PRELIMINARY

GEOTECHNICAL EXPLORATION

PROPOSED COMMERCIAL BUILDING AND RESTAURANT

PM 249-27-28, LOT1, APN 3217-021-023

SIERRA HIGHWAY AT CROWN VALLEY ROAD

ACTON, CALIFORNIA

M14-201 3-22-14

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INTRODUCTION

This report presents the results of our geotechnical engineering exploration conducted at the subject site on Sierra Highway in Acton, California. Provided herein is a description and an evaluation of the soil and geologic materials and a discussion of the subsurface conditions at the site. This information provides the basis for our geotechnical engineering recommendations presented herein for construction of a commercial building and a restaurant.

This report is provided to the client with the understanding that it will be submitted to the appropriate governmental authorities that control the issuance of necessary permits. Provided are recommendations for site preparation, foundation design, surface drainage control, floor slabs design and pavement sections.

Objective

The primary objective of this exploration has been to provide our best opinions and advice on the geotechnical issues that pertain to the stability of the site, to evaluate the geotechnical feasibility of the proposed construction, and to provide geotechnical recommendations considered to be applicable to the proposed development.

Location

The property is located on the south side of Sierra Highway just west of Crown Valley Road. Access from the Antelope Valley Freeway (SR14) is via the Crown Valley exit. Proceed north on Crown Valley then west on Sierra Highway. The property is the first vacant lot on the south side of the street.

SCOPE

The scope of our exploration involved the completion of the following:

1. Review of available general geologic data, including those referenced below,
2. Research to review previous reports prepared for nearby properties.
3. Review of preliminary topographic maps, aerial photographs and site development plans.
4. Geologic mapping of earth materials at the site and in the surrounding area.
5. Excavation and detailed logging of four hollow stem borings and four 24 -inch auger borings used for percolation testing.
6. Sampling of representative earth materials.
7. Laboratory testing to evaluate representative geotechnical properties of the soil and bedrock encountered at the site.
8. Geotechnical analysis of field and laboratory data.
9. Preparation of a geotechnical map and various graphs presenting laboratory data.
10. Presentation of our procedures, findings and recommendations.

PROPOSED DEVELOPMENT

The findings and recommendations contained in this report are based on

preliminary plans provide by the architect, Robert Friedman. It is proposed to develop a small retail center consisting of a 6000 square foot retail building and a 3000 square foot restaurant. A 1600 square foot storage building is also proposed at the southwest corner of the site.

Although the site is flat-lying, some grading will be necessary at the site preparation stages of the development. Earth materials will need to be imported to raise the southerly portions of the lot. Some materials have been stockpile on the lot in the past. Cut or fill slopes will be minor (generally less than 5 feet high) and will be constructed at slope ratios of 2:1 or flatter.

No retaining walls are proposed at this time. Should they be necessary the retaining walls can be constructed using conventional foundations.

Foundations are expected to be conventional in design. Anticipated foundation bearing pressures for the residences are not expected to exceed 1500 psf for continuous footings and 2500 psf for isolated pad footings.

Building locations are considered preliminary at this point in the project development. Recommendations for commercial foundation design are considered preliminary in nature and are intended to aid the design professionals. Review of the buildings final design is recommended once plans become available.

Should changes in the structural design or location of the buildings as described herein be made, the conclusions and recommendations contained in this report may not be valid unless the changes are reviewed and approved in writing by a representative of this firm.

SITE CONDITIONS

The property is geographically located in the eastern Soledad Canyon area of Southern California. The region consists of broad alluvial fans with drainage courses tributary to the Santa Clara River. These alluvial plains are surrounded by the San Gabriel Mountains on the south and the Sierra Pelona on the north.

Geologically, the region is considered to be within the eastern Soledad Basin The surrounding alluvial terrain is underlain by the Vasquez Formation south of the

freeway and primarily by the Precambrian age Anorthosite-Gabbro Complex.

The site is topographically situated on southern descending slopes just south of Sierra Highway. Adjacent to the sidewalk, grades drop some 4 to 5 feet below the level of the street. Gradients then continue to the rear of the lot at ratios of about 20:1 or flatter.

The property consist of a rectangular shaped lot that extends some 280 feet from Sierra Highway on the west and some 220 feet on the east. The lot fronts along some 335 feet of Sierra Highway. The site is currently vacant. Some stockpile of imported fill has been placed one the western side of the site.

Vegetation consists of thin grasses and weeds. Much of the vegetation has been removed. Drainage is by sheetflow to the southwest. Drainage along Sierra Highway is controlled by a concrete curb and gutter.

FIELD EXPLORATION

The site was explored on February 14, 2014, by drilling 4 hollow stem auger borings to a maximum of 26 feet. Four additional borings were drilled on February 20, 2014, to a maximum depth of 40 feet using a 24-inch diameter flight auger.

Soil samples were obtained for laboratory testing. The earth materials were logged in detail and are presented in the Log of Borings.

On-site and nearby bedrock exposures were carefully observed. The approximate distribution of the earth materials on the site and vicinity and the boring locations are shown on Plate 1.

EARTH MATERIALS

The earth materials at the site are classified as artificial fill and alluvial soil.

Artificial Fill (Af)

Artificial fill consists of 2 to5 feet of a dry, reddish brown gravelly silty sand and a fine to medium grained reddish brown sand. Fill has been imported in the past from sites nearby as it resembles onsite materials.

Older Alluvial Soil (Qoa)

Soil at the site has been classified regionally as an older alluvial soil. These materials range from a medium brown, fine to medium grained, silty sand to a reddish brown, coarse grained gravelly sand. The material is firm to tight, dry to moist, and dense. Although the fill is considered dense based on the sample blow counts, near surface deposits show a propensity to consolidate when saturated and under load.

ENGINEERING GEOLOGY

The engineering geologic factors evaluated include excavation characteristics and groundwater.

Excavation Characteristics

Earth materials can be excavated using conventional equipment. Locally hard soil was encountered in the drilling although no coring was required. It is recommended that conventional grading equipment be employed.

Groundwater

No groundwater seepage was observed on the site or in our borings excavated to a maximum depth of 40 feet. A review of groundwater maps produced by the State of California for the Acton Quadrangle indicate that the groundwater levels are greater than 40 feet beneath the surface of the site. The groundwater level is considered to be substantially below the level of the proposed development.

Localized groundwater levels can fluctuate as a result from such things as poor site drainage, over watering, and broken water lines. These factors can result in damage to the proposed development such as settlement, the adverse influence of expansive soils, damage to basement and retaining walls, damage to floor slabs and interior floors and the introduction of moisture in the sub-floor areas, potentially leading to mold, fungus and mildew. It is important that improvement for surface and subgrade drainage are incorporated into the design and construction of the development to minimize these effects of localized groundwater. It is also important that site maintenance by the owners include regular site review and the immediate correction of such issues.

EVALUATION OF GEOLOGIC HAZARDS

An evaluation of geologic hazards at the site includes seismic hazards. Seismic hazards addressed are ground shaking, fault displacement, ground lurching, tsunami potential and liquefaction potential, including seismically induced settlement and lateral spreading.

Seismic Hazard Evaluation

The site is located in Southern California, an area that is historically subject to earthquakes and ground shaking. No known surface traces of active faults traverse the site. The site is not located within an Alquist Priolo Earthquake Fault Zones. The nearest major seismic source is believed to be the San Andreas Fault located some 6 miles to the north. It is postulated that the San Andreas Fault is capable of producing probable earthquake magnitudes ranging from 6.8 to 8.0. This fault has been classified by the State as a A-Type fault with a slip rate that ranges from 20 to 35 mm/yr. Reoccurrence intervals between major ruptures has been postulated at about 140 by the Southern California Earthquake Data Center.

Based upon an analysis of the seismic parameters using "EQFAULT", a maximum probable repeatable high ground acceleration of 0.51g can be expected during the lifespan of the structure. A review of the ground shaking maps produced by the State of California for the Acton 7.5 minute Quadrangle suggest that a 10% exceedance in 50 years peak ground acceleration is on the order of 0.58 g. This adopts a M_w of 7.8 with an epicentral distance of 7 km (3.5 miles).

Ground shaking resulting from earthquakes common to Southern California can be expected within the lifespan of the structure. No major problems are anticipated as a result of fault displacement or ground lurching resulting from earthquakes provided the foundation system is constructed as herein recommended.

CBC Seismic Design Factors

Based on Section 1613 of the 2007 California Building Code, the following seismic criterial should be used in the design of the structures. Based on our experience with similar soil characteristics and based on the input of geographic coordinates into the USGS website, a return for the site yielded the following:

Table I
Seismic Design Criteria

Peak Ground Acceleration (g's)	Site Class Table 1613.5.2	(Ss) Short Period Spectral Accelerations (0.2 sec.)	(S1) One Second Period Spectral Accelerations	(Fa) Site Coefficient	(Fv) Site Coefficient
0.58	D	1.531	0.724	1.0	1.5

Liquefaction Potential

Liquefaction is an earthquake related phenomena, that generally occurs where the underlying sandy soil has a low to moderate density in areas where high groundwater conditions exist. A review of available seismic hazard maps of the Acton Quadrangle indicate the site is not located within an area susceptible to liquefaction. The soil conditions that occur at the site is one of thick dense older alluvium underlain by bedrock. No groundwater was encountered. The observed conditions are not considered to be conducive to liquefaction. Liquefaction is not expected to occur at the site during the lifespan of the project. Subsequently, the risk for seismically induced settlement, lateral spreading and ground effects phenomena such as sandboils, ground fissures, etc., is considered to be nil.

LABORATORY TESTING

Laboratory tests were conducted on representative samples to determine certain physical properties of the earth materials. Field moisture content, in-place density, maximum laboratory compaction, expansion potential, consolidation, and shear strength characteristics were determined from these tests.

In-Place Density and Moisture Content

The in-place density and field moisture content of representative samples were determined using ASTM methods D-2937-04 and D-2216-05 or D-4643-00, whichever is applicable. The following table presents the results of our testing.

Table II
Results of In-situ Density and Moisture Tests

Sample #	Depth (ft)	Material Type	In-Place Dry Density (pcf)	Moisture Content (%)
B1-1	5	SM	115	3
B1-2	10	SP	105	3
B1-3	15	SW	119	3.5
B1-4	20	SW	125	9
B1-5	25	SM	125	6
B2-1	5	SM	110	2
B2-2	10	SW	107	3.5
B2-3	15	SP	112	4
B2-4	20	SP	110	4
B3-1	5	SW	111	3
B3-2	10	SW	109	10
B3-3	15	SW	120	7
B3-4	20	SW	117	4
B4-1	2	SW	113	2
B4-2	7	SP	118	4

Maximum Laboratory Compaction

The maximum laboratory compaction and optimum moisture content of a typical silty gravelly sand was determined in accordance with ASTM Method D1557-02e1. The compaction test was made on the sample portion passing a #4 sieve. The soil is placed in a 4-inch diameter mold having a 1/30 cubic foot volume and compacted with 25 blows of a 10-pound hammer falling 18 inches on each of five layers. The maximum compaction of the silty gravelly sand was 131 pcf at an optimum moisture content of 10 percent.

Direct Shear

Direct shear tests were conducted on representative samples to determine the shear-strength characteristics. The samples were saturated under a normal load

before testing. Shear loads were applied at a minimum rate of 0.03 inches per minute and or at a rate determined in accordance with the consolidated-drained shear test method ASTM D-3080-04. The peak and ultimate shear-strength values for the samples tested are presented on Table lll below.

Table III
Results of Shear Tests

Sample Number	Depth (ft)	Soil Type	Unit Weight (pcf)	Ultimate Cohesion (psf)	Ultimate Friction Angle (degrees)	Peak Cohesion (psf)	Peak Friction Angle (degrees)
B2-1	5	Qoa	112	120	36	120	38
B4-1	2	Qoa	115	60	33	80	33
B4*	2-5	Afc	130	140	30	180	40

*Remolded to 90%

Consolidation

Consolidation tests were performed on in-situ moisture and saturated specimens of the silty gravelly sand in accordance with the test method ASTM D2435-04. The consolidometer, like the direct shear machine, is designed to receive the specimens in the field conditions. Porous stones placed at the top and bottom of the specimen permit free flow of water into and from the specimens during the test. Successive load increments are applied to the top of the specimens and progressive and final settlements under each load increment are recorded to an accuracy of 0.001 inch. The consolidation curves of the results are shown in the Appendix.

Expansion Index

Expansion index testing was conducted according to the requirements of the ASTM D-4829-03, on a sample(s) of the silty sand obtained at the site. This test measures the expansion index of a remolded test sample, under a total load of 12.63 pounds while submerged. The test is started at a degree of saturation of 50 percent. Measurements are periodically taken and continue to be read for a 24-hour period or until the rate of expansion becomes constant. Results of this test indicates that the silty sand has an expansion index of 1.

CORROSION TESTING

Testing has been conducted to evaluate the corrosion potential at the site. These tests include chemical testing for sulfates, chlorides, assessing the soil ph and testing the soil conductivity.

Chemical Testing

Samples of a typical soil sample were sent to American Environmental Testing Labs in Burbank for assessments of sulfide-sulfate, chlorides and ph.

Soluble Sulfate

Results of the soluble sulfate test (CT Method 417) indicate that the soil tested has 38.2 ppm of soluble sulfate available. Based on Table 4.3.1 from the ACI 318.05 (American Concrete Institute) the tested soil presents a negligible sulfate exposure.

Table IV

Sulfate Exposure	Water-Soluble Sulfate (SO4) in soil, % by mass	Sulfate (SO4) in water, ppm	Cement Type	Maximum w/cm by mass	Minimum Design Compressive Strength, f'c, MPa (psi)
Negligible	< 0.10	< 150	No special type	—	—
Moderate	0.10 to 0.20	150 to 1500	II, IP(MS), IS(MS), P(MS), I(PM)(MS), I(SM)(MS)	0.50	28 (4000)
Severe	0.20 to 2.00	1500 to 10,000	V	0.45	31 (4500)
Very severe	> 2.00	>10,000	V + pozz	0.45	31 (4500)

Based on these tests it is concluded that the concrete is not susceptible to sulphate attack. No special recommendations for sulphate resisting concrete are considered necessary.

Dissolved Chloride

The results of the dissolved chloride test (CT Method 422), indicates samples contained 80.1 ppm of dissolved chloride. Levels less than 100 ppm are considered to be moderately corrosive. It is recommended that underground conduits consist of a suitable PVC or equal. Additionally, it is recommended that a Type V cement should be used with a 0.5 water to cementitious materials ratio.

Acidity/Alkalinity

Corrosion will occur anywhere two dissimilar metals that are connected directly or indirectly by an electrolyte, such as water. This is the same chemical reaction that occurs within a battery. Nearly all metals will corrode to some degree. From a geotechnical perspective, the rate and extent of the corrosion depends on the degree of dissimilarity of the underground conduit or metals and the physical and chemical characteristics of the ion transferring media (soil & water).

In acidic media or one which has a low pH, corrosion occurs because of the lack of dissolved cations, such as calcium and magnesium in the media. Media with high levels of sodium, chloride, or other ions will increase conductivity and promote corrosion. Corrosion can be accelerated by inordinately low pH (acidic media) and also excessively high pH (alkaline media), high water temperature, oxygen and dissolved CO_2, and high dissolved solids, such as: salts, sulfates, etc.

A media that is considered to be neutral is one that is compared to pure water. Pure water has a pH= 7.0. Descriptive terms for reaction and their respective ranges in pH are as follows:

Table V - pH Reaction Class

Reaction Class	Range in pH
Ultra Acid	1.8-3.4
Extremely Acid	3.5-4.4
Very Strong Acid	4.5-5.0
Strong Acid	5.1-5.5
Moderately Acid	5.6-6.0
Slightly Acid	6.1-6.5
Neutral	6.6-7.3
Slightly Alkaline	7.4-7.8
Moderately Alkaline	7.9-8.4
Strongly Alkaline	8.5-9.0
Very Strong Alkaline	9.1-11

If the pH is above 8.5 soils can be detrimental to metal pipes. If the pH is less

than 5.5, the soil can be corrosive to concrete. The soil ph was measured to be at 7.85, which is considered to be slightly alkaline. Based on this test, the potential for electrolytic corrosion of metal such as ferrous pipes or reinforcement steel is considered to be low.

Resistivity Testing

Testing to evaluate the resistivity of a representative sample was performed using a 4-pin soil resistance meter using a Wenner arrangement. Testing was conducted in accordance with Method ASTM G57-95a (Standard Test Method for Field Measurement of Soil Resistivity Using the Wenner Four-Electrode Method."). The results of the testing are indicated below on Table VI.

Table VI
Results of Resistivity Testing

Sample Number	Material Type	Resistivity (Ohm-centimeters)
B1 @ 0-7'	SM	9800

The degree of soil corrosivity potential is based on the following table.

Table VII
Degree of Corrosivity

Soil Resistivity (Ohm-centimeters)	Degree of Corrosivity
0-1,000	Severely Corrosive
1,000 - 2000	Corrosive
2,000 - 10,000	Moderately Corrosive
Over 10,000	Mildly Corrosive

Based on the results, the on-site soil has a moderate degree of corrosivity. It is recommended that underground conduits consist of a suitable PVC or equal.

RECOMMENDATIONS

Based on the findings of our exploration, the site is considered to be suitable from a soil and engineering geologic standpoint for construction of a commercial building and restaurant provided the recommendations included herein are followed and integrated into the grading and building plans.

Geotechnical Considerations

The primary geotechnical issue considered significant to the project development will be the near surface soils that demonstrate a propensity to consolidate under load when saturated. These materials generally have a lower density and could potentially lead to settlement if left unmitigated. These near surface soils should be removed and recompacted under the proposed building areas to remedy the condition.

It is recommended that the proposed storage building be moved away from the property line as indicated on Plate 1 so that room for over-excavation and recompaction of the building pad is available without encroaching on the adjacent buildings. As indicated the building should be moved 15 feet to the east. Another option would be to place the storage building on a pile foundation embedded below the depth of 7 feet. If this option is proposed recommendations for a pile foundation system provided herein shall be used.

Section 111

It is the finding of this firm that the proposed work, grading and structures will be safe and that the property will not be affected by any hazard from landslide, settlement or slippage and the proposed work, grading and structures will not adversely affect the geotechnical stability of the area outside of the proposed work in compliance with the County Code, provided our recommendations are followed.

GRADING RECOMMENDATIONS

General

The proposed grading will include removal and recompaction of fill, and hillside grading, including possibly slope stabilization. All grading shall be conducted in a responsible, workmanlike manner. All fill material should be placed in accordance with our grading guidelines (attached) and should be constructed in accordance with the Appendix J of the Los Angeles County Grading ordinance unless otherwise specified herein.

All removal areas and excavations extended into competent soil shall be observed by a representative of the geotechnical engineer or engineering geologist

before placing any fill. It is the responsibility of the client to notify Miller Geosciences, Inc., when grading operations or construction begins so that the required observations can be made.

All surface vegetation and debris shall be removed from the site during the initial phases of grading. This debris shall be removed from the site and disposed of properly.

A careful search shall be made for subsurface debris, abandoned water wells, septic tanks, seepage pits and any other undesirable void or structure buried during grading operations. Should such subsurface cavities or debris be encountered, they shall be removed down to firm material and properly backfilled and compacted as directed by the geotechnical engineer.

The final grading plan should be reviewed by this firm to insure changed are in conformance with the recommendations presented in this report.

Suitability of Materials

Artificial fill and natural soils observed at the site are suitable for use in compacted fills provided they are properly prepared. Fine-grained native soils should be blended with on-site granular materials under the observation and approval of the Soils Engineer.

Imported Materials

All imported soils, if any, to be used as structural fill shall be observed and approved by a representative of the geotechnical engineer prior to transport to the site. Imported fill material shall be free of organic or construction debris and rocks greater than 8 inches in diameter, measured at its widest point. Imported soils shall be similar to or less expansive than the existing on-site soils. The rock to soil ratios of imported material shall not exceed 50 percent.

Pad Over-Excavation

If structures are proposed to be located partially on the cut portions and partially on the compacted fill, it is recommended that the entire pad area be over-excavated and refilled with soils compacted to a minimum of 90 percent of the laboratory maximum compaction to provide a firm uniform base.

Over-excavations shall extend to a depth of at least 7 feet below the existing grade prior to placing any new fill. All over-excavation and recompaction shall extend a minimum lateral distance beyond the building line of 7 feet or shall extend to a distance equal to the depth of removal, whichever is greater.

Special attention shall be given to the areas near the cut/fill transition line so that proper removals and compaction of loose soils is achieved.

Parking Lot Over-Excavation

The entire parking lot area shall be over-excavated and refilled with soils compacted to a minimum of 90 percent of the laboratory maximum compaction to provide a firm uniform base. Over-excavations shall extended to a depth of at least 2 feet below the original grade. All excavations and recompaction in the parking lot area extended a minimum lateral distance of 5 feet beyond the limits of the asphalt.

Expansive Soils

Soils on the site are generally granular and have a low-expansion potential. Selective grading is recommended such that granular soils are blended with the clayey soils to reduce the potential of expansivity. The final grades of each lot exposing fine-grained soils should be tested and soils verified for expansion potential once grading is completed.

Shrinkage/Bulking

The earth materials used during grading are expected to change in volume. These conditions will vary with the type of material used in the grading process. Volume changes assigned to earth materials are as follows:

Table VIII
Estimated Change in Volume

Topsoil/Alluvium/Existing Fill:	8 - 20 % shrinkage

Slope Maintenance

In order to minimize sloughing on slope faces, it is recommended that a slope maintenance program be implemented as soon as possible.

Slope maintenance includes proper drainage control, planting, irrigation, and rodent control. Slopes should be planted with a light weight, drought resistant, deep-

rooted groundcover or bushes.

PRIVATE SEWAGE DISPOSAL

Because sewers are unavailable to serve the property, seepage pits are proposed to serve the sewage effluent disposal needs of the proposed residence. The design of the private sewage disposal system should be in accordance with the Los Angeles County Health Department requirements.

Due to favorable geologic conditions on the site no special restrictions are considered necessary for seepage pit location. From a geologic standpoint seepage pits may be located anywhere near the four test holes (see Plate 1). All seepage pits should be capped a minimum of 5 feet below the existing surface and 15 horizontal feet from any descending fill-soil contacts, whichever is deeper as determined by the engineering geologist during our observation once the pits have been excavated.

Effluent from seepage pits is expected to percolate downward through the older alluvium. Sustained, long-term use of the private sewage disposal system is not expected to adversely affect the site or adjacent site stability, or result in the mounding or daylighting of sewage effluent provided that our recommendations are followed.

BUILDING RECOMMENDATIONS

The following recommendations shall be integrated into the building plans.

Foundations

Conventional continuous footings are adequate for foundation support and may be supported in compacted fill. Continuous footings may be designed using a bearing pressure of 2000 psf for the compacted fill. The dimensions of the conventional footings should be as indicated on the Table below. Minimum embedment depths shall be measured below the top of the recommended bearing material as determined by the Geotechnical Engineer.

Table IX
Recommended Foundation Dimensions

Expansion Potential		Very Low
Expansion Index		0 - 20
Foundations Dimensions	Footing Width	
	1-Story	12"
	2-Story	15"
	Exterior Footing Depth	
	1-Story	12"
	2-Story	18"
	Interior Footing Depth	
	1-Story	12"
	2-Story	18"

Where a footing or grade beam extends across a descending slope, the stem wall, grade beam, or footing shall extend up to a minimum 18 inches above the highest adjacent grade.

Independent footings may be designed using a bearing pressure of 2500 psf. The dimensions on independent footings should be a minimum of 2 feet square and founded at least 2 feet into the recommended bearing material. The vertical reinforcing bars for the pedestal shall be confined with two # 4 or three # 3 ties within the top five inches of the concrete or masonry pedestal. Increases in bearing pressure for foundations in compacted fill are not recommended for additional excavation depth.

Footings should be reinforced with at least two No.4 reinforcing bars at the top and two No.4 reinforcing bars at the bottom or as indicated on the table below for expansive soils. One bar of steel shall be placed near the base of the footing and one bar of steel shall be placed near the top of the foundation wall.

Table X
Recommended Foundation Reinforcement

Expansion Potential	Very Low	Low	Medium	High
Footing Reinforcement	4 # 4 Bars, 2 Top, 2 Bottom	4 # 4 Bars, 2 Top, 2 Bottom	4 # 5 Bars, 2 Top, 2 Bottom	4 # 5 Bars, 2 Top, 2 Bottom

Footings should be located below a line measured at a 45-degree angle from the bottom of any utility trench, unless reviewed and approved by the Soils Engineer.

Spoils generated from the footing excavations shall not be spread across the slab and pavement areas without the benefit of proper fill placement in accordance with our recommendations provided herein. In lieu of compacting the spoils, the fill may be removed from the site. Backfills placed adjacent to the footing trenches to restore grades after the footing construction has been completed, should also be properly compacted using mechanical methods recommended herein. All slab and pavement subgrades shall be tested for compaction prior to placing aggregate base or sand.

The bearing pressure given is for the total of dead and frequently applied live loads and may be increased by one-third for short duration loading which includes the effects of wind or seismic forces.

Friction Piles

Friction piles may be used to support the storage building if placed directly adjacent tot he western property line. Piles should be a minimum of 24 inches in diameter and a minimum of 10 feet into native soils. Piles may be assumed fixed at 7 feet into firm native soil. The piles may be designed for a skin friction of 250 psf for that portion of pile in contact with the native soils below a depth of 7 feet. All piles should be tied in two horizontal directions with grade beams. Grade beams shall extend at least 12 inches below the lowest adjacent grade and provide a minimum 24-inch distance horizontally from the bottom outside face of the grade beam to the face of the descending slope.

Spoils generated from the pile excavations shall not be cast out over the descending slopes nor spread in the slab and pavement areas without the benefit of proper fill placement in accordance with our recommendations provided herein. In lieu of compacting the spoils, the fill may be removed from the site. Backfills placed adjacent to the grade beam trenches to restore grades after the footing construction has been completed, should also be properly compacted using mechanical methods recommended herein.

Lateral Design

Resistance to lateral loading may be provided by friction acting at the base of foundations and by passive earth pressure within the compacted fill. An allowable coefficient of friction of 0.35 may be used with the dead load forces.

Passive earth pressure may be computed as an equivalent fluid having a density of 250 pcf with a maximum earth pressure of 1500 psf. When combining passive and friction for lateral resistance, the passive component should be reduced by one-third.

Foundation Settlement

Settlement of the foundation system is expected to occur on initial load application. The maximum settlement is expected to be ½ -inch. Differential settlement is not expected to exceed ¼-inch within a span of 30 feet.

It is important that the structure be supported on similar material to reduce the potential for differential settlement. It is, therefore, recommended that all footings be founded in compacted fill.

The elimination of the differential swell/settlement potential is unlikely at the site. It is likely that some cosmetic distress will result. It should be understood that the cosmetic distress may warrant occasional repair by the homeowner. The cost of these repairs shall be considered to be within the standard upkeep of the structures and not the responsibility of the geotechnical consultants.

Floor Slabs

The soils on the site are primarily silty gravelly sand having a low expansion potential. Floor slabs should be designed as indicated on the following table provided below. Sand placed below the slab shall be used as a sub-grade material. Slabs shall be reinforced with steel bars placed a minimum of 16 inches on-center, in two directions. Slabs to be covered with flooring should be protected by an acceptable plastic vapor barrier. To prevent punctures and aid in the concrete cure, the barrier should be covered with a 1-inch layer of sand.

Table XI
Recommendations for Floor Slab Design

Expansion Potential	**Very Low**
Expansion Index	**0 - 20**
Slab Thickness	4“ actual
Slab Reinforcement	# 3 Bars on 16" Centers Two Directions
Moisture Barrier	1" Sand over 10 Mil Visqueen
Sub-grade	Optional
Pre-saturation	Recommended

Non Structural Flat Work

We recommend the following information be provided to the designers and contractors, and that the following procedures be incorporated in the design and construction of any future improvements.

- Sub-grade soils below the concrete slabs should be pre-moistened to achieve at least 120 percent of the optimum moisture content to a depth of 18 inches, immediately prior to concrete placement.
- Concrete slabs-on-grade should have a minimum thickness of 4 inches. All slabs-on-grade, shall contain a minimum reinforcement consisting of # 3 bars, at 18 inches on-center, each way, or an equivalent. The reinforcement must be placed near mid-height of the slab.
- Avoid the construction of raised planters adjacent to structural improvements.

Landscaping

Initial seeding and planting of the slopes should be planned to achieve, as rapidly as possible, a well established and deep rooted, vegetation requiring minimal watering. Trees should be placed no closer than one-half the mature tree height from the structures.

Sprinklers should be designed to provide maximum uniform coverage with a minimum amount of water and overlap. Over-watering with wasteful runoff and serious

ground saturation must be avoided. If automatic sprinkler systems are installed, their use must be adjusted to account for natural and seasonal rainfall conditions.

Site Maintenance

Lot maintenance and landscaping should be conducted recognizing the potential for expansion and contraction of the soil. It is extremely important to minimize the moisture variation below all hardscape improvements. Property owners should provide for the following as part of the site maintenance.

- sealing and maintaining construction/control joints within concrete slabs and walkways.
- irrigating uniformly on all sides of the foundations, keeping the soil moist but not allowing the soil to become either excessively wet or dry. Leaking irrigation systems should be repaired immediately.
- Maintaining positive drainage away from structures and providing roof gutters on all structures with down spouts installed to carry roof runoff directly into area drains away from any slope or structure.
- Observing the soil conditions around the perimeter of the structures during extremely hot or dry or unusually wet weather conditions so that modifications can be made in the irrigation program to maintain a relatively constant moisture condition.
- Maintaining and clearing all interceptor ditches, drainage terraces, down drains, and any other drainage devices that have been installed to promote slope stability.
- Owners must undertake a program to eliminate burrowing animals.

Foundation and Building Setback

Setbacks from the top or toe of slope should comply with the minimum requirements setforth in Section 1805.3 of the 2007 California Building Code or with the requirements of the controlling governmental agency.

Drainage Protection

Final grading shall provide positive drainage away from the footings and from the lot. ADDITIONALLY, proper drainage shall also be provided away from the building

footing and from the lot during construction. Maintaining a proper drainage system will minimize the shrink/swell potential of the subsoils.

All pad and roof drainage should be collected and transferred to an approved dispersal area in non-erosive drainage devices. Drainage should not be allowed to pond on the pad or against any foundation or retaining wall.

Preliminary Pavement Design Criteria

Asphaltic concrete paving will be required for parking areas and driveways. It is recommended that the upper 6-inches of the existing grade be scarified and recompacted to 95 percent of the maximum density at optimum moisture. Based on an estimated R-value of 30 for the onsite materials, the following pavement sections are given for various vehicle uses. The lifespan of the pavement sections is estimated to be ten years.

Table XII
Street Section Design Recommendations

Vehicle Use	Assumed Traffic Index	Asphalt Pavement Section (in)	Base Course Section (in)
Passenger Car	4	3	4
Trucks	5	4	6

High concentrated vehicle load and high traffic areas should be provided with a concrete apron. These areas include but are not necessarily limited to loading docks, trash receptacles and driveway approaches. Concrete slabs should be provided with a crushed aggregate base similar to that recommended for the pavement sections.

Approval

A set of building and grading plans should be submitted to this office for review and approval prior to initiation of construction.

It is recommended that all foundation excavations be observed by this firm prior to placing concrete or steel. Any fill which is placed should be tested for compaction if used for engineering purposes.

The soils to be penetrated by the proposed excavation may vary significantly across the site. Preliminary information on vertical and lateral soil extent is based

solely on the observations made at the borings. The contractor should verify that similar conditions exist throughout the proposed excavation area. If different subsurface conditions from those described herein, are encountered at the time of construction, we recommend that we be contacted immediately to evaluate the conditions encountered.

It is advised that the client contact **Miller Geosciences, Inc.,** at least **1 week** in advance of commencing grading to allow for contractual agreements for geotechnical services during the construction phases of your project.

Please advise this office at least 24 hours prior to any required verification.

Representatives of Miller Geosciences, Inc., will observe work in progress, perform tests on soil, and observe excavations and trenches. It should be understood that the contractor or others shall supervise and direct the work and they shall be solely responsible for all construction means, methods, techniques, sequences and procedures, and shall be solely and completely responsible for conditions of the job site, including safety of all persons and property during the performance of the work.

We are providing this information solely as a service to our client. Under no circumstances should the information provided herein be interpreted to mean that Miller Geosciences, Inc. is assuming the responsibility for construction site safety or the Contractor's activities; such responsibility is not being implied and should not be inferred.

Periodic observation by Miller Geosciences, Inc., is not intended to include verification of dimensions or review of the adequacy of the contractor's safety measures in, on, or near the construction site.

Remarks

The conclusions and recommendations contained herein are based on the findings and observations made at the boring locations. While no great variations in subsurface conditions are anticipated, if conditions are encountered during construction that appear to differ from those disclosed, Miller Geosciences, Inc., should be notified, so the need for modifications can be considered.

Testing of the entire soil mass that is at the site is not practical. As such, our

testing is a statistical representation of the onsite soil conditions. Engineering judgement is used in selecting the location of the test, selecting the type of test and assessing the type of soil in accordance with accepted practices in the area at the time of the study. Engineering and geologic judgement is also used during construction, including compaction testing, footing observation, bottom observation, sub-drain observation and benching observation during our site visits in accordance with accepted practices in the area at the time of the construction. No other representations with respect to the data contained in this report are made.

This report has been compiled for the exclusive use of Doug and Joanna Gaudi and their authorized representatives. It shall not be transferred to, or used by, a third party, to another project or applied to any other project on this site, other than as described herein, without consent and/or thorough review by this facility.

Should the project be delayed beyond the period of one year after the date of this report, the site should be observed and the report reviewed to consider possible changed conditions.

The owner and the contractor should make themselves aware of and become familiar with the applicable local, state, and federal safety regulations, including the current OSHA Excavation and Trench Safety Standards.

This report is issued with the understanding that it is the responsibility of the owner, or his representative, to assure that the information and recommendations contained herein are called to the attention of the designers and builders for the project.

The limits of our liability for data contained in this report are presented on the following page.

MILLER GEOSCIENCES, INC.

Steven B. Miller
CEG 1303, Exp. 7-31-15

CERTIFIED ENGINEERING GEOLOGIST
STEVEN B. MILLER
No. 1303
Exp. 7-31-15
STATE OF CALIFORNIA

Leonard C. Hayes
GE 386, Exp. 9-30-15

REGISTERED PROFESSIONAL ENGINEER
LEONARD C. HAYES
No. 386
Exp. 9-30-15
GEOTECHNICAL
STATE OF CALIFORNIA

LIMITATIONS

This report is based on the development plans provided to our office. In the event that any significant changes in the design or location of the structure(s); as outlined on this report, are planned, the conclusions and recommendations contained in this report may not be considered valid unless the changes are reviewed and the conclusions of this report are modified or approved by the geotechnical engineer and engineering geologist in writing.

The subsurface conditions, excavations, characteristics and geologic structure described herein and shown on the enclosed cross section(s) have been projected from individual borings or test pits placed on the subject property. The subsurface conditions and excavation characteristics, and geologic structure should in no way be construed to reflect any variations which may occur between these borings or test pits.

It should be noted that fluctuations in the level of groundwater may occur due to variations in rainfall, temperature, over-watering, and other factors not evident at the time measurements were made and reported herein. Miller Geosciences, assumes no responsibility for variations in groundwater levels that may occur across the site or in time.

If conditions encountered during construction appear to differ from those disclosed, this office shall be notified to consider the need for modifications. No responsibility for construction compliance with design concepts, specifications or recommendations is assumed unless on-site construction review is performed during the course of construction that pertains to the specific recommendations contained herein.

This report has been prepare in accordance with sound, generally accepted engineering practices common to the region. No warranties, either expressed or implied, are made regarding the professional advice provided under the terms of the agreement and included in this report.

This report is intended to aid your design professionals in their design of your project. Utilization of the advice presented herein is intended to reduce the risk associated with the construction projects. The professional opinions and geotechnical advise contained in this report are not intended to imply total performance of the project or guarantee that unusual conditions will not be discovered during or after construction.

GRADING GUIDELINES

Site Clearing

Any existing brush, loose fill and porous soils shall be excavated to competent native materials. Before placement of any fill soils, the exposed surface shall be scarified, cleansed of debris and recompacted to **90** percent of the laboratory standard under the direction of the Soils Engineer according to the following "Placing, Spreading, and Compacting Fill Materials."

Preparation

After the foundation for the fill has been cleared, and scarified, it shall be brought to a proper moisture content and compaction to not less than **90** percent of the maximum dry density according to D1557-02e1 where fill depths do not exceed 40 feet below finished qrade. Where proposed fill thickness exceed 40 feet, the degree of compaction shall be not less than 93 percent of maximum dry density for those portions that are deeper than 40 feet below finished grade,

Materials

On-site materials may be used in the fill if cleansed of debris. Imported fill materials shall be approved by the Soils Engineer and may be obtained from any other approved source. The materials used should be free of excessive organic matter and other deleterious substances and shall not contain rocks or lumps greater than 6 inches in maximum dimension.

Placing, Spreading and Compacting Fill Materials

Fill materials shall be placed in layers which when compacted shall not exceed 6 inches in thickness. Each layer shall be spread evenly and shall be thoroughly mixed during the spreading to ensure uniformity of material and moisture of each layer.

Where the moisture content of fill material is below optimum value determined by the Soils Engineer, water shall be uniformly added to obtain the approximate optimum moisture content.

Where the moisture content of the fill materials is higher than the optimum value determined by the Soils Engineer, the fill materials shall be aerated by blading, disking or mixing with dry materials until the optimum moisture content is obtained.

After each layer has been placed, mixed and spread evenly, it shall be thoroughly compacted to not less than 90 percent of the maximum dry density according to ASTM D1557-02e1, unless the fill thickness is deeper than 40 feet..

Compaction shall be by sheepsfoot roller, tract rolling or other types of acceptable compaction equipment of such design so that the contractors can compact the fill material to the specified density. Rolling shall be done while the fill material is at the specified moisture content, to ensure that the desired density has been obtained. The final surface of the areas to review slabs-on-grade should be rolled to a dense smooth surface.

Field density tests shall be made by the Soils Engineer at intervals not to exceed 2 feet of fill height. Where sheepsfoot rollers are used, the soil may be disturbed to a depth of several inches. Density reading shall be taken in the compaction material below the disturbed surface. When these readings suggests the density of any fill or portion of it is below the required 90 percent density, the particular layer of portion shall be reworked until the required density has been obtained.

The grading specifications should be a part of the project specifications. The Soils Engineer shall review the grading plan before grading.

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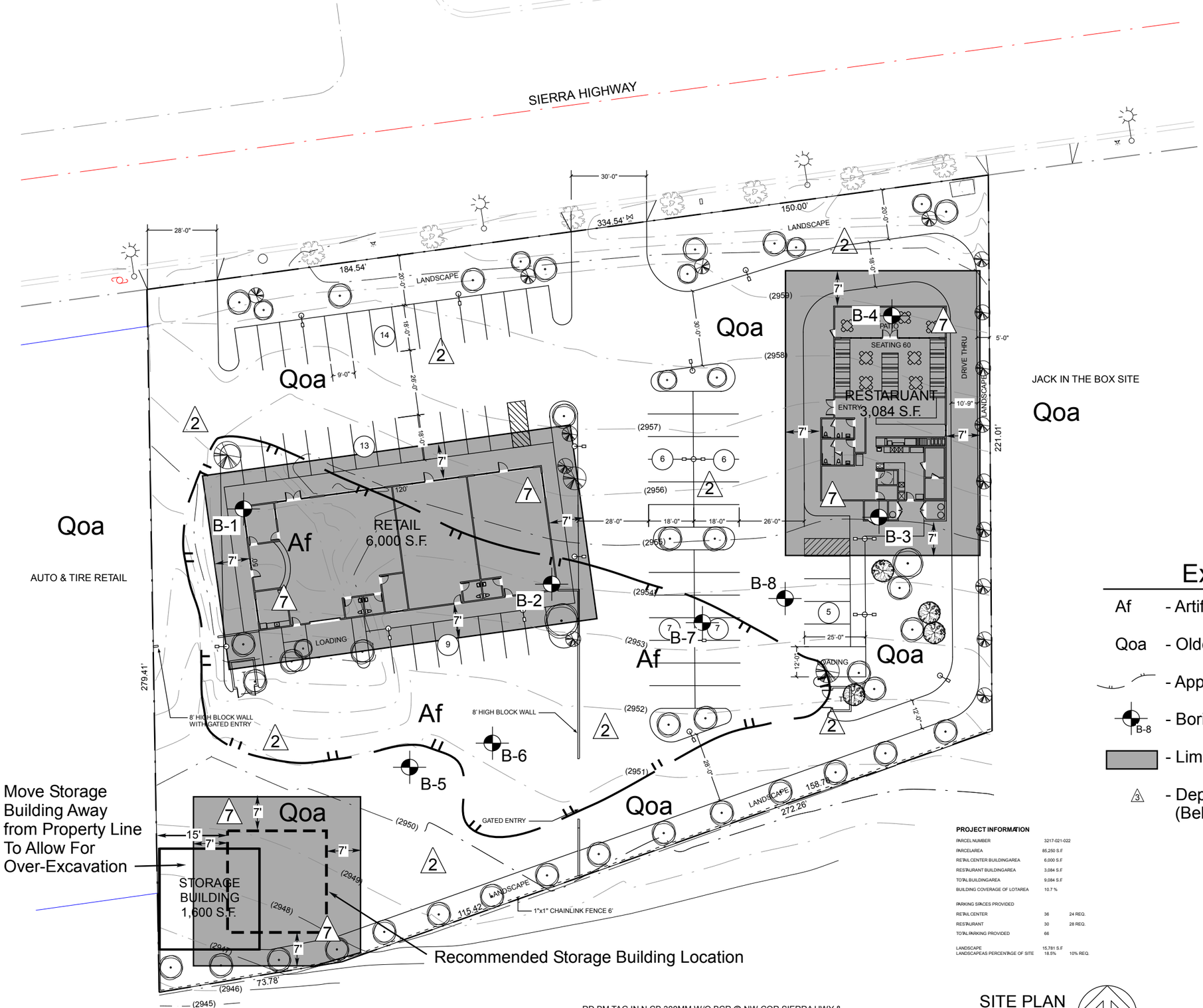
APPENDIX A



Explanation

- Af - Artificial Fill
- Qoa - Older Alluvium
- - Approximate Limits of Fill
- B-8 - Boring Location
- - Limits of Building Over-Excavation
- 3 - Depth of Over-Excavation (Below Original Grade)

PROJECT INFORMATION

PARCEL NUMBER	3217-021-022	
PARCEL AREA	85,250 S.F	
RETAIL CENTER BUILDING AREA	6,000 S.F	
RESTAURANT BUILDING AREA	3,084 S.F	
TOTAL BUILDING AREA	9,084 S.F	
BUILDING COVERAGE OF LOT AREA	10.7 %	
PARKING SPACES PROVIDED		
RETAIL CENTER	36	24 REQ.
RESTAURANT	30	28 REQ.
TOTAL PARKING PROVIDED	66	
LANDSCAPE	15,781 S.F	
LANDSCAPE AS PERCENTAGE OF SITE	18.5%	10% REQ.

RD BM TAG IN N CB 300MM W/O BCR @ NW COR SIERRA HWY & CROWN VALLEY RD 19.8M W & 12.8M N C/L INT
ELEV=2965.483 L5170

SITE PLAN

ROBERT H. FRIEDMAN
ARCHITECT
2059 E. FOOTHILL BOULEVARD
PASADENA, CALIFORNIA 91107
(626) 484-5251
FRIEDMAN ARCHITECTS
robert@friedmanarchitects.com

PROJECT NAME

ACTON RETAIL CENTER FEED STORE & PRIMO RESTAURANT

OWNER

DOUG & JOANNA GAUDI
43233 55th STREET EAST
LANCASTER, CA

SHEET INDEX

REVISIONS

No.	Issue	Date

SHEET INFORMATION

Job No:

Drawn By:

Date: December 2, 2013

ROBERT H. FRIEDMAN C16793

LICENSED ARCHITECT ROBERT H. FRIEDMAN C16793 RENEWAL 5-31-15 STATE OF CALIFORNIA

SHEET TITLE

GEOTECHNICAL MAP

SITE: Sierra Highway at Crown Valley Road
Acton, California

SCALE: 1" = 40'	BY: sbm	REV:
M14-201	DATE: February, 2014	PLATE 1

MILLER GEOSCIENCES, INC.

Boring Log

Drilling Method: 8" Hollow Stem Auger	Water Level: Not Encountered	Boring #: 1
Sampling Method: 2.4" Drive Tube	Drilling Conditions: Sunny, Cool	Sheet: 1 of 1
Surface Conditions: Edge of mound		Logged By: sbm

Sample #	Blow Count	Depth	Soil Graph	Interval	Description and Comments
		0		0-2'	Artificial Fill (Af); Gravelly Silty Sand, reddish brown, dry, firm.
				2-5'	Artificial Fill (Af); Sand, reddish brown, fine to medium grained, firm, damp.
B-1-1 @ 5'	26			5-10'	Older Alluvial Soil (Qoa); Silty Sand, medium to strong brown, firm, damp, fine to medium grained.
B-1-2 @ 10'	36	10		10-14'	Older Alluvial Soil (Qoa); Sand, medium brown, firm, dry, cohesionless, fine to medium grained.
B-1-3 @ 15'	48			14-17'	Older Alluvial Soil (Qoa); Gravelly Sand, reddish brown, coarse grained, firm, dry to damp, moderately well graded.
				17-21'	Older Alluvial Soil (Qoa); Silty Gravelly Sand, strong reddish brown, tight, dense, dry to damp, well graded.
B-1-4 @ 20'	47	20		21-26'	Older Alluvial Soil (Qoa); Silty Sand, reddish brown, firm, dense, damp to moist, well graded.
B-1-5 @ 25'	22				
					Total Depth: 26'
		30			
		40			
		50			

Site: Sierra Highway at Crown Valley, Acton, Ca	Date: 2-14-14	M14-201	Plate: 2

MILLER GEOSCIENCES, INC. *Engineering Geologic / Geotechnical Services*

26831 Ruether Ave. Unit P, Santa Clarita, California 91351-6567 *(661) 299-2206 Fax (661) 299-2207*

Boring Log

Drilling Method: 8" Hollow Stem Auger	Water Level: Not Encountered	Boring #: 2
Sampling Method: 2.4" Drive Tube	Drilling Conditions: Sunny, Cool	Sheet: 1 of 1
Surface Conditions: slight slope to the SW		Logged By: sbm

Sample #	Blow Count	Depth	Soil Graph	Interval	Description and Comments
		0		0-3'	Artificial Fill (Af); Silty Sand, reddish brown, damp, loose to firm, slightly gravelly.
				3-5'	Older Alluvial Soil (Qoa); Silty Sand, tan to brown, loose, damp, fine grained.
B-2-1 @ 5'	23			5-15'	Older Alluvial Soil (Qoa); Silty Gravelly Sand, reddish brown, firm, dense, damp, medium to coarse grained.
B-2-2 @ 10'	24	10			
B-2-3 @ 15'	50			15-21'	Older Alluvial Soil (Qoa); Gravelly Sand, yellowish brown, tight, dense, damp, coarse grained.
B-2-4 @ 20'	48	20			
					Total Depth: 21'
		30			
		40			
		50			

Site: Sierra Highway at Crown Valley, Acton, Ca	Date: 2-14-14	M14-201	Plate: 3

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Boring Log

Drilling Method: 8" Hollow Stem Auger	Water Level: Not Encountered	Boring #: 3
Sampling Method: 2.4" Drive Tube	Drilling Conditions: Sunny, Cool	Sheet: 1 of 1
Surface Conditions: slight slope to the SW		Logged By: sbm

Sample #	Blow Count	Depth	Soil Graph	Interval	Description and Comments
		0		0-10'	Older Alluvial Soil (Qoa); Silty Gravelly Sand, medium brown, firm, dry to damp, fine to coarse grained.
B-3-1 @ 5'	28				
		10		10-15'	Older Alluvial Soil (Qoa); Silty Pebbly Sand, medium brown, firm to tight, dense, damp, fine to medium grained.
B-3-2 @ 10'	42				
				15-20'	Older Alluvial Soil (Qoa); Silty Pebbly Sand, slightly clayey, reddish brown, firm to tight, dense, damp to moist, fine to medium grained.
B-3-3 @ 15'	30				
		20		20-21'	Older Alluvial Soil (Qoa); Gravelly Silty Sand, medium brown, tight, dense, damp, medium to coarse grained.
B-3-4 @ 20'	50				
					Total Depth: 21'
		30			
		40			
		50			

Site: Sierra Highway at Crown Valley, Acton, Ca	Date: 2-14-14	M14-201	Plate: 4

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Boring Log

Drilling Method: 8" Hollow Stem Auger	Water Level: Not Encountered	Boring #: 4
Sampling Method: 2.4" Drive Tube	Drilling Conditions: Sunny, Cool	Sheet: 1 of 1
Surface Conditions: slight slope to the SW		Logged By: sbm

Sample #	Blow Count	Depth	Soil Graph	Interval	Description and Comments
B-4-1 @ 2'	30	0		0-5'	Older Alluvial Soil (Qoa); Silty Gravelly Sand, medium brown, firm, dense, dry to damp, fine to medium grained.
				5-7'	Older Alluvial Soil (Qoa); Silty Pebbly Sand, tan brown, firm to tight, dense, dry to damp, fine to medium grained, some clay binder.
B-4-2 @ 7'	26			7-16'	Older Alluvial Soil (Qoa); Gravelly Silty Sand, reddish brown, tight, dense, damp, medium to coarse grained.
B-4-3 @ 12'	50	10			
B-4-4 @ 15'	36				
					Total Depth: 16'
		20			
		30			
		40			
		50			

Site: Sierra Highway at Crown Valley, Acton, Ca	Date: 2-14-14	M14-201	Plate: 5

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Boring Log

Drilling Method: 24" Auger	Water Level: Not Encountered	Boring #: 5
Sampling Method: None	Drilling Conditions: Sunny, Cool, windy	Sheet: 1 of 1
Surface Conditions: slight slope to the SW		Logged By: sbm

Sample #	Blow Count	Depth	Soil Graph	Interval	Description and Comments
		0		0-12'	Older Alluvial Soil (Qoa); Silty Sand, medium brown, firm, dense, dry to damp, medium grained slightly gravelly.
		10		12-16'	Older Alluvial Soil (Qoa); Silty Gravelly Sand, reddish brown, firm to tight, dense, dry to damp, fine to coarse grained.
				16-41'	Older Alluvial Soil (Qoa); Silty Sand, reddish brown, tight, dense, damp, fine to coarse grained, slightly gravelly.
		20			
		30			
		40			
					Total Depth: 41'
		50			

Site: Sierra Highway at Crown Valley, Acton, Ca	Date: 2-20-14	M14-201	Plate: 6

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Boring Log

Drilling Method: 24" Auger	Water Level: Not Encountered	Boring #: 6
Sampling Method: None	Drilling Conditions: Sunny, Cool, windy	Sheet: 1 of 1
Surface Conditions: slight slope to the SW		Logged By: sbm

Sample #	Blow Count	Depth	Soil Graph	Interval	Description and Comments
		0		0-2'	Artificial Fill (Af); Silty Gravelly Sand, medium brown, loose, damp,
				2-15'	Older Alluvial Soil (Qoa); Silty Gravelly Sand, reddish brown, firm to tight, dense, dry to damp, fine to coarse grained.
		10			
				15-30'	Older Alluvial Soil (Qoa); Silty Sand, strong reddish brown, tight, dense, damp, fine to coarse grained, slightly gravelly.
		20			
		30			Total Depth: 30'
		40			
		50			

Site: Sierra Highway at Crown Valley, Acton, Ca	Date: 2-20-14	M14-201	Plate: 7

MILLER GEOSCIENCES, INC. *Engineering Geologic / Geotechnical Services*
26831 Ruether Ave. Unit P, Santa Clarita, California 91351-6567 *(661) 299-2206 Fax (661) 299-2207*

Boring Log

Drilling Method: 24" Auger	Water Level: Not Encountered	Boring #: 7
Sampling Method: None	Drilling Conditions: Sunny, Cool, windy	Sheet: 1 of 1
Surface Conditions: slight slope to the SW		Logged By: sbm

Sample #	Blow Count	Depth	Soil Graph	Interval	Description and Comments
		0		0-2'	Artificial Fill (Af); Silty Gravelly Sand, medium brown, loose, damp,
				2-11'	Older Alluvial Soil (Qoa); Silty Gravelly Sand, reddish brown, firm to tight, dense, dry to damp, fine to coarse grained.
		10		15-30'	Older Alluvial Soil (Qoa); Silty Sand, strong reddish brown, tight, dense, damp, fine to coarse grained, slightly gravelly.
		20			
		30			Older Alluvial Soil (Qoa); Silty Gravelly Sand, reddish brown, tight, dense, damp, fine to coarse grained.
					Total Depth: 30'
		40			
		50			

Site: Sierra Highway at Crown Valley, Acton, Ca	Date: 2-20-14	M14-201	Plate: 8

MILLER GEOSCIENCES, INC. *Engineering Geologic / Geotechnical Services*
26831 Ruether Ave. Unit P, Santa Clarita, California 91351-6567 *(661) 299-2206 Fax (661) 299-2207*

Boring Log

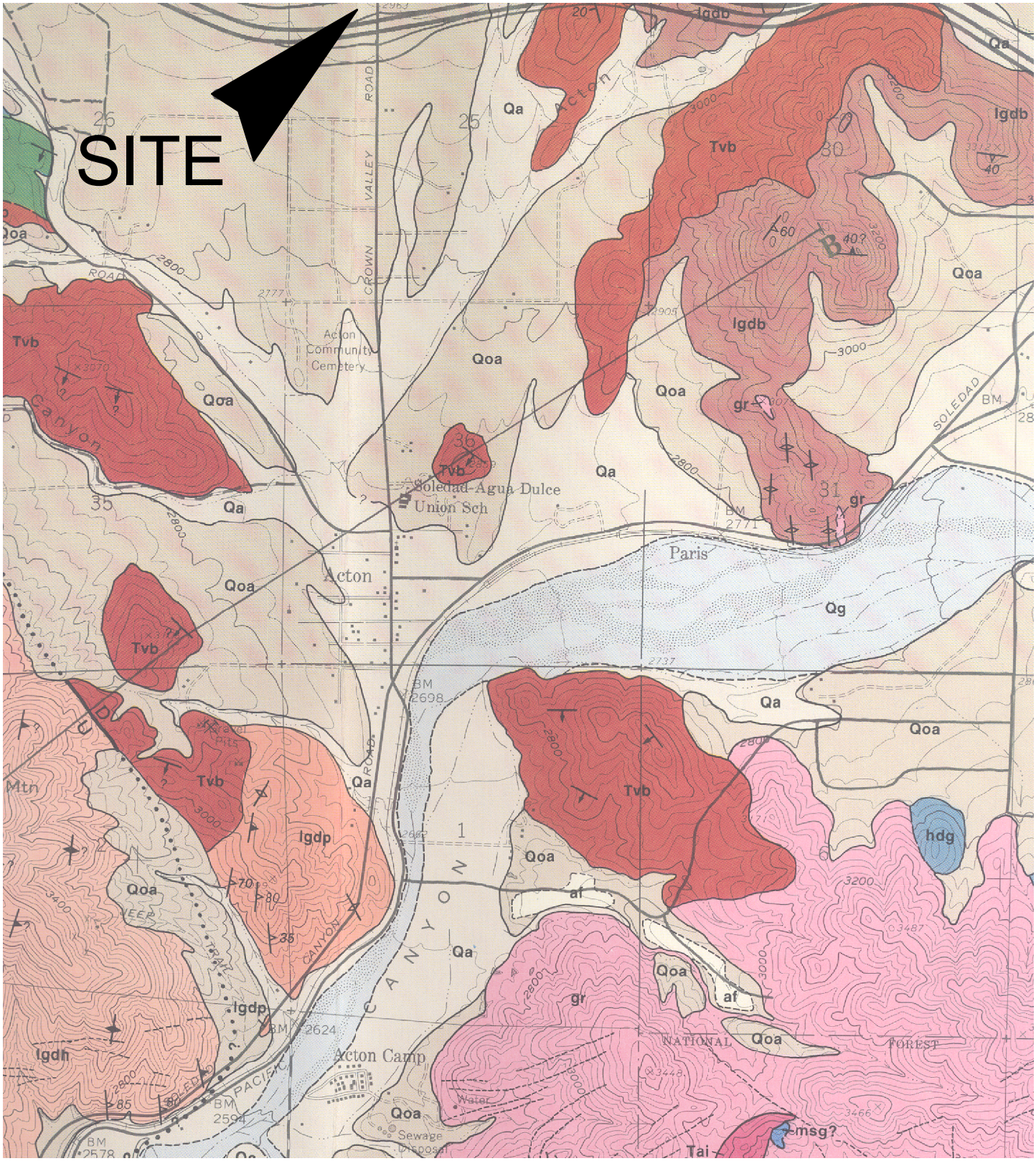
Drilling Method: 24" Auger	Water Level: Not Encountered	Boring #: 8
Sampling Method: None	Drilling Conditions: Sunny, Cool, windy	Sheet: 1 of 1
Surface Conditions: slight slope to the SW		Logged By: sbm

Sample #	Blow Count	Depth	Soil Graph	Interval	Description and Comments
		0		0-10'	Older Alluvial Soil (Qoa); Silty Gravelly Sand, reddish brown, firm to tight, dense, dry to damp, fine to coarse grained.
		10		10-26'	Older Alluvial Soil (Qoa); Silty Sand, strong reddish brown, tight, dense, damp, fine to coarse grained, slightly gravelly.
		20			
					Older Alluvial Soil (Qoa); Silty Gravelly Sand, reddish brown, tight, dense, damp, coarse grained.
		30			Total Depth: 30'
		40			
		50			

Site: Sierra Highway at Crown Valley, Acton, Ca	Date: 2-20-14	M14-201	Plate: 9

MILLER GEOSCIENCES, INC. *Engineering Geologic / Geotechnical Services*
26831 Ruether Ave. Unit P, Santa Clarita, California 91351-6567 *(661) 299-2206 Fax (661) 299-2207*

Regional Geologic Map



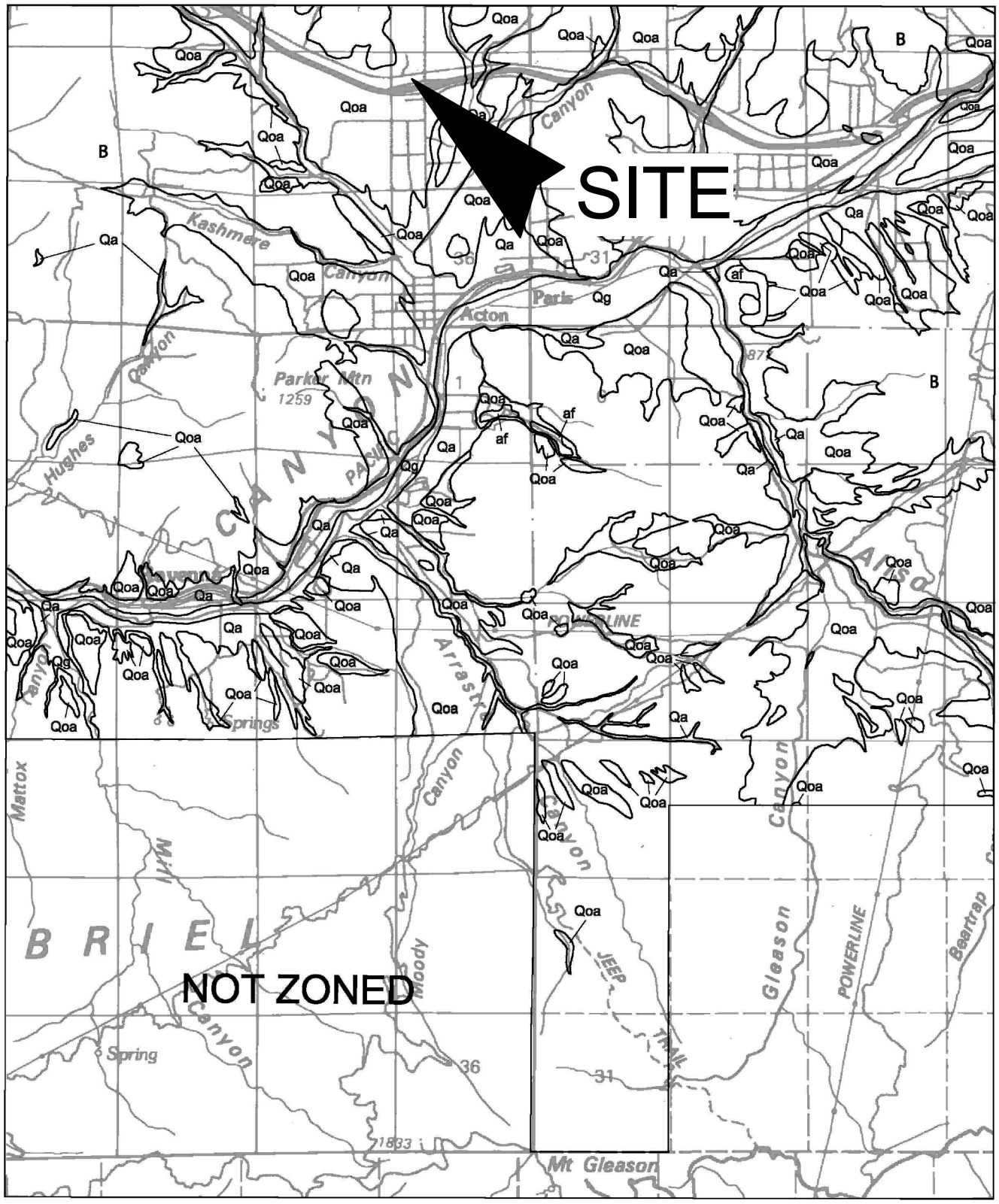
Ref: Dibblee, T.W., and Ehrenspeck, H.E., ed., 1996, Geologic Map of the Acton Quadrangle, Los Angeles County, California: Dibblee Geologic Foundation Map DF-59, scale 1:24,000.

Scale: 1" = 2000'

SITE: Sierra Highway @ Crown Valley Road, Acton	DATE: 3-14	M14-201	PLATE 10

MILLER GEOSCIENCES, INC. GEOLOGIC AND GEOTECHNICAL SERVICES

26831 Ruether Ave., Suite P, Santa Clarita, California, 91351 (661) 299-2206 *Fax (661) 299-2207



Base map enlarged from U.S.G.S. 30 x 60-minute series

ACTON QUADRANGLE

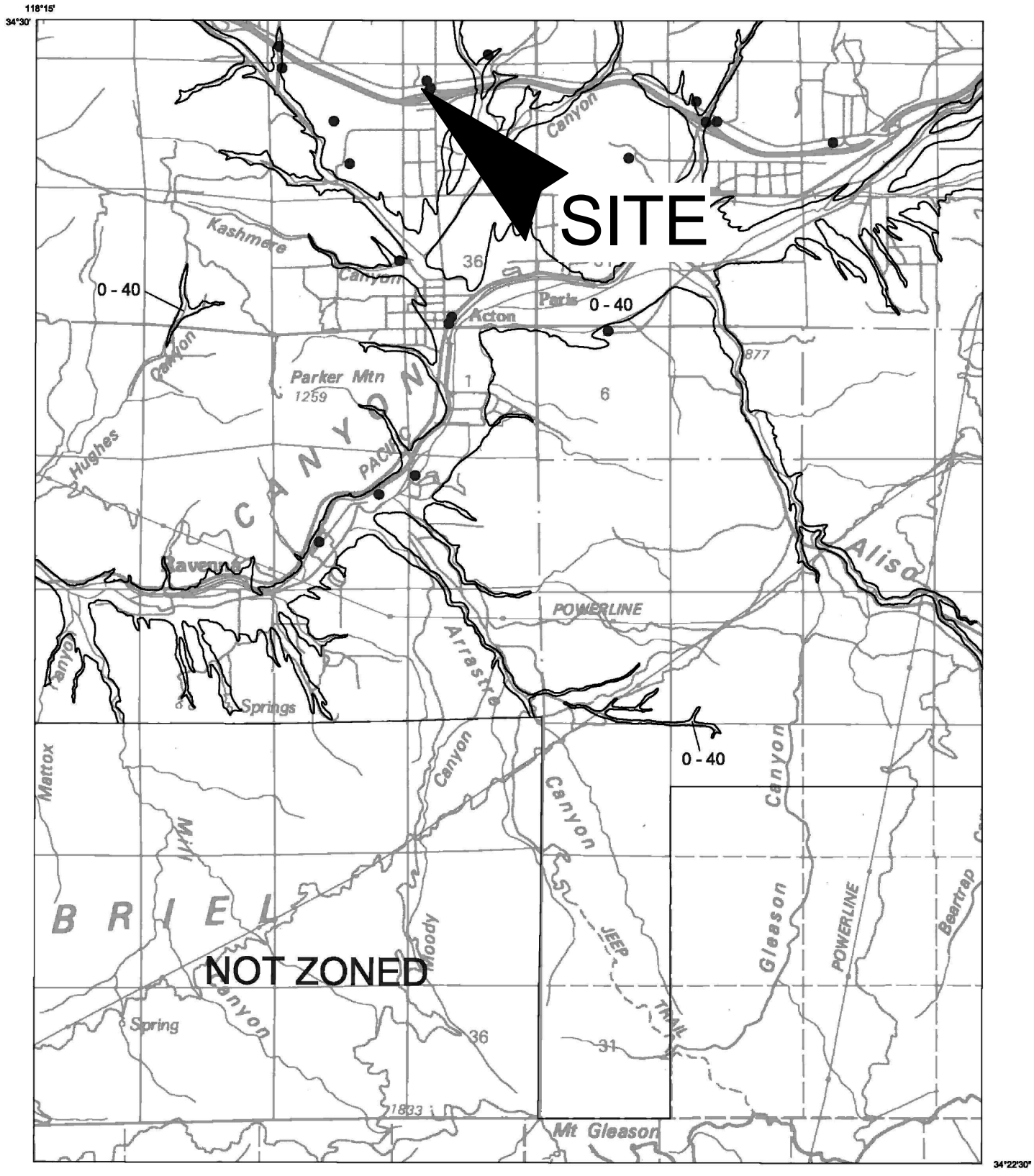
SCALE

N

B = Pre-Quaternary bedrock.
See "Bedrock and Surficial Geology" in Section 1 of report for descriptions of units.

Plate 11

Plate 1.1 Quaternary Geologic Map of portions of the Acton 7.5-Minute Quadrangle, California. Modified from Dibblee (1996).



Base map enlarged from U.S.G.S. 30 x 60-minute series

ACTON QUADRANGLE

SCALE

N

0 - 40 Depth to ground water, in feet

See "Bedrock and Surficial Geology" in Section 1 of report for descriptions of units.

● Geotechnical borings and trenches used in liquefaction evaluation

Plate 12

Plate 1.2 Depth to historically high ground water, and locations of boreholes and trenches used in this study, Acton 7.5-Minute Quadrangle, California.

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*                    *
*    E Q F A U L T   *
*                    *
*    Version 3.00    *
*                    *
**********************
```

DETERMINISTIC ESTIMATION OF
PEAK ACCELERATION FROM DIGITIZED FAULTS

JOB NUMBER: M14-201

DATE: 03-21-2014

JOB NAME: Sierra Hwy @ Crown Valley

CALCULATION NAME:

FAULT-DATA-FILE NAME: CDMGFLTE.DAT

SITE COORDINATES:
   SITE LATITUDE: 34.4923
   SITE LONGITUDE: 118.2001

SEARCH RADIUS: 100 mi

ATTENUATION RELATION: 7) Bozorgnia Campbell Niazi (1999) Hor.-Pleist. Soil-Uncor.
   UNCERTAINTY (M=Median, S=Sigma): M   Number of Sigmas: 0.0
   DISTANCE MEASURE: cdist
   SCOND: 0
   Basement Depth: 5.00 km   Campbell SSR: 0   Campbell SHR: 0
   COMPUTE PEAK HORIZONTAL ACCELERATION

FAULT-DATA FILE USED: CDMGFLTE.DAT

MINIMUM DEPTH VALUE (km): 3.0

EQFAULT SUMMARY

DETERMINISTIC SITE PARAMETERS

ABBREVIATED FAULT NAME	APPROXIMATE DISTANCE mi (km)	ESTIMATED MAX. EARTHQUAKE EVENT: MAXIMUM EARTHQUAKE MAG.(Mw)	ESTIMATED MAX. EARTHQUAKE EVENT: PEAK SITE ACCEL. g	ESTIMATED MAX. EARTHQUAKE EVENT: EST. SITE INTENSITY MOD.MERC.
SAN ANDREAS - 1857 Rupture	6.1(9.8)	7.8	0.508	X
SAN ANDREAS - Mojave	6.1(9.8)	7.1	0.432	X
SIERRA MADRE	10.7(17.2)	7.0	0.333	IX
SIERRA MADRE (San Fernando)	11.8(19.0)	6.7	0.253	IX
SAN GABRIEL	12.5(20.1)	7.0	0.241	IX
VERDUGO	14.7(23.6)	6.7	0.200	VIII
CLAMSHELL-SAWPIT	18.3(29.4)	6.5	0.134	VIII
NORTHRIDGE (E. Oak Ridge)	19.2(30.9)	6.9	0.192	VIII
SANTA SUSANA	19.4(31.2)	6.6	0.134	VIII
HOLSER	21.1(34.0)	6.5	0.112	VII
SAN ANDREAS - Carrizo	22.7(36.6)	7.2	0.144	VIII
RAYMOND	24.2(39.0)	6.5	0.094	VII
HOLLYWOOD	24.4(39.2)	6.4	0.087	VII
ELYSIAN PARK THRUST	27.4(44.1)	6.7	0.107	VII
SANTA MONICA	30.4(48.9)	6.6	0.077	VII
OAK RIDGE (Onshore)	30.7(49.4)	6.9	0.095	VII
CUCAMONGA	30.8(49.5)	7.0	0.103	VII
SAN CAYETANO	32.7(52.6)	6.8	0.082	VII
NEWPORT-INGLEWOOD (L.A.Basin)	33.2(53.5)	6.9	0.072	VII
SAN JOSE	35.0(56.3)	6.5	0.059	VI
COMPTON THRUST	36.0(58.0)	6.8	0.082	VII
MALIBU COAST	36.1(58.1)	6.7	0.066	VI
WHITTIER	36.5(58.8)	6.8	0.059	VI
SIMI-SANTA ROSA	36.8(59.3)	6.7	0.065	VI
GARLOCK (West)	38.2(61.5)	7.1	0.071	VI
SAN ANDREAS - Southern	40.5(65.2)	7.4	0.083	VII
SAN ANDREAS - San Bernardino	40.5(65.2)	7.3	0.077	VII
SANTA YNEZ (East)	40.6(65.3)	7.0	0.061	VI
CHINO-CENTRAL AVE. (Elsinore)	40.9(65.9)	6.7	0.057	VI
PALOS VERDES	41.3(66.5)	7.1	0.064	VI
ANACAPA-DUME	42.1(67.8)	7.3	0.087	VII
SAN JACINTO-SAN BERNARDINO	43.0(69.2)	6.7	0.044	VI
CLEGHORN	43.7(70.4)	6.5	0.037	V
PLEITO THRUST	45.1(72.6)	7.2	0.074	VII
BIG PINE	51.3(82.5)	6.7	0.035	V
WHITE WOLF	52.4(84.3)	7.2	0.061	VI
HELENDALE - S. LOCKHARDT	52.6(84.6)	7.1	0.047	VI
ELSINORE-GLEN IVY	54.6(87.8)	6.8	0.035	V
VENTURA - PITAS POINT	54.7(88.1)	6.8	0.042	VI
M.RIDGE-ARROYO PARIDA-SANTA ANA	55.4(89.2)	6.7	0.038	V

DETERMINISTIC SITE PARAMETERS

ABBREVIATED FAULT NAME	APPROXIMATE DISTANCE mi (km)	ESTIMATED MAX. EARTHQUAKE EVENT: MAXIMUM EARTHQUAKE MAG.(Mw)	ESTIMATED MAX. EARTHQUAKE EVENT: PEAK SITE ACCEL. g	ESTIMATED MAX. EARTHQUAKE EVENT: EST. SITE INTENSITY MOD.MERC.
NORTH FRONTAL FAULT ZONE (West)	55.6(89.5)	7.0	0.048	VI
LENWOOD-LOCKHART-OLD WOMAN SPRGS	55.7(89.6)	7.3	0.051	VI
GARLOCK (East)	55.7(89.7)	7.3	0.051	VI
RED MOUNTAIN	62.6(100.8)	6.8	0.035	V
CHANNEL IS. THRUST (Eastern)	63.2(101.7)	7.4	0.064	VI
MONTALVO-OAK RIDGE TREND	63.6(102.3)	6.6	0.033	V
SAN JACINTO-SAN JACINTO VALLEY	63.9(102.9)	6.9	0.031	V
OAK RIDGE(Blind Thrust Offshore)	64.2(103.4)	6.9	0.042	VI
NEWPORT-INGLEWOOD (Offshore)	64.4(103.6)	6.9	0.031	V
GRAVEL HILLS - HARPER LAKE	67.7(109.0)	6.9	0.029	V
So. SIERRA NEVADA	72.3(116.3)	7.1	0.037	V
BLACKWATER	75.7(121.8)	6.9	0.025	V
ELSINORE-TEMECULA	76.2(122.6)	6.8	0.023	IV
LANDERS	79.9(128.6)	7.3	0.032	V
NORTH FRONTAL FAULT ZONE (East)	80.6(129.7)	6.7	0.023	IV
CALICO - HIDALGO	80.7(129.8)	7.1	0.027	V
SANTA YNEZ (West)	81.6(131.3)	6.9	0.023	IV
SANTA CRUZ ISLAND	82.6(132.9)	6.8	0.025	V
NORTH CHANNEL SLOPE	83.1(133.7)	7.1	0.031	V
LITTLE LAKE	83.3(134.0)	6.7	0.019	IV
JOHNSON VALLEY (Northern)	85.9(138.2)	6.7	0.018	IV
CORONADO BANK	86.0(138.4)	7.4	0.032	V
PINTO MOUNTAIN	89.4(143.8)	7.0	0.022	IV
SAN JACINTO-ANZA	89.7(144.3)	7.2	0.025	V
EMERSON So. - COPPER MTN.	94.7(152.4)	6.9	0.019	IV
TANK CANYON	96.1(154.6)	6.4	0.015	IV

-END OF SEARCH- 66 FAULTS FOUND WITHIN THE SPECIFIED SEARCH RADIUS.

THE SAN ANDREAS - Mojave FAULT IS CLOSEST TO THE SITE.
IT IS ABOUT 6.1 MILES (9.8 km) AWAY.

LARGEST MAXIMUM-EARTHQUAKE SITE ACCELERATION: 0.5084 g

CALIFORNIA FAULT MAP

Sierra Hwy @ Crown Valley

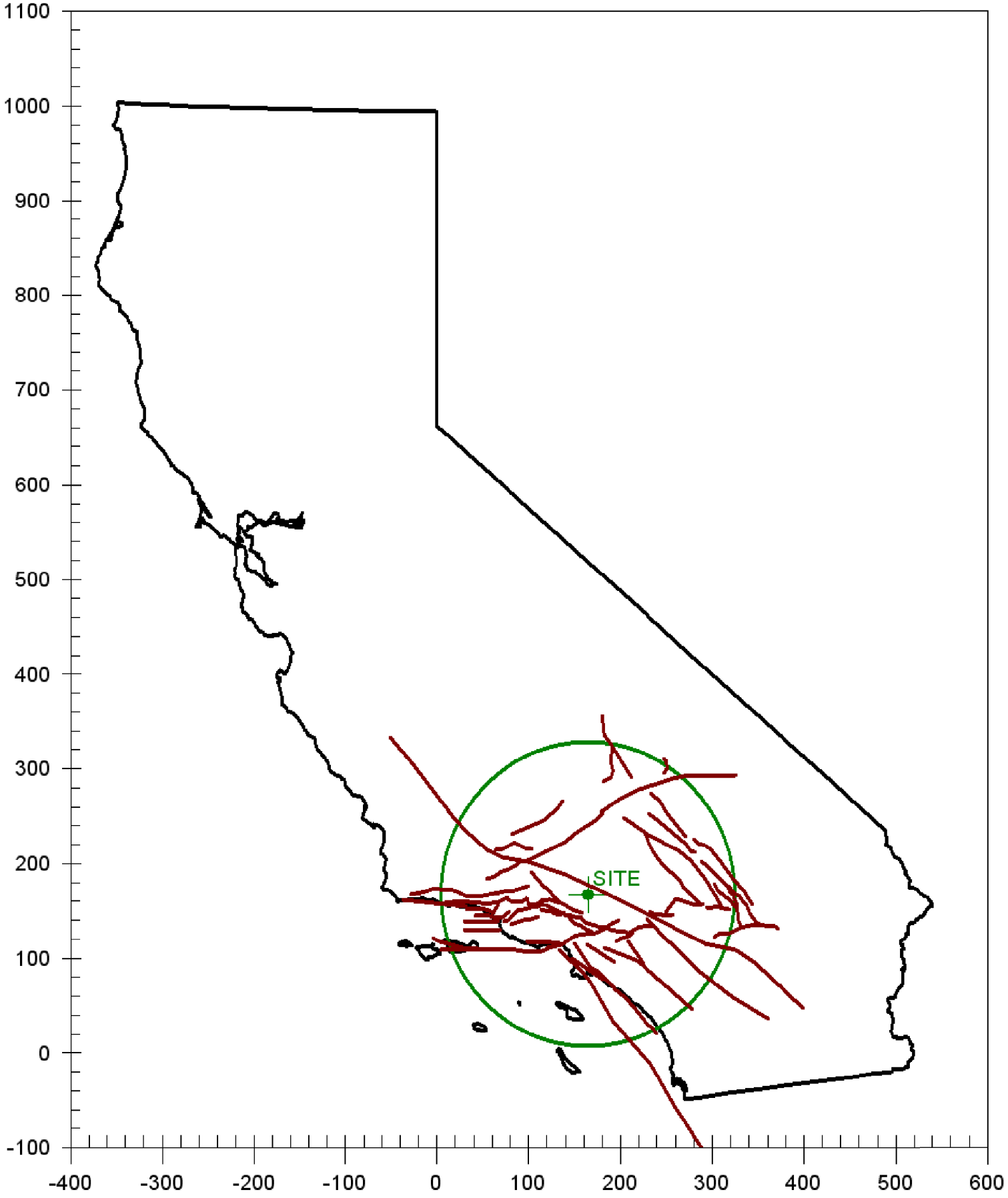
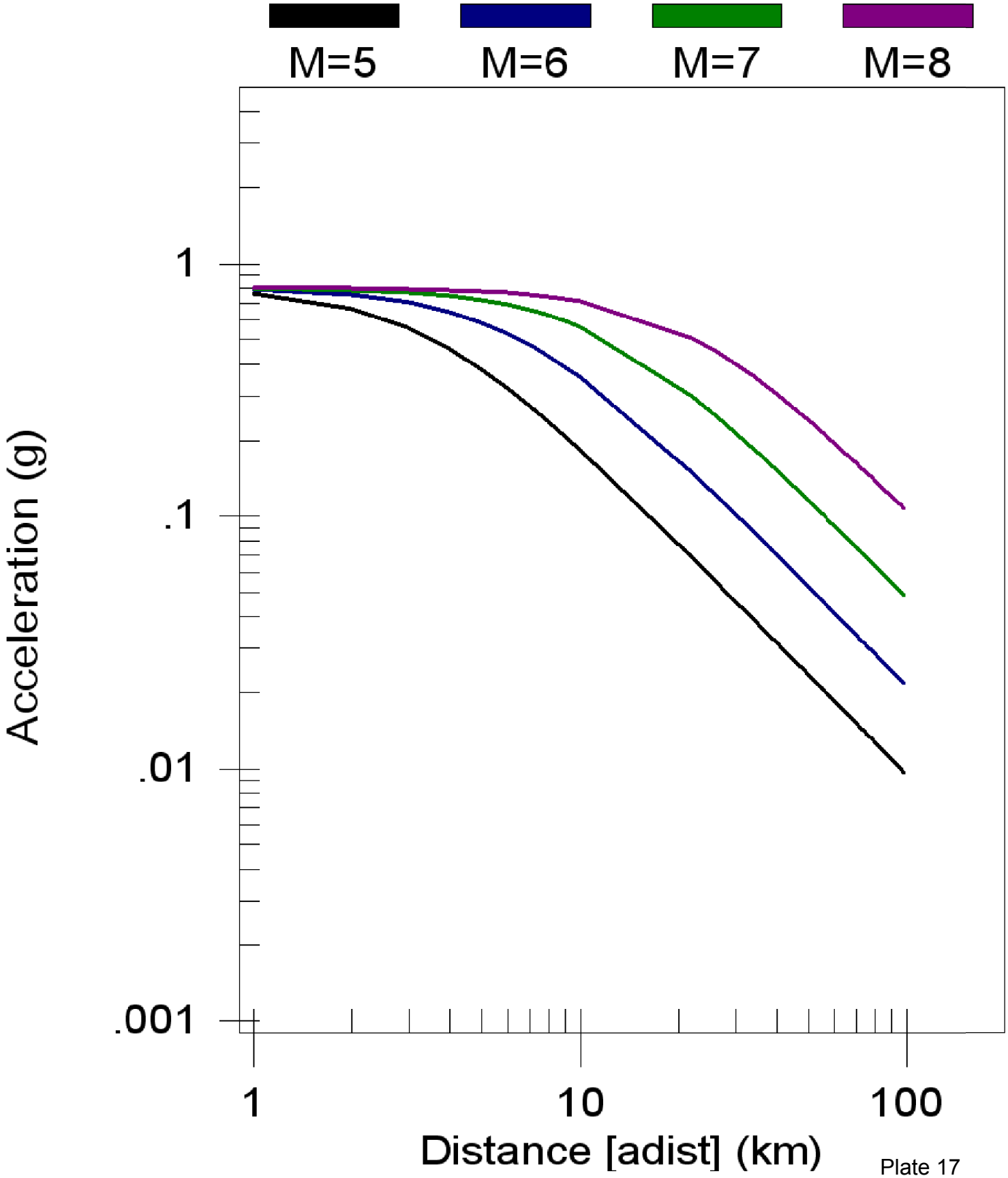


Plate 16

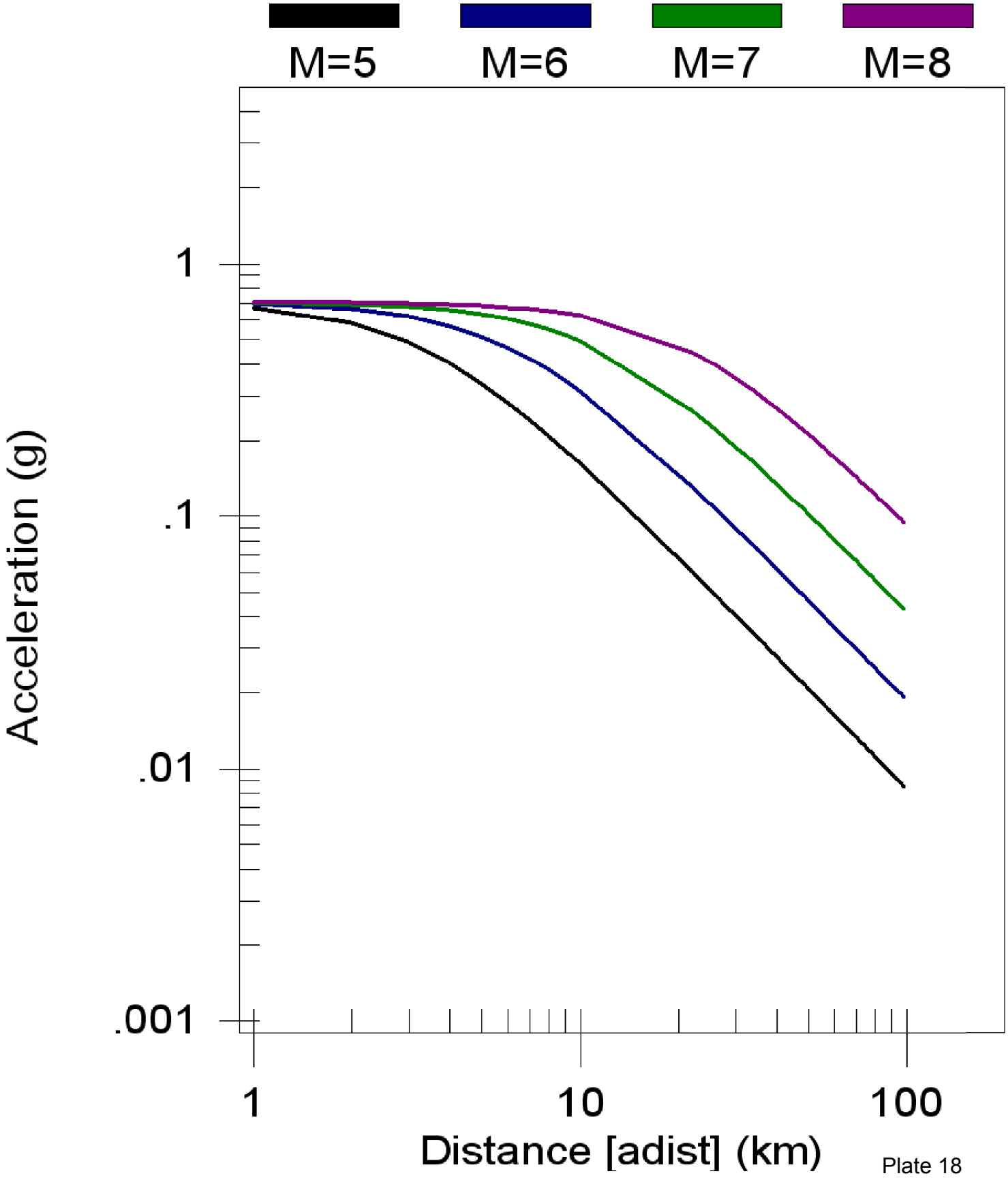
BLIND-THRUST FAULTS

7) Bozorgnia Campbell Niazi (1999) Hor.-Pleist. Soil-Uncor.



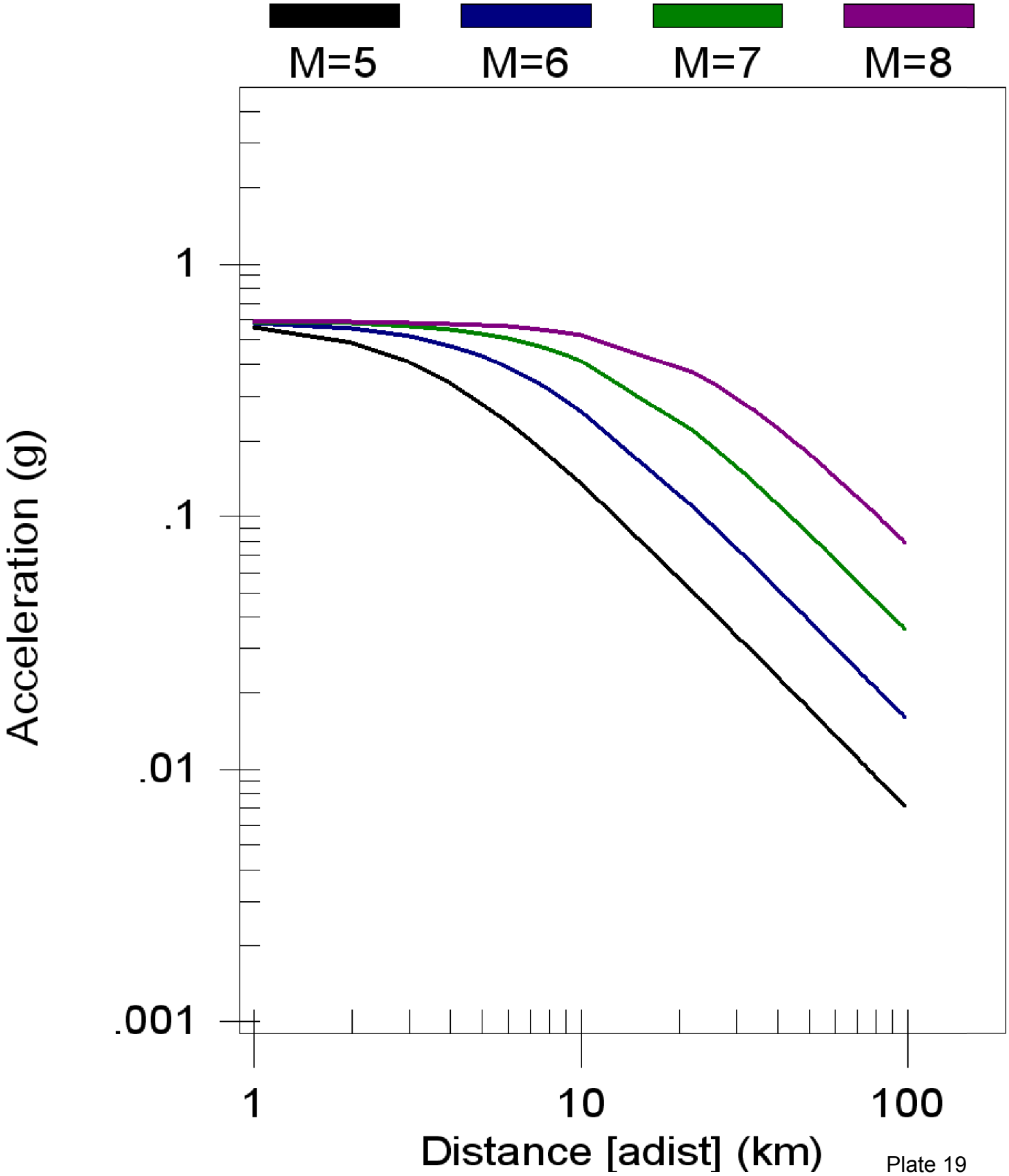
DIP-SLIP FAULTS

7) Bozorgnia Campbell Niazi (1999) Hor.-Pleist. Soil-Uncor.



STRIKE-SLIP FAULTS

7) Bozorgnia Campbell Niazi (1999) Hor.-Pleist. Soil-Uncor.



EARTHQUAKE MAGNITUDES & DISTANCES

Sierra Hwy @ Crown Valley

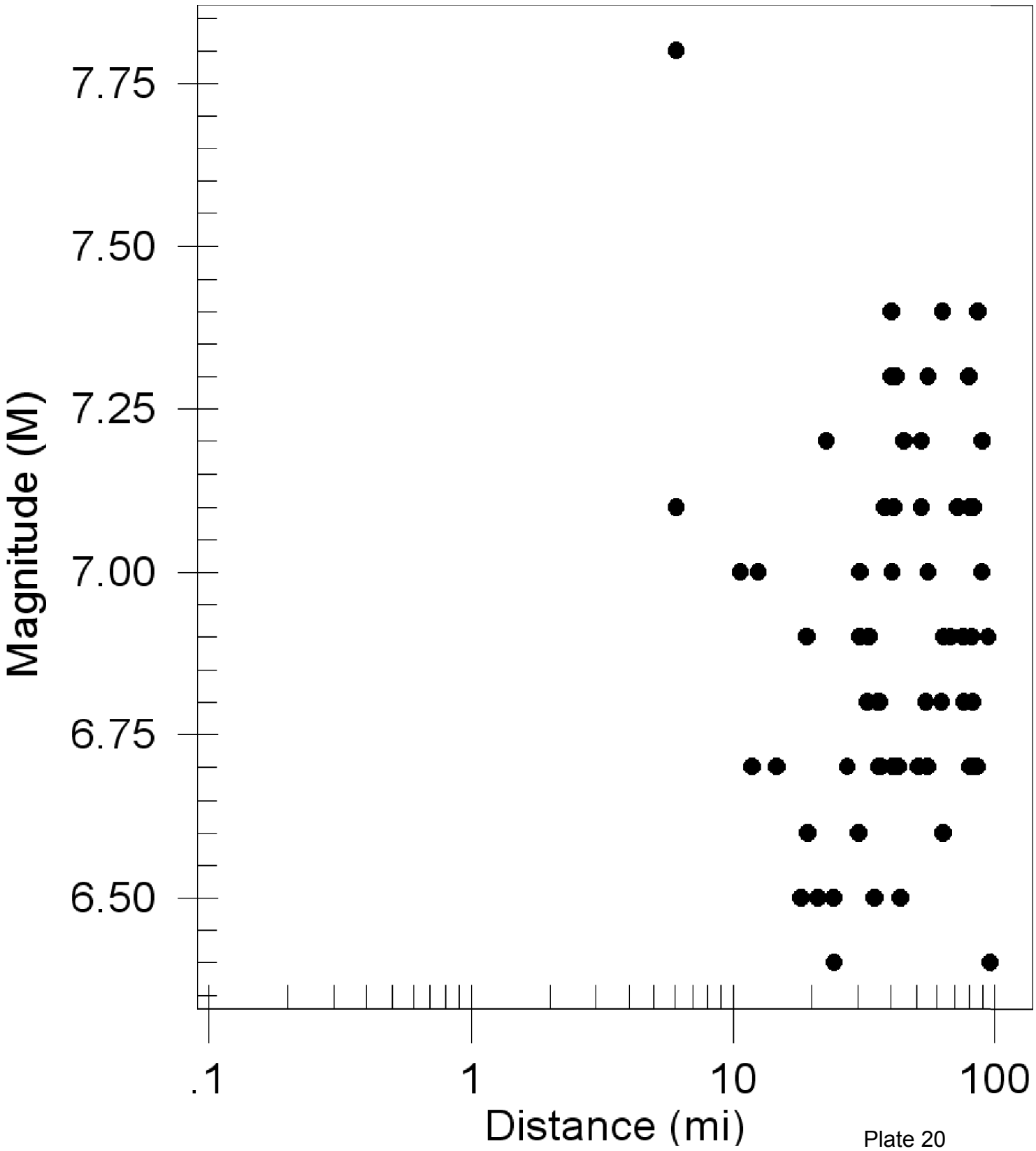


Plate 20

MAXIMUM EARTHQUAKES

Sierra Hwy @ Crown Valley

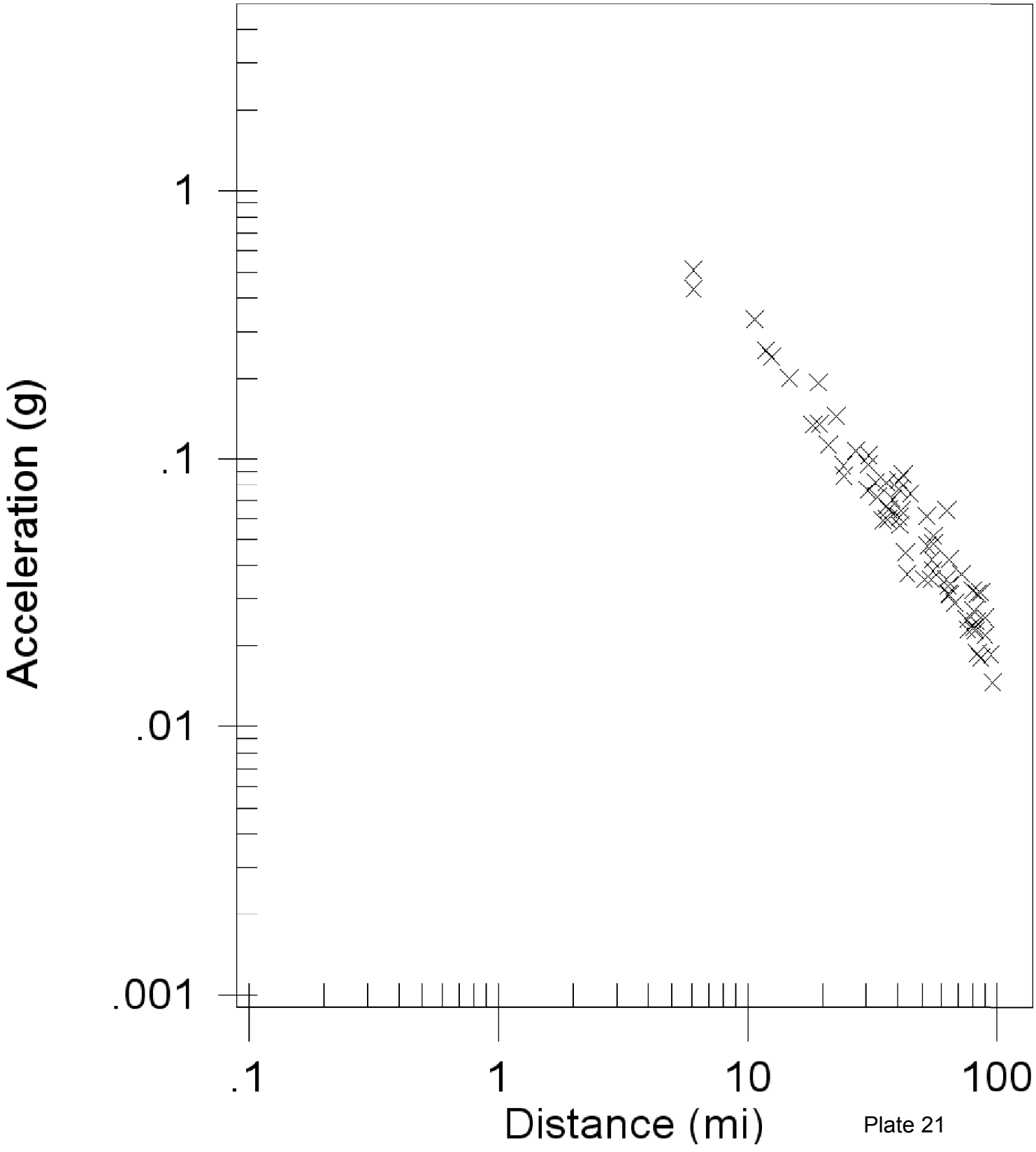


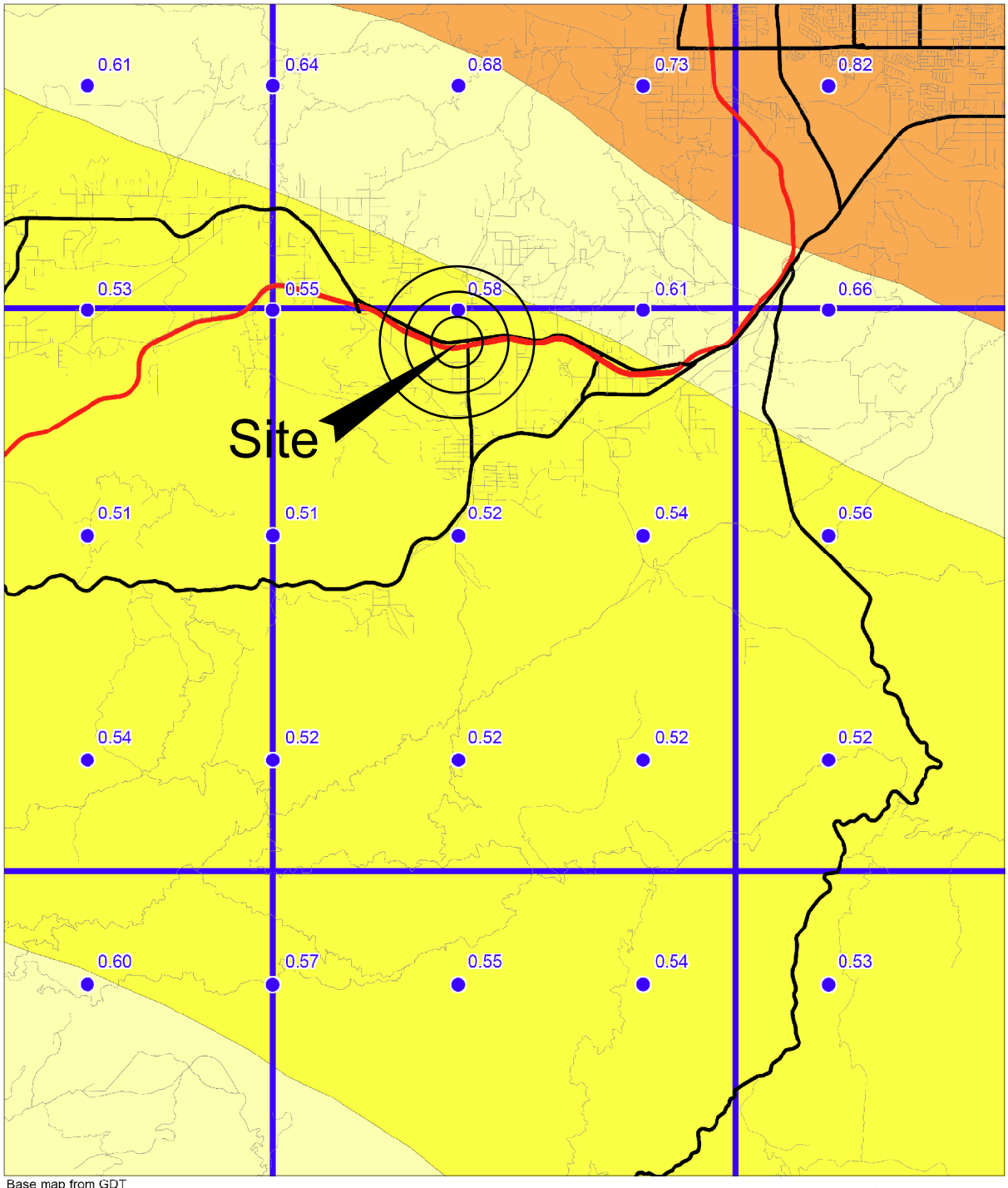
Plate 21

ACTON 7.5 MINUTE QUADRANGLE AND PORTIONS OF ADJACENT QUADRANGLES

10% EXCEEDANCE IN 50 YEARS PEAK GROUND ACCELERATION (g)

1998

ALLUVIUM CONDITIONS



Base map from GDT

0 1.5 3
Miles

Department of Conservation
California Geological Survey

Figure 3.3

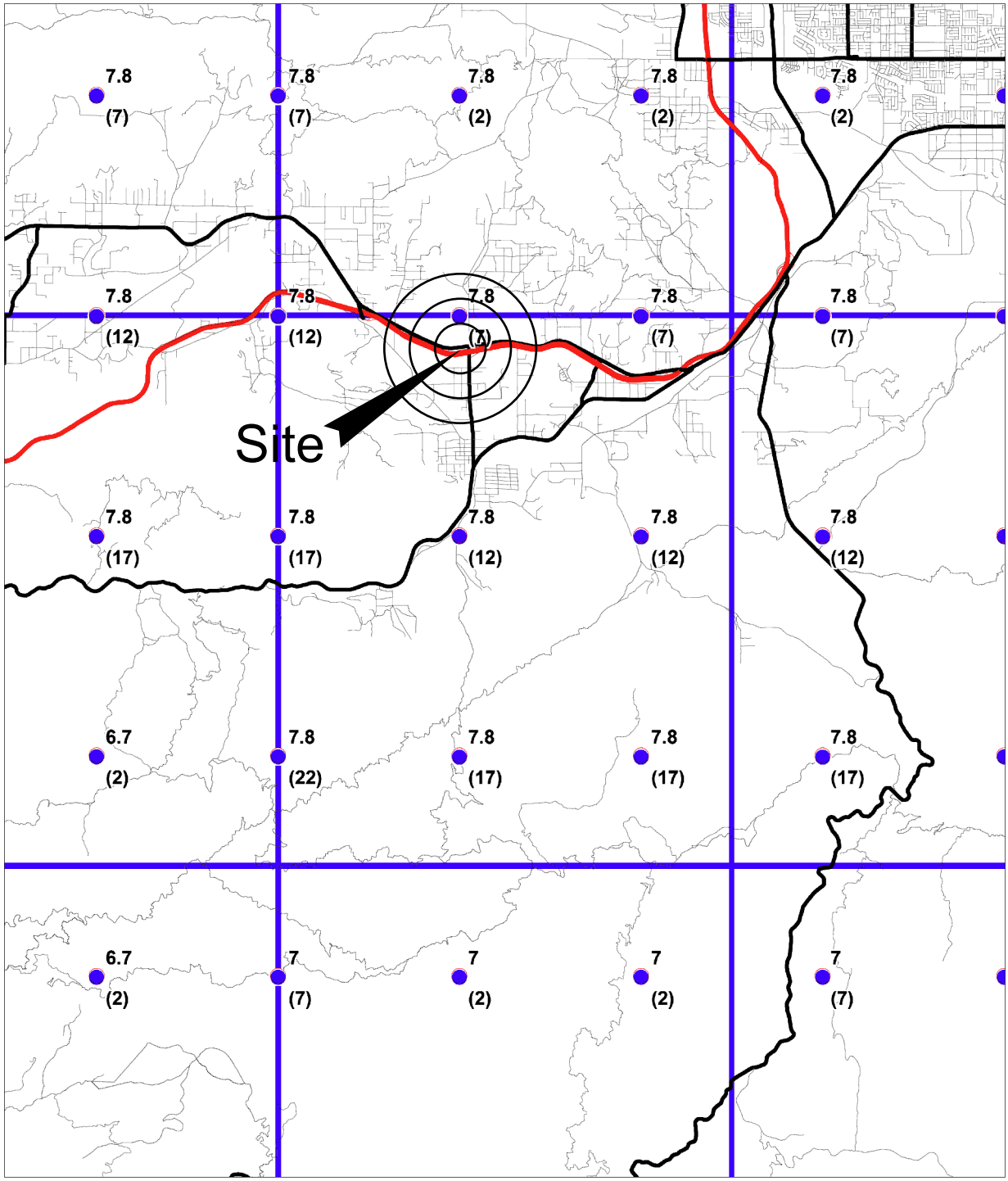
Plate 22

ACTON 7.5 MINUTE QUADRANGLE AND PORTIONS OF
ADJACENT QUADRANGLES

10% EXCEEDANCE IN 50 YEARS PEAK GROUND ACCELERATION

1998

PREDOMINANT EARTHQUAKE
Magnitude (Mw)
(Distance (km))



Base map from GDT

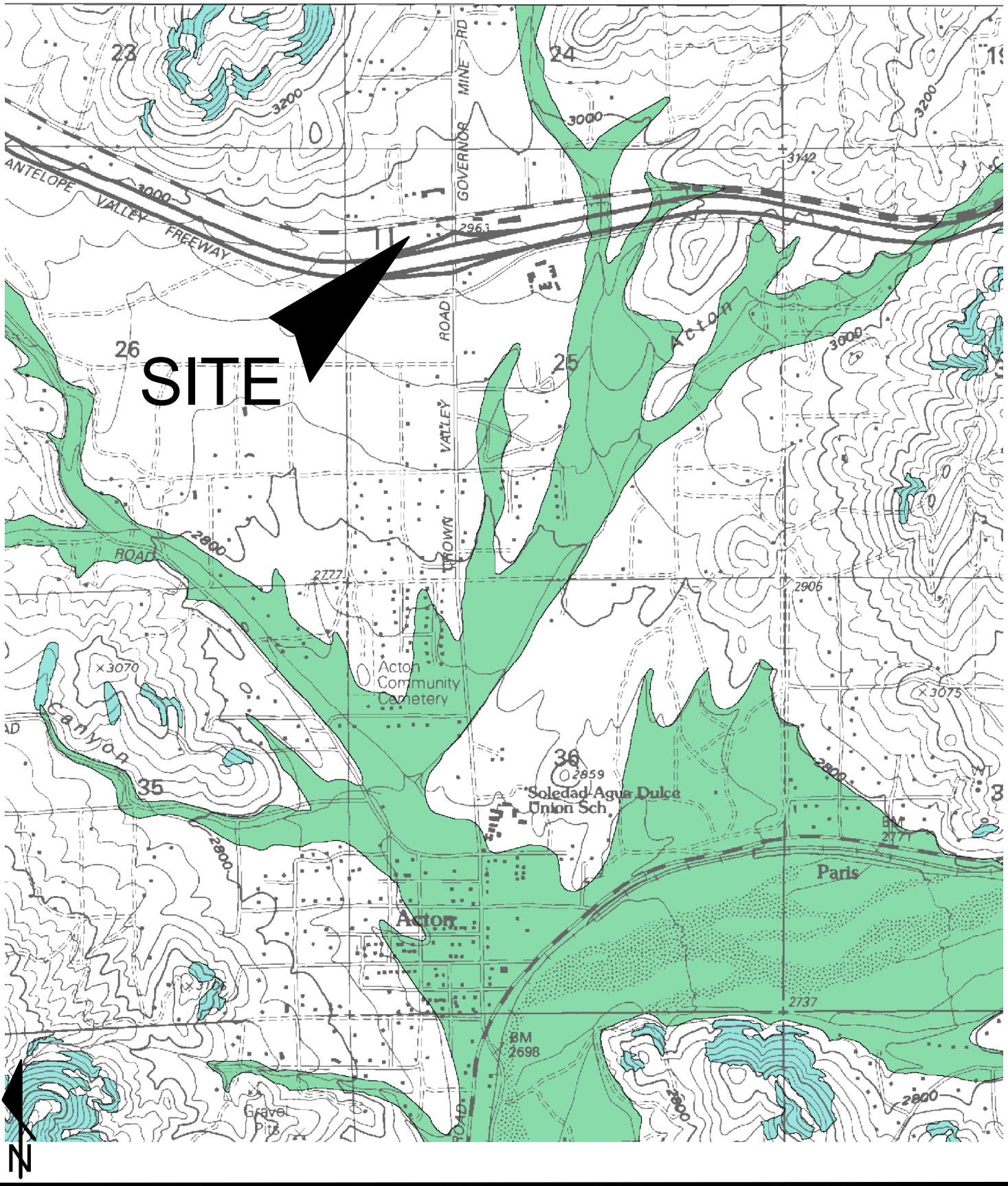
0 1.5 3
Miles

Department of Conservation
California Geological Survey

Figure 3.4

Plate 23

Regional Geologic Map



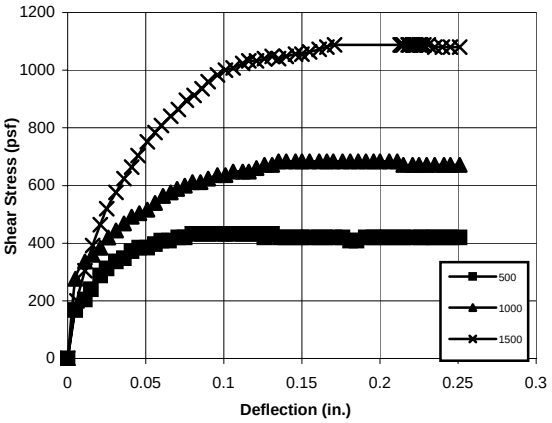
SITE: Sierra Highway @ Crown Valley Road, Acton	DATE: 3-14	M14-201	PLATE 24

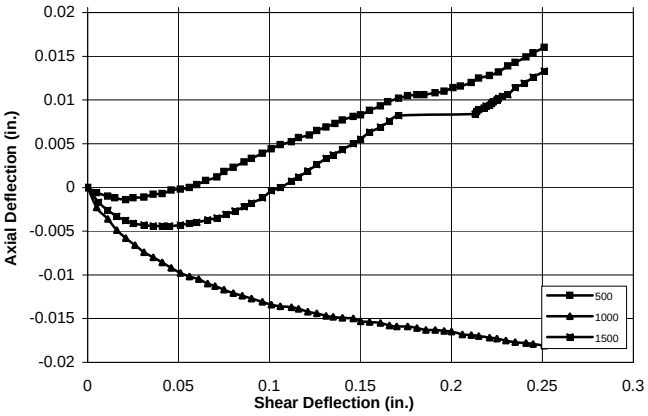
MILLER GEOSCIENCES, INC. *GEOLOGIC AND GEOTECHNICAL SERVICES*

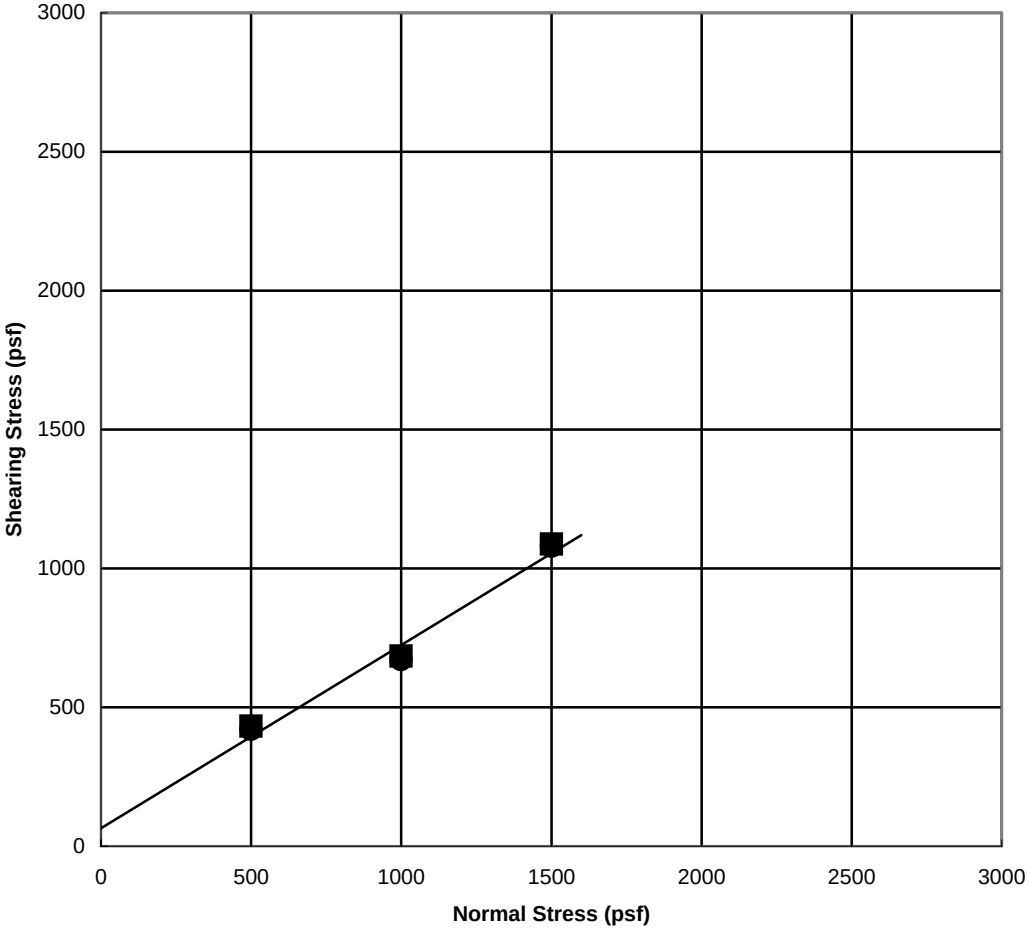
*26831 Ruether Ave., Suite P, Santa Clarita, California, 91351 (661) 299-2206 *Fax (661) 299-2207*

APPENDIX B

Direct Shear Test







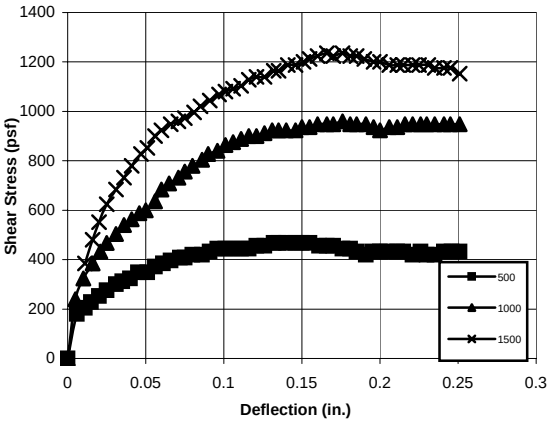
W_t=	2	%	γ_d=	113	pcf	C=	60	psf	ϕ=	33 °
W_s=	16	%	γ_s=	130	pcf	C_p=	80	psf	ϕ_p=	33 °

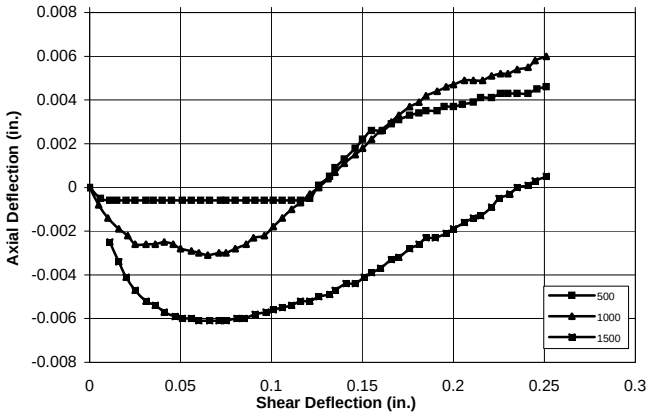
Undisturbed XX Remolded

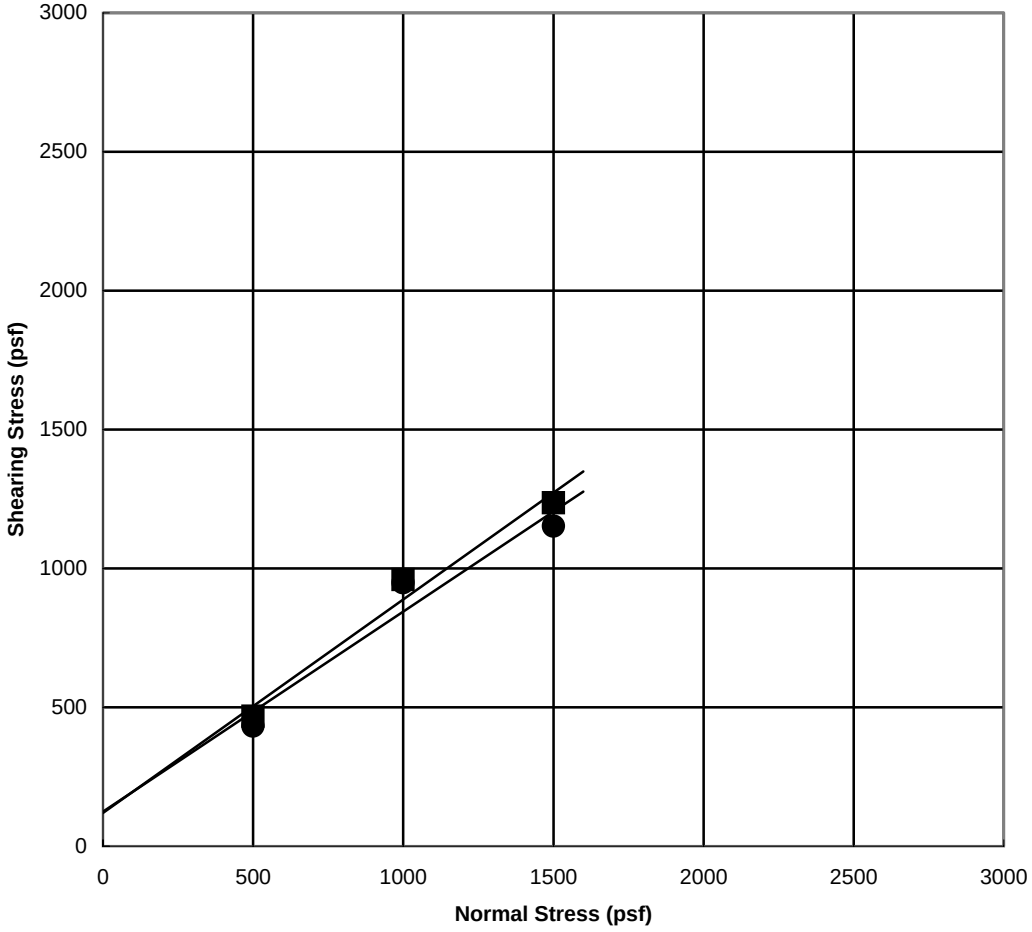
Classification: Older Alluvium Sample #: B4-1 @ 2'

Site:	Date:	Job:	Plate:
Sierra Highway at Crown Valley, Acton, CA	Feb, 2014	M14-201	25

Direct Shear Test







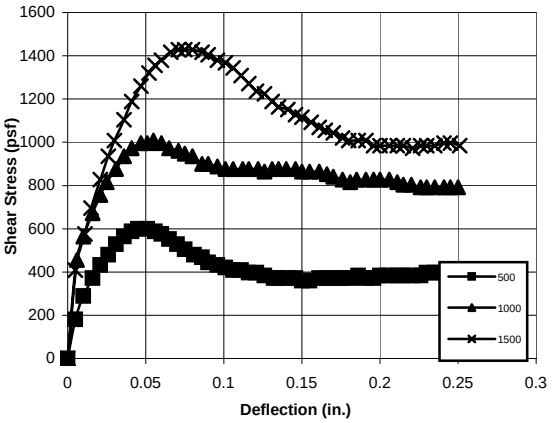
W_t=	2	%	γ_d=	110	pcf	C=	120	psf	ϕ=	36 ^{o}
W_s=	15	%	γ_s=	127	pcf	C_p=	120	psf	ϕ_p=	38 ^{o}

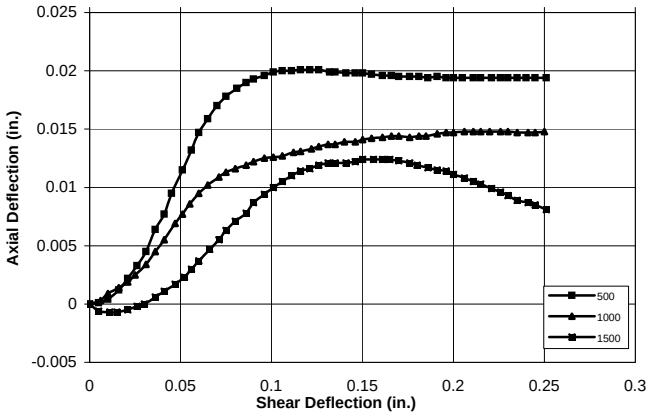
Undisturbed XX Remolded

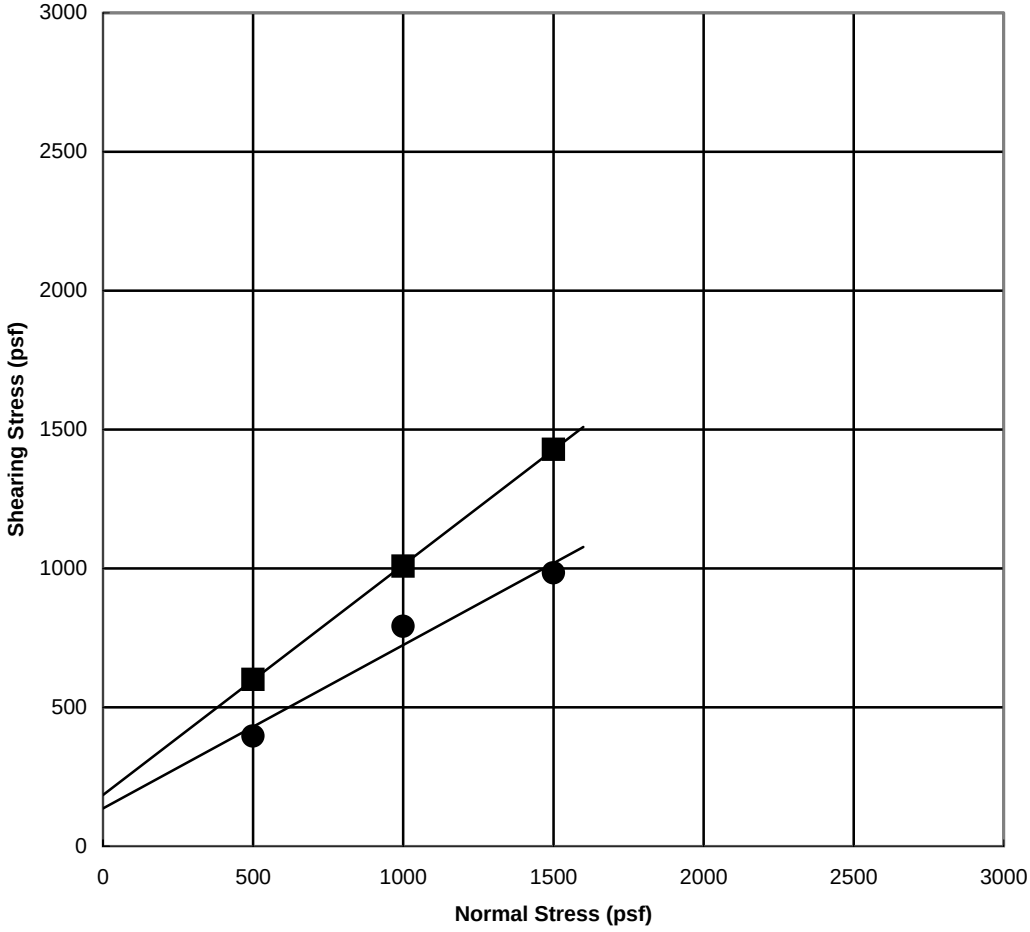
Classification: Older Alluvium Sample #: B2-1@5'

Site:	Date:	Job:	Plate:
Sierra Highway at Crown Valley, Acton, Ca	Feb-14	M14-201	27

Direct Shear Test







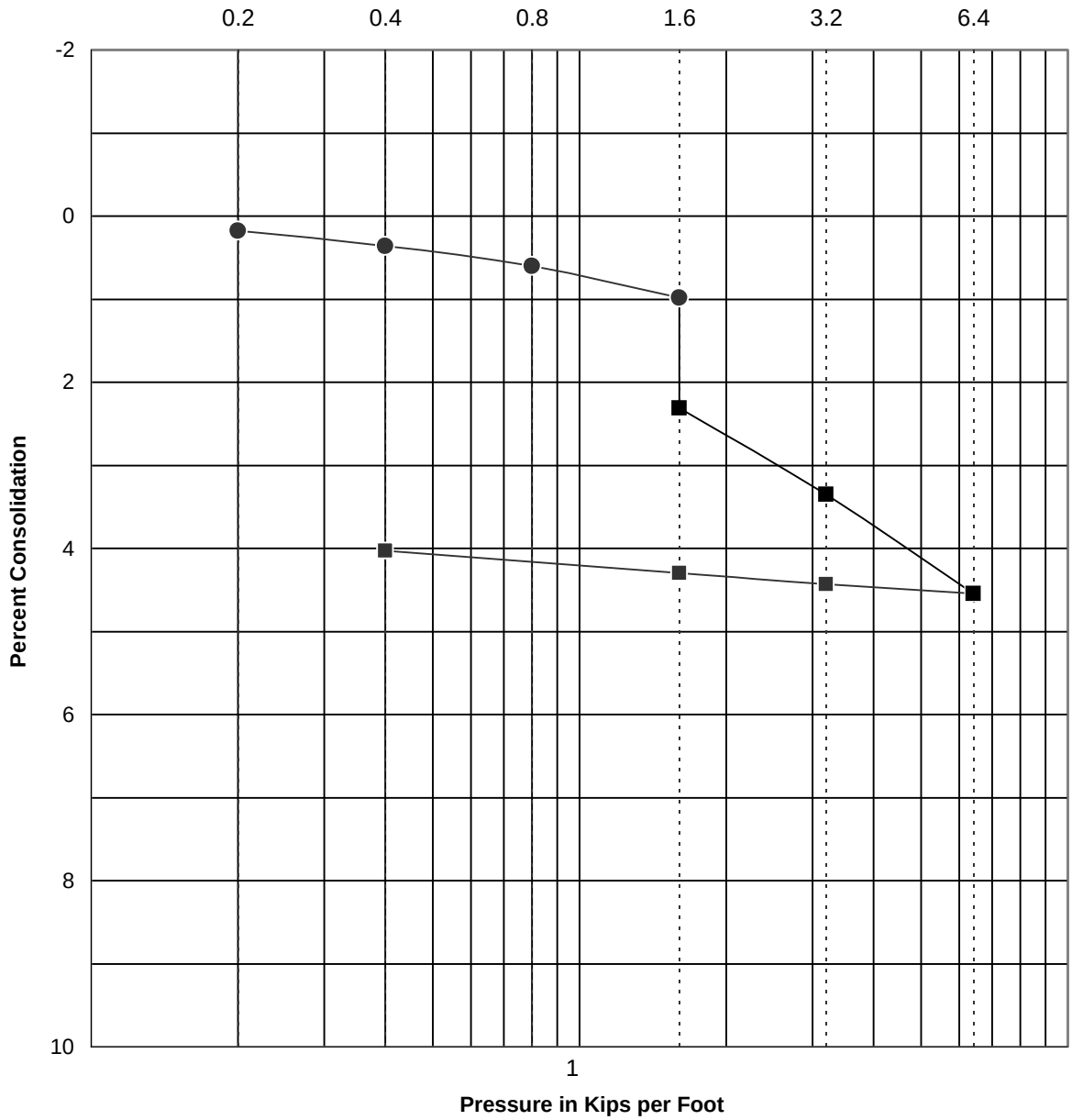
W_t=	10	%	γ_d=	118	pcf	C=	140	psf	ϕ=	30 ^{o}
W_s=	15	%	γ_s=	135	pcf	C_p=	180	psf	ϕ_p=	40 ^{o}

Undisturbed Remolded to 90%

Classification: Older Alluvium Sample #:

Site:	Date:	Job:	Plate:
Sierra Highway at Crown Valley, Acton, Ca	Feb-14	M14-201	27

Consolidation Test Results



W_t= 3 % γ_d= 115 pcf W_s= 13 % γ_s= 130 pcf

Classification: SM

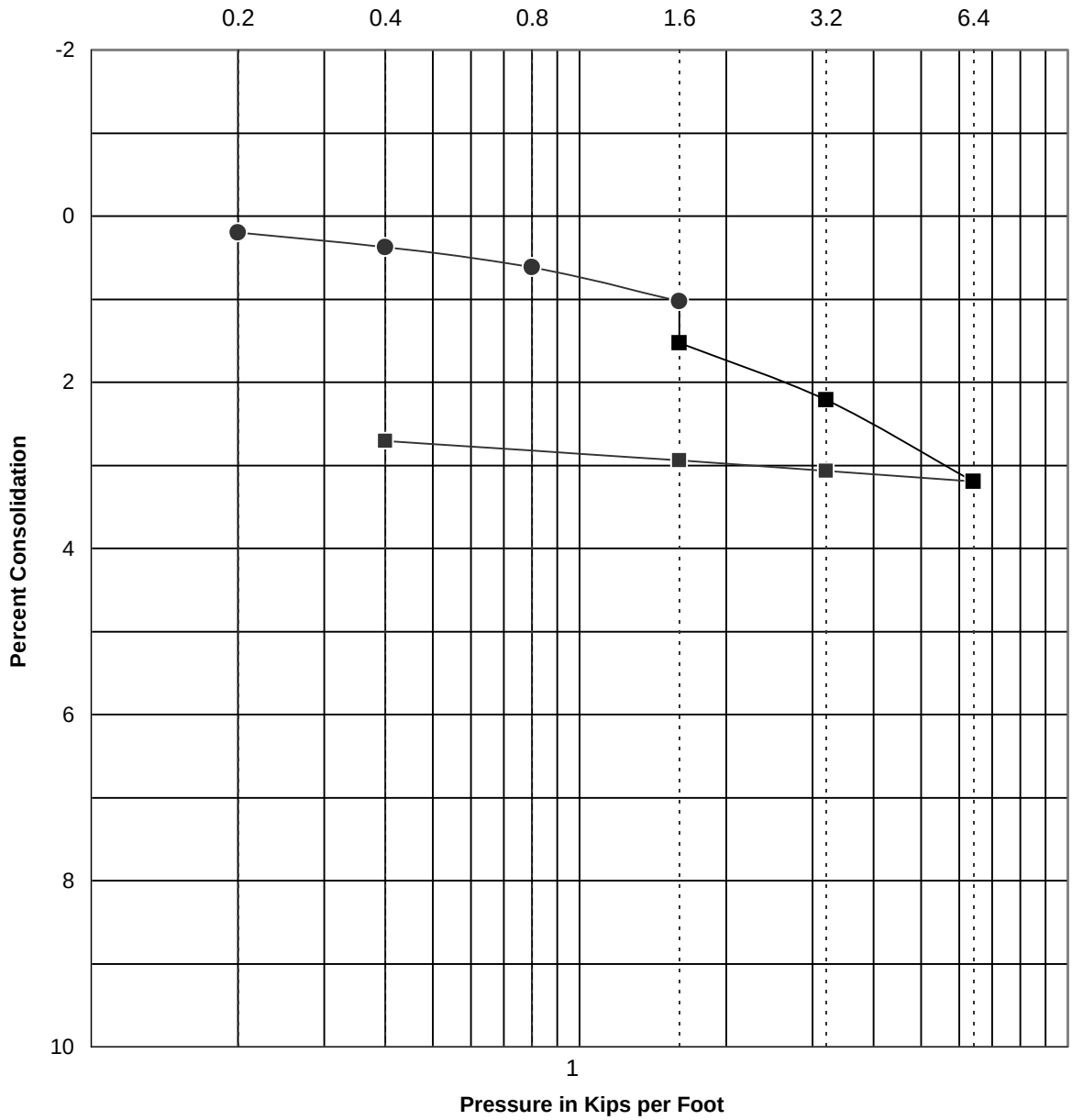
Sample # : B1-1@5'

Plotted by: SBM

Checked by: LCH

Site:	Date:	Job:	Plate:
Sierra Highway at Crown Valley, Acton, CA	Feb-14	M14-201	28

Consolidation Test Results



W_t= 3 % γ_d= 105 pcf W_s= 12 % γ_s= 118 pcf

Classification: SP

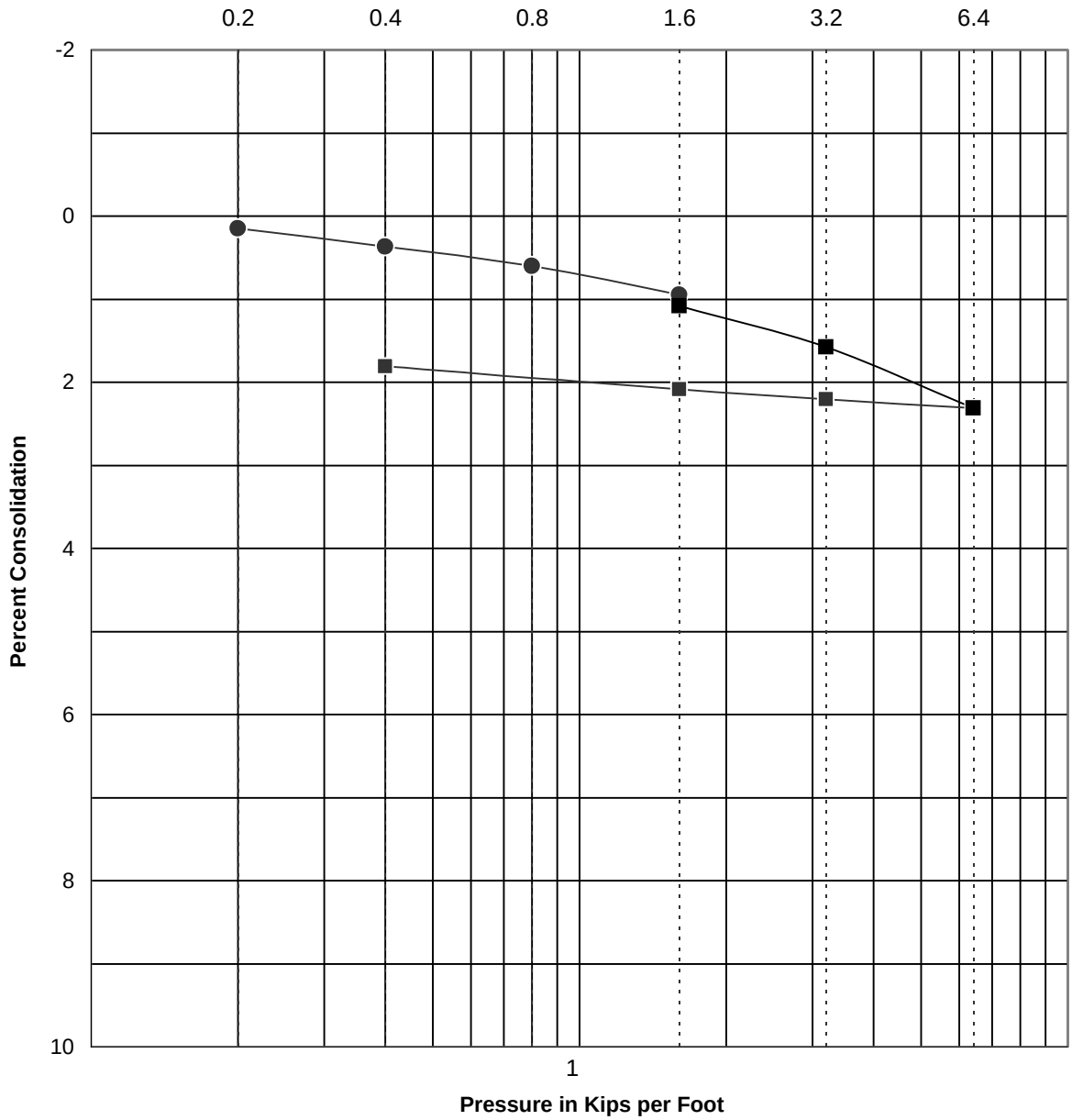
Sample # : B1-2 @ 10'

Plotted by: SBM

Checked by: LCH

Site:	Date:	Job:	Plate:
Sierra Highway at Crown Valley, Acton, Ca	Feb-14	M14-201	29

Consolidation Test Results



W_t= 9 % γ_d= 125 pcf W_s= 11 % γ_s= 140 pcf

Classification: SM

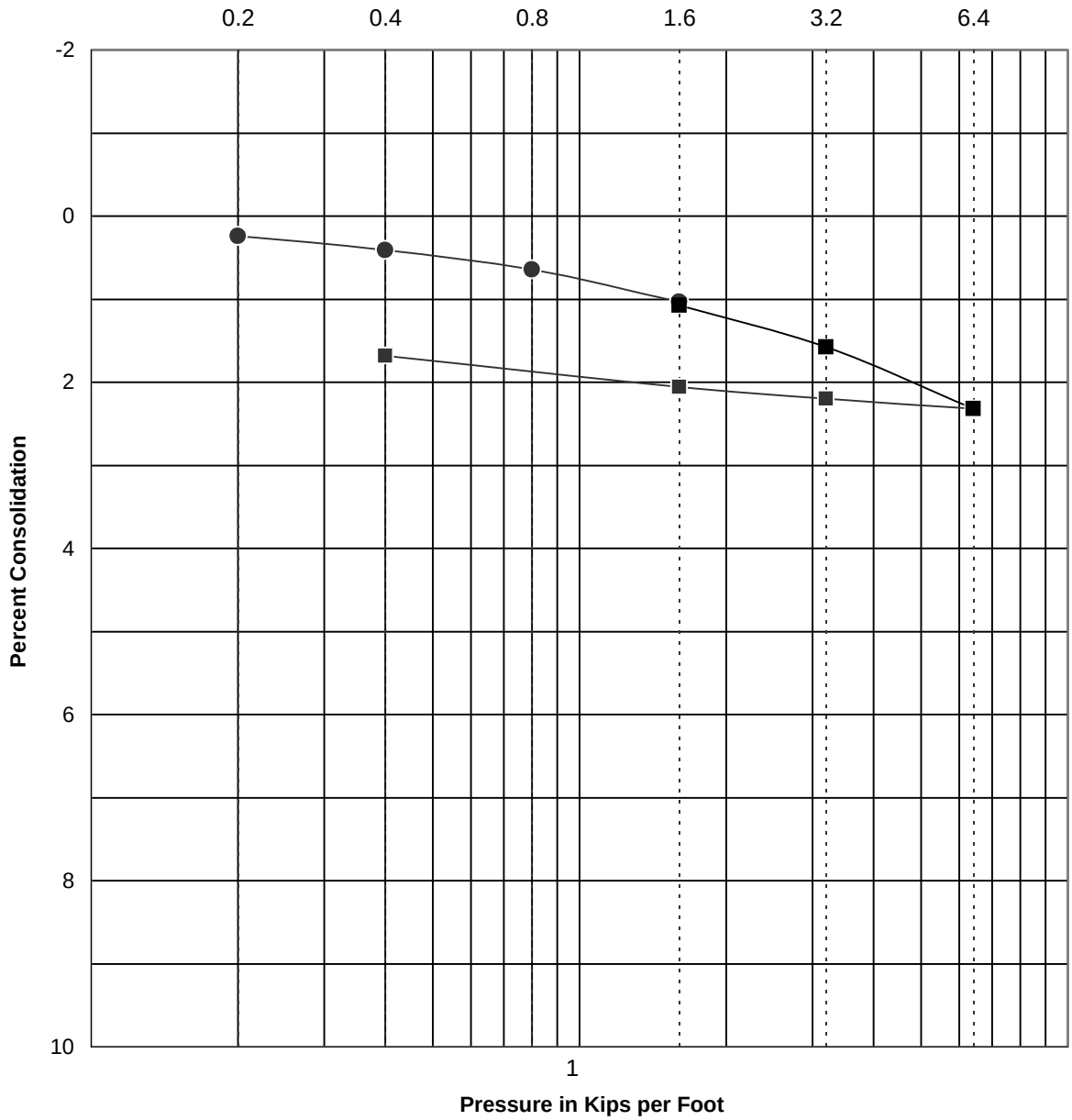
Sample # : B1-4@20'

Plotted by: SBM

Checked by: LCH

Site:	Date:	Job:	Plate:
Sierra Hwy	Feb-14	M14-201	30

Consolidation Test Results



W_t= 6 % γ_d= 125 pcf W_s= 12 % γ_s= 141 pcf

Classification: SM

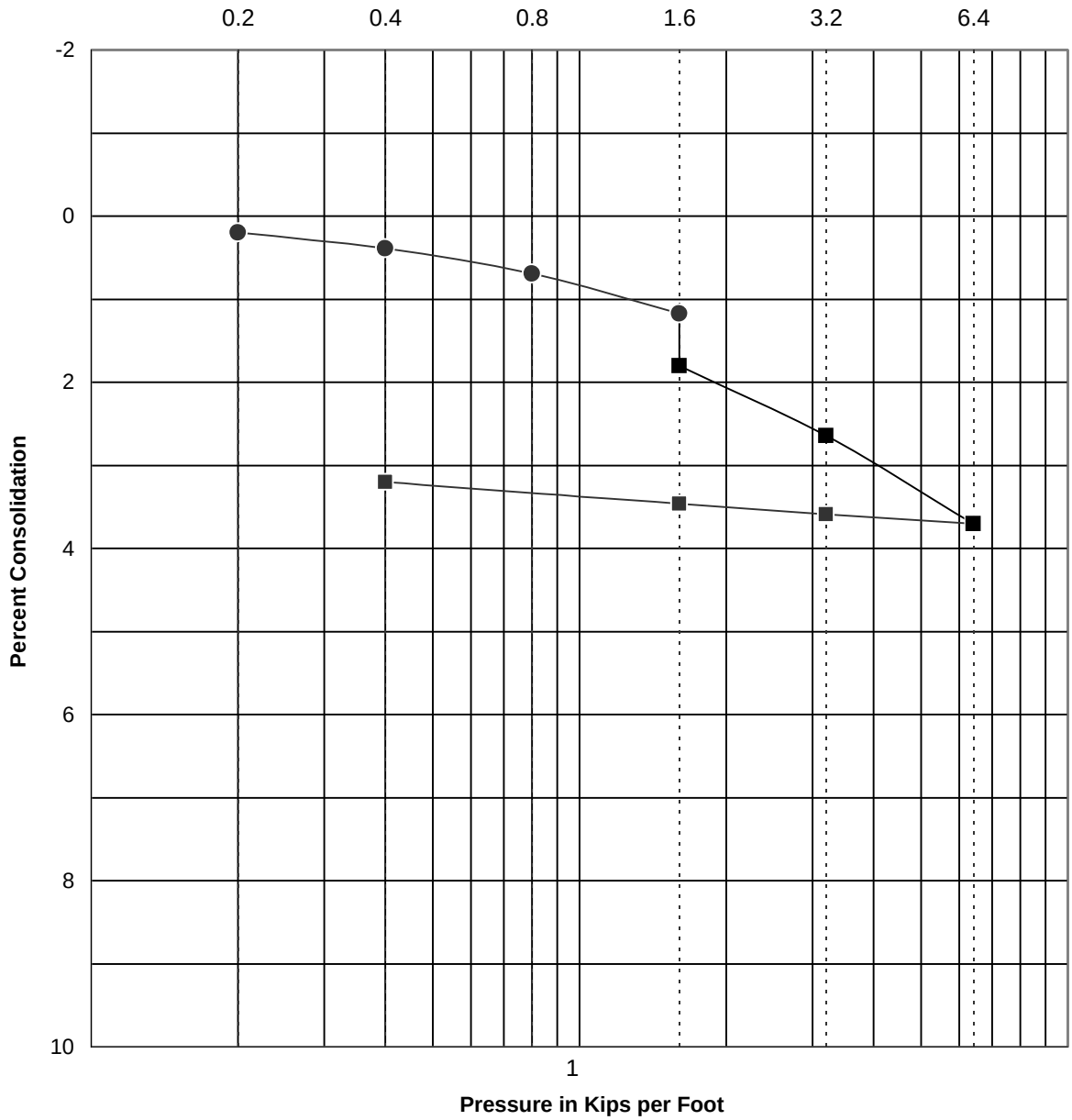
Sample # : B1-5@25'

Plotted by: SBM

Checked by: LCH

Site:	Date:	Job:	Plate:
Sierra Hwy at Crown Valley, Acton, Ca	Feb-14	M14-201	31

Consolidation Test Results



W_t= 4 % γ_d= 112 pcf W_s= 13 % γ_s= 127 pcf

Classification: SP

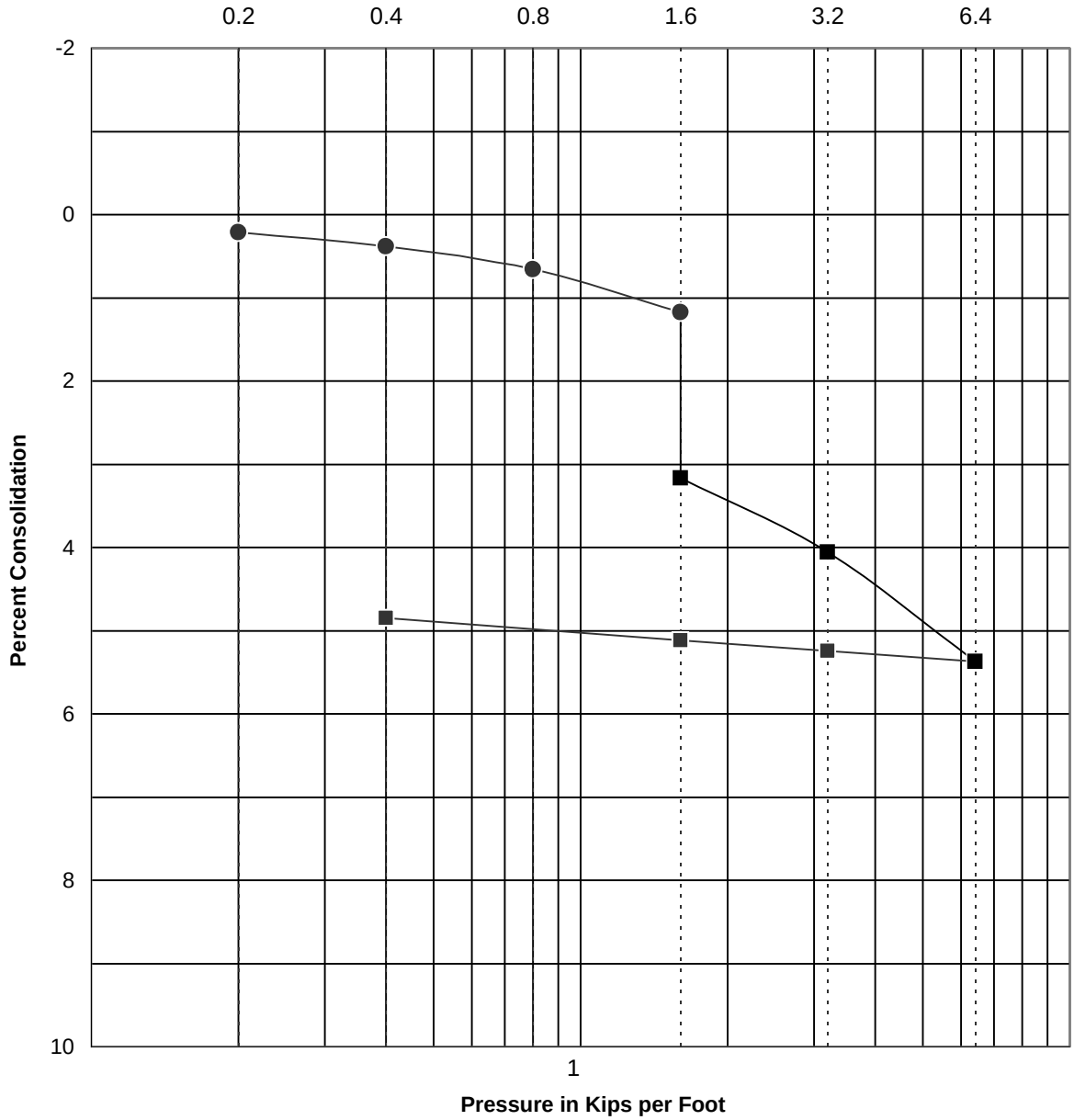
Sample # : B2-3@15'

Plotted by: SBM

Checked by: LCH

Site:	Date:	Job:	Plate:
Sierra Highway at Crown Valley, Acton, Ca	Feb-14	M14-201	33

Consolidation Test Results



W_t= 3 % γ_d= 111 pcf W_s= 13 % γ_s= 126 pcf

Classification: SW

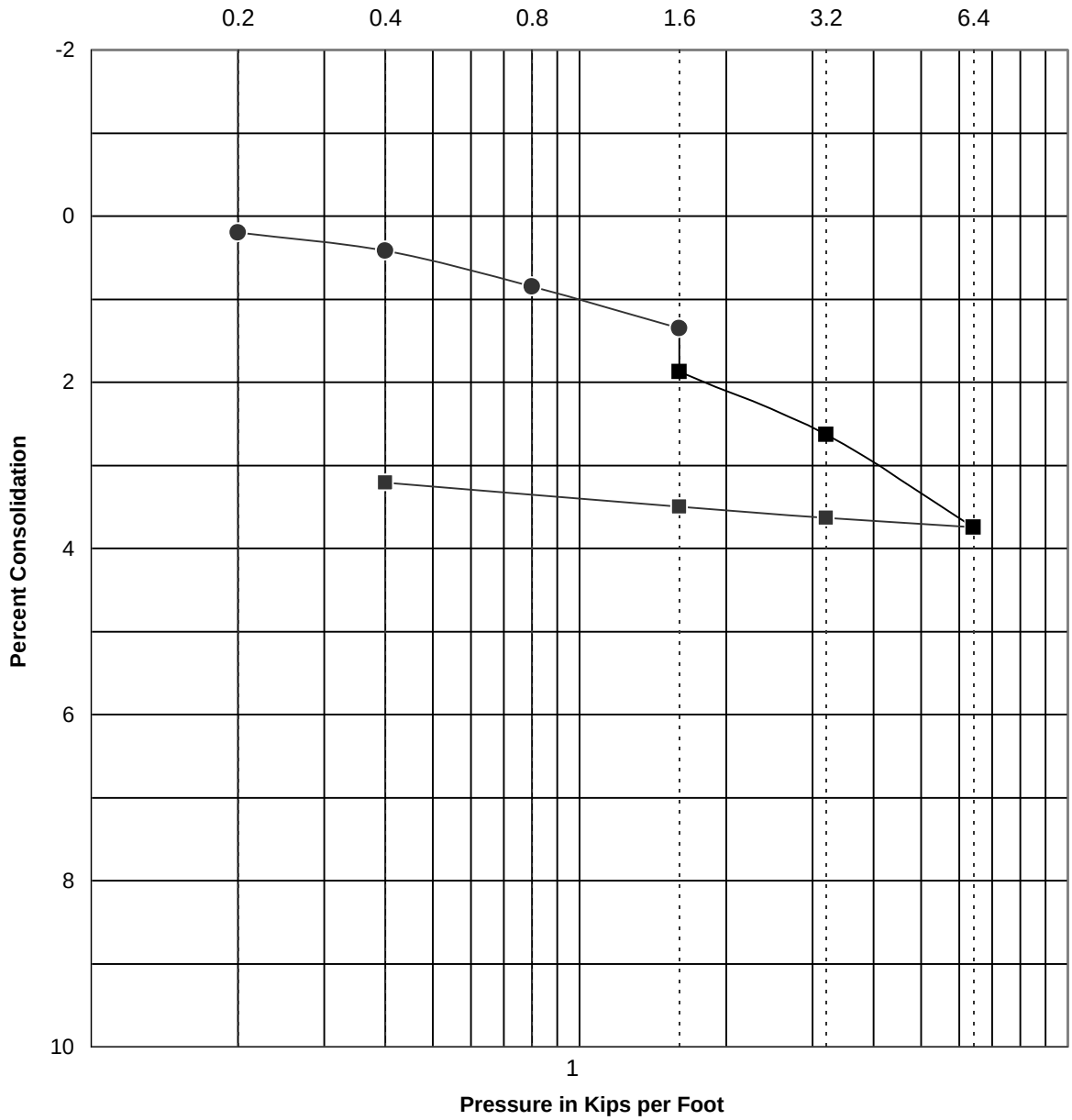
Sample # : B3-1@5'

Plotted by: SBM

Checked by: LCH

Site:	Date:	Job:	Plate:
Sierra Hwy at Crown Valley, Acton, Ca	Feb-14	M14-201	34

Consolidation Test Results



W_t= 7 % γ_d= 120 pcf W_s= 12 % γ_s= 134 pcf

Classification: Silty Sand

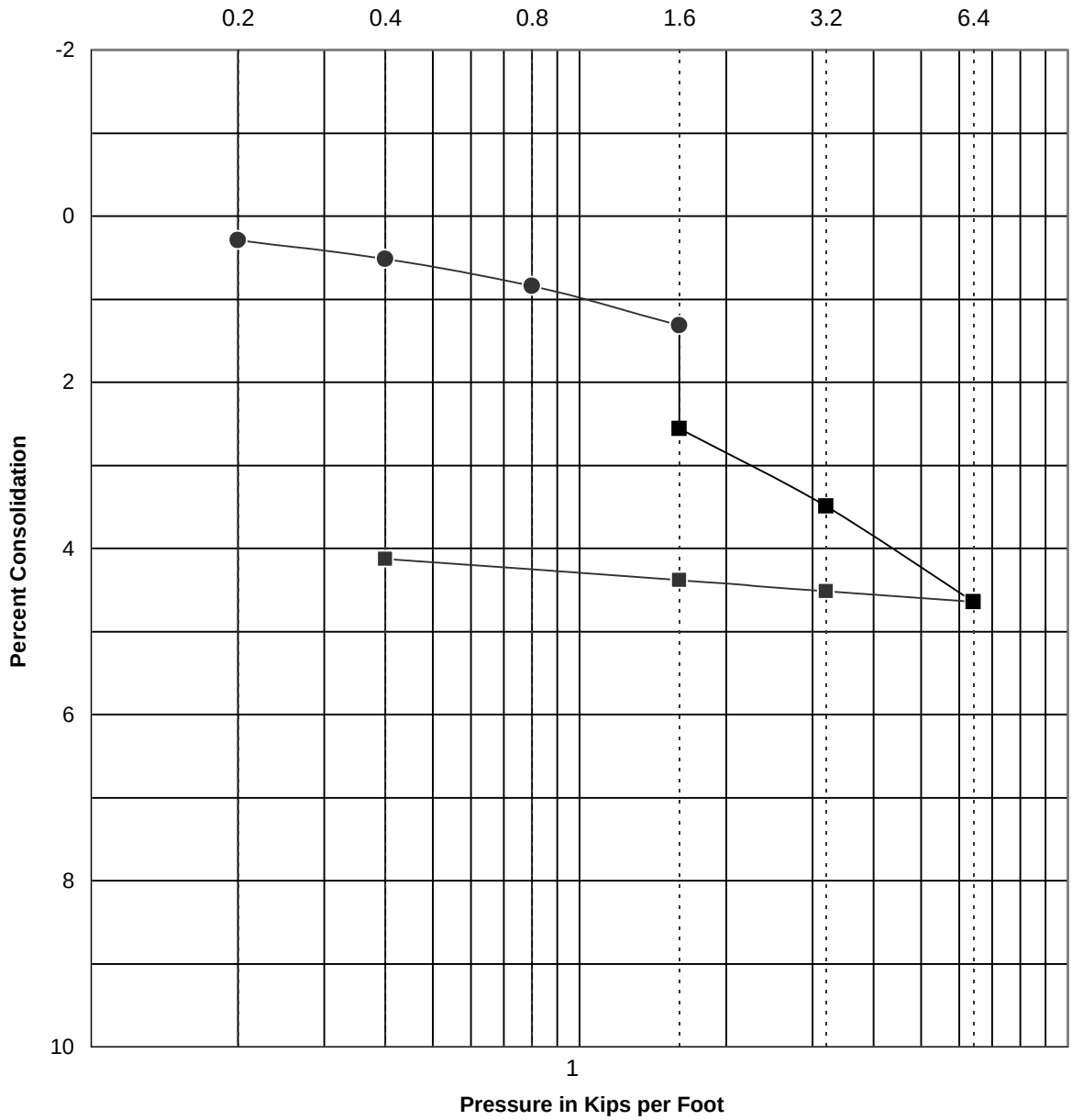
Sample # : B3-3@15'

Plotted by: SBM

Checked by: LCH

Site:	Date:	Job:	Plate:
Sierra Hwy at Crown Valley, Acton, Ca	Feb-14	M14-201	35

Consolidation Test Results



W_t= 4 % γ_d= 118 pcf W_s= 11 % γ_s= 132 pcf

Classification: Silty Sand

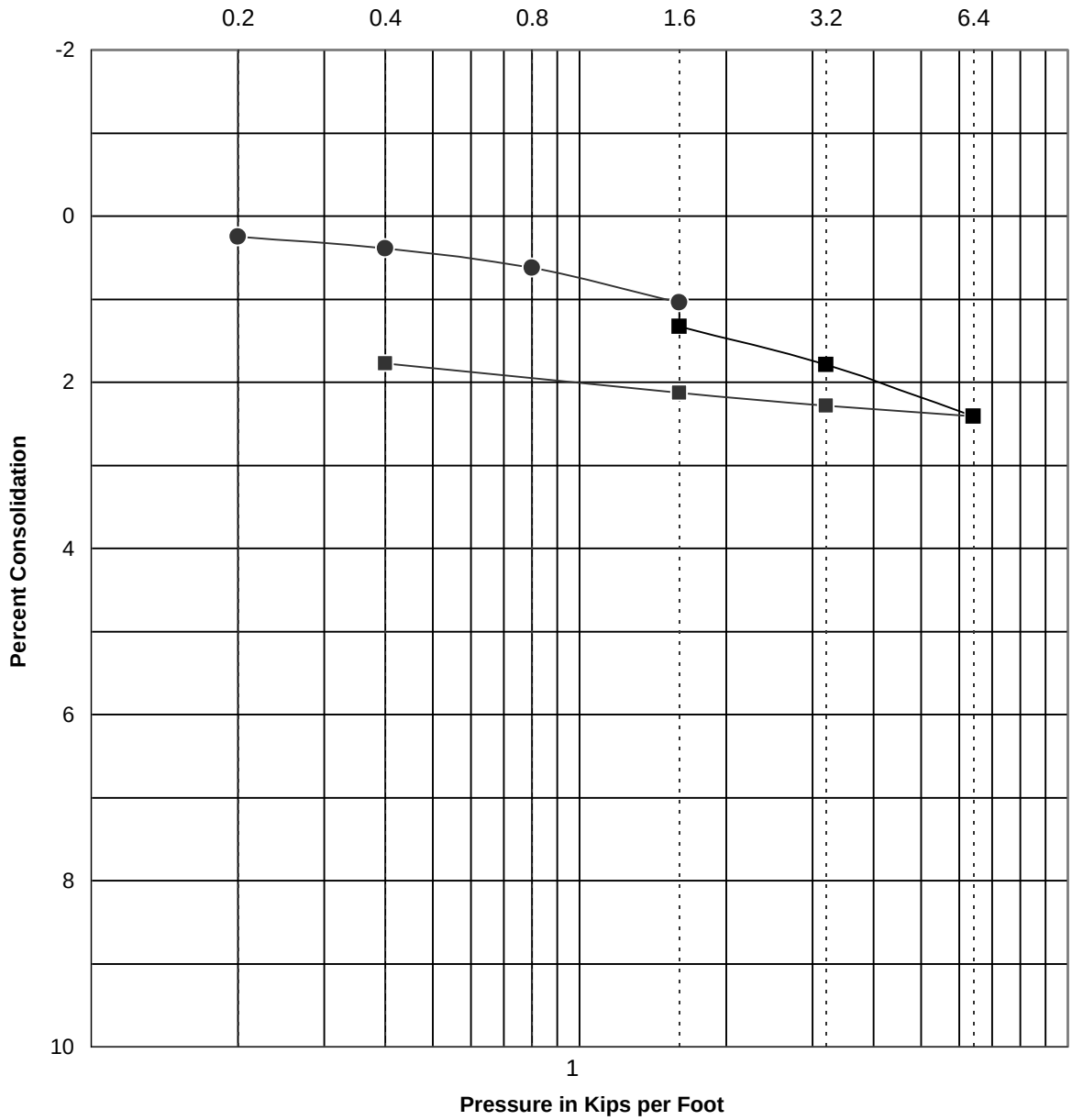
Sample # : B4-2@7'

Plotted by: SBM

Checked by: LCH

Site:	Date:	Job:	Plate:
Sierra Highway at Crown Valley, Acton, Ca	Feb-14	M14-201	37

Consolidation Test Results



W_t= 7 % γ_d= 129 pcf W_s= 11 % γ_s= 143 pcf

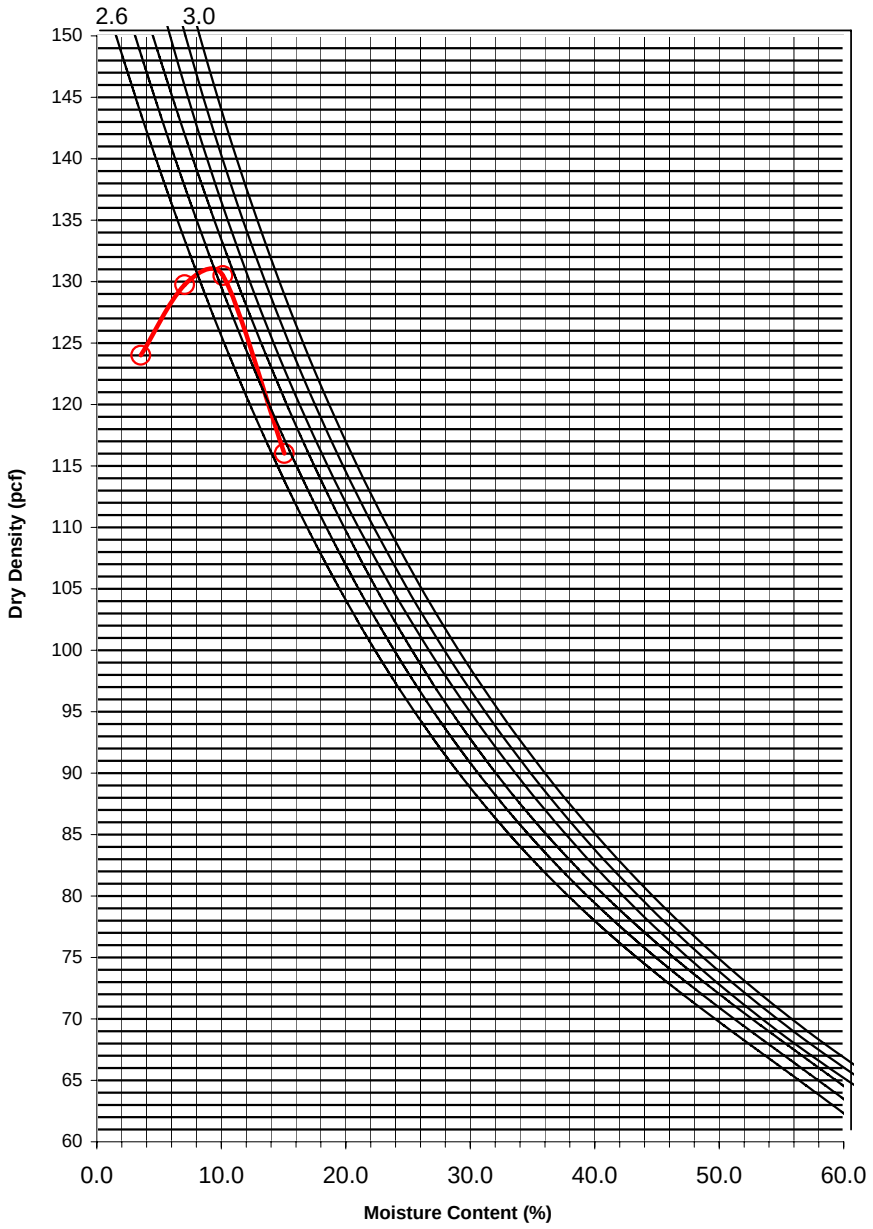
Classification: Silty Sand

Sample # : B4-3@12'

Plotted by: SBM

Checked by: LCH

Site: Sierra Hwy	Date: Feb-14	Job: M11-201	Plate: 38



Dry Density					
	1	2	3	4	
Initial Weight (lbs)	9.68	10.03	10.19	9.85	
Weight of Mold (lbs)	5.4	5.4	5.4	5.4	
Weight of Soil	4.28	4.63	4.79	4.45	
Wet Density (pcf)	128.40	138.90	143.70	133.50	
Moisture Content (%)	3.54	7.05	10.12	15.07	
Dry Density (pcf)	124.01	129.75	130.49	116.02	

Moisture Content					
	1	2	3	4	
Wet Soil + Tare	103.82	84.94	92.94	111.94	
Dry Soil + Tare	100.33	79.46	84.55	97.50	
Weight of Tare	1.70	1.75	1.68	1.67	
Dry Soil	98.63	77.71	82.87	95.83	
Weight of Water	3.49	5.48	8.39	14.44	
Soil Moisture	0.0354	0.0705	0.1012	0.1507	

Maximum Dry Density	131	pcf
Optimum Moisture	10%	%

Sample Number	B1
Depth	0-7'
Type of Soil	Silty Sand

Laboratory Maximum Compaction

SITE:	Sierra Hwy				
M14-201	Date:	3/1/2014	By:	GM	Plate 39

MILLER GEOSCIENCES, INC. _____

EXPANSION INDEX TEST

From ASTM Method D4829-03

A. Determine Initial Degree of Saturation (50%):

From D1557

Laboratory Maximum	130	pcf
Optimum Moisture	10	%
Specific Gravity	2.8	

If unknown use 2.7

Degree of Saturation (S) = 53.8

Moisture Content of Soil at 50% Saturation = 6.14 %

Moisture Content							
	1	2	3	4	5	6	After Test
Wet Soil + Tare	101.69	86.64					103.81
Dry Soil + Tare	98.19	82.31					91.15
Weight of Tare	1.67	16.80					1.71
Dry Soil	96.52	65.51	0.00	0.00	0.00	0.00	89.44
Weight of Water	3.50	4.33	0.00	0.00	0.00	0.00	12.66
Soil Moisture	3.63	6.61	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	14.15

Soil Moisture of Sample Used:	6.61	%			
Weight of Sample:	614.93	gms	Weight of Ring:	198.16	gms
Initial Unit Weight:	126.2	pcf	Final Moisture Content:	14.2	%
Initial Dry Unit Weight:	118.9	pcf	Final Degree of Saturation:	92.3	

B. Expansion Test

Initial Reading	0.0000	Date	2/25/2014	Time	4:30pm

Date:	2/26/14	Time:	4:30pm	Reading:	0
Date:		Time:		Reading:	
Date:		Time:		Reading:	
Date:		Time:		Reading:	
Date:		Time:		Reading:	
Date:		Time:		Reading:	
Date:		Time:		Reading:	

$$\text{Expansion Index} = \frac{(\text{Final Thickness} - \text{Initial Thickness}) \times 1000}{\text{Initial Thickness}} = 0$$

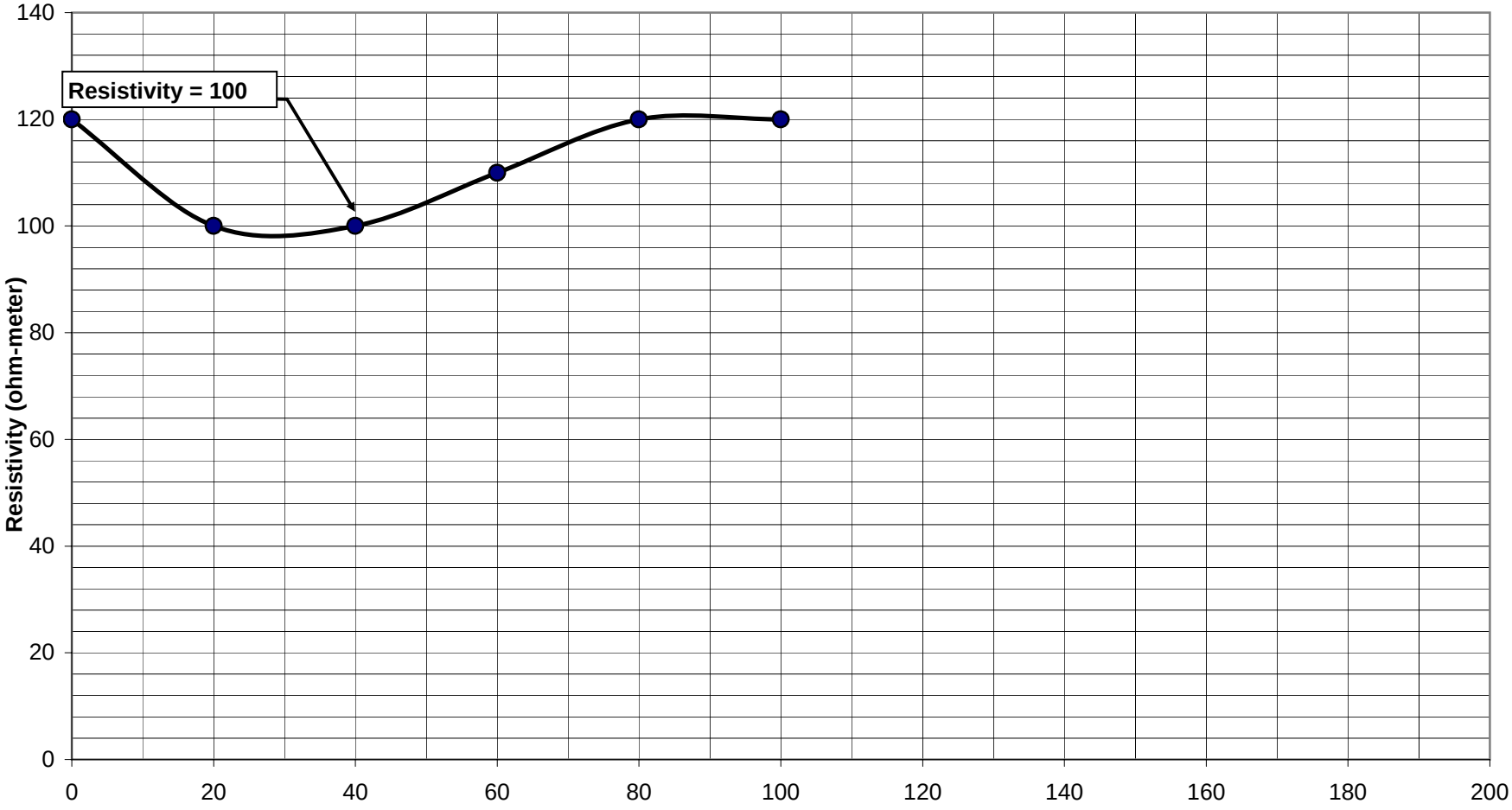
$$\text{Expansion Index Correction} = EI_{50} = EI_{measured} - (50 - S_{measured}) \frac{65 + EI_{measured}}{220 - S_{measured}} = 1$$

Expansion Index	Potential Expansion
0-20	Very Low
21-50	Low
51-90	Medium
91-130	High
above 130	Very High

SITE:	Sierra Hwy						
M14-201	Date:	2/26/2014	By:	GM	Plate	40	
MILLER GEOSCIENCES, INC.							

Soil Resistivity

(CT-643)



Sierra Hwy, California

APPENDIX C

American Environmental Testing Laboratory Inc.
2834 & 2908 North Naomi Street Burbank, CA 91504 • DOHS NO: 1541, LACSD NO: 10181
Tel: (888) 288-AETL • (818) 845-8200 • Fax: (818) 845-8840 • www.aetlab.com

Ordered By

Miller Geosciences, Inc. **23890 Copper Hill Drive, #111** **Valencia, CA 91354-**

Number of Pages	**4**
Date Received	**03/05/2014**
Date Reported	**03/19/2014**

Telephone: (661)299-2206
Attention: Steve Miller

Job Number	Order Date	Client
72464	03/05/2014	MILGEO

Project ID: M14-201
Project Name: Sierra HWY

Enclosed please find results of analyses of 1 soil sample which was analyzed as specified on the attached chain of custody. If there are any questions, please do not hesitate to call.

Checked By: _____ Approved By: C. Razmara

Cyrus Razmara, Ph.D.
Laboratory Director

American Environmental Testing Laboratory Inc.
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Ordered By

Miller Geosciences, Inc.
23890 Copper Hill Drive, #111
Valencia, CA 91354-

Telephone: (661)299-2206
Attention: Steve Miller

Project ID: M14-201
Date Received 03/05/2014
Date Reported 03/19/2014

Job Number	Order Date	Client
72464	03/05/2014	MILGEO

CERTIFICATE OF ANALYSIS
CASE NARRATIVE

AETL received 1 samples with the following specification on 03/05/2014.

Lab ID	Sample ID	Sample Date	Matrix	Quantity Of Containers
72464.01	Lab1	03/01/2014	Soil	1

Method ^ Submethod	Req Date	Priority	TAT	Units
(CT417)	03/12/2014	2	Normal	mg/Kg
(CT422)	03/12/2014	2	Normal	mg/Kg
CT532	03/12/2014	2	Normal	pH unit

The samples were analyzed as specified on the enclosed chain of custody.
Analytical non-conformances have been noted on the report.

Checked By: _____ Approved By: C. Razmara

Cyrus Razmara, Ph.D.
Laboratory Director

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ANALYTICAL RESULTS

Ordered By

Miller Geosciences, Inc.
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Valencia, CA 91354-

Telephone: (661)299-2206
Attn: Steve Miller
Page: **2**

Project ID: M14-201
Project Name: Sierra HWY

AETL Job Number	Submitted	Client
72464	03/05/2014	MILGEO

Method: (CT417), Sulfate (soluble) content of soil by CA DOT Method

QC Batch No: 030714-1

Our Lab I.D.			Method Blank	**72464.01**			
Client Sample I.D.				Lab1			
Date Sampled				03/01/2014			
Date Prepared			03/07/2014	03/07/2014			
Preparation Method			CT417	CT417			
Date Analyzed			03/07/2014	03/07/2014			
Matrix			Soil	Soil			
Units			mg/Kg	mg/Kg			
Dilution Factor			1	1			
Analytes	**MDL**	**PQL**	**Results**	**Results**			
Sulfate (soluble)	5	10	ND	38.2			

QUALITY CONTROL REPORT

QC Batch No: 030714-1; Dup or Spiked Sample: 72464.01; LCS: Clean Sand; QC Prepared: 03/07/2014; QC Analyzed: 03/07/2014; Units: mg/Kg

Analytes	Sample Result	MS Concen	MS Recov	MS % REC	MS DUP Concen	MS DUP Recov	MS DUP % REC	RPD %	MS/MSD % Limit	MS RPD % Limit
Sulfate (soluble)	0.00	200	171 X	85.5	200	175 X	87.5	2.3	80-120	<15

QC Batch No: 030714-1; Dup or Spiked Sample: 72464.01; LCS: Clean Sand; QC Prepared: 03/07/2014; QC Analyzed: 03/07/2014; Units: mg/Kg

Analytes	SM Result	SM DUP Result	RPD %	SM RPD % Limit						
Sulfate (soluble)	38.2	37.3	2.4	<15						

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ANALYTICAL RESULTS

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Attn: Steve Miller
Page: 3

Project ID: M14-201
Project Name: Sierra HWY

AETL Job Number	Submitted	Client
72464	03/05/2014	MILGEO

Method: (CT422), Chloride (soluble) content of soil by CA DOT Method

QC Batch No: 030714-1

Our Lab I.D.			Method Blank	72464.01			
Client Sample I.D.				Lab1			
Date Sampled				03/01/2014			
Date Prepared			03/07/2014	03/07/2014			
Preparation Method			CT422	CT422			
Date Analyzed			03/07/2014	03/07/2014			
Matrix			Soil	Soil			
Units			mg/Kg	mg/Kg			
Dilution Factor			1	1			
Analytes	**MDL**	**PQL**	**Results**	**Results**			
Chloride (soluble)	5.0	10.0	ND	80.1			

QUALITY CONTROL REPORT

QC Batch No: 030714-1; Dup or Spiked Sample: B030714; LCS: Clean Sand; QC Prepared: 03/07/2014; QC Analyzed: 03/07/2014; Units: mg/Kg

Analytes	Sample Result	MS Concen	MS Recov	MS % REC	MS DUP Concen	MS DUP Recov	MS DUP % REC	RPD %	MS/MSD % Limit	MS RPD % Limit
Chloride (soluble)	0.00	200	167 X	83.5	200	170 X	85.0	1.8	80-120	<15

QC Batch No: 030714-1; Dup or Spiked Sample: B030714; LCS: Clean Sand; QC Prepared: 03/07/2014; QC Analyzed: 03/07/2014; Units: mg/Kg

Analytes	SM Result	SM DUP Result	RPD %	SM RPD % Limit						
Chloride (soluble)	80.1	80.6	<1	<15						

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ANALYTICAL RESULTS

Ordered By

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Telephone: (661)299-2206
Attn: Steve Miller
Page: **4**

Project ID: M14-201
Project Name: Sierra HWY

AETL Job Number	Submitted	Client
72464	03/05/2014	MILGEO

Method: CT532, pH of soil by CA DOT Method

QC Batch No: 030714-1

Our Lab I.D.			**72464.01**				
Client Sample I.D.			Lab1				
Date Sampled			03/01/2014				
Date Prepared			03/07/2014				
Preparation Method			CT532				
Date Analyzed			03/07/2014				
Matrix			Soil				
Units			pH unit				
Dilution Factor			1				
Analytes	**MDL**	**PQL**	**Results**				
pH	0.01	0.01	7.85				
Temperature (C)	0.01	0.01	21.1				

QUALITY CONTROL REPORT

QC Batch No: 030714-1; Dup or Spiked Sample: 72464.01; LCS: Clean Sand; LCS Prepared: 03/07/2014; LCS Analyzed: 03/07/2014; Units: pH unit

Analytes	SM Result	SM DUP Result	RPD %	SM RPD % Limit	LCS Concen	LCS Recov	LCS % REC	LCS/LCSD % Limit		
pH	7.85	7.89	<1	<15	7.00	7.00	100	80-120		

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Data Qualifiers and Descriptors

Data Qualifier:

#:	Recovery is not within acceptable control limits.
*:	In the QC section, sample results have been taken directly from the ICP reading. No preparation factor has been applied.
B:	Analyte was present in the Method Blank.
D:	Result is from a diluted analysis.
E:	Result is beyond calibration limits and is estimated.
H:	Analysis was performed over the allowed holding time due to circumstances which were beyond laboratory control.
J:	Analyte was detected . However, the analyte concentration is an estimated value, which is between the Method Detection Limit (MDL) and the Practical Quantitation Limit (PQL).
M:	Matrix spike recovery is outside control limits due to matrix interference. Laboratory Control Sample recovery was acceptable.
MCL:	Maximum Contaminant Level
NS:	No Standard Available
S6:	Surrogate recovery is outside control limits due to matrix interference.
S8:	The analysis of the sample required a dilution such that the surrogate concentration was diluted below the method acceptance criteria.
X:	Results represent LCS and LCSD data.

Definition:

%Limi:	Percent acceptable limits.
%REC:	Percent recovery.
Con.L:	Acceptable Control Limits
Conce:	Added concentration to the sample.
LCS:	Laboratory Control Sample
MDL:	Method Detection Limit is a statistically derived number which is specific for each instrument, each method, and each compound. It indicates a distinctively detectable quantity with 99% probability.

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Data Qualifiers and Descriptors

MS:	Matrix Spike
MS DU:	Matrix Spike Duplicate
ND:	Analyte was not detected in the sample at or above MDL.
PQL:	Practical Quantitation Limit or ML (Minimum Level as per RWQCB) is the minimum concentration that can be quantified with more than 99% confidence. Taking into account all aspects of the entire analytical instrumentation and practice.
Recov:	Recovered concentration in the sample.
RPD:	Relative Percent Difference