVIRONMENTAL GEOTECHNICAL GEOLOGY GROUNDWATER MINING MATERIALS
873 NORTH MAIN STREET, SUITE 150, BISHOP, CALIFORNIA 93514
549 OLD MAMMOTH ROAD, SUTIE 222, MAMMOTH LAKES, CALIFORNIA 93546
www.sgsi.us

AASHTO R18

PROJECT:	CLIENT:
Sargent Ranch	Sargent Ranch LLC
SAMPLE DEPTH: 22'	LOCATION: BH-4
DATE: 9/14/2015	TESTED BY: CC
JOB NO.: 3.31274	LAB SUPERVISOR: DD

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.1	0.2	3.9	19.3	42.7	33.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375"	100.0		
#4	99.9		
#10	99.7		
#20	98.5		
#40	95.8		
#60	92.8		
#100	86.2		
#200	76.5		
0.0303 mm.	61.1		
0.0198 mm.	53.3		
0.0118 mm.	43.6		
0.0085 mm.	39.7		
0.0060 mm.	35.9		
0.0030 mm.	28.1		
0.0013 mm.	19.8		

* (no specification provided)

Soil Description

Gray clay (CL)

Atterberg Limits

PL= 15 LL= 34 PI= 19

Coefficients

D_{85}= 0.1375 D_{60}= 0.0285 D_{50}= 0.0168
D_{30}= 0.0036 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-6(12)

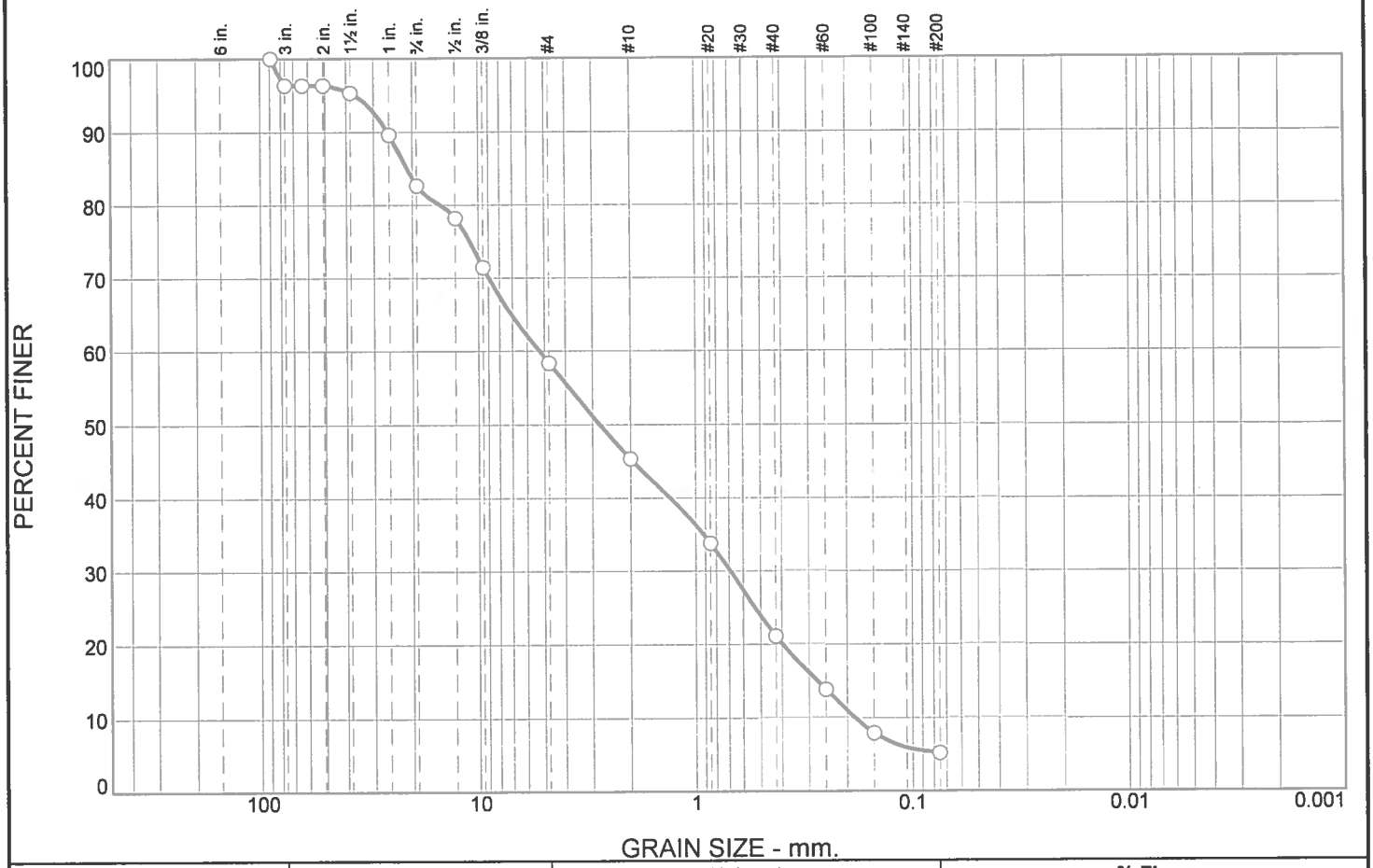
Remarks

Sample No.: 14-286 **Source of Sample:** Sargent Ranch Job #3.31274 **Date:** 11-18-14
Location: **Elev./Depth:**

PEZONELLA ASSOCIATES, INC.
Reno, Nevada

Client: Sierra Geotechnical Services Inc.
Project: Sierra Geotechnical Services
Misc. Laboratory Testing
Project No: 4437.07I **Plate**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
3.6	13.8	24.2	13.1	24.2	15.9	5.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3.5"	100.0		
3"	96.4		
2.5"	96.4		
2"	96.4		
1.5"	95.3		
1"	89.6		
.75"	82.6		
.5"	78.2		
.375"	71.4		
#4	58.4		
#10	45.3		
#20	33.8		
#40	21.1		
#60	13.9		
#100	7.9		
#200	5.2		

* (no specification provided)

Soil Description

Brown sand (SP-SM) with gravel and cobbles

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 21.2346 D_{60}= 5.2752 D_{50}= 2.7787
D_{30}= 0.6893 D_{15}= 0.2735 D_{10}= 0.1838
C_u= 28.70 C_c= 0.49

Classification

USCS= AASHTO=

Remarks

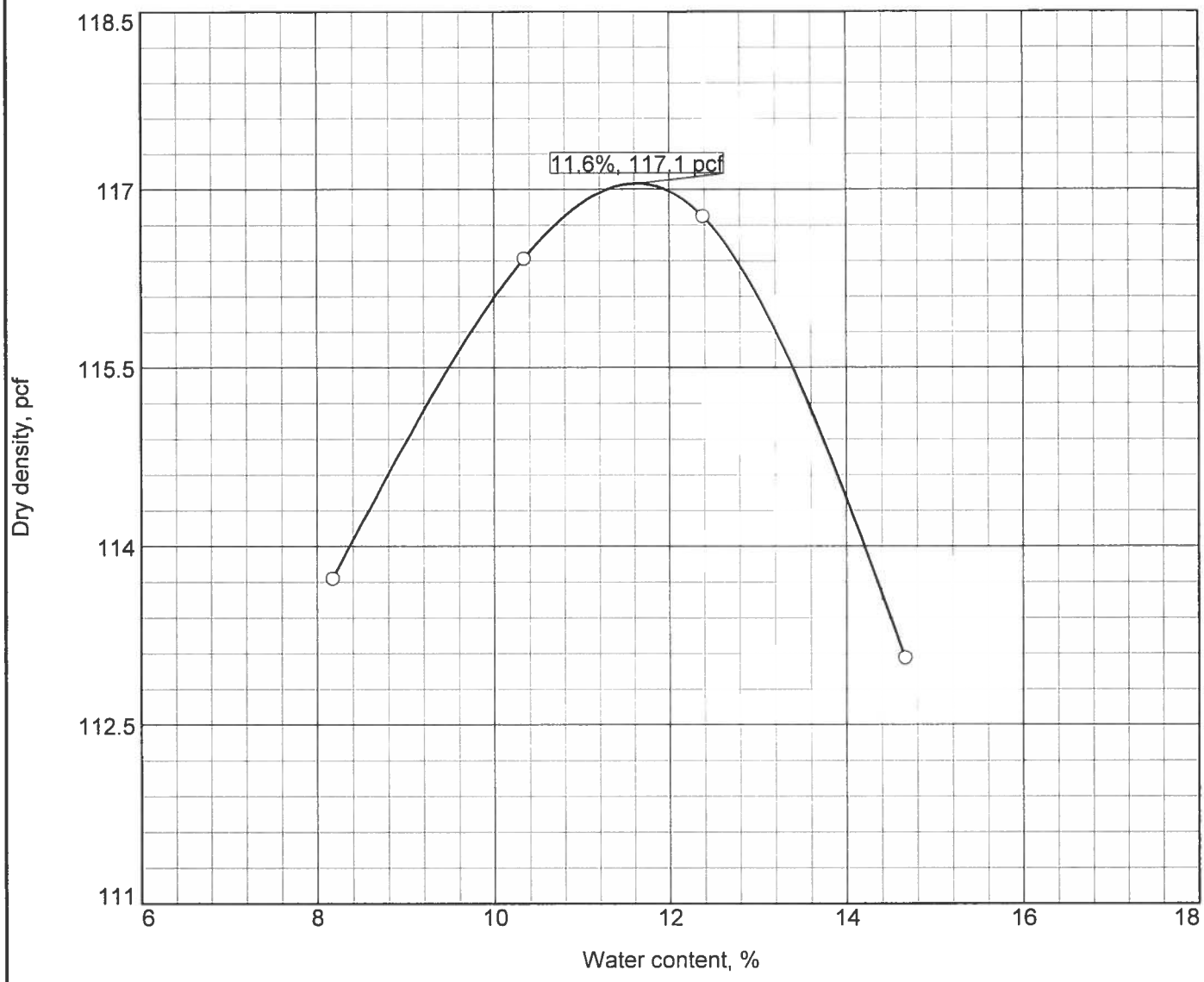
L.A. Abrasion test results = 25.3% loss

Sample No.: 14-287 **Source of Sample:** Sargent Ranch Job #3.31274 **Date:** 11-18-14
Location: **Elev./Depth:**

PEZONELLA ASSOCIATES, INC.
Reno, Nevada

Client: Sierra Geotechnical Services Inc.
Project: Sierra Geotechnical Services
Misc. Laboratory Testing
Project No: 4437.07I **Plate**

COMPACTION TEST REPORT



Test specification: ASTM D 1557-02 Method A Modified

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > #4	% < No.200
	USCS	AASHTO						
	CL	A-6(12)			34	19	0.1	76.5

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 117.1 pcf Optimum moisture = 11.6 %	Gray clay (CL)

Project No. 4437.07I **Client:** Sierra Geotechnical Services Inc.
Project: Sierra Geotechnical Services
Misc. Laboratory Testing **Date:**
○ **Sample Source:** Sargent Ranch Job #3.31274 **Sample No.:** 14-286

Remarks:

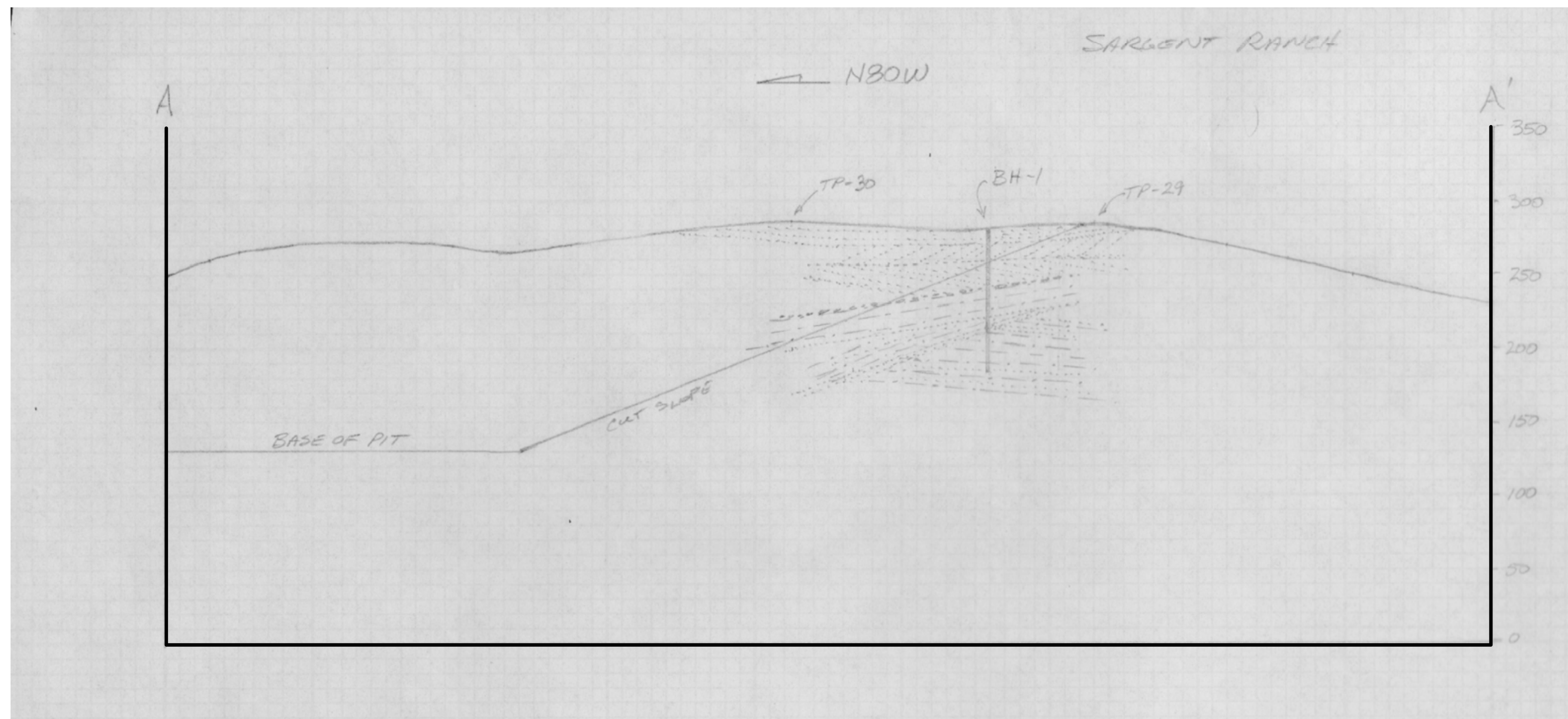
PEZONELLA ASSOCIATES, INC.

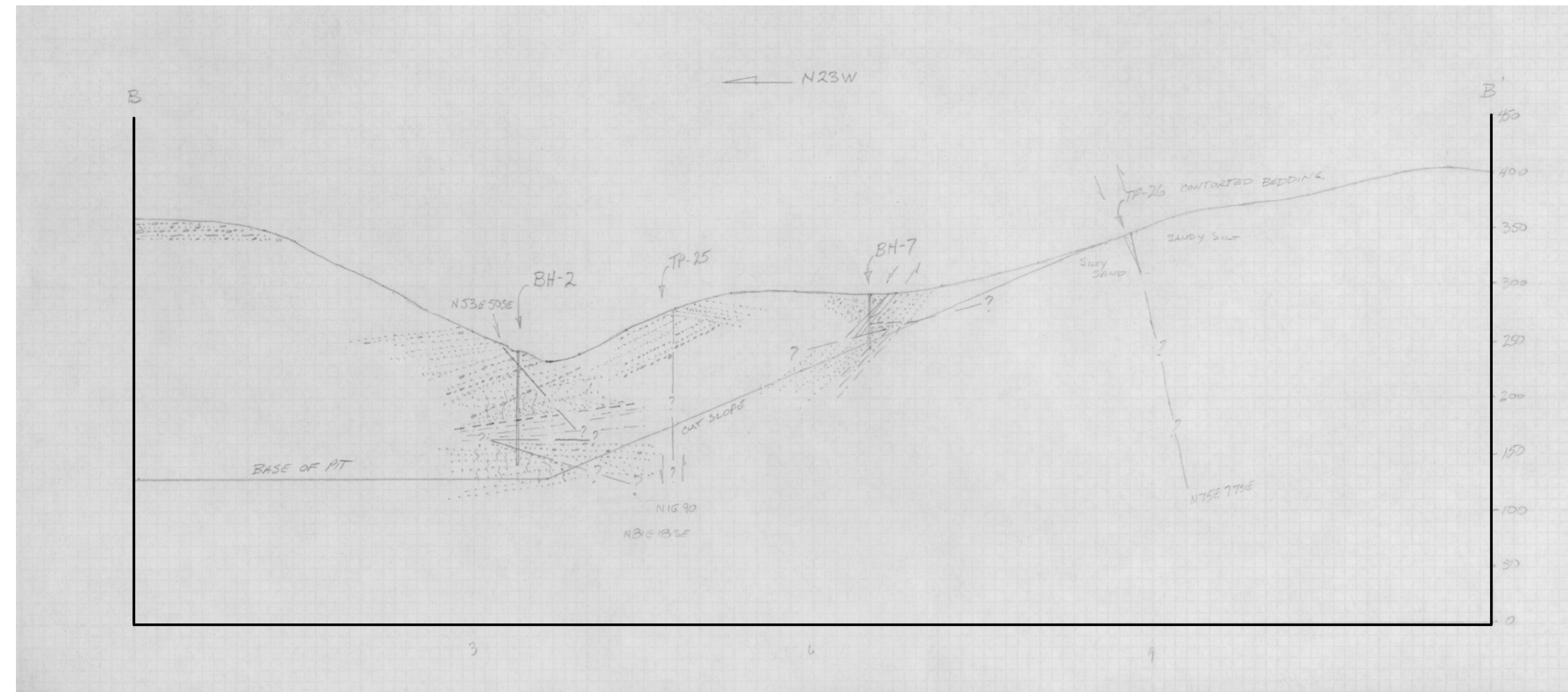
Reno, Nevada

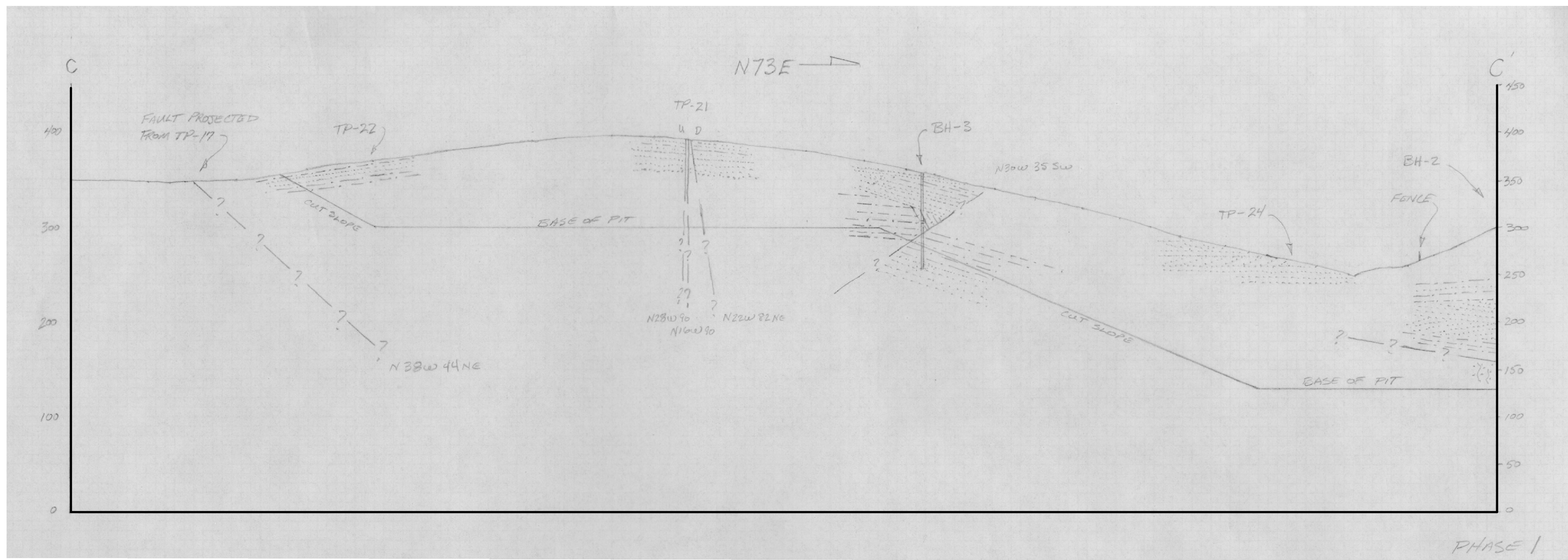
Plate

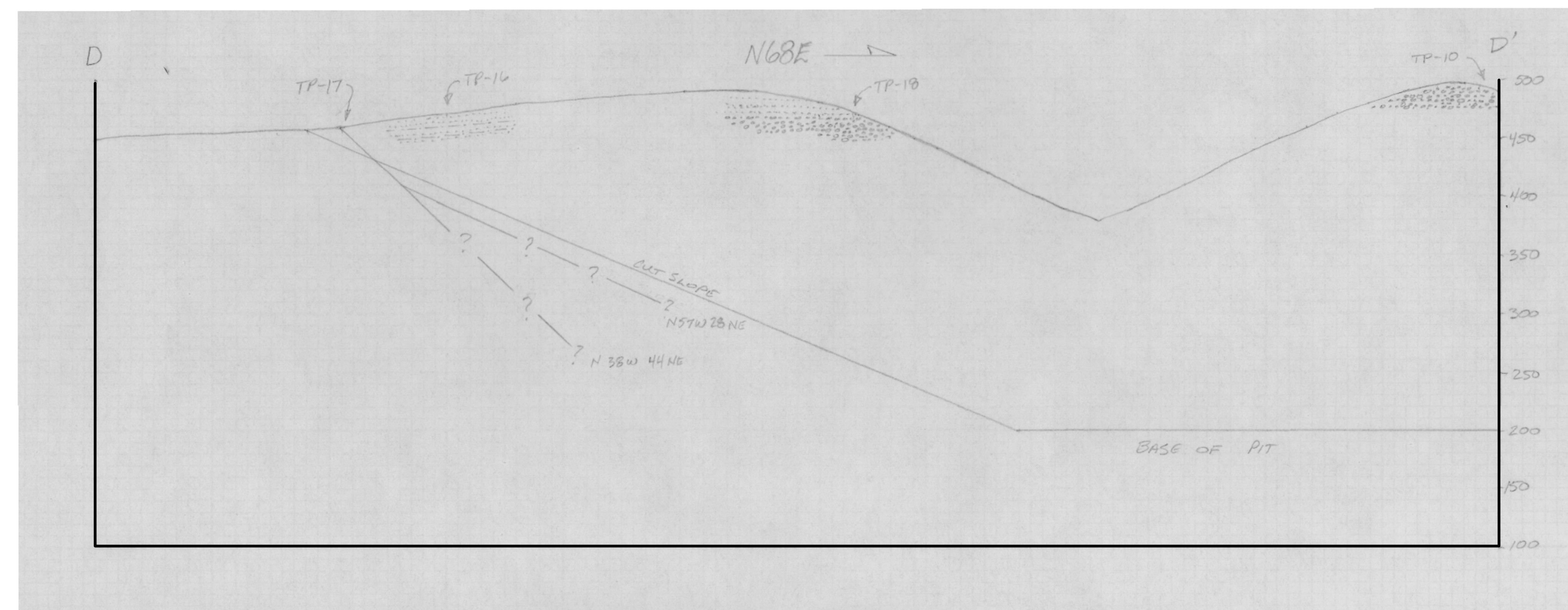
APPENDIX C

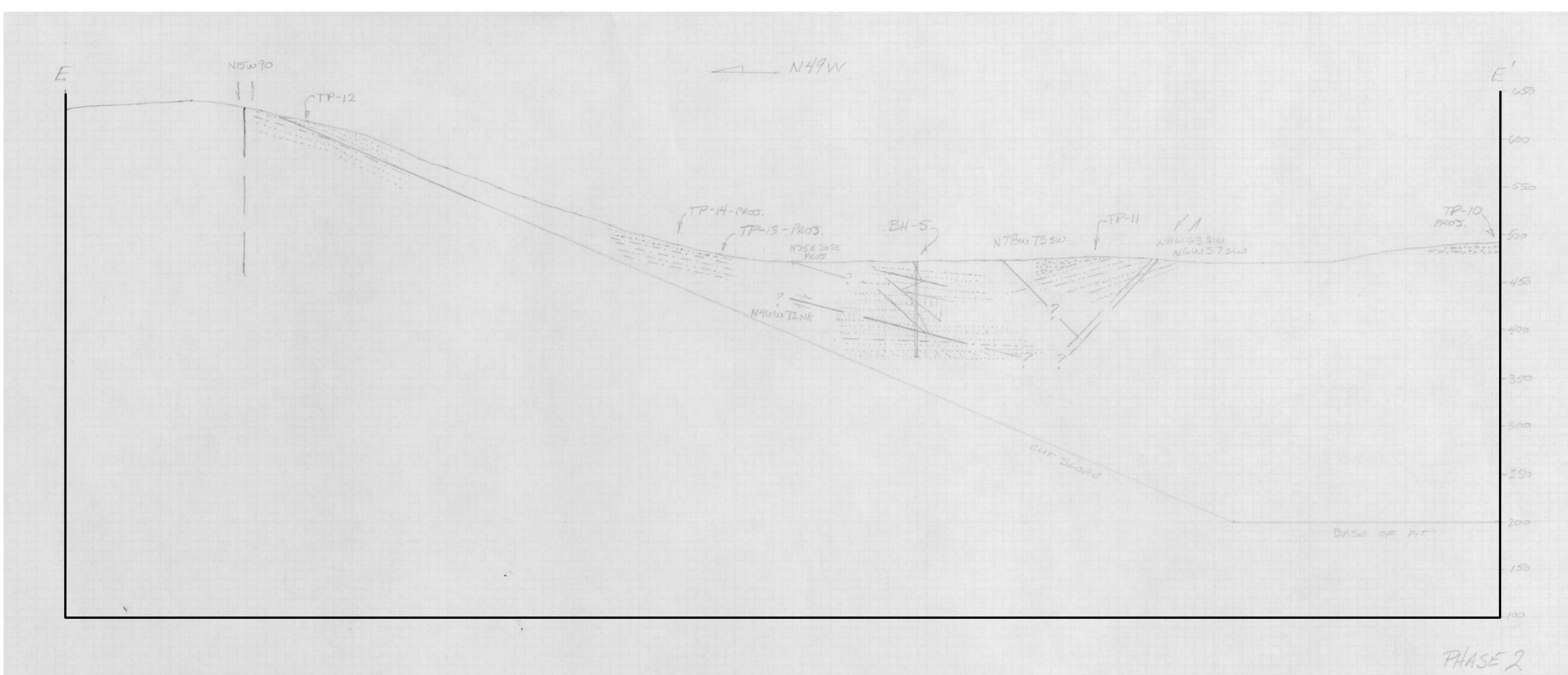
GEOLOGIC CROSS SECTIONS

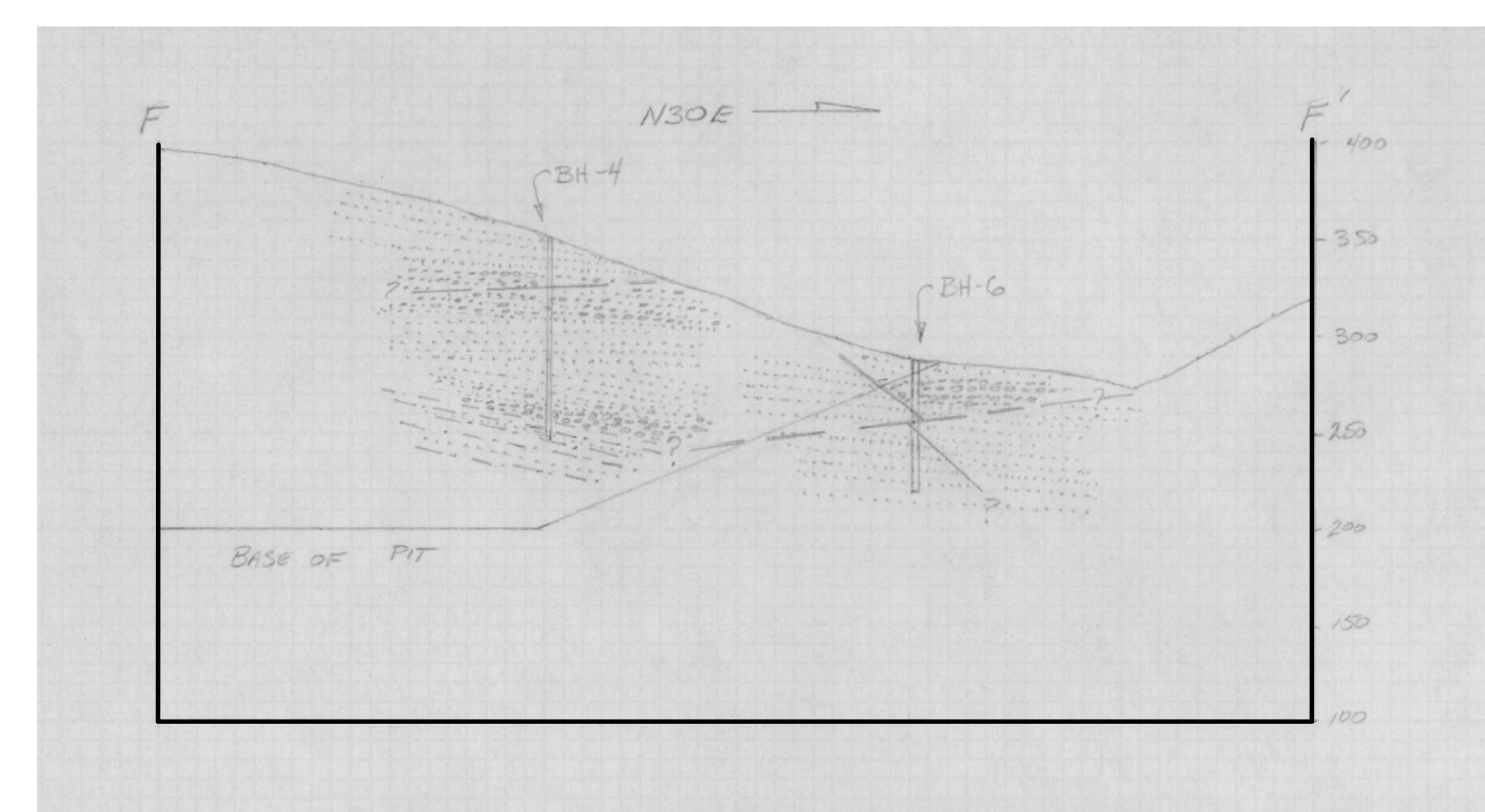












GRAPHIC SCALE

0 100 150 200 300 400

(Horizontal & Vertical)
1 inch = 100 feet

SARGENT RANCH
GEOLOGIC CROSS SECTIONS AA' thru FF'
SARGENT RANCH LLC

post office box 5024
569 old mammoth rd., ste. 222
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email: info@sgsi.us

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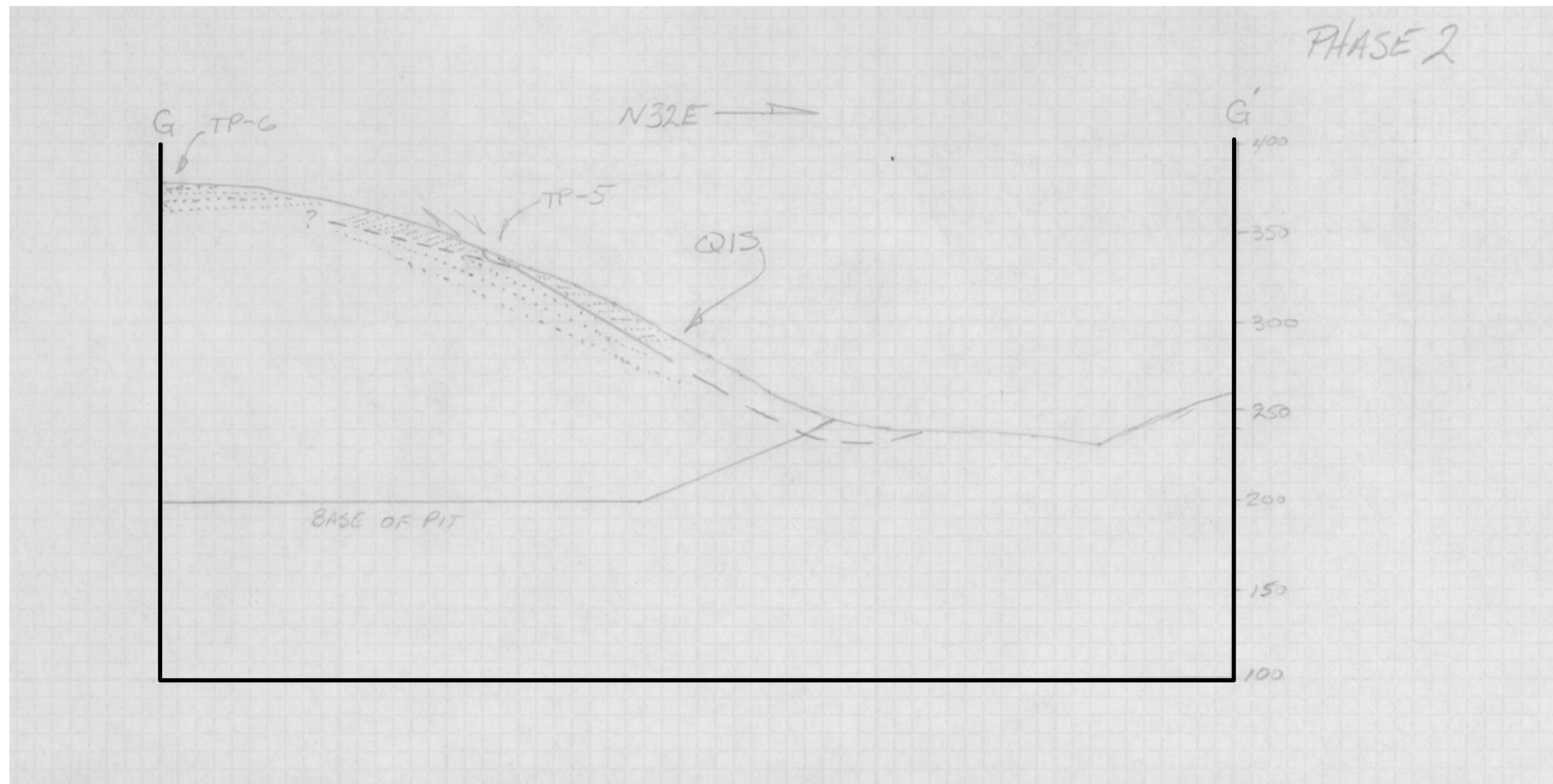
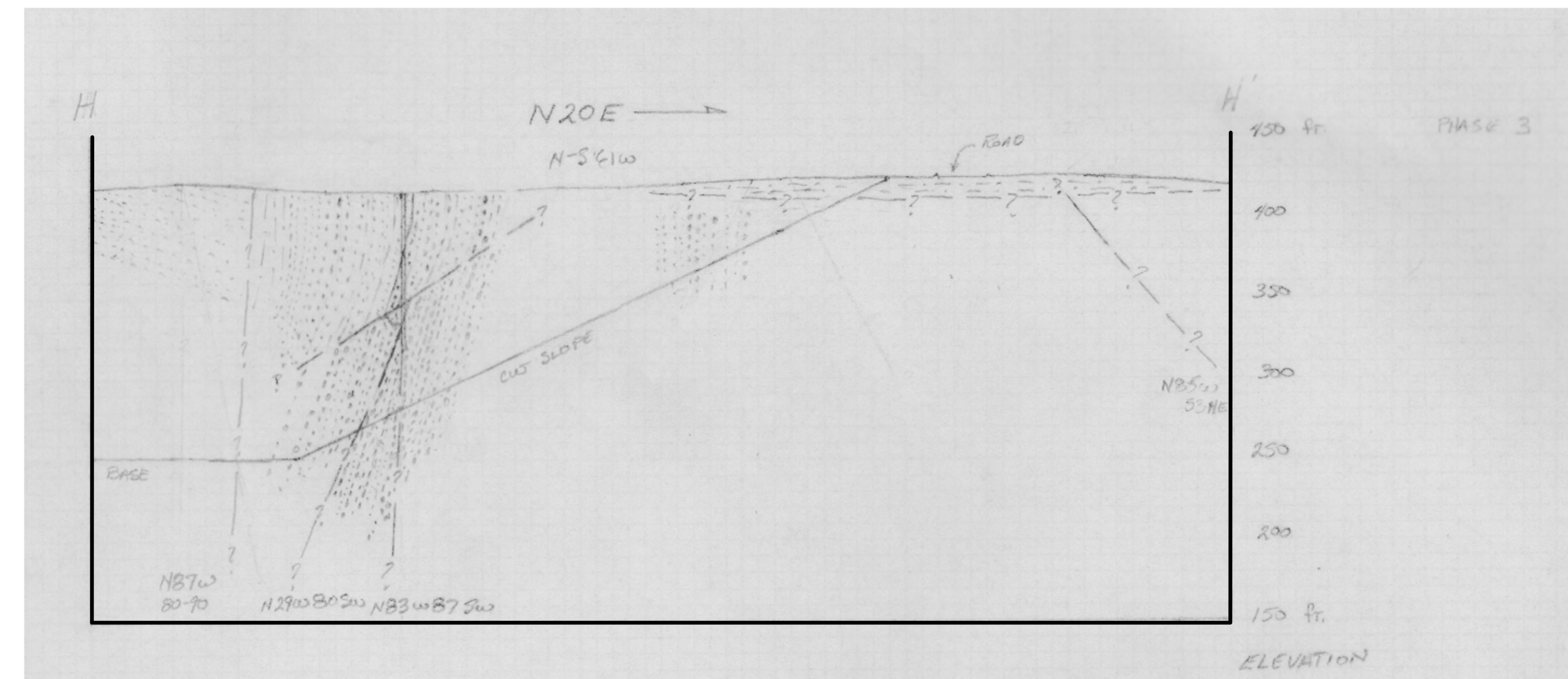
email: info@sgsi.us

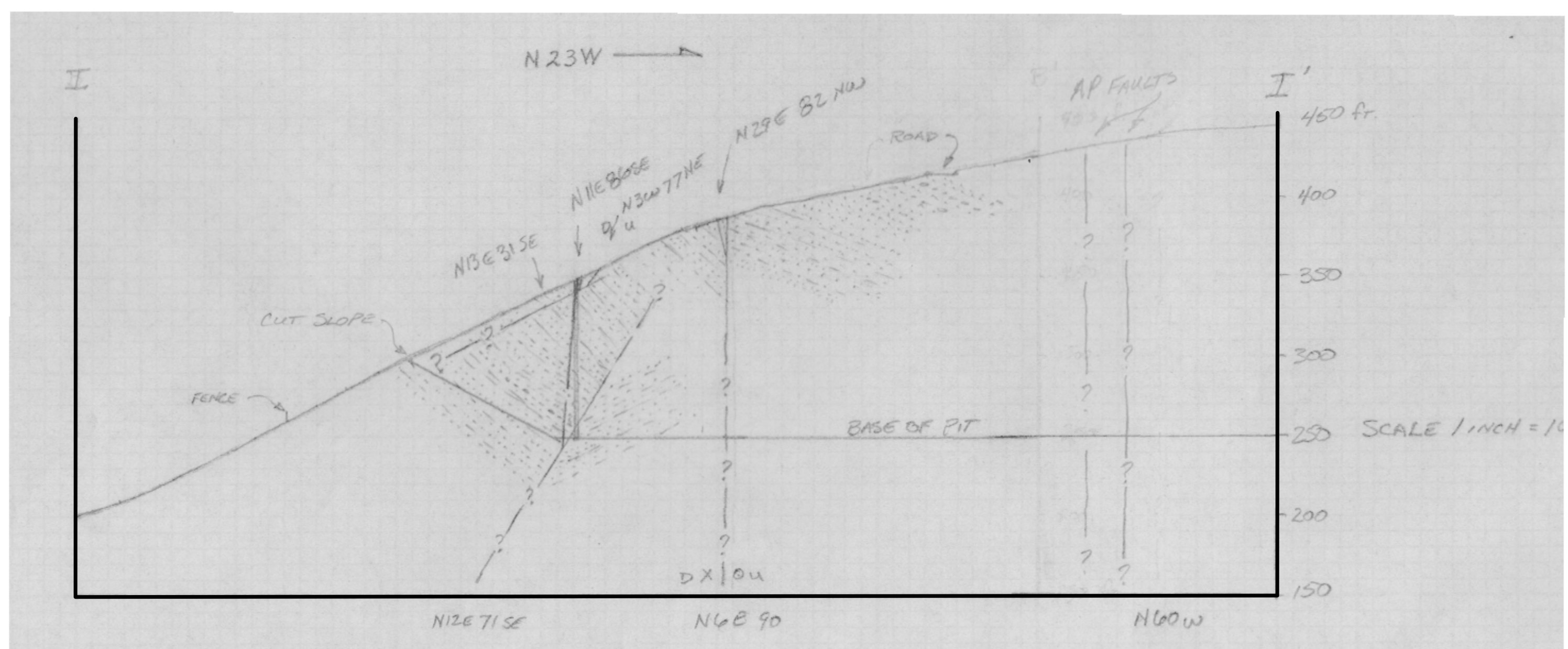
SIERRA GEOTECHNICAL SERVICES, INC.
GEOTECHNICAL • GEOLOGY • GROUNDWATER • ENVIRONMENTAL • MATERIALS

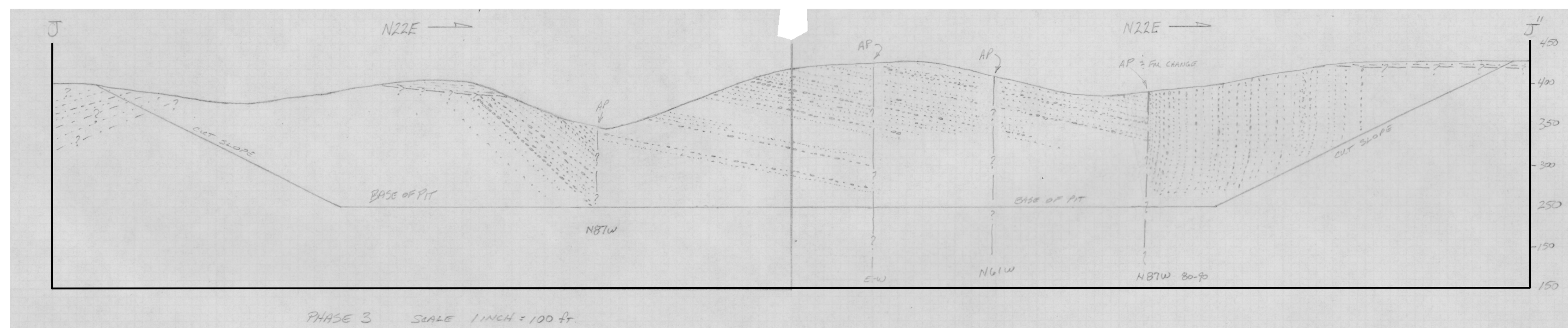
REVISIONS	BY

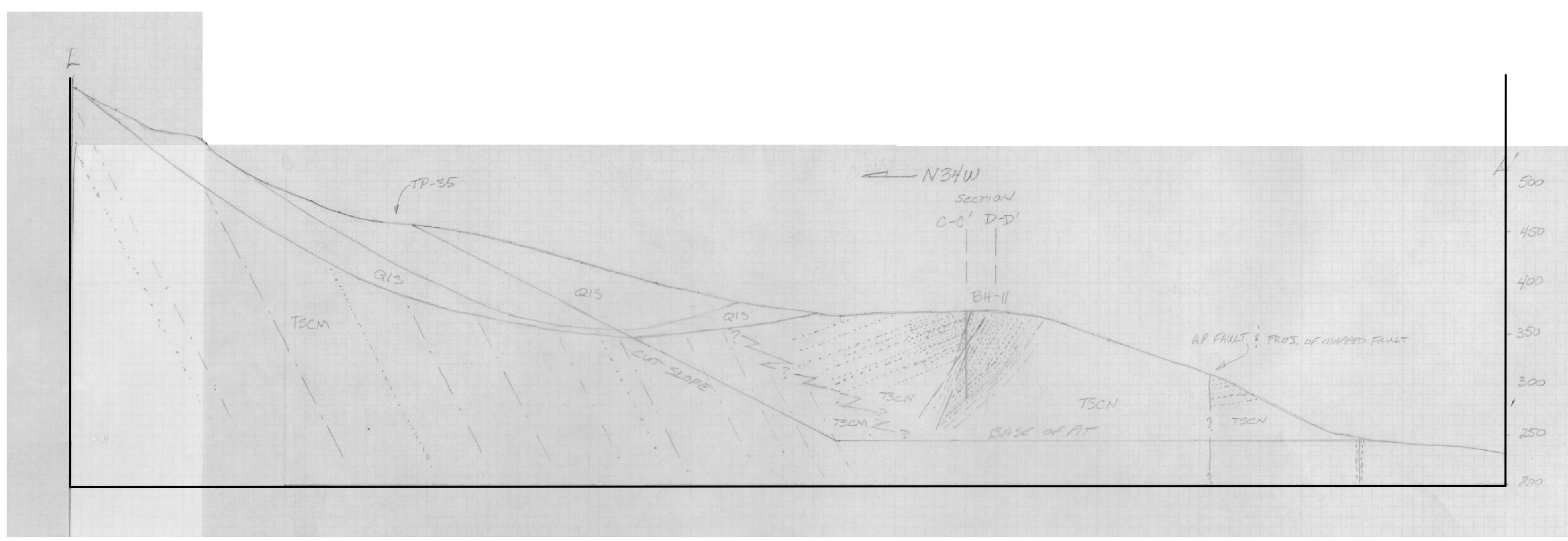
DATE 9/2016
SCALE 1"=100'
DRAWN DD
JOB NO. 3.31274
DWG GEOLOGY.DWG
SHEET 2 OF 4 SHEETS











GRAPHIC SCALE

0 100 150 200 300 400

(Horizontal & Vertical)
1 inch = 100 feet

SARGENT RANCH

GEOLOGIC CROSS SECTIONS GG', HH', II', JJ' & LL'

SARGENT RANCH LLC

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REVISIONS	BY

DATE 9/2016

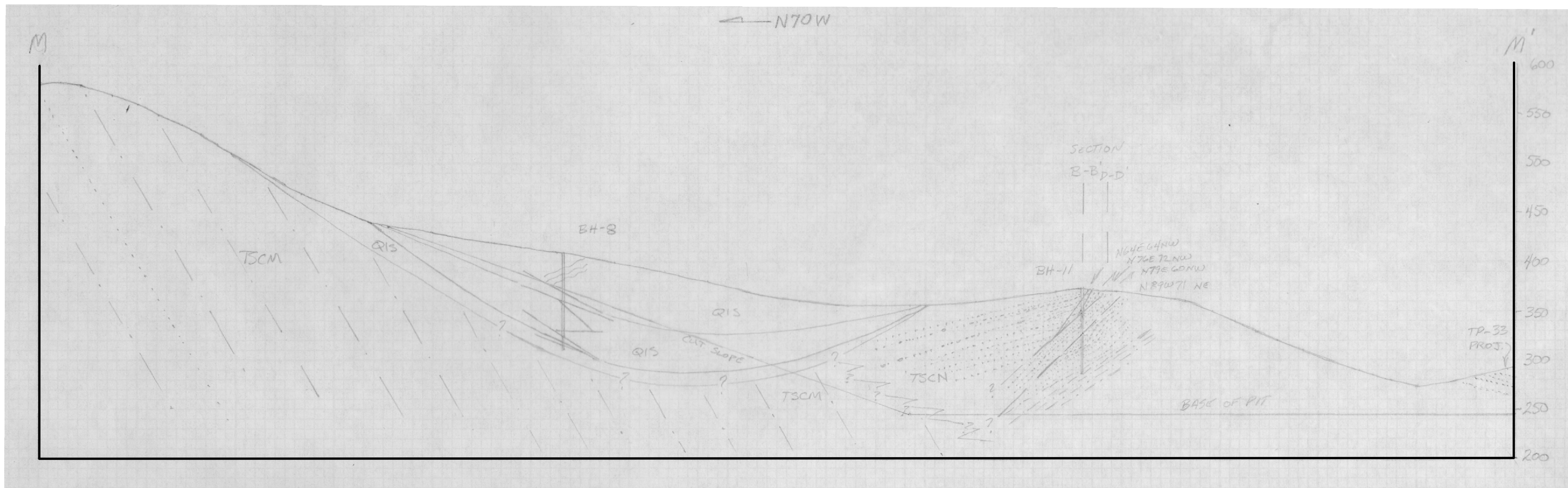
SCALE 1"=100'

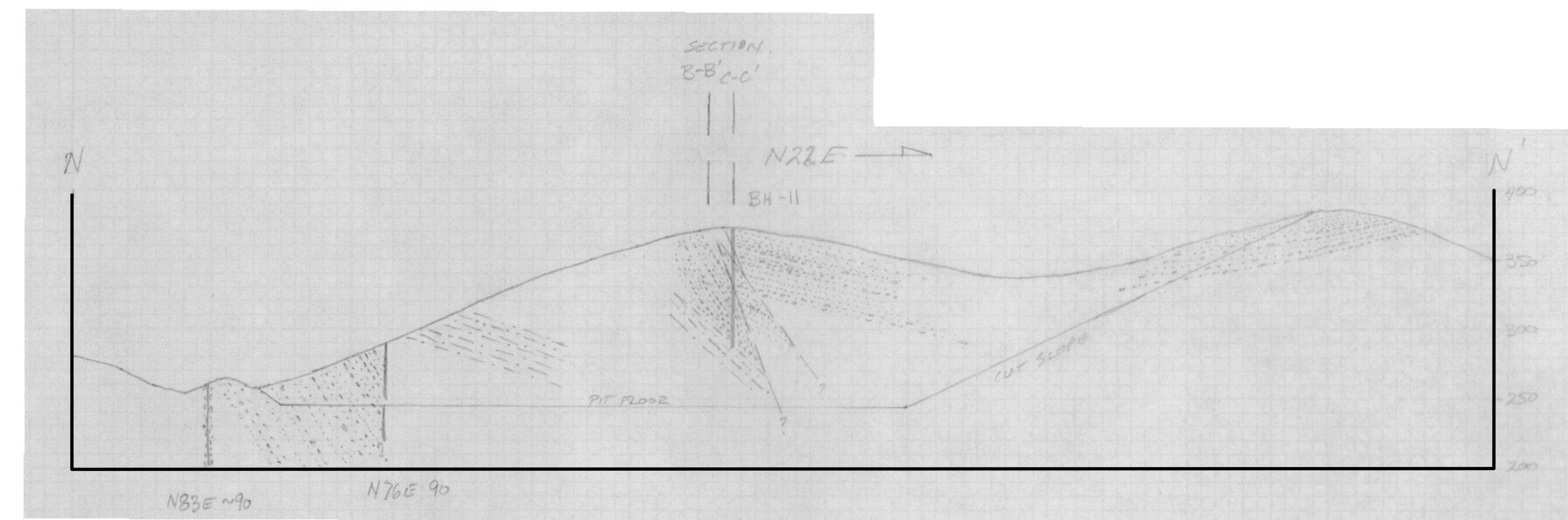
DRAWN DD

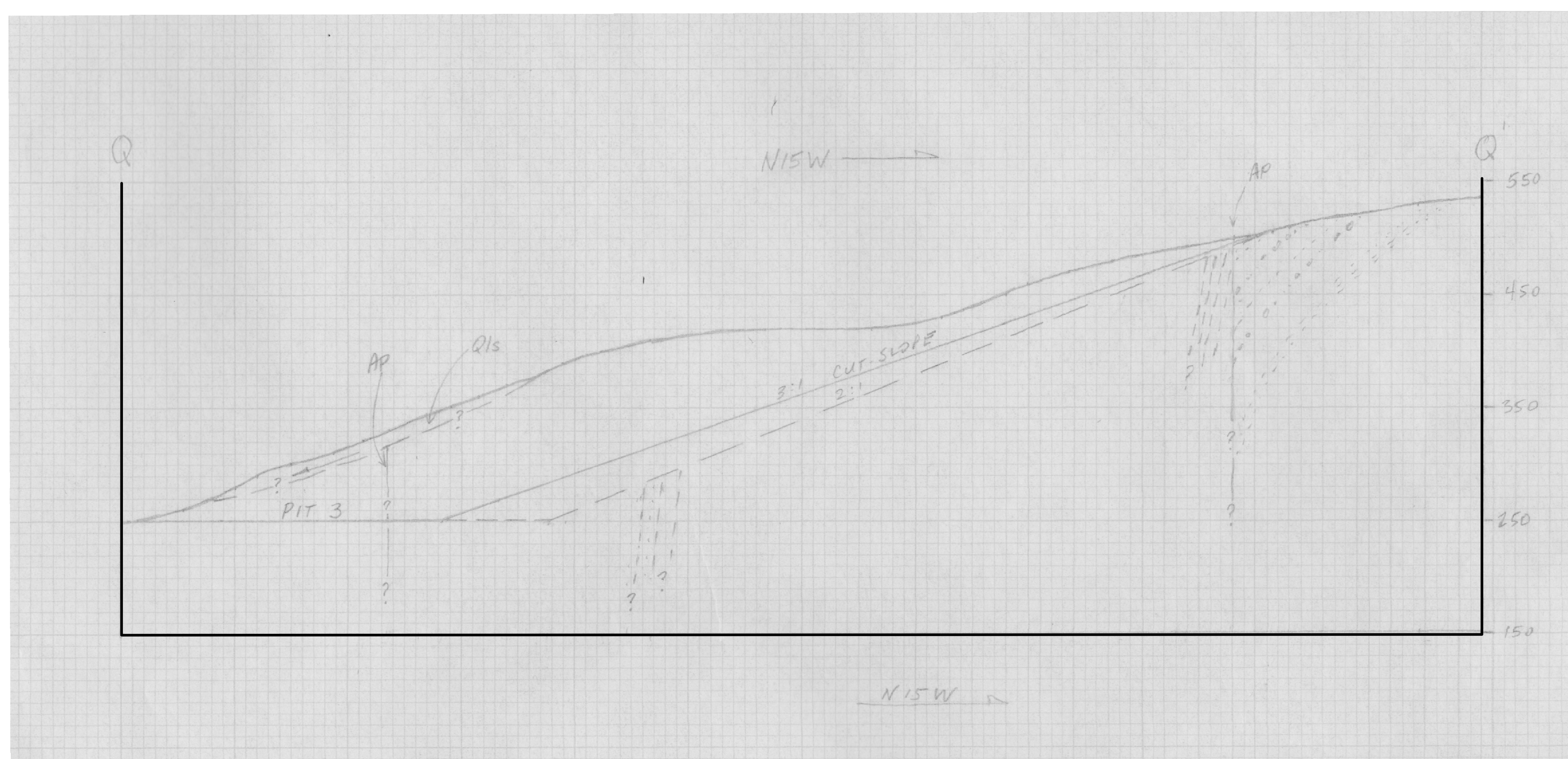
JOB NO. 3.31274

DWG GEOLOGY.DWG

SHEET 3 OF 4 SHEETS







GRAPHIC SCALE

0 100 150 200 300 400

(Horizontal & Vertical)
1 inch = 100 feet

SARGENT RANCH

GEOLOGIC CROSS SECTIONS MM', NN' & QQ'

SARGENT RANCH LLC

SGS
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GEOTECHNICAL • GEOLOGY • GROUNDWATER • ENVIRONMENTAL • MATERIALS

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BISHOP, ca 93514
phone: (760) 937-4789
email: info@sgsi.us

REVISIONS	BY

DATE	9/2016
SCALE	1"=100'
DRAWN	DD
JOB NO.	3.31274
DWG	GEOLOGY.DWG
SHEET	4
OF	4 SHEETS

APPENDIX D

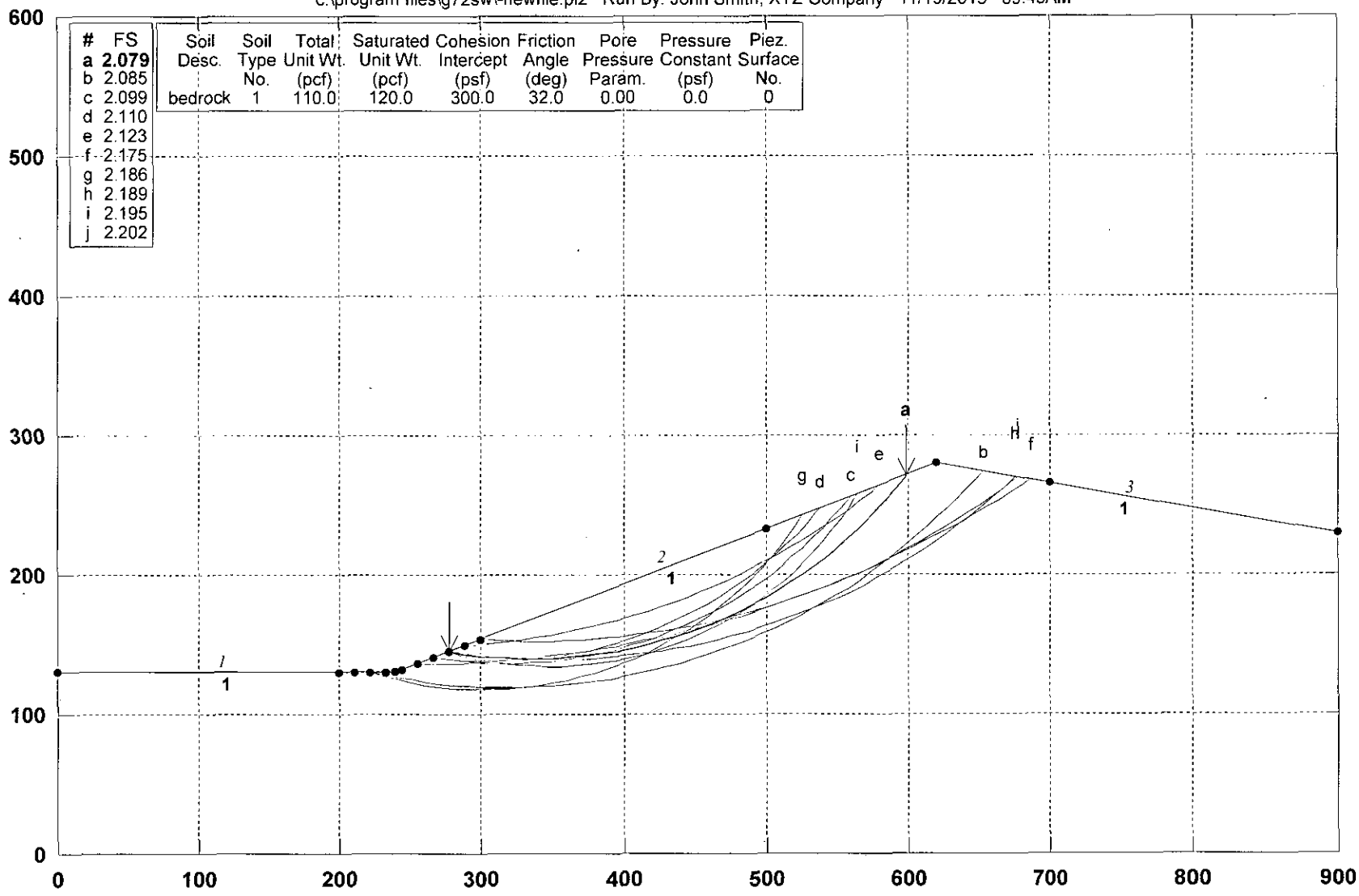
SLOPE STABILITY ANALYSIS

Sargent Ranch Quarry Site Section A-A'

c:\program files\g72sw\-newfile.pl2 Run By: John Smith, XYZ Company 11/19/2015 09:43AM

#	FS
a	**2.079**
b	2.085
c	2.099
d	2.110
e	2.123
f	2.175
g	2.186
h	2.189
i	2.195
j	2.202

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
bedrock	1	110.0	120.0	300.0	32.0	0.00	0.0	0



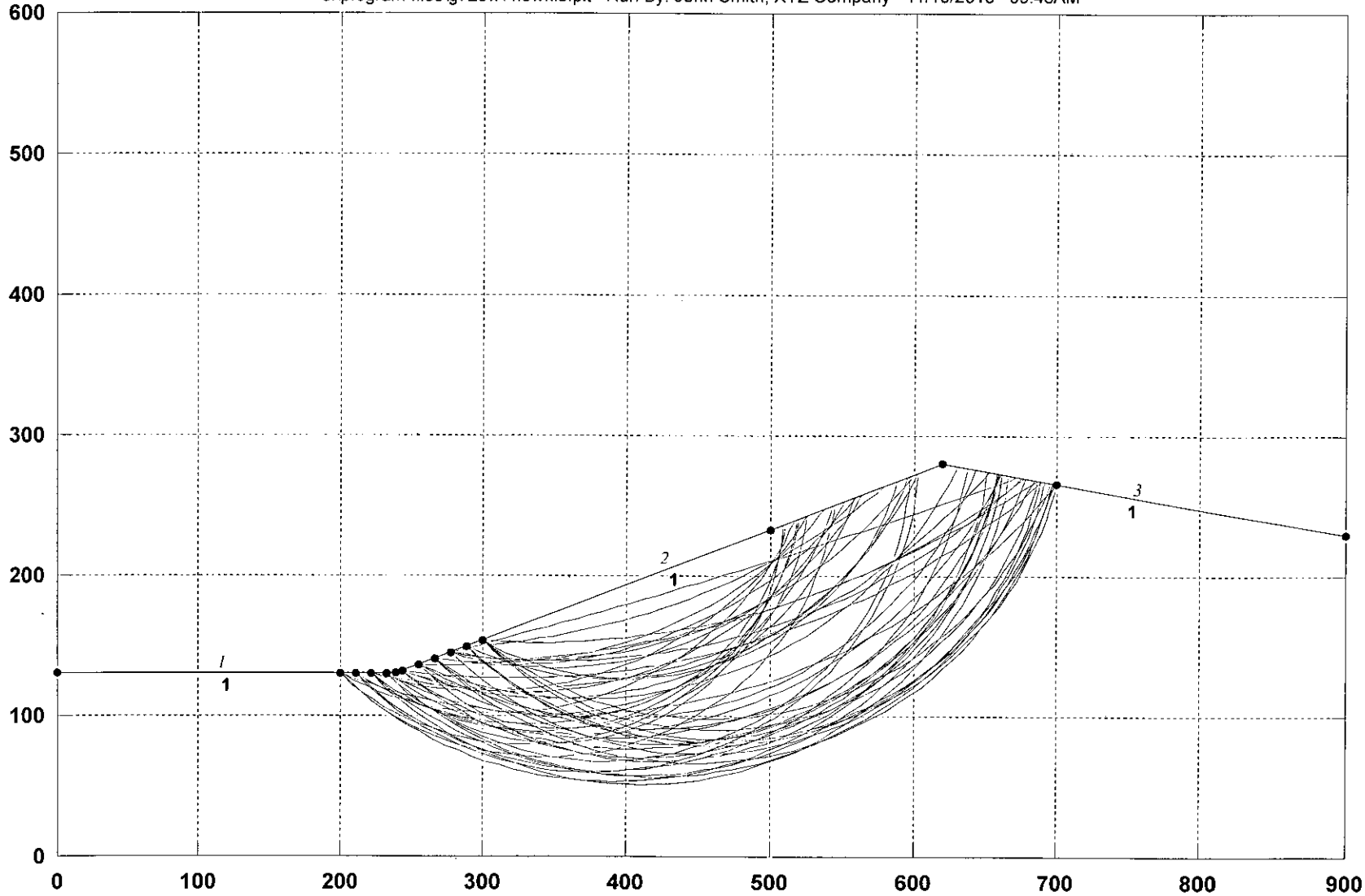
GSTABL7 v.2 FSmin=2.079

Safety Factors Are Calculated By The Modified Bishop Method

GSTABL7

Sargent Ranch Quarry Site Section A-A'

c:\program files\g72sw\-newfile.plt Run By: John Smith, XYZ Company 11/19/2015 09:43AM



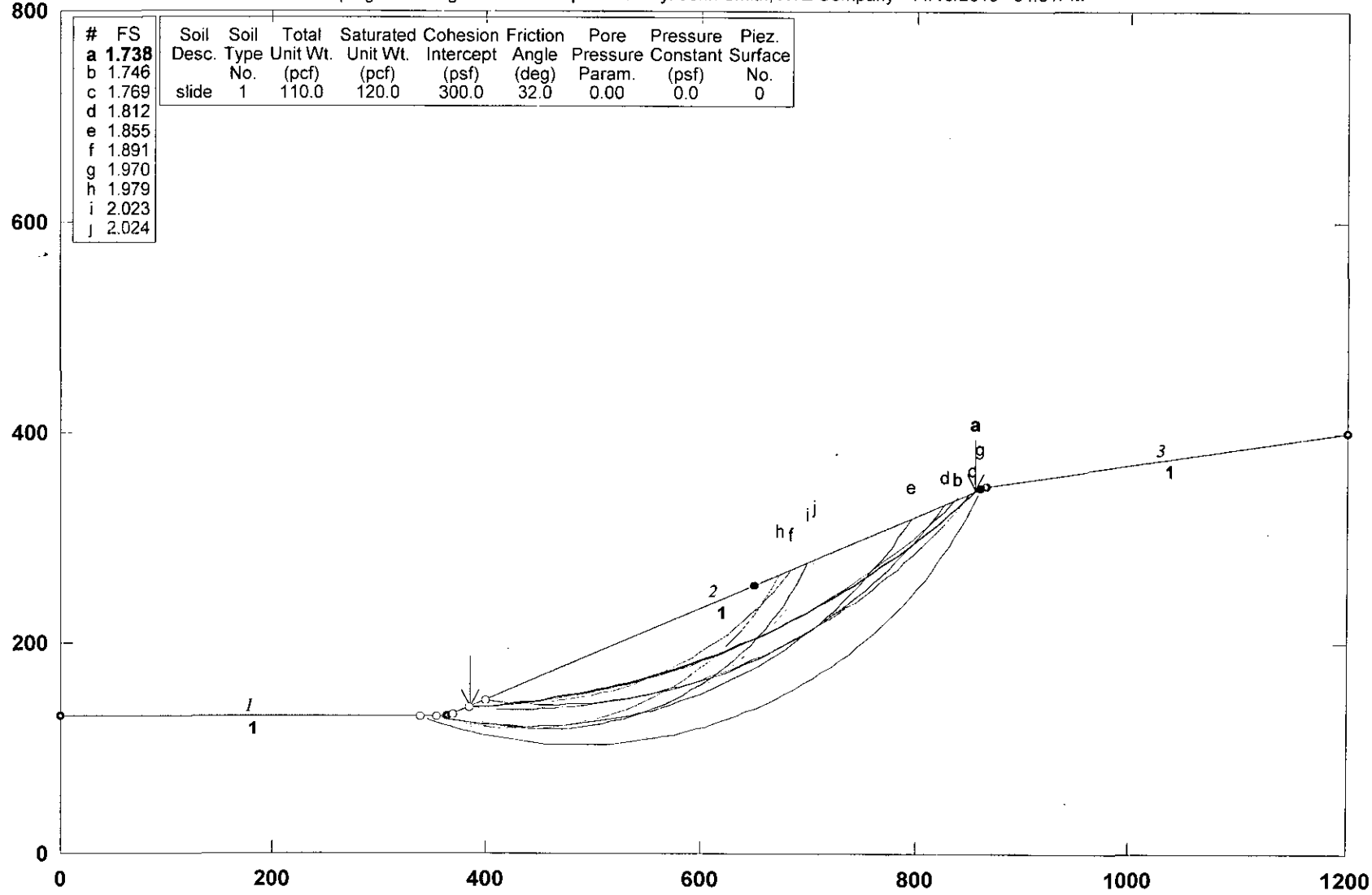
GSTABL7

Sargent Ranch Quarry Site Section B-B' Deep Clay Bedding

c:\program files\g72sw\-newfile.pl2 Run By: John Smith, XYZ Company 11/19/2015 04:51PM

#	FS
a	**1.738**
b	1.746
c	1.769
d	1.812
e	1.855
f	1.891
g	1.970
h	1.979
i	2.023
j	2.024

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
slide	1	110.0	120.0	300.0	32.0	0.00	0.0	0



GSTABL7 v.2 FSmin=1.738

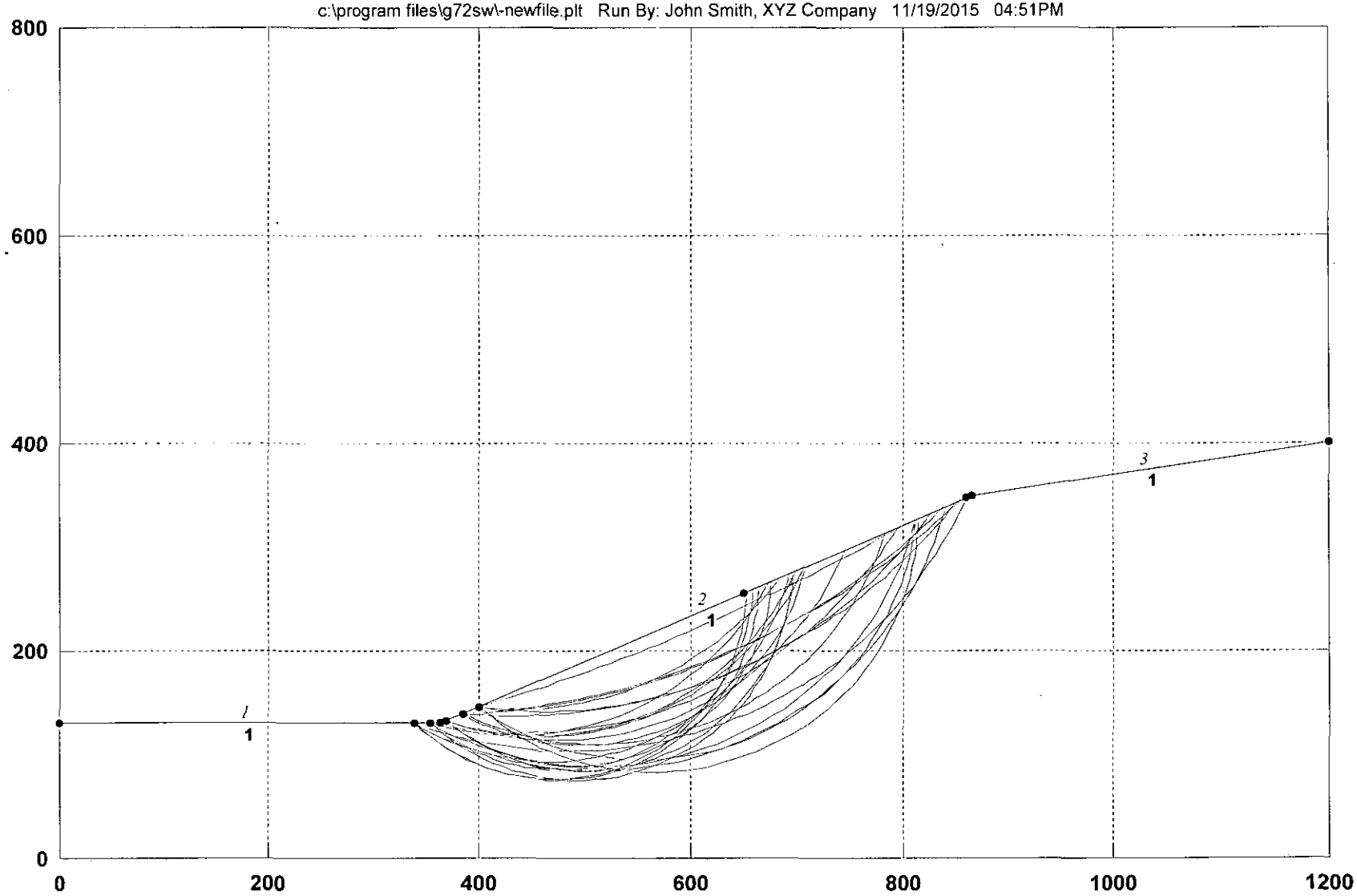
Safety Factors Are Calculated By The Modified Bishop Method

GSTABL7

FS, if Cross bedded

Sargent Ranch Quarry Site Section B-B' Deep Clay Bedding

c:\program files\g72sw\-newfile.plt Run By: John Smith, XYZ Company 11/19/2015 04:51PM



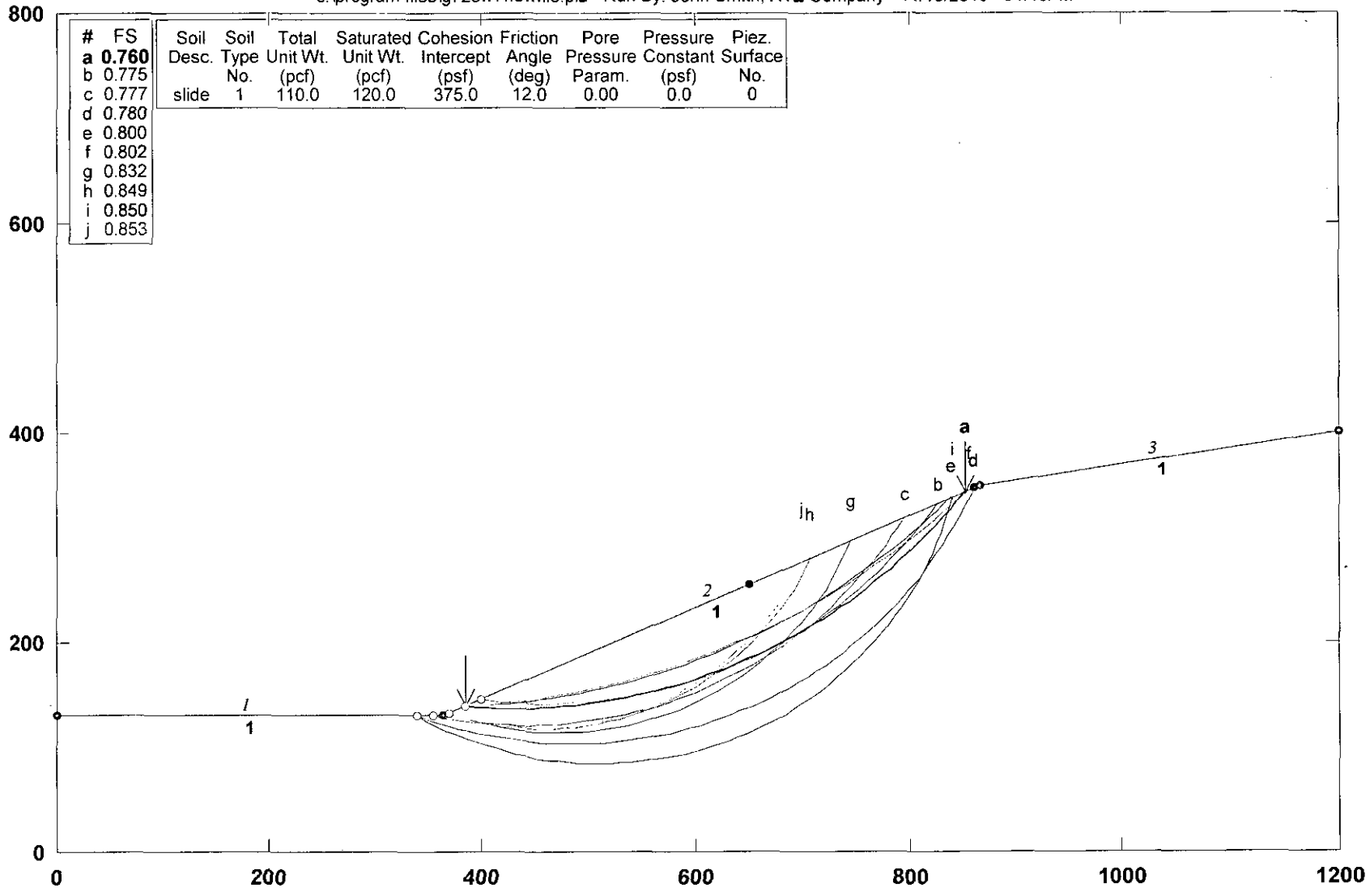
GSTABL7

Sargent Ranch Quarry Site Section B-B' Deep Clay Bedding

c:\program files\g72sw\-newfile.pl2 Run By: John Smith, XYZ Company 11/19/2015 04:46PM

#	FS
a	**0.760**
b	0.775
c	0.777
d	0.780
e	0.800
f	0.802
g	0.832
h	0.849
i	0.850
j	0.853

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
slide	1	110.0	120.0	375.0	12.0	0.00	0.0	0



GSTABL7 v.2 FSmin=0.760

Safety Factors Are Calculated By The Modified Bishop Method

GSTABL7

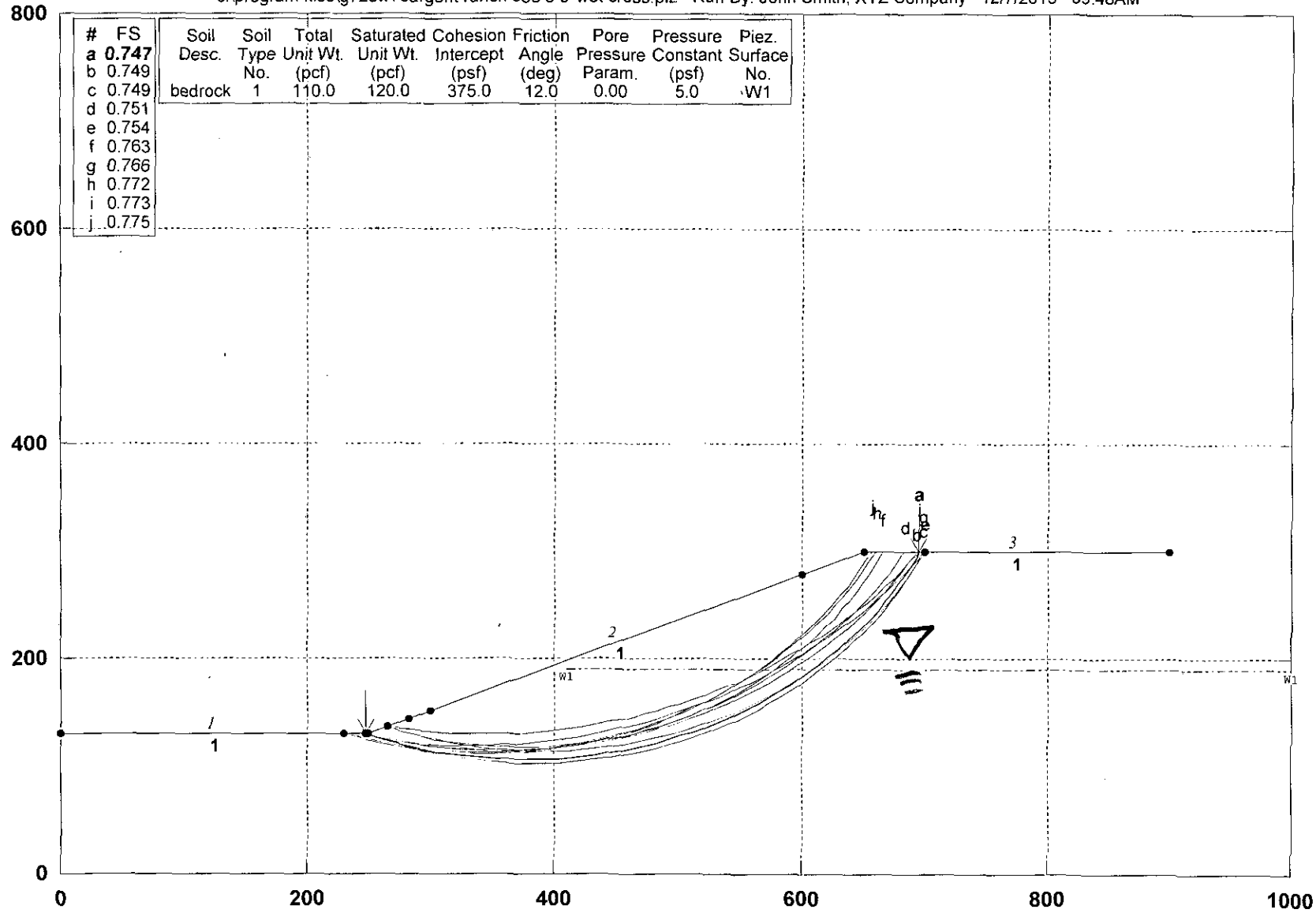
If Bedding Plane Failure Clay

Sargent Ranch Quarry Site Section C-C' with water

c:\program files\g72sw\-sargent ranch sec c-c' wet cross.pl2 Run By: John Smith, XYZ Company 12/7/2015 09:48AM

#	FS
a	**0.747**
b	0.749
c	0.749
d	0.751
e	0.754
f	0.763
g	0.766
h	0.772
i	0.773
j	0.775

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
bedrock	1	110.0	120.0	375.0	12.0	0.00	5.0	W1



GSTABL7 v.2 FSmin=0.747

Safety Factors Are Calculated By The Modified Bishop Method

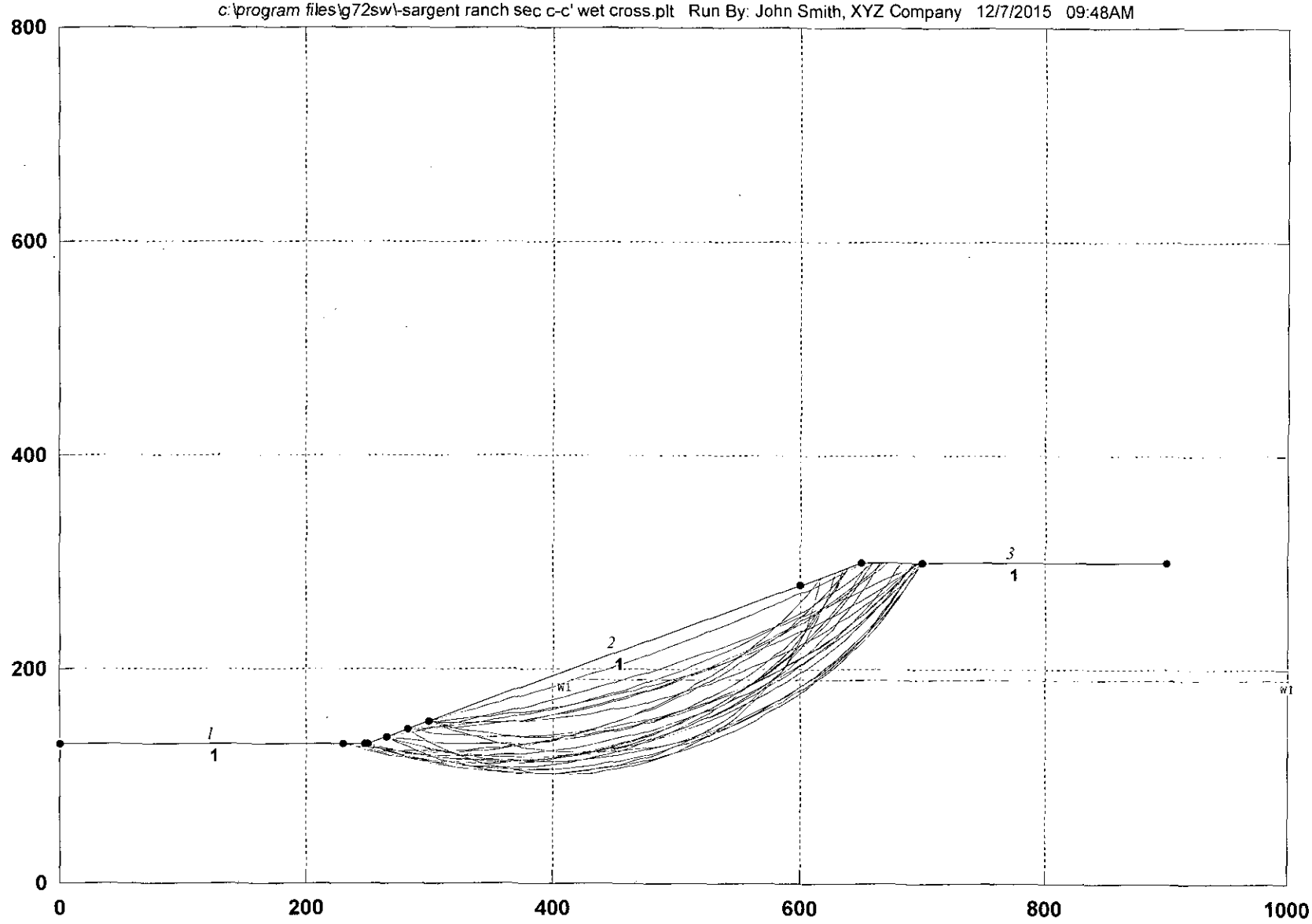
GSTABL7

No water F.S. = .81 ~ See C-C' Daylight

Water 5' head at el 190

Sargent Ranch Quarry Site Section C-C' with water

c:\program files\g72sw\-sargent ranch sec c-c' wet cross.plt Run By: John Smith, XYZ Company 12/7/2015 09:48AM

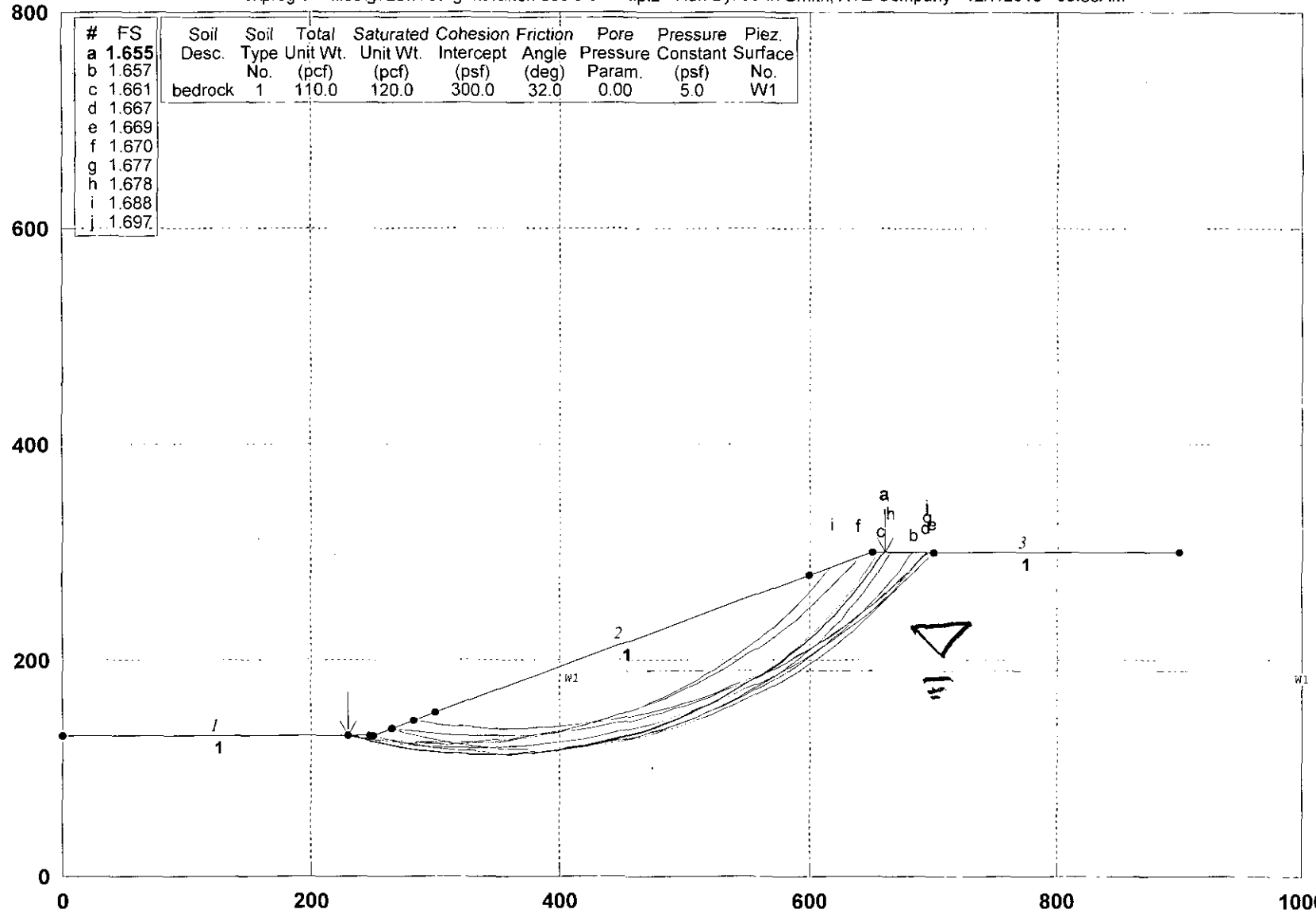


GSTABL7

Sec C-C' - Daylight
Water 5' head @ el 190

Sargent Ranch Quarry Site Section C-C' ~~Typical Seismic~~

c:\program files\g72sw\-sargent ranch sec c-c' wet.pl2 Run By: John Smith, XYZ Company 12/7/2015 09:39AM



#	FS
a	**1.655**
b	1.657
c	1.661
d	1.667
e	1.669
f	1.670
g	1.677
h	1.678
i	1.688
j	1.697

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
bedrock	1	110.0	120.0	300.0	32.0	0.00	5.0	W1

GSTABL7 v.2 FSmin=1.655

Safety Factors Are Calculated By The Modified Bishop Method

GSTABL7

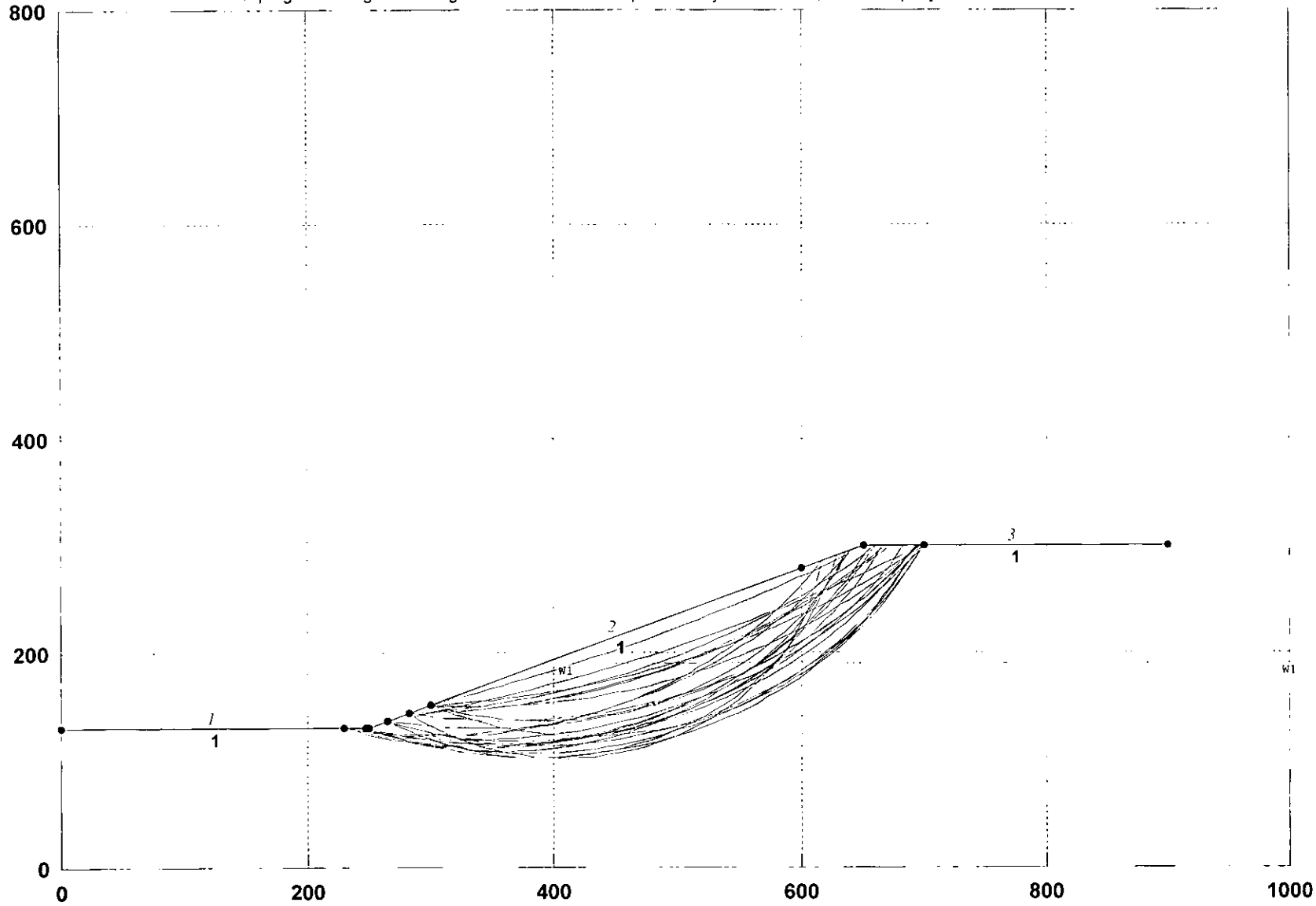
No Water F.S. = 1.85

Sec C-C'-Cross

Water 5' head el 190'

Sargent Ranch Quarry Site Section C-C' ~~Typical Seismic~~

c:\program files\g72sw\-sargent ranch sec c-c' wet.plt Run By: John Smith, XYZ Company 12/7/2015 09:39AM

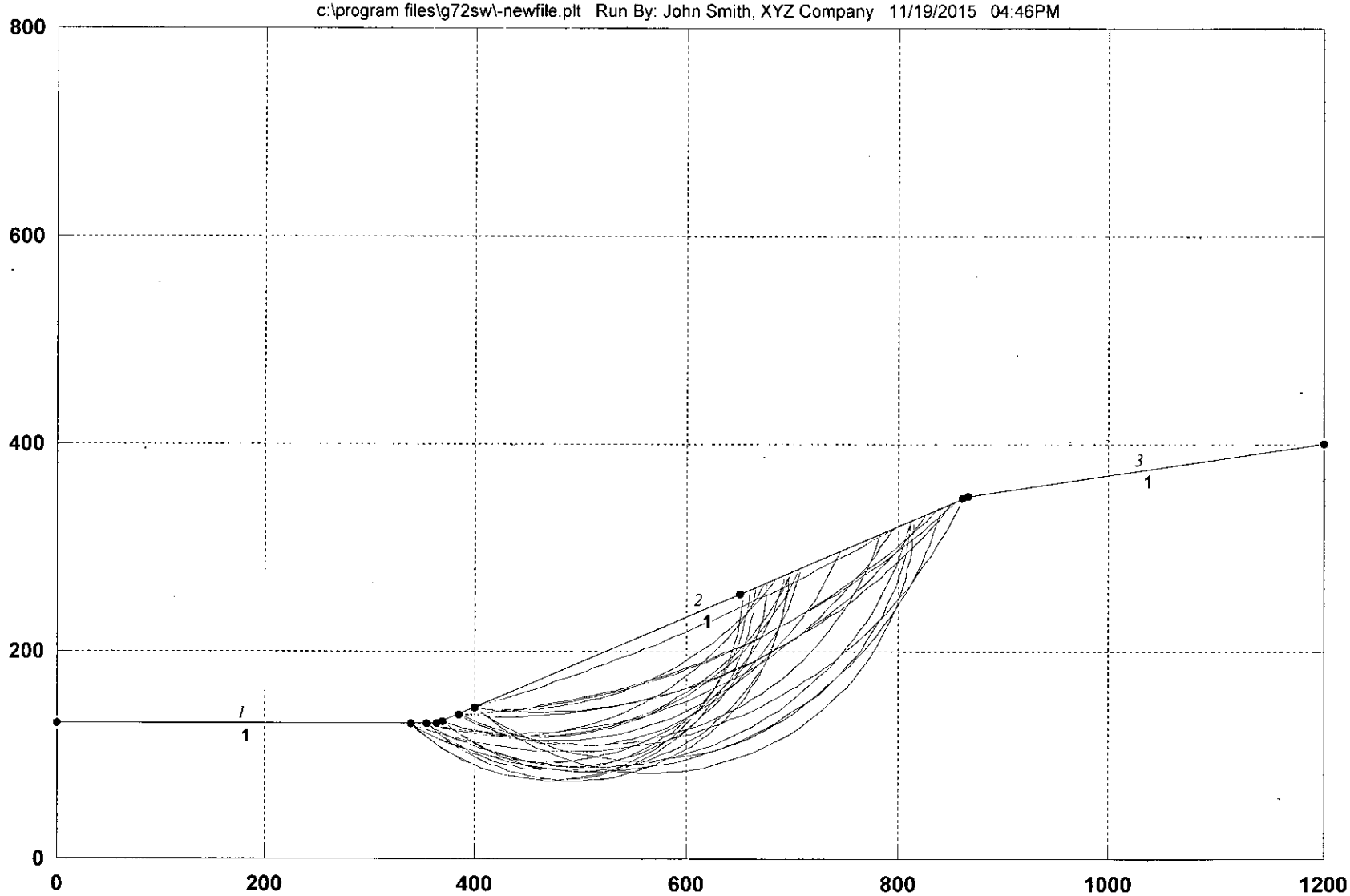


GSTABL7

Sec C-C' Cross
Water at el 190, 5' head

Sargent Ranch Quarry Site Section B-B' Deep Clay Bedding

c:\program files\g72sw\-newfile.plt Run By: John Smith, XYZ Company 11/19/2015 04:46PM



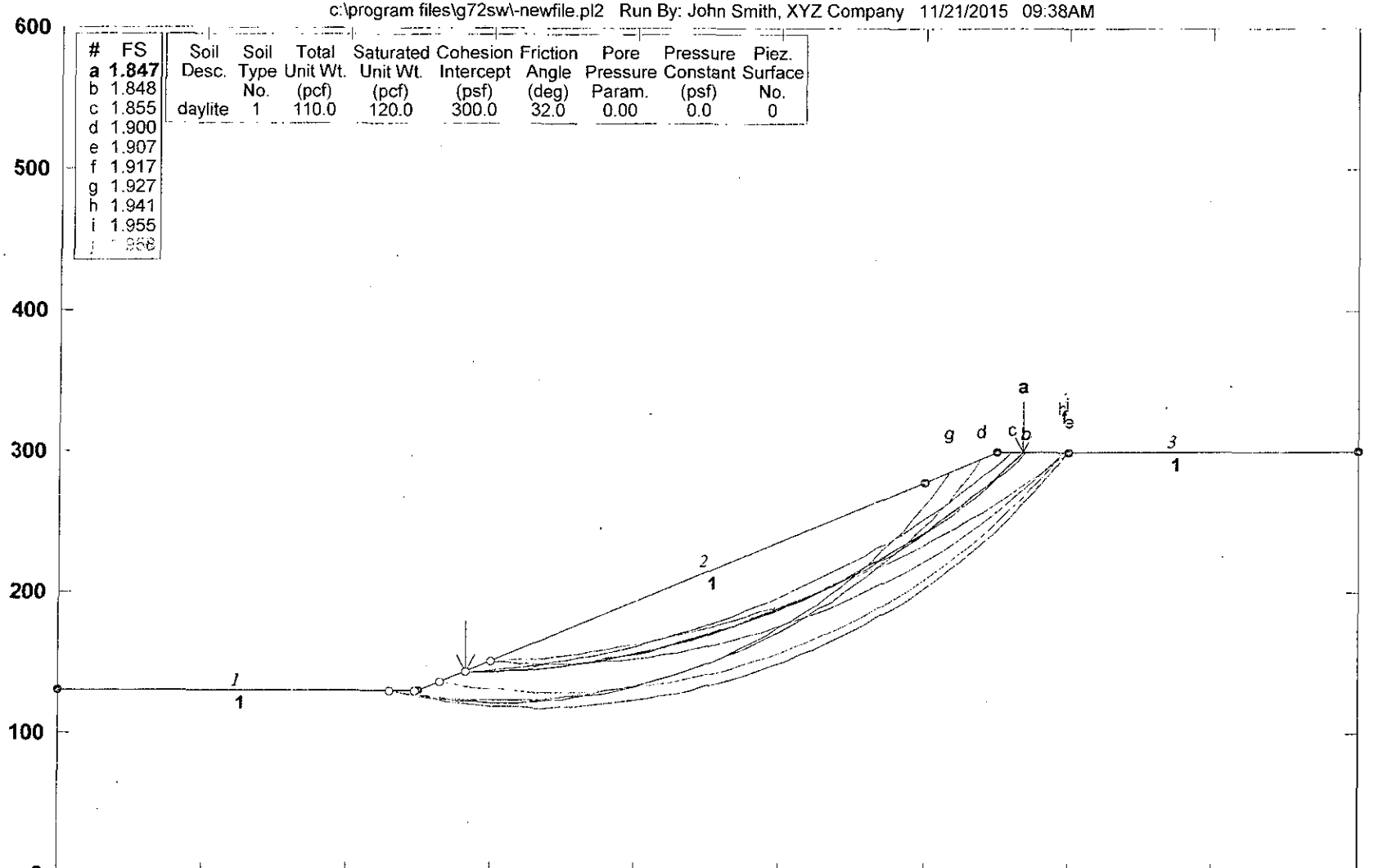
GSTABL7

Sargent Ranch Quarry Site Section C-C' Daylighted Clay Bedding Low

c:\program files\g72sw\-newfile.pl2 Run By: John Smith, XYZ Company 11/21/2015 09:38AM

#	FS
a	**1.847**
b	1.848
c	1.855
d	1.900
e	1.907
f	1.917
g	1.927
h	1.941
i	1.955
j	1.956

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
daylite	1	110.0	120.0	300.0	32.0	0.00	0.0	0



GSTABL7 v.2 FSmin=1.847

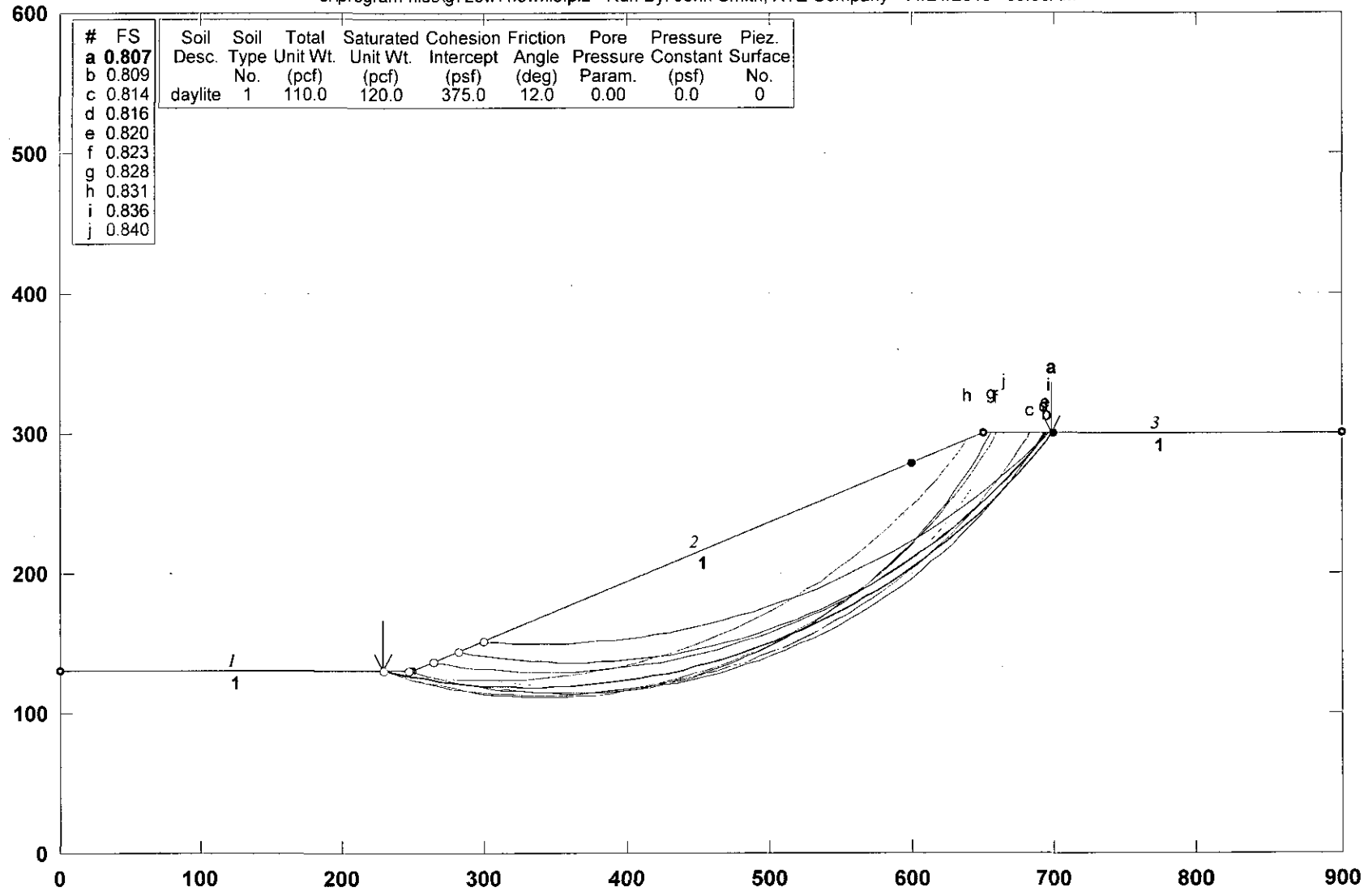
Safety Factors Are Calculated By The Modified Bishop Method

GSTABL7

Cross Bedded

Sargent Ranch Quarry Site Section C-C' Daylighted Clay Bedding Low

c:\program files\g72sw\-newfile.pl2 Run By: John Smith, XYZ Company 11/21/2015 09:33AM



#	FS
a	**0.807**
b	0.809
c	0.814
d	0.816
e	0.820
f	0.823
g	0.828
h	0.831
i	0.836
j	0.840

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
daylite	1	110.0	120.0	375.0	12.0	0.00	0.0	0

GSTABL7 v.2 FSmin=0.807

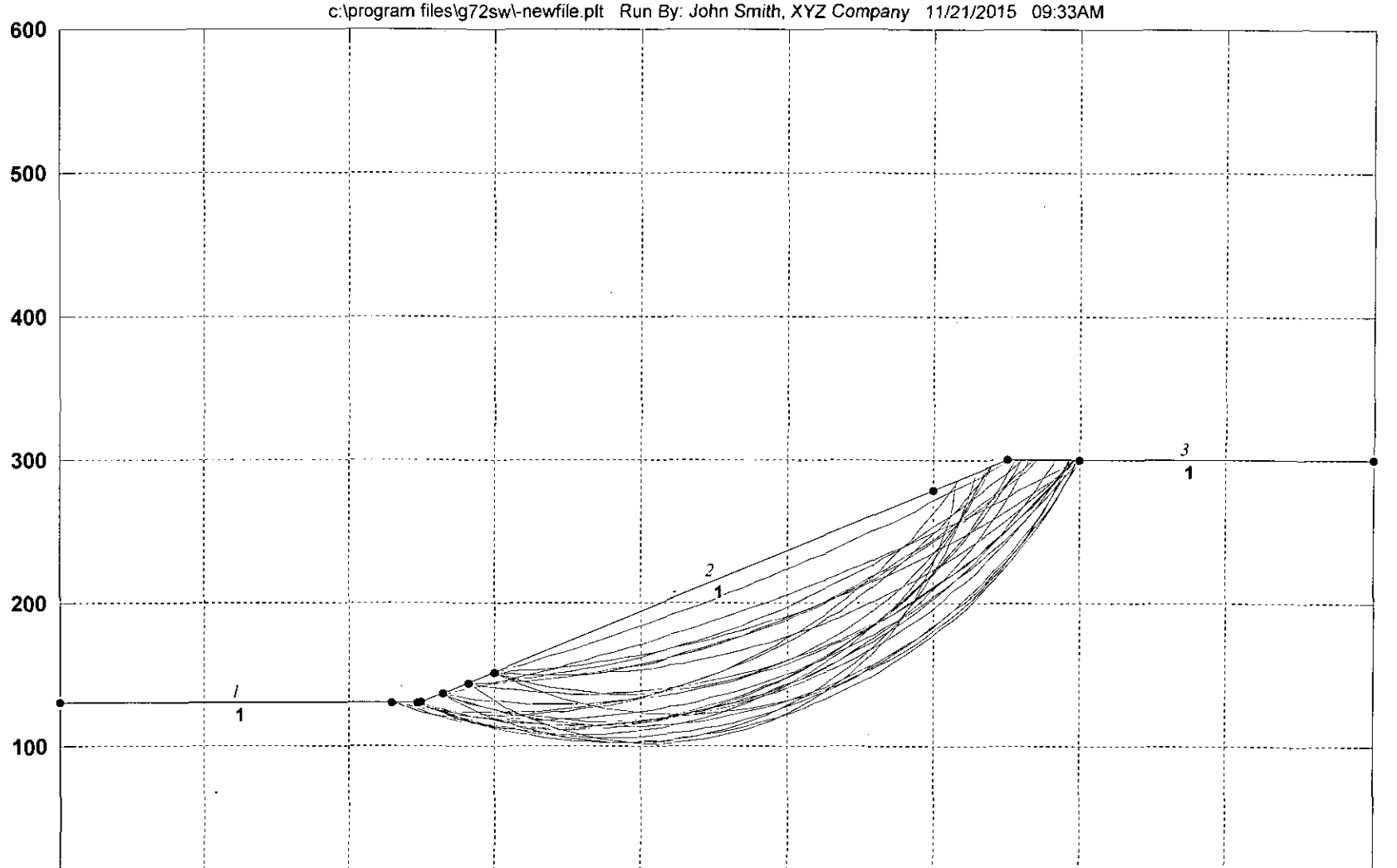
Safety Factors Are Calculated By The Modified Bishop Method

GSTABL7

Daylighted Bedding

Sargent Ranch Quarry Site Section C-C' Daylighted Clay Bedding Low

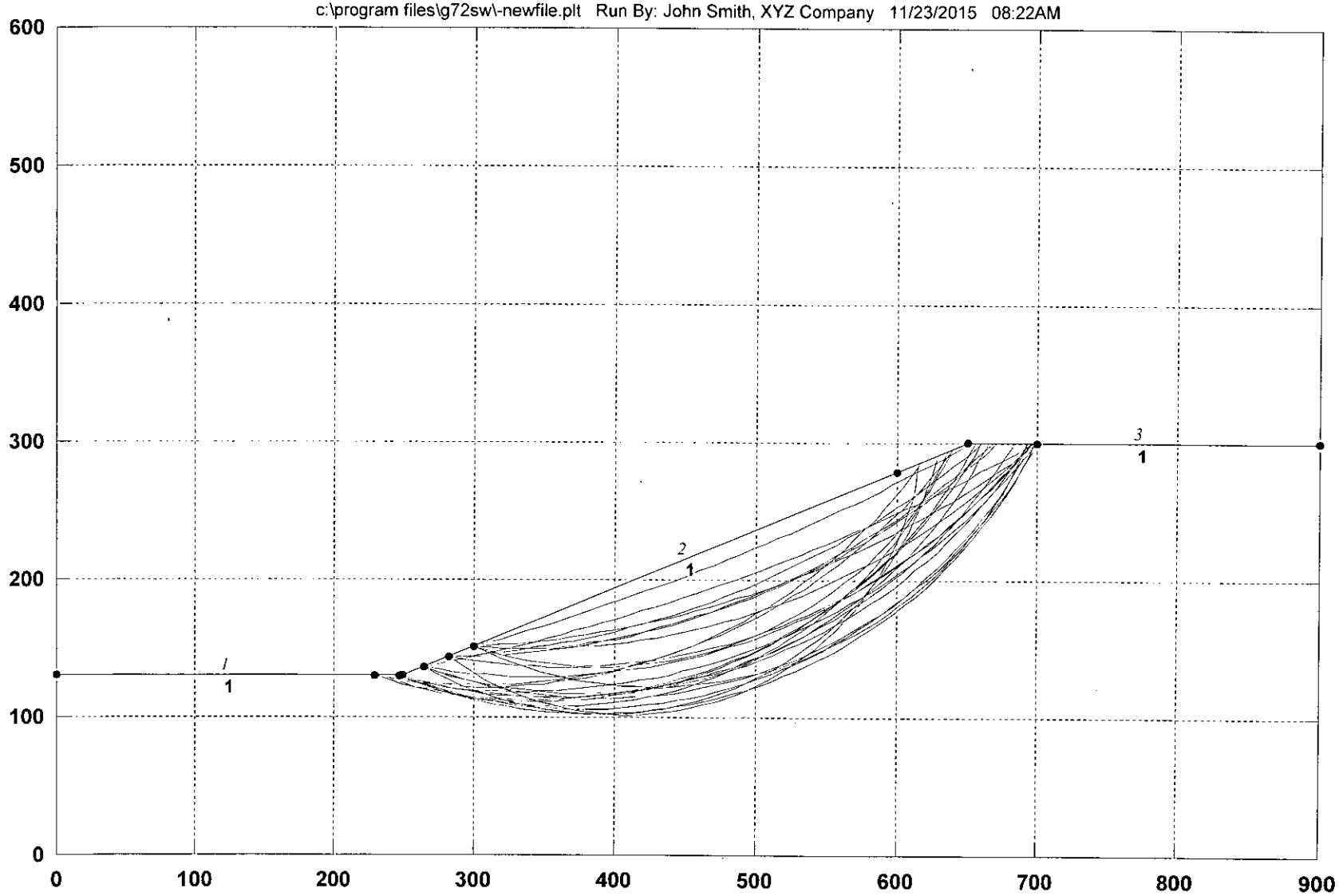
c:\program files\g72sw\-newfile.plt Run By: John Smith, XYZ Company 11/21/2015 09:33AM



GSTABL7

Sargent Ranch Quarry Site Section C-C' Typical Seismic

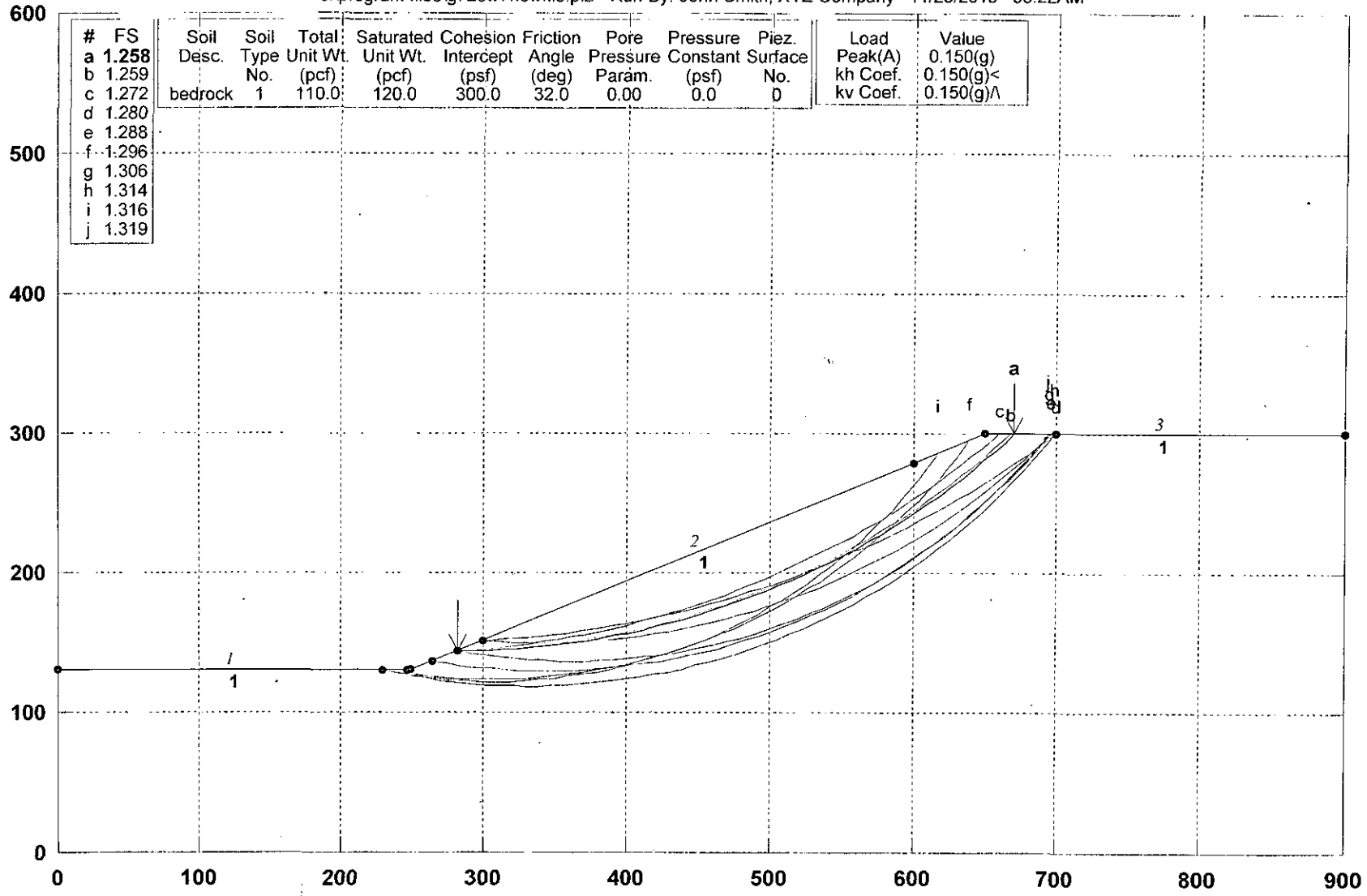
c:\program files\g72sw\-newfile.plt Run By: John Smith, XYZ Company 11/23/2015 08:22AM



GSTABL7

Sargent Ranch Quarry Site Section C-C' Typical Seismic

c:\program files\g72sw\-newfile.pl2 Run By: John Smith, XYZ Company 11/23/2015 08:22AM



#	FS
a	1.258
b	1.259
c	1.272
d	1.280
e	1.288
f	1.296
g	1.306
h	1.314
i	1.316
j	1.319

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
bedrock	1	110.0	120.0	300.0	32.0	0.00	0.0	0

Load	Value
Peak(A)	0.150(g)
kh Coef.	0.150(g)<
kv Coef.	0.150(g)/\

GSTABL7 v.2 FSmin=1.258

Safety Factors Are Calculated By The Modified Bishop Method

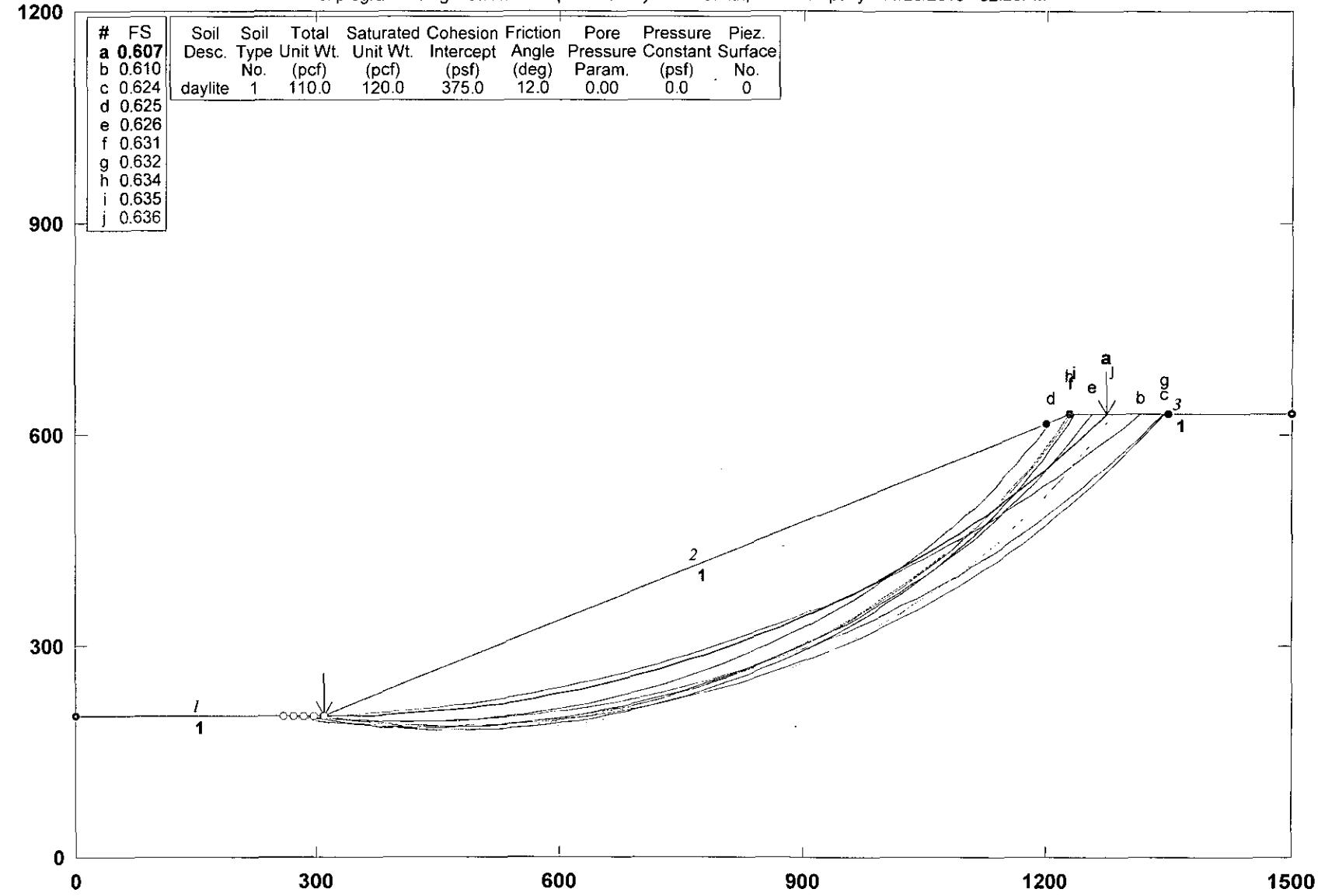
GSTABL7

Sargent Ranch Quarry Site Section E-E'Daylighted Clay Bedding

c:\program files\g72sw\-newfile.pl2 Run By: John Smith, XYZ Company 11/20/2015 02:26PM

#	FS
a	**0.607**
b	0.610
c	0.624
d	0.625
e	0.626
f	0.631
g	0.632
h	0.634
i	0.635
j	0.636

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
daylite	1	110.0	120.0	375.0	12.0	0.00	0.0	0



GSTABL7 v.2 FSmin=0.607

Safety Factors Are Calculated By The Modified Bishop Method

GSTABL7

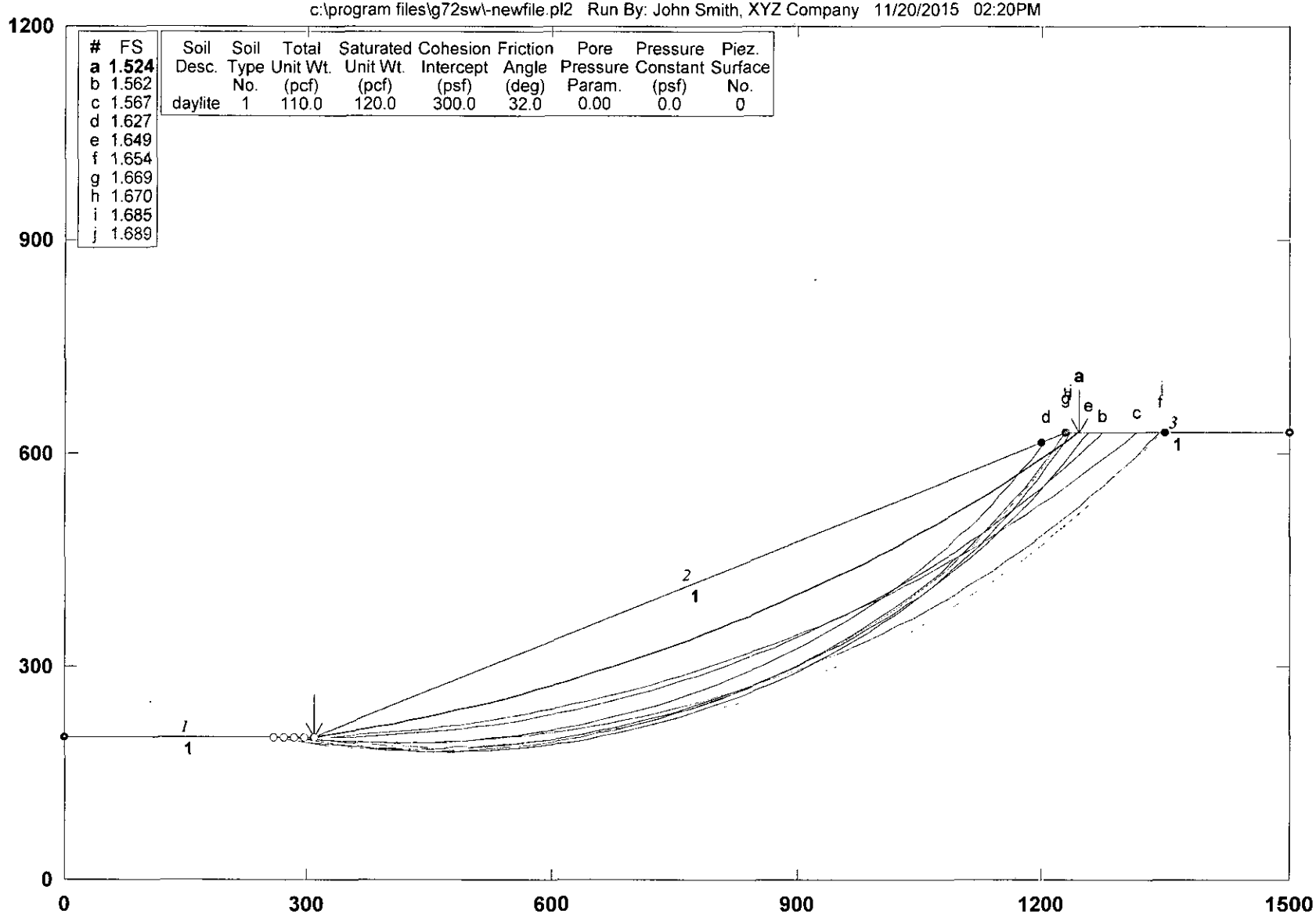
Daylight Bedding Cond.

Sargent Ranch Quarry Site Section E-E'Daylighted Clay Bedding

c:\program files\g72sw\-newfile.pl2 Run By: John Smith, XYZ Company 11/20/2015 02:20PM

#	FS
a	**1.524**
b	1.562
c	1.567
d	1.627
e	1.649
f	1.654
g	1.669
h	1.670
i	1.685
j	1.689

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
daylite	1	110.0	120.0	300.0	32.0	0.00	0.0	0



GSTABL7 v.2 FSmin=1.524

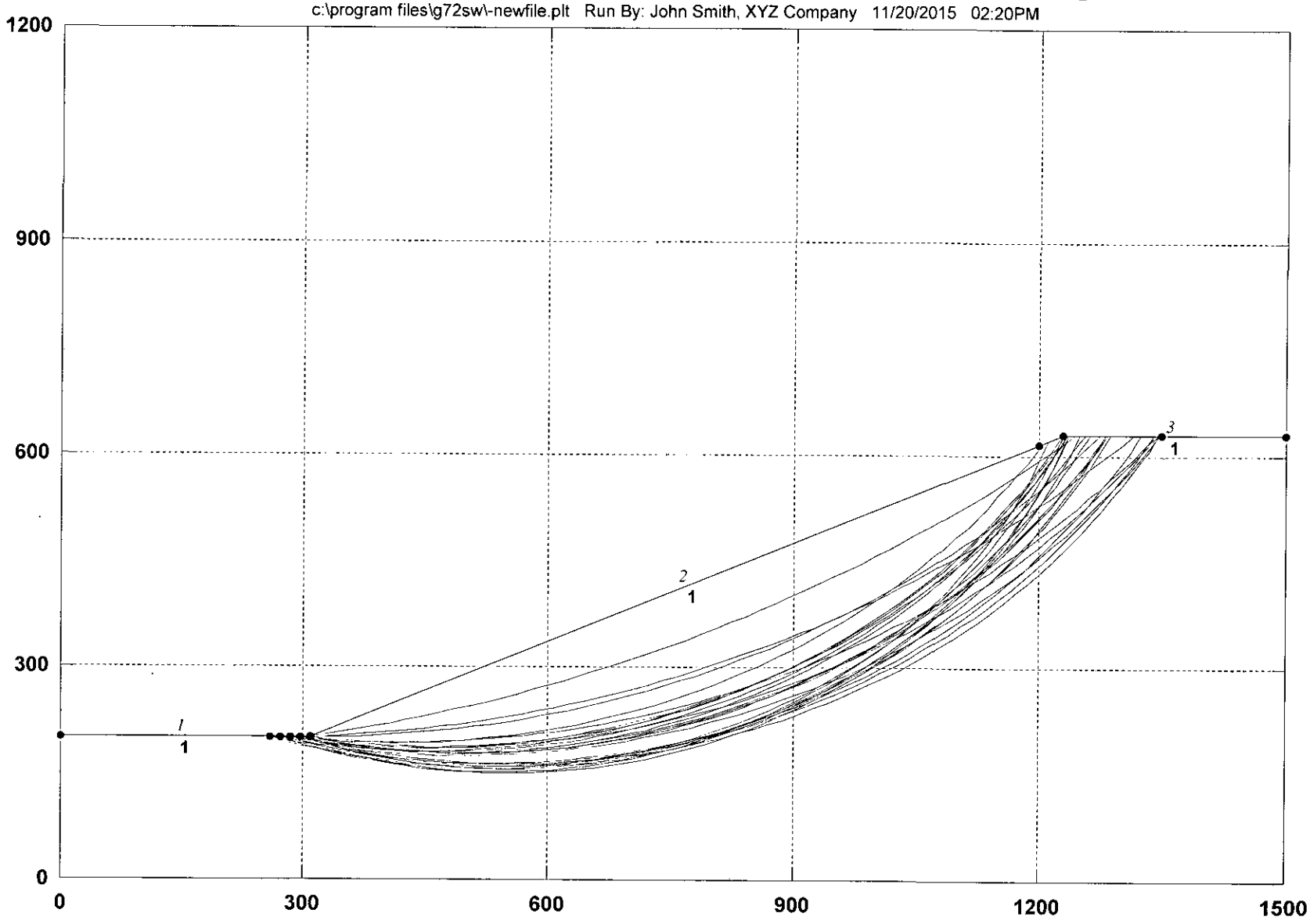
Safety Factors Are Calculated By The Modified Bishop Method

GSTABL7

Cross Bedded

Sargent Ranch Quarry Site Section E-E'Daylighted Clay Bedding

c:\program files\g72sw\-newfile.plt Run By: John Smith, XYZ Company 11/20/2015 02:20PM

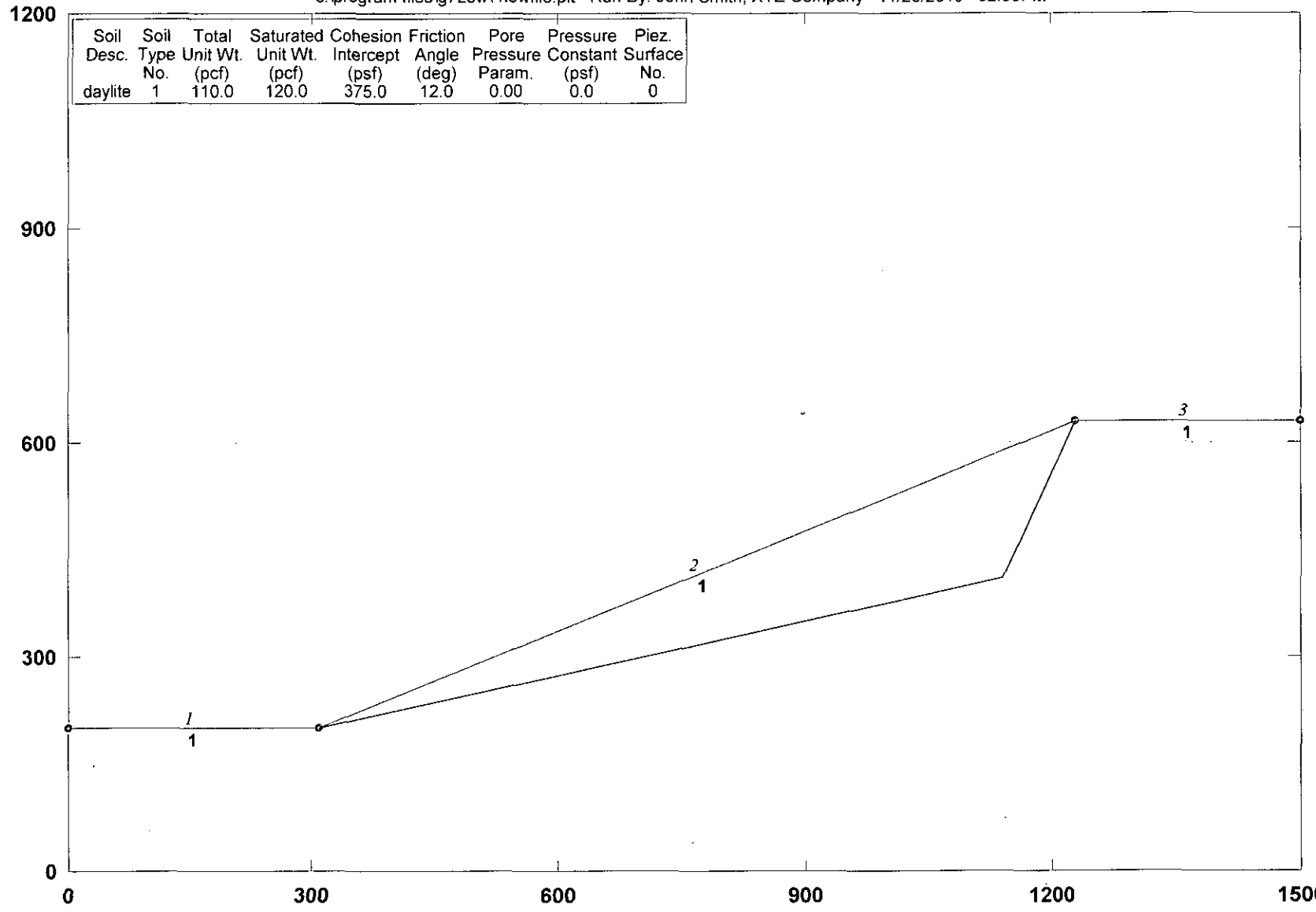


GSTABL7

Sargent Ranch Quarry Site Section E-E'Daylighted Clay Bedding

c:\program files\g72sw\-newfile.plt Run By: John Smith, XYZ Company 11/20/2015 02:35PM

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
daylite	1	110.0	120.0	375.0	12.0	0.00	0.0	0



GSTABL7 v.2 FSmin=0.687

Factor Of Safety Is Calculated By The Simplified Janbu Method

GSTABL7

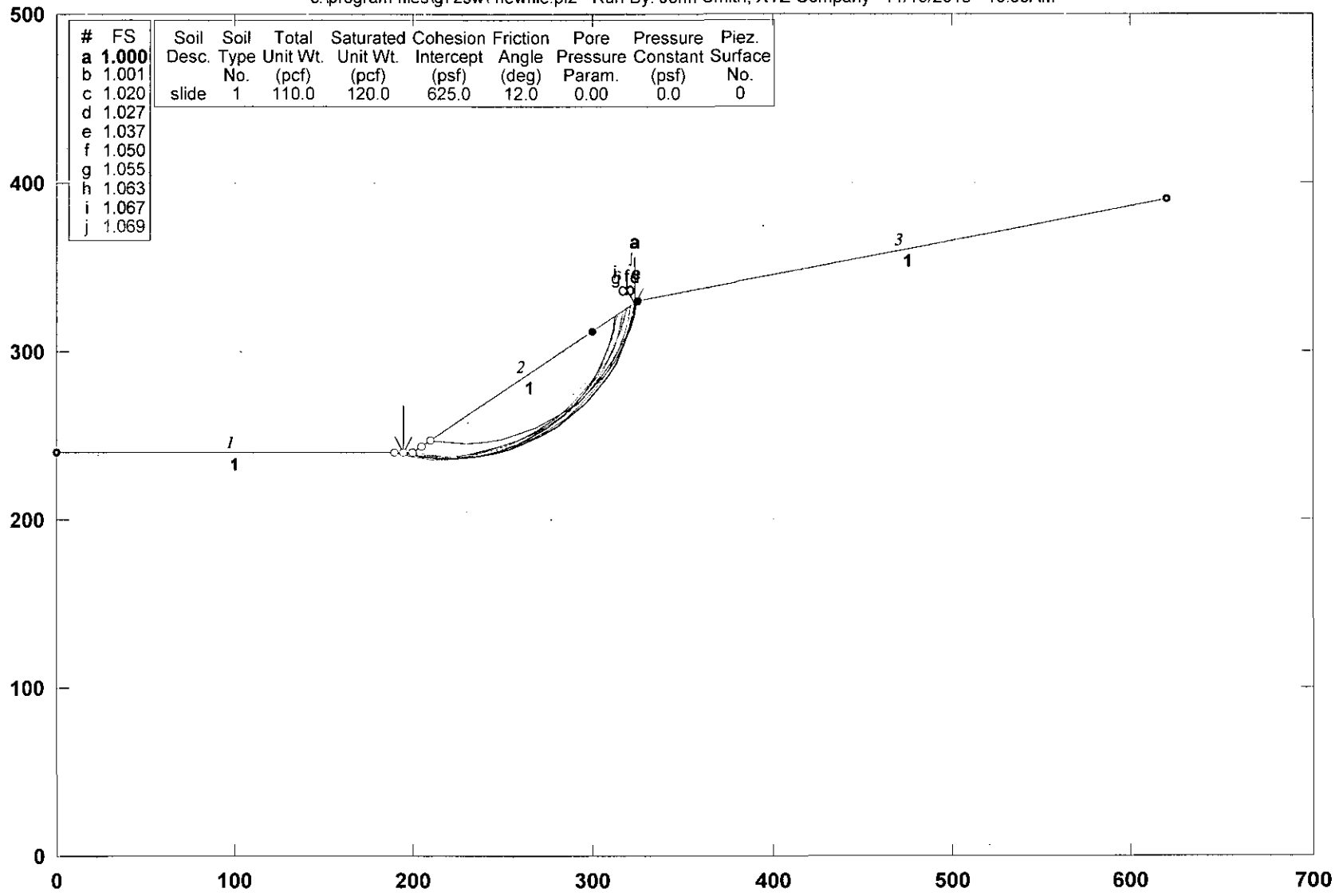
Block Failure 13° Daylighted Bedding

Sargent Ranch Quarry Site Section G-G' Back Calc Shallow

c:\program files\g72sw\-newfile.pl2 Run By: John Smith, XYZ Company 11/19/2015 10:55AM

#	FS
a	**1.000**
b	1.001
c	1.020
d	1.027
e	1.037
f	1.050
g	1.055
h	1.063
i	1.067
j	1.069

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
slide	1	110.0	120.0	625.0	12.0	0.00	0.0	0



GSTABL7 v.2 FSmin=1.000

Safety Factors Are Calculated By The Modified Bishop Method

GSTABL7

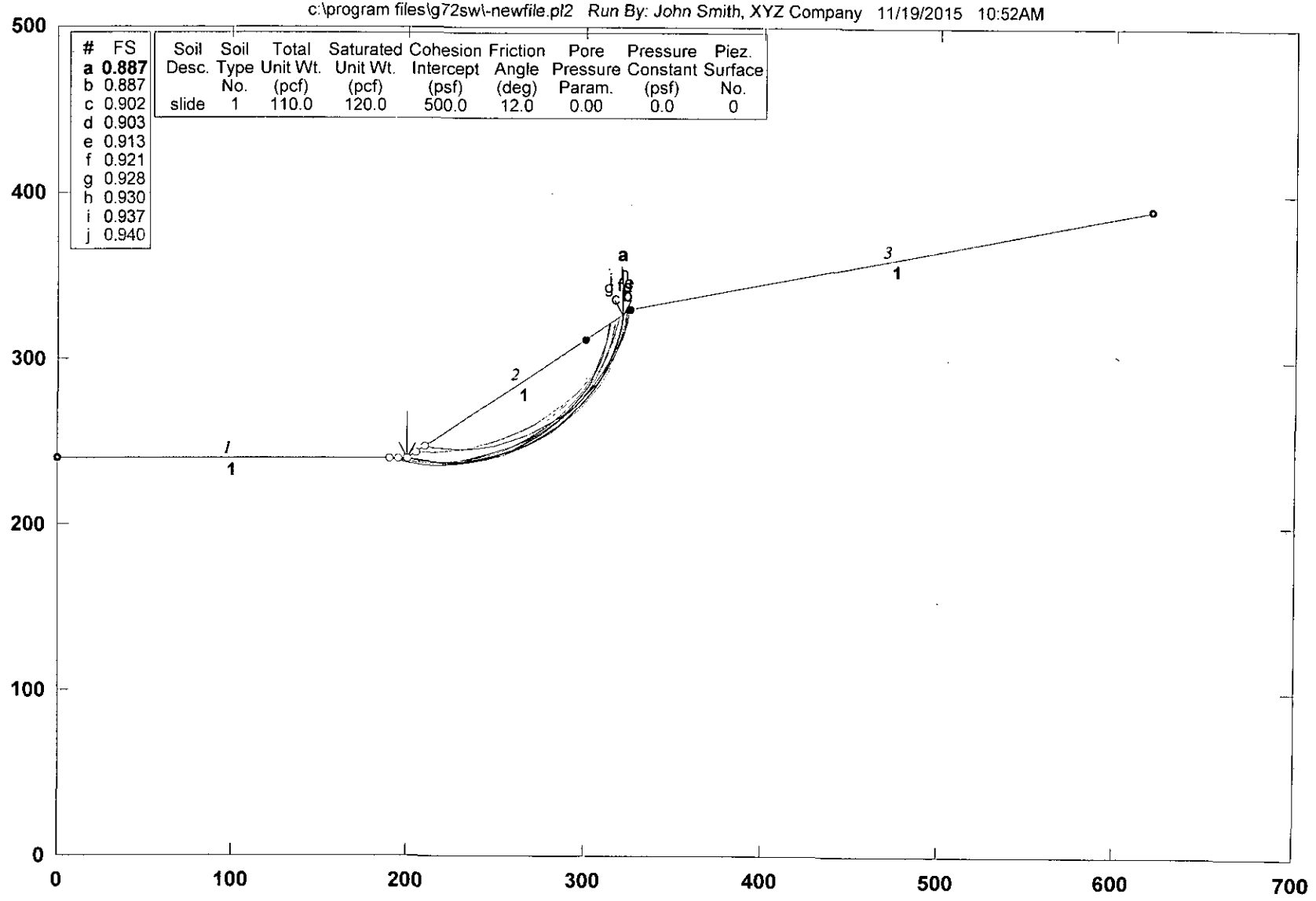
Back Calc Surficial

Sargent Ranch Quarry Site Section G-G' Back Calc Shallow

c:\program files\g72sw\-newfile.pl2 *Run By: John Smith, XYZ Company* 11/19/2015 10:52AM

#	FS
a	**0.887**
b	0.887
c	0.902
d	0.903
e	0.913
f	0.921
g	0.928
h	0.930
i	0.937
j	0.940

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
slide	1	110.0	120.0	500.0	12.0	0.00	0.0	0



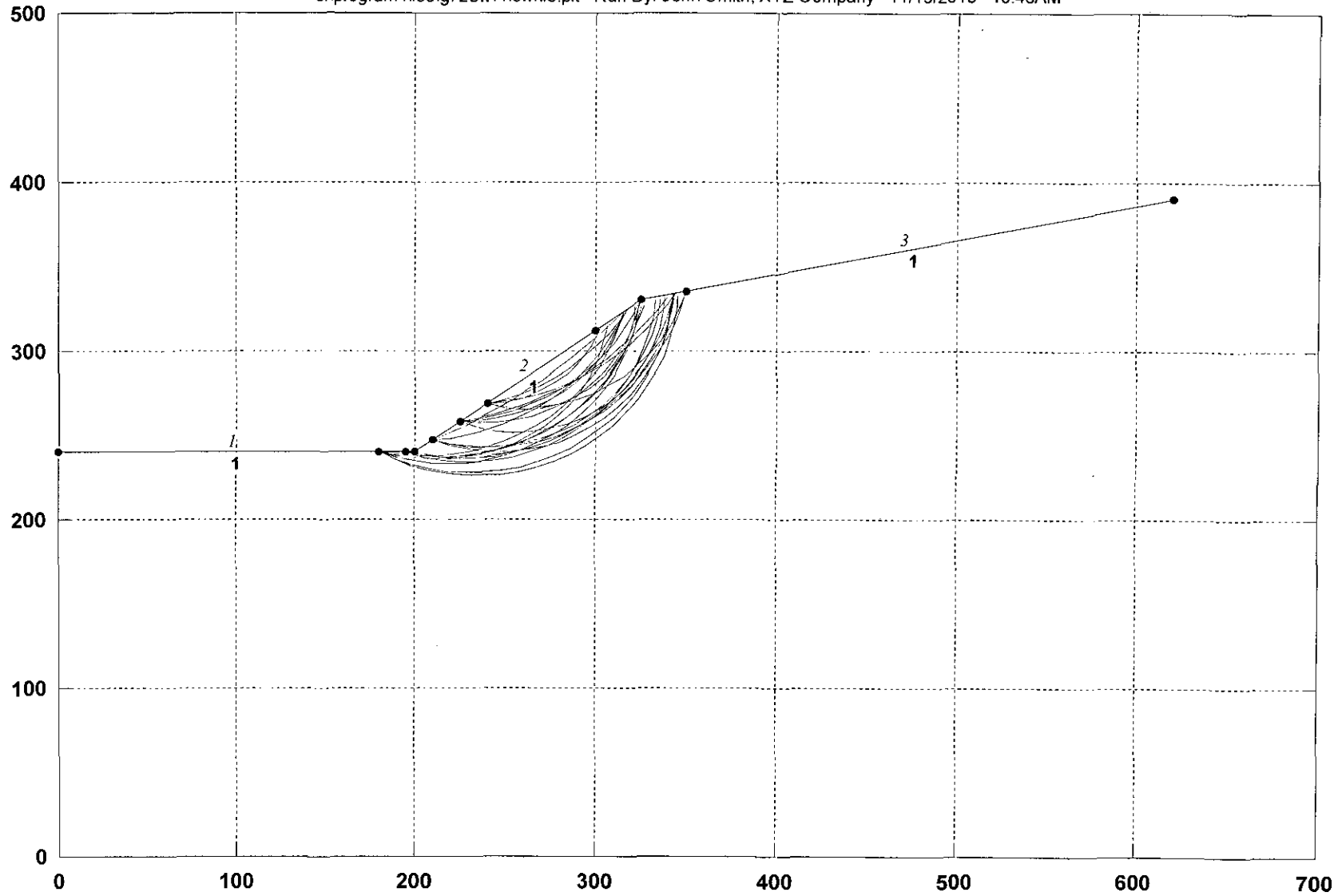
GSTABL7 v.2 FSmin=0.887

Safety Factors Are Calculated By The Modified Bishop Method

GSTABL7

Sargent Ranch Quarry Site Section G-G' Back Calc Shallow

c:\program files\g72sw\-newfile.plt Run By: John Smith, XYZ Company 11/19/2015 10:46AM



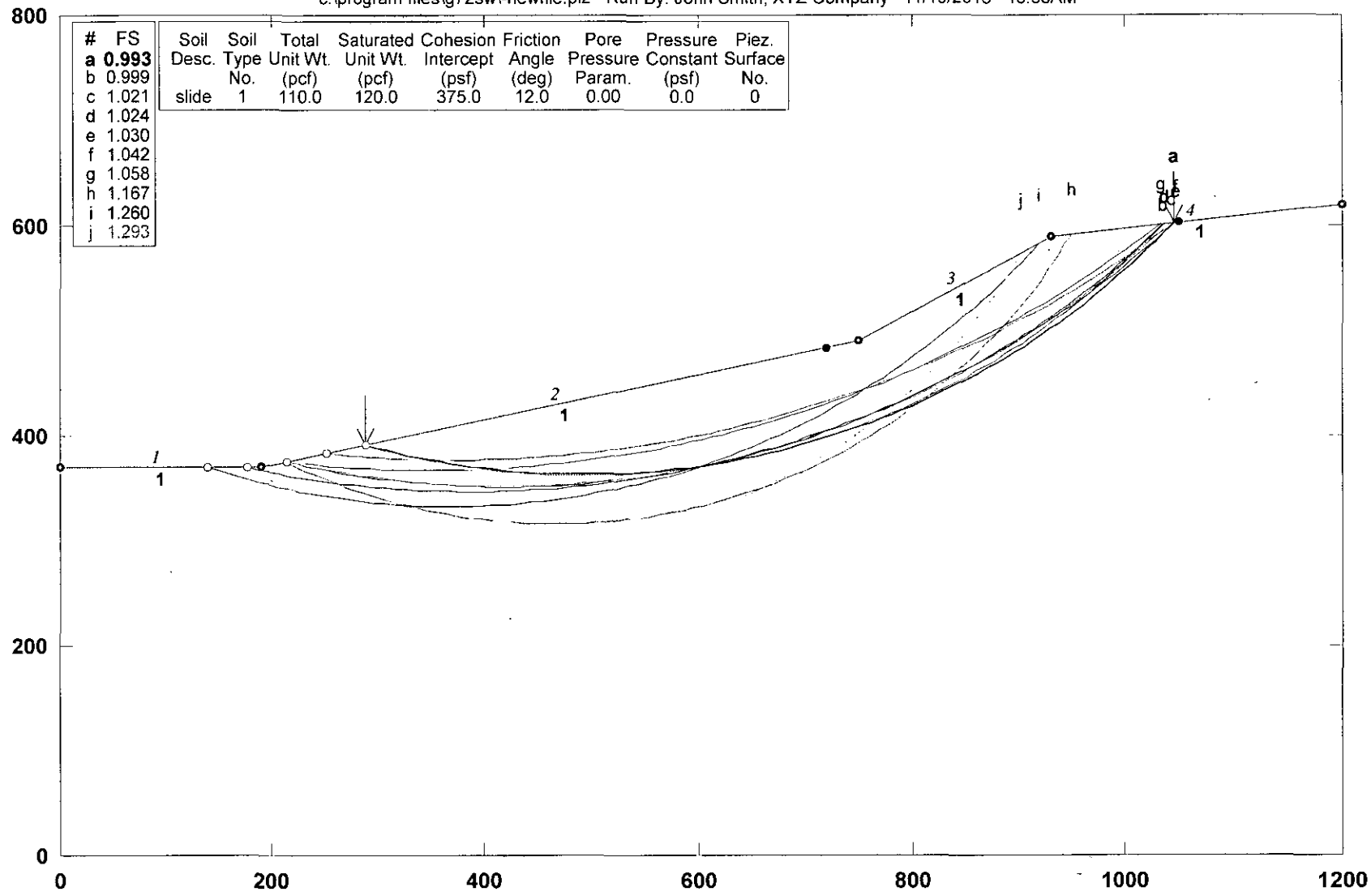
GSTABL7

Sargent Ranch Quarry Site Section L-L' Back Calc

c:\program files\g72sw\-newfile.pl2 Run By: John Smith, XYZ Company 11/19/2015 10:33AM

#	FS
a	**0.993**
b	0.999
c	1.021
d	1.024
e	1.030
f	1.042
g	1.058
h	1.167
i	1.260
j	1.293

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
slide	1	110.0	120.0	375.0	12.0	0.00	0.0	0



GSTABL7 v.2 FSmin=0.993

Safety Factors Are Calculated By The Modified Bishop Method

GSTABL7

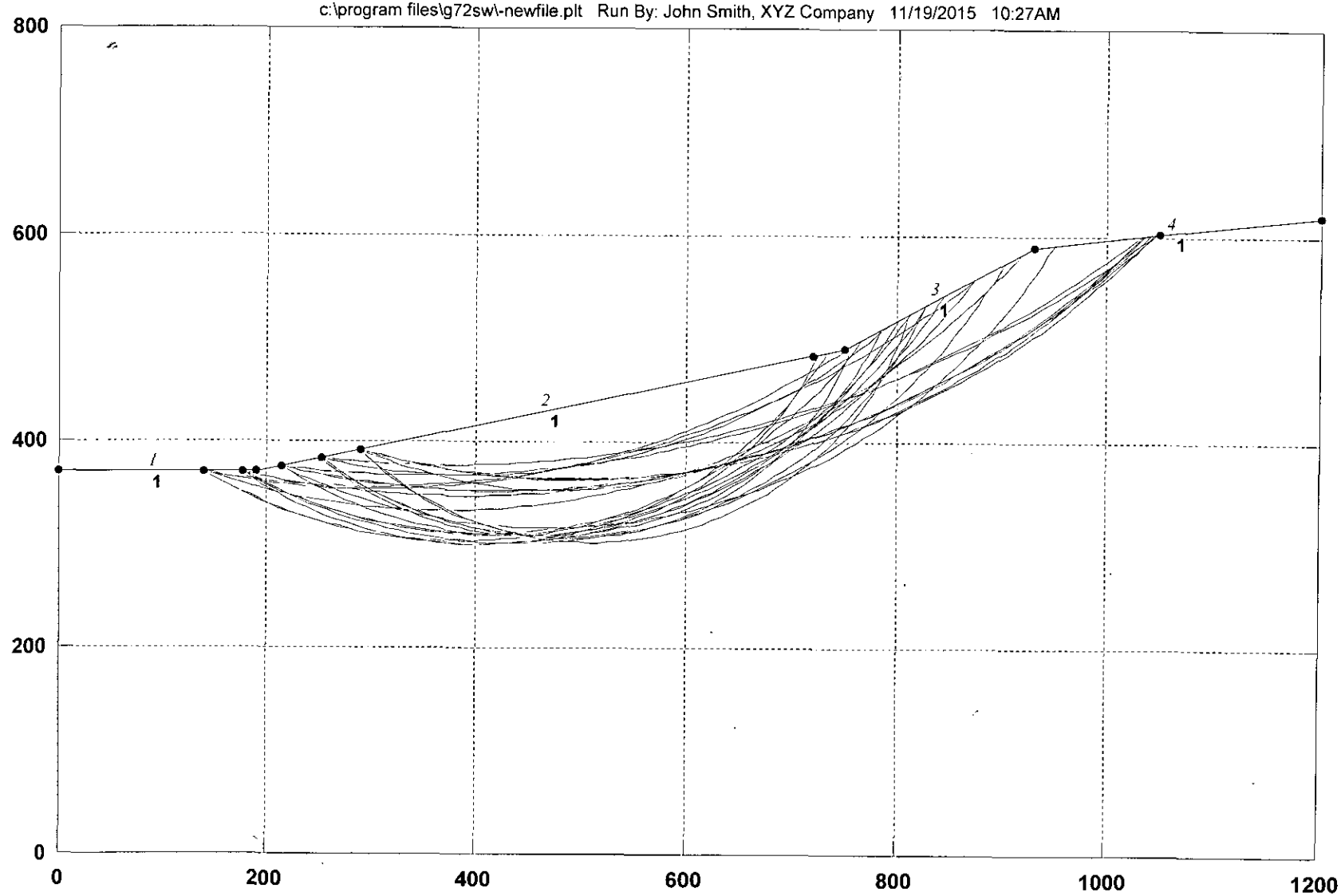
$\phi = 12^\circ$

$c = 375$ psf

Back Calc ϕ/c

Sargent Ranch Quarry Site Section L-L' Back Calc

c:\program files\g72sw\-newfile.plt Run By: John Smith, XYZ Company 11/19/2015 10:27AM



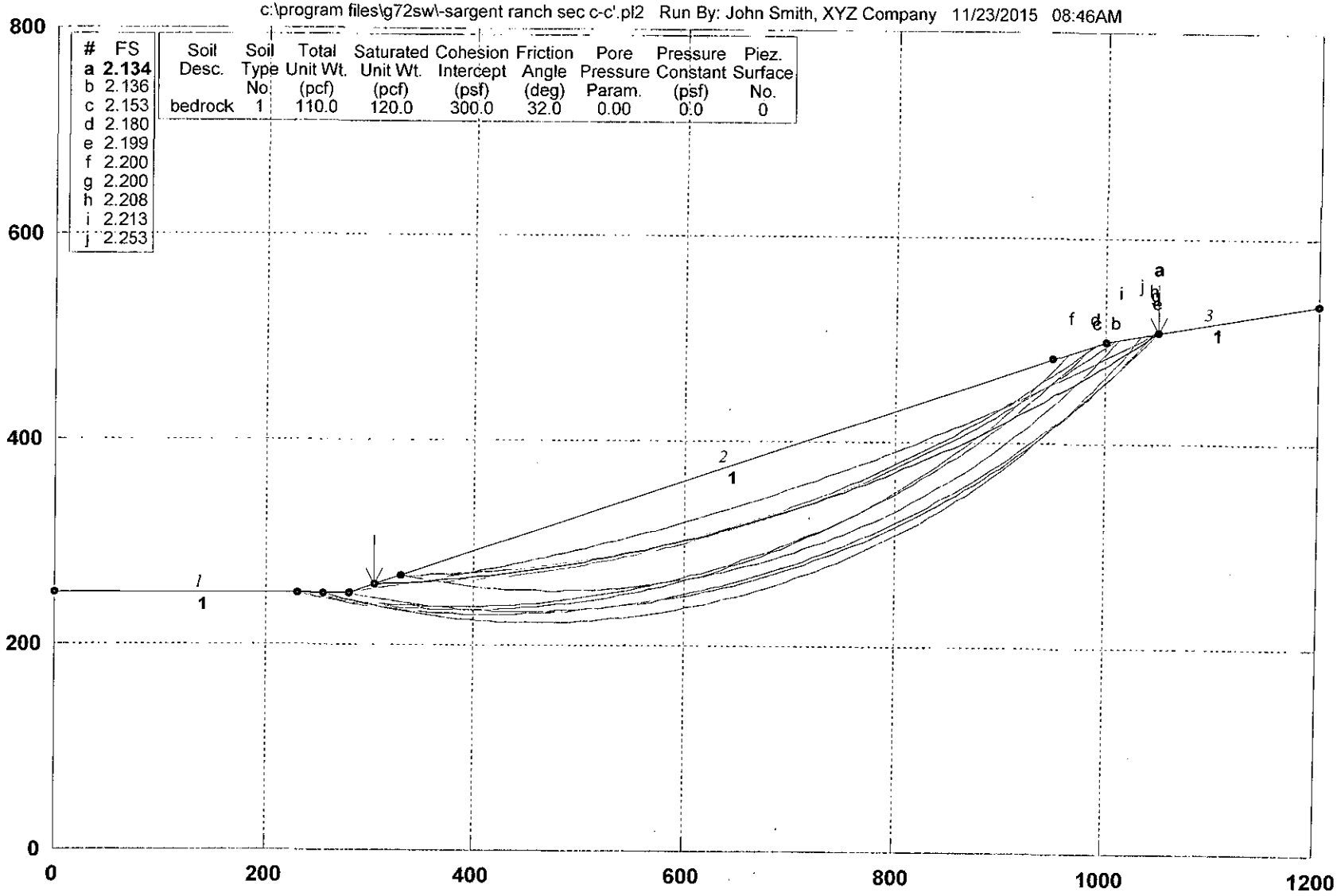
GSTABL7

Sargent Ranch Quarry Site Section Q-Q' Cross Bedded

c:\program files\g72sw\-sargent ranch sec c-c'.pl2 Run By: John Smith, XYZ Company 11/23/2015 08:46AM

#	FS
a	**2.134**
b	2.136
c	2.153
d	2.180
e	2.199
f	2.200
g	2.200
h	2.208
i	2.213
j	2.253

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
bedrock	1	110.0	120.0	300.0	32.0	0.00	0.0	0



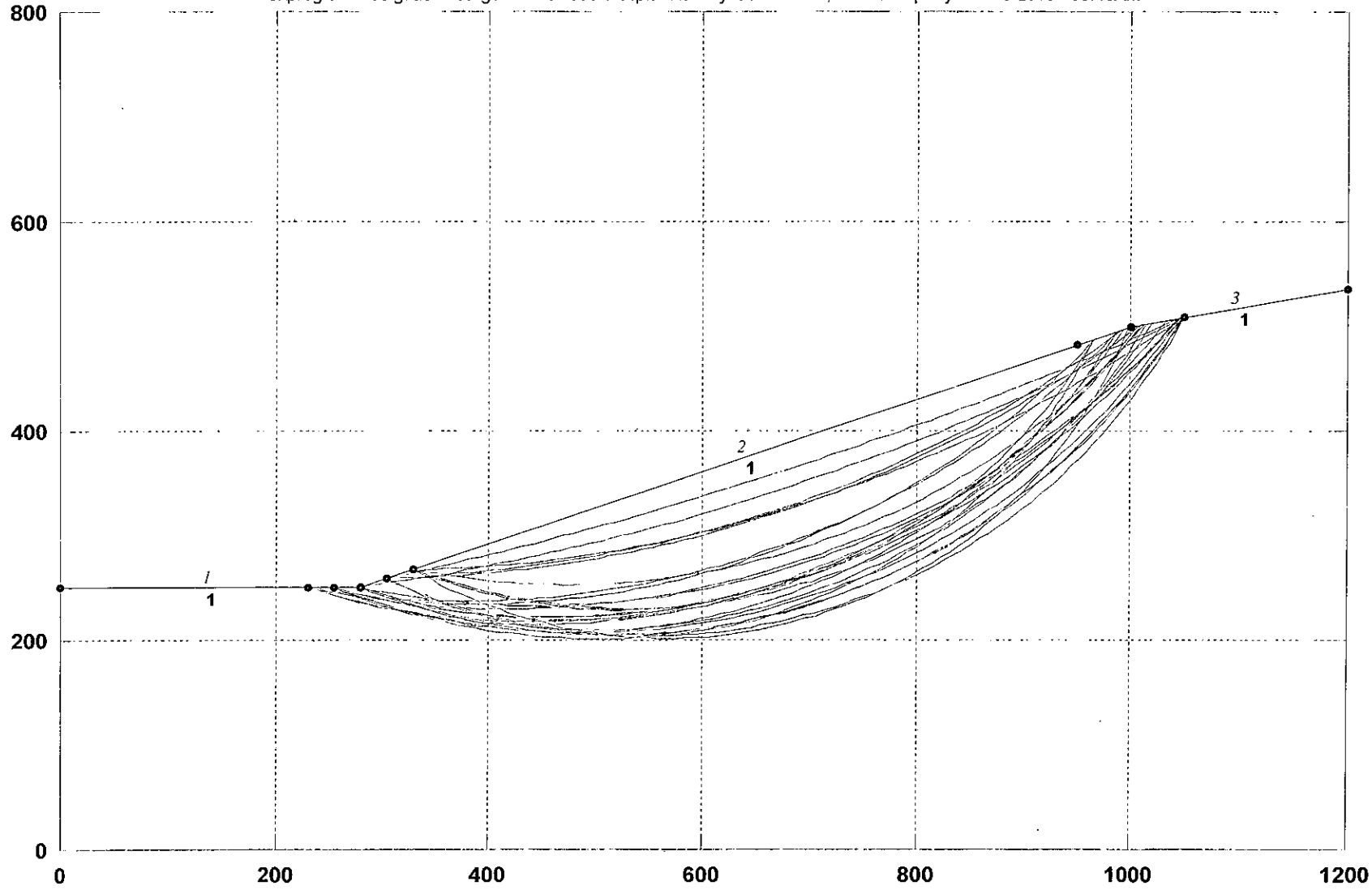
GSTABL7 v.2 FSmin=2.134

Safety Factors Are Calculated By The Modified Bishop Method

GSTABL7

Sargent Ranch Quarry Site Section Q-Q' Cross Bedded

c:\program files\g72sw\-sargent ranch sec c-c'.plt Run By: John Smith, XYZ Company 11/23/2015 08:46AM



GSTABL7

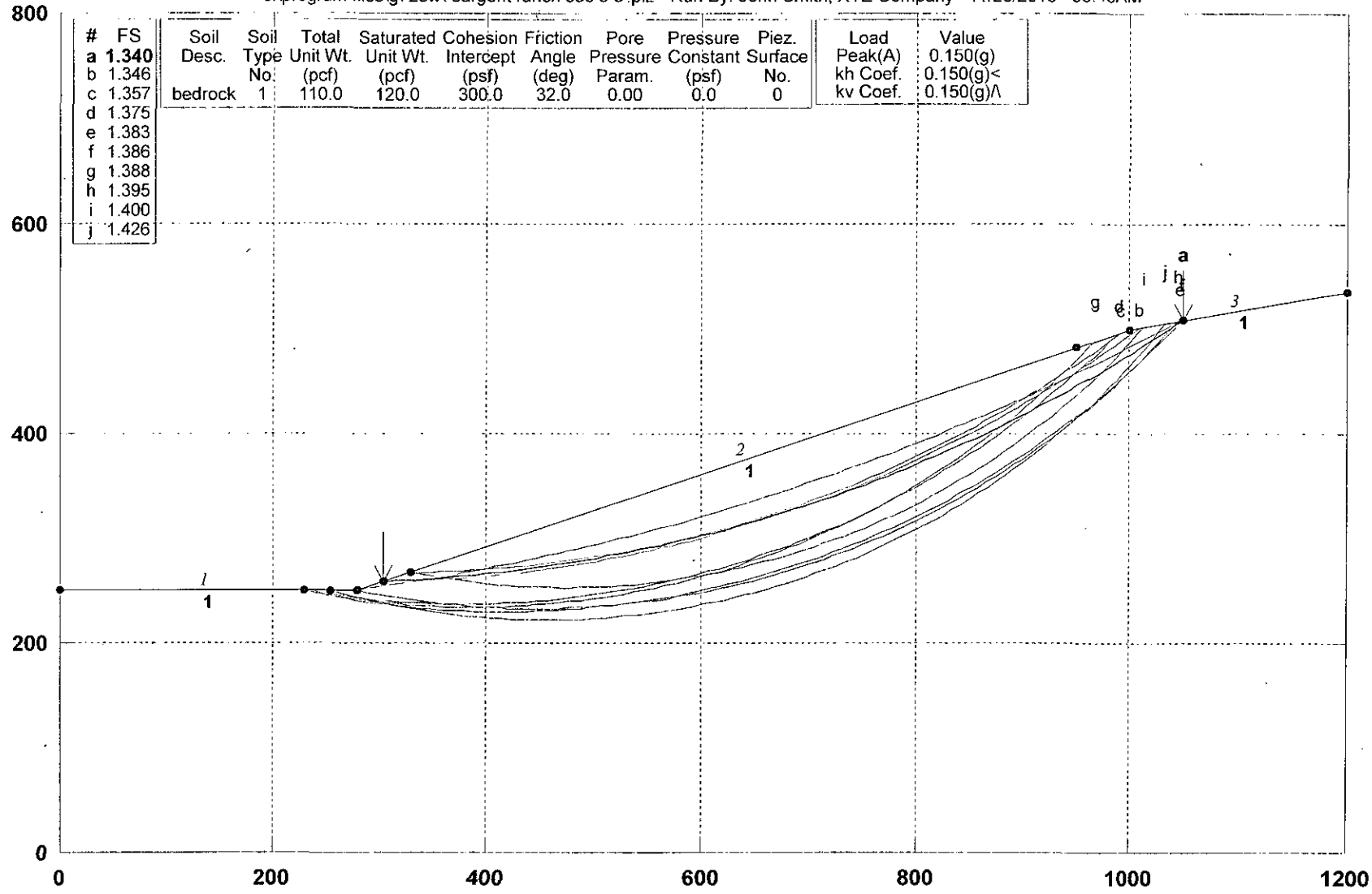
Sargent Ranch Quarry Site Section Q-Q' Cross Bedded

c:\program files\g72sw\-sargent ranch sec c-c'.pl2 Run By: John Smith, XYZ Company 11/23/2015 08:43AM

#	FS
a	**1.340**
b	1.346
c	1.357
d	1.375
e	1.383
f	1.386
g	1.388
h	1.395
i	1.400
j	1.426

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
bedrock	1	110.0	120.0	300.0	32.0	0.00	0.0	0

Load	Value
Peak(A)	0.150(g)
kh Coef.	0.150(g)<
kv Coef.	0.150(g)Λ



GSTABL7 v.2 FSmin=1.340

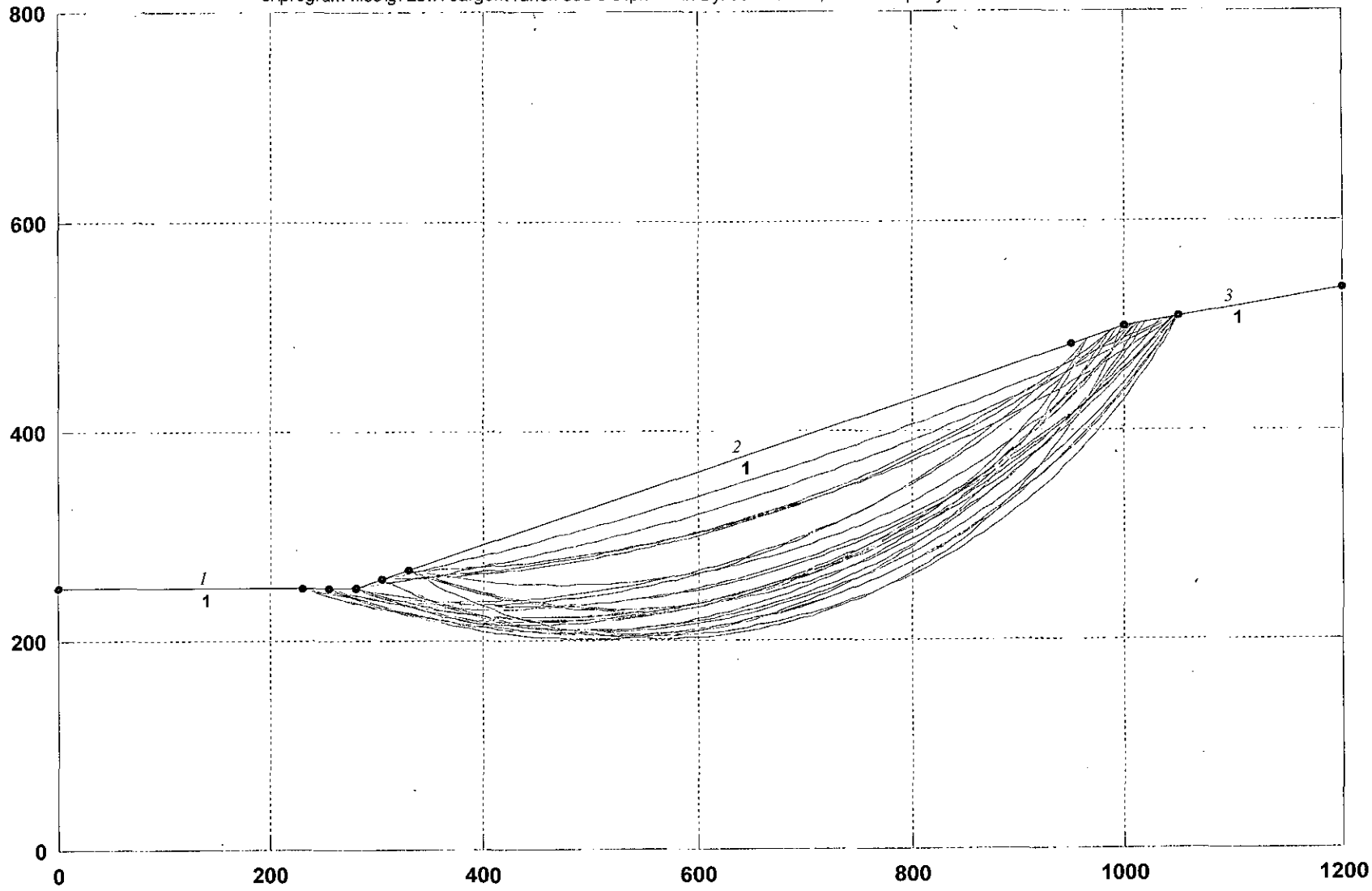
Safety Factors Are Calculated By The Modified Bishop Method

GSTABL7

Seismic

Sargent Ranch Quarry Site Section Q-Q' Cross Bedded

c:\program files\g72sw\-sargent ranch sec c-c'.plt Run By: John Smith, XYZ Company 11/23/2015 08:43AM



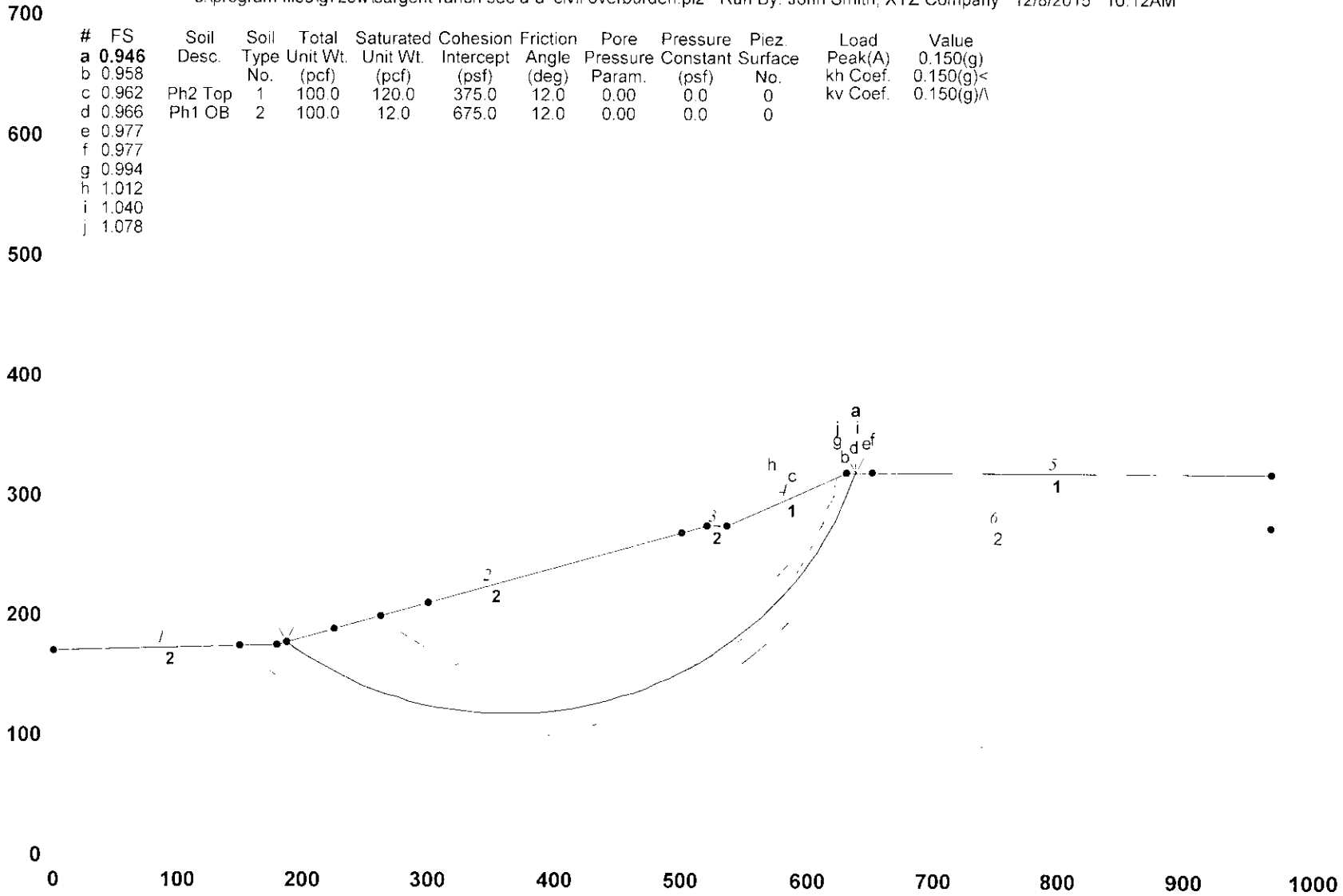
GSTABL7

SEISMIC

Sargent Ranch Sec A-A' Civil Overburden

c:\program files\g72sw\sargent ranch sec a-a' civil overburden.pl2 Run By: John Smith, XYZ Company 12/8/2015 10:12AM

#	FS	Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.	Load Peak(A) kh Coef. kv Coef.	Value 0.150(g) 0.150(g)< 0.150(g)/\
a	**0.946**											
b	0.958											
c	0.962	Ph2 Top	1	100.0	120.0	375.0	12.0	0.00	0.0	0		
d	0.966	Ph1 OB	2	100.0	12.0	675.0	12.0	0.00	0.0	0		
e	0.977											
f	0.977											
g	0.994											
h	1.012											
i	1.040											
j	1.078											



GSTABL7 v.2 FSmin=0.946

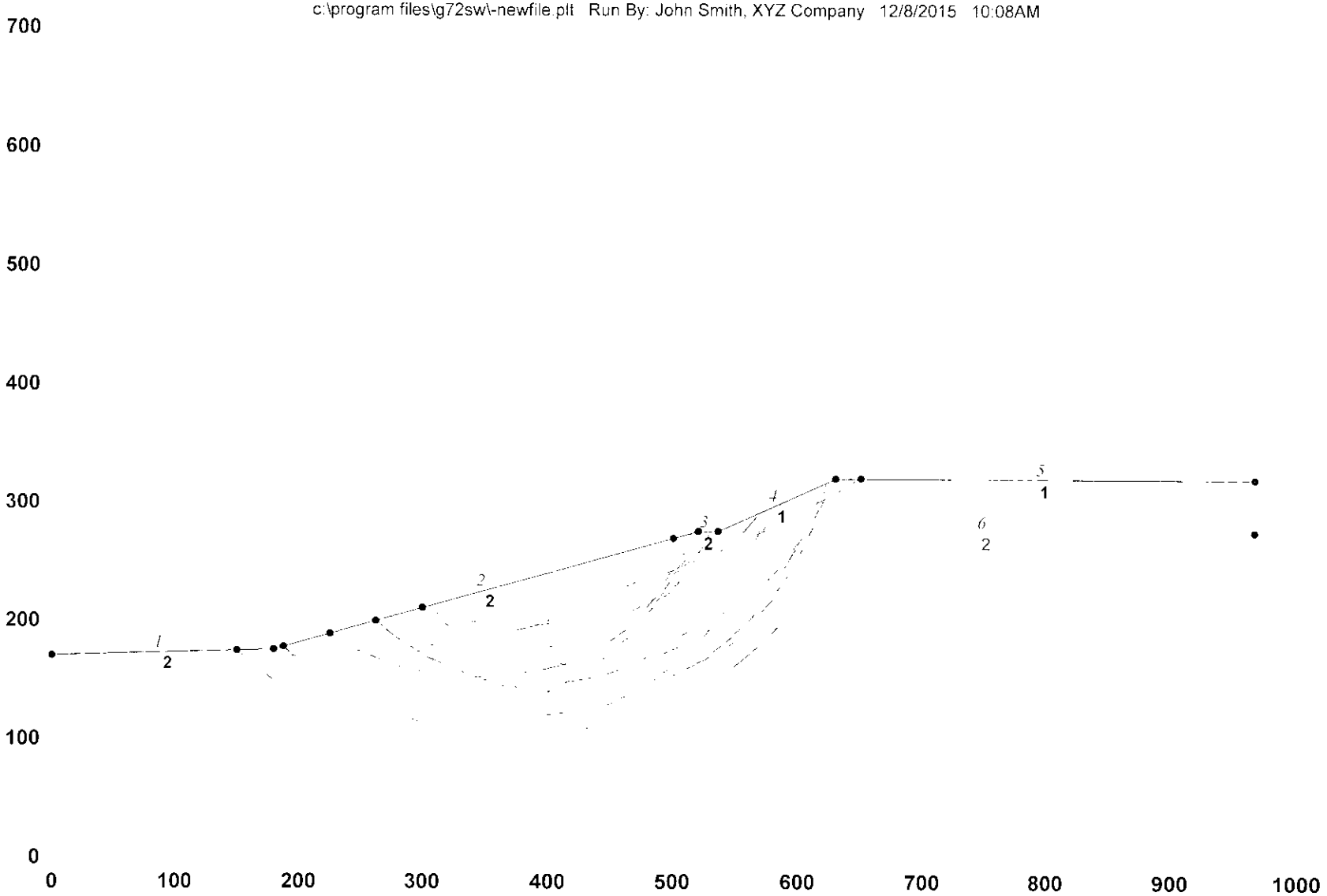
Safety Factors Are Calculated By The Modified Bishop Method

GSTABL7

Seismic

Sargent Ranch Sec A-A' Civil Overburden

c:\program files\g72sw\-newfile.plt Run By: John Smith, XYZ Company 12/8/2015 10:08AM

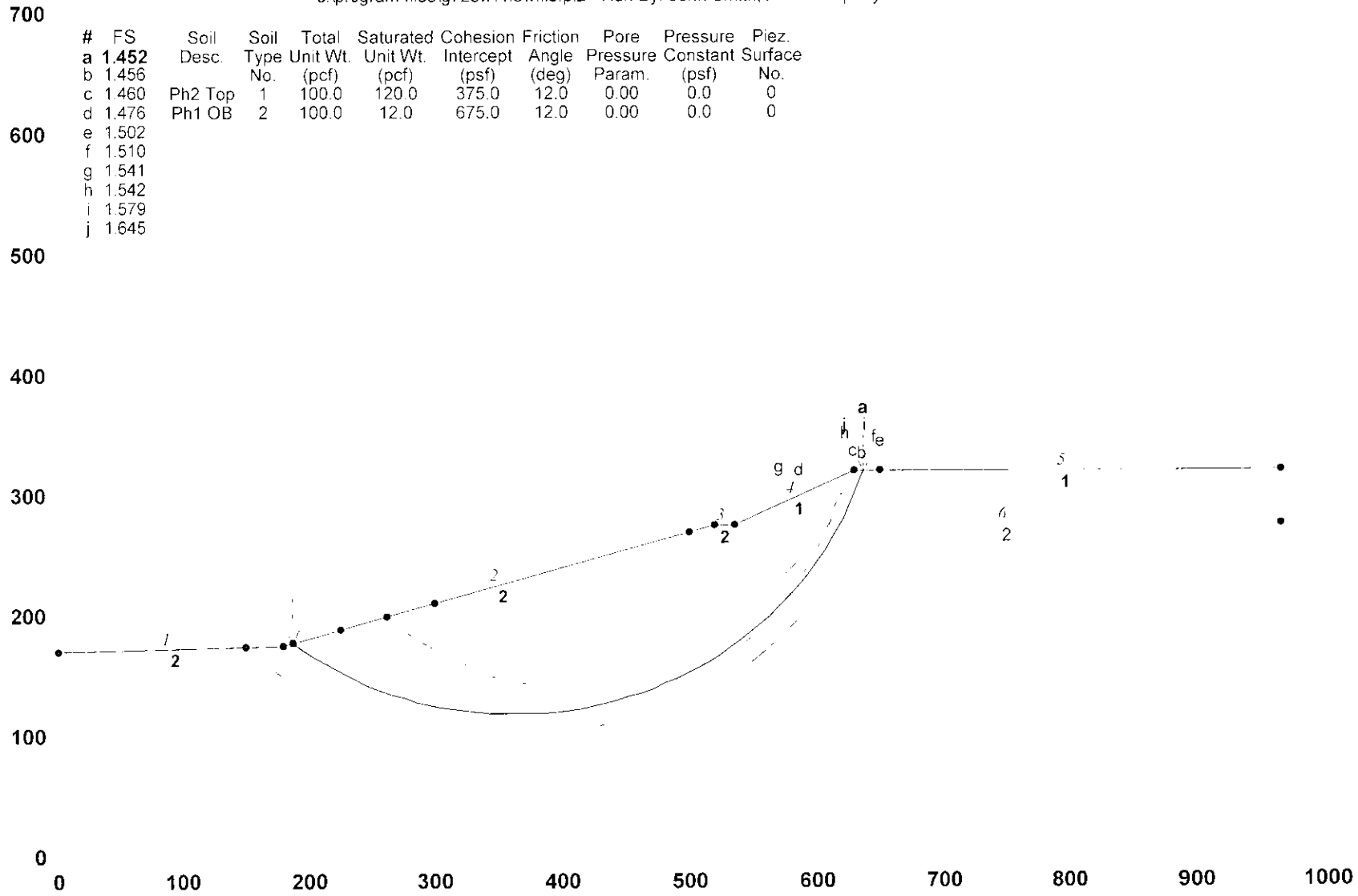


GSTABL7

Sargent Ranch Sec A-A' Civil Overburden

c:\program files\g72sw\-newfile.pl2 Run By: John Smith, XYZ Company 12/8/2015 10:08AM

#	FS	Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
a	**1.452**									
b	1.456									
c	1.460	Ph2 Top	1	100.0	120.0	375.0	12.0	0.00	0.0	0
d	1.476	Ph1 OB	2	100.0	12.0	675.0	12.0	0.00	0.0	0
e	1.502									
f	1.510									
g	1.541									
h	1.542									
i	1.579									
j	1.645									

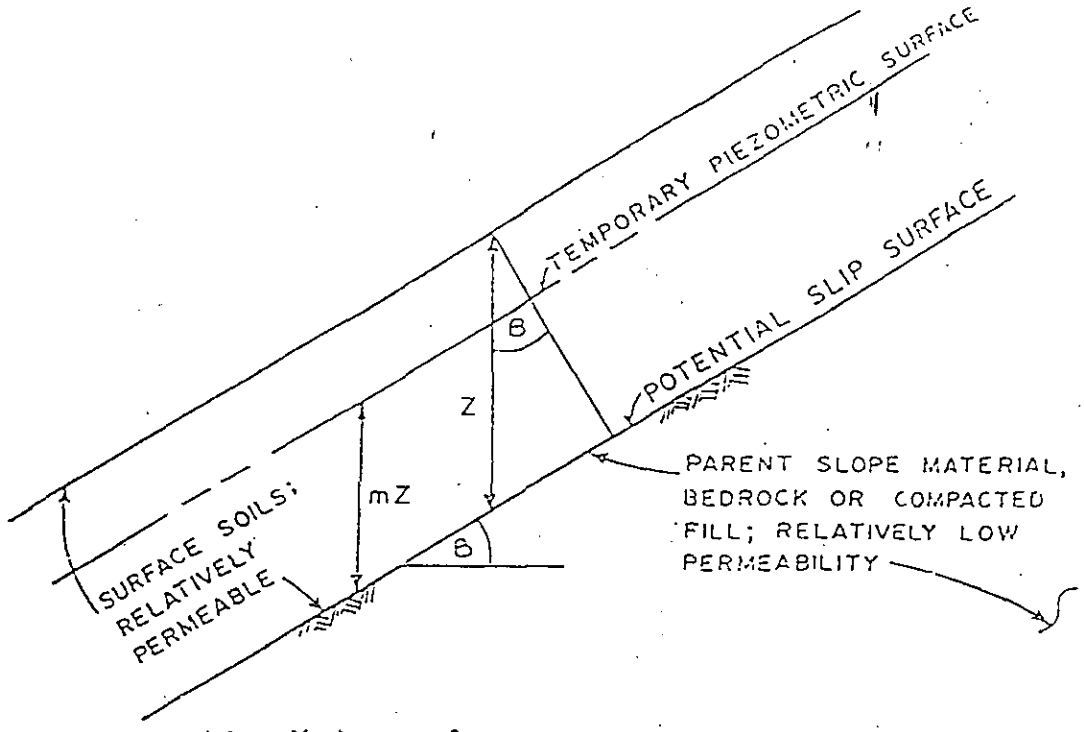


GSTABL7 v.2 FSmin=1.452

Safety Factors Are Calculated By The Modified Bishop Method

GSTABL7

STATIC



$$F = \frac{C + (\gamma - m\gamma_w)\, Z \cos^2 B \tan \phi}{\gamma Z \sin B \cos B}$$

WHERE:

F	= FACTOR OF SAFETY	
γ	= UNIT WEIGHT OF THE SOIL (sat)	120 pcf
γ_w	= UNIT WEIGHT OF THE WATER	62.4 pcf
C	= COHESION	375
ϕ	= ANGLE OF SHEARING RESISTANCE	12°
Z	= VERTICAL DEPTH OF THE SLIP SURFACE	3'
m	= FRACTION OF Z SUCH THAT mZ IS THE VERTICAL HEIGHT OF THE TEMPORARY WATER SURFACE ABOVE THE SLIP SURFACE.	1
β	= SLOPE ANGLE	17°

Cos B = .95
Cos²B = .90
tan φ = .21
Sin B = .29

$$F = \frac{375 + (120 - 62.4)\, 3'(.9).21}{120(3).29(.95)}$$

$$= \frac{375 + 33}{99.2} = 4.11 \text{ OK @ } 3{:}1$$

@ φ = 12°, C = 150 $\quad F = 150 + (57.6)\, 3'(.9).21 / 120(3).29(.95) = \frac{183}{99.1} = 1.84$ OK

REFERENCE:

U.S. GEOLOGICAL SURVEY
PROFESSIONAL PAPER 851

Sargent Ranch - Quarry

SURFICIAL SLOPE STABILITY ANALYSIS

SCALE	CHECKED BY	DRAWN BY ROH
DATE		
SIZE		DRAWING NO. F.I.G.

PZ/2 Surficial
Sargent Ranch
RD Hinkle
R66#402

Failure on Sec 6-6'

$\beta = 27°$

$\sin\beta = .45$

$\cos\beta = .89$

$\cos^2\beta = .79$

$$F = \frac{375 + (57.6)\,3''\,(.79)\,.24}{120\,(3)\,.45\,(.9)}$$

$$= \frac{375 + 28.6}{145} = 2.78 \text{ OK}$$

Real $\phi = 12°$ $C = 150$ in Surface Failures

APPENDIX E

STANDARD OF CARE IN QUARRY SLOPE DEVELOPMENT

General: Slope design for open pit mines and quarries includes consideration of both mining economics (the steepness and overall stability of the slopes) and operating safety (particularly mitigation of wedge failures, rockfall and slide hazards). Design factors related to safety must be of paramount importance, whether for permanent or temporary slopes, and slope designs must be implemented to meet the current standard of care in the mining industry for operating safely below slopes. This standard includes incorporating effective catch benches into pit slopes.

The minimum standard of care for safety in development of mine slopes is defined by Federal regulations that are enforced by Mine Safety and Health Administration (MSHA), or by equivalent State agencies using State regulations that can be no less stringent than Federal regulations. In addition, operating practices and slope designs to enhance operator safety are often developed at the corporate level, and these may be supplemented at the Operating level based on site conditions at individual pits.

Mine slope stability requirements are regulated by Title 30 of the Code of Federal Regulations, Section 56.3130. This Section requires that mining methods shall maintain slope stability in places where persons work or travel in performing their assigned tasks, and that bench configurations be based on the type of equipment used for scaling.

MSHA provides interpretation guidelines for ground control. These indicate that MSHA requires that a bench adequate to retain rockfall must be maintained above work or travel areas. Where there is not an effective catch bench above a work or travel area, other measures must be taken to protect the miners, such as berming off or ceasing mining in the affected area.

Benching Practices

Operating safety is generally enhanced by implementing the following practices: Thorough bench face scaling to reduce risks of raveling using equipment that can safely reach the top of the bench to scale loose rock/soil; Inspection and monitoring program to ensure that conditions are safe below existing slopes; Geological documentation and geotechnical evaluation program to ensure that the conditions assumed for the slope and bench design are met in the field; Operator awareness training to train operators in safe practices, and to educate operators regarding potential hazards.

Mining a single bench configuration provides flexibility in enabling operations to be restricted in the area of bench toes, but it does not eliminate all need for operations, access, and mapping in areas that can be subject to significant slope hazards. Developing stable bench faces and controlling hazards with effective catch benches is therefore important even for single bench operations.

Testing and Observation

The recommendations provided in this report are based on the assumption that SGS will be retained as the Geotechnical Engineer of Record for the project. It is important to maintain continuity of geotechnical interpretation and confirm field conditions encountered are similar to those anticipated during design. In accordance with the CBC testing and observation services by the Geotechnical Engineer of Record are required to verify construction has been performed in accordance with this report, approved plans and specifications. If we are not retained for these services, we cannot assume any responsibility for other's interpretations of our recommendations or the future performance of the project.

Erosion Control

We expect the majority of surface runoff to readily infiltrate the exposed final cut faces and the intervening benches. Locally, cemented zones may limit infiltration, but we do not expect high volumes of concentrated runoff. We recommend the intervening benches be out-sloped 2% to avoid concentrated flow and consequent erosion of the benches. Disturbed slopes adjacent to the excavation should be protected from erosion by planting native vegetation, or other appropriate means.

Appendix G.2
Paleontological Technical Report

ESA

PALEO SOLUTIONS
Paleontological and Archaeological Compliance and Consulting Services

PALEONTOLOGICAL TECHNICAL REPORT: SARGENT QUARRY PROJECT, UNINCORPORATED SANTA CLARA COUNTY, CALIFORNIA

Prepared for:

DAVID J. POWERS & ASSOCIATES, INC.

Amie Ashton, Project Manager
1871 The Alameda, Suite 200
San Jose, CA 95126

Prepared by:

PALEO SOLUTIONS, INC.

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Geraldine@paleosolutions.com
(562) 818-7713

Geraldine Aron, M.S. – Principal Investigator
Courtney Richards, M.S. – Report Author

PSI Report #: CA17SantaClaraDAV01R

JANUARY 2017

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Table of Contents

Figures

Tables

1.0 EXECUTIVE SUMMARY

This report presents the results of the paleontological technical study conducted by Paleo Solutions, Inc. (Paleo Solutions), under contract to David J. Powers & Associates, Inc. (DJP&A) in support of the Sargent Quarry Project (project) located in unincorporated Santa Clara County (see Figure 1). This work was required by the County of Santa Clara to meet their requirements as the lead agency under the California Environmental Quality Act (CEQA). The Sargent Quarry Project proposes a sand and gravel mining operation, as well as construction and operation of aggregate processing facilities, on approximately 300 acres of the 6,400-acre Sargent Ranch property in an incorporated area of southern Santa Clara County, approximately four miles south of the City of Gilroy, California. Mining activities will take place in four phases, and it is estimated that approximately 38,665,000 cubic yards of material will be mined over a 30-year term.

The paleontological study for the project included a geologic map review, literature and database search, institutional records search, and analysis of the paleontological potential of geologic units within the project area. Geologic mapping of the project area indicates that project excavations have the potential to impact unknown to high sensitivity (Potential Fossil Yield Classification [PFYC] U-4) Pliocene unnamed claystone, Pliocene Etchegoin Formation, and Pleistocene older alluvium, and low sensitivity (PFYC 2) Pleistocene to Holocene landslide deposits and Holocene alluvium (Dibblee and Minch, 2006). According to the records search, there are no previously recorded fossil localities from within the project area; however, numerous other vertebrate, invertebrate and plant fossils have been recorded from the Etchegoin Formation and other Pliocene- to Pleistocene-age sediments in surrounding counties (UCMP, 2016; PBDB, 2017). No fossils are recorded from within Holocene-age alluvium or Holocene- to Pleistocene-age landslide deposits.

Based on PFYC guidelines applied to the results of the literature review and records search completed for this study, the Pliocene Etchegoin Formation has a high paleontological potential (PFYC 4), the unnamed Pliocene claystone has an unknown potential (PFYC U), and Pleistocene-aged Quaternary older alluvium (if encountered subsurface) has a moderate paleontological potential (PFYC 3). Holocene-age alluvial deposits and landslide deposits are unlikely to contain significant paleontological resources, and therefore are considered to have a low paleontological potential (PFYC 2).

Due to the presence of geologic units with high to unknown paleontological potential within the project area, mitigation of potential adverse impacts resulting from proposed mining activities and construction of associated facilities and infrastructure is recommended. Full time monitoring would generally be implemented during excavations into the high to moderate sensitivity geologic units, however, this approach is not feasible due to the long term (30 years) and full time nature of this mining project. In order to partially mitigate the loss of paleontological resources it is recommended that a Qualified Paleontologist be retained to prepare and implement a paleontological resource mitigation plan (PRMP) the outlines procedures for periodic spot checks and/or part-time monitoring of mining activities that impact native Etchegoin Formation, unnamed claystone, and Pleistocene older alluvium (if encountered subsurface). A paleontological resources worker environmental awareness training should also be prepared and presented to all mining and construction personnel.

2.0 INTRODUCTION

This report presents the results of the paleontological technical study conducted by Paleo Solutions, under contract to DJP&A in support of the Sargent Quarry Project (project) located in unincorporated Santa Clara County (Figure 1). This work was required by the County of Santa Clara to meet their requirements as the lead agency under CEQA. All paleontological work was completed in compliance with CEQA, local guidelines, and best practices in paleontology.

Mining activities will take place in four phases (Figure 2) over the course of 30 years, as detailed in the following sections. Geologic mapping of the project area indicates that project excavations have the potential to impact unknown to high sensitivity (PFYC U-4) Pliocene unnamed claystone, Pliocene Etchegoin Formation, and Pleistocene older alluvium, and low sensitivity (PFYC 2) Pleistocene to Holocene landslide deposits and Holocene alluvium (Dibblee and Minch, 2006).

2.1 Project Overview

The Sargent Quarry Project proposes a sand and gravel mining operation, as well as construction and operation of aggregate processing facilities, on approximately 300 acres of the 6,400-acre Sargent Ranch property. Aggregates are materials (such as sand, gravel, and crushed rock) that, along with water and Portland cement, are an essential ingredient in concrete. The approximately 300-acre area where mining activities would occur is located along the easternmost portion of the property and is currently used for cattle grazing. The remaining approximately 6,080 acres of the Sargent Ranch would be maintained in their current conditions and would not be utilized for mining, processing, or reclamation activities.

Alluvial sand and gravel deposits (consisting of conglomerate, sandstone, and siltstones) would be mined at the Sargent Quarry, processed, and sold to companies for use at construction sites in the region. These deposits exist on hills at Sargent Ranch as a result of geologic plate-tectonic actions between the North American Plate and the Pacific Plate, as well as the San Andreas Fault and the Sargent Fault. Alluvial sand and gravel deposits have been uplifted up from their original location along historic riverbeds at the valley floor to a height of approximately 600 feet above sea level. Sand and gravel deposits would be mined using an open-pit mining or method to an approximate depth 200 feet above sea level as part of the project. No underground mining would occur; rather, hillslopes within mining areas would be cutback and mined over time with the quarry floor no deeper than the base of the hillslopes. The open-pit mining area would include sidewalls and benches to provide for the stability of the quarry slopes.

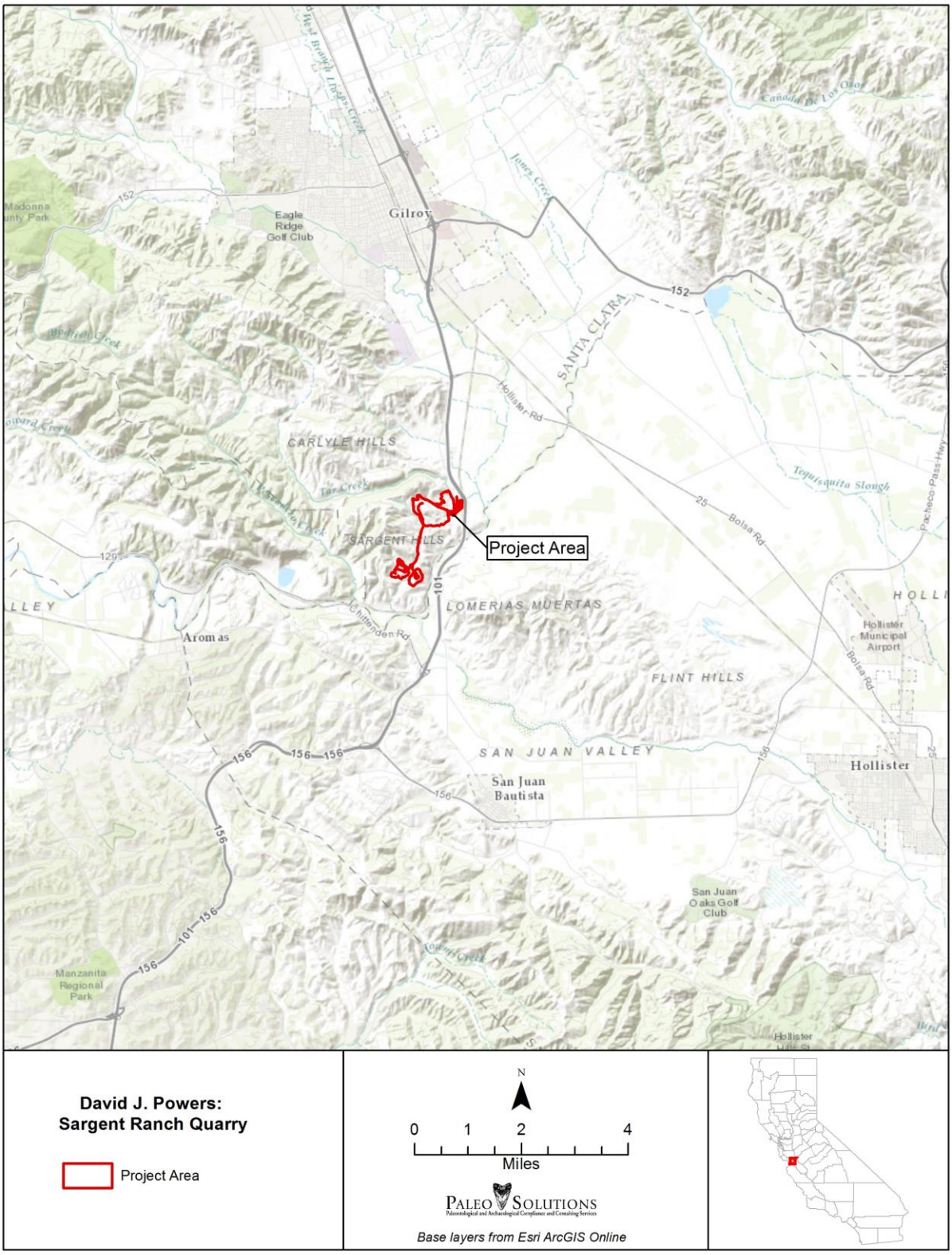

Figure 1. Project Location Map.

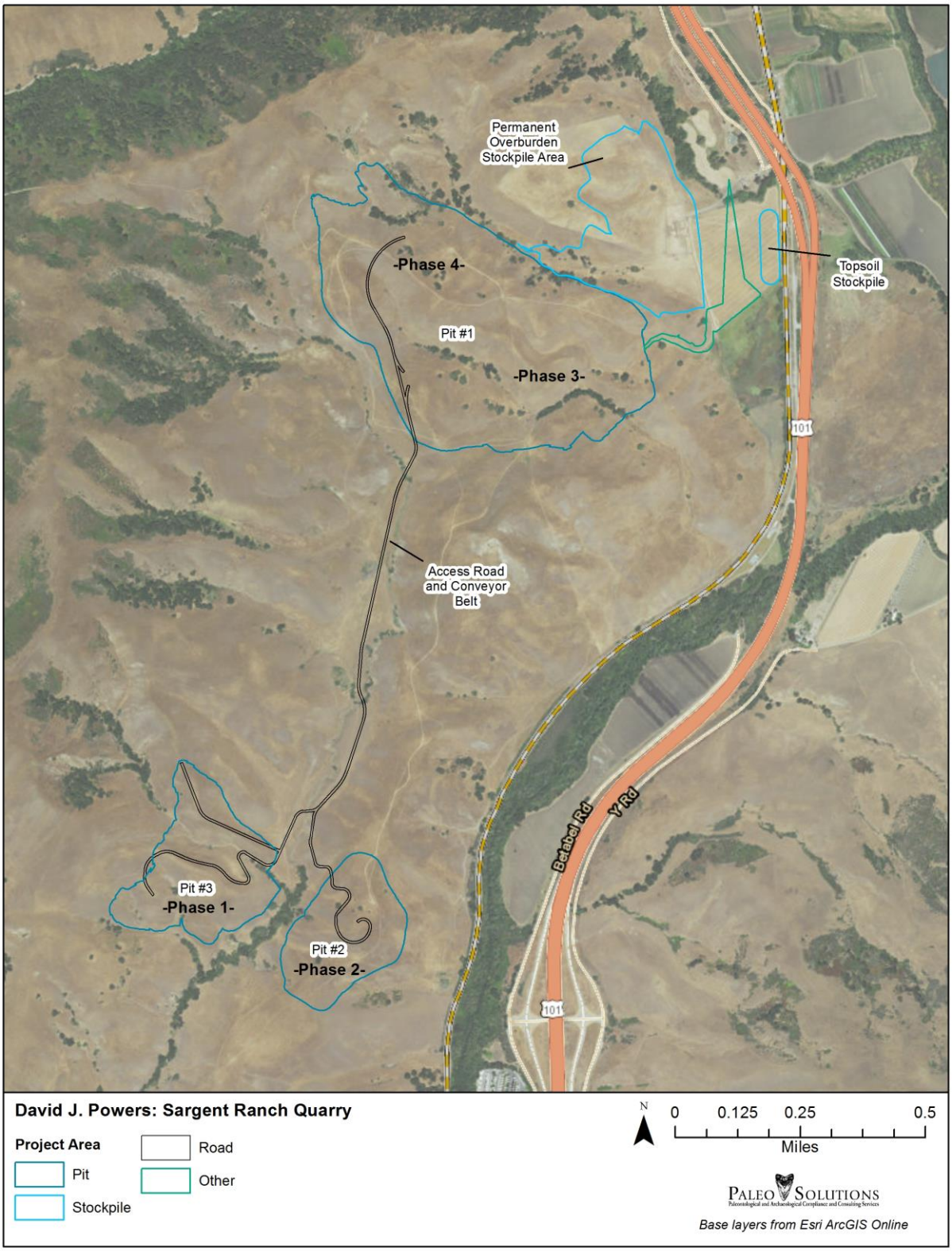

Figure 2. Project Overview Map.

It is estimated that approximately 38,665,000 cubic yards of material, including about 28 million cubic yards (40 million tons) of sand and gravel aggregate would be mined over the 30-year permit term of the quarry. Mined sand and gravel aggregate deposits would be sold locally for a variety of construction-related uses. Overburden and/or material un-saleable as concrete-grade aggregate would be stockpiled and sold as engineered fill or used in the final reclamation of quarry slopes at the conclusion of each mining phase, which is described further below.

The project requires issuance of a Conditional Use Permit by Santa Clara County for the 30-year operational mining term of the quarry and approval of a site-specific Reclamation Plan. Mining activities and future implementation of the Reclamation Plan for the project would be required to satisfy the reclamation requirements of the Surface Mining and Reclamation Act (SMARA) of 1975 found in Title 14 of the California Code of Regulations (CCR) Section 3500, as well as the County's Surface Mining ordinance requirements within Santa Clara County Code Section 4.10.370. The County has primary discretionary authority over the project and serves as the Lead Agency responsible under CEQA and SMARA.

2.2 Project Location

The approximately 6,400-acre Sargent Ranch property is located within the foothills of the Coast Range Mountains in an incorporated area of southern Santa Clara County, approximately four miles south of the City of Gilroy, California. Sargent Ranch is located adjacent to and west of Highway 101, approximately one mile south of the Highway 101 and Highway 25 interchange. Sargent Ranch is bound to the east by Highway 101, to the south by the Pajaro River, and to the west and north by privately-owned rangeland. Several creeks cross the Sargent Ranch property, including Sargent Creek and Tar Creek. Elevations range from approximately 150 feet above mean sea level (amsl) to over 800 feet amsl.

The approximately 300-acre project area where mining operations would occur is located on the eastern portion of Sargent Ranch and consists of an irregularly shaped group of three parcels (Assessor's Parcel Numbers: 810-38-014, -016, and -017). The project area is accessed from Highway 101 via Old Monterey Road. The project location is shown on Figures 1. Mining would occur in four separate mining areas in phases, as shown in Figure 2.

2.3 Project Description

The proposed Sargent Quarry would be an open pit quarry operating for a term of 30 years with mining occurring in four phases, shown in Figure 2. Estimated mining quantities for each phase of the project are shown in the following Table 1. The duration of each phase would be based in part on the demand for sand and gravel materials.

TABLE 1. ESTIMATED MINING QUANTITIES

Mining Phase	Product (cubic yards)	Overburden (cubic yards)	Excavation Total (cubic yards)
Phase 1	3,400,000	1,500,000	5,000,000
Phase2	2,565,000	900,000	3,565,000
Phase 3	9,650,000	3,325,000	13,300,000
Phase 4	12,375,000	4,200,000	16,800,000
Total	**27,990,000**	**9,925,000**	**38,665,000**

2.3.1 Mining Plan

On-site construction would include grading and site clearing for development of a processing plant area, roads, a bridge over Tar Creek, and a materials conveyor system. The processing area would include buildings, parking areas, processing areas, a process pond and settling pond. Several berms would also be constructed for flood control and visual screening purposes. Mining of sand and gravel would be conducted using bulldozers, excavators, graders, and front end loaders. No blasting is proposed.

Prior to the start of mining at each phase, the limits of excavation will be clearly staked. The area to be excavated will be cleared of vegetation using a backhoe, excavator, and trucks. Topsoil and overburden will be removed and stockpiled separately. Stockpiles of topsoil and overburden materials would be placed at several locations: adjacent to the processing area, and within several of the individual mining areas. A permanent overburden stockpile area would be placed between the location of the processing plant and Phase 3 and Phase 4 mining areas. This area would receive materials during Phases 1, 3 and 4.

Typical mining methods would include grading of an open pit with 2:1 side walls and 10-foot-wide benches every 30 vertical feet on the side slopes. Once mining is complete, additional earthmoving would be undertaken as part of reclamation of each mined area.

During active periods of mining, interim slopes of 2:1 with 10-foot benches every 30 vertical feet would be constructed. The mining process for Phase 1 through Phase 4 and associated facilities are described further in the following sections. Disturbance areas for each phase and associated facilities are summarized within **Error! Reference source not found.**.

TABLE 2. ESTIMATED DISTURBANCE AREAS

Project Facility	Disturbance Area (acres)
Mining Phase 1	41.9
Mining Phase 2	28.8
Mining Phase 3	61.7
Mining Phase 4	90.5
Access Roads	0.4
Conveyor Belt and Maintenance Road	14.2
Processing Plant and Related Facilities	62.3

Phase 1 and Phase 2 mining areas are located on two hilltops on either side of Sargent Creek at the southeast portion of Sargent Ranch. Following topsoil and overburden removal, sand and gravel would be excavated from west to east using mobile equipment (e.g. scrapers, bulldozers, excavators, and front-end loaders). During mining Phases 1 and 2, interim quarry pit slopes would be maintained with gradients of 2:1 and 10-foot-wide benches every 30 vertical feet.

To transport mined material from the Phase 1 and Phase 2 mining areas, an approximately 1.6-mile-long, elevated conveyor belt would be constructed. The base of the conveyor would be elevated about four feet above grade. The conveyor belt would move the aggregate from the mining area to a 14-acre processing plant area in the northeastern portion of the site. A 15-foot-wide dirt road would be constructed alongside the eight-foot-wide conveyor belt structure for access and conveyor belt maintenance purposes. The conveyor belt and maintenance road will

generally follow the east side of the western ridge of the Sargent Valley. Grading will be required for the maintenance road.

Once sand and gravel excavation in Phase 1 is complete, operations will move into the Phase 2 area of the quarry and reclamation actions will begin in the Phase 1 area. Overburden from Phase 2 will be placed in the excavated area of Phase 1 to construct the permanent slope faces. At the end of Phase 2 mining operations, the conveyor belt will be removed, and its path regraded and revegetated. The maintenance road that runs parallel to the conveyor belt would be left in place to continue to provide access to the mined-out sites, while reclamation activities are still ongoing. Mining in the Phase 1 and Phase 2 areas is anticipated to occur for 10 to 15 years with roughly 8,565,000 cubic yards of material being excavated.

Mining operations at Phase 3 and Phase 4 would begin approximately 15 years into the 30-year term of the Conditional Use Permit, with Phase 4 occurring after mining activities are completed for Phase 3. Operations would occur in back of the previously described vegetated, screening berm constructed at part of Phase 1 and 2 activities.

Topsoil and overburden would be removed and stored. The Phase 3 and Phase 4 hillsides would be mined from west to east using mobile excavation equipment (similar to Phases 1 and 2). Material would be hauled in trucks to the on-site processing plant. An unpaved approximately 0.30-mile-long, 30-foot-wide roadway would provide access from Phases 3 and 4 to the processing plant.

Because work associated with Phase 4 would not begin until after Phase 3 mining activities have ceased, Phase 4 overburden would be placed in the Phase 3 pit and would also be placed onto the northern, eastern, and western temporary slope of the Phase 4 mining area to create a permanent slope of 3:1, which would be maintained upon termination mining activities. Phase 3 and Phase 4 areas is anticipated to occur for 10 to 15 years with roughly 30,100,000 cubic yards of material excavated. Phase 4 will be the largest phase of the project with a total excavation of approximately 16,800,000 cubic yards.

2.3.2 Processing Plant

An approximately 14-acre processing plant would be constructed in the northeastern portion of the site. The processing plant will include an office, shop, maintenance buildings, equipment storage yard, 17-space parking area, truck scales, and loading area. During mining operations, excavated sand and gravel would be hauled via the conveyor belt (for Phases 1 and 2) or trucks (for Phases 3 and 4) to the processing plant. A five-foot-tall berm would be constructed around the northern boundary of the processing plant site to provide flood protection.

Excavated material would be mechanically sized, washed, sorted into stockpiles, and prepared for shipping at the processing plant. Some materials would also be crushed and sorted into stockpiles via radial stacker and conveyers. Materials would be kept wet to minimize dust emissions. Sprinklers and water trucks would be used to control dust at the processing plant and on stockpiles.

The processing plant would also contain a process water pond, which would be used to retain water for reuse in aggregate processing. Groundwater would be pumped from a new on-site well to supply water to the process pond and for dust control as part of processing plant operations.

Surface runoff from areas disturbed by processing operations would be directed via drainage ditches and swales to a stormwater sediment basin. Stormwater in the settling pond would be allowed to percolate on-site or be reused for processing plant operations (e.g., dust control, washing aggregate materials). The stormwater sediment basin would also receive runoff from swales surrounding the adjacent overburden stockpiles, containing stormwater from disturbed area to the project site.

An approximately 50-foot-tall visual screening berm would be constructed along the east side of the processing plant (adjacent to Highway 101) utilizing overburden and topsoil mined as part of Phase 1. The project proposes to grade the berm to resemble the form and shape of the surrounding hillslopes. The berm would be seeded so it would blend with its surroundings and screen views of the processing plant and mining operations associated with and Phase 3 and 4 of the project.

2.3.3 On-Site Road and Bridge Construction

The project proposes construction of access and maintenance roads extending from the quarry entrance across Tar Creek to the processing plant and to all four mining areas. The internal access roads would be 15 to 20 feet in width (depending on location) and cover approximately 0.4 acres of the site. At some locations on slopes approaching Phase 1 and 2 mining areas, engineered fill would be placed to support the road. Roads would be constructed to County standards for drainage and erosion control.

A bridge is proposed over Tar Creek to provide truck access to the processing area, truck scales and office. The bridge would span the banks of the creek and extend to a height of approximately 5 feet above the bank of Tar Creek. The bridge would be approximately 24 feet in width and 50 feet in length. Berms would be installed on both sides of the bridge to direct flows into Tar Creek and elevate the bridge.

2.3.4 Site Access and Roadway Modifications

Access to the project site would occur via southbound Highway 101 and Old Monterey Road through a gated entrance on to an existing private access road. Both Old Monterey Road and the private access road would be repaved to accommodate the two-way truck traffic associated with the project.

Trucks traveling to destinations north of the quarry would use the Sargent Ranch undercrossing of Highway 101. The existing Sargent Ranch undercrossing of Highway 101 would be widened and paved under the proposed project. A new 13-foot-wide, approximately 0.25-mile-long acceleration lane for trucks accessing northbound Highway 101 would installed as part of the project on the east side of the Sargent Ranch on-ramp to Highway 101.

3.0 DEFINITION AND SIGNIFICANCE OF PALEONTOLOGICAL RESOURCES

As defined by Murphey and Daitch (2007): "Paleontology is a multidisciplinary science that combines elements of geology, biology, chemistry, and physics in an effort to understand the history of life on earth. Paleontological resources, or fossils, are the remains, imprints, or traces of once-living organisms preserved in rocks and sediments. These include mineralized, partially mineralized, or unmineralized bones and teeth, soft tissues, shells, wood, leaf impressions, footprints, burrows, and microscopic remains. Paleontological resources include not only fossils themselves, but also the associated rocks or organic matter and the physical characteristics of the fossils' associated sedimentary matrix.

The fossil record is the only evidence that life on earth has existed for more than 3.6 billion years. Fossils are considered non-renewable resources because the organisms they represent no longer exist. Thus, once destroyed, a fossil can never be replaced. Fossils are important scientific and educational resources because they are used to:

- Study the phylogenetic relationships amongst extinct organisms, as well as their relationships to modern groups;
- Elucidate the taphonomic, behavioral, temporal, and diagenetic pathways responsible for fossil preservation, including the biases inherent in the fossil record;
- Reconstruct ancient environments, climate change, and paleoecological relationships;
- Provide a measure of relative geologic dating that forms the basis for biochronology and biostratigraphy, and which is an independent and corroborating line of evidence for isotopic dating;
- Study the geographic distribution of organisms and tectonic movements of land masses and ocean basins through time;
- Study patterns and processes of evolution, extinction, and speciation; and
- Identify past and potential future human-caused effects to global environments and climates."

Fossil resources vary widely in their relative abundance and distribution and not all are regarded as significant. According to the Bureau of Land Management (BLM) Instructional Memorandum (IM) 2009-011, a "Significant Paleontological Resource" is defined as:

> "Any paleontological resource that is considered to be of scientific interest, including most vertebrate fossil remains and traces, and certain rare or unusual invertebrate and plant fossils. A significant paleontological resource is considered to be of scientific interest if it is a rare or previously unknown species, it is of high quality and well-preserved, it preserves a previously unknown anatomical or other characteristic, provides new information about the history of life on earth, or has an identified educational or recreational value. Paleontological resources that may be considered not to have scientific

> significance include those that lack provenience or context, lack physical integrity due to decay or natural erosion, or that are overly redundant or are otherwise not useful for research. Vertebrate fossil remains and traces include bone, scales, scutes, skin impressions, burrows, tracks, tail drag marks, vertebrate coprolites (feces), gastroliths (stomach stones), or other physical evidence of past vertebrate life or activities" (BLM, 2008).

Vertebrate fossils, whether preserved remains or track ways, are classified as significant by most state and federal agencies and professional groups (and are specifically protected under Division 1 of the California Public Resources Code, Section 5020.1 [b]). In some cases, fossils of plants or invertebrate animals are also considered significant and can provide important information about ancient local environments.

The full significance of fossil specimens or fossil assemblages cannot be accurately predicted before they are collected, and in many cases, before they are prepared in the laboratory and compared with previously collected material. Pre-construction assessment of significance associated with an area or formation must be made based on previous finds, characteristics of the sediments, and other methods that can be used to determine paleoenvironmental and taphonomic conditions.

4.0 LAWS, ORDINANCES, REGULATIONS AND STANDARDS

This section of the report presents the regulatory requirements pertaining to paleontological resources that will apply to this project.

4.1 State and Local Regulatory Setting

4.1.1 California Environmental Quality Act (CEQA)

The procedures, types of activities, persons, and public agencies required to comply with the California Environmental Quality Act (CEQA) are defined in the Guidelines for Implementation of CEQA (State CEQA Guidelines), as amended on March 18, 2010 (Title 14, Section 15000 et seq. of the California Code of Regulations [i.e., 14 CCR Section 15000 et seq.) and further amended January 4th, 2013. One of the questions listed in the CEQA Environmental Checklist is: “Would the project directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?” (State CEQA Guidelines Section 15064.5 and Appendix G, Section V, Part C).

4.1.2 State of California Public Resources Code

The State of California Public Resources Code (Chapter 1.7), Sections 5097 and 30244, includes additional state level requirements for the assessment and management of paleontological resources. These statutes require reasonable mitigation of adverse impacts to paleontological resources resulting from development on state lands, and define the excavation, destruction, or removal of paleontological “sites” or “features” from public lands without the express permission of the jurisdictional agency as a misdemeanor. As used in Section 5097, “state lands” refers to lands owned by, or under the jurisdiction of, the state or any state agency. “Public

lands" is defined as lands owned by, or under the jurisdiction of, the state, or any city, county, district, authority, or public corporation, or any agency thereof.

4.1.3 Santa Clara County Guidelines

The County of Santa Clara General Plan (1994) recognizes paleontological sites as having scientific value and the potential to increase our knowledge of the natural world, and has a goal (Goal 5.1) to protect and preserve paleontological resources. Policies C-RC 49 and R-RC 81 state that heritage resources, which includes paleontological resources, within Santa Clara County and within rural unincorporated areas should be preserved. Policies C-RC 50 and R-RC 82 provide a countywide general approach to heritage resource protect, which involves 1) Inventory and evaluation of heritage resources, 2) Prevention or minimization of adverse impacts on heritage, and 3) restoration, enhancement, and commemoration of resources as appropriate. Additional policies and recommendations set the guidance by which the general approach is to be implemented (Policies C-RC 51 through C-RC 56 and R-RC 83 through R-RC 94; Implementation Recommendations C-RC(i) 24 through C-RC(i) 29 and R-RC(i) 32 through R-RC(i) 34).

4.2 Permits

No paleontological permits are required for this project.

5.0 METHODS

This paleontological study included a geologic map review, literature and database search, and institutional record search. The goal of this report is to identify the level of paleontological potential of the project area, and make recommendations for the mitigation of adverse impacts on paleontological resources that may occur as a result of the proposed mining activities and construction of associated facilities and infrastructure. Courtney Richards, M.S. authored this report with Geraldine Aron, M.S. GIS maps were prepared by Barbara Webster, M.S.

Paleo Solutions reviewed geologic mapping of the project area by Dibblee and Minch (2006). The literature reviewed included published and unpublished scientific papers and available online databases. A paleontological record search was conducted at the University of California Museum of Paleontology at Berkeley (UCMP) by Kenneth Finger, Ph.D. The results of the record search (dated November 17, 2016) are attached as Appendix A.

5.1 Paleontological Sensitivity Classification Criteria

The results of the geologic map review, literature review, and museum record search were used to complete a paleontological sensitivity analysis using the BLM (2016) PFYC system criteria.

The PFYC system was developed and refined by the BLM (2007, 2016). The PFYC system is a predictive resource-management tool founded on two basic facts of paleontology: occurrences of paleontological resources are closely tied to the geologic units (i.e., formations, members, or beds) that contain them, and the likelihood of the presence of fossils can be broadly predicted from the distribution of geologic units at or near the surface (Table 3). Therefore, geologic

mapping, as the documentation of geologic unit distribution, is a reliable method for assessing the potential of geologic units to preserve fossils.

The PFYC system classifies geologic units on the relative abundance of scientifically significant vertebrate, invertebrate, or plant fossils and their sensitivity to adverse impacts, with a higher classification number indicating a higher potential for fossil occurrences. Among paleontologists, it is understood that this classification is preferably applied to the geologic formation, member, or other distinguishable unit at the most detailed mappable level. Although significant localities may occasionally occur in a geologic unit, the existence of a few important fossils or localities widely scattered over a large area does not necessarily indicate a higher classification for the unit. The relative abundance of significant localities is intended to serve as the major determinant for the class assignment. The PFYC system is intended to provide baseline guidance for predicting, assessing, and mitigating impacts on paleontological resources.

TABLE 3. THE PFYC SYSTEM

BLM PFYC Designation	Assignment Criteria Guidelines and Management Summary
1 = Very Low Potential	Geologic units are not likely to contain recognizable paleontological resources.
	Units are igneous or metamorphic, excluding air-fall and reworked volcanic ash units.
	Units are Precambrian in age.
	Management concern is usually negligible, and impact mitigation is unnecessary except in rare or isolated circumstances.
2 = Low Potential	Geologic units are not likely to contain paleontological resources.
	Field surveys have verified that significant paleontological resources are not present or are very rare.
	Units are generally younger than 10,000 years before present.
	Recent aeolian deposits
	Sediments exhibit significant physical and chemical changes (i.e., diagenetic alteration) that make fossil preservation unlikely
	Management concern is generally low, and impact mitigation is usually unnecessary except in occasional or isolated circumstances.
3 = Moderate Potential	Sedimentary geologic units where fossil content varies in significance, abundance, and predictable occurrence.
	Marine in origin with sporadic known occurrences of paleontological resources.
	Paleontological resources may occur intermittently, but these occurrences are widely scattered
	The potential for authorized land use to impact a significant paleontological resource is known to be low-to-moderate.
	Management concerns are moderate. Management options could include record searches, pre-disturbance surveys, monitoring, mitigation, or avoidance. Opportunities may exist for hobby collecting. Surface-disturbing activities may require sufficient assessment to determine whether significant paleontological resources occur in the area of a proposed action and whether the action could affect the paleontological resources.
U = Unknown Potential	Geologic units that cannot receive an informed PFYC assignment
	Geological units may exhibit features or preservational conditions that suggest significant paleontological resources could be present, but little information about the actual paleontological resources of the unit or area is unknown.
	Geologic units represented on a map are based on lithologic character or basis of origin, but have not been studied in detail.
	Scientific literature does not exist or does not reveal the nature of paleontological resources.
	Reports of paleontological resources are anecdotal or have not been verified.
	Area or geologic unit is poorly or under-studied.

BLM PFYC Designation	Assignment Criteria Guidelines and Management Summary
	BLM staff has not yet been able to assess the nature of the geologic unit
	Until a provisional assignment is made, geologic units with unknown potential have medium to high management concerns. Field surveys are normally necessary, especially prior to authorizing a ground-disturbing activity.
4 = High Potential	Geologic units that are known to contain a high occurrence of paleontological resources.
	Significant paleontological resources have been documented but may vary in occurrence and predictability.
	Surface-disturbing activities may adversely affect paleontological resources.
	Rare or uncommon fossils, including nonvertebrate (such as soft body preservation) or unusual plant fossils, may be present.
	Illegal collecting activities may impact some areas.
	Management concern is moderate to high depending on the proposed action. A field survey by a qualified paleontologist is often needed to assess local conditions. On-site monitoring or spot-checking may be necessary during land disturbing activities. Avoidance of known paleontological resources may be necessary.
5 = Very high Potential	Highly fossiliferous geologic units that consistently and predictably produce significant paleontological resources.
	Significant paleontological resources have been documented and occur consistently
	Paleontological resources are highly susceptible to adverse impacts from surface disturbing activities.
	Unit is frequently the focus of illegal collecting activities.
	Management concern is high to very high. A field survey by a qualified paleontologist is almost always needed and on-site monitoring may be necessary during land use activities. Avoidance or resource preservation through controlled access, designation of areas of avoidance, or special management designations should be considered.
W = Water	Includes any surface area that is mapped as water. Most bodies of water do not normally contain paleontological resources. However, shorelines, reservoirs, sinkholes and cenotes, and dredging or river systems may contain paleontological resources.
I = Ice	Includes any area that is mapped as ice or snow. Receding glaciers and melting snow fields may expose paleontological resources.

Copies of this report will be submitted to DJP&A and the County of Santa Clara. Paleo Solutions will retain an archival copy of all project information.

6.0 GEOLOGY AND PALEONTOLOGY

The project area is situated in the Coast Range Province (Wallace, 1990; Oakeshott, 1966). A geomorphic province is a region of unique topography and geology that is readily distinguished from other regions based on its landforms and diastrophic history. The geology of the project area vicinity includes a complex assemblage of Jurassic to Cretaceous (200 to 66 million years ago [Ma]) rocks of the Franciscan Formation and Pliocene to Holocene (5 Ma to present) terrestrial and marine sedimentary deposits. The complex geology of the project vicinity, which spans 200 million years, is due to the complex history of the Coast Range Province, which is recorded by sedimentary, volcanic and plutonic rocks that were deposited on the continental shelves as well as in deep, narrow marine troughs (Dickinson, 1981; Oakeshott, 1966). Periodic volcanism, plutonic intrusion and orogeny (mountain building) influenced all of the sedimentary deposits found in the Coast Range Province and within the project area.

The Coast Range Province is a series of north-northwest trending mountain ranges and valleys bounded to the east by the Great Valley and to the west by the Pacific Ocean; the southern Coast Range is dominated by more east-west structural trends (Oakeshott, 1966). The tectonic regime and topography of California in the vicinity of the project has been highly influenced by the development of the San Andreas Fault System since 30 Ma (Atwater, 1970; Dickinson, 1981). Three fault zones dominate the structural pattern of the Coast Range Province, these include the Nacimiento-Sur, San Andreas and the South Fork Mountain faults. The Nacimiento-Sur and San Andreas faults separate the Franciscan Complex from granitic basement rock, and have influenced Cenozoic deposits (Atwater, 1970; Oakeshott, 1966).

6.1 Mapped Geology

Geologic mapping by Dibblee and Minch (2006) indicates that the project is underlain by Pliocene unnamed claystone (Tn), and Etchegoin Formation (Te); Pleistocene to Holocene landslide deposits (Qls); and Holocene alluvium (Qa). Jurassic to Cretaceous Franciscan Assemblage (fs) and serpentine (sp); Pliocene unnamed sandstone (Tns); Pleistocene older alluvium (Qoa); and Holocene stream channel deposits (Qg) are also mapped in the vicinity of the project. Of these additional units, however, only the Pleistocene older alluvium (Qoa) is anticipated to potentially be impacted by project-related ground disturbance.

The geographic distributions of the geologic units in the project site, as mapped by Dibblee and Minch (2006), are illustrated in Figure 3 and summarized by project component in Table 4.

6.1.1 Pliocene Etchegoin Formation (Te)

The Etchegoin Formation is a Pliocene to latest Miocene formation (Dibblee and Minch, 2006) that was first described by F.M Anderson in 1905 from exposures near Etchegoin Ranch located northeast of Coalinga in Fresno County, California (Anderson, 1905). It was originally referred to as the "Etchegoin Beds" and was divided into two informal members: the Etchegoin sand (lower two thirds of the beds) and San Joaquin clays (upper one third of the beds) (Anderson, 1905), which were later broken into the Jacalitos Formation (lower clay), Etchegoin Formation (middle sand) (Arnold and Anderson, 1908), and San Joaquin Formation (upper clay) (Woodring, 1934 [as reported in Geolex, 2017]). These designations have been revised, abandoned, and revived multiple times over the years (e.g., Barbat and Galloway, 1934; Wilmarth, 1936; Wilson, 1943; and Adegoke, 1969 [as reported in Geolex, 2017]). However, in 1973 the Jacalitos Formation was abandoned because it was determined to be neither lithologically nor paleontologically distinct from the Etchegoin Formation, and only the Etchegoin and San Joaquin formations were retained (Dibblee, 1973). Two formal members for the Etchegoin Formation are in current usage by the US Geological Survey (Geolex, 2017): the Tupman Shale and Carman Sandstone members of Barryman (1973).

The unit mapped as Etchegoin Formation by Dibblee and Minch (2006) is equivalent to the marine Purisima beds of Allen (1946) (as reported in Armstrong, 1980) located southwest of the San Andreas Fault in the Santa Cruz Mountains (Dibblee and Minch, 2006). Siltstones, sandstones, conglomerates, and tuffs of the Etchegoin Formation were deposited in a shallow marine environment, and are up to 3000 feet thick in the Tar Creek area (Armstrong, 1980) near Sargent Ranch, although they reach a maximum thickness of 5485 feet elsewhere in the San

Joaquin Valley (Loomis, 1990). Exposures of the Etchegoin Formation in the project area consist of weakly lithified tan, bedded, fine to medium grained sandstone (Dibblee and Minch, 2006).

The Etchegoin Formation has produced a diverse and significant Pliocene to Miocene fossil assemblage in California, including more than 3480 invertebrate, plant, and vertebrate specimens from over 800 localities. Invertebrates from this formation include crustaceans such as crabs and barnacles, starfish, sea urchins, corals, bryozoans (moss animals), brachiopods and a variety of bivalve (clam) and gastropod (snail) species from Contra Costa, Fresno, Monterey, Kings, Kern, and San Benito counties (UCMP, 2016). Terrestrial plant fossils have been recovered from this formation in Fresno County, including willow, sycamore, silk tassel, and ash (UCMP, 2016). Vertebrates from the Etchegoin Formation have been recovered from Fresno, Kings, Kern, and San Benito counties, and include the type specimens of the extinct horses *Neohipparion molle* and *Protohippus coalingensis*, and mastodon *Pliomastodon vexillarius* (UCMP, 2016). Other recovered vertebrate fossils include terrestrial taxa such as mastodons, gomphotheres, sloths, rhinoceros, saber-toothed cats, pronghorns, horses, camels, deer, peccaries, foxes, rabbits, rodents, and birds; and marine taxa including baleen whales, toothed-whales, otters, walruses, seals, dolphins, sharks, rays, and bony fish (Appendix B; UMCP, 2016; PBDB, 2017). Due to the abundance of fossil resources, the Etchegoin Formation is considered to have a high paleontological potential (PFYC 4).

6.1.2 Pliocene Unnamed Claystone (Tn)

The unnamed claystone unit is interpreted as being Pliocene to Pleistocene in age. It consists of a weakly lithified, gray, soft claystone that locally includes thin sandstone layers, which is interpreted as being deposited in a terrestrial valley and lacustrine environment (Dibblee and Minch, 2006), and may be equivalent to the non-marine Purisima beds of Allen (1946) (as reported in Armstrong, 1980). Unnamed geologic units generally are not responsive to searches in paleontological databases or scientific literature, because they lack formal designation. However, the reported age and lithology (Dibblee and Minch, 2006) are similar to those of other geologic units that have preserved fossil resources in central California, including horse, beaver, and camel fossils from the Purisima Formation (Boessenecker, 2011). Therefore, the possibility that the unnamed claystone may also contain fossils cannot be precluded, and the unit it is considered to have an unknown paleontological potential pending a field investigation (PFYC U).

6.1.3 Pleistocene Older Alluvium (Qoa)

While not mapped at the surface within the project area, Pleistocene-aged older alluvium (Qoa) is mapped in the vicinity of Phase 4, the processing plant, and access roads (Dibblee and Minch, 2006), and may therefore be encountered at shallow depths in areas mapped as younger Holocene alluvium. Sediments consist of poorly bedded, poorly lithified alluvial pebble gravel and sand (Dibblee and Minch, 2006; Armstrong, 1980). Alluvial deposits of Pleistocene age have proven to yield significant vertebrate fossil localities throughout California and Santa Clara County, including terrestrial mammals such as mammoth, horse, camel, bison, sloth, bear, deer, birds, rodents, and reptiles (PDBD, 2017; Appendix B). Paleontological resources occurrences in Pleistocene older alluvium are widely scattered, and the potential for fossil preservation varies based on the lithology (e.g., fine grained sand has a higher potential than coarse grained gravel). Therefore, this geologic unit is assigned a moderate paleontological sensitivity (PFYC 3).

6.1.4 Pleistocene to Holocene Landslide Deposits (Qls)

Landslide deposits (Qls) are formed by gravity-induced movement of sediment in areas with moderate to high terrain relief. They are formed from Quaternary or older sediments on unstable slopes and on older landslide deposits, and are generally unstratified. Lithologies of landslide deposits vary and are dependent upon the type of source rock. In general, landslides (and debris flows) are much less likely to contain well-preserved fossils than intact native sediments. Landslide sediments are often subjected to increased groundwater percolation, which tends to have a negative effect on the preservation of fossils, and gravitationally-induced movements of sediment can also destroy fossil remains through abrasion and breakage. Additionally, when the original stratigraphic position of the sediments is disturbed, there are varying degrees of information loss with the severity of changes to the slide mass. While paleontological resources may be found in these sediments, they have lost their native geologic context and as such are generally not considered scientifically significant (Jahns, 1954; Cooper and Eisentraut, 2002). Quaternary Landslide deposits have low potential for producing significant paleontological resources (PFYC 2).

6.1.5 Holocene Alluvium (Qa)

Quaternary alluvium (Qa) consists of surficial Holocene-age sediments that were laid down by fluvial processes (transported by water) in valley areas. Deposits are composed of poorly consolidated alluvial clay, sand, and gravel (Dibblee and Minch, 2006). Due to their age, these younger Quaternary deposits typically do not contain significant vertebrate fossils, at least in the uppermost layers, but they may well contain significant vertebrate fossil remains at depth in older deposits. Quaternary surficial sediments have a low paleontological potential (PFYC 2).

TABLE 4. MAPPED GEOLOGIC UNITS
(Dibblee and Minch, 2006)

Project Facility	Geologic Units
Mining Phase 1	Pliocene unnamed claystone (Tn) and Etchegoin Formation (Te)
Mining Phase 2	Pliocene unnamed claystone (Tn) and Etchegoin Formation (Te)
Mining Phase 3	Pliocene Etchegoin Formation (Te)
Mining Phase 4	Pliocene Etchegoin Formation (Te); Pleistocene older alluvium (Qoa)*****; Pleistocene to Holocene landslide deposits (Qls); and Holocene alluvium (Qa)
Conveyor Belt and Maintenance and Access Roads	Pliocene unnamed claystone (Tn) and Etchegoin Formation (Te); Pleistocene older alluvium (Qoa)*****; and Holocene alluvium (Qa)
Processing Plant and Related Facilities	Pliocene Etchegoin Formation (Te)*****; Pleistocene older alluvium (Qoa)*****; and Holocene alluvium (Qa)

* Not mapped at the surface in this area, but may be encountered at depth beneath the Holocene alluvium (Qa).

6.2 Paleontological Records Search Results

Paleo Solutions requested a paleontological search of records maintained by UCMP (Appendix B). The museum record search indicates that there are no previously recorded vertebrate fossil localities recorded within the project area or a five mile radius. The closest recorded vertebrate locality (UCMP V6561) is located approximately 5.5 miles northeast of the project area. The locality consists of an extinct Pleistocene peccary (*Platygonus*) tooth discovered during drilling for a well in San Filipe, Santa Clara County (Finger, 2016; UCMP, 2016).

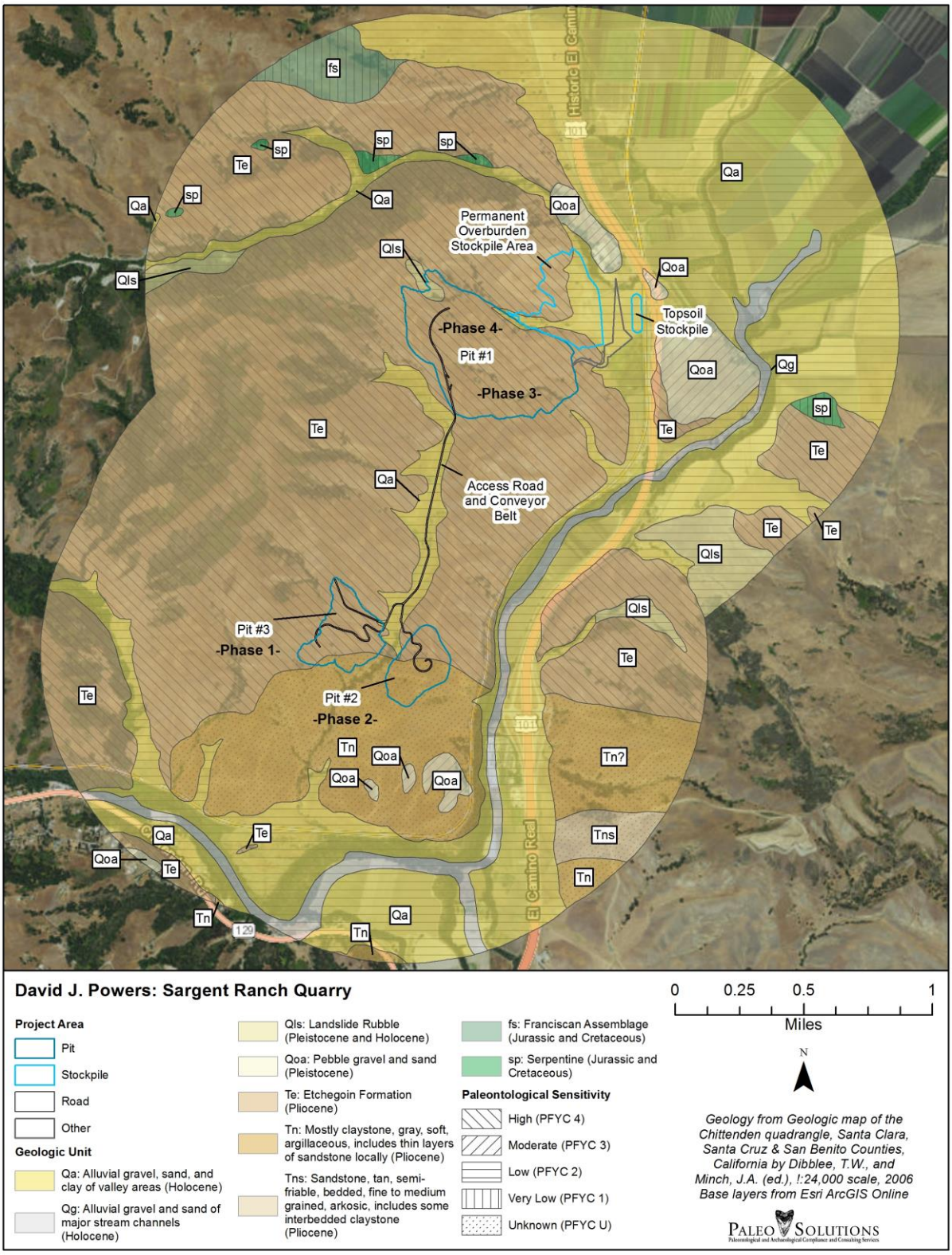

Figure 3. Project Geology Map.

7.0 RESOURCE ASSESSMENT

7.1 Sensitivity of Geological Units

According to the record search conducted by UCMP, no previously recorded fossil localities exist in the project area (Finger, 2016); however, numerous other vertebrate, invertebrate and plant fossils have been recorded from the Etchegoin Formation and other Pliocene- to Pleistocene-age sediments in surrounding counties (UCMP, 2016; PBDB, 2017). No fossils are recorded from within Holocene-age alluvium or Holocene- to Pleistocene-age landslide deposits.

Based on PFYC guidelines applied to the results of the literature review and records search completed for this study, the Pliocene Etchegoin Formation has a high paleontological potential (PFYC 4), the unnamed Pliocene claystone has an unknown potential (PFYC U), and Pleistocene-aged Quaternary older alluvium (if encountered subsurface) has a moderate paleontological potential (PFYC 3). Holocene-age alluvial deposits are generally less than 10,000 years old, and are considered to have a low paleontological potential (PFYC 2). Fossils that are discovered in landslide deposits and artificial fill will lack stratigraphic context, and so these units are also considered to have a low paleontological potential (PFYC 2).

7.2 Impacts to Paleontological Resources

Direct impacts to paleontological resources concern the physical destruction of fossils, usually by human-caused ground disturbance. Indirect impacts to paleontological resources typically concern the loss of resources to theft and vandalism resulting from increased public access to paleontologically sensitive areas. Cumulative impacts to paleontological resources concern the incremental loss of these nonrenewable resources to society as a whole.

Mining activities and construction excavation and grading for associated facilities has the potential to uncover significant fossil resources in areas mapped as Pliocene Etchegoin Formation and unnamed Pliocene claystone. Shallow excavations into Holocene alluvium, previously disturbed sediments, or artificial fill are unlikely to uncover significant fossil vertebrate remains. These deposits may, however, overlie older in-situ sedimentary deposits, including high paleontological potential Etchegoin Formation and moderate potential Pleistocene older alluvium. Therefore, grading and other earthmoving activities may potentially result in significant direct impacts to paleontological resources throughout the entirety of the project site.

The Project is considered to result in potentially significant direct impacts on paleontological resources due to the high, moderate, and unknown paleontological potential of the Etchegoin Formation, Pleistocene older alluvium, and unnamed claystone, combined with the large scale of excavation associated with the proposed mining operations at the Sargent Quarry. Mitigation measures that meet local and state requirements should therefore be in place prior to the initiation of this project. Full time monitoring would generally be implemented during excavations into the high to moderate sensitivity geologic units, however, this approach is not feasible due to the long term (30 years) and full time nature of this mining project. Below are recommendations that would partially mitigate the loss of paleontological resources exposed during mining activities and construction of associated facilities and infrastructure, however, the

project will still have the potential to result in significant and unavoidable direct impacts. There are no anticipated indirect or cumulative impacts.

- Retain a Qualified Paleontologist meeting Society of Vertebrate Paleontology standards (SVP, 2010) to oversee all paleontological mitigation.
- Prepare a paleontological resource mitigation plan (PRMP).
- Conduct worker environmental awareness trainings for construction and mining personnel.
- Implement procedures and recommendations for redirection of work should a paleontological resource be identified.
- Implement paleontological spot checking/part-time monitoring in areas of high to unknown paleontological sensitivity.
- Conduct paleontological field surveys prior to commencement of each mining phase.
- Recover, prepare, and curate any significant paleontological resources.
- Prepare annual paleontological mitigation reports summarizing the results of the mitigation program implemented for the project.

8.0 RECOMMENDATIONS

Due to the presence of geologic units with high to unknown paleontological potential within the project area, mitigation of potential adverse impacts resulting from mining and construction activities is recommended.

1. Prior to the start of construction and mining activities, a paleontological resources monitoring plan (PRMP) should be prepared and implemented by a Qualified Paleontologist. The PRMP should provide guidance for paleontological field surveys, fossil sampling, spot checking/monitoring, reporting, and on-call response to fossil discoveries that occur within the next 30 years of mining operations. The plan should also include a curation agreement with UCMP or other accredited repository approved by County of Santa Clara.

2. A Qualified Paleontologist should provide a worker training program to inform mining personnel of the possibility for fossil discoveries, and will instruct personnel to immediately inform their supervisor if any bones or other substantial fossils remains are unearthed at the project site and a paleontologist is not present. In such a case, workers should immediately cease all activity within a 50 foot radius of the discovery site until a Qualified Paleontologist can be mobilized to the project site to examine and evaluate the find. If necessary, appropriate salvage measures will be developed in consultation with the Project Proponent and County of Santa Clara. Work may not resume in the discovery area until it has been authorized by a Qualified Paleontologist. The training should be provided to new personnel prior to beginning work on the site and such trainings should be coordinated with the site manager and should coincide with spot checking/sampling visits. Verification of training will be provided as an appendix to the annual report submitted to the County of Santa Clara.

3. The Qualified Paleontologist should conduct periodic spot checks and/or part-time monitoring of mining activities that impact native Etchegoin Formation, unnamed claystone, and Pleistocene older alluvium (if encountered subsurface) (see Figure 3) to check for the presence of any recently uncovered macrofossils, or layers that should be sampled for microfossils. The frequency and timing of the spot checks/part-time monitoring should be outlined in the PRMP and coordinated with the site manager based on excavation activities and locations. The frequency of spot checking/part-time monitoring efforts in a given portion of the quarry property may be reduced, at the discretion of the Qualified Paleontologist in consultation with the County of Santa Clara and Project Proponent, if it is determined that only previously disturbed, imported, or Holocene-aged alluvial sediments are being impacted, or if sediments are deemed to be non-conducive to fossil preservation.

4. In addition to spot checking/part-time monitoring, a paleontological survey should be conducted in Phases 1-4 of the Project area prior to the expansion of mining activities into those areas to allow for the in situ documentation and collection of any surficial fossils. Following each survey, a paleontological survey memorandum should be prepared and submitted to the Project Proponent and appended to the annual paleontological mitigation report submitted to the County of Santa Clara.

5. Paleontological spot checking/part-time monitoring and sampling should be limited to exposures of Etchegoin Formation, unnamed claystone, and Pleistocene alluvium. Paleontological mitigation is not recommended in artificial fill or imported material (non-native sediments), previously disturbed sediments, landslide deposits, or Holocene-aged sediments.

6. All fossils and bulk matrix samples collected at the project site will be removed to a secure paleontological laboratory for preparation to the point of identification and curation. All data, including the results of the analysis and research on the fossil collection, should be compiled along with the fossil specimen inventory and detailed paleontological locality forms, maps and photos for inclusion in the annual report.

7. A paleontological mitigation report will be delivered to the Project Proponent, County of Santa Clara, and, if fossils are discovered, the University of California Museum of Paleontology (or other appropriate fossil repository) annually. The report shall include dates of field work, results of spot checking/part-time monitoring, survey and sampling, fossil analyses, significance evaluation, conclusions and future recommendations, locality forms, and an itemized list of specimens. Detailed survey reports and verification of new mining personnel paleontology trainings will be included as appendices.

REFERENCES

Adegoke, O.S. 1969. Stratigraphy and paleontology of the marine Neogene formations of the Coalinga region, California: University of California Publications in Geological Sciences, v. 80, 269 p.

Allen, J.E. 1946. Geology of the San Juan Bautista quadrangle, California. California Division of Mines Bulletin 133, 112 p.

Anderson, F.M. 1905. A stratigraphic study in the Mount Diablo Range of California. California Academy of Sciences Proceedings, 3rd series, v. 2, no. 2, p. 155-249.

Armstrong, C.F. 1980. Environmental Geology Analysis of the Tar Creek South Study Area, Santa Clara County, California. California Department of Conservation and Division of Mines and Geology. DMG Open-File Report 80-11.

Arnold, R.A. and R. Anderson. 1908. Preliminary Report on the Coalinga Oil District, Fresno and Kings Counties, California. US Geological Survey, Bulletin 357, 142 p.

Atwater, T. 1970. Implications of plate tectonics for the Cenozoic tectonic evolution of western North America. Geological Society of America Bulletin, v. 81, p. 3513-3536.

Barbat, W.F. and J. Galloway. 1934. San Joaquin Clay, California. American Association of Petroleum Geologists Bulletin, v 18, no. 4, p. 476-499.

Berryman, W.M. 1973. Lithologic characteristics of Pliocene rocks cored at Elk Hills, Kern County, California, IN Contributions to economic geology: U.S. Geological Survey Bulletin, 1332-D, p. D1-D56.

Boessenecker, R.W. 2011. Comparative Taphonomy and Taphofacies Analysis of Marine Vertebrates in the Neogene Purisima Formation, Central California. Montana State University, Master of Science Thesis. May 2011.

Bureau of Land Management (BLM). 2007. Potential Fossil Yield Classification (PFYC) System for Paleontological Resources on Public Lands, Instruction Memorandum No. 2008-009. Department of the Interior, Washington, D.C.

Bureau of Land Management (BLM). 2016. Potential Fossil Yield Classification system: BLM Instruction Memorandum No. 2016-124 (PFYC revised from USFS, 2008).

Bureau of Land Management (BLM). 2008. Assessment and Mitigation of Potential Impacts to Paleontological Resources: BLM Instruction Memorandum No. 2009-011.

Cooper, J. D., and Eisentraut, P.J., 2002, Orange County Archaeo/Paleo Curation Draft Guidelines, Procedures and Policies - Draft Document. Prepared for County of Orange, Board of Supervisors.

County of Santa Clara. 1994. County of Santa Clara General Plan. Available online: https://www.sccgov.org/sites/dpd/PlansOrdinances/GP/Pages/GP.aspx

Dibblee T.W. Jr. 1973. Stratigraphy of the Southern Coast Ranges near the San Andreas Fault from Cholame to Maricopa, California. Geological Survey Professional Paper 764.

Dibblee, T.W. Jr. and J.A. Minch. 2006. Geologic map of the Chittenden quadrangle, Santa Clara, Santa Clara, Santa Cruz & San Benito Counties, California. Dibblee Foundation Map DF-228. Scale 1:24,000.

Dickinson, W.R. 1981. Plate tectonics and the continental margin of California. IN Ernest, W.G., ed. The geotectonic development of California. Rubey, v. 1, Prentice-Hall, New Jersey.

Finger, K. 2016. "Re: Paleontological record search for Sargent Ranch Quarry." Email message to Barbara Webster of Paleo Solutions dated 17 November 2016.

Geolex. 2017. Online search of the Geologic Map Database. Accessed January 217. Available online at: https://ngmdb.usgs.gov/Geolex/UnitRefs/EtchegoinRefs_5299.html

Jahns, R.H., 1954. Geology of Southern California. State of California, Department of Natural Resources, Bulletin 170, Volume 1.

Loomis, K.B. 1990. Depositional Environments and Sedimentary History of the Etchegoin Group, West-Central San Joaquin Valley, California. Structure, Stratigraphy and Hydrocarbon Occurrences of the San Joaquin Basin, California, pp. 231-246.

Murphey, P.C. and D. Daitch. 2007. *Paleontological overview of oil shale and tar sands areas in Colorado, Utah and Wyoming*: U.S. Department of Energy, Argonne National Laboratory Report Prepared for the U.S. Department of Interior Bureau of Land Management, 468 p. and 6 maps (scale 1:500,000).

Oakeshott, G.B. 1966. Geology of the California Coastal Ranges. IN Part 1: Mineral Resources. Report of the U.S. Geological Survey in Collaboration with the California Division of Mines and Geology and the U.S. Bureau of Mines, p. 34-40.

PaleoBiology Database (PBDB). 2016. Online search of the PaleoBiology Database, accessed January 2017.

Society of Vertebrate Paleontologists (SVP). 2010. Standard Procedures for the Assessment and Mitigation of Adverse Impacts to Paleontological Resources. 11 p.

University of California Museum of Paleontology (UCMP). 2016. Online search of the University of California Museum of Paleontology database, accessed December 2016.

Wallace, R.E. 1990. The San Andreas fault system, California. U.S. Geological Survey Professional Paper, no. 1515.

Wilmarth, M.G., 1936, [Selected Geologic Names Committee remarks (ca. 1910-1937) on Cenozoic rocks and sediment of the western U.S.], IN Wilmarth, M.G., 1938, Lexicon of geologic names of the United States (including Alaska): U.S. Geological Survey Bulletin, 896, pts. 1-2, 2396 p.

Wilson, I.F., 1943, Geology of the San Benito quadrangle, California. California Journal of Mines and Geology, v. 39, no. 2, p. 183-270.

Woodring, W.P. 1934. Geologic map and structure sections of Kettleman Hills, southern California. US Geological Survey, unpublished report. Map scale 1:31,680.

APPENDIX A
MUSEUM RECORD SEARCH RESULTS

Gmail by Google

Courtney Richards <crichards@paleosolutions.com>

Paleontological records search for Sargent Ranch Quarry

Barbara Webster <bwebster@paleosolutions.com> Thu, Nov 17, 2016 at 3:08 PM
To: Courtney Richards <crichards@paleosolutions.com>, Geraldine Aron <geraldine@paleosolutions.com>

---------- Forwarded message ----------
From: **Kenneth Finger** <kfinger@berkeley.edu>
Date: Thu, Nov 17, 2016 at 1:50 PM
Subject: Re: Paleontological records search for Sargent Ranch Quarry
To: Barbara Webster <bwebster@paleosolutions.com>

Hi Barbara,

The UCMP database search did not fiind any vertebrate localities within 5 miles of the project site. The closest is V6561 in San Felipe, ~5.5 to the NE, which yielded the tooth of a late Pleistocene peccary.

A $250 invoice for this service will be forthcoming.

Ken

Kenneth L. Finger, PhD
Senior Museum Scientist
Museum of Paleontology
University of Califomia, Berkeley
UCMP

[Quoted text hidden]
[Quoted text hidden]
<RecordSearchMap_SargentRanch.pdf>

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Barbara Webster, MS GIS Specialist & Archaeologist, Paleo Solutions

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Certifications: DBE, WBE, UDBE, SBE, WOSB, EDWOSB

UCMP **image.tiff**
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APPENDIX B
ONLINE RECORD SEARCH RESULTS

ONLINE RECORDS SEARCH RESULTS SUMMARY: ETCHEGOIN FORMATION

Locality Number	Taxon	Common Name	Element	County	Source
-2951	†*Pliohippus*	horse	tooth	Fresno County	UCMP, 2016
-2950	†*Hipparionini*	horse	postcranial fragment	Fresno County	
-2387	†*Pliohippus*	horse	bone fragments	Fresno County	
	†*Pliohippus coalingensis*	horse	tooth		
-2386	†*Pliohippus*	horse	tooth	Fresno County	
-2126	†*Hipparion*	horse	molar	Fresno County	
-2090	†*Pliohippus*	horse	molar	Fresno County	
-2078	†*Pliohippus*	horse	tooth	Fresno County	
-2076	†*Neohipparion molle**	horse	molar	Fresno County	
-2074	†Machairodontidae	saber-toothed cat	dentary fragment	Fresno County	
	Camelidae	camel	molar		
	Cervidae	deer	astragalus		
	†*Psudaelurus*	prehistoric cat	dentary fragment		
	†*Pliohippus*	horse	teeth		
	†*Pliohippus*	horse	tooth		
-2073	†*Protohippus coalingensis**	horse	premolar	Fresno County	
V2405	†*Protohippus*	horse	tooth	Kings County	
V3520	†*Castor californicus*	beaver	teeth	Kings County	
	†*Castor californicus*	beaver	teeth		
	Stoasodon	eagle ray	teeth		
	Osteichthyes	bony fish	otoliths, dermal ossicles		
	†*Mimomys primus*	vole	dentary with molars		
	†*Lutravus*	otter	not reported		
	†*Enhydriodon lluecai*	otter	premolar		
	Odocoileus	deer	not reported		
	Tayassuidae	peccary	not reported		
	Tayassuidae	peccary	not reported		
	Pilosa	anteater or sloth	not reported		

Locality Number	Taxon	Common Name	Element	County	Source
	Pinnipedia	pinniped	not reported		
	†*Equus simplicidens*	horse	not reported		
	†Mammutidae	mastodon	tooth		
	Ruminantia	ruminant	horn core		
	†Mammutidae	mastodon	teeth		
	†Mammutidae	mastodon	tooth		
	†Mammutidae	mastodon	tooth		
	Tayassuidae	peccary	premolar		
	Tayassuidae	peccary	molar		
	Tayassuidae	peccary	tooth fragments		
	Cervidae	deer	molar		
	Cervidae	deer	molar		
	†*Enhydriodon*	otter	premolar		
	Vulpes	fox	molar		
	†*Lutravus*	otter	molar		
	Odocoileus	deer	molar		
	Tayassuidae	peccary	tooth fragment		
	Carnivora	carnivore	not reported		
	†*Castor californicus*	beaver	teeth		
	Chondrichthyes	shark	teeth		
	†*Pliopatomys*	muskrat	dentary with molars		
	Leporidae	rabbit	dentary with premolars and molars		
	Leporidae	rabbit	dentary with premolars		
	Eutheria	placental mammal	teeth		
	Leporidae	rabbit	calcaneum		
	Leporidae	rabbit	calcaneum		
	Leporidae	rabbit	calcaneum		
	Leporidae	rabbit	innominate fragment		
	Eutheria	placental mammal	metapodial, phalanx		

Locality Number	Taxon	Common Name	Element	County	Source
	Gliridae	dormouse	incisor		
	Leporidae	rabbit	teeth		
	Leporidae	rabbit	teeth		
	†*Castor californicus*	beaver	postcranial bones		
	†*Castor californicus*	beaver	teeth		
	†*Castor californicus*	beaver	teeth		
	†*Pliohippus*	horse	dentary with premolar		
	†*Pliohippus*	horse	tooth fragments		
	†*Hipparionini*	horse	metapodial, mid phalanx		
	Artiodactyla	even-toed ungulate	horn core fragments		
	Artiodactyla	even-toed ungulate	bone fragments		
	Artiodactyla	even-toed ungulate	bone fragments		
	Eutheria	placental mammal	tooth fragments		
	Fissipeda	carnivore	dentary fragments		
	Fissipeda	carnivore	tooth fragments		
	Cetacea	whale	atlas		
	Cetacea	whale	petrosals		
	Cetacea	whale	petrosals		
	Carcharodon tembloris	Lamniformes	tooth		
	Carcharodon riversi	Lamniformes	teeth		
	Carcharodon rectus	Lamniformes	tooth		
	Carcharodon	Lamniformes	tooth		
	Carcharias	sand tiger shark	tooth		
	Carcharodon	white shark	tooth		
	†*Isurus clavatus*	mako shark	teeth		
	Hexanchus	sixgill shark	teeth		
	Hexanchus	sixgill shark	teeth		
	Lamna	mackerel shark	tooth		
	Hexanchus	sixgill shark	tooth		

Locality Number	Taxon	Common Name	Element	County	Source
	†*Carcharhinus antiquus*	shark	tooth		
	Proboscidea	elephant	tusk fragment		
	†*Pliomastodon vexillarius**	mastodon	dentary		
	†*Pliomastodon vexillarius*	mastodon	patella, astragalus		
	Cervidae	deer	phalanx		
	†*Castor Californicus*	beaver	molar		
	†*Castor Californicus*	beaver	molar		
	†*Castor Californicus*	beaver	molar		
	†*Castor Californicus*	beaver	molar		
	†*Castor Californicus*	beaver	molar		
	†*Castor Californicus*	beaver	molar		
	†*Castor Californicus*	beaver	molar		
	†*Castor Californicus*	beaver	molar		
	†*Castor Californicus*	beaver	molar		
	†*Castor Californicus*	beaver	molar		
	†*Castor Californicus*	beaver	molar		
	†*Castor Californicus*	beaver	molar		
	†*Castor Californicus*	beaver	molar		
	†*Castor Californicus*	beaver	molar		
	†*Castor Californicus*	beaver	molar		
	†*Castor Californicus*	beaver	premolar		
	†*Castor Californicus*	beaver	premolar		
	†*Castor Californicus*	beaver	premolar		
	†*Castor Californicus*	beaver	molar		
	†*Castor Californicus*	beaver	molar		
	†*Castor Californicus*	beaver	molar		
	†*Castor Californicus*	beaver	molar		
	†*Castor Californicus*	beaver	molar		
	†*Castor Californicus*	beaver	molar		
	†*Castor Californicus*	beaver	molar		

Locality Number	Taxon	Common Name	Element	County	Source
	†*Castor Californicus*	beaver	molar		
	†*Castor Californicus*	beaver	molar		
	†*Castor Californicus*	beaver	molar		
	†*Castor Californicus*	beaver	molar		
	†*Castor Californicus*	beaver	molar		
	†*Parapontoporia sternbergi*	river dolphin	periotic		
	†*Parapontoporia sternbergi*	river dolphin	periotic fragment		
	†*Parapontoporia sternbergi*	river dolphin	periotic		
	Delphinidae	oceanic dolphin	periotic fragment		
	Odontoceti	toothed whale	periotic fragment		
V3634	†*Enhydriodon lluecai*	otter	dentary fragment with molar	Kings County	
V3930	†*Pliohippus*	horse	tooth	Fresno County	
	†*Pliohippus*	horse	tooth		
V4105	†*Mammut*	mastodon	femur	Fresno County	
V4721	†*Pliohippus*	horse	tooth fragment	Fresno County	
	Antilocapridae	pronhorn	metapodial fragment		
V4722	†*Neohipparion molle*	horse	molar	Fresno County	
V4723	†*Pliohippus*	horse	tooth	Fresno County	
V4724	†*Pliohippus*	horse	tooth	Fresno County	
V4725	†*Neohipparion*	horse	metatarsal	Fresno County	
V5335	Camelidae	camel	tooth	Fresno County	
	†*Pliohippus*	horse	fossette		
	Proboscidea	elephant	tooth		
V5339	Antilocaprinae	pronghorn	molar	Fresno County	
V5914	†*Teleoceras*	rhinoceros	lumbar vertebra	San Benito County	
V5927	†*Pliohippus*	horse	tooth	Kings County	
V6329	Cetacea	whale	bone fragments	Kings County	
	†*Gomphotherium*	gomphothere	tooth fragment		
V65462	Pisces?	fish	inflated skull bone fragment	Kings County	

Locality Number	Taxon	Common Name	Element	County	Source
	†*Pliohippus*	horse	dentary fragment		
V66143	†*Pliohippus*	horse	molar	Kings County	
V66151	†Cetotheriidae	baleen whale	skull	Kings County	
V6647	Osteichthyes	bony fish	vertebra	Kings County	
V67105	†*Pliohippus*	horse	postcranial fragment	Fresno County	
V6842	†*Balaenula*	baleen whale	skull	Kings County	
	†*Balaenula*	baleen whale	skull		
V71130	Alcidae	auk	proximal ulna	Monterey County	
V74156	Odobenidae	walrus	proximal femur	San Benito County	
	Odobenidae	walrus	proximal tibia		
V74162	†*Pliopedia pacifica*	walrus	humerus	Kings County	
V93185	Mammalia	mammal	thoracic vertebra	Kings County	
V2079	Proboscidea	elephant	not reported	Fresno County	PBDB, 2017
	Tayassuidae	peccary	not reported		
	Cervidae	deer	not reported		
V2119	Proboscidea	elephant	not reported	Fresno County	
	Tayassuidae	peccary	not reported		
	Cervidae	deer	not reported		
V2370	Camelidae	camel	not reported	Fresno County	
	Cervidae	deer	not reported		
V2374	Cervidae	deer	not reported	Fresno County	
not reported	†*Cosomys primus*	vole	not reported	Kern County	
Locality 300	Equinae	horse	ungual phalanx	Kings County	
Locality 318	Ruminantia	ruminant	not reported	Kings County	
Locality 319	Equini	horse	not reported	Kings County	
Locality 329	Ruminantia	ruminant	not reported	Kings County	
USGS M1220	†*Pliopedia pacifica*	walrus	not reported	Kings County	
	cf. *Callorhinus* sp.	fur seal	not reported		

† denotes extinct taxon; * denotes type specimen

ONLINE RECORDS SEARCH RESULTS SUMMARY: PLEISTOCENE OLDER ALLUVIUM IN SANTA CLARA COUNTY

Locality Number	Taxon	Common Name	Element	County	Source
V6561	†*Platygonus*	peccary	tooth	Santa Clara County	Finger, 2016; UCMP, 2016
V99597	†*Mammuthus columbi*	Columbian mammoth	not reported	Santa Clara County	PBDB, 2017
499891	*Equus* sp.	horse			
	†*Paramylodon harlani*	Harlan's ground sloth			
	Proboscidea	elephant			
	†*Camelops* sp.	camel			
	Bison sp.	bison			
	†*Capromeryx* sp.	pronghorn			
V91128	†*Mammuthus* sp.	mammoth			
V90003	*Bison* sp.	bison			
USGS M1203	*Equus* sp.	horse			
USGS M1227	Geomyidae	pocket gopher			
	Dipodomys cf. *heermanni*	kangaroo rat			
	Equus sp.	horse			
	†*Paramylodon harlani*	Harlan's ground sloth			
	†*Mammuthus columbi*	Columbian mammoth			
	†*Camelops* sp.	camel			
	Bison sp.	bison			
	Odocoileus sp.	deer			
USGS M1218	*Thomomys* sp.	pocket gopher			
	Equus sp.	horse			
	Ursidae	bear			
	†*Camelops* sp.	camel			

	Bison sp.	bison			
USGS M1001	Rodentia	rodent			
	Reithrodontomys sp.	harvest mouse			
	Sciuridae	squirrel			
	Leporidae	rabbit			
	Artiodactyla	even-toed ungulate			
	Neotoma sp.	packrat			
	Reptilia	reptile			
USGS M1202	Felidae	cat			
V4916	*Bison* sp.	bison			

† denotes extinct taxon

September 21, 2017

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RE: Addendum to the Paleontological Technical Report for the Sargent Quarry Project, Unincorporated Santa Clara County, California

1.0 INTRODUCTION

This addendum to the Paleontological Technical Report for the Sargent Quarry Project (project) evaluates the potential impacts on paleontological resources associated with the expansion of the project footprint to include geotechnical contingency setback areas and a wetland mitigation area (see Figure 1). This work was completed by Paleo Solutions, Inc. (Paleo Solutions) under contract to David J. Powers & Associates, Inc. (DJP&A). All work was conducted in compliance with the California Environmental Quality Act (CEQA), State of California Public Resources Code, and Santa Clara County guidelines.

1.1 Project Description

This section describes additions to the project footprint and related ground-disturbing activities. Only modifications from the original project description are discussed here; for a full project description, please refer to the original technical report (Richards and Aron, 2017).

1.1.1 Geotechnical Contingency Setback Areas

The proposed limits of quarry mining consist of an area of 318 acres of excavation. Cut slopes are sloped at a 2:1 angle with 10-foot benches every 30 feet of slope angle. Finished and reclaimed slopes will be back filled to an angle of 3:1.

However, since the quarry is new and geotechnical information regarding the proposed cut slopes cannot be based on direct observations of existing similar cut slopes, it is necessary to provide buffer areas around portions of the defined quarry excavation area in case of cut slope instability. This "geotechnical setback areas" provide regions within the approved project footprint that are not proposed for mining but may be used if slopes in certain portions of the project need to be laid back at a more gradual angle to achieve stability. Reasons for slope instability may include landslides, clay lenses, perched water tables or any other reasons as directed by a geotechnical engineer from time to time. The total acreage included in these areas are 120 acres.

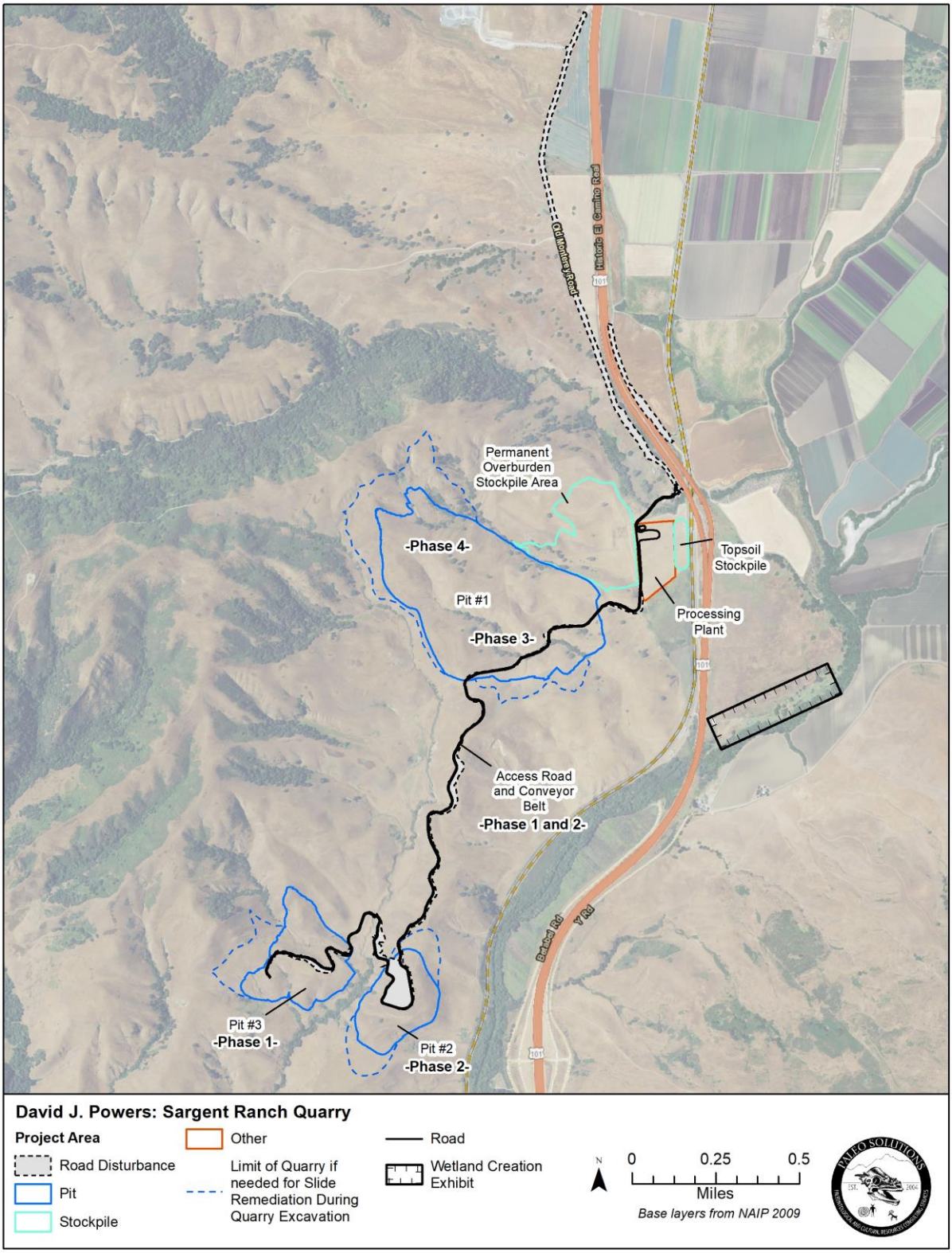

Figure 1. Project Area Overview Map.

1.1.2 Wetland Mitigation Area

The applicant is looking at mitigation that will be required by regulatory/jurisdictional agencies for project wetlands/waters impacts. An eight to nine acre area for wetland mitigation has been identified on the east side of Highway 101. The project proposes to regrade the area and plant wetland-appropriate species (anticipated to require up to 2 to 3 feet of ground disturbance).

2.0 METHODS

The methodology used to analyze impacts related to the geotechnical contingency setback areas and wetland mitigation area is the same as the methodology described and used in the original technical report. The additional areas fall within the paleontological record search buffer used by the University of California Museum of Paleontology at Berkeley (Finger, 2016), therefore, a supplemental record search was not required.

3.0 GEOLOGY AND PALEONTOLOGY

The previously analyzed Sargent Quarry footprint has been expanded by this addendum to include the geotechnical contingency setback areas and a wetland mitigation area. The geotechnical contingency setback areas are underlain by high paleontological potential (Potential Fossil Yield Classification [PFYC] 4) Pliocene Etchegoin Formation (Te), unknown potential (PFYC U) Pliocene unnamed claystone (Tn), and a minor amount of low potential (PFYC 2) Pleistocene to Holocene landslide deposits (Qls). The wetland mitigation area is underlain by high paleontological potential (PFYC 4) Pliocene Etchegoin Formation (Te), moderate potential (PFYC 3) Pleistocene older alluvium (Qoa), and low potential (PFYC 2) Holocene alluvium (Qa) and stream channel deposits (Qg) (Dibblee and Minch, 2006; Figure 2). The Holocene stream channel deposit (Qg) is the only geologic unit not previously analyzed in the technical report; and no additional paleontological resources were identified from the expanded footprint.

The Holocene stream channel deposits (Qg) consist of alluvial gravel and sand deposited by major streams (Dibblee and Minch, 2006). Due to their young age, these deposits typically do not contain significant vertebrate fossils, at least in the uppermost layers, but they may well contain significant vertebrate fossil remains at depth in older deposits. Holocene stream channel deposits have a low paleontological potential (PFYC 2).

Please refer to the original technical report for a full discussion of the remainder of the geologic units and their paleontological context.

TABLE 1. MAPPED GEOLOGIC UNITS
(Dibblee and Minch, 2006)

Project Facility	Geologic Units
Geotechnical Contingency Setback Areas - Mining Phase 1	Pliocene unnamed claystone (Tn) and Etchegoin Formation (Te)
Geotechnical Contingency Setback Areas - Mining Phase 2	Pliocene unnamed claystone (Tn) and Etchegoin Formation (Te)
Geotechnical Contingency Setback Areas - Mining Phase 3	Pliocene Etchegoin Formation (Te)
Geotechnical Contingency Setback Areas - Mining Phase 4	Pliocene Etchegoin Formation (Te) and Pleistocene to Holocene landslide deposits (Qls)
Wetland mitigation area	Pliocene Etchegoin Formation (Te), Pleistocene older alluvium (Qoa), and Holocene alluvium (Qa) and stream channel deposits (Qg)

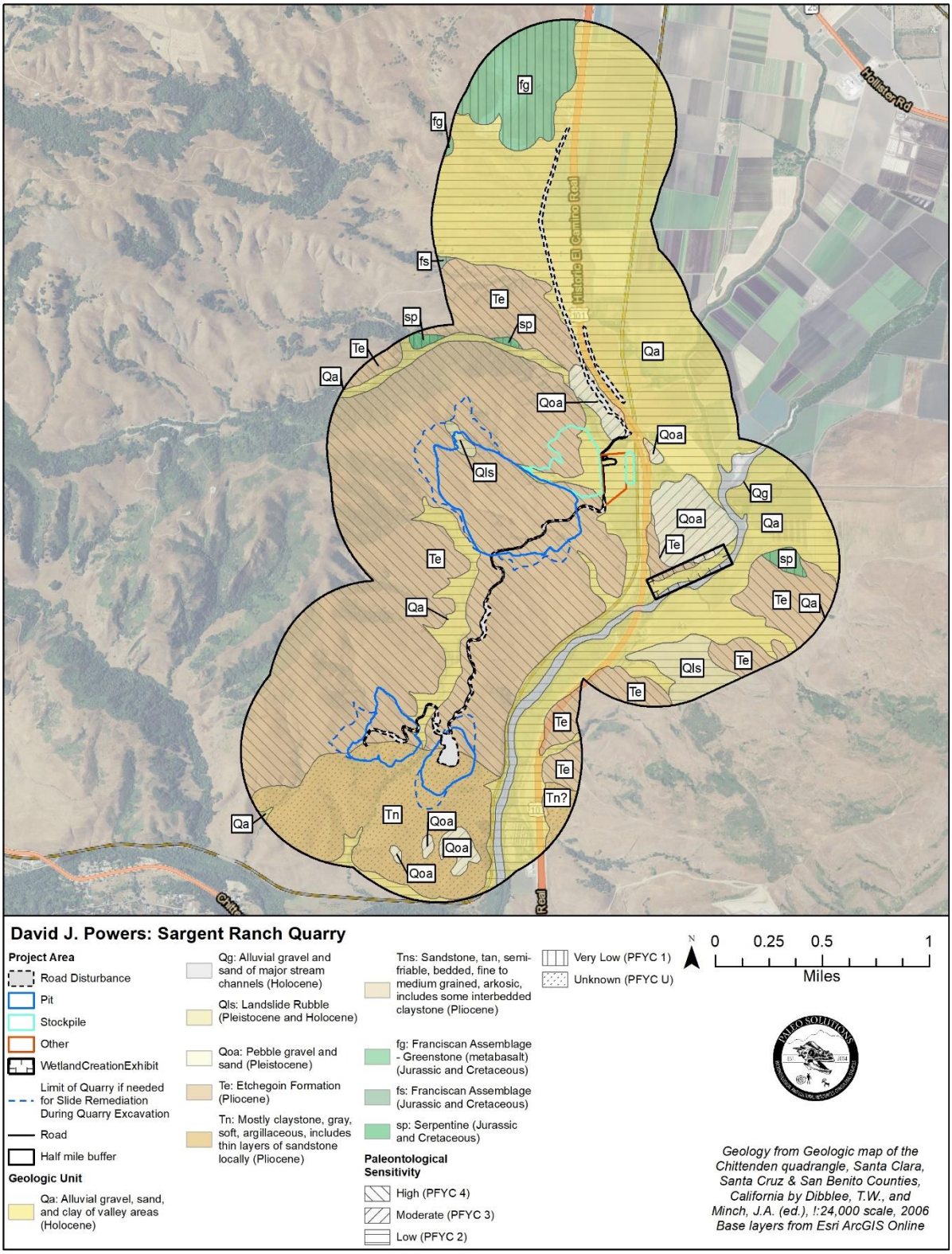

Figure 2. Project Area Geology Map.

4.0 IMPACTS TO PALEONTOLOGICAL RESOURCES

No additional paleontologically sensitive geologic units or known paleontological resources are present within the geotechnical contingency setback areas and wetland mitigation area; therefore, no new impacts on paleontological resources were identified for the expanded Sargent Quarry Project footprint. There is one geologic unit with high paleontological potential and one with unknown potential mapped within the geotechnical contingency setback areas: the Pliocene Etchegoin Formation and unnamed claystone, respectively. There is one geologic unit with high paleontological potential and one with moderate potential mapped within the wetland mitigation area: the Pliocene Etchegoin Formation and Pleistocene older alluvium, respectively. If ground disturbance in paleontologically sensitive native sediments is required the impacts on paleontological resources would be the same as previously identified in the original technical report.

Full time monitoring would generally be implemented during excavations into the high to moderate sensitivity geologic units, however, this approach is not feasible due to the long term (30 years) and full time nature of this mining project. The recommendations provided in the original technical report would partially mitigate the loss of paleontological resources exposed during ground disturbing activities. However, the project will still have the potential to result in significant and unavoidable direct impacts. There are no anticipated indirect or cumulative impacts.

5.0 RECOMMENDATIONS

Due to the presence of geologic units with high, moderate, and unknown paleontological potential within the geotechnical contingency setback areas and wetland mitigation area, mitigation of potential adverse impacts resulting from ground disturbing activities is recommended, as described in Section 8 of the original technical report. However, these recommendations should be expanded to include part-time monitoring of grading in the wetland mitigation area that impacts native Etchegoin Formation or Pleistocene older alluvium, either at the surface or at depth beneath the Holocene alluvium or stream channel deposits.

6.0 REFERENCES

Dibblee, T.W. Jr. and J.A. Minch. 2006. Geologic map of the Chittenden quadrangle, Santa Clara, Santa Clara, Santa Cruz & San Benito Counties, California. Dibblee Foundation Map DF-228. Scale 1:24,000.

Finger, K. 2016. "Re: Paleontological record search for Sargent Ranch Quarry." Email message to Barbara Webster of Paleo Solutions dated 17 November 2016.

Richards, C. and G. Aron. 2017. Paleontological Technical Report: Sargent Quarry Project, Unincorporated Santa Clara County, California. Report prepared by Paleo Solutions, Inc. for David J. Powers & Associates, Inc., dated January 2017.