ENGEO INCORPORATED

GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS
MATERIALS TESTING

GEOTECHNICAL REPORT UPDATE

BASS LAKE ROAD REALIGNMENT - PHASE 2

EL DORADO COUNTY, CALIFORNIA

SUBMITTED

TO

SILVER SPRINGS LLC.
2999 OAK ROAD, SUITE 400
WALNUT CREEK, CA 94597

PREPARED

BY

ENGEO INCORPORATED

PROJECT NO. 4235.5.050.01

FEBRUARY 2, 2005

Project No.
4235.5.050.01

February 2, 2005

Mr. Bill Scott
Silver Springs LLC
2999 Oak Road, Suite 400
Walnut Creek, Ca. 94597

Subject: Bass Lake Road Realignment – Phase 2
El Dorado County, California

GEOTECHNICAL REPORT UPDATE

References:

1. Anderson Geotechnical Consultants, Inc.; Geotechnical Report for Bass Lake Property, El Dorado County, California; May 1989, File No. 2011-3..

2. Anderson Consulting Group; Geotechnical Report Update, Silver Springs (Formerly Bass Lake Property), El Dorado Hills, California; January 4, 2000, File No. 2011.4.

3. MacKay & Somps Civil Engineers, Inc.; Plans for the Improvement of Silver Springs Bass Lake Road; dated April 5, 2002.

Dear Mr. Scott:

In accordance with our January 12, 2005 agreement, we prepared this geotechnical report update for use in design and construction of Phase 2 of the Bass Lake Road Realignment project in El Dorado County, California.

We summarize below the project description, project history, and our updated conclusions and recommendations.

PROJECT DESCRIPTION

The project is located within the future Silver Springs residential subdivision in El Dorado County, California. The project is located to the south of Green Valley Road and north of Old Bass Lake Road. Phase 1 of the improvements phase of the project has already been completed. Phase 1 consisted of construction of rough grading along New Bass Lake Road, construction of four culvert crossings of New Bass Lake Road, construction of a detention basin, and underground construction of portions of the sanitary sewer, sewer force main and storm drain.

Phase 2 of the onsite improvements will include finishing construction of New Bass Lake Road, widening of Green Valley Road along the frontage of the Silver Springs project, and underground construction of the remainder of the utilities including sanitary sewer, storm drain, and water line.

PROJECT HISTORY

Anderson Geotechnical Consultants, Inc. (AGC) prepared the original geotechnical report for the Silver Springs Development (formerly called the Bass Lake Property), dated May 26, 1989 (Reference 1). In January of 2000 Anderson Consulting Group (ACG – formerly AGC) prepared an update for the Silver Springs Development (Reference 2). As you know, the assets of ACG were purchased by ENGEO Incorporated in 2002.

We include the January 2000 ACG update as Appendix A, and the May 1989 AGC report as Appendix B.

SITE CONDITIONS

We visited the site on December 22, 2004 to observe the current condition of the project site.

We observed the following site conditions:

- The majority of New Bass Lake Road appears to have been rough graded,
- The soil observed at the ground surface is typically reddish brown sands that appear to be residual soil from decomposed granite,
- Four culvert crossings have been constructed across the alignment of New Bass Lake Road,
- Several manholes labeled as either Storm Drain or Sanitary Sewer were observed within the alignment of New Bass Lake Road. The tops of the manholes were typically flush with the ground or slightly higher than the adjacent ground,
- A large detention basin has been constructed along the western side of the alignment of New Bass Lake Road,

CONCLUSIONS

Based on our site observations and review, it is our opinion that the findings, conclusions, and recommendations in the May 26, 1989 AGC Geotechnical Report, Reference 1, are applicable for design of the proposed subdivision.

The pavement sections presented in the 1989 report are based on an assumed R-value of 30 of the subgrade soil. The soil in the upper 2 feet of the pavement subgrade should consist of native, non-clayey soil in order for this R-value to be valid. The validity of the assumed R-value should be confirmed during finished grading of the roadway improvements. Further, an ENGEO representative should be present during the remaining underground construction to verify that the pavement subgrade soil is consistent with the assumed material type.

CLOSURE

This letter was prepared for the sole use of Silver Springs LLC and their design consultants for application to the design of the proposed Phase 2 of the Bass Lake Road Realignment On-site Improvements. We strived to perform our services in accordance with generally accepted geotechnical engineering practices at this time and location. No warranty is expressed or implied.

Our experience and that of our profession clearly indicates that the risk of costly design, construction, and maintenance problems can be significantly lowered by retaining the design geotechnical engineering firm to review the project plans and specifications and provide geotechnical testing and observation services during construction. Please let us know when working drawings are nearing completion, and we will be glad to discuss these additional services with you.

If you have any questions or comments regarding this letter, please call and we will be glad to discuss them with you.

Sincerely,

ENGEO Incorporated

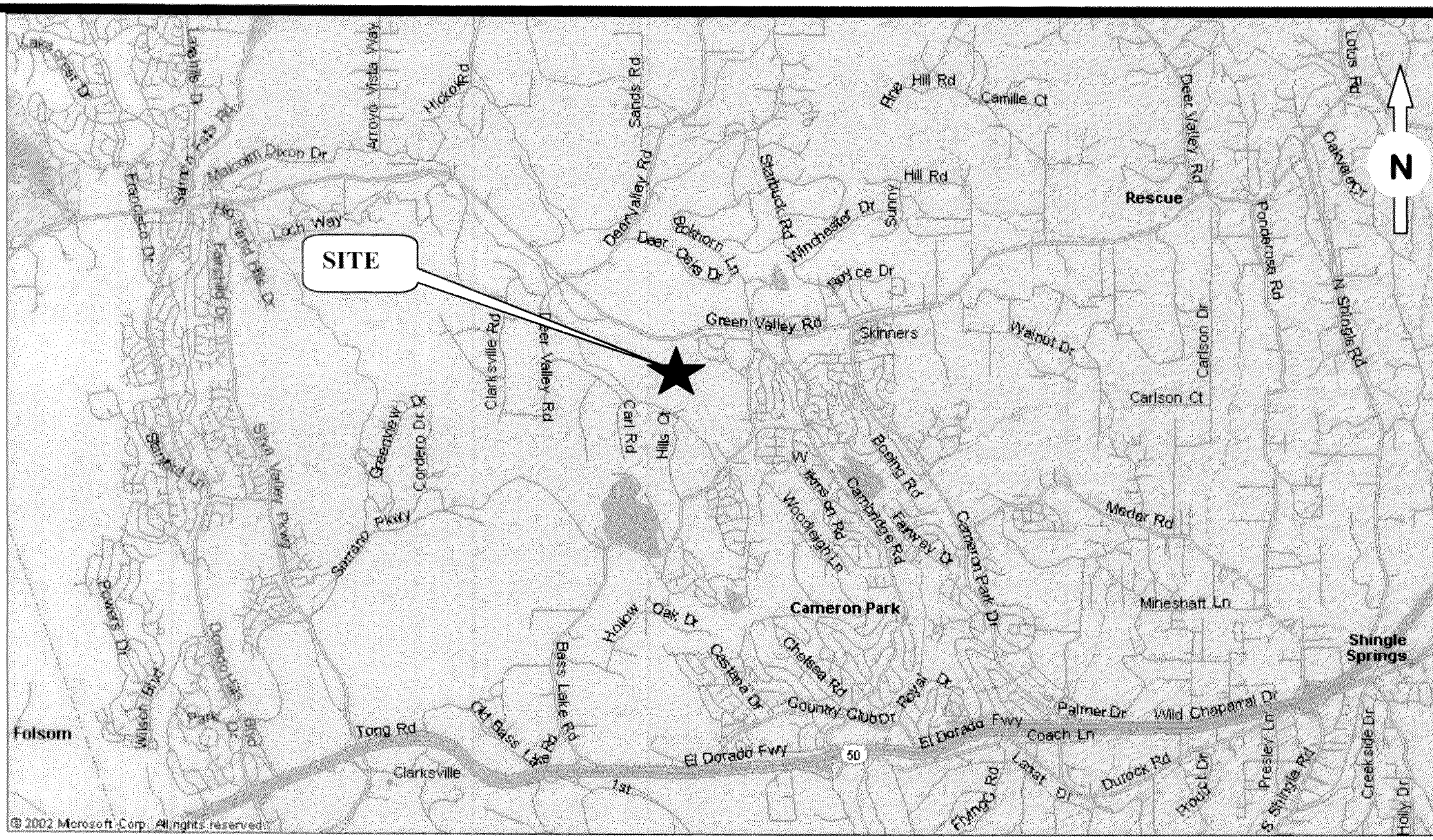
REGISTERED PROFESSIONAL ENGINEER
JEFF A. FIPPIN
2631
Exp. 6/30/07
GEOTECHNICAL
STATE OF CALIFORNIA

Jeff Fippin, PE, GE

Reviewed by:

Mark M. Gilbert, PE, GE

Attachments: Figure 1 Vicinity Map
Appendix A - Anderson Consulting Group; Geotechnical Report Update, Silver Springs (Formerly Bass Lake Property), El Dorado Hills, California; January 4, 2000, File No. 2011.4.
Appendix B - Anderson Geotechnical Consultants, Inc.; Geotechnical Report for Bass Lake Property, El Dorado County, California; May 1989, File No. 2011-3.



VICINITY MAP

Bass Lake Road Realignment Phase 2
El Dorado Hills, CA

ENGEO INCORPORATED

Not to Scale

Job No.
4235.5.050.01

Figure 1

APPENDIX A

Anderson Consulting Group; Geotechnical Report Update, Silver Springs (Formerly Bass Lake Property), El Dorado Hills, California; January 4, 2000, File No. 2011.4.

GEOTECHNICAL
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EMPLOYEE-OWNED

File No. 2011.4
January 4, 2000

Bass Lake Joint Venture
John Sedar
Benson and Sedar
14401 Blue Ravine Road
Folsom, CA 95630

Subject: **GEOTECHNICAL REPORT UPDATE**
SILVER SPRINGS (FORMERLY BASS LAKE PROPERTY)
Bass Lake Road
El Dorado Hills, California

Dear Mr. Sedar:

In accordance with our October 20, 1999 agreement, we prepared this geotechnical report update for use in design of the proposed Phases I through IV of Silver Springs project in El Dorado Hills, California. We summarize below the project description, project history, scope of services, and our updated conclusions and recommendations.

PROJECT DESCRIPTION

MacKay and Somps prepared the "Large Lot Tentative Map and Small Lot Tentative Map" (Revised November 2, 1998) for the Silver Springs project. Base on this plan and discussions with Mr. Dennis Stefani with MacKay and Somps, we understand that improvements will include construction of:

1. Single family residential construction on Phases I, II, III, and IV, including interior streets and associated utilities.
2. Realignment of Bass Lake Road along the western boundary of the project, including two box culverts at approximately the same location as noted in our original Geotechnical Report.
3. Phases V, VI, and VII will not be included in the Silver Springs project.

PROJECT HISTORY

We prepared the original Geotechnical Report (File 2011.1, May 26, 1989) for the Bass Lake Project, which encompasses current Phases I through IV of the Silver Springs Project. Silver Springs Phases I through IV are in a portion of the area referenced as "Parcel I" in the original Geotechnical Report. We attached a copy of this report for reference.

SCOPE OF SERVICES

Our scope of services included the following:

1. Review our original Geotechnical Report and improvement plans referenced in the tentative map referenced above.
2. Perform a site visit to observe existing surface conditions.
3. Prepare a Geotechnical Report Update letter with supplemental conclusions and recommendations for Phases I, II, III, IV, and the Bass Lake Road realignment.

SITE RECONNAISSANCE

We visited the site on November 10, 1999 to observe existing surface features. The surface conditions in Phases I though IV and Bass Lake Road realignment areas were generally similar to those discussed in our original report. The proposed Bass Lake Road centerline was staked through the project. Doug VeerKamp General Engineering contractors was working on sewer improvements along the Bass Lake Road Alignment. They indicated that the sewer line and force main was already installed.

CONCLUSIONS AND SUPPLEMENTAL RECOMMENDATIONS

Based on our review, it is our opinion that the findings, conclusions, and recommendations in our May 26, 1989 Geotechnical Report are applicable for design of the proposed project provided the following supplemental recommendations are incorporated into the final design.

Paragraph 32 (Subsurface Drains)

Replace this paragraph with:

We should be retained to evaluate the need for subdrains once preliminary grading plans are developed, and again during site grading. If we determine that subdrains are necessary, we will provide specific geotechnical recommendations for subdrain design based on site-specific seepage conditions.

Paragraph 40 (Grading)

Add the following new paragraphs:

The relative compaction and optimum moisture content of soil and rock referred to in this report are based on the most recent ASTM D1557 test method. Compacted soil should not be considered acceptable if it is unstable. It should exhibit only minimal *flexing* or *pumping,* as determined by an ACG representative.

As used in this report, the term "moisture condition" refers to adjusting the moisture content of the soil by either drying if too wet or adding water if too dry. We define "structural areas" in as any area sensitive to settlement of compacted soil. These areas include, but are not limited to building pads, sidewalks, pavement areas, driveways, and retaining walls.

Paragraph 43 (Grading)

Delete this paragraph

Paragraphs 51 (Grading)

Replace this paragraph with:

Remove significant concentrations of clay, as determined by an Anderson Consulting Group representative, from the upper 2 feet of building pad subgrade. In lieu of clay removal, clay may be thoroughly mixed with granular soil such that the resulting mixture has a Plasticity Index less than 15. In pavement areas, clay should be removed within the upper 12 inches of finish subgrade and replaced with granular soil having a minimum R-value of 30.

Paragraphs 57 and 60 (Foundations)

Add the following recommendations to these paragraphs:

Strip footings should be reinforced with a minimum of two No. 4 rebars, one top, and one bottom. The need for additional reinforcement should be evaluated by a structural engineer based on actual design loads.

Paragraph 84 (Slabs-on-Grade)

Replace this paragraph with the following:.

We recommend the following minimum design:

1. Place 6X6-W1.4XW1.4 wire mesh within the middle third of the slab to help control the width of shrinkage cracks, which inherently occur as concrete cures.
2. Provide a minimum concrete thickness of 4 inches.

To reduce moisture migration problems where moisture sensitive floor coverings will be used, underlay concrete floor slabs with:

1. 2 inches of clean sand (less than 5 percent passing the U. S. Standard No. 40 Sieve); **Over**
2. Vapor barrier membrane consisting of 10-mil polyethylene "plastic" sheeting, properly sealed at penetrations and edges; **Over**
3. 4 inches of clean crushed rock. Crushed rock should have 100 percent passing the ¾-inch sieve and less than 5 percent passing the No. 4 Sieve; **Over**
4. Compacted subgrade.

Moisture migrating through or from interior floor slabs can be reduced further by specifying a maximum water-cement ratio of 0.50 for slab concrete, pouring concrete at a slump between 3 and 5 inches, and using a more puncture resistant, less permeable vapor barrier membrane.

The structural engineer should provide final design thickness and additional reinforcement for any structural loads.

Paragraph 89 (Retaining Structures)

Design values provided in Paragraph 87 assume a drained backfill condition. Construct either graded rock drains or geosynthetic drainage composites behind the retaining walls to reduce hydrostatic lateral forces. For rock drain construction, we recommend two types of rock drain alternatives:

1. A minimum 12-inch-thick layer of Class 2 Permeable Filter Material (Caltrans Specification 68-1.025) placed directly behind the wall, or
2. A minimum 12-inch-thick layer of washed, crushed rock with 100 percent passing the ¾-inch sieve and less than 5 percent passing the No. 4 sieve. Envelope rock in a nonwoven geotextile filter fabric such as Mirafi 140NC, or equivalent.

For both types of rock drains:

1. Place the rock drain directly behind the walls of the structure.
2. Extend rock drains from the wall base to within 12 inches of the top of the wall.
3. Place a minimum of 4-inch-diameter perforated pipe at the base of the wall, inside the rock drain and fabric, with perforations placed down.
4. Place pipe at a gradient at least 1 percent to direct water away from the wall by gravity to a drainage facility.

ACG should review and approve geosynthetic composite drainage systems prior to use.

Paragraph 91 (Pavement Design)

Replace this paragraph with:

We performed laboratory resistance value (R-value) testing on bulk soil samples that we obtained from planned pavement areas. The test R-values were generally between 27 and 32, with one R-value of 13 that represents clay soil. We used an R-value of 30 and Caltrans design methods (including the asphalt factor of safety) to prepare flexible pavement section alternatives.

Use the following flexible pavement sections for various traffic indices and an R-value of 30:

Table 1: Minimum Pavement Sections
R-value = 30

Traffic Index	Asphalt Concrete (in.)	*Class 2 Aggregate Base (in.)
4	2.5	6
5	2.5	7
6	3	9
7	4	10
8	4.5	12

*Caltrans Class 2 Aggregate Base

The civil engineer should determine the appropriate traffic indices based on the estimated traffic loads and frequencies. The traffic indices used in our pavement design are considered reasonable values for the proposed development and should provide a pavement life of approximately 20 years with a normal amount of flexible pavement maintenance. The traffic parameters used for design were selected based on engineering judgment and not on information furnished to us such as an equivalent wheel load analysis or a traffic study.

If clay is observed within the upper 12 inches of finish pavement subgrades, it should be removed and replaced with granular soil having a minimum R-value of 30.

Saturated pavement subgrades or aggregate base can cause premature failure or increased maintenance of asphalt concrete pavements. This condition often occurs where landscape areas directly abut pavements. If increased protection against saturated subgrades or aggregate base is desired, construct concrete cut-off curbs where pavements directly abut landscape areas. Extend the curbs at least 4 inches into the subgrade below the aggregate base course level.

Paragraph 92 (Pavement Design)

Replace this paragraph with:

The upper 12 inches of pavement subgrade and all aggregate base should be compacted to at least 95 percent relative compaction, per ASTM D1557. For rocky subgrades, as determined by Anderson Consulting Group, compact the upper 12-inches of pavement subgrades with at least 8 passes of a Cat 825 compactor while the material is at or near the optimum moisture content.

FUTURE SERVICES

Our experience and that of our profession clearly indicates that the risk of costly design, construction, and maintenance problems can be significantly lowered by retaining the design geotechnical engineering firm to perform the following:

1. Review the final construction plans and specifications, and
2. Observe the earthwork and foundation construction.

Please let us know when you will require these services and we will prepare a supplemental agreement.

CLOSURE

This letter was prepared for the sole use of Bass Lake Joint Venture for application to the design of the proposed Silver Springs subdivision, as described herein. This update was prepared in accordance with generally accepted geotechnical engineering practices at this time and location. No warranty is expressed or implied. This letter is subject to the limitations of our May 26, 1989 Geotechnical Report covering Silver Springs.

If you have any questions or comments regarding this letter, please call and we will be glad to discuss them with you.

Sincerely,

ANDERSON CONSULTING GROUP

David J. Morrell
Project Manager
Ext. 211
Mobile: 916-417-9205

Mark M. Gilbert, PE
Principal Engineer
Ext. 203
Mobile: 916-416-9002

REGISTERED PROFESSIONAL ENGINEER MARK M. GILBERT 2191 Exp. 3-31-04 GEOTECHNICAL STATE OF CALIFORNIA

Copies: 4 to Addressee
1 to Dennis Stefani/MacKay & Somps

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APPENDIX B

Anderson Geotechnical Consultants, Inc.; Geotechnical Report for Bass Lake Property, El Dorado County, California; May 1989, File No. 2011-3.

REPORT

to

BENSON AND SEDAR

RANCHO CORDOVA, CALIFORNIA

GEOTECHNICAL REPORT

for

BASS LAKE PROPERTY

El Dorado County, California

by

ANDERSON GEOTECHNICAL CONSULTANTS, INC.

631 Commerce Drive

Roseville, California

MAY 1989

File No. 2011-3
26 May 1989

Benson and Sedar
2724 Kilgore Road
Rancho Cordova, CA 95670

Attention: Steve Benson

Subject: Bass Lake Project
El Dorado County, California
GEOTECHNICAL REPORT

Dear Steve:

Transmitted herein is our Geotechnical Report for the approximately 287 acre Bass Lake Project located in El Dorado County, California. The findings of our study along with recommendations for design and construction of the proposed subdivision are included in the body of this report.

Geotechnical reconnaissance utilizing a few exploratory borings and trenches relies on conformity of the material between the probes. Oftentimes during construction we find this not to be the case. Therefore in presenting this report we wish to do so with the understanding that we be allowed to continue on this project by providing testing and observation services during construction. Such services would include engineering services during construction, testing of fill for lots, streets and utility trenches, and engineering observation of foundation construction.

Yours truly,

ANDERSON GEOTECHNICAL CONSULTANTS, INC.

Jeff S. Patton

Edward J. Uhlir
C.E. 35598/E.G. 1275

copies: 5 to Benson and Sedar

File No. 2011-3
26 May 1989

GEOTECHNICAL REPORT

Location and Description of Project

1. The approximately 287 acre Bass Lake Project is located in El Dorado County, California. The project consists of two irregularly shaped parcels. The first parcel, which is by far the much larger of the two (approximately 244 acres), is generally rectangular and elongated along in the north-south direction. It is bordered to the south, west and northeast by rural residences or undeveloped land; to the north by Green Valley Road; and to the southeast by Bass Lake Road. The second parcel, which is approximately 43 acres, is relatively narrow and wraps around the north and east sides of Bass Lake. It is bounded on the south and west by Bass Lake, to the southeast by Bass Lake Road, and to the northeast by rural residences and undeveloped land. A vicinity map showing the location of the property is included in the Appendix as Figure 1. Topographic maps showing the boundaries of the property are included as Plates I and II. The topographic maps are reproductions of the Bass Lake and Bass Lake II, Tentative Maps, prepared by Mackay and Somps, July 1988.

2. Site terrain of Parcel 1 can generally be broken into three areas: steep hillsides, gentle slopes, and relatively flat areas. The area is predominantly covered with open areas of wild grasses with scattered groves of large oak trees. The exceptions are the steep hillsides on the east side of the site that are predominantly covered with thick growths of brush; and the gradually sloping southwest portion of the site which is predominantly covered by brush and digger pine similar to the second parcel.

3. Three main drainages, which are the headward extension of Green Springs Creek, cross the site in a generally northwesterly direction. These drainages are fed by many smaller swales on the site and appear to be at or near the headward end of the local drainage basin. Generally the drainages are only active during the wet season, with the exception of the western most drainage which may have water flowing on a year around basis due to a seepage area on the southwest corner of Parcel 1. A small man-made dam and associated pond are located in a drainage swale on the northeast portion of Parcel 1. The current development plan calls for the dam to be removed.

4. At the time of our field investigation two areas containing old structures were observed in the central portion of Parcel 1. The first in the north central portion of the parcel, consisted of a residence and two associated out structures. In the south central portion of the parcel was another old residence which was also surrounded by several old out structures. All of the existing structures are planned for demolition. A cemetery on the northwest corner of the parcel is scheduled to remain.

5. Site terrain of the second parcel consists of relatively flat ground surrounding Bass Lake. The site is covered with varying vegetation ranging from wild grasses, thick growths of brush with digger pine; to sparsely spaced large oak trees. The vegetation change from predominantly brush and digger pine to oaks and grasses appears to represent varying soil conditions across the parcel, with the areas of brush, and digger pine being characteristic of areas where bedrock is at or near the surface, and areas with oaks and grasses being characteristic of a much deeper and more developed soil profile. At the time of our investigation the only structure on the site was a round sheet metal storage building; however, a review of the United States Geological Surveys (USGS) 7.5 minute series, topographic map, Clarksville Quadrangle, California, photo revised 1973, of the area indicates that other structures have been present on the site.

6. No surface drainages such as creeks or swales are present on this portion of the site. However, there is a small pond on the southern end of the parcel that is to be included in the development. The source of the water for the pond is seepage from Bass Lake. An area of seepage was observed on the ground surface between the pond and Bass Lake; therefore, even though the pond and the lake have been physically separated they appear to still be hydrologically connected. According to old maps of the area the small pond was once part of the present Bass Lake. Another seepage area was noted on the downstream side of the levee of the small pond. At the time of our investigation the slopes of the levee of the small pond had approximately 30 foot high digger pines and an oak growing on the slopes.

7. Proposed development of both parcels 1 and 2 is to consist predominantly of custom single family homes, with the exception of two commercial lots that front Green Valley Road on the north end of the Parcel 1. For the purpose of providing recommendations for design and construction, we have assumed that the homes will be one to two story, wood frame structures utilizing interior concrete slab-on-grade floors or raised wood floors. No lot grading is proposed with the exception of units 1A and 1B, which are located on the lower flatter portion of the site. Several streets will be constructed to provide access to the home sites and the plans also call for Bass Lake Road to be widened to four lanes and rerouted through the site. Based on the Preliminary Grading Plans prepared by Mackay and Somps, April 1988, cut and fill areas for the roadways are expected to be 5 and 10 feet maximum, with the exception of isolated areas along the proposed Bass Lake Road extension where cuts may exceed 20 feet. The southern extension of the road would be on property that was not included within the project boundaries at the time of our field investigation, and access to the property was not available. However, if the proposed road alignment remains as it was at the time this report was prepared, the new road will be partially located over a small creek and a small man-made dam and pond that were not part of the area investigated for this report. Additional geotechnical recommendations will be required for this section of the road when access to the area is available. A park area is planned for the southern section of the Parcel 2, adjacent to Bass Lake.

8. The project also includes construction of four box culverts on Parcel 1. Two of the culverts will be along the realignment of Bass Lake Road where it crosses the two main drainages running through the parcel. The remaining two will be located where the main interior street crosses over the two main drainages running through the parcel. Additionally, a sewage pump station will be located near the center of the western boundary of Parcel 1, just south the southernmost of the two main drainages crossing the parcel.

9. In the event the assumptions we have made regarding the type of construction and the cut\fill heights prove to be different from those that will be used at the site, the conclusions and recommendations contained in our report will not be considered valid unless the changes are reviewed and the conclusions of our report are modified or verified in writing.

Purpose and Scope

10. This Geotechnical Report, prepared by Anderson Geotechnical Consultants, Inc. is intended for use in design and construction by the engineers, architects, and contractors involved with the residential development of the Bass Lake Project. Recommendations for commercial development can be made when information regarding proposed development is available. The recommendations contained in this report are not intended for any structures other than one to two story wood frame residential buildings. Recommendations presented in this report must be reviewed by Anderson Geotechnical Consultants, Inc. prior to use for commercial or industrial projects to determine if the recommendations are applicable to such projects.

11. The purpose of this report is to provide recommendations for site grading and clearing, alternative foundation systems, slab-on-grade construction, roadway construction, drainage, underground utility construction, installation of box culverts at creek crossings, lift station construction, and pond backfilling. A discussion of the excavatability of the underlying rock for proposed lot and roadway grading, and utility installation is included. Recommendations to control groundwater seepage are also included in this report. Discussions of the site geology and seismicity were beyond the scope of this report. An investigation of the corrosion potential of the soil and rock was also beyond the scope of this investigation.

12. To provide our recommendations, work was undertaken which included site inspection, the drilling and sampling of 20 exploratory borings, the excavation of 24 exploratory trenches, laboratory testing of samples obtained, and engineering analysis of the data. In addition a seismic refraction survey was performed to determine the depth to, and hardness of, the rock underlying the site.

13. We also obtained information from previous work we had performed for the preliminary phase of the project; which, consisted of two Preliminary Geotechnical Site Analyses. These analyses addressed basic soil and rock conditions, drainage characteristics, potential seismic activity, soil percolation, and any obvious toxic or archeological conditions.

14. Our professional services were performed, our findings obtained, and our recommendations prepared in accordance with generally accepted geotechnical engineering principles and practices. This warranty is in lieu of all other warranties, either expressed or implied.

Soil and Rock Conditions

15. Soil and rock conditions vary widely across the site from hard fresh rock at or near the surface to a well developed soil profile extending to greater than 20 feet below the surface. Soil thickness in the swales and low areas tends to be thicker than on the hills and ridges, due to soil accumulation from water deposition and due to weathering of the underlying bedrock.

16. A sandy clay layer observed to be between one and two feet thick was observed at several of the boring and trench locations. The clay is the result of residual weathering of the underlying bedrock and represents the soil type developed from complete weathering of the rock. This clay layer appears to occur in relatively isolated areas or pockets in the low or gently sloped areas of the site. Additional areas or pockets of stiff clay were encountered within the relatively thick alluvial deposits associated with the drainage swales.

17. For the purposes of this investigation the rock units and the overlying soil profiles can be broken into 2 units. The rock underlying the site generally ranges from metavolcanic rock on the southwestern portion to granitic rock over most of the remainder of the site. The general soil profiles associated with each underlying rock unit are outlined below.

Granitic Rock

1) The majority of the site, with the exception of the southwest corner of the Parcel 1 and most of the Parcel 2, is underlain by hard massive granitic rock which is overlain by a soil profile of varying thickness. A small area in the north section of Parcel 2, between trenches 22 and 24, contains a similar soil profile. The soil profile generally consists of a colluvial layer overlying weathered in-place granitic rock. The degree of weathering generally decreases with depth and ranges from completely weathered to fresh. The soil resulting from complete weathering of the granitic rock, can be described as red-brown, moderately dense to dense, sandy silt with clay to silty sand with clay. As the degree of weathering decreases the soil generally becomes denser and sandier. The colluvial layer which overlies the weathered

in-place rock is relatively thin (0 to 2 feet thick) on the steeper slopes and becomes thicker (greater than 15 feet thick) in the flatter portions of the site. The colluvial layer has the same general appearance and characteristics of completely weathered granitic rock and can generally be described as red brown, moderately dense, sandy silt to silty sand with clay.

Metavolcanic Rock

2) The majority of the Parcel 2 and the southwest portion of Parcel 1 is underlain at or near the surface by hard moderately weathered to fresh metavolcanic rock that could not be excavated with a Case 580E backhoe. The soil profile above this rock and is generally less than two feet thick, and in many areas is less than 6 inches thick. The overlying soil can generally be described as red brown sandy/clayey silt and was easily excavated with a case 580E backhoe. The excavatability of the weathered rock is further discussed in a later section.

18. The soil and rock profile described above is very generalized. If soil and rock conditions for a specific area are desired, the reader is advised to consult the logs of the borings and trenches contained in the Appendix as Figures 2 through 44. We have indicated the soil and rock type, color, moisture, consistency and Unified Soil Classification System symbol when applicable on the logs.

19. The locations of the exploratory borings and trenches were determined by pacing from identifiable features and property boundaries shown on the "Bass Lake" and "Bass Lake II", Tentative Maps, prepared by Mackay and Somps, July 1988. Surface elevations of the borings and trenches were determined by interpolating between the contours shown on the site plans. Hence, the degree of accuracy can only be implied to the degree that these methods warrant.

20. Unanticipated soil conditions are commonly encountered and cannot be fully determined by exploratory borings and trenches. Such unexpected conditions frequently require that additional expenditures be made to attain a properly constructed project. Therefore, some contingency fund is recommended to accommodate such potential extra costs.

Expansive Soil

21. Results of swell tests run on select samples of the red brown sandy/clayey silt that underlies the topsoil indicated that it has a moderate potential for expansion. However, our experience at nearby sites indicates that, in areas where the clay buildup above the underlying rock is particularly heavy, and where dark to light grey silty clay is encountered in the drainage swales, that the clay may have a high expansion potential.

22. Any clay encountered at the site should be avoided during building pad and street grading due to the potential for expansion. Recommendations to handle potentially expansive soil during grading operations are included in a later section of this report. We have also included special foundation recommendations to reduce the effect of potentially expansive soil conditions.

Surface Water

23. At the time of our field investigation several areas of surface water were observed. The major drainage swales crossing the site all had water flowing in them at the time of our field investigation (March and April of 1989). A seepage area was observed in the southwest corner of Parcel 1, this area was also observed to be in a wet condition at the time of our preliminary investigation on 13 May 1987. With the exception of water flowing from any seepage areas that may be in a wet condition on a year around basis, the drainages crossing the site are assumed to flow on an ephemeral basis. The drainages which cross the site are generally the headward extensions of Green Springs Creek which crosses the site from the southeast to the northwest.

24. As has been discussed previously, two small ponds were also present on the site at the time of our investigation. The first pond located on the northeast portion of the site exists where a small dam has been built across a drainage swale, and was used to store water for cattle. The current plans call for this dam to be removed.

25. The other pond, located on the southwestern side of the site (within Parcel 2) is immediately adjacent to Bass Lake. A review of old maps of the area indicates that the pond was once part of Base Lake; however, the pond and the lake are now separated by a levee. Water was observed flowing into the pond from a seepage area between the pond and Bass Lake. Consequently, while the pond and the lake have been separated at the surface by a levee it appears that they may still be hydrologically connected. Seepage was also noted on the downstream side of the pond. The current plans call for this pond to remain; therefore, recommendations for seepage control were requested. Recommendations for controlling seepage are contained in the subsurface drain section.

Groundwater

26. Seepage was observed in both the weathered rock and alluvial deposits at depths between 4 and 16 feet below the surface in borings 4, 7, 10, and 19, and trenches 14, and 15. These borings and trenches were generally located within drainage swales on the lower portions of the site. The seepage may represent seasonal subsurface water flow due to percolating rainwater or the existence of springs in these areas. Water was also encountered in trenches 20 and 23. Trench 20 was located in the seepage area downstream from the pond adjacent to Bass Lake on Parcel 2. Trench

23 was located in a relatively flat area immediately north of Bass Lake where the soil profile was deeper and more developed than the surrounding area. The water at trench 23 may represent either seasonal subsurface water flow due to percolating rainwater or the existence of seepage from the adjacent Bass Lake. We anticipate that the depth of seepage will vary through the year and could be lower or even disappear in the summer months. Our field work was performed during March and April of 1989, which was a period of unseasonably high rainfall.

27. Our experience has shown that it is not unusual for subsurface water to migrate within the near surface soil or rock in a geologic environments similar to those at this site. We would like to stress that although every effort has been made to identify areas of seepage or potential seepage within the scope of our investigation, our experience has shown that in this geologic environment there is a risk that areas of seepage will manifest themselves after development has been completed. This is one of the reasons we stress the importance of retaining our firm during grading operations so that we might help identify potential seepage areas, thus reducing the incidence of post construction subsurface water problems. Other man caused water problems in this environment could develop due to landscaping and change of grades after the lots have been built on. We believe it important that all property owners be advised of the potential for seepage and how they can have an adverse effect on potential water problems by their actions to alter established drainage.

28. Water levels were measured in the drill holes and trenches at the times and under the conditions stated. Interpretations of this data have been made in the text of this report. However, it must be noted that fluctuations in the level of the groundwater may occur due to fluctuations in the rainfall, temperature, and other factors.

Dewatering

29. Dewatering may be necessary for utility line installation near the drainage swales and the area near trench 23, depending upon the time of year the utilities are installed and the depth of the lines. Dewatering may also be necessary for installation of utility trenches on the gentle slope in the southwest corner of the Parcel 1 where a seepage area was observed at the ground surface. It is likely that dewatering will be necessary for installation of the pump station located near boring 4. We anticipate that dewatering of utility line excavations and the pump station location could be done by placing sump pumps in the base of the trenches or excavations.

30. Dewatering is not anticipated to be necessary in the higher portions of the site for either grading or underground utility installation. An exception to this could occur if construction takes place in the winter or spring when trapped groundwater (above the rock) could conceivably cause a problem or if construction occurs near an unknown spring that actively transmits water during sometimes of the year.

Subsurface Drains

31. During our field investigation we identified two areas where subdrains may be required to properly control subsurface water flow. The first area is the downstream side (seepage area) of the pond on parcel 2, and the second is the seepage area located in the southwest corner of parcel 1. Although, we did not observe any other areas where subdrains would be required, based on our experience with similar projects, we anticipate that additional subsurface drains may be necessary in the development of the site. Additional subdrains may be necessary where fill is placed over existing drainage swales, and where cut slopes intercept seepage zones. The areas where subsurface seepage is most likely is the contact between weathered rock and the overlying soil. Subdrains may also be required where springs become active after periods of rainfall. Where subdrains are constructed, an easement should be created or the location of the drains clearly marked so that future property owners are fully aware of their presence.

32. Subdrains could consist of either trench drains or blanket drains dependant upon the field conditions and should be constructed deep enough to intercept subsurface seepage and still be able to drain. The drain should be lined with a nonwoven filter fabric such as Supac 5 NP, Mirafi 140N, Typar 3401 or the equivalent. A perforated plastic pipe should be installed near the bottom of the drain with the perforations down. The pipe should be able to withstand the pressure of the overlying backfill without flexing and be sized to handle the expected flow of water. The drain should be backfilled with pea gravel or washed crushed rock. The filter fabric should then be folded over the top of the rock. The upper part of the drain should be backfilled with compacted native soil. Clean-outs should be provided at regular intervals along the subdrains. More specific recommendations can be made by us when grading begins and the existing conditions can be better evaluated.

Seismic Refraction Survey

33. As part of the scope of work for this project, a seismic refraction survey was performed to help determine the depth to and hardness of the underlying bedrock. Seven traverses were made at the locations shown on Plates I and II. A signal enhancement seismograph was used to measure the first arrival times of the waves produced by a mechanical source. Shock waves were measured

at ten foot intervals. The maximum distance between the geophone and the point where the shock wave was induced was 120 feet. The data collected from the seismic survey is presented in the following table.

TABLE 1
Summary of Seismic Refraction Survey Results

Traverse	Approximate Depth (ft.)	Velocity (f.p.s.)	Material
A-A'	0 to >20 feet	5000	Moderately to slightly weathered granitic rock
B-B'	0 to >20 feet	7400	Moderately to slightly weathered metamorphic rock
C-C'	0-9 feet	2000	Completely to moderately weathered granitic rock
	>9 feet	4000	Moderately to slightly weathered granitic rock
D-D'	0-10 feet	2400	Completely to moderately weathered granitic rock
	>10 feet	4300	Moderately to slightly weathered granitic rock
E-E'	0-13 feet	1800	Completely to moderately weathered granitic rock
	>13 feet	11000	Moderately to completely weathered granitic rock
F-F'	0-14 feet	2000	Completely to moderately weathered granitic rock
	>14 feet	7500	Moderately to slightly weathered granitic rock

TABLE 1 (Con't)

Summary of Seismic Refraction Survey Results

Traverse	Approximate Depth (ft.)	Velocity (f.p.s.)	Material
G-G'	0-10 feet	3100	Completely to moderately weathered granitic rock
	>10 feet	7500	Moderately to slightly weathered granitic rock

34. Limitations involved with the use of seismic refraction investigations must be kept in mind when using data collected from such investigations. The limitations may effect recorded arrival times of shock waves. These limitations include irregular and weathered bedrock surfaces, inconsistencies within the rock (i.e., quartz veins, fractures, etc.), and background noise produced by wind, airplanes, and other sources.

Rock Excavatability

35. Evaluation of the excavatability of the underlying bedrock at the property is based on the performance of a Case 580E backhoe utilized to excavate the exploratory trenches, results of our exploratory borings, knowledge of excavatability of similar type material, and on results of our seismic refraction survey.

36. Seismic velocities determined from our survey were compared with charts appearing in the 1980 edition of the Caterpiller Performance Handbook which relate the seismic velocity of the various rock types with the ripper performance. Results of this comparison indicate that ripping performance will vary across the site. In general the handbook indicates that rock with seismic velocity less than 6000 feet per second may be rippable using a Cat D8 dozer with a single ripper tooth. The results of our seismic survey and our depth of borings and trenches indicates that the upper 8 to 10 feet of soil and weathered rock should be rippable with a Cat D8 Dozer, with the exception of the southwest corner of parcel 1 and most of Parcel 2. However, we encountered refusal at depths shallower than 8 feet in borings 1 and 13, and trench 16 indicating that very hard rock exists within 10 feet of the surface.

37. Trenches 19, 21, 22, and 24 were located on Parcel 2 where bedrock was located at or near the surface. These trenches encountered refusal at depths from 6 inches to 6 feet below the ground surface. Results of the seismic survey done in this area indicate the bedrock might be rippable with a Cat D9 dozer using a single ripper tooth.

38. The results of the seismic survey and the borings and trenches indicate that rock underlying the entire site is differentially weathered. This indicates that hard resistant rock masses may be encountered that are too hard to be broken by conventional construction equipment; therefore, blasting may be required for excavation. In the southwest corner of parcel 1, most of parcel 2, and below 8 to 10 feet below the ground surface in parcel 1, the chances of blasting being required will be greater.

39. In some areas of the site, particularly the southwest corner of Parcel 1 and most of Parcel 2 it was not possible to excavate the trenches using the Case 580E backhoe. In other areas of the site it was sometimes too difficult to excavate the trenches deeper than 10 feet below the surface. This difficulty in trenching along with the seismic survey results and previous experience with rock types similar to those encountered on the site indicates that large excavators the size of a Cat 235 or 245 will be necessary to excavate almost all of the utility trenches on the southwest corner of parcel 1 and the majority of parcel 2. Large excavators will also be required in other areas of the site where it was difficult to excavate the trenches to depths greater than 8 to 10 feet below the surface. Even using the large excavators there will be areas where blasting or hydraulic jack hammering will be required.

Grading

40. Prior to general site grading operations, any trash or debris that may exist on the site should be totally removed from the construction areas. All of the existing buildings planned to be removed should be removed including all associated footing and buried utilities (i.e. leach fields, septic tanks, etc.). All trees designated not to remain should be removed including their associated root systems. Depressions resulting from removal of trees, large boulders, or depressions left from removal of structures, leech fields, septic tanks, etc., should be properly prepared and backfilled in accordance with the recommendations contained in this section.

41. After general clearing operations have been completed, all areas to be graded should be stripped of all remaining short organics and grasses. In order to obtain proper organic removal stripping should extend an inch or two into the soil. The strippings will not be suitable for use as fill within a building pad or roadway area (or within 10 feet of such areas) and should be

stockpiled or removed from the site, or used as fill in landscape areas. If used for fill, strippings must be compacted to a minimum of 85% relative compaction. The strippings should not be used in an area where they may create a potential slope stability problem.

42. Material derived from removal of the dam on the northeast corner of the Parcel 1 should generally be suitable for use as fill provided it is primarily granular in nature and has been sufficiently dried. Prior to the placement of any fill over the former pond site all soft sediments or high concentrations of organics should removed from the pond area. Sediments removed from the pond will not be suitable for use as fill within building pads or roadway areas (or within 10 feet of such areas) if they contain a high percentage of clay or organics. Sediments derived from the pond suitable for use as fill, should be sufficiently dried or mixed with dry soil prior to use as fill.

43. As discussed earlier in this report soil with a high clay content may be present, particularly in drainage swale areas or as sporadic build-ups above the moderately weathered to fresh underlying bedrock. The clays at the site are potentially expansive; therefore, we recommend that wherever soil with high clay concentrations are exposed at finished pad grade or within 2 feet of finished subgrade in roadway areas, that it be removed to a depth at least 2 feet below finished pad grade or finished subgrade and replaced with granular soil or weathered rock. Further recommendations for clay encountered in building pad areas are given in the Foundations section.

44. After completion of the clearing and stripping operations, areas to receive fill should be scarified to a depth of 6 inches. This includes the depressions resulting from foundation removal, excavation of tree root systems, septic tank and leach field removal, or any other excavations that may result from clearing of the site. If the depressions are large or over 18 inches in depth, the loose soil should be removed and the depressions widened to allow access for grading equipment. The soil in the bottom of the excavation should then be scarified to a minimum depth of 6 inches. The scarified soil should then be moisture conditioned, and recompacted to at least 90% relative compaction at or near the optimum moisture content. Any clay uncovered during the scarification process should be thoroughly mixed with the surrounding granular soil. Fill required to bring the ground back to near the initial height should then be placed and compacted per the following paragraph.

45. After the ground surface has been prepared as described in the previous paragraphs fill may be placed in level lifts which do not exceed 6 inches in compacted thickness. All fill in structural areas should be moisture conditioned and recompacted to a minimum of 90% relative compaction at or near optimum moisture content until final pad grade is achieved. Compaction requirements are based on ASTM D1557-78 specifications for the determination of maximum dry density.

46. Fill placed on the existing slopes should be benched into the existing slope to prevent a weak soil plane from developing. Benching should be accomplished in such a manner so that any underlying clay exposed will be thoroughly mixed with more granular soil. Fill placed on slopes steeper than a 6:1 slope gradient (horizontal to vertical) should be provided with a base key at the toe of the fill slope. The base key should extend at least two feet (vertically) into the underlying partially weathered rock as measured at the downhill side of the key. It should be at least 14 feet wide to allow proper compaction with conventional grading equipment. Base keys should slope into the hillside at a gradient not less than 2%. Subsequent fill should be benched into the hillside as described above.

47. Fill should be placed in level lifts which when compacted do not exceed 6 inches in compacted thickness. Fill should be compacted to a minimum of 90% relative compaction at or near the optimum moisture content. If testing of the fill compaction is not possible due to the presence of substantial amounts of rock, compaction should be achieved by a minimum of 5 passes with a Cat 825 compactor or the equivalent.

48. Fill material should consist of uncontaminated native soil and rock or approved import material. Import material should be predominantly granular in nature, free of organics and debris, and not contain any rocks larger than 6 inches in any dimension. If it is desirable to use import material, the soil must be sampled and approved by the Geotechnical Engineer or his representative prior to its transport to the site.

49. Rock may be excavated in some portions of the site that will exceed six inches in diameter. This material may be used in deeper portions of fill provided it does not hinder the compaction process. That is, if the contractor is able to place 12 to 18 inch rock in the fill and obtain proper compaction around it, then it will be acceptable to use the larger material. Rock over six inches in any dimension should be avoided within 3 feet of finished grade in a building pad, and should not be placed within one foot of finished subgrade in roadway areas. In any case, rock to rock contact points within the fill should be avoided to reduce creation of voids within the fill.

50. Cut building pads (or portions of the pads that are in cut) should be scarified to 8 inches and recompacted to a minimum of 90% relative compaction unless competent rock is encountered first. In that case scarification would not be necessary. Compaction may be necessary, however, if loose areas are observed. If cut/fill building pads are constructed, the depth of fill beneath the structure should not exceed 5 feet, otherwise it may be necessary to overexcavate and recompact the cut potion of the pad so that the differential depth of fill does not exceed 5 feet. This should reduce the risk of differential settlement. The need for overexcavation and recompaction for cut portions of the building pads can best be evaluated after the grading plans are finalized.

51. Concentrations of clay encountered during grading should be removed and used in landscape areas, or buried beneath deeper fills (at least 3 feet below pad grade), or be well mixed with the surrounding granular soil to reduce its potential for expansion. Road cuts exposing clay should be overexcavated to weathered rock or to a depth of 2 feet below subgrade elevation whichever is less, and backfilled with granular soil or a mixture of granular soil and clay.

52. All fill slopes and cut slopes in the surface soil and weathered rock should be constructed at a gradient of 2:1 (horizontal to vertical) or flatter. Where very competent rock is encountered (in cut) a gradient of 1:1 is permissible subject to our approval. Where drainage will be directed towards the top of a cut or fill slope, a v-ditch must be provided to direct water away from the slope toward a street or controlled storm inlet.

53. After the proper gradient has be obtained on all cut and fill slopes, the slopes should be compacted by track walking. An alternate to track walking fill slopes would be to overfill the slopes and, following construction cut the slopes to the proper gradient. Cut and fill slopes should be vegetated as soon as feasible to minimize erosion of the soil.

54. Cut slope stability is affected by the presence of groundwater, tension cracks, clay seems, and other planes of weakness. During site grading the cut slopes should be observed to determine or recognize factors which could affect the stability of the slope. If detrimental factors are observed, it may be necessary to flatten the slopes or provide other remedial measures.

Volume Factors

55. Based on past experience with similar soil and rock conditions and the results of our comparison of the in-place densities of the material and the maximum dry density as determined by ASTM D1557-78 test standards, we estimate the shrinkage factor from cut to fill for the topsoil in the upper 1 to 3 feet to be between 15% and 20%. A shrinkage factor of +10% to -10% may be used as an estimate for weathered rock.

56. The above volume factors are for guide purposes only and due to the limitation of the methods used to calculate them, they will not necessarily result in a balance of cut/ fill on the site. Unknown factors also effecting cut/fill include overcompaction, undercompaction, stripping losses or excesses not compensated for in the balance calculations, changes in topography not represented on the map, errors in the calculations of cut and fill, and staking error.

Foundations

57. If lot grading is performed so that an essentially level pad is provided, a conventional shallow strip perimeter footing with either a raised wood floor or slab-on-grade would be suitable. Strip footings, both exterior and interior, should extend at least 12 inches into the prepared building pad and be at least 12 inches in width. Interior column loads, such as posts for a raised wood floor, may be supported on spread footings which extend 12 inches or more into the prepared building pad. If clay is encountered in either spread or strip footing excavations the footings should be deepened through the clay layer to the weathered rock. Footings should be sized for an allowable bearing capacity of 2,500 p.s.f. for dead plus live loads. A one third increase may be added for the short term effects of wind and\or seismic loading.

58. The average lateral resistance over the side of the footing provided by the soil may be taken as 220d (p.s.f.) where d is the depth of the footing below the finished pad elevation. Increased lateral resistance may be achieved by keying the footing into the underlying rock.

59. We anticipate that hard rock will be reached in some of the building pads before the 12 inch footing depth is achieved. If this situation arises, the footing depth may be reduced to 8 inches. However, this reduction is only applicable when undisturbed hard rock is encountered and its presence in the footing excavations is observed by a representative of Anderson Geotechnical Consultants. If sufficient lateral support is not provided by an 8 inch deep footing, the footing could be anchored into the rock by drilling and installing a rebar every 5 horizontal feet. The rebar should extend a minimum of 12 inches into the rock and be secured with an epoxy or grout. The vertical rebar should then be connected to the horizontal reinforcing in the footing.

60. On sloping lots, conventional shallow strip foundations are usually not appropriate. On such lots it will be necessary to utilize a stepped foundation or pier and grade beam foundation. With either of these, we anticipate that a raised wood floor would be used rather than a slab-on-grade, since a slab-on-grade would require hand compacting of the backfill after the footing walls are constructed. This is discussed further in the slab-on-grade section of this report. If a stepped foundation is selected it should extend a minimum of 18 inches into natural ground at all locations a be a minimum of 12 inches in width. If clay is encountered at the base of the footing excavations, the footings should be deepened through the clay layer. Footings for interior columns or isolated loads should also be extended a minimum of 18 inches below the existing ground surface. Reinforcement must be determined by the Structural Engineer depending upon the loads and the amount of stepping, which would be dependant upon the steepness of the site. The allowable bearing capacity for this type of foundation is also 2,500 p.s.f. for dead plus live loads. A one-third increase for the short term effects of wind or seismic loading is again applicable. Lateral resistance may be determined in accordance with paragraph 57.

61. If a pier and grade beam foundation system is utilized for the sloping lots, the piers should be at least 12 inches in diameter. All piers should extend at least 12 inches into the underlying partially weathered rock. We should be allowed to observe pier excavations to determine if the minimum depth of pier embedment into the weathered rock has been achieved. Each pier excavation must be thoroughly cleaned of all loose soil and rock prior to concrete placement. An end bearing capacity of 6,000 p.s.f. may be used for dead plus live loads. A one-third increase may be added to this value to account for the short term effects of wind and\or seismic loading. The grade beam should be at least 6 inches wide and designed to span the distance between the piers. The grade beam may be constructed directly on grade, unless drainage is directed to the grade beam, in which case the grade beam should be trenched a minimum of 6 inches into the pad to help prevent water buildup under the house.

62. In order to check that foundation excavations have been prepared as recommended (i.e. proper depth of embedment and width, suitable bearing material, proper cleaning of footing base, etc.) it will be necessary for us to have a representative on site to observe foundation preparation for all structures.

Small Pond

63. An investigation of the stability of the existing embankment for the small pond, immediately adjacent to Bass Lake, on Parcel 2 was beyond the scope of our investigation. However, during our field work we observed seepage on the downstream slope of the embankment and several trees (Digger Pine and Oak) up to approximately 30 feet tall growing on the slope of the embankment. It is opinion that, since, the embankment has seepage on the downstream slope and large trees and brush growing on its face, that its integrity is in question. Therefore, we have included the following recommendations for additional work related to evaluating the suitability of the embankment:

1. Perform further investigation to evaluate the integrity of the embankment. However, without the construction records for the embankment and complete removal and replacement of all areas where established root system are present, we would not be able to perform a complete evaluation.

2. Since alternative 1 does not appear practical, our second alternative would be to remove the existing embankment and replace it with a properly constructed embankment. If requested we would be glad to provide recommendations for reconstruction.

Box Culvert Creek Crossings

64. Four box culvert creek crossings have been proposed. Two of the crossings will be under the proposed realignment of Bass Lake Road, where it crosses the two main drainages running through the central portion of Parcel 1. The other two locations will be where the proposed interior streets cross the same two creeks. We have been informed by Mackey and Somps that the culverts will have 7 foot wide boxes at both locations on the northernmost creek and 8 foot wide boxes at both locations on the southernmost creek. The base of the culverts will be at or near the base of the existing creeks. Locations of the culverts are shown on Plate I in the Appendix.

65. Our exploratory boring and trench (boring 4 and trench 15) performed near where the southernmost creek crosses the interior street, encountered alluvial deposits to depths greater than 15 feet below the ground surface. From 0 to 8 feet we encountered moderately stiff to stiff silty\sandy clay. The clay was underlain by very dense clayey sand to sandy silt to greater than 15 feet below the surface. At this location it should be suitable to place the box culvert on the stiff silty\sandy clay. However, if loose sand or soft clays are encountered at the base of the culvert excavation it will be necessary to overexcavate the unsuitable material to a depth where suitable material occurs, but, not exceeding 5 feet. The overexcavation should then be backfilled with rocky fill. If the overexcavation extends to 5 feet, and firm suitable material has not been encountered, a heavy geotextile such as Mirafi 1200 HP, Supac 6WS, Amoco 2002 or 2006, or the equivalent should be placed in the bottom of the excavation and the excavation should then be filled with rocky fill. The overexcavation should extend 10 feet beyond the perimeter of the culvert. The geotextile fabric should be rolled out so there is at least 2 feet of over lay between adjacent strips of fabric. The box culvert could then be placed on top of the rocky fill. Although this method will reduce the risk of settlement, some settlement may still occur. Therefore, abutment design should take into consideration the potential for settlement.

66. Due to inaccessibility, no borings or trenches were performed where the proposed realignment of Bass Lake Road crosses the southernmost creek; however, the recommendation given above for where the interior street crosses the southernmost creek should generally be applicable.

67. Trench 14, excavated near the crossing of the northernmost creek and the interior roadway, encountered approximately 4 feet of dark red brown silty/clayey sand derived from complete weathering of granitic rock. The surface layer was underlain by approximately 5 feet medium brown, medium dense gravely sand with silt & clay (alluvial material). At approximately 9 feet below the surface we encountered olive brown, severely weathered in-place granitic rock (DG). It should be suitable to place the box culvert at this location on silty\clayey sand. However if loose or soft soil and rock conditions are present at the base of the culvert it will be necessary to over excavate the base as described in paragraph 64.

68. Due to inaccessibility no borings or trenches were performed where the proposed realignment of Bass Lake Road crosses the northernmost creek. However, the recommendation in the previous paragraph should generally be applicable.

69. Final determination of the suitability of the base material at each of the box culvert location will have to be made by a representative from our company at the time of construction.

70. In order to reduce the amount of water entering the construction area we recommend construction take place during summer or early fall when groundwater levels are at or near the seasonal low point. Even if construction takes place during the dry season it is anticipated that dewatering will be necessary. Dewatering should be possible by using cutoff trenches and sump pumps or by diverting the water the flow around the excavation.

71. Scour protection should be provided at the upstream face of the box culverts to reduce the risk of undermining the culverts. Scour protection at the base of the culvert could consist of a concrete lip placed from the bottom of the culvert to a depth 2 feet below the base. Protection along the vertical sides of the culvert should consist of concrete wing walls, rock riprap, gabions, sacked concrete or other suitable material.

72. Permeable backfill such as coarse sand or gravel should be placed behind the sides of the culvert to drain the backfill. If pea gravel is used, a filter fabric such as Mirafi 140N or the equivalent should be placed between the gravel and the backfill to prevent the gravel from clogging. A synthetic drainage fabric such as Enkadrain or equivalent, may be substituted for the gravel or sand layer, if desired. Care must be taken during installation to insure that the filter part of the material faces the backfill. Collected water may be removed either by installing weep holes at the base of the wall or by installing a perforated drainage pipe along the bottom of the permeable material which leads to an appropriate point of discharge. The drains should extend to within 3 feet of the top of the culvert. At least 3 feet of compacted native soil or aggregate base should be placed above the drain.

Pump Station

73. A pump station has been proposed to be located near the center of the western property line on Parcel I. At the time this report was prepared the base elevation of the pump station was not known, however, we have assumed that it will be no more than 15 feet below the existing ground surface.

74. Boring 4 and trench 15 located near the proposed pump station location encountered alluvial deposits to depths greater than 15 feet below the ground surface. The soil from 0 to 8 feet was moderately stiff to stiff silty\sandy clay. The clay was underlain by very dense clayey sand to sandy silt to greater than 15 feet below the surface. The water at the end of our field work was observed to be 16 feet below the surface in the boring, however, the soil excavated from the trench was in a wet condition and free water was seeping into the sides of the trench. Therefore, we have assumed that the water level may be at or near the ground surface.

75. Due to the potential for high groundwater, dewatering may be necessary for pump station construction. The method of dewatering will depend upon the time of year the construction is performed, the depth to ground water, and the lateral constraints on the working area. We anticipate that it should be possible to dewater the excavation placing sump pumps into the sumps that have been excavated into the base of the excavation. However, it may be necessary to use a multistage system consisting of such elements as well points, deep wells, or sheet piles. The method used should be selected by a contractor experienced in dewatering. Which ever method is selected it should be performed a sufficient depth below the base of the excavation to create a stabilized base upon which the pump station can be constructed.

76. To reduce the risk of slope failure during construction the walls of the excavation should be sloped no steeper than 1 to 1 (horizontal to vertical). However it may be necessary to flatten the slopes if they do not appear stable. The proper slope gradient can best be determined as the excavation proceeds. If lateral constraints do not allow a sloped excavation some other method of lateral constraint such as sheet piles will have to be employed.

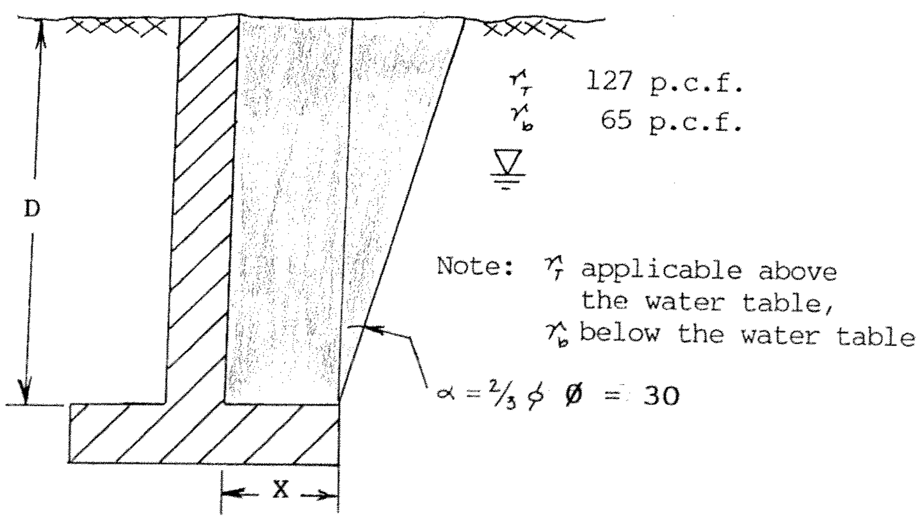
77. For design purposes the vertical walls of the pump station can be assumed to act as retaining structures. Since, it does not appear practical to provide drainage behind these walls, and since groundwater was observed close to the surface, the pump station should be designed assuming undrained conditions, with the water level at or near the surface. For design purposes, the soil pressures exerted against the wall are assumed to be equal to the pressure exerted by an equivalent fluid. The following equivalent fluid weights are applicable for horizontal backfill consisting of granular soil or weathered rock. These values do not include a safety factor.

	Below High Groundwater
Active condition	105 p.c.f.
Passive condition	180 p.c.f.
At-rest condition	115 p.c.f.

78. Line, point, or uniform surface surcharge loads located closer to the edge of the wall then a distance half the wall height may increase the load on the wall. The effect of these loads can best be determined when the magnitude and the horizontal and vertical points of application with respect to the wall have been finalized.

79. The weight of the pump station is expected to be much less that the weight of the overburden material removed during the excavation even when the pump station is full of water. Therefore a suitable bearing capacity should be provided by the soil at the base of the excavation.

80. Due to the high groundwater encountered during our investigation we recommend the pump station be constructed to resist buoyant forces that will act to raise the structure from the ground. The simplest way to reduce the risk of buoyancy, aside from having the station full of water, is to thicken the base of the station sufficiently to counteract the uplift forces. Since, increasing the slab thickness a sufficient amount may not be practical, a second option would be to construct an extended lip around the perimeter of the structure, as shown in the diagram below.



81. The weight of the wedge of soil above the lip may be used to resist uplift. The slope of the wedge may be considered to act at an angle of two-thirds of the friction angle from vertical. Based on results of our investigation a friction angle of 30 degrees will be applicable if the soil wedge is within the perimeter of compacted granular backfill. If the soil wedge acts on the in-place clay soil a friction angle of 15 degrees would be applicable. The moist unit weight (127 pcf) is applicable only for soil above the water table. For soil below the water table a buoyant unit weight of 65 p.c.f. would be applicable.

82. Another option would be to use soil/rock anchors. Soil/rock anchors may be used to increase the total downward force acting to reduce uplift forces. The size of the lip needed and whether or not soil/rock anchors will be needed will depend on the total buoyant forces determined to be acting on the structure.

83. Backfill placed around the pump station should consist of properly placed native soil compacted to 90% or higher relative compaction at or near optimum moisture content based on ASTM D1557-78 test specifications.

Slabs-On-Grade

84. Conventional concrete slab-on-grade floors are suitable for graded lots with a level building pad. Interior slabs-on-grade should be a minimum of 4 inches thick and underlain by 3 inches of washed, crushed rock overlain by a vapor barrier at least 10 mils thick and 1 inch of clean sand. An alternate to this would be to underlie the slab with 4 inches of washed crushed rock. The rock should be graded so that 100% passes the 3\4 inch sieve and 0 to 5% passes the No. 4 sieve. Due to the potential for expansion the slabs should be reinforced with a minimum 6 x 6 - W1.4 x W1.4 welded wire fabric, placed in the center of the slab.

85. We have previously mentioned that we do not anticipate that a slab-on-grade will be used with a stepped foundation on sloping lots, since it would require hand backfilling behind the footing walls. However, if a slab-on-grade is used with a stepped foundation, it will be very important to properly backfill beneath the slab. The backfill material should be placed in lifts which do not exceed 6 inches and be compacted using mechanical compaction to 90% relative compaction. Native material which free of large rocks would be suitable for such granular backfill. If import is selected, it must be essentially granular, i.e. sand and silt (no clay) and should be approved by us prior to its transport to the site.

86. All exterior flatwork, i.e., sidewalks, driveways, patios, etc., may be placed directly on the prepared soil subgrade without the use of a rock barrier. However, the subgrade should be free of any debris or clay and properly compacted and moistened before placement of the concrete.

Retaining Structures

87. It is anticipated that if retaining structures are used for the project, they will be less than ten feet in vertical height. For design purposes, the soil pressures exerted against the wall are assumed to be equal to the pressure exerted by an equivalent fluid. The following equivalent fluid weights

and coefficient of friction are applicable for horizontal backfill consisting native granular soil or weathered rock. These values do not include a safety factor.

Active condition	-	45 p.c.f.
Passive condition	-	390 p.c.f.
At-rest condition	-	65 p.c.f.
Coefficient of Friction	-	0.58

88. For backfill, sloped at 2:1 (horizontal to vertical) an equivalent fluid weight for the active condition would be 70 p.c.f. Line, point, or uniform surface surcharge loads located closer to the edge of the wall then a distance half the wall height may increase the load on the wall. The effect of these loads can best be determined when the magnitude and the horizontal and vertical points of application with respect to the wall have been finalized.

89. Positive drainage is essential behind any retaining structure to prevent the backfill from becoming completely saturated and to prevent the buildup of hydrostatic water pressure. Positive drainage for retaining walls may consist of a vertical layer of permeable material, such as coarse sand or pea gravel at least 12 inches in thickness, positioned between the retaining wall and the soil backfill. If pea gravel is used, a filter fabric, such as Mirafi 140N, Typar 3401, or the equivalent, should be placed between it and the soil backfill to prevent the pea gravel from becoming clogged. A synthetic drainage fabric, such as Enkadrain or equivalent, may be substituted for the gravel or sand layer, if desired. Care must be taken during installation to assure that the filter part of the material faces the soil backfill. Collected water may be removed either by installing weep holes along the bottom of the wall or by installing a perforated drainage pipe which leads to suitable drainage facilities along the bottom of the permeable material.

Pavement Design

90. During our investigation we obtained bulk samples of anticipated subgrade material. We performed R-value tests on representative samples of the materials collected. The samples were tested in accordance with California Test 301 with the following results:

TABLE II
Summary of R-Values

Sample No.	Description	R-Value
CB-3	dark red brown sandy SILT	31*
CB-10	dark red brown silty SAND	32

TABLE II (Continued)
Summary of R-Values

Sample No.	Description	R-Value
CB-12	medium brown sandy CLAY w/ silt	13
CB-13	dark red brown silty SAND/sandy SILT	27

* - R-value corrected for expansion

91. We have not been provided with traffic indices (T.I.'s) for the project. Therefore, we have provided alternate pavement sections based on T.I.'s of 4.5 for cul-de-sacs, 6.0 for interior streets, and 8.0 for Bass Lake Road. These values were obtained by using the proposed roadway widths to obtain the T.I.'s as would be required in Sacramento County. We understand that Bass Lake Road will ultimately be expanded to 6 lanes, but the curb to curb width will only be expanded by 4 feet; therefore, the T.I. would remain essentially the same. If these T.I.'s are not acceptable for El Dorado County we can provide alternate sections. Based on these assumed traffic indices and the design R-Value of 30, we have calculated the pavement sections below. Using an R-value of 30 is applicable only if clay soils have been removed from the upper two feet of the subgrade and the subgrade material has been checked to verify the validity of the R-value by a representative from our company. The pavement sections calculated were obtained using California Test Method 301 and include the standard Caltrans safety factor.

TABLE III
Pavement Sections

Location: Cul-de-sacs
Traffic Index: 4.5
Design R-Value: 30

Alternate Sections	A
Asphaltic Concrete	2.5"
Class 2 Baserock, R=78 min.	6.0"
Native Subgrade Soil (Recompacted to 90%)	6.0"

TABLE III (Continued)
Pavement Sections

Location: Interior Streets
Traffic Index: 6.0
Design R-Value: 30

Alternate Sections	A
Asphaltic Concrete	3.0"
Class 2 Baserock, R=78 min.	9.0"
Native Subgrade Soil (Recompacted to 90%)	6.0"

Location: Bass Lake Road
Traffic Index: 8.0
Design R-Value: 30

Alternate Sections	A
Asphaltic Concrete	4.5"
Class 2 Baserock, R=78 min.	12.0"
Native Subgrade Soil (Recompacted to 90%)	6.0"

92. These pavement sections are based on the assumption that the native subgrade soil is uniformly compacted to a minimum of 90% relative compaction and that the baserock is compacted to a minimum of 95% relative compaction. Relative compaction should be based on ASTM D1557-78 specifications for the determination of maximum dry density. Areas in which rock is exposed at the subgrade elevation or in which the subgrade material consists of a high percentage of rock mixed with the soil should be compacted by making at least three passes with a compactor that is equivalent to or larger than a Cat 825. A representative of Anderson Geotechnical should observe the compaction in rocky subgrade material.

93. Due to the presence of relatively impervious rock near the ground surface, it is important that drainage of streets be carefully designed so that no water is allowed under the paved areas. If water seeps under asphalt that is underlain by rock, the water will collect between the rock and the

asphalt resulting in possible pavement failure. Therefore, it will be important to minimize the amount of water allowed under the paved areas. All asphalt surfaces should be sloped at a minimum gradient of 2%.

Drainage

94. Proper drainage is important in the development of the project. Final grading adjacent to structures should be sloped so that surface water drains away from the buildings. Final backfill placed adjacent to building foundations or other structures should be free of construction debris, properly compacted, and sloped to match the existing ground so that storm or irrigation waters are not allowed to pond or rest next to the structures. Landscape grading should be designed so that storm or irrigation water is directed to properly designed storm drainage facilities.

Utility Line Construction

95. The surface soil layer at the site was easily excavatable using a Case 580E backhoe equipped with an 18 inch bucket. The completely weathered to moderately weathered surface soil layer was generally excavatable to a depth 8 feet below the ground surface. However, refusal was encountered at shallower depths at several locations across the site, particularly in Parcel 2 where refusal was generally at or near the surface. The underlying weathered rock presented varying degrees of difficulty to trenching. The backhoe generally encountered refusal after penetrating 5 to 10 feet below the surface, with some trenches penetrating further depending upon the degree of weathering and/or the fracture pattern of the rock. We were able to excavate up to 10 feet and deeper in some areas of the site, and less than 6 inches in others. A larger backhoe would be necessary for better production in the hard slightly weathered rock. In addition, pre-ripping along utility line alignments and or blasting will be necessary in some areas.

96. Dewatering is not anticipated to be necessary for installation of utility lines less than 10 feet deep. This assumes that construction takes place during the drier months of the year when surface soil is not saturated and there is no surface water running on the site. The possible exception to this is in the low areas of the drainage swales where ground water may be present during the summer.

97. The upper 5 feet of the excavations should be generally stable, provided that the upper soil layers are not saturated as may be possible in the rainy season. However, significant fracturing in weathered rock may cause local instability. Trenches deeper than 5 feet should be excavated, and shored or sloped, in accordance with current OSHA regulations. Design of shoring is beyond our scope of work.

98. After the underground utilities have been installed, the trenches should be properly backfilled. Backfill may consist of native soil provided any rock has been broken into pieces no larger than 6 inches in any dimension. If it is desired to use import material it must be granular in nature (sand or silt) and not contain any rock fragments greater than 6 inches in any dimension. Import soil should be approved by a representative from our firm prior to import to the site.

99. Trench backfill should be compacted to a minimum of 90% relative compaction in structural and under pavement areas and 85% relative compaction in non-structural areas, such as landscaping. Compaction should be accomplished using mechanical methods and should be placed in one-foot maximum lifts in structural areas and two-foot lifts in landscaped areas. However, the contractor may utilize any lift thickness, provided the desired compaction is achieved.

100. To minimize disturbance of building pads that have been properly compacted, We recommend that deep utility lines for sewer storm drains, etc. not be designed to cross any building pad. We must be allowed to review all utility line plans if any utility is located along lot lines. All utility line backfill placed in easements between lot lines must be observed and tested by our firm.

101. An investigation of the corrosion potential of the native soil and rock was beyond the scope of our investigation.

Limitations

102. The analyses, conclusions, and recommendations contained in our report are based on site conditions as they existed at the time of our investigation, and further assume that probes such as exploratory borings and trenches are representative of the subsurface conditions throughout the site; i.e., the subsurface conditions everywhere are not significantly different from those disclosed by the probes.

103. If, during construction, different subsurface conditions from those encountered during our explorations are observed or appear to be present beneath the excavations, we must be advised promptly so that we can review these conditions and reconsider our recommendations where necessary.

104. If there is a substantial lapse of time between the submission of our report and the start of work at the site (2 years or more), or if conditions have changed due to natural causes or construction operations at or adjacent to the site, we urge that our report be reviewed to determine the applicability of the conclusions and recommendations considering the changed conditions and time lapse. This report is applicable only for the project and site studied.

105. This geotechnical report did not include an investigation for the existence of possible hazardous materials. If such an investigation is necessary, please let us know. If any hazardous materials are encountered during construction, the proper regulatory officials should be notified immediately.

APPENDIX

Vicinity Map

Field Investigation and Laboratory Testing

Notes to Logs of Borings and Trenches

Logs of Test Borings

Logs of Test Trenches

Summary of Laboratory Test Results

R-Value Test Results

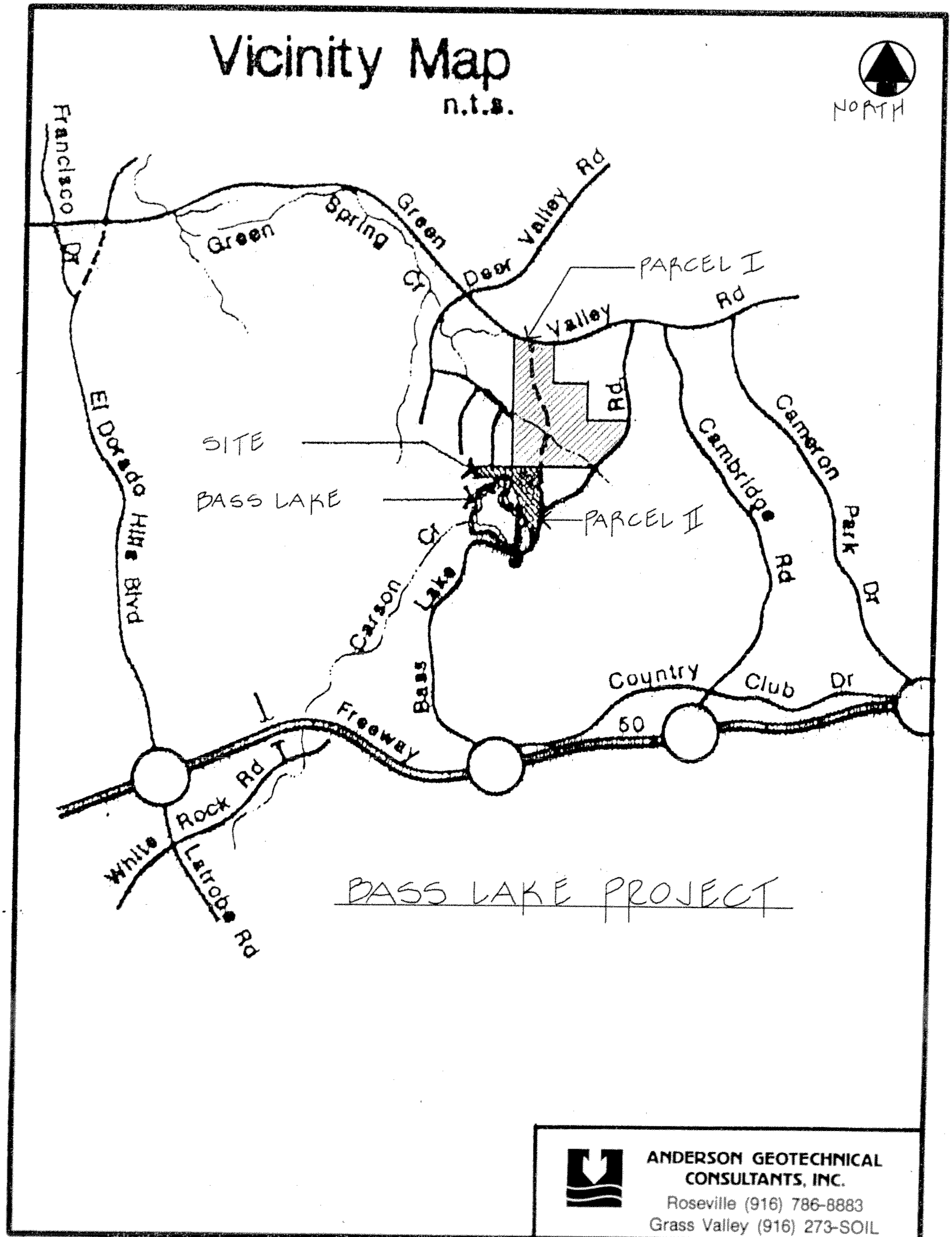
Compaction Test Curves

PLATES

Plate I

Plate II

FILE NO. 2011-3



MAY 1989

FIGURE 1

File No. 2011-3
26 May 1989

FIELD INVESTIGATION AND LABORATORY TESTING

Twenty four exploratory test trenches were excavated on the site to a maximum depth of 12 feet. Additionally, 20 exploratory boring were drilled to a maximum depth of 19 feet. The trenches and borings were logged in the field by a Geotechnical Engineer to determine the underlying soil profile and retrieve soil samples for testing so that specific geotechnical design criteria could be obtained for use in design and construction of the proposed project. The borings were performed on 17 March and 10 April 1989, and trenches were performed on 1 April 1989. Logs of the trenches and borings, graphically depicting the materials encountered, are presented as Figures 2 through 45. Additionaly a seismic survey to determine the depth to and rippability of the underlying rock was performed on 4 May 1989.

Test trenches were performed using a Case 580E backhoe with a 18 inch wide bucket. Exploratory borings were performed with a Mobile B-34 truck mounted drill rig, using 4 inch diameter continuous flight augers. Undisturbed soil sampling was accomplished with a 3 inch diameter (O.D.) sampler fitted with 6 inch long brass liners. The sampling tool was driven into the ground by the force of a 140 pound hammer dropping 30 inches. Samples were sealed to preserve them at their natural moisture content for later laboratory testing. Bulk samples were taken of the surface soil for additional laboratory testing.

Laboratory tests were performed on selected soil samples taken from the borings to determine the physical and engineering properties of the soil. Field blow counts for the 3-inch O.D. sampler were converted to the equivalent number for a 2 inch O.D. sampler.

The undisturbed samples were tested for in-place moisture content and dry unit weight by weighing a known volume of soil before and after oven drying. Laboratory compaction curves, direct shear tests, swell tests, grain size analysis, and R-value testing were also performed. The test results are summarized later in this Appendix.

File No. 2011-3
26 May 1989

NOTES TO LOGS OF TRENCHES

The lines designating the interface between soil and rock materials on the logs of borings/trenches are determined by interpolation and are therefore approximations. The transition between the materials may be abrupt or gradual. Only at boring/trench locations should profiles be considered as reasonably accurate and then only to the degree implied by the notes on the boring/trench logs.

A field log was prepared for each boring/trench by our field representative. The log contains information concerning the boring and trenching methods, samples attempted and recovered, indications of the presence of various materials such as weathered rock, gravel, roots, etc., and observations of ground water. It also contains the field representative's interpretation of the soil and rock conditions between samples. Therefore, these logs contain both factual and interpretative information. The copies are on file in our office. We must emphasize that our recommendations are based on the contents of the final logs and the information contained therein and not on the field logs. The final logs presented herein represent our interpretation of the contents of the field logs and the results of the laboratory examinations and tests of the field samples.

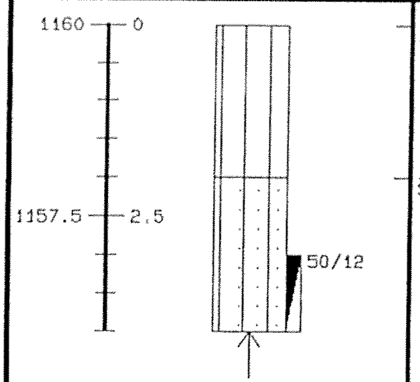
The boring/trench logs and related information depict subsurface conditions only at these specific locations and at the particular time designated on the logs. Soil and rock conditions at other locations may differ from conditions occurring at these boring/trench locations. Also, the passage of time may result in a change in the soil conditions at these boring/trench locations.

LOG OF BORING

Boring: 1 — Project: 2011-3

Date: 17 March 1989 — Elevation: 1160

Water depth at completion: n/a — Depth to caving: n/a

ELEV / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	Sample Number	Density p.c.f.	Moisture %
		ML	Medium redbrown, wet, soft to medium dense, clayey silt with sand. (Colluvium)	Completely weathered granite rock.			
		SM	Olive brown, wet-moist, dense, silty sand.	Refusal in slightly to moderately weathered rock. Rock fabric clearly evident	1-1		

Bottom at 4 feet.

Figure Number 2

ANDERSON GEOTECHNICAL CONSULTANTS, INC.

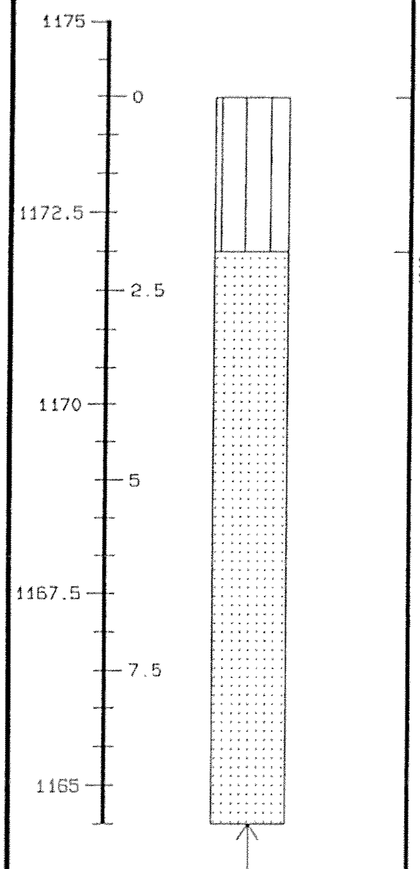
LOG OF BORING

Boring: 2 Project: 2011-3

Date: 17 March 1989 Elevation: 1174

Water depth at completion: n/a Depth to caving: n/a

ELEV / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	Sample Number	Density p.c.f.	Moisture %
		ML	Medium to redbrown wet, clayey Silt with sand (Colluvium)				
		SW-SM	Olive brown, wet to moist, dense, (fine to medium) sand with silt.	Moderately to completely weathered granite rock.			
				Drilling difficulty varies. Zones of hard and softer material.			



Bottom at 9.5 feet.

Figure Number 3

ANDERSON GEOTECHNICAL CONSULTANTS, INC.

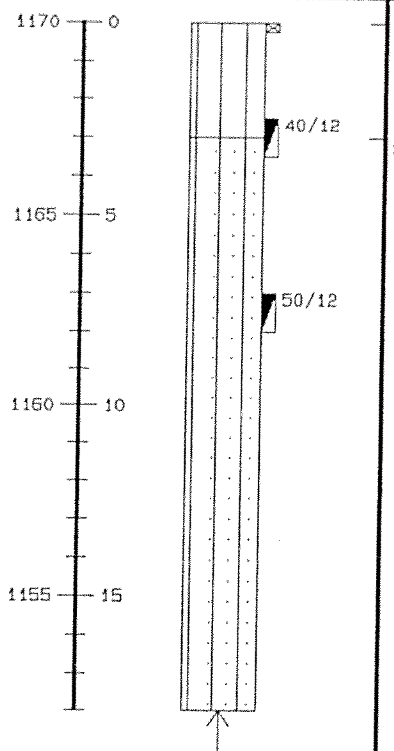
LOG OF BORING

Boring: 3 | Project: 2011-3

Date: 17 March 1989 | Elevation: 1170

Water depth at completion: n/a | Depth to caving: n/a

ELEV / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	Sample Number	Density p.c.f.	Moisture %
		ML-MC	Med.to redbrown, wet to moist, mod. dense, clayey silt w/sand to sandy silt with clay.	Colluvium	CB-3		
	40/12	SM	Light brown, moist, dense, silty (fine to medium) sand.	Interval 3-1 includes two samples. Numbers 3-1-1 and 3-1-2. Rock fabric clearly evident Completely weathered granite rock.	3-1	110.7	16.3
	50/12			Same moderate to completely weathered granite rock.	3-2		



Boring terminated at refusal. Bottom at 18 feet.

Figure Number 4

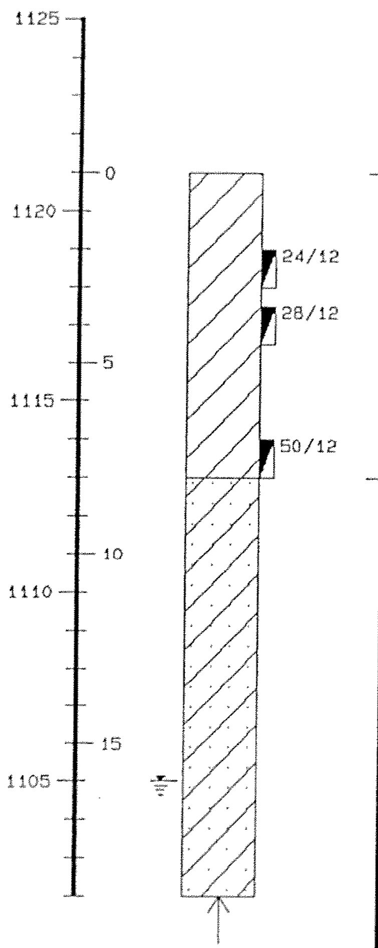
ANDERSON GEOTECHNICAL CONSULTANTS, INC.

LOG OF BORING

Boring: 4 | Project: 2011-3

Date: 17 March 1989 | Elevation: 1121

Water depth at completion: 16 feet | Depth to caving: n/a



ELEV / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	Sample Number	Density p.c.f.	Moisture %
0		CL-ML	Dark brown, moist to wet, moderately stiff, silty clay with sand. (Colluvium)				
	24/12				4-1		
	28/12			Sample collected in plastic bag.	4-2		
	50/12			Interval 4-3 includes two samples. Numbers 4-3-1 and 4-3-1.	4-3		
		SC-CL (DG)	Mottled grey-red-brown-tan, sandy clay w/silt-clayey sand w/silt & minor rock fragments.	Completely to severely weathered granite rock (Colluvium).			
				Cuttings "silty clay (micaçous) with fine sand."			
				Cutting, moderate, medium brown, silty fine sand.			

Bottom at 19 feet. Easy drilling.

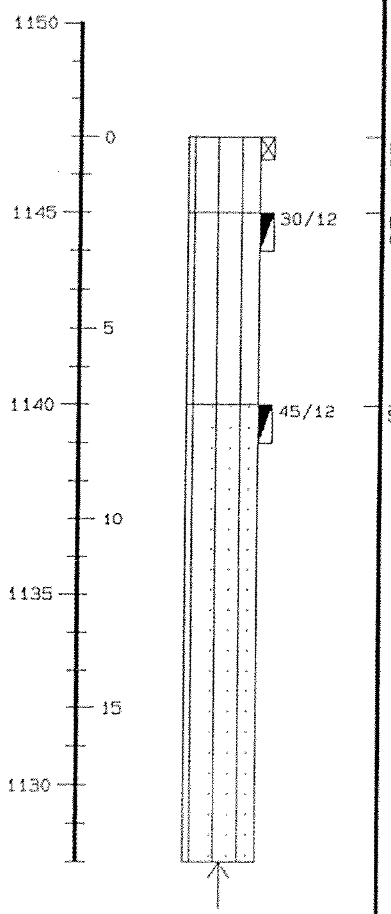
Figure Number 5

LOG OF BORING

Boring: 5 | Project: 2011-3

Date: 17 March 1989 | Elevation: 1147

Water depth at completion: n/a | Depth to caving: n/a



USCS	Soil Description	Remarks	Sample Number	Density p.c.f.	Moisture %
ML-CL	Med.to redbrown, wet to moist, mod. stiff, clayey silt w/sand to silty clay with sand.	(Colluvium)	CB-5		
ML-CL	Med.to dk. brown, wet, med. stiff, silty clay w/sand.	Completely weathered in-place residual granite soil.	5-1		
SM	Lt. brown, moist-wet, mod. dense, silty (fine to coarse) sand with clay.	Completely to moderately weathered granite rock. Rock fabric evident.	5-2	91	28.2
		Difficult drilling 15 to 16 feet.			

Boring terminated at 19 feet.

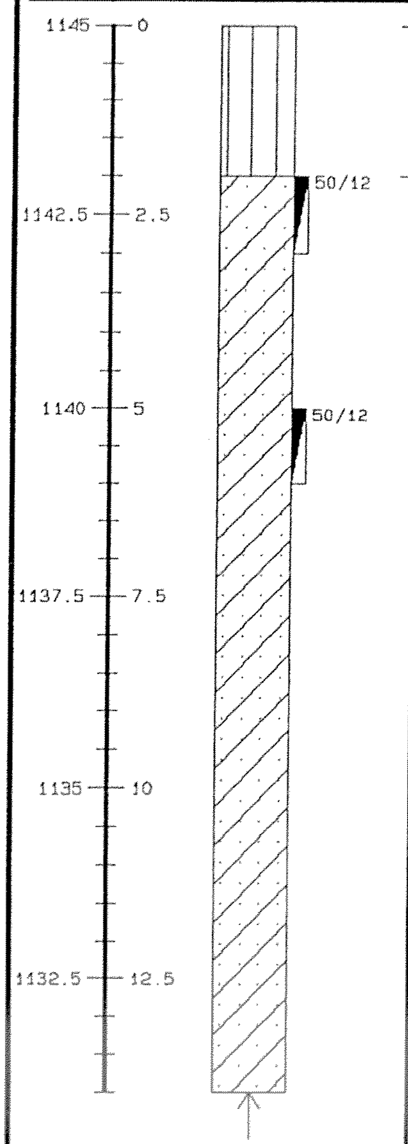
Figure Number 6

LOG OF BORING

Boring: 6 | Project: 2011-3

Date: 17 March 1989 | Elevation: 1145

Water depth at completion: n/a | Depth to caving: n/a



ELEV / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	Sample Number	Density p.c.f.	Moisture %
1145 / 0		ML	Med. to red brown, wet-moist, clayey silt with sand. (Colluvium)				
	50/12	SC	Med.-light brown, moist, dense, clayey sand with silt.	Completely weathered granite rock.	6-1		
1140 / 5	50/12			Denser at 5 feet.	6-2	131.2	11.3
				Occasional harder rock zones generally less than 1 foot thick.			
				Becoming gradually less weathered with depth, harder drilling.			

Refusal at 14 feet. Bottom.

Figure Number 7

LOG OF BORING

Boring: 8

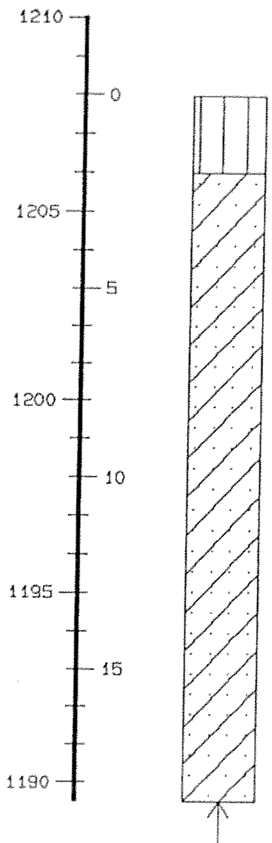
Project: 2011-3

Date: 17 March 1989

Elevation: 1208

Water depth at completion: n/a

Depth to caving: n/a



ELEV / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	Sample Number	Density p.c.f.	Moisture %
		ML	Red brown, wet to moist, clayey silt with sand. (Colluvium)				
		SC-SM	Medium brown, moist, dense, clayey (f-m) sand w/silt to silty (f-m) sand w/clay.	Completely weathered granite rock. Rock fabric evident.			

Bottom at 18.5 feet. Refusal.

Figure Number 9

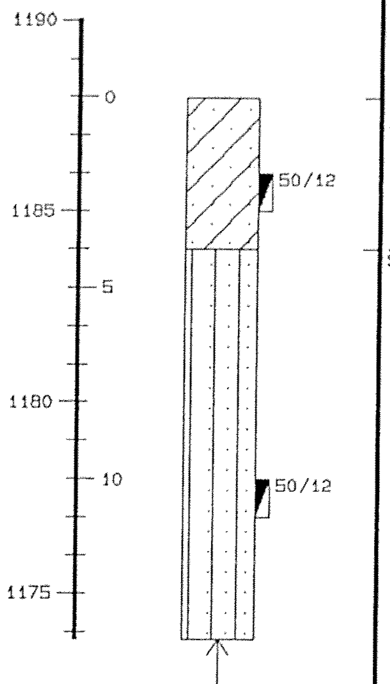
LOG OF BORING

Boring: 9 | Project: 2011-3

Date: 17 March 1989 | Elevation: 1188

Water depth at completion: n/a | Depth to caving: n/a

ELEV / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	Sample Number	Density p.c.f.	Moisture %
0		SC-SM	Red brown, wet-moist, dense, clayey (f-m) sand w/silt, & hard fresh rock fragments.	Colluvium.			
	50/12				9-1		
		SM	Med. brown, wet to moist silty (fine to medium) sand with clay.	Completely weathered granite rock.			
10	50/12				9-2		
			Tip: Orange brown, moist, very dense, (fine to coarse) sand with silt and clay.	Tip: Completely weathered in-place granite rock. Rock fabric clearly evident.			



Bottom at 11 feet.

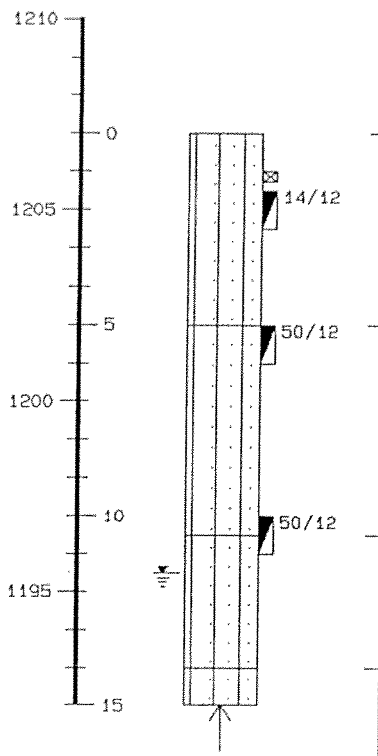
Figure Number 10

LOG OF BORING

Boring: 10 | Project: 2011-3

Date: 17 March 1989 | Elevation: 1207

Water depth at completion: 11.5 feet | Depth to caving: n/a



ELEV / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	Sample Number	Density p.c.f.	Moisture %
0		SM	Dark red-brown, moist, moderately dense, silty sand with a little clay.				
1205	14/12				B-10 10-1	105.7	22.3
			% clay increases.	Clayier.			
5	50/12	SM	Reddish-brown, moist, dense, silty sand with clay.	Severely weathered granite rock.	10-2	110.0	16.6
10	50/12	SM	Brown, moist, very dense, silty sand with clay.		10-3	121.0	12.2
		SM	Olive brown, moist to wet, very dense, silty sand with clay.	Moderately weathered granite rock. Difficult drilling.			

Bottom at 15 feet. No caving.

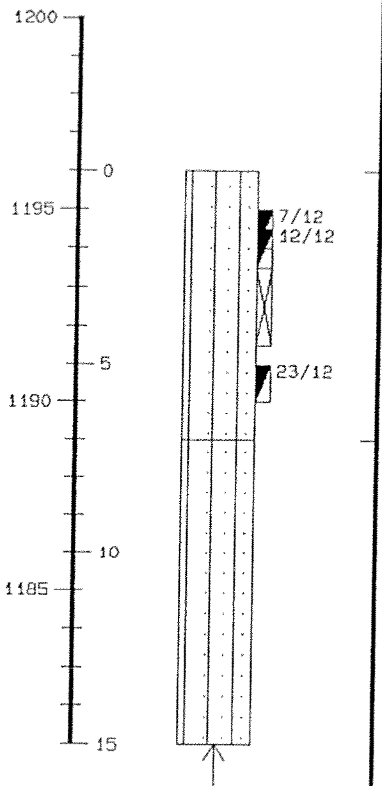
Figure Number 11

LOG OF BORING

Boring: 11 — Project: 2011-3

Date: 17 March 1989 — Elevation: 1196

Water depth at completion: n/a — Depth to caving: n/a



ELEV / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	Sample Number	Density p.c.f.	Moisture %
0		SM	Dark red-brown, moist, loose moderately dense silty sand with a little clay.		11-1 11-2 CB-11		
				Clayier with depth; some scattered pebbles.	11-3		
		SM	Olive brown, moist, dense, silty sand with clay.	Moderately weathered granite rock. Drilling more difficult.			
			Color grades to grey-brown.	Difficult drilling.			
				Near refusal			

Total Depth 15 feet. No GW. No caving.

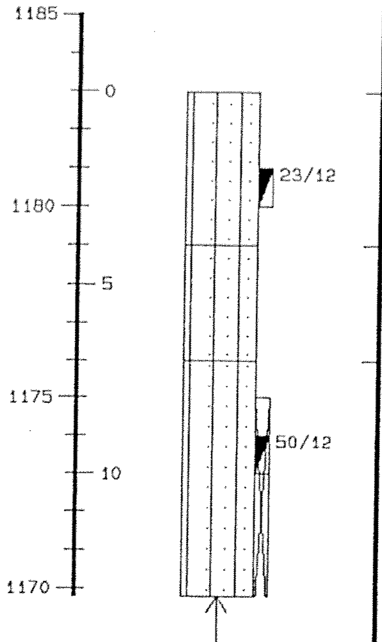
Figure Number 12

LOG OF BORING

Boring: 12 Project: 2011-3

Date: 17 March 1989 Elevation: 1183

Water depth at completion: n/a Depth to caving: n/a



ELEV / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	Sample Number	Density p.c.f.	Moisture %
		SM	Dark red-brown, moist, moderately dense, silty sand with some clay.				
	23/12				12-1	96.1	11.2
		SM	Brown, moist, dense, silty sand with clay.	Severely to moderately weathered granite rock.			
		SM	Light olive brown, moist, very dense, silty sand with clay.	Moderately weathered granite rock. Difficult drilling.	CB-12		
	50/12				12-2		
				Refusal			

No GW. No caving. Refusal to auger.
Bottom at 11 feet.

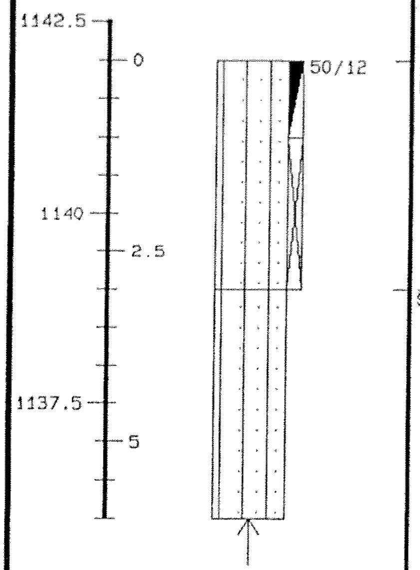
Figure Number 13

LOG OF BORING

Boring: 13 | Project: 2011-3

Date: 17 March 1989 | Elevation: 1142

Water depth at completion: n/a | Depth to caving: n/a



ELEV / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	Sample Number	Density p.c.f.	Moisture %
		SM-ML	Dark red-brown, moist, mod. dense, silty sand to sandy silt.		13-1		
					CB-13		
		SM	Brown, moist, very dense, slightly weathered granite rock.				
				Difficult drilling			

Bottom at 6 feet. Refusal

Figure Number 14

ANDERSON GEOTECHNICAL CONSULTANTS, INC.

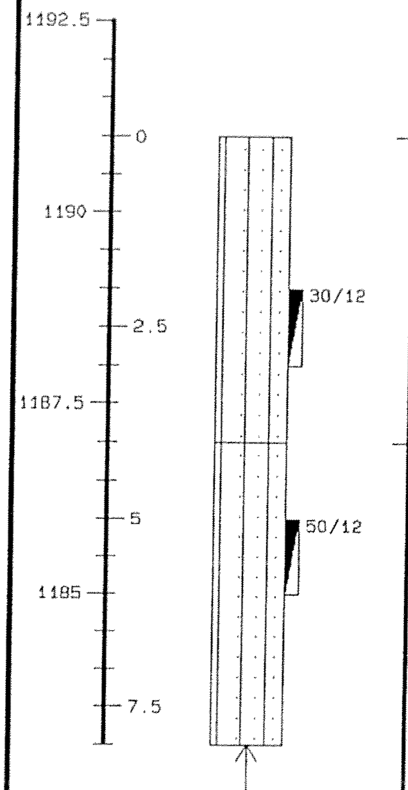
LOG OF BORING

Boring: 14 — Project: 2011-3

Date: 17 March 1989 — Elevation: 1191

Water depth at completion: n/a — Depth to caving: n/a

ELEV / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	Sample Number	Density p.c.f.	Moisture %
0		SM	Brown, moist, moderately dense, silty sand with scattered pebbles.				
2.5	30/12				14-1	113.8	14.2
				Some clay lenses.			
		SM	Brown to gray-brown, moist, dense, silty sand.	Moderately weathered granite rock.			
5	50/12				14-2	116.9	10.2
				Difficult drilling.			



Bottom at 8 feet. No GW. No caving.
Refusal

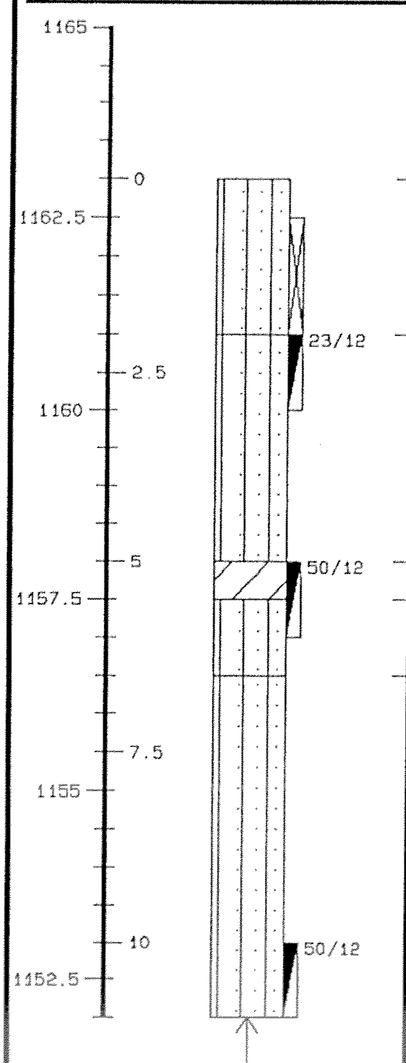
Figure Number 15

LOG OF BORING

Boring: 15 Project: 2011-3

Date: 17 March 1989 Elevation: 1163

Water depth at completion: n/a Depth to caving: n/a



USCS	Soil Description	Remarks	Sample Number	Density p.c.f.	Moisture %
SM	Dark red-brown, moist, moderately dense, silty sand.				
			CB-15		
SM	Reddish brown, moist moderately dense, silty sand.	Severely weathered granite rock.	15-1	106.7	16.3
CL	Grey brown clay layer.		15-2	118.6	16.0
SM	Reddish brown, moist moderately dense, silty sand.	Severely weathered granite rock.			
M(DG)	Brown to olive brown, moist, dense, silty sand.				
		Moderately weathered granite rock. Difficult drilling.			
			15-3	134.1	9.9

Bottom at 11 feet. No GW. No caving.

Figure Number 16

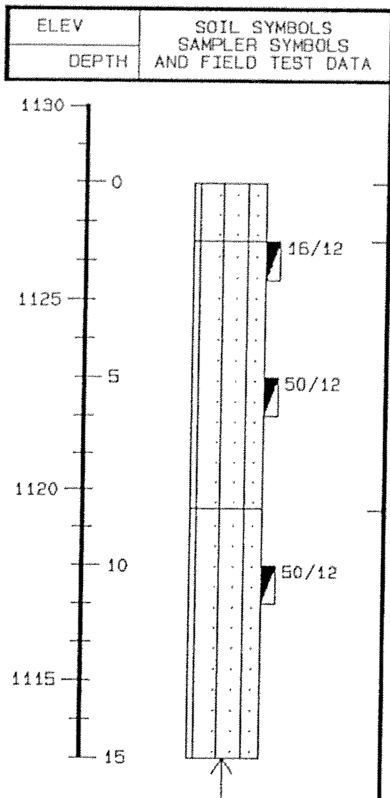
ANDERSON GEOTECHNICAL CONSULTANTS, INC.

LOG OF BORING

Boring: 16 Project: 2011-3

Date: 17 March 1989 Elevation: 1128

Water depth at completion: n/a Depth to caving: n/a



USCS	Soil Description	Remarks	Sample Number	Density p.c.f.	Moisture %
SM	Red-brown, moist, moderately dense silty (fine) grained sand with clay.				
SM	Red-brown, moist, moderately dense silty sand.	Severely weathered granite rock.	15-1		
		Becoming less weathered.	16-2	122.4	13.4
		Difficult drilling.			
SM	Light reddish brown, moist, very dense silty sand.				
		Moderately weathered granite rock.	15-3	118.1	15.4
		Difficult drilling.			

Bottom at 15 feet. No GW. No caving.

Figure Number 17

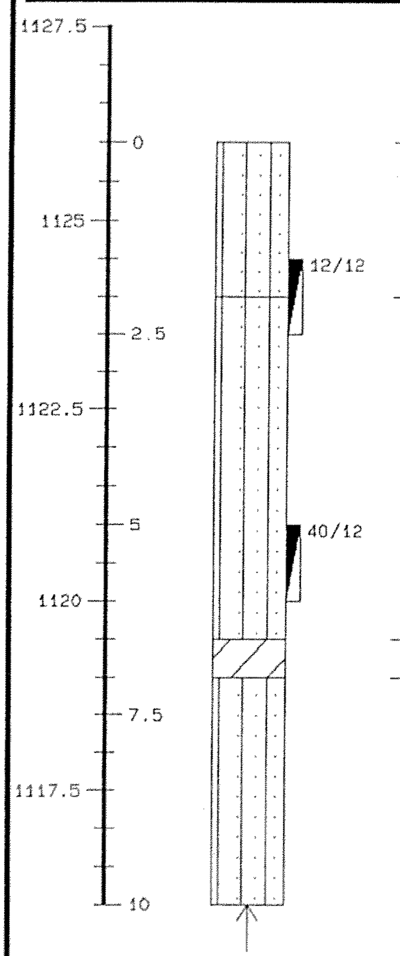
ANDERSON GEOTECHNICAL CONSULTANTS, INC.

LOG OF BORING

Boring: 17 | Project: 2011-3

Date: 17 March 1989 | Elevation: 1126

Water depth at completion: n/a | Depth to caving: n/a



ELEV / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	Sample Number	Density p.c.f.	Moisture %
		SM	Red-brown, moist, moderately dense, silty sand with some clay.				
	12/12				17-1	107.0	19.7
		SM	Light reddish brown, moist, dense, silty/clayey sand with scattered pebbles.	Severely weathered granite rock.			
	40/12				17-2		
		CL	Clay layer.				
		SM	Brown, moist, dense, silty sand.				
				Moderately weathered granite rock.			

Bottom at 10 feet.
No GW. No Caving.

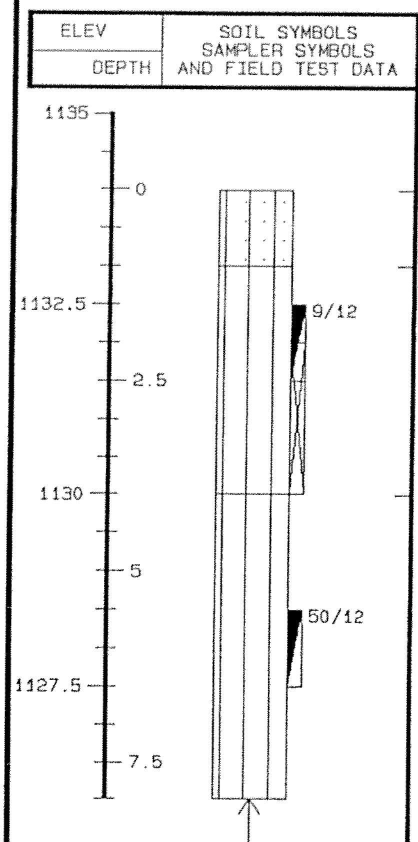
Figure Number 18

LOG OF BORING

Boring: 18 | Project: 2011-3

Date: 17 March 1989 | Elevation: 1134

Water depth at completion: n/a | Depth to caving: n/a



USCS	Soil Description	Remarks	Sample Number	Density p.c.f.	Moisture %
SM	Dark red-brown, moist moderately dense, silty sand with some clay.				
ML	Red brown, moist, mod. stiff, sandy silt with clay.		18-1	100.4	21.3
	Becoming clayier.		CB-18		
		Moderately weathered granite rock.			
ML	Light gray-brown, moist, dense silty sand.				
			18-2	102.7	14.5
		Becoming less weathered.			

Bottom at 8 feet. Refusal.

Figure Number 19

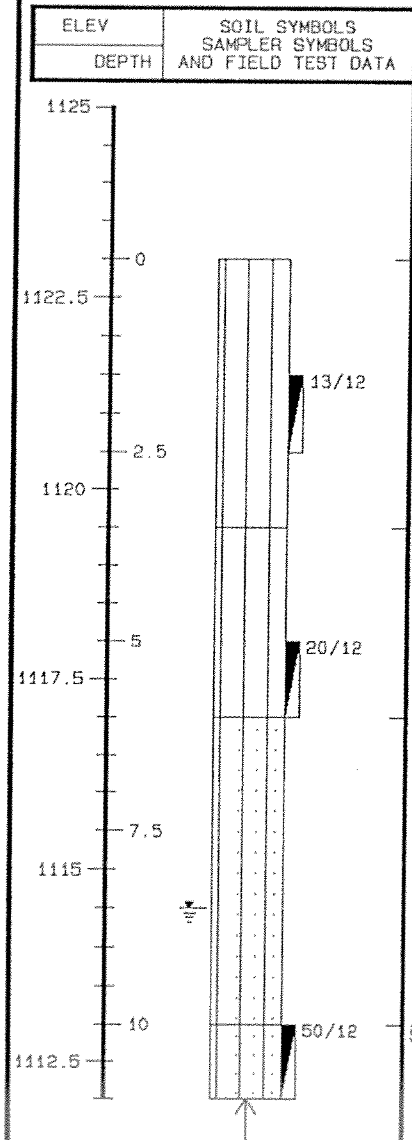
ANDERSON GEOTECHNICAL CONSULTANTS, INC.

LOG OF BORING

Boring: 19 | Project: 2011-3

Date: 17 March 1989 | Elevation: 1123

Water depth at completion: 8.5 | Depth to caving: n/a



USCS	Soil Description	Remarks	Sample Number	Density p.c.f.	Moisture %
ML	Dark brown to black, wet, medium stiff, clayey silt with sand.				
			19-1	76.8	33.8
		Drills very easy.			
ML	Olive gray, wet, stiff clayey silt with sand				
			19-2	93.0	31.5
SM	Grades to an olive brown, moist, dense, silty sand.	Harder drilling. Moderately weathered granite rock.			
SM	Light reddish brown, moist very dense, silty sand.	Slightly weathered granite rock.	19-3	116.2	19.5

Bottom at 11 feet. Standing water at surface.

Figure Number 20

ANDERSON GEOTECHNICAL CONSULTANTS, INC.

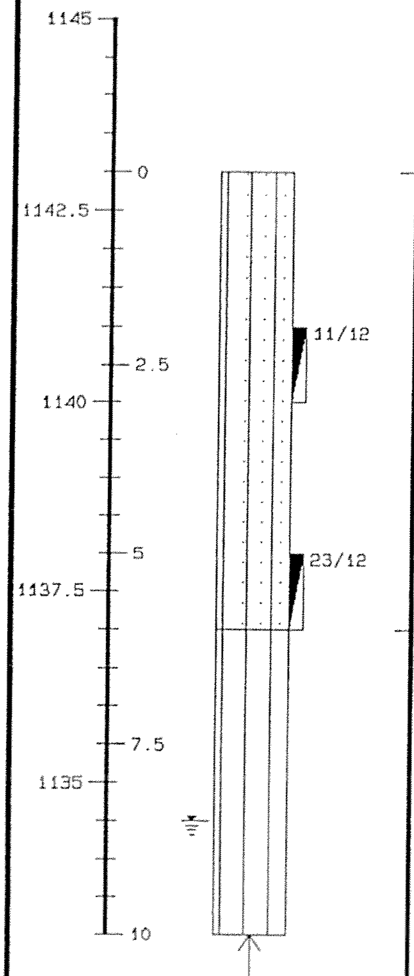
LOG OF BORING

Boring: 20 | Project: 2011-3

Date: 17 March 1989 | Elevation: 1143

Water depth at completion: 8.5 | Depth to caving: n/a

ELEV / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	Sample Number	Density p.c.f.	Moisture %
0		SM	Dark red-brown, moist, loose to moderately dense, silty sand with trace clay.				
2.5	11/12				20-1	104.6	22.5
				Clayier			
5	23/12				20-2		
		ML	Brown to olive brown, moist stiff, clayey silt with sand.				
				Harder drilling.			
10							



Bottom at 10 feet. No GW. No caving.

Figure Number 21

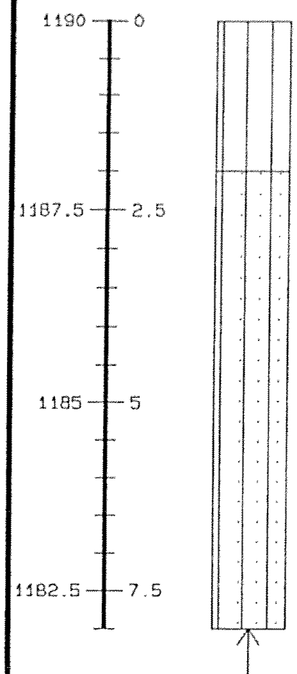
ANDERSON GEOTECHNICAL CONSULTANTS, INC.

TRENCH LOG

Trench: 1
Date: 1 April 1989
Water depth at completion: n\a

Project: 2011-3
Elevation: 1190
Depth to caving: n\a

ELEV / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	Sample Number
1190 — 0		ML	Dark redbrown, moist, clayey silt with sand.	Completely weathered granite rock (Colluvium).	
1187.5 — 2.5		SM-SW	Light redbrown to light brown, moist, moderately dense, silty sand.	Moderately to severely weathered granite rock. Rock fabric evident.	
1185 — 5				Becoming very dense.	
1182.5 — 7.5					



Bottom at 8 feet.

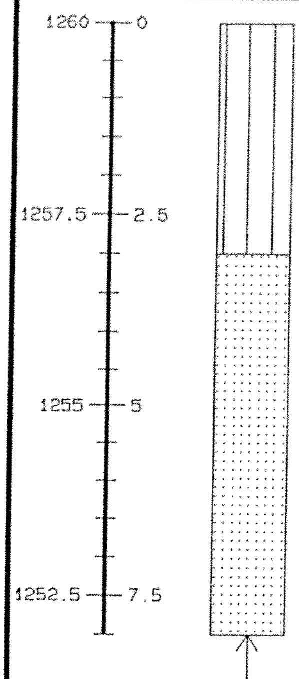
Figure 22

TRENCH LOG

Trench: 2
Date: 1 April 1989
Water depth at completion: n\a

Project: 2011-3
Elevation: 1260
Depth to caving: n\a

ELEV / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	Sample Number
1260 — 0		ML	Dark redbrown, moist, sandy silt with clay & occasional large hard angular rock frag.	Completely weathered rock (Colluvium).	
1257.5 — 2.5		SW-SP	Light redbrown to light brown, moist, dense, silty sand.	Moderately to severely weathered granite rock. Rock fabric evident.	
1255 — 5				Becoming denser, less weathered.	
1252.5 — 7.5					



Bottom at 8 feet.

Figure 23

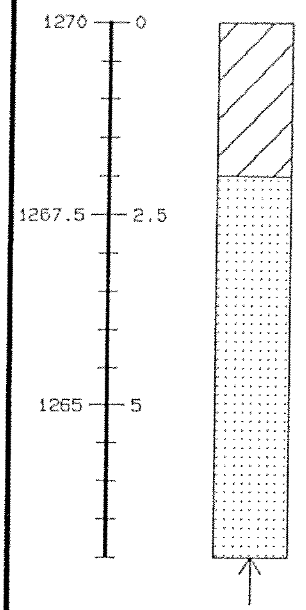
ANDERSON GEOTECHNICAL CONSULTANTS, INC.

TRENCH LOG

Trench: 3
Date: 1 April 1989
Water depth at completion: n\a

Project: 2011-3
Elevation: 1270
Depth to caving: n\a

ELEV / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	Sample Number
		MC-CL	Dark redbrown, moist, clayey silt with sand & occasional large hard angular rock frag.	Completely weathered rock (Colluvium).	
		SW	Grades to lighter redbrown, silty sand.	Completely weathered rock. Rock fabric evident.	
				Becoming very dense, less weathered	
				Very hard at 7 feet, fresh rock at base.	



Bottom at 7 feet.

Figure 24

ANDERSON GEOTECHNICAL CONSULTANTS, INC.

TRENCH LOG

Trench: 4
Date: 1 April 1989
Water depth at completion: n\a

Project: 2011-3
Elevation: 1300
Depth to caving: n\a

ELEV / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	Sample Number
1300 — 0		ML-CL	Dark redbrown, moist, clayey silt with sand.	Completely weathered granite rock (Colluvium).	
1297.5 — 2.5		SM	Light redbrown to light brown, moist, silty sand.	Rock fabric evident. Consistency of silty sand. Completely to mod. weathered granite rock. Rock fabric evident.	
1295 — 5				Becoming denser, less silt.	
1292.5 — 7.5				Moderate to severely weathered, very friable.	

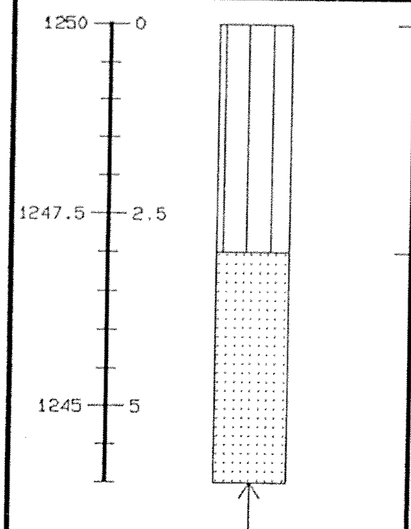
Bottom at 9 feet.

Figure 25

TRENCH LOG

Trench: 5
Date: 1 April 1989
Water depth at completion: n\a

Project: 2011-3
Elevation: 1250
Depth to caving: n\a

ELEV / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	Sample Number
		ML-CL	Orange to redbrown, moist, clayey silt with sand and angular rock fragments.	Completely weathered rock (Colluvium).	
		SW	Light to medium brown, moist, silty sand.	Severely to moderately weathered granite rock. Rock fabric evident.	
				Very hard, moderate to slightly weathered, near refusal.	

Bottom at 6 feet.

Figure 26

TRENCH LOG

Trench: 6
Date: 1 April 1989
Water depth at completion: n\a

Project: 2011-3
Elevation: 1210
Depth to caving: n\a

ELEV / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	Sample Number
1210 / 0		ML	Dark redbrown, moist, clayey silt to sandy silt with angular rock fragments.	Completely weathered rock (Colluvium).	
1207.5 / 2.5					
1205 / 5		SW	Orangebrown to light brown, moist, silty sand.	Severely weathered granite rock. Rock fabric evident, friable.	
1202.5 / 7.5					
1200 / 10					

Bottom at 10 feet.

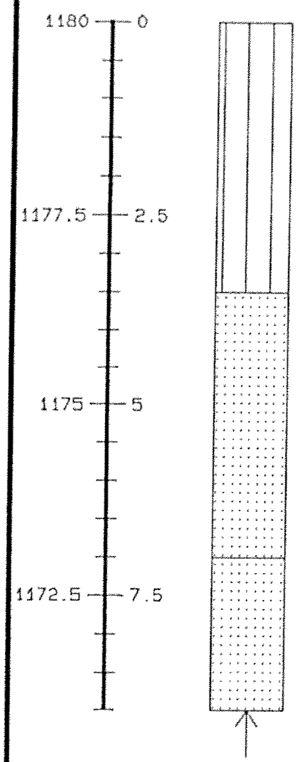
Figure 27

ANDERSON GEOTECHNICAL CONSULTANTS, INC.

TRENCH LOG

Trench: 7
Date: 1 April 1989
Water depth at completion: n\a

Project: 2011-3
Elevation: 1180
Depth to caving: n\a

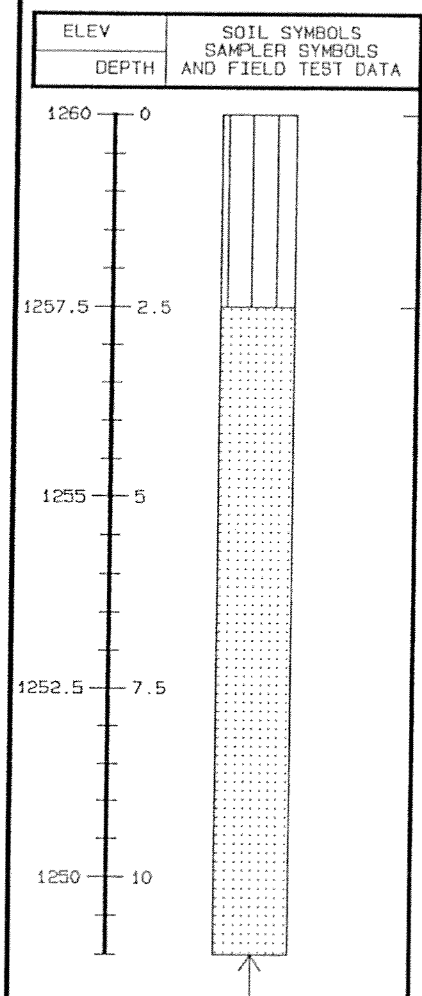
ELEV / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	Sample Number
		ML	Dark redbrown, moist to wet, sandy-clayey silt.	Completely weathered granite rock (Colluvium).	
		SW-SM	Dark redbrown to orange brown, moderately dense silty sand.	Moderately to serverely weathered granite rock. Fresh rock west end of trench. Rock fragments difficult to break in hand.	
		SW	Light brown, very dense, sand with silt.	Moderately weathered granite rock. Hard digging.	

Bottom at 9 feet.

TRENCH LOG

Trench: 8
Date: 1 April 1989
Water depth at completion: n\a

Project: 2011-3
Elevation: 1260
Depth to caving: n\a



USCS	Soil Description	Remarks	Sample Number
ML	Dark redbrown, moist, clayey, sandy silt with occasional small, hard, rock fragments.	Completely weathered rock (Colluvium).	
SW	Light red brown to orange brown, moist, silty sand to sand with silt.	Severe to moderately weathered granite rock.	
		Becoming denser.	

Bottom at 11 feet.

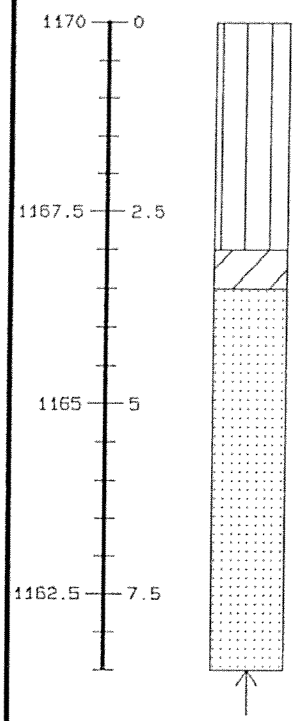
Figure 29

TRENCH LOG

Trench: 9
Date: 1 April 1989
Water depth at completion: n\a

Project: 2011-3
Elevation: 1170
Depth to caving: n\a

ELEV / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	Sample Number
1170 — 0		ML	Dark redbrown, moist, wet clayey, sandy silt.	Completely weathered granite rock (colluvium).	
1167.5 — 2.5		CL	Increase in clay % Consistency of silty clay with sand.		
1165 — 5		SW	Olive brown, moist, dense, sand with silt matrix. Hard fresh angular granite rock fragments mixed in.	Moderately weathered to fresh granite rock. Rock frabric evident	
1162.5 — 7.5				Very hard digging.	



Bottom at 8.5 feet.

Figure 30

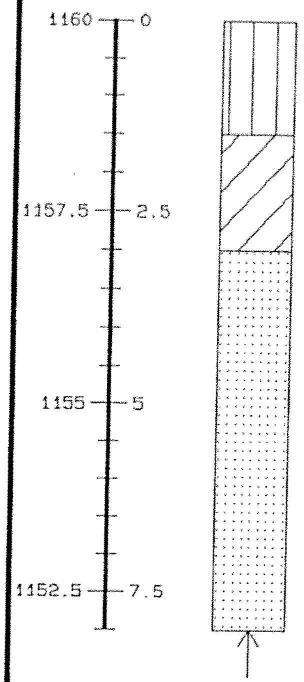
ANDERSON GEOTECHNICAL CONSULTANTS, INC.

TRENCH LOG

Trench: 10
Date: 1 April 1989
Water depth at completion: n\a

Project: 2011-3
Elevation: 1160
Depth to caving: n\a

ELEV / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	Sample Number
		ML	Dark redbrown, moist, sandy, clayey silt.	Completely weathered granite rock (Colluvium).	
		CL	Olive brown, moist silty Clay with sand.		
		RX	Hard quartz layer.		
		SW	Olive brown, moist, dense, sand with silt.	Moderate to severely weathered granite rock. Rock fabric evident. Friable to difficult to bre	
				Very dense, difficult digging, fresh rock fragments. Near refusal	



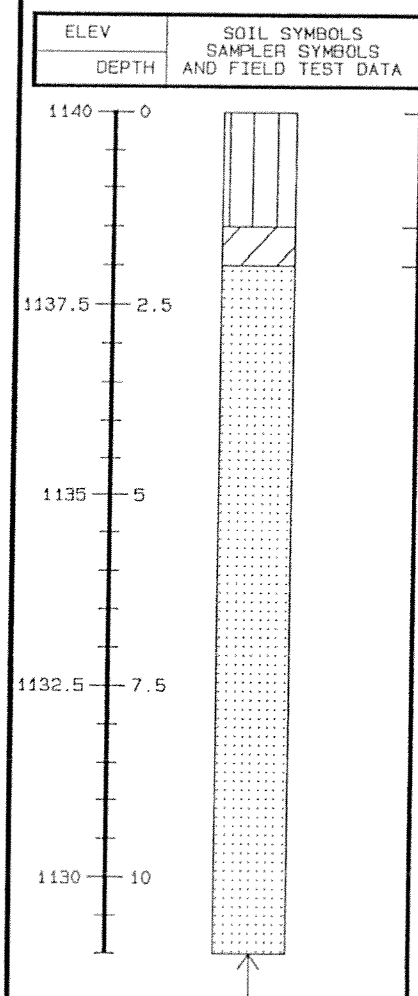
Bottom at 8 feet - near refusal.

Figure 31

TRENCH LOG

Trench: 11
Date: 1 April 1989
Water depth at completion: n\a

Project: 2011-3
Elevation: 1140
Depth to caving: n\a



USCS	Soil Description	Remarks	Sample Number
ML	Dark redbrown, moist to wet sandy, clayey clayey silt.	Completely weathered rock (Colluvium).	
CL	Medium brown, moist to wet, silty clay with trace sand.		
SW	Tan to very light brown, moist fine sand with silt.	Very severely weathered granite rock. Rock fabric evident. Very friable.	
		Same very light colored tan to white.	
		Becoming denser, still friable.	

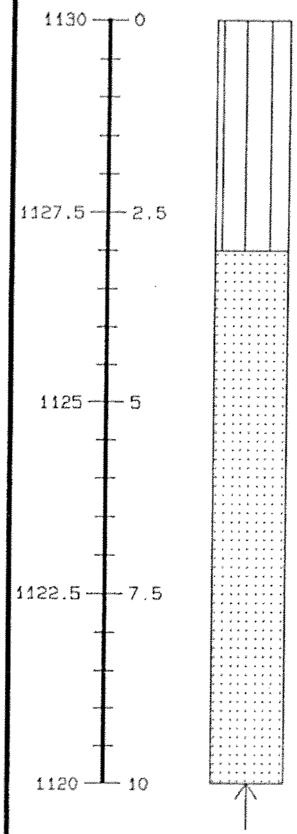
Bottom at 11 feet.

Figure 32

TRENCH LOG

Trench: 12
Date: 1 April 1989
Water depth at completion: n\a

Project: 2011-3
Elevation: 1130
Depth to caving: n\a



ELEV / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	Sample Number
1130 / 0		ML	Dark redbrown, moist to wet sandy, clayey silt with occasional hard rock fragment.		
				Minor clay build-up above weathered rock.	
		SW	Light olive brown, moist, silty sand with clay.		
				Severely weathered granite rock. Rcok fabric evident. Friable.	
				Increasing % of sand.	
				Becoming dense to very dense.	
				Very dense. Tough digging.	

Bottom at 10 feet.

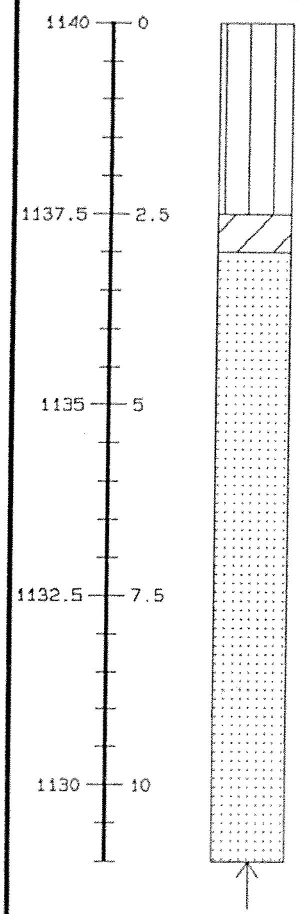
Figure 33

TRENCH LOG

Trench: 13
Date: 1 April 1989
Water depth at completion: n\a

Project: 2011-3
Elevation: 1140
Depth to caving: n\a

ELEV / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	Sample Number
1140 — 0		ML	Dark redbrown, moist, sandy, clayey silt.	Completely weathered rock (Colluvium).	
1137.5 — 2.5		CL	Very minor clay build up above severely weathered rock.		
		SW	Orange to brown, moist, silty sand.	Severely weathered granite rock. Rock fabric evident. Friable.	
1135 — 5					
1132.5 — 7.5					
1130 — 10				Easy digging.	



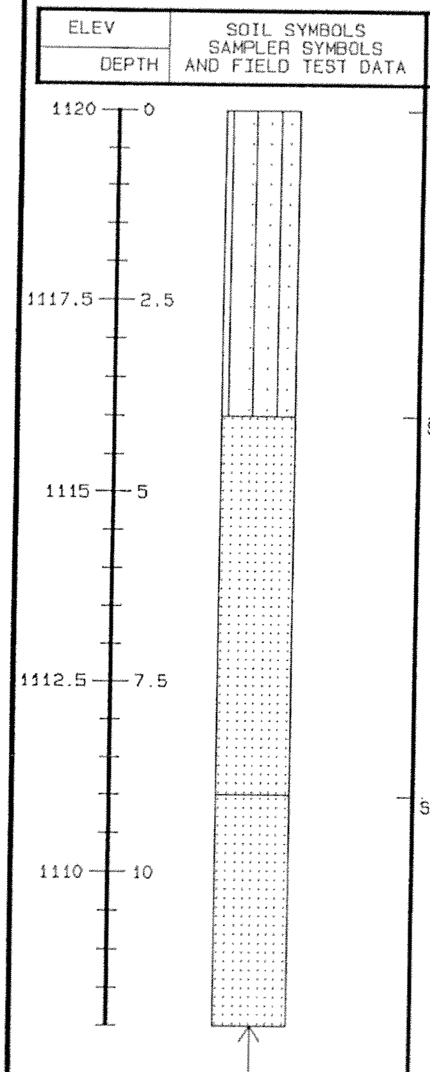
Bottom at 11 feet.

Figure 34

TRENCH LOG

Trench: 14
Date: 1 April 1989
Water depth at completion: n\a

Project: 2011-3
Elevation: 1120
Depth to caving: n\a



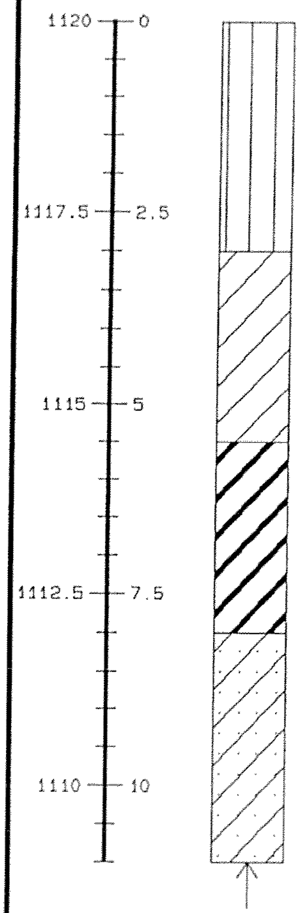
USCS	Soil Description	Remarks	Sample Number
SM	Dark brown to dark redbrown, wet to saturated, silty, clayey fine to medium sand.	Completely weathered rock (Colluvium).	
SW	Medium to dark brown, saturated, medium dense, gravely (rounded, >3"), sand w/silt & clay.	Water running into trench this layer.	
SW	Olive brown, moist to wet, sand with silt and clay.	Severely weathered granite rock. Rock fabric evident. Friable.	

Bottom at 12 feet.

TRENCH LOG

Trench: 15
Date: 1 April 1989
Water depth at completion: n\a

Project: 2011-3
Elevation: 1120
Depth to caving: n\a



ELEV / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	Sample Number
1120 / 0		ML	Dark brown, moist to wet, mod. stiff sandy silt with clay and occasional gravel to clayey silty with sand.		
		CL-CH	Dark brown to black, moist to wet, stiff sandy clay with silt.		
		CH	Grades to grey-brown, very stiff clay with silt.		
		SC-SW	Olive brown, wet, dense, clayey sand with gravel (rounded).	Colluvium. Sometimes highly Micocous.	

Bottom at 11 feet.

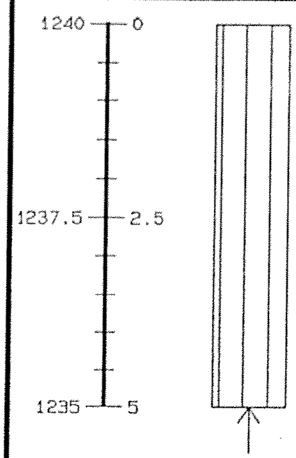
Figure 36

TRENCH LOG

Trench: 16
Date: 1 April 1989
Water depth at completion: n\a

Project: 2011-3
Elevation: 1240
Depth to caving: n\a

ELEV / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	Sample Number
		ML	Dark redbrown, moist, sandy, clayey silt.		
		RX	Olive brown, moist, severely weathered to fresh, fine granite rock.	Completely weathered granite rock (Colluvium).	
				Difficult digging, large % fresh rock.	



Bottom at 5 feet. Near refusal.

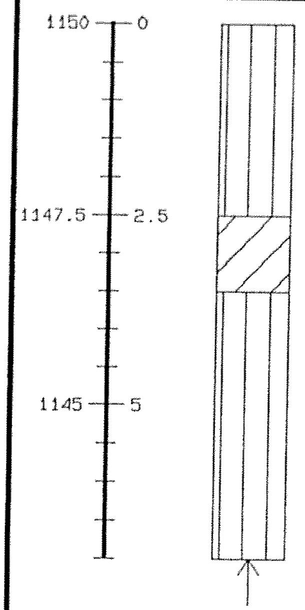
Figure 37

TRENCH LOG

Trench: 17
Date: 1 April 1989
Water depth at completion: n\a

Project: 2011-3
Elevation: 1150
Depth to caving: n\a

ELEV / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	Sample Number
1150 / 0		ML	Dark redbrown, moist to wet, clayey, sandy silt.	Completely weathered granite rock (Colluvium).	
1147.5 / 2.5		CL	Medium brown, moist, medium stiff sandy clay with silt.		
		ML	Dark redbrown, moist to wet, clayey, sandy silt.		
1145 / 5		RX	Olive brown, moist, sand to sand with clay.	Fresh to severely weathered granite rock. Hard digging.	



Bottom at 7 feet.

Figure 38

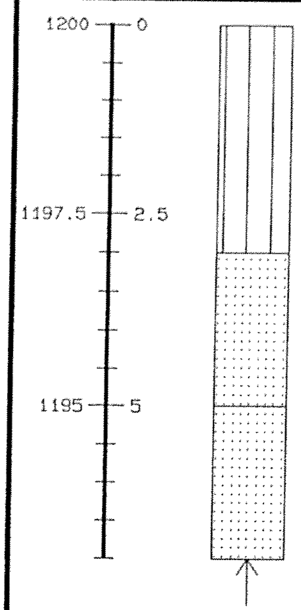
ANDERSON GEOTECHNICAL CONSULTANTS, INC.

TRENCH LOG

Trench: 18
Date: 1 April 1989
Water depth at completion: n\a

Project: 2011-3
Elevation: 1200
Depth to caving: n\a

ELEV / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	Sample Number
1200 / 0		ML	Dark redbrown, moist, clayey, sandy silt.	Completely weathered granite rock (Colluvium).	
1197.5 / 2.5					
		SW	Olive brown, sand with clay and silt. Occasional fresh rock fragments.	Severely to moderately weathered granite rock. Rock fabric evident.	
1195 / 5		SW	Olive brown, sand with silt and clay. Approximately 40% fresh rock fragments.	Fresh to moderately weathered granite rock. Difficult digging.	



Bottom at 7 feet.

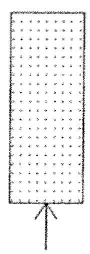
Figure 39

TRENCH LOG

Trench: 19 | Project: 2011-3

Date: 1 April 1989 | Elevation: 1235

Water depth at completion: n\a | Depth to caving: n\a

ELEV / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	Sample Number
1235 — 0 1232.5 — 2.5		RX-SW	Redbrown, silty, clayey sand matrix. Approximately 50% fresh rock fragments.		

Bottom at 2.5 feet.

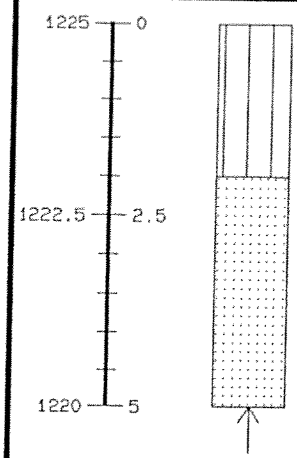
Figure 40

ANDERSON GEOTECHNICAL CONSULTANTS, INC.

TRENCH LOG

Trench: 20
Date: 1 April 1989
Water depth at completion: n\a

Project: 2011-3
Elevation: 1225
Depth to caving: n\a



ELEV / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	Sample Number
		ML	Dark brown to black, saturated to wet, clayey silt with organics.		
		RX-SW	Olive brown, sand with silt with fresh rock fragments.	Completely weathered to fresh metavolcanic rock.	

Bottom at 5 feet.

Figure 41

TRENCH LOG

Trench: 21
Date: 1 April 1989
Water depth at completion: n\a

Project: 2011-3
Elevation: 1230
Depth to caving: n\a

ELEV / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	Sample Number
1230 — 0		ML	Dark redbrown, sandy, clayey silt.		
			Olive, metavolcanic rock.	Refusal at 6" to 1 foot.	
		RX	Olive metavolcanic rock.		

Bottom at 1 foot.

TRENCH LOG

Trench: 22
Date: 1 April 1989
Water depth at completion: n\a

Project: 2011-3
Elevation: 1240
Depth to caving: n\a

ELEV / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	Sample Number
1240 — 0		SW	Dark brown to redbrown silty sand Matrix. Approximately 50% fresh rock fragments.	Completely weathered to fresh metavolcanic rock. Hard digging.	
1237.5 — 2.5		RX-SW	Matrix material dark to olive brown. fresh to severely weathered in-place rock.		
1235 — 5					

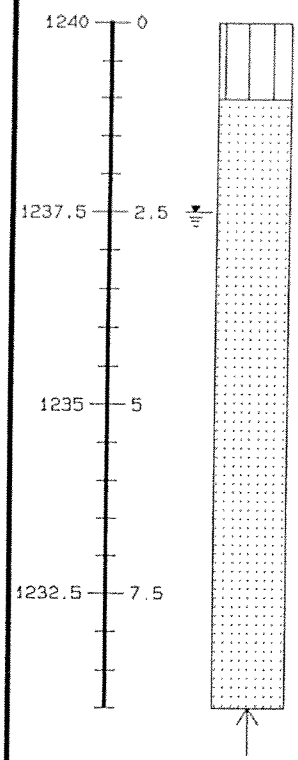
Bottom at 6 feet.

TRENCH LOG

Trench: 23
Date: 1 April 1989
Water depth at completion: 2.5

Project: 2011-3
Elevation: 1240
Depth to caving: n\a

ELEV / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	Sample Number
		ML	Dark redbrown, moist to wet, sandy, clayey silt.		
		SW	Medium olive brown, moist, sand with silt.	Severely to moderately weathered granite rock. Rock fabric evident. Hard to break in hand.	
				Becoming denser.	



Bottom at 9 feet.

Figure 44

TRENCH LOG

Trench: 24
Date: 1 April 1989
Water depth at completion: n\a

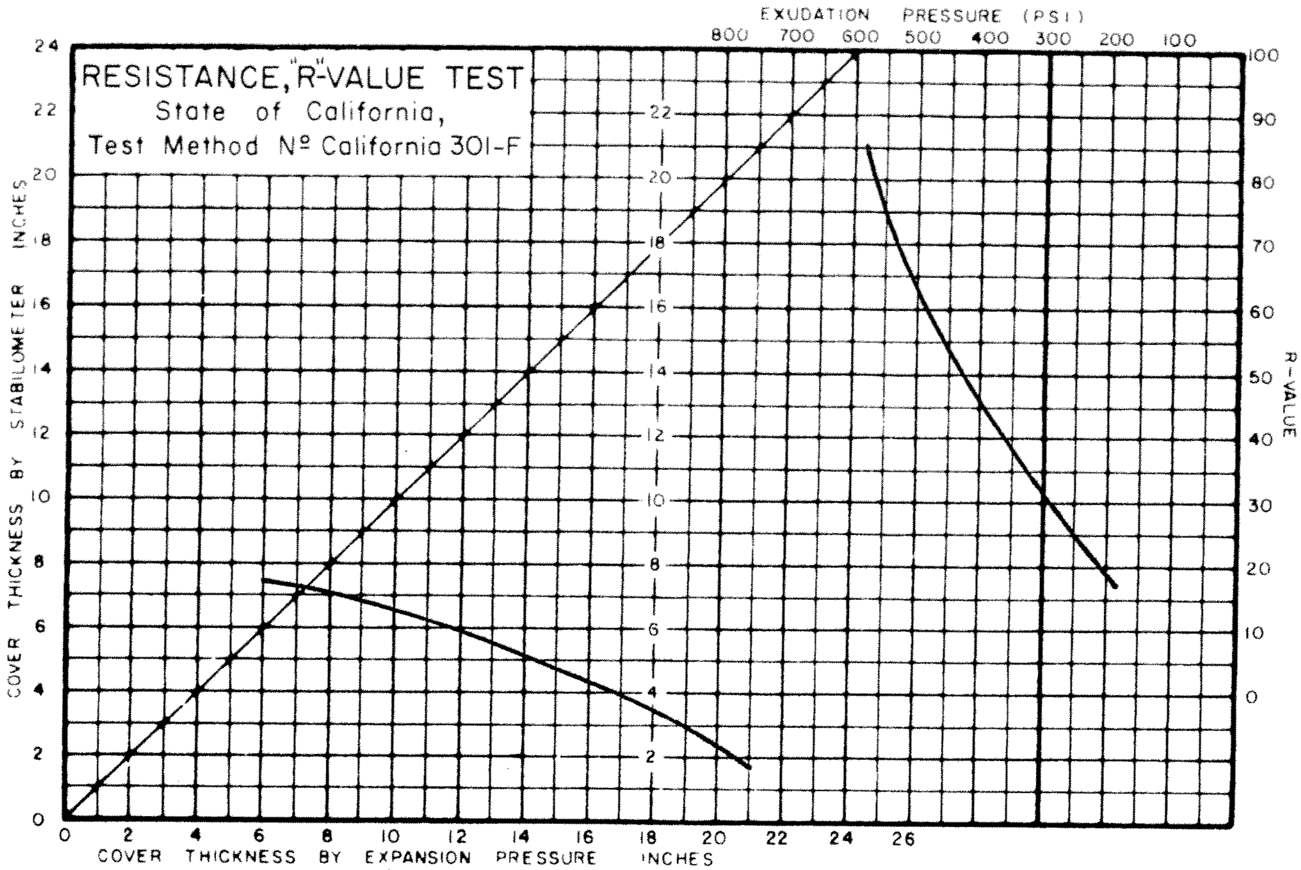
Project: 2011-3
Elevation: 1230
Depth to caving: n\a

ELEV / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	Remarks	Sample Number
1230 / 0		ML	Dark redbrown, moist, sandy, clayey silt.		

rock at approximately 8"

Figure 45

File Nº. 2011-3
Date: May 1989



Sample: CB-10

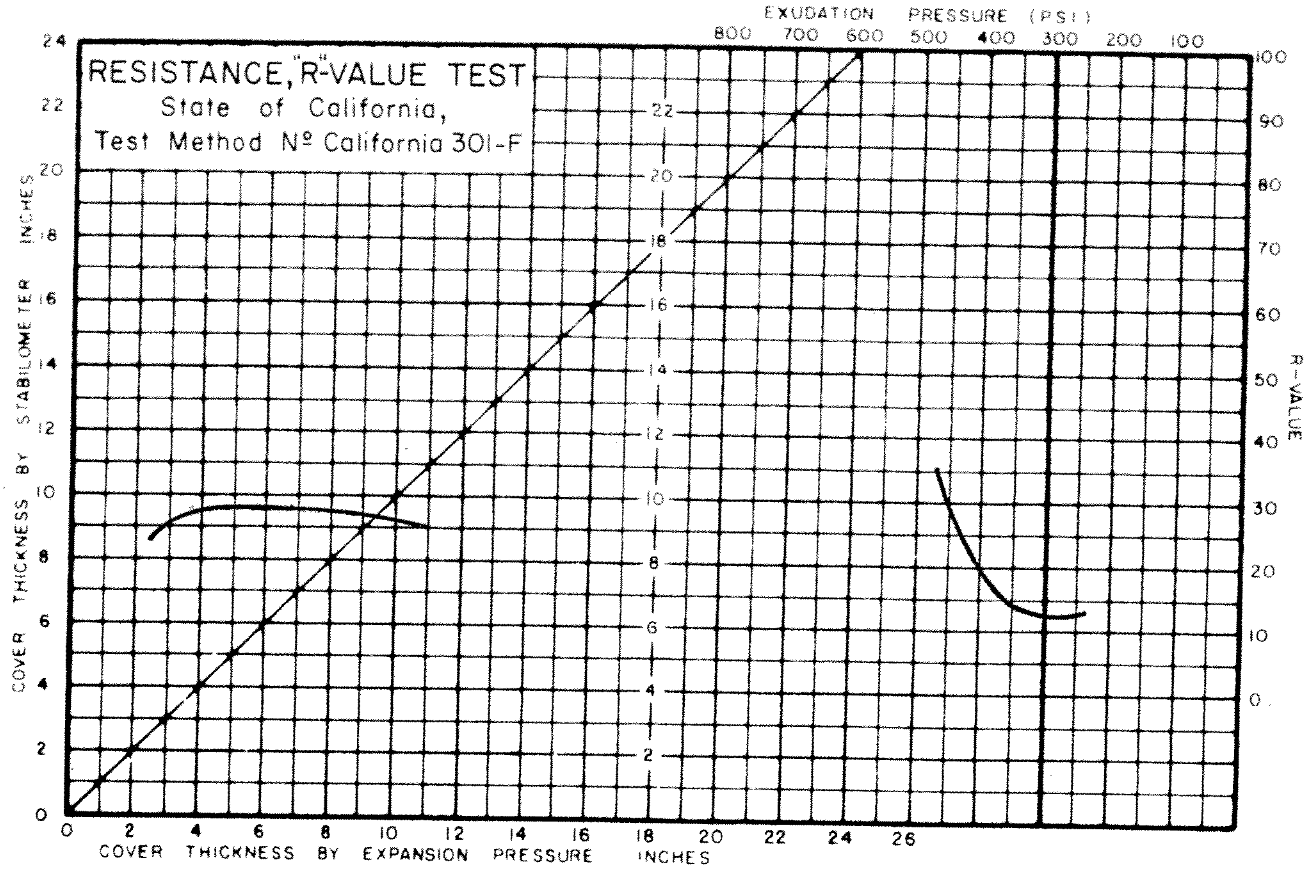
Description: Red-brown sandy SILT with gravel

Specimen	B	C	D
Exudation Pressure, p.s.i.	326	283	557
Expansion dial (.0001")	18	15	51
Expansion Pressure, p.s.f.	77.8	64.8	220.3
Resistance Value, "R"	36	29	78
% Moisture at Test	17.3	18.8	15.8
Dry Density at Test, p.c.f.	123.7	128.0	125.8
"R" Value at 300 p.s.i. Exudation Pressure	= (32)		

Corrected for expansion (34)

Figure 47: R-Value Test Results

File Nº. 2011-3
Date: May 1989



Sample: CB-12

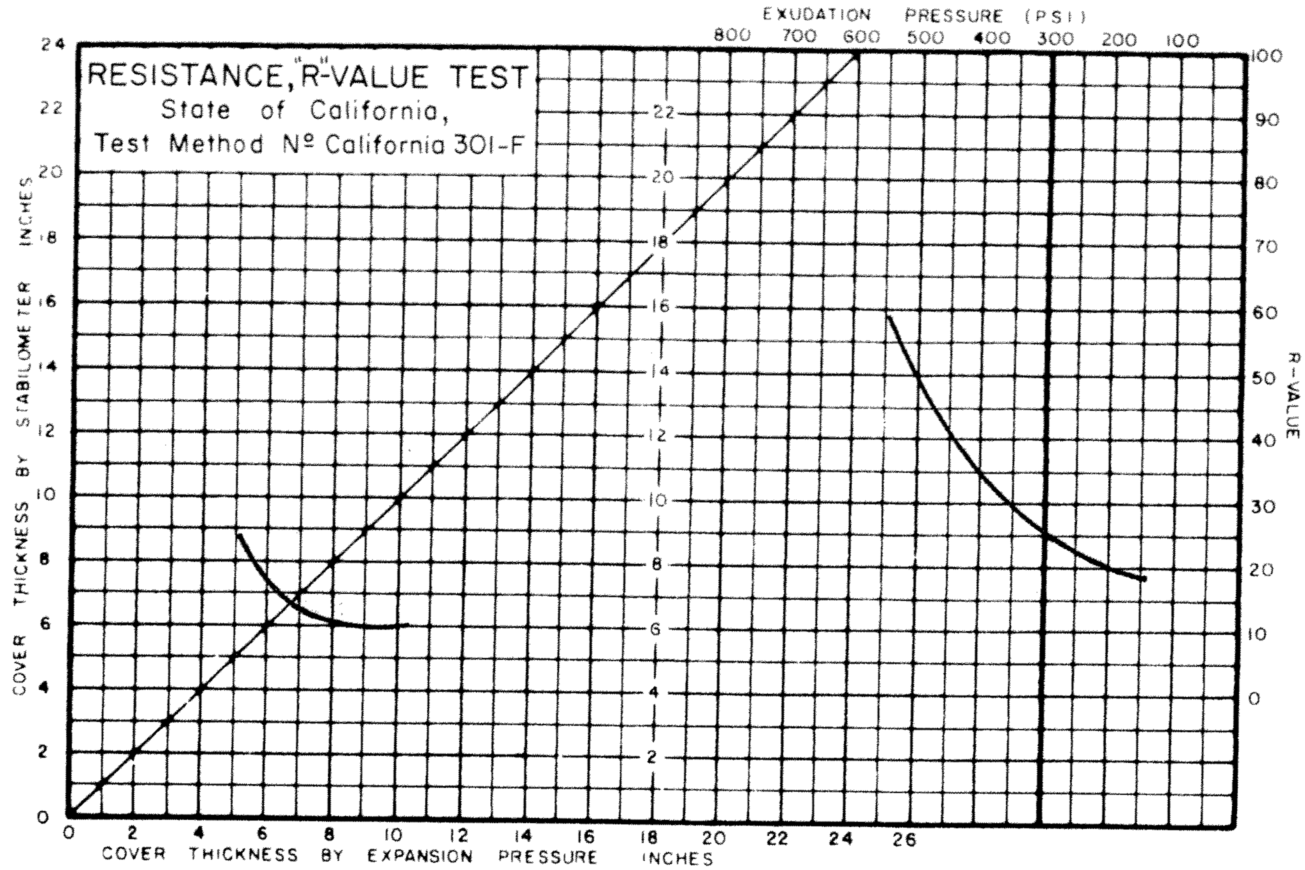
Description: Tan-brown sandy CLAY with silt

Specimen	C	D	E
Exudation Pressure, p.s.i.	334	412	295
Expansion dial (.0001")	15	6.0	8
Expansion Pressure, p.s.f.	64.8	25.9	34.6
Resistance Value, "R"	13	22	14
% Moisture at Test	19.7	17.2	20.2
Dry Density at Test, p.c.f.	117.8	121.7	116.0
"R" Value at 300 p.s.i. Exudation Pressure	= (13)		

Corrected for expansion (16)

Figure 48: R-Value Test Results

File №. 2011-3
Date: May 1989



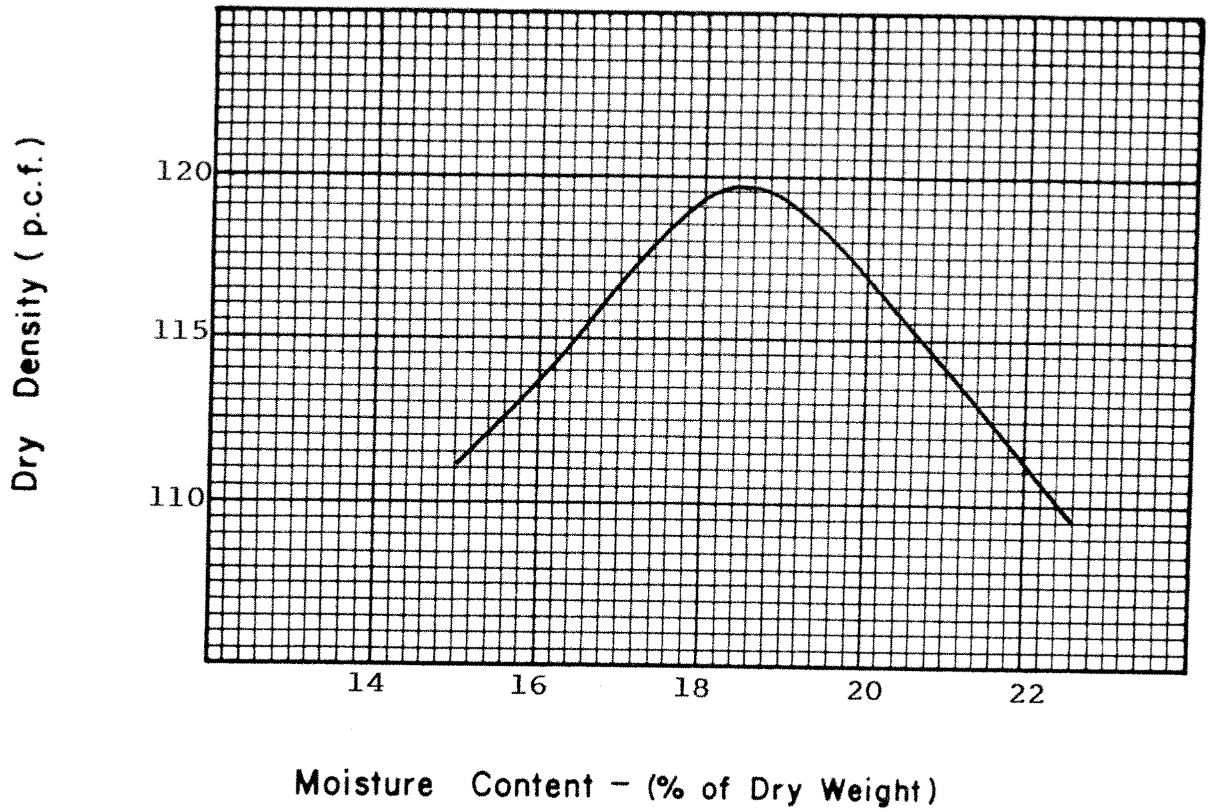
Sample: CB-13

Description: Red-brown sandy SILT with gravel

Specimen	A	B	C
Exudation Pressure, p.s.i.	443	240	396
Expansion dial (.0001")	19	13	26
Expansion Pressure, p.s.f.	82.1	56.2	112.3
Resistance Value, "R"	40	23	44
% Moisture at Test	16.7	18.7	17.7
Dry Density at Test, p.c.f.	129.6	119.0	118.0
"R" Value at 300 p.s.i. Exudation Pressure	= (27)		

Corrected for expansion (38)

Figure 49: R-Value Test Results



Sample : CB-5

Description : Red-brown sandy SILT, trace clay

Laboratory Test Procedure : ASTM D-1557-78 Method "A"

Maximum Dry Density : 120.0 p.c.f.

Optimum Moisture Content : 18.5 %

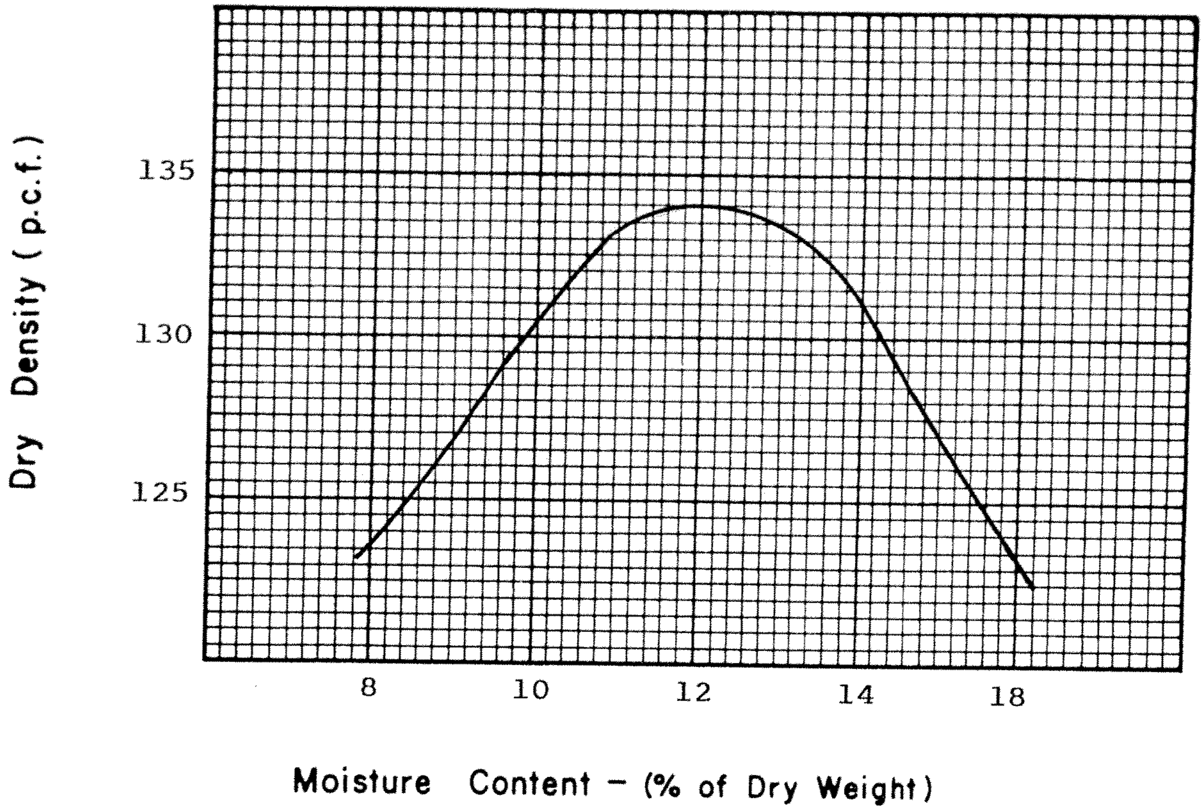
Figure 50: Compaction Curve Test Results

File No. 2011-3
26 May 1989

TABLE IV

Summary of Moisture-Density and Direct Shear Test Results

Sample No.	Depth Ft.	Moisture Content % dry wt.	Dry Density p.c.f.	Unit Cohesion p.s.f.	Angle of Internal Friction Degrees
3-1-1	2.5	16.3	110.7		
5-1	2.5	28.2	91	560	7
6-2	5.0	11.3	131.2		
7-1-1	2.0	13.8	122.7		
7-2	14	15.6	122.3		
10-1	1.0	22.3	105.7		
10-2	5.0	16.6	111.0		
10-3	10.0	12.2	121.0		
12.1	2.0	11.2	96.1		
14-1	2.0	14.2	113.8		
14-2	5.0	10.2	116.9		
15-1	1.5	16.3	106.7	520	34
15-2	5.0	16.0	118.6		
15-3	10.0	9.9	134.1		
16-2	5.0	13.4	122.4		



Sample : CB-11

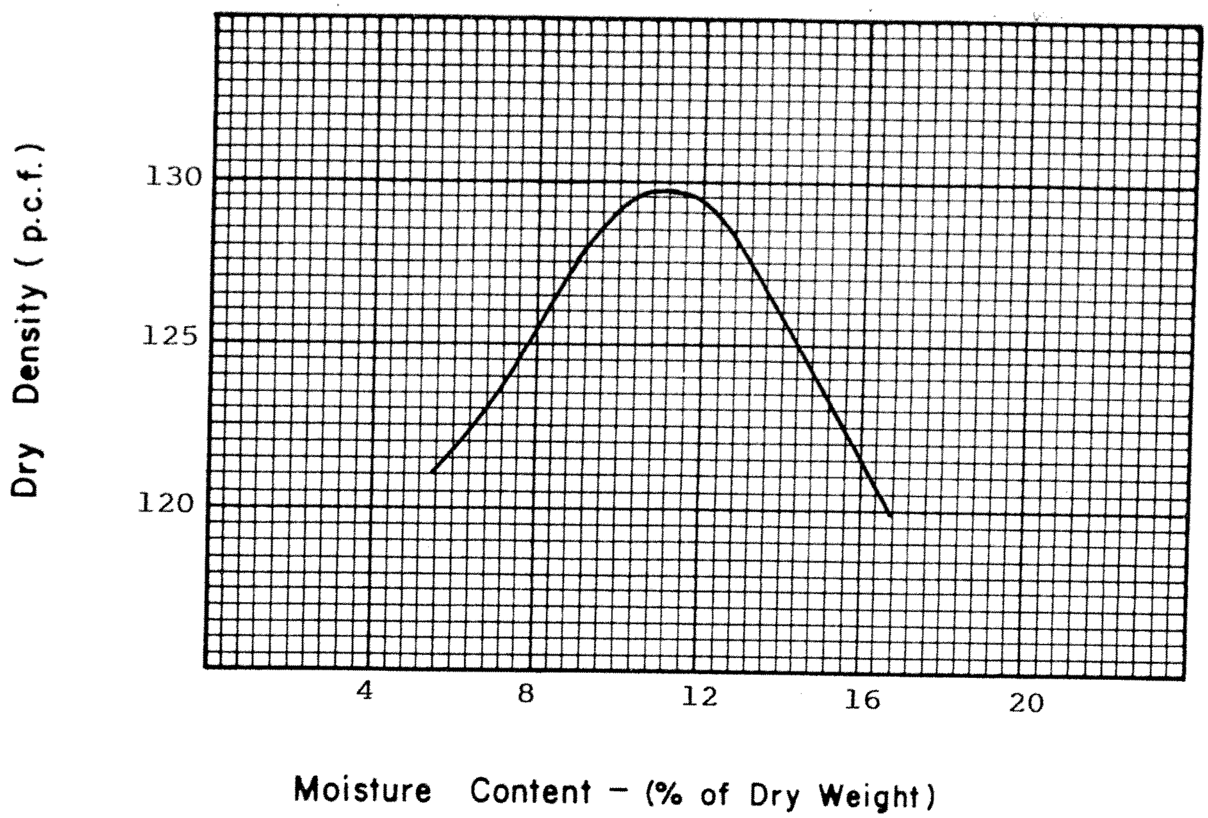
Description : Red-brown silty SAND to sandy SILT, trace clay

Laboratory Test Procedure : ASTM D-1557-78 Method "A"

Maximum Dry Density : 134.0 p.c.f.

Optimum Moisture Content : 12.0 %

Figure 51: Compaction Curve



Sample : CB-15

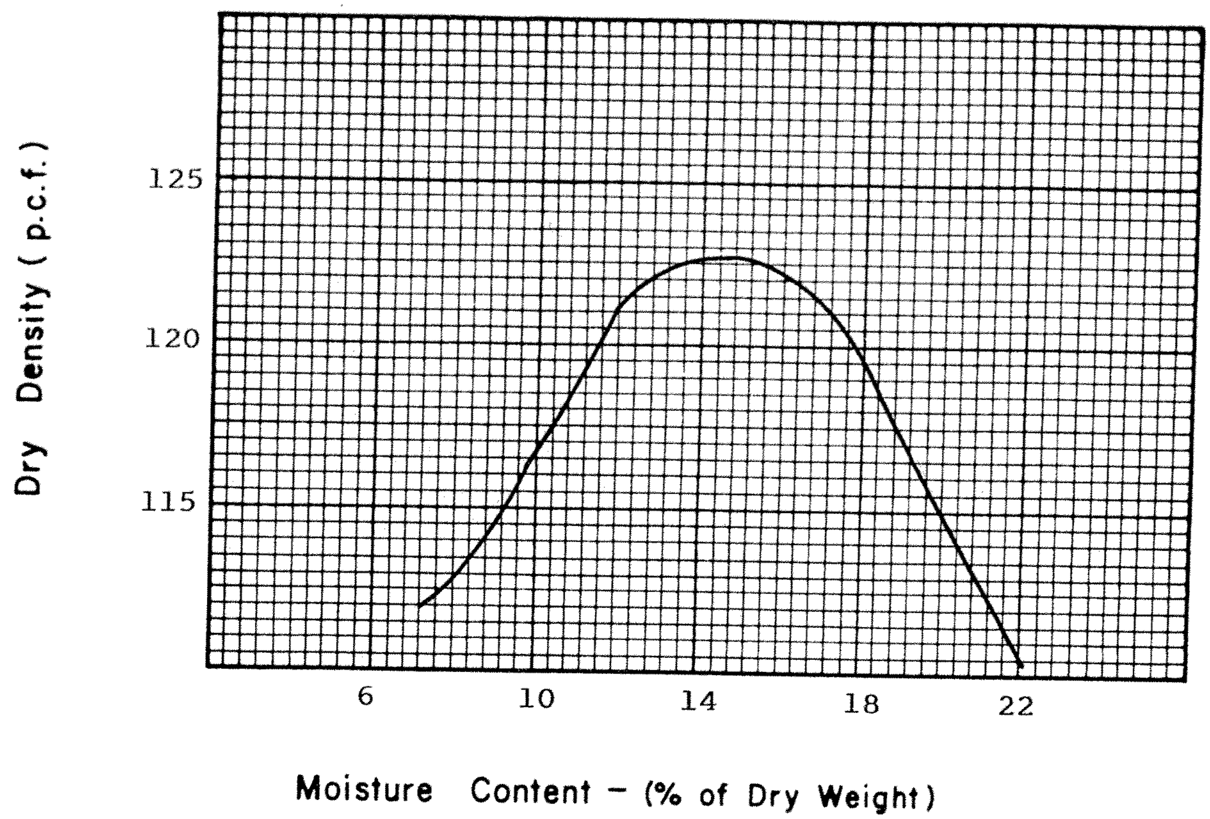
Description : Red-brown sandy SILT

Laboratory Test Procedure : ASTM D-1557-78 Method "A"

Maximum Dry Density : 130.0 p.c.f.

Optimum Moisture Content : 11.2 %

Figure 52: Compaction Curve Test Results



Sample : CB-18

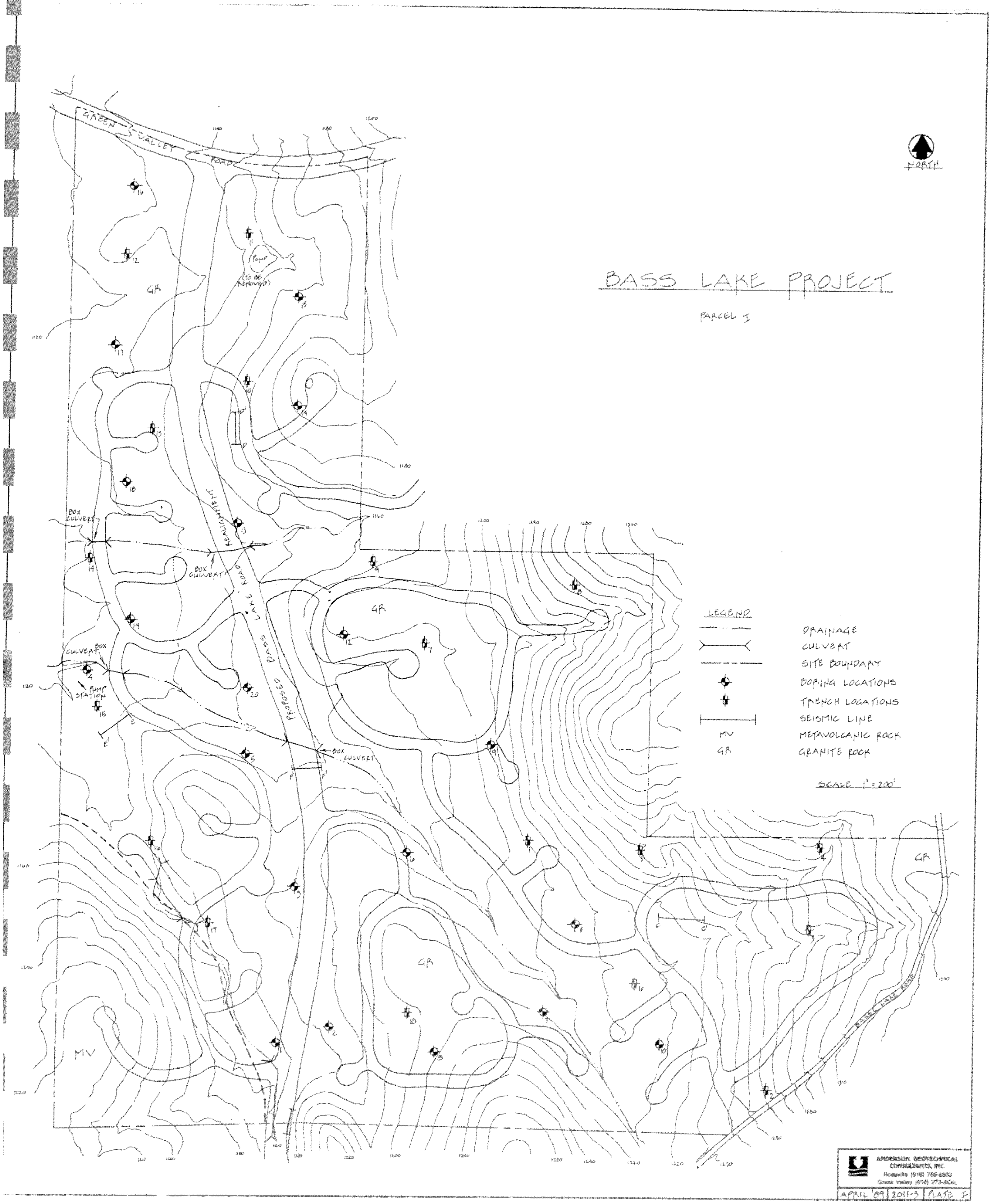
Description : Red-brown sandy SILT

Laboratory Test Procedure : ASTM D-1557-78 Method "A"

Maximum Dry Density : 123.0 p.c.f.

Optimum Moisture Content : 14.5 %

Figure 53: Compaction Curve Test Results



BASS LAKE PROJECT
PARCEL I
NORTH
GREEN VALLEY ROAD
POND (TO BE REMOVED)
PROPOSED BASS LAKE ROAD REALIGNMENT
BOX CULVERT
CULVERT
PUMP STATION
BASS LAKE ROAD
GR
MV
LEGEND
DRAINAGE
CULVERT
SITE BOUNDARY
BORING LOCATIONS
TRENCH LOCATIONS
SEISMIC LINE
MV METAVOLCANIC ROCK
GR GRANITE ROCK
SCALE 1" = 200'
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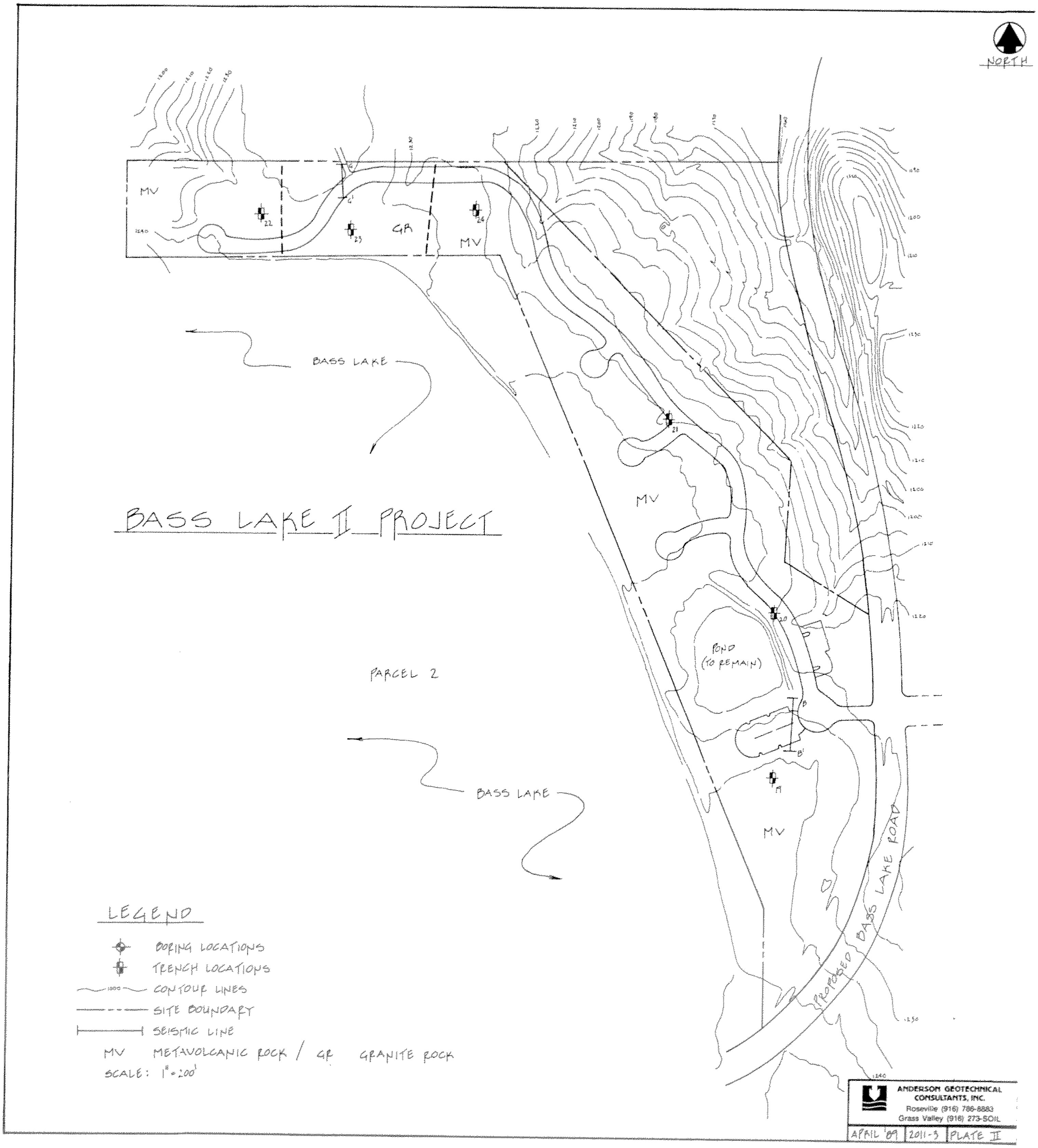
2011-3
PLATE I


NORTH
MV
GR
MV
22
23
24
21
20
19
BASS LAKE
BASS LAKE II PROJECT
PARCEL 2
BASS LAKE
POND
(TO REMAIN)
MV
MV
PROPOSED BASS LAKE ROAD
LEGEND
BORING LOCATIONS
TRENCH LOCATIONS
CONTOUR LINES
SITE BOUNDARY
SEISMIC LINE
MV METAVOLCANIC ROCK / GR GRANITE ROCK
SCALE: 1" = 200'
ANDERSON GEOTECHNICAL CONSULTANTS, INC.
Roseville (916) 786-8883
Grass Valley (916) 273-SOIL
APRIL '89
2011-3
PLATE II