

**GEOTECHNICAL FEASIBILITY STUDY  
TIMBERLINE VILLAGE  
Auburn, California**

**Prepared by**

**EARTH SYSTEMS CONSULTANTS  
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**JUNE 1993**



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File No. NRS-6028-01  
June 2, 1993

Western Care Construction Co., Inc.  
4020 Sierra College Boulevard, Suite 200  
Auburn, California 95677

Attention: Ms. Linda Bowman

Subject: Timberline Village  
Auburn, Placer County, California  
**GEOTECHNICAL FEASIBILITY STUDY**

Ladies and Gentlemen:

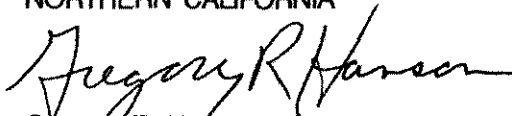
In response to your request, we have completed a geotechnical feasibility study of the Timberline Village property in Auburn, Placer County, California. This study included a review of pertinent geologic literature, aerial photograph interpretation, geologic reconnaissance of the site, excavation and sampling of test borings and backhoe test pits, laboratory testing of selected samples, analysis of the data obtained by these methods, and preparation of this report.

No evidence was found for the presence of active or potential geotechnical concerns on this site that would preclude its development for mixed use. It is our opinion that the site is geotechnically suitable for the development as currently proposed.

The submission of this report completes our work on this phase of the project. Please contact this office if you have any questions. It will be our pleasure to be of continuing service to you.


Very truly yours,

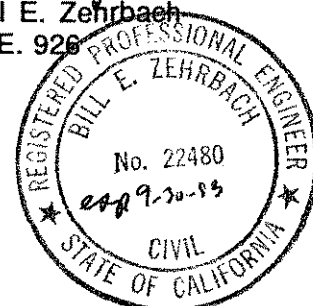
EARTH SYSTEMS CONSULTANTS  
NORTHERN CALIFORNIA

  
Gregory R. Hanson  
C.E.G. 1469

GRH/BEZ:tm610

Copies: 5 to Addressee

  
Bill E. Zehrbaach  
G.E. 926



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## **GEOTECHNICAL FEASIBILITY STUDY**

**PROJECT: Timberline Village  
Auburn, Placer County, California**

**CLIENT: Western Care Construction Co., Inc.**

## **INTRODUCTION**

### **Purposes and Scope**

The purposes of this study were to identify and evaluate the soil, geologic and seismic conditions at this site. This results of this study are to be used in evaluating the geotechnical feasibility of the site for mixed use development including residential, commercial, office and civic use.

This study included a review of available geotechnical literature and maps, aerial photograph interpretation, geologic reconnaissance and mapping of the site and surrounding area, excavation and sampling of test borings and test pits, laboratory testing of relatively undisturbed soil samples and disturbed bulk samples to determine some of their physical and engineering characteristics, analysis of the accumulated data, and preparation of this report. Preliminary recommendations for site preparation, drainage, grading and foundation design are presented. This study did not include an evaluation of possible toxic or hazardous materials that may be present at or beneath the site.

### **Location and Site Description**

The site consists of approximately 92.6 acres of undeveloped land located on the north end of Richardson Drive, north of Bell Road, in Auburn, Placer County, California (see Location Map,

Figure 1). The L-shaped parcel is bounded by Timberline Estates Unit 1 on the south, by residential development to the west, by undeveloped lands to the north, and by residential and undeveloped parcels to the east.

Topographically, the site is characterized by low, gently sloping northwest/southeast trending ridgelines, separated by two major northwest flowing drainages (see Figure 2).

Gradients in the southerly leg and north central portion of the property (near the larger drainage) are very gentle, typically on the order of 2 to 4 percent. Gradients along the flanks of the ridgelines at the west side and northeast corner typically range from 6 to 12 percent, with the ridgetop areas being nearly level. Elevations across the site range from approximately 1,440 feet at the southwest corner to about 1,348 at the northwest corner.

The largest drainage channel is an ephemeral creek system trending from the southeast corner of the site to a juncture with the other main drainage at the northwest corner of the site. This drainage is very erratic and weakly developed in the upper meadowlands comprising the southern leg of the property, becoming somewhat more incised through the northwest portion. The other primary drainage is in the westernmost section and is more strongly incised. A third, minor drainage channel, trends along the westerly flank of the ridge in the northeast portion of the site. That channel is a narrow, shallow man-made feature.

The site is vegetated with a heavy growth of oak forest in the ridgeland areas in the west and the northeast corner. The rest of the site is primarily vegetated with grasses and low shrubs, with scattered growths of trees.

The site is undeveloped and has no existing structures. A small remnant slab-on-grade is located in the southwest corner of the site. Numerous dirt paths traverse the site, with several being strongly rutted from vehicular use.

**Proposed Development**

It is our understanding that the project will consist of the construction of a mixed-use village which will include apartments, townhomes, single-family residences, commercial/retail/office buildings, and civic facilities. The project will also include interspersed open space parcels.

Site grading is anticipated to primarily consist of cuts and fills of less than 10 feet. Localized areas of greater cuts and fills will occur in the northern portion of the site.

## PROCEDURES AND RESULTS

### Literature and Map Review

The most useful literature pertinent to this study are listed in the REFERENCES CITED. Most of the published geologic information on this area is of a preliminary nature, based on reconnaissance techniques and extrapolation of data rather than on thorough investigation.

The site is located in the eastern foothills of the Sierra Nevada Range within the Western Sierra Nevada Metamorphic Belt of California. These rocks are part of a north- to northwest-trending belt of material characterized by stratified metamorphic rocks of sedimentary and volcanic origin into which basic and ultramafic bodies have intruded.

The regional geology has been mapped by the California Division of Mines and Geology (Mineral Land Classification of Auburn 15-minute Quadrangle, 1984; Geologic Map of the Sacramento Quadrangle, 1987). These maps differ in scale but agree that the site is underlain by metavolcanic melange terrane rock of Paleozoic-Metazoic age. That part of the California Division of Mines and Geology (1984) map that includes the site is shown in Figure 3. The underlying unit (mv) is described as metavolcanic rocks within a belt of chaotically intermixed rocks.

The nearest faults considered active by the California Division of Mines and Geology (1988) are the Cleveland Hills Fault, about 40 miles north of the site, the Zamora Fault, approximately 44 miles west of the site, the Antioch Fault, located approximately 51 miles west of the site, and the Carson Valley Fault 67 miles east of the site. The faults east of the site are normal faults associated with uplift on the east side of the Sierras. The faults west of the site are part of the Hayward-Calaveras Fault system that trend northwestward through the San Francisco Bay Area.

### Previous Investigations

Western Care Construction Company furnished us two geotechnical study reports relating to the site vicinity which had been prepared for them by Earthtec, Ltd. One report had been prepared in 1987 for the then proposed Timberline Senior Center which would be on the subject site at the proposed intersection of Richardson Drive and Education Streets. Nine borings, drilled to depths of 4 to 10 feet, were placed for that investigation. The report indicated that soil profiles consisted of shallow depths of clayey silt soil overlying highly weathered meta-volcanic schist and siltstone.

The other report, prepared in 1992, was on the Oakwood Care Facility which is to be located at the northwest corner of the intersection of Bell Road and Richardson Drive, adjacent to the subject site. Three borings, drilled to depths of 3 to 12 feet, were placed for that study. The soil profile reportedly consisted of a shallow depth of gravelly silt soil over weathered bedrock (meta-sedimentary rock).

Both studies report generally non-problematic conditions, with no major geotechnical problems noted for either site. The surficial soils were reported to be non-expansive. However, no laboratory testing was performed to characterize the shrink/swell potentials.

### Aerial Photograph Interpretation

The following set of stereo aerial photographs of the site vicinity were used in this study:

<u>Date</u>	<u>Scale</u>	<u>Type</u>
February 27, 1992	1:7,000	Black and White

These photographs were scrutinized for the presence of terrain features characteristic of active fault zones, particularly lineaments. Lineaments are seen on a stereo aerial photo pair as



features with tonal differences on either side. These differences may indicate changes in soil types, vegetation, groundwater levels or sedimentary bedding characteristics. Lineaments are often indicative of the presence of geologic structures such as folds and faults. These photos were also studied for the presence of terrain features that may be associated with ancient or active landsliding, contacts between various rock types and for areas of shallow groundwater.

Faint northwest-trending lineaments can be seen throughout the site vicinity. These lineaments correspond to regional drainage valleys and ridges and to the general "fabric" of the metavolcanic rocks in this region.

The flatter areas in the south parcel appear to have relatively dark tones reflecting high moisture contents in the surficial soils. The slopes are generally heavily wooded, but clear sections appear with lighter tonations, indicative of shallower bedrock and better drained soils.

The looping interconnected series of dirt roads stands out strongly in the photographs. A trailer, or shed, which is not currently on the site, was observed in the photograph to be in the woods at the northeast section of the site.

No features indicative of faulting or landsliding were observed in the photographs.

### **Geologic Reconnaissance**

Geologic reconnaissance was conducted at the site on March 26 and 29, 1993, by geologists from our firm. The purpose of the reconnaissance was to identify and evaluate the surficial soil and geologic conditions at the site.

The site was examined for evidence of possible faulting, landsliding, rock outcrops, structure, and other geologic conditions pertinent to the proposed land use.

Logs of the borings showing the locations of drive samples, the penetration resistance, the results of the density and moisture content tests, and the descriptions of the materials encountered are presented in Appendix A.

Nine test pits were excavated on the site on March 26, 1993, with the use of a rubber-tired backhoe. The test pits ranged in depth from 4 to 6 feet. The excavations were logged by a staff geologist and representative samples were taken of the units encountered. In addition to bulk samples, relatively undisturbed samples were obtained by manually driving a 3.0-inch O.D. sampler (containing a 2-1/2-inch diameter, 6-inch long liner) with a slide hammer. Those samples were then sealed and taken to our laboratory for subsequent testing and classification. The logs of the excavations, showing the geologic structure and description of the materials encountered, are presented in Appendix A. The locations of the test pits are shown on Figure 2.

### Laboratory Testing

The laboratory testing program was directed toward determining some of the physical and engineering properties of the soils and rock materials at the site. Samples considered representative of materials anticipated to be exposed at finished grade or to be within the zone of influence of the proposed structures or fills were selected for testing.

Moisture content and density tests were performed on the undisturbed samples in order to determine the in-place density and moisture content variation through the soil profiles. Maximum density, based on the ASTM D1557-91 test method, was determined for a selected representative soil sample from a proposed cut area.

Atterberg Limits tests were performed in order to aid in the classification of the uppermost soil encountered, and to assess the expansivity of the fine-grained soils. Classification of the soil types was determined based on the Uniform Building Code Standard No. 29-1 which utilizes the Unified Soil Classification System.

Direct shear tests were performed on undisturbed and remolded soil samples to evaluate their relative strength characteristics. Samples to be sheared were presoaked for a minimum period of 24 hours under a 100 psf surcharge and then allowed to drain briefly before and during the shear testing. Specimens were sheared under normal loads ranging from 1,000 to 3,000 pounds per square feet.

Cohesive soils classified as potentially expansive were tested for their volumetric changes relative to changes in water content. The expansion potentials of the soils were also determined by swell tests performed on the direct shear test specimens prior to shearing.

An R-Value test was performed in order to aid in pavement design.

The results of the laboratory tests are discussed in the section "Soil Conditions," and are presented in Appendix A.

## GEOTECHNICAL EVALUATION AND DISCUSSION

### Assessment of Seismic Hazards

No active faults have been mapped in the site vicinity. The nearest faults considered to be active by the California Division of Mines and Geology (1988) are the Cleveland Hills Fault, 40 miles north of the site and the Zamora Fault located 44 miles west of the site. The San Andreas Fault is located approximately 96 miles southwest of the site. Numerous earthquakes have occurred in the Oroville area located approximately 40 miles northwest of the site. At present, it is not possible to predict when or where movement will occur on these faults. It must be assumed, however, that a moderate to major earthquake along one or more of these faults will result in moderate ground shaking on this site.

In the event of an earthquake, seismic risk to a structure will depend on the distance of the structure from the epicenter and source fault, the character and magnitude of the earthquake, the geologic, groundwater and soil conditions underlying the structure and its immediate vicinity, and the nature of the construction.

The site is situated in an area that has experienced only minor earthquake activity since 1808 (Goter, 1988). During the earthquake of April 18, 1906 (estimated Richter magnitude 8.3), on the San Andreas Fault, the site reportedly experienced some ground shaking estimated to be V-VI on the Rossi-Forel Intensity Scale. This intensity is described as being a shock of moderate intensity resulting in disturbance of some furniture and ringing of some bells, but no significant damage. Intensities from possible earthquakes on active, smaller faults closer to the site would most likely be less than that produced by the 1906 event. The lack of active faults in the site vicinity and the distance of the site from known active faults makes the potential for seismic hazards to occur low at this site. The trace of the Bear Mountain Fault mapped through the site is considered inactive and is therefore not a project design consideration.

### **Slope Stability**

The natural slopes on and near the site are relatively gentle and show generally good slope stability. Slope failures were not observed on the site. The near-surface soils on the majority of the site are generally cohesive and are moderately resistant to erosion.

### **Summary of Soil and Bedrock Conditions**

Data obtained from the site reconnaissance and the 9 test pits placed for this study indicates that the site is generally underlain by 1 to 3 feet of firm to stiff reddish brown sandy clay and sandy silt generally possessing low plasticity. The soils are primarily of residual derivation, forming over hard green-gray metavolcanic rock and over somewhat less resistant green schist. Outcrops of the harder metavolcanics are found along the ridgetops in the northerly portion of the site. A shallow depth of alluvial soil (dark brown silty and sandy clays) were encountered in Test Pit 3, directly overlying the schist.

Laboratory testing of the soils reveal adequate strength parameters relative to the proposed development. Direct shear tests on undisturbed near-surface samples indicated angles of internal friction of 11 and 20 degrees, with corresponding unit cohesions of 450 and 400 pcf, respectively. Testing of a near surface sample recompacted to 90 percent indicated a 20 degree angle of internal friction and a 350 psf unit cohesion. Swell Indices ranged from low (0.0) to moderately high (0.8) for the shear samples. The Plasticity Index of 12 indicated for a sample from the surficial unit in Test Pit 5 is in the low range.

### **Groundwater and Seepage**

The test pits were excavated following a period of wet weather and the upper soils tended to be very moist. A slow rate of seepage was noted in Test Pits 1, 3, 5, 6, 7 and 8, typically on top of

the contact of the soil and bedrock. The moisture appears to be from rainfall and runoff penetrating the upper soil and accumulating on the top of the bedrock unit which acts as an aquatard.

### **Construction**

Data analyzed from reconnaissance and the test pits suggest that the anticipated minor grading can be performed using conventional grading and construction equipment. Ripping of the harder shallow rock areas will probably require a D-10 size dozer and there is a possibility that relatively localized blasting of hard outcrops could be required. Cut grading of upper hill areas will produce a significant portion of boulder size material, which may not be usable in engineered fills. The possible need for localized blasting is considered moderately high for utility trench excavations, especially those deeper than 5 feet or those through outcrop areas.

## CONCLUSIONS AND RECOMMENDATIONS

The following conclusions, opinions and recommendations are based on the evaluation of the data described in this report.

1. The site is considered geotechnically suitable for the proposed mixed use development. No geologic or seismic conditions were found from this study that would preclude use of the property as planned, provided the recommendations presented in this report are incorporated into the design and implemented during construction.
2. The principal geotechnical factors affecting this site are the shallow depth to rock, a moderately high potential for erosion on unprotected graded areas, and the potential for rapid saturation of the upper soils. The existing slopes generally appear to be stable and no landslides or signs of potential instability were observed. The soils at this site generally appear to have relatively low shrink/swell characteristics. Engineering solutions can be developed to mitigate the geotechnical concerns identified on this site. These may include shallow subexcavation in areas cut into rock, control of surficial drainage to reduce erosion, and the use of subdrains to intercept seepage. Additional soil studies should be performed to develop specific solutions when the grading and improvement plans are available.
3. No evidence was found which suggests that the site cannot be graded with other than conventional construction procedures and equipment. Locally, ripping of the harder bedrock in or near outcrop areas may be a concern. Excavation of deeper utility trenches may be difficult in localized areas and could require blasting, especially near outcrop areas, which are located on top of the ridgelines in the northern section. The test pits placed for the study did not encounter difficult excavation.

4. Site grading and drainage plans should address the control of off-site and on-site drainage. The use of shallow subdrains should be considered to mitigate the tendency for water to accumulate or seep above the soil/bedrock contact.
5. Both cut and fill slopes may be prepared at gradients of 2:1 (horizontal to vertical) or less. Steeper cut gradients may be allowable in areas of hard rock, upon approval and observation by a Certified Engineering Geologist.
6. The use of conventional foundation systems and slab-on-grade floor systems appears possible on this site. Preliminary concepts indicate footings trenched 12 to 18 inches into the building pad. Where grading will result in transition cut/fill or transition soil/rock pads, subexcavation should be performed to provide more uniform subgrade conditions. Further exploration and laboratory testing should be performed to study the possible localized presence of expansive soils on the site.
7. It may be advantageous to segregate the less gravelly upper soil as grading cuts are made, especially for potential uses requiring finer grained soils.
8. Preliminary pavement design may be performed utilizing an R-Value of 28. Additional R-Value tests should be performed at a later date, when grading plans are available.
9. Additional soil studies will be required to further develop site-specific geotechnical recommendations for the development planned on the site. Such studies should not be undertaken until a preliminary grading plan has been developed and building siting has been completed.



## REFERENCES CITED

California Division of Mines and Geology, 1987, GEOLOGIC MAP OF THE SACRAMENTO QUADRANGLE; Scale 1:250,000.

California Division of Mines and Geology, 1984, MINERAL LAND CLASSIFICATION OF THE AUBURN 15-MINUTE QUADRANGLE, CDMG Open-File Report 83-37.

California Division of Mines and Geology, 1984, SUMMARY REPORT: FAULT EVALUATION PROGRAM, 1983 AREA - SIERRA NEVADA REGION, CALIFORNIA.

California Division of Mines and Geology, 1988, FAULT-RUPTURE HAZARD ZONES IN CALIFORNIA; California Division of Mines and Geology Special Publication No. 42 (revised).

Earthtec, Ltd., 1987, GENERAL GEOTECHNICAL STUDY, TIMBERLINE SENIOR CENTER, AUBURN, CALIFORNIA.

Earthtec, Ltd., 1992, GENERAL GEOTECHNICAL STUDY, OAKWOOD CARE FACILITY, AUBURN, CALIFORNIA.

Goter, S., 1988, SEISMICITY OF CALIFORNIA: 1808-1987: U.S. Geological Survey Open File Report 88-286.

Jennings, C.W., 1975, FAULT MAP OF CALIFORNIA, California Division of Mines and Geology, Geologic Data Map Series, Map 1.

U.S. Department of Agriculture, 1980, SOIL SURVEY OF PLACER COUNTY, CALIFORNIA.

## LIMITATIONS AND UNIFORMITY OF CONDITIONS

1. The recommendations of this report are based upon the assumption that the soil conditions do not deviate from those disclosed in the borings and test pits. If any variations or undesirable conditions are encountered during construction, Earth Systems Consultants Northern California should be notified so that supplemental recommendations can be given.
2. This report is issued with the understanding that it is the responsibility of the owner or his representatives to see that the information and recommendations contained herein are called to the attention of the other members of the design team (engineer and architect) for the project and are incorporated into the plans, and that the necessary steps are taken to see that the contractors and subcontractors carry out such recommendations.
3. The findings of this report are valid as of the present date. However, changes in the conditions of a property can occur with the passage of time, whether due to natural processes or to the works of man, on this or adjacent properties. In addition, changes in applicable or appropriate standards may occur, whether they result from legislation or the broadening of knowledge. Accordingly, the findings of this report may be invalidated, wholly or in part, by changes outside of our control. Therefore this report is subject to review by Earth Systems Consultants Northern California after a period of three (3) years has elapsed from date of issuance of this report.
4. The body of the report specifically recommends that Earth Systems Consultants Northern California be provided the opportunity for a general review of the grading and foundation plans and specifications for this property, and that Earth Systems Consultants Northern California be

retained to provide observation and testing services during construction. The validity of the recommendations of this report assumes that Earth Systems Consultants Northern California will be retained to provide these services.

5. This report was prepared upon your request for our services, and in accordance with currently accepted geotechnical engineering practice. No warranty based on the contents of this report is intended, and none shall be inferred from the statements or opinions expressed herein.

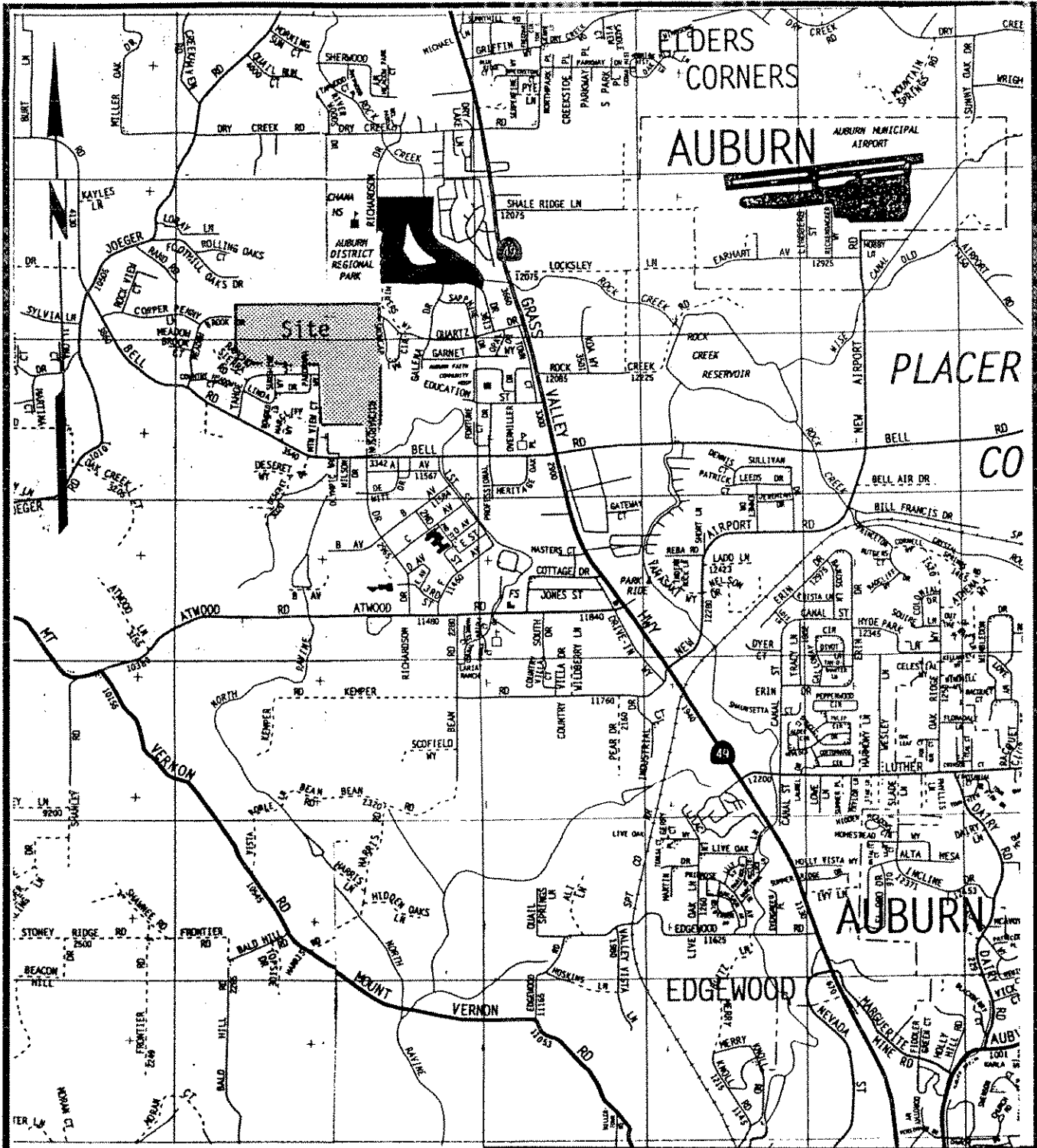
6. The scope of our services did not include any environmental assessment or investigation for the presence or absence of wetlands or hazardous or toxic materials in the soil, surface water, groundwater or air, on or below or around this site. Any statements in this report or on the soil boring (test pit) logs regarding odors noted or unusual or suspicious items or condition observed, are strictly for the information of our client.

## FIGURES

Figure 1 - Location Map

Figure 2 - Site Plan

Figure 3 - Geologic Map



**LOCATION MAP**

**TIMBERLINE VILLAGE**  
 Richardson Drive  
 Auburn, California



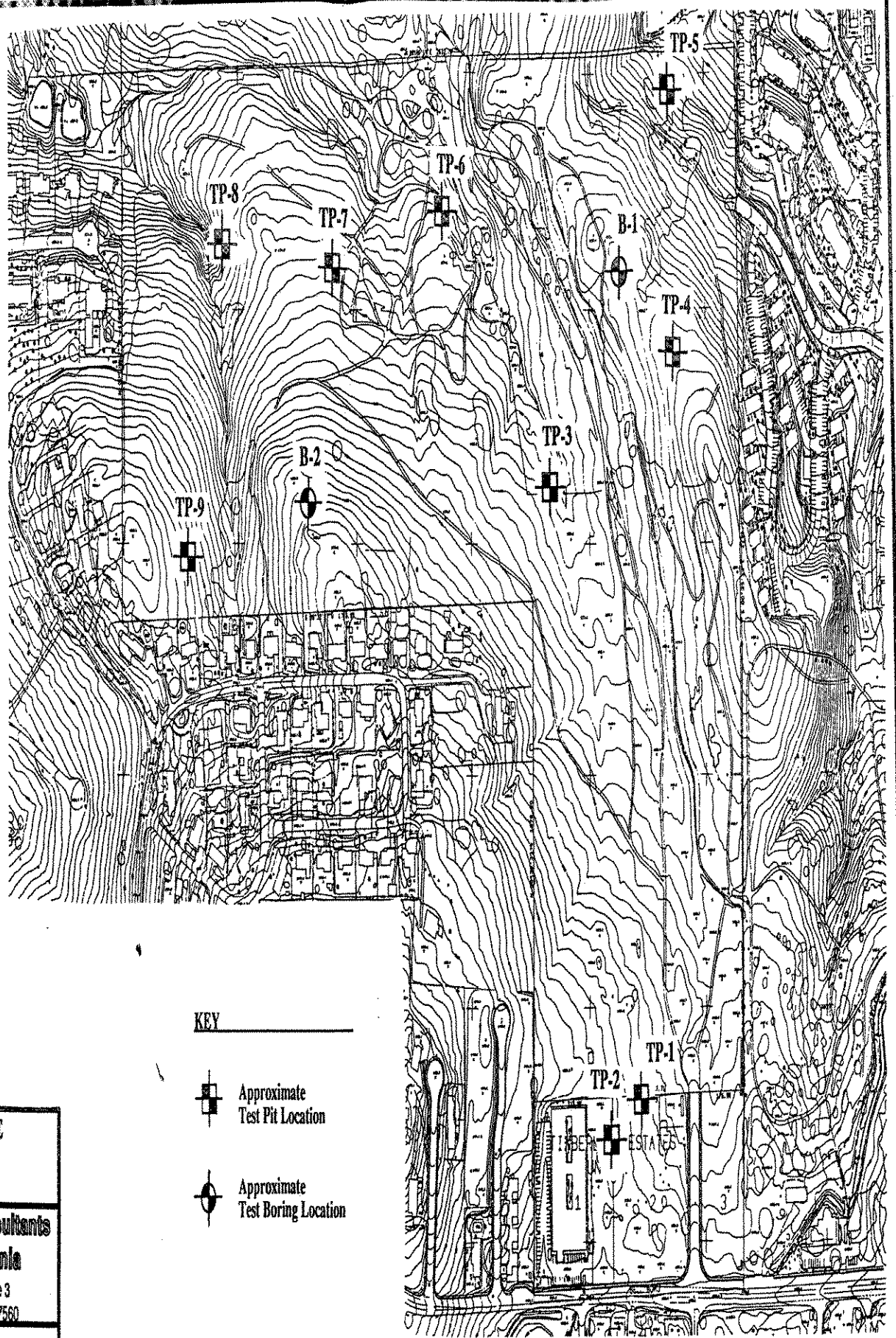
**Earth Systems Consultants**  
 Northern California  
 4231 Pacific Street, Suite 3  
 Rocklin, CA (916)652-7560

Date: June, 1993

File No: NRS-6028-01

Figure 1

Approximate Scale:  
1-inch equals 300 feet



## SITE PLAN

**TIMBERLINE VILLAGE**  
Richardson Drive  
Auburn, California



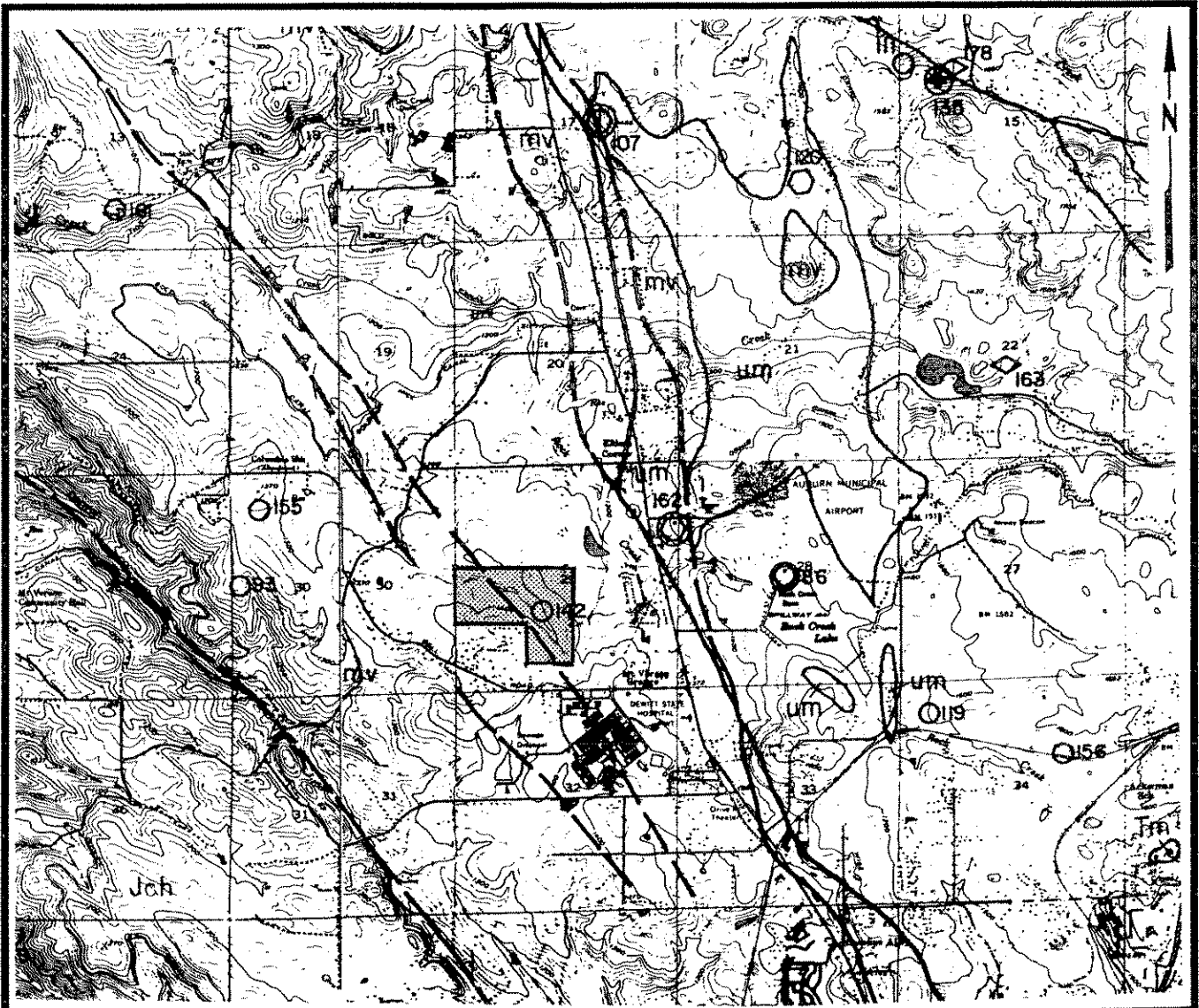
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Date: June, 1993

File No: NRS-6028-01

Figure 2



-Base from C.D.M.G., 1984, Open File Report 83-37

**LEGEND**

- t Dredge Tailing
- Qal Quaternary Alluvium
- Tm Mehrten Formation
- Tg Tertiary river channel deposits
- Mzg Mesozoic granitic intrusive rock
- Mzd Mesozoic dioritic intrusive rock
- Jch Mesozoic Volcanic Island Arc Terrane
- ms Metasedimentary rock
- mv Metavolcanic rock
- mvs Undifferentiated metavolcanics and metasedimentary rock
- gb Gabbro
- um Ultramafic rock

— Fault (dashed where approximated)

Site is Shaded

Approximate Scale: 1-inch = 4000 feet

**GEOLOGIC MAP**

**TIMBERLINE VILLAGE**  
Richardson Drive  
Auburn, California



**Earth Systems Consultants**  
Northern California

4231 Pacific Street, Suite 3  
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Date: June, 1993

File No: NRS-6028-01

FIGURE 3

**APPENDIX A**

**EQFAULT - Summary of Active Faults**

**Logs of Test Borings**

**Logs of Test Pits**

**Summary of Laboratory Test Results**

**Compaction Test**

**Plasticity Chart**

**R-Value Test**



DATE: Tuesday 4-6-1993

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*****  
*  
*           E Q F A U L T           *  
*  
*           Ver. 1.01               *  
*  
* Licensed to:  PACIFIC GEOSCIENCE *  
*  
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```

(Estimation of Peak Horizontal Acceleration  
From Digitized California Faults)

SEARCH PERFORMED FOR: Geological purposes

JOB NUMBER: NRS-6028-01

JOB NAME: Timberline Village - Placer County

SITE COORDINATES:

LATITUDE: 38.48 N  
LONGITUDE: 121.05 W

SEARCH RADIUS: 100 mi

ATTENUATION RELATION: IDRIS (1987) - mean

Soil Conditions: Rock/Stiff Soil

COMPUTE PEAK HORIZONTAL ACCELERATION

FAULT-DATA FILE USED: CALIFLT.DAT

DETERMINISTIC SITE PARAMETERS

ABBREVIATED FAULT NAME	APPROX. DISTANCE mi (km)	MAX. CREDIBLE MAG. ACC. g	PEAK SITE INTENS. MM	MAX. PROB. MAG. ACC. g	PROBABLE SITE INTENS. MM	PEAK SITE ACC. g	MAX. PROB. MAG. ACC. g	PROBABLE SITE INTENS. MM
ANTIPOCH	51 ( 81)	6.50	0.032	4.00	0.003	4.00	0.003	I
CALAVERAS	69 (111)	7.00	0.033	6.50	0.020	6.50	0.020	IV
CARSON VALLEY	67 (107)	7.00	0.034	5.75	0.010	5.75	0.010	III
CONCORD	64 (103)	6.75	0.030	6.25	0.018	6.25	0.018	IV
CORDELIA	60 ( 96)	6.75	0.033	3.50	0.002	3.50	0.002	-
GREEN VALLEY	62 (100)	7.00	0.037	6.25	0.019	6.25	0.019	IV
GREENVILLE	61 ( 99)	7.00	0.038	5.25	0.007	5.25	0.007	II
HAYWARD	78 (125)	7.00	0.028	6.75	0.022	6.75	0.022	IV
HEALDSBURG - ROGERS CREEK	78 (126)	7.00	0.027	7.00	0.027	7.00	0.027	V
LAS POSITAS	65 (105)	6.50	0.022	4.50	0.002	4.50	0.002	-
MAACAMA	87 (140)	7.60	0.043	7.50	0.039	7.50	0.039	V
MORTIGALITA	95 (154)	6.75	0.016	4.50	0.001	4.50	0.001	-
PALO COLORADO-SAN GREGORIO	97 (157)	7.75	0.044	6.75	0.016	6.75	0.016	IV
SAN ANDREAS (Northern)	96 (154)	8.00	0.056	7.50	0.035	7.50	0.035	V
STAMPEDE	79 (127)	6.00	0.009	5.25	0.004	5.25	0.004	I
WEST NAPA	68 (110)	6.50	0.020	3.00	0.002	3.00	0.002	-
WEST WALKER	82 (132)	6.75	0.020	5.25	0.004	5.25	0.004	I
ZAMORA	44 ( 71)	6.50	0.039	5.25	0.012	5.25	0.012	III

\*\*\*\*\*

END OF SEARCH- 18 FAULTS FOUND WITHIN THE SPECIFIED SEARCH RADIUS.

THE ZAMORA FAULT IS CLOSEST TO THE SITE.  
IT IS ABOUT 44.4 MILES AWAY.

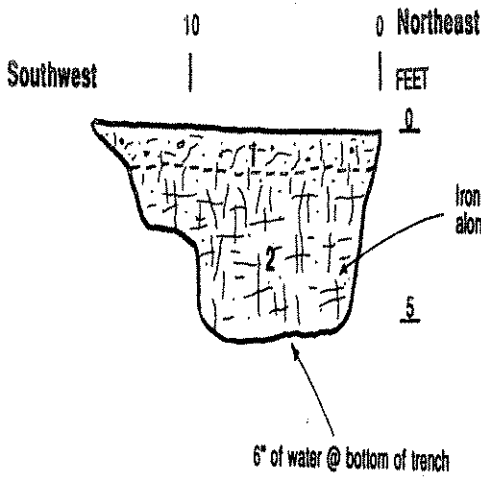
LARGEST MAXIMUM-CREDIBLE SITE ACCELERATION: 0.056 g

LARGEST MAXIMUM-PROBABLE SITE ACCELERATION: 0.039 g

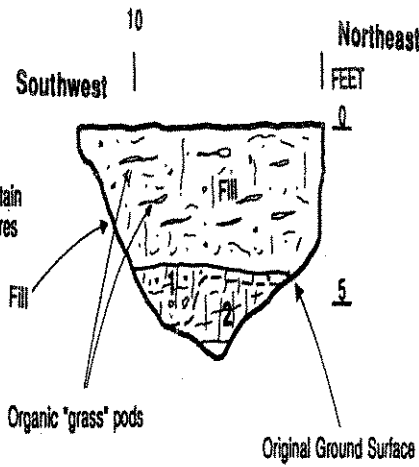
Date Drilled: 3/23/93		Logged by: GRH		Ground Elevation:			BORING 1			
Depth (in Feet)	Symbol	Pen. Resist. (Blows/Ft.)	Pocket Pen. (t.s.f.)	FIELD DESCRIPTION AND CLASSIFICATION			Dry Density (p.c.f.)	Moisture Content (%)	Water Level	
				DESCRIPTION AND REMARKS	Moist. Cond.	Consistency				Soil Type
0				GROUND SURFACE					0	
				Red-brown fine sandy CLAY	Moist	Medium Stiff	CL			
		38	0.5	Yellow-brown fine sandy CLAY with angular 1/2" to 2" clasts of meta volcanics	Damp	Stiff-Very Stiff	CL	100.5	23.7	
		1.75						105.2	20.9	
	Bag "A"			Medium orange-brown weathered schist, friable, closely fractured, fine to medium sandy texture (punky - grains are soft), with black to dark green grains, some foliation	Slightly Damp	Very Dense				
5	50/3"								5	
				-drilling in same relatively uniform rock drilling characteristic is like soft weathered rock	Slightly Damp	Very Dense				
10	50/4"								10	
				Yellowish-orange-brown slightly finer-textured, friable, closely fractured meta-volcanic rock with semi-schistose structure (Green schist)	Slightly Damp	Very Dense				
15	50/3"								15	
				-continuing in green schist	Damp	Very Dense				
20	100/5.5"								20	
				Boring terminated at 20 feet. No groundwater encountered.						

Date Drilled: 3/23/93		Logged by: GRH		Ground Elevation:			BORING 2			
Depth (in Feet)	Symbol	Pen. Resist. (Blows/Ft.)	Pocket Pen. (t.s.f.)	FIELD DESCRIPTION AND CLASSIFICATION			Dry Density (p.c.f.)	Moisture Content (%)	Water Level	
				DESCRIPTION AND REMARKS	Moist. Cond.	Consis- tency				Soil Type
0				GROUND SURFACE					0	
				Red-brown sandy lean CLAY	Moist	Medium Stiff- Stiff	CL			
		50/ 2"		Yellow-brown with green schist, friable, sandy-textured, volcanic derivation, with foliation						
5		50/ 2"		Schist, alternating 1/8" to 1/2" bands of red-brown, orange, yellow-brown, green, silty sandy texture, with some clasts of hard grey volcanic rock (meta- andesite)	Slightly Damp	Very Dense			5	
10		50/ 3"		Light yellow-green schist, friable but tighter than unit above  -slow drilling	Slightly Damp	Very Dense			10	
15				Hard crystalline meta-volcanic rock					15	
20				Boring met refusal at 16 feet. No groundwater encountered.					20	

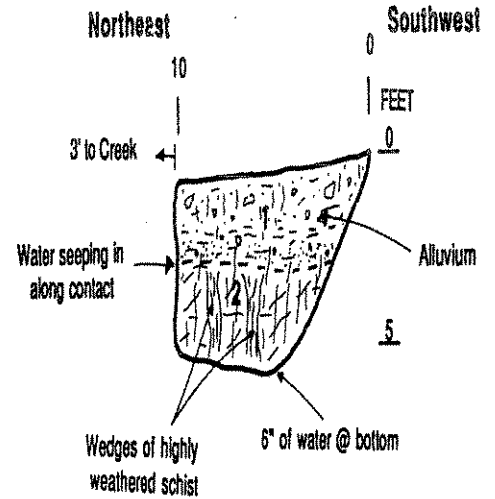
**TEST PIT 1**  
N9°E NW Face



**TEST PIT 2**  
N10°E NW Face



**TEST PIT 3**  
N50°E SE Face



**UNIT DESCRIPTIONS TEST PIT 1**

- 1. Clayey silty/silty clay with sand and gravel  
7.5YR 3/2 Dark brown, moist, wet at contact with unit 2, firm, slightly porous to porous, sand and gravel size fragments are composed of subangular metamorphosed volcanics and subrounded milky quartz.
- 2. Metamorphosed volcanics  
Grey to olive, moist where weathered, hard, slightly porous, fractured, slightly friable, has a greenish aphanitic groundmass and very fine-grained anhedral crystals within groundmass.

**UNIT DESCRIPTIONS TEST PIT 2**

- 1. Clayey silty/silty clay with sand and gravels  
5YR 5/6 Yellowish red, moist, firm, slightly porous to porous, sand and gravel size frags. are composed of metamorphosed Volcanics and milky quartz.
- 2. Metamorphosed volcanics  
Grey to olive, slightly moist where weathered, hard, vary slightly porous, fractured, slightly friable, has a greenish aphanitic groundmass and very fine-grained anhedral crystals within groundmass.

**UNIT DESCRIPTIONS TEST PIT 3**

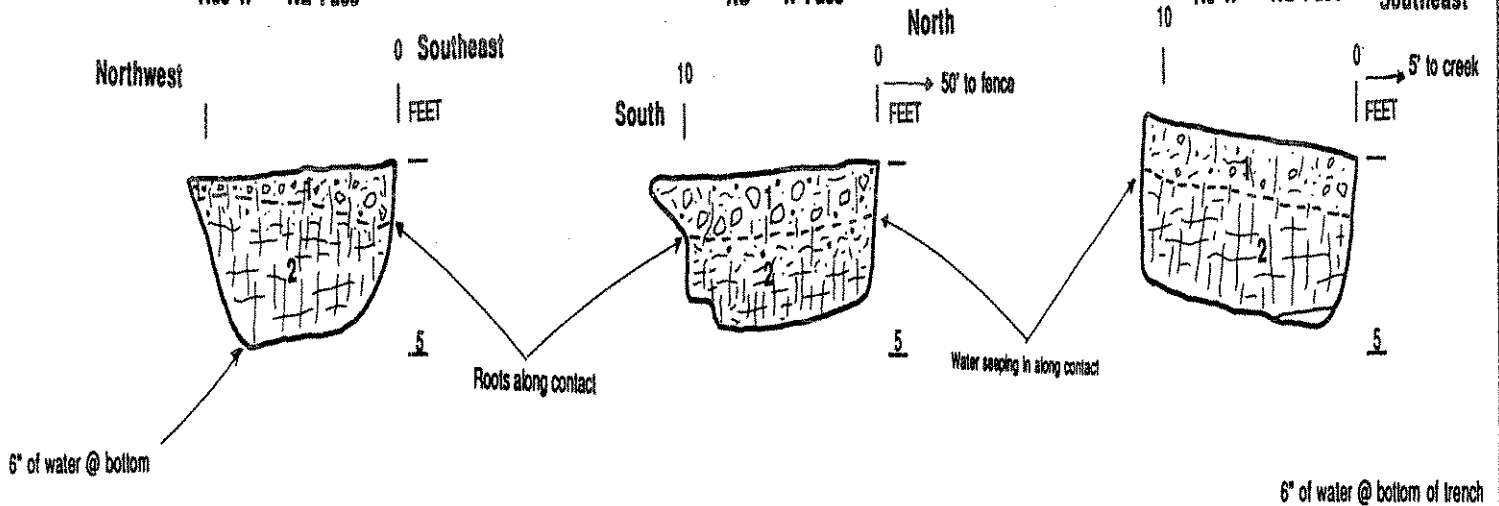
- 1. Silty clay with gravel/sandy clay to clayey sand with gravel and rock frags.  
5YR 4/4 Reddish brown, moist-wet, medium dense, loose, laminated near base of unit, rock frags. and gravels are composed of metamorphosed volcanics and milky quartz. (alluvium).
- 2. Chlorite schist  
Pale olive, moist, stiff-hard, very slightly porous, foliated, fractured, upper 1' is highly weathered. Has a dominant chloritic colour and some relict mafic minerals, Phaneritic texture.

**LOG OF TEST PITS 1, 2 AND 3**  
Timberline Village  
Placer County, California

**TEST PIT 4**  
N38°W NE Face

**TEST PIT 5**  
NS W Face

**TEST PIT 6**  
N5°W NE Face



UNIT DESCRIPTIONS TEST PIT 4

- |                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                           |
|-------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>1. Clayey silt/silty clay with sand gravel and cobble size fragments</p> <p>2. Chlorite schist</p> | <p>7.5YR 3/2 Dark brown, moist, stiff, slightly porous, sand and gravel size fragments are made up of metamorphosed volcanics</p> <p>Pale olive, moist, stiff-hard, very slightly porous to non-porous, friable, semischistose, weak lamination, phaneritic, upper 2' highly weathered and fractured, dominant chloritic green colour and some relict mafic minerals.</p> |
|-------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

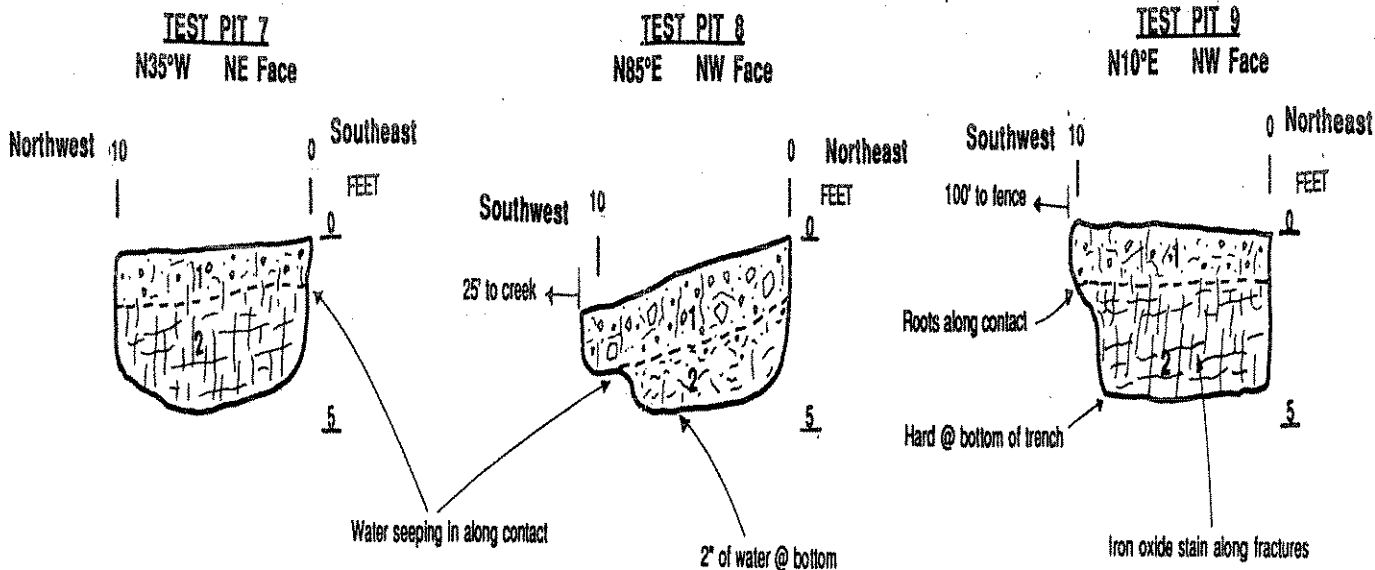
UNIT DESCRIPTIONS TEST PIT 5

- |                                                                                                       |                                                                                                                                                                                                                                                                                                                                          |
|-------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>1. Clayey silt/silty clay with sand gravel and cobble size fragments</p> <p>2. Chlorite Schist</p> | <p>7.5YR 3/2 Dark brown, moist, stiff, slightly porous, sand and gravel size fragments are made up of metamorphosed volcanics</p> <p>Pale olive, moist, stiff-hard, very slightly porous, friable, semischistose, weakly foliated, fractured, blocky, phaneritic. Upper 1' is highly weathered into a clayey matrix with minor sand.</p> |
|-------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

UNIT DESCRIPTIONS TEST PIT 6

- |                                                                                            |                                                                                                                                                                                                                                                                              |
|--------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>1. Clayey silt/silty clay with sand and gravel size frags</p> <p>2. chlorite schist</p> | <p>7.5YR 3/2 Dark brown, moist, stiff, slightly porous, sand and gravel size fragments are made up of metamorphosed volcanics</p> <p>olive, damp, hard, very slightly porous to non-porous, platy, weakly foliated, semischistose, phaneritic, rocky, blocky, fractured.</p> |
|--------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**LOG OF TEST PITS 4, 5 AND 6**  
**Timberline Village**  
**Placer County, California**



Creek is 225' to East

UNIT DESCRIPTIONS TEST PIT 7

- |                                                                                                                                           |                                                                                                                                                                                                                                                                  |
|-------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ol style="list-style-type: none"> <li>1. Clayey silty/silty clay with sand and gravel size frags.</li> <li>2. Chlorite schist</li> </ol> | <p>5YR 4/4 Reddish brown, moist, stiff, slightly porous, fragments are composed of metamorphosed volcanics.</p> <p>Pale olive, moist, hard, very slightly porous to non-porous, platy, weakly foliated, semischistose, phaneritic, rocky, blocky, fractured.</p> |
|-------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

UNIT DESCRIPTIONS TEST PIT 8

- |                                                                                                                                                      |                                                                                                                                                                                                                                                          |
|------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ol style="list-style-type: none"> <li>1. Clayey silty/silty clay with sand, gravel and cobble size fragments</li> <li>2. Chlorite schist</li> </ol> | <p>5YR 4/4 Reddish brown, moist, stiff, porous, frags are composed of metamorphosed volcanics and are partly colluvial in this unit.</p> <p>Pale olive, moist, firm, upper 1.5' is highly weathered into a clayey matrix, semi-schistose, fractured.</p> |
|------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

UNIT DESCRIPTIONS TEST PIT 9

- |                                                                                                                                                      |                                                                                                                                                                                                 |
|------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ol style="list-style-type: none"> <li>1. Clayey Silty/Silty clay with sand and gravel size fragments</li> <li>2. Metamorphosed volcanics</li> </ol> | <p>5YR 4/4 Reddish brown, moist, stiff, porous, iron oxide stained.</p> <p>Greenish grey, damp where weathered, hard, homfelsic aphanitic groundmass, dense, fractured, iron oxide stained.</p> |
|------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**LOG OF TEST PITS 7,8 AND 9  
Timberline Village  
Placer County, California**

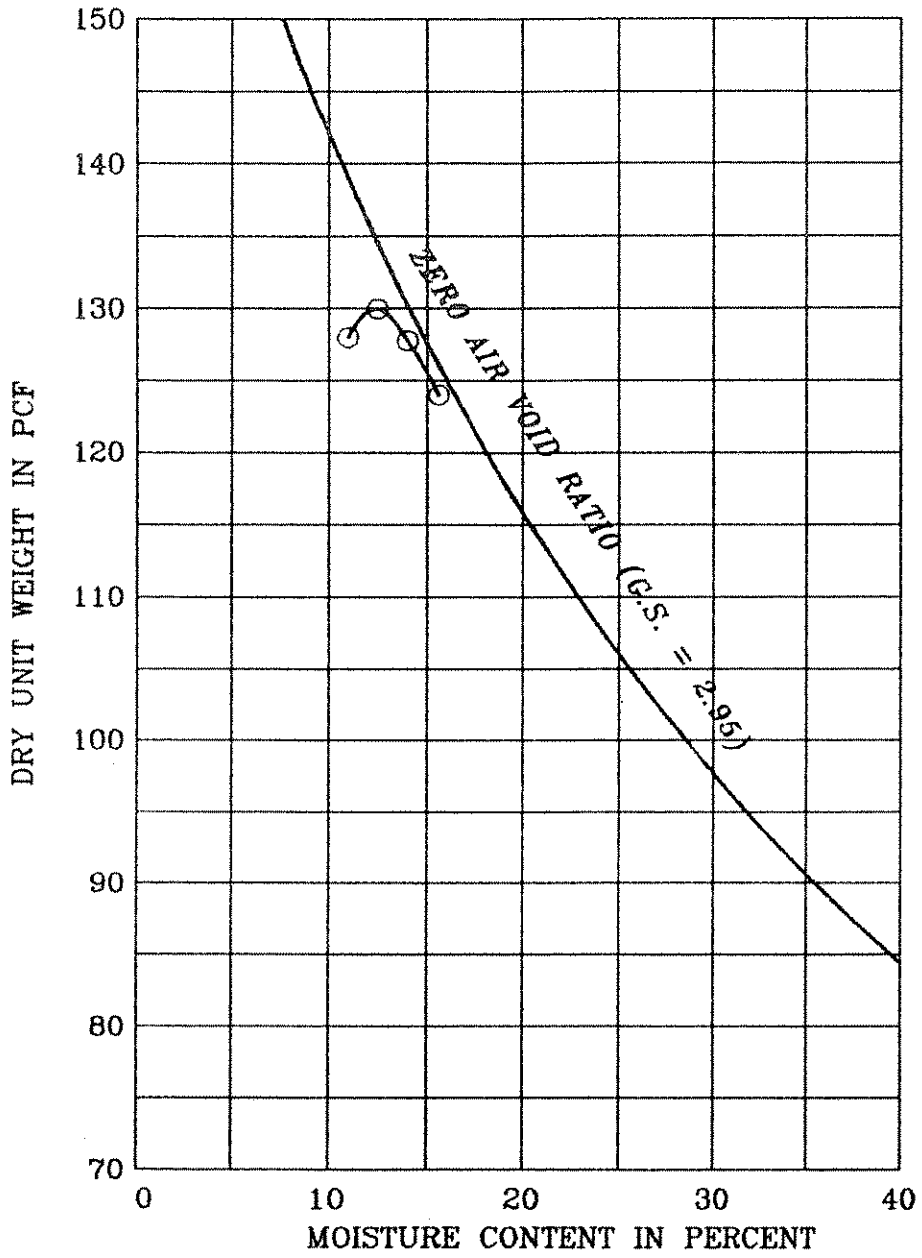
Table A-1

Summary of Laboratory Test Results

Sample Number	Depth (feet)	<u>In-Place Conditions</u>		<u>Swell Testing</u>			<u>Direct Shear Testing</u>	
		Dry Density (pcf)	Moisture Content (%dry wt)	Swell Index (A)	% Swell	Moisture Increase % (B)	Angle of Internal Friction	Unit Cohesion psf
1-1-1	1.5	100.5	23.7	0.0	0.0	0.5	20°	400
1-1-2	2.0	105.2	20.9					
TP1-1	0.5	97.5	22.2					
TP2-1	1.5	81.7	27.0					
TP2-2	4.5	98.6	24.2					
TP5-2	3.5	108.6	21.2	0.9	1.5	1.7	11*	450
TP7-1	1.0	90.9	24.6					
TP7-2	1.5	92.3	22.1					
TP8-2	3.0	82.4	34.5					
TP9-2	3.0	103.6	24.2					
B*	2.0	116.9	12.5	0.8	7.8	9.5	20°	350

Notes: (A) = Swell Index equals percent swell divided by percent moisture increase.  
 (B) = Moisture Increase following at least 24 hours of soaking prior to testing.  
 \* = Sample recompacted to 90 percent relative compaction (based on ASTM D1557-91).

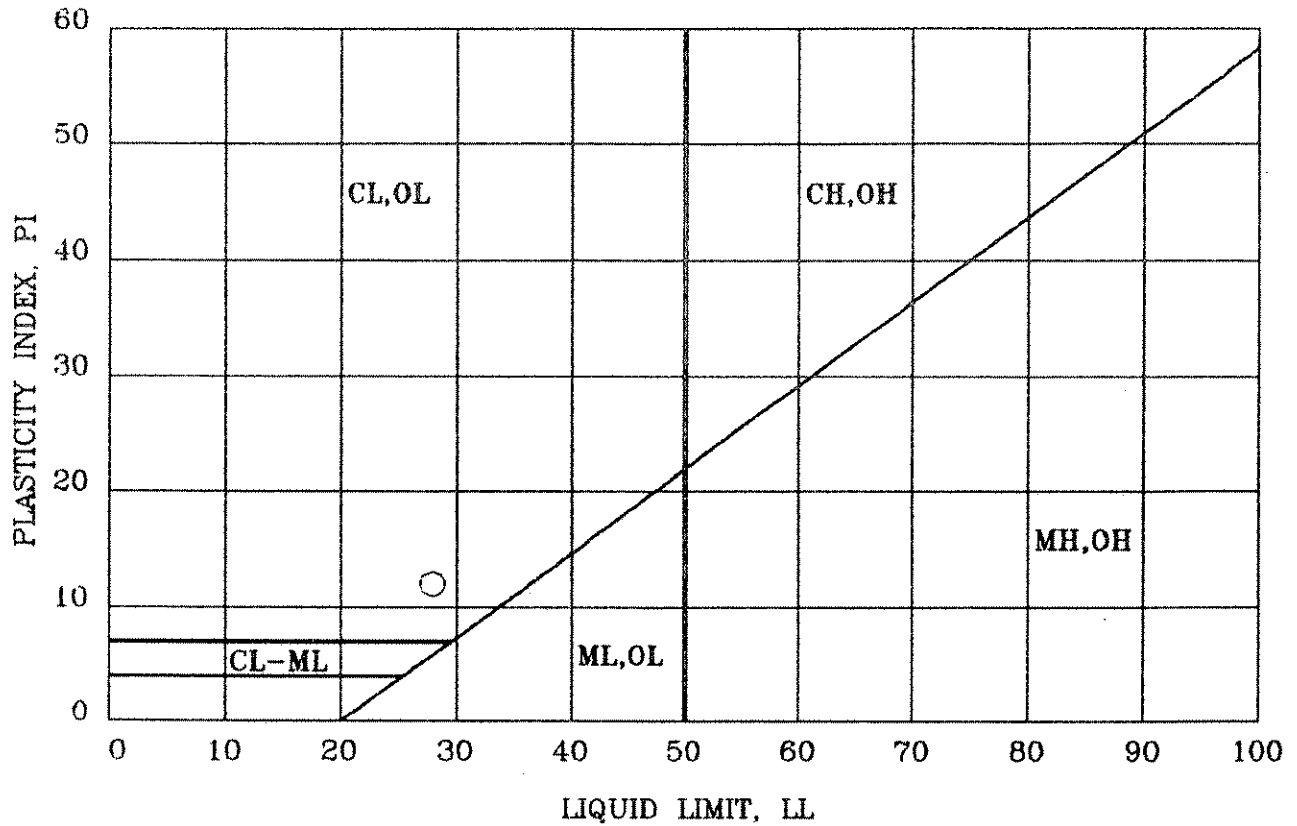




SYMBOL	SAMPLE LOCATION	DEPTH (ft)	DESCRIPTION	TEST METHOD	OPTIMUM MOISTURE (%)	MAXIMUM DRY DENSITY (pcf)
O	B	1.5-6	Tan Sandy Clay	1557-91A	12.5	130.0

Remark :

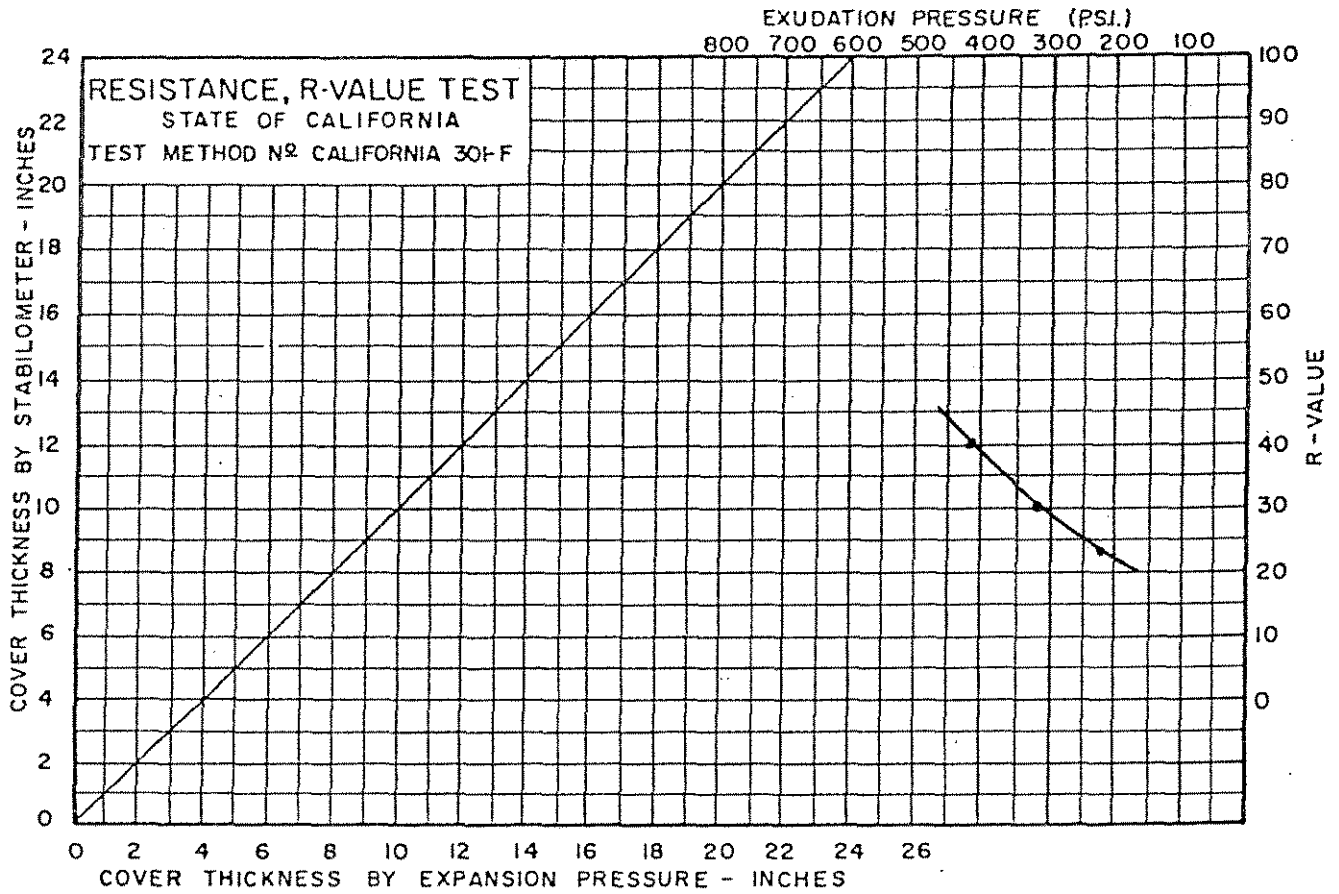
NRS-6028-01	Timberline Village
Earth Systems	COMPACTION TEST



SYMBOL	BORING	DEPTH (ft)	MC (%)	LL (%)	PL (%)	PI (%)	LI (-)	DESCRIPTION
○	TP-5	1	.0	28	16	12	-1.38	Red. Brn Sandy Lean clay W/ Gvl

Remark :

Timberline Village	NRS-6028-01
Earth Systems	PLASTICITY CHART



SAMPLE: Bag C (Test pit 5 at 1-foot)  
DESCRIPTION: Reddish brown sandy clay

SPECIMEN	A	B	C
EXUDATION PRESSURE (PSI.)	218	320	420
EXPANSION DIAL (.0001")	20	28	40
EXPANSION PRESSURE (P.S.F.)	87	121	173
RESISTANCE VALUE, "R"	23	30	40
% MOISTURE AT TEST	18.3	17.7	17.0
DRY DENSITY AT TEST (PCF)	112.0	113.6	115.0
"R" VALUE AT 300 P.S.I. EXUDATION PRESSURE	= ( 28 )		