GEOTECHNICAL EVALUATION
RIO SECO SCHOOL
SANTEE, CALIFORNIA

PREPARED FOR:
Santee School District
9625 Cuyamaca Street
Santee, California 92071

PREPARED BY:
Ninyo & Moore
Geotechnical and Environmental Sciences Consultants
5710 Ruffin Road
San Diego, California 92123

September 14, 2007
Project No. 106113001

September 14, 2007
Project No. 106113001

Ms. Christina Becker
Santee School District
9625 Cuyamaca Street
Santee, California 92071

Subject: Geotechnical Evaluation Report
Rio Seco School
Santee, California

Dear Ms. Becker:

In accordance with your authorization, we have performed a geotechnical evaluation for the proposed improvements at Rio Seco School, located at 9545 Cuyamaca Street, in Santee, California. This report presents our geotechnical findings, conclusions, and recommendations regarding the proposed project. Our report was prepared in accordance with our proposal which was originally dated May 7, 2007, revised June 12, 2007 and August 8, 2007.

We appreciate the opportunity to be of service on this project. Please contact our project engineer, Mr. Kenneth Mansir, with questions about this report.

Sincerely,
NINYO & MOORE

Christina Tretinjak
Senior Staff Geologist

Kenneth H. Mansir, Jr., P.E., G.E.
Principal Engineer

REGISTERED PROFESSIONAL ENGINEER
KENNETH H. MANSIR, JR.
No. 2739
EXP. 06/30/08
GEOTECHNICAL
STATE OF CALIFORNIA

Jonathan Goodmacher, C.E.G. 2136, H.G.
Principal Geologist

PROFESSIONAL GEOLOGIST
JONATHAN C. GOODMACHER
Exp. 10/07
No. 2136
CERTIFIED ENGINEERING GEOLOGIST
STATE OF CALIFORNIA

CAT/ABS/KHM/JG/RI/kh

Distribution: (3) Addressee
(6) Sprotte + Watson

TABLE OF CONTENTS

Page

Tables

Figures

Appendices

1. INTRODUCTION

In accordance with your request and our proposal originally dated May 7, 2007, revised June 12, 2007 and August 8, 2007, we have performed a geotechnical evaluation for the proposed improvements to Rio Seco School, located at 9545 Cuyamaca Street, in Santee, California (Figure 1). The proposed improvements include new buildings and additions to existing buildings. The purposes of this study were to provide geotechnical design and construction recommendations for the proposed improvements.

2. SCOPE OF SERVICES

The scope of services for this study included the following:

- Reviewing readily available background information including geologic maps and literature, stereoscopic aerial photographs, topographic maps, and a conceptual site plan of the proposed project.
- Performing a geologic reconnaissance of the site to observe the existing conditions and to mark out proposed boring locations.
- Acquiring County of San Diego Department of Environmental Health (DEH) boring permits.
- Coordinating with school personnel and Underground Service Alert (USA) to clear the proposed boring locations for existing underground utilities.
- Excavation and logging of three exploratory test pits to depths ranging from 5 to 10 feet below the existing ground surface.
- Drilling, sampling, and logging eleven exploratory borings to depths ranging from approximately 4 to 51½ feet below the existing ground surface. Bulk and relatively undisturbed drive samples of soil were collected at selected intervals from the borings and transported to our in-house geotechnical laboratory for testing.
- Geotechnical laboratory testing to evaluate soil conditions and obtain parameters for use in design of the project.
- Compiling and analyzing data obtained from our field and laboratory evaluations.
- Preparing this report presenting our findings, conclusions, and geotechnical recommendations for the design and construction of the proposed project.

3. PROJECT DESCRIPTION

It is our understanding that the proposed improvements to Rio Seco School include construction of a new approximately 7,200-square-foot, single story classroom building, minimal additions to existing Building B and between Building A and C, and a reconfiguration of the parking lot on the west side of the campus. We anticipate that the new building will be a slab-on-grade structure of wood or steel-frame. Foundations will likely consist of shallow, spread and continuous footings. Building loads are expected to be typical of this type of relatively light construction.

4. SITE DESCRIPTION

Rio Seco School is located in Santee, California. The school site is situated on a generally flat-lying, rectangular-shaped parcel. Site boundaries include Riverwalk Drive to the north, Cuyamaca Street to the west, Rio Seco baseball fields to the south, and residential buildings currently being developed to the east. The site is at latitude 32.851° North and longitude 116.981° West. The current site elevations range from approximately 340 to 350 feet above mean sea level (MSL).

5. SUBSURFACE EXPLORATION AND LABORATORY TESTING

The initial portion of our subsurface exploration was conducted on June 22 and June 26, 2007, and consisted of the excavation of six exploratory borings (borings B-1 through B-6) on the southern portion of the site. The borings encountered fill and alluvial soils that were considered unsuitable for structural support. Three test pits were subsequently excavated along the northerly boundary of the site to evaluate soil conditions in that area. The test pits were excavated using a rubber-tire backhoe equipped with a 24-inch bucket. As a result of the soils observed in that area the District requested that we perform a second phase of our subsurface exploration. This occurred on August 17, 2007 and consisted of the excavation of five additional exploratory borings. Borings B-7 though B-10 were located on the northern portion of the site, and boring B-11 was located in the area of the proposed parking lot reconfiguration on the western portion of the site.

A truck-mounted drill rig with an 8-inch diameter continuous flight hollow stem auger was used to excavate the borings located within the proposed buildings. The borings that were located in the area of proposed additions to existing buildings (B-3 and B-6) were excavated using a hand auger. The borings were drilled to depths ranging from approximately 4 to 51½ feet.

The purpose of our subsurface exploration was to observe and sample the underlying earth materials. Relatively undisturbed and bulk samples were obtained from the borings at selected intervals. The approximate locations of the excavations are shown on Figure 2, and the boring logs are presented in Appendix A. The test pit logs are not presented in this report but are available for review upon your request.

Geotechnical laboratory testing of samples obtained during our subsurface exploration included an evaluation of in-situ moisture content and dry density, grain-size analysis, Atterberg Limits, consolidation, shear strength, expansion index, Proctor density, soil corrosivity (electrical resistivity, pH, chloride content, and sulfate content), and R-Value. The tests were performed at our in-house laboratory. The results of the in-situ moisture content and dry density tests are shown at the corresponding sample depths on the boring logs in Appendix A. The results of the other laboratory tests performed are presented in Appendix B.

6. GEOLOGY AND SUBSURFACE CONDITIONS

Our findings regarding regional and local geology at the subject site are provided in the following sections.

6.1. Regional Geologic Setting

The project area is situated in the coastal foothill section of the Peninsular Ranges Geomorphic Province. This geomorphic province encompasses an area that extends approximately 900 miles from the Transverse Ranges and the Los Angeles Basin south to the southern tip of Baja California (Norris and Webb, 1990). The province varies in width from approximately 30 to 100 miles. In general, the province consists of rugged mountains underlain by Jurassic metavolcanic and metasedimentary rocks, and Cretaceous igneous rocks of the southern California batholith.

The Peninsular Ranges Province is traversed by a group of sub-parallel faults and fault zones trending roughly northwest. Several of these faults (Figure 3) are considered active faults. The Elsinore, San Jacinto and San Andreas faults are active fault systems located northeast of the project area and the Agua Blanca–Coronado Bank, San Clemente, Newport-Inglewood and Rose Canyon faults are active faults located west of the project area. Major tectonic activity associated with these and other faults within this regional tectonic framework consists primarily of right-lateral, strike-slip movement. Further discussion of faulting relative to the site is provided in the Faulting and Seismicity section of this report.

6.2. Site Geology

Geologic units encountered during our subsurface evaluation included fill materials, Quaternary-age alluvial deposits, and materials of the Tertiary-age Friars Formation. Generalized descriptions of the earth units are provided in the subsequent sections and shown on Figure 4. In addition, cross-sectional views of the earth units encountered are shown on Figures 5 and 6.

6.2.1. Fill Material

Fill material was encountered in our subsurface exploration to depths up to approximately 6½ feet. As encountered, the material generally consisted of light brown, dark brown, dark grayish brown and dark reddish brown, damp to moist, medium dense, silty and clayey sand and silty, sandy gravel, with organic matter (roots, plant debris).

6.2.2. Alluvium

Materials mapped as both younger and older alluvium are present at the site. For purposes of this report they are discussed as alluvium. Alluvium was encountered in our borings underlying the fill to a depth up to approximately 16 feet. As encountered, the material generally consisted of light brown, brown, dark brown and reddish brown, damp to wet, loose to medium dense, silty and clayey sand and stiff, sandy and silty clay.

6.2.3. Friars Formation

Materials of the Friars Formation were encountered in our borings underlying the other units to the total depth explored. As encountered, the material generally consisted of light brown, light green, light gray and reddish brown, damp to moist, weakly to moderately indurated or weakly to strongly cemented sandy claystone, sandy siltstone and clayey sandstone with some gravel.

6.3. Rippability

Based on our subsurface exploration of the site, the on-site fill material is expected to be rippable with normal heavy-duty earthmoving equipment in good condition to the total depth explored.

6.4. Groundwater

During our field evaluation, groundwater was encountered in borings B-1 and B-2 at a depth of approximately 35 feet. In addition, seepage was encountered at a depth of approximately 6 feet in one of our test pits. Groundwater levels can fluctuate due to seasonal variations, irrigation, groundwater withdrawal or injection, and other factors.

6.5. Flood Hazards

Based on review of Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM), posted on the County of San Diego, San Diego Geographic Information Source (SanGIS) website (County of San Diego, 2004), the site is not within a flood zone. Based on review of topographic maps, the site is located approximately 0.35 miles north of the San Diego River bed that serves as a drainage for the El Capitan and San Vicente Reservoirs and Lake Jennings. The site is located at an elevation approximately 10 to 20 feet above the riverbed. Based on this review and our site reconnaissance, the potential for significant flooding of the site may be a design consideration.

6.6. Faulting and Seismicity

The subject site is considered to be in a seismically active area. Our review of readily available published geological maps and literature indicates that there are no known active or potentially active faults (i.e., faults that exhibit evidence of ground displacement in the last 11,000 years and 2,000,000 years, respectively), underlying the proposed site.

The closest known active fault is the Rose Canyon Fault, which is capable of generating an earthquake magnitude of 7.2 (California Geological Survey [CGS, 2003]). The Rose Canyon Fault is located approximately 14 miles west of the site (Treiman, 1993).

In general, hazards associated with seismic activity include: strong ground motion; ground surface rupture; liquefaction; and tsunamis. These hazards are discussed in the following sections.

6.6.1. Strong Ground Motion

Based on our review of background information, the following Table 1 summarizes the historical seismicity of the San Diego area. Listed are events of magnitude 5.0 or greater. In addition, aftershocks are not listed if they are of lower magnitude.

Table 1 – Historical Earthquakes that Affected the Site

Date	Moment Magnitude (M)	Epicentral Distance (km)	Epicentral Distance (mi)
November 22, 1800	6.5	34	21
May 27, 1862	5.9	26	16
February 9, 1890	6.3	87	64
February 24, 1892	6.7	65	40
May 28, 1892	6.3	82	51
October 23, 1894	5.7	17	11
September 30, 1916	5.0	84	52
January 1, 1920	5.0	46	29
November 25, 1934	5.0	90	56
March 25, 1937	6.0	91	57
June 4, 1940	5.1	53	32
October 21, 1942	6.5	92	57
August 15, 1945	5.7	88	55
November 4, 1949	5.7	88	55

Table 1 – Historical Earthquakes that Affected the Site

Date	Moment Magnitude (M)	Epicentral Distance (km)	Epicentral Distance (mi)
March 19, 1954	6.2	95	59
September 23, 1963	5.0	92	57
April 9, 1968	6.4	92	57
April 28, 1969	5.8	80	50
January 12, 1975	5.1	92	57
February 25, 1980	5.6	83	52
July 13, 1986	5.8	84	52
October 31, 2001	5.2	84	52
June 12, 2005	5.2	84	52

Based on a Probabilistic Earthquake Hazard Analysis computer program by Blake (FRISKSP, 2000), the calculated ground acceleration for the Upper-Bound Earthquake (UBE) at the site, defined as having a 10 percent probability of exceedance in 100 years, with a statistical return period of approximately 949 years, is 0.29g (29 percent of the acceleration of gravity). The calculated ground acceleration for the Design-Basis Earthquake (DBE), defined as having a 10 percent probability of exceedance in 50 years, with a statistical return period of approximately 475 years is 0.24g. The requirements of the governing jurisdictions and applicable building codes should be considered in the design of structures. The most significant seismic event likely to affect the project site would be an earthquake within the Rose Canyon fault zone which can generate a 7.2 magnitude earthquake (CGS, 2003).

The requirements of the governing jurisdictions and the 2001 California Building Code (CBC) should be considered in the project design. Distances to active faults within 62 miles of the site are presented in Table 2.

Table 2 – Active Fault Distances

Fault	Distance (km)	Distance (mi)	Moment Magnitude
Rose Canyon	22	14	7.2
Coronado Bank	43	27	7.6
Elsinore Fault – Julian	45	28	7.1
Earthquake Valley	52	32	6.5

Table 2 – Active Fault Distances

Fault	Distance (km)	Distance (mi)	Moment Magnitude
Newport-Inglewood (Offshore)	55	34	7.1
Elsinore – Temecula	59	37	6.8
Elsinore – Coyote Mountain	60	37	6.8
San Jacinto – Coyote Creek	79	49	6.8
San Jacinto – Anza	81	50	7.2
San Jacinto – Borrego	84	52	6.6
Elsinore – Glen Ivy	95	59	6.8
San Jacinto – San Jacinto Valley	100	62	6.9

As discussed, the closest known active fault is the Rose Canyon Fault located approximately 14 miles west of the school site, and has been assigned a maximum earthquake magnitude of 7.2. The site is not located within a State of California Alquist-Priolo Earthquake Fault Zone.

6.6.2. CBC Seismic Design Parameters

According to the 2001 edition of the CBC, the proposed site is within Seismic Zone 4, and is not within a UBC Near-Source Zone. Table 3 includes the seismic design parameters for the site as defined in, and for use with, the 2001 edition of the CBC (CBSC, 2001).

Table 3 – Seismic Design Parameters

Parameter	Value	2001 UBC Reference
Seismic Zone Factor, Z	0.40	Table 16A – I
Soil Profile Type	S_D	Table 16A – J
Seismic Coefficient C_a	0.44	Table 16A – Q
Seismic Coefficient C_v	0.64	Table 16A – R
Near-Source Factor, N_a	1.0	Table 16A – S
Near-Source Factor, N_v	1.0	Table 16A – T
Seismic Source Type	B	Table 16A – U

6.6.3. Surface Rupture

Ground surface rupture due to active faulting is not considered likely in the project area due to the absence of any known active faults underlying the site. Lurching or cracking of the ground surface as a result of nearby or distant seismic events is also considered unlikely.

6.6.4. Liquefaction

Based on the generally dense nature of the subsurface materials, it is our opinion that the potential for liquefaction at the site is not a design consideration.

6.6.5. Tsunamis

Tsunamis are long wavelength seismic sea waves (long compared to the ocean depth) generated by sudden movements of the ocean bottom during submarine earthquakes, landslides, or volcanic activity. Based on the inland location of the site, the potential for damage due to tsunami is considered nil.

6.7. Landsliding

Based on our review of referenced geologic maps, literature, topographic maps, and stereoscopic aerial photographs, no landslides or indications of deep-seated landsliding were noted underlying the project site. As such, the potential for significant large-scale slope instability at the site is not a design consideration.

7. CONCLUSIONS

Based on our review of the referenced background data, geologic field reconnaissance, subsurface evaluation, and laboratory testing, it is our opinion that the proposed improvements to Rio Seco School are feasible from a geotechnical standpoint, provided that the recommendations of this report are incorporated into the design and construction of the project. Geotechnical considerations include the following:

- The on-site fill and alluvial materials are generally excavatable with conventional heavy-duty earth moving equipment.
- The fill and alluvial materials encountered in our exploratory borings are considered unsuitable for structural support. Recommendations are presented herein for remedial grading of this material.
- The moisture content of some of the excavated soils may be above optimum for compaction and may require some spreading and drying prior to placement as fill.

- Seepage was noted during our subsurface exploration.
- The project site is not located in a Near-Source Zone, but it is located in Seismic Zone 4 according to the CBC (CBSC, 2001). Accordingly, the potential for seismic accelerations will need to be considered in the design of proposed structural improvements.
- Highly expansive soils are present in the building pad areas. These materials are not suitable for reuse as fill.
- Based on the laboratory test results and Caltrans criteria, the site is considered corrosive. A corrosion engineer should be consulted and provide recommendations for construction of improvements.

8. RECOMMENDATIONS

The following sections present our geotechnical recommendations for the design and construction of the proposed building. We recommend that the site earthwork and construction be performed in accordance with the following recommendations and the recommendations presented in the Typical Earthwork Guidelines included in Appendix C. In case of conflict, the following recommendations shall supersede those outlined in Appendix C.

8.1. Site Preparation

The project site should be cleared and grubbed prior to grading. Clearing and grubbing should consist of the substantial removal of vegetation and other deleterious materials from the areas to be graded. Clearing and grubbing should extend to the outside of the proposed excavation and fill areas. The debris generated during clearing and grubbing should be removed from areas to be graded and be disposed of off site at a legal dumpsite.

8.2. Cut/Fill Transitions

In order to reduce the potential for differential settlement, we recommend that where a cut/fill transition line or a transition between formational materials and compacted fill extends beneath a proposed building location, the cut portion of the pad should be overexcavated by one-third or more of the deepest fill depth or 3 feet beneath the lowest foundation of the structure, whichever is greater, and replaced with compacted fill. The overexcavation should be extended outward from the building footprint to a distance of 3 feet plus the depth of overexcavation. The grading and building plans should be reviewed by Ninyo & Moore to evaluate the potential transition locations.

8.3. Remedial Grading

Based on the observed condition of the existing soils, we recommend that the existing fill/alluvial soils be removed in the building pad area of the proposed new structures. Additionally, highly expansive soils should be removed and should not be reused as fill soils. For the purpose of this report, the building pad area is defined as that area underlying any settlement-sensitive structure and extending a horizontal distance of 5 feet beyond the limits of the structure and extending downward at a 1:1 (horizontal:vertical) inclination. The depth and extent of the removal should be observed in the field by Ninyo & Moore. The excavated fill/alluvial soils should be replaced/recompacted with suitable fill materials to the design elevations in accordance with the earthwork recommendations in this report. Deeper removals may be needed if unsuitable materials are exposed during grading.

The resultant removal surface should be scarified to a depth of approximately 8 inches, moisture conditioned and recompacted to 90 percent or more of relative compaction as evaluated by American Society of Testing and Materials (ASTM) test method D 1557. At the time of grading operations, additional recommendations may be provided to stabilize the excavation bottoms.

8.4. Excavation Characteristics

Our evaluation of the excavation characteristics of the on-site materials is based on the results of the exploratory excavations and our experience with similar materials. The test excavations encountered fill materials, alluvial deposits, and sedimentary rock. In our opinion, excavation of the on-site soils should generally be achievable with heavy-duty equipment in good operating condition.

8.5. Materials for Fill

On site materials as highly expansive and are not suitable for reuse as fill materials. Fill material should not generally contain rocks or lumps greater than 6 inches, and particles not more than approximately 40 percent larger than ¾-inch. Utility trench backfill should not contain rocks or lumps over approximately 3 inches in general. Soils classified as silts or clays should not be used for backfill in the pipe zone. Larger chunks, if generated during excavation, may be broken into acceptably sized pieces or disposed of off site. Imported fill material, if needed for the project, should generally be granular soils with low or very low expansion potential. Import material should also have generally low corrosion potential. Materials for use as fill should be evaluated by Ninyo & Moore's representative prior to filling or importing.

The soils encountered in the excavations should be generally suitable for reuse as backfill in the utility trench zone, provided they are free of organic material, contaminated material, clay lumps, debris, and rocks greater than 3 inches in diameter. Rocks greater than 3/4-inch in diameter should not exceed 40 percent of the backfill volume.

8.6. Import Soil

Imported fill material, if needed for the project, should generally be granular soils with a very low to low expansion potential (i.e., an expansion index [EI] of 50 or less as evaluated by Uniform Building Code [UBC, 1997] test method 18-2). Import material should also be non-corrosive in accordance with Caltrans (2003) corrosion guidelines. Materials for use as fill should be evaluated by Ninyo & Moore's representative prior to filling or importing.

8.7. Compacted Fill

Prior to placement of compacted fill the contractor should request an evaluation of the exposed ground surface by Ninyo & Moore. Unless otherwise recommended, the exposed ground surface should then be scarified to a depth of approximately 8 inches and watered or dried, as needed, to achieve moisture contents generally above the optimum moisture content. Backfill should be moisture conditioned to a moisture content within approximately 2 percent of the optimum moisture content, placed, and compacted to 90 or more percent of the specified relative compaction, as evaluated by ASTM D 1557. Wet soils, if encountered, should be allowed to dry to moisture contents within approximately 2 percent of optimum prior to their placement as backfill. Backfill lift thickness will be dependent upon the type of compaction equipment utilized. Backfill should generally be placed in uniform lifts not exceeding 8 inches in loose thickness. Base and the upper 12 inches of pavement subgrade should be compacted to 95 percent or more relative compaction. Special care should be exercised to avoid damaging utilities during compaction of the backfill.

8.8. Temporary Excavations, Braced Excavations and Shoring

We recommend that trenches and excavations be designed and constructed in accordance with Occupational Safety and Health Administration (OSHA) regulations. These regulations provide trench sloping and shoring design parameters for trenches up to 20 feet deep based on a description of the soil types encountered. Trenches over 20 feet deep should be designed by the Contractor's engineer based on site-specific geotechnical analyses. For planning purposes, we recommend that the following OSHA soil classifications be used:

Fill and Alluvium	*Type C*
Friars Formation	*Type B*

Upon making the excavations, the soil classifications and excavation performance should be confirmed in the field by the geotechnical consultant in accordance with the OSHA regulations. Temporary excavations should be constructed in accordance with OSHA recommendations. For trench or other excavations, OSHA requirements regarding personnel safety should be met using appropriate shoring (including trench boxes), or by laying back the slopes no steeper than 1.5:1 (horizontal:vertical) in fill and alluvial deposits. Temporary excavations that encounter seepage may require shoring or may be stabilized by placing sandbags or gravel along the base of the seepage zone. Excavations encountering seepage should be evaluated on a case-by-case basis. On-site safety of personnel is the responsibility of the contractor.

8.9. Foundations

The following foundation design parameters are provided based on our preliminary analysis. The foundation design parameters are not intended to control differential movement of soils. Minor cracking (considered tolerable) of foundations may occur. The proposed buildings will likely be constructed on spread and continuous foundations bearing on compacted fill or formational material. The following sections present our preliminary foundation recommendations.

8.9.1. Foundations

The following foundation design parameters are provided based on our preliminary analysis. The foundation design parameters are not intended to control differential movement of soils. Minor cracking (considered tolerable) of foundations may occur. The proposed buildings will likely be constructed on spread and continuous foundations bearing on compacted fill material. The following sections present our preliminary foundation recommendations.

8.9.2. Shallow Foundations

Shallow foundations, either spread or continuous placed in compacted fill may be designed using an allowable bearing capacity of 3,000 pounds per square foot (psf). These allowable bearing capacities may be increased by one-third when considering loads of short duration such as wind or seismic forces. Foundations should be founded 18 inches or more below lowest adjacent grade. Continuous footings should have a width of 15 inches or more and isolated footings should be 24 inches or more in width.

Foundations should be reinforced in accordance with the recommendations of the project structural engineer. From a geotechnical standpoint, we recommend that continuous footings be reinforced with four No. 4 reinforcing bars, two placed near the top of the footing and two near the bottom.

8.9.3. Shallow Foundation Lateral Earth Pressures

Allowable lateral bearing pressures equal to an equivalent fluid weight of 300 pounds per cubic foot (pcf) may be used provided the footings are placed neat against the undisturbed compacted fill or sedimentary rock. The lateral bearing pressure may be increased with depth to a maximum of 3,000 psf. Footings may also be designed using a coefficient of friction between soil and concrete of 0.35. To estimate the total frictional resistance, the coefficient should be multiplied by the dead load.

The foundations should be designed for their specific loads and usage. We recommend that a structural engineer experienced with such structures be consulted.

8.9.4. Static Settlement

We estimate that the proposed structures, designed and constructed as recommended herein, will undergo total settlements of less than approximately 1 inch. Differential settlements are typically about one-half of the total settlement.

8.10. Floor Slabs

The slabs should be designed for their specific loads and usage. We recommend that a structural engineer experienced with such construction be consulted. The slab thickness should be as recommended by the structural engineer. To help limit shrinkage cracking, we recommend that slabs-on-grade be 5 or more inches in thickness and be reinforced with No. 3 reinforcing bars placed at the midpoint of the slab and spaced at 18 inches on-center both ways. The reinforcing bars should be placed on chairs. Floor slabs should be constructed and reinforced in accordance with the recommendations of the structural engineer.

Floor slabs should be underlain by a moisture barrier consisting of a 2-inch layer of clean sand underlain by a polyethylene moisture barrier, 10-mil or thicker, which is, in turn, underlain by a 4-inch layer of clean coarse sand/pea gravel. Soils underlying the slabs should be moisture conditioned and compacted in accordance with the recommendations contained in this report. Joints should be constructed at intervals designed by the structural engineer to help reduce random cracking of the slab.

8.11. Concrete Flatwork

To reduce the potential manifestation of distress to exterior concrete flatwork due to minor soil movement and concrete shrinkage, we recommend that such flatwork be installed with crack-control joints at appropriate spacing as designed by the structural engineer. Due to the presence of expansive soils on the site, we recommend exterior flatwork be 5 inches thick, reinforced with No. 3 bars, 18 inches on center. Exterior slabs should be underlain by 4 inches of clean sand. Subgrades should be prepared in accordance with the earthwork recommendations presented herein. Positive drainage should be established and maintained adjacent to flatwork.

8.12. Soil Corrosivity

Laboratory testing was performed on samples of the on-site soils to evaluate pH and electrical resistivity, as well as chloride and sulfate contents. The pH and electrical resistivity tests were performed in accordance with California Test (CT) Method 643 and the sulfate and chloride tests were performed in accordance with CT Methods 416 and 422, respectively. These laboratory test results are presented in Appendix B.

The results of the corrosivity testing indicated that the electrical resistivity of the three samples tested were approximately 11,390, 1,740, and 160 ohm-cm, respectively. The soil pH of the samples were approximately 5.9, 8.0, and 7.2, respectively. A pH value of 5.9 is considered acidic and values of 8.0 and 7.2 are considered basic. The chloride content of the tested samples were approximately 55, 645, and 2,800 parts per million (ppm). Based on the laboratory test results and Caltrans criteria, the site warrants a corrosive site classification, which is defined as soil with more than 500 ppm chlorides, more than 0.20 percent sulfates, or pH less than 5.5. A corrosion engineer should be consulted and provide recommendations for construction of improvements.

8.13. Concrete

Concrete in contact with soil or water that contains high concentrations of soluble sulfates can be subject to chemical deterioration. Based on the CBC criteria (CBSC, 2001), the potential for sulfate attack is negligible for water-soluble sulfate contents in soil ranging from 0.00 to 0.10 percent by weight, and moderate for water-soluble sulfate contents ranging from 0.10 to 0.20 percent by weight. The potential for sulfate attack is severe for water-soluble sulfate contents ranging from 0.20 to 2.00 percent by weight and very severe for water-soluble sulfate contents over 2.00 percent by weight. Laboratory testing indicated the sulfate content of the samples tested of less than 0.01 percent, 0.09 percent, and 0.08 percent. Due to the potential use of import soil and variable conditions, we recommend that Type V cement be used for concrete structures in contact with soil.

8.14. Pavement Design

Based on the results of our subsurface evaluation and laboratory testing, we have used an R-value of 49 for the preliminary basis for design of flexible pavements in the parking area planned for reconfiguration at the project site. Actual pavement recommendations should be based on R-value tests performed on bulk samples of the soils that are exposed at the finished subgrade elevations in planned parking areas.

We understand that traffic will consist primarily of automobiles, light trucks, school buses, and occasional heavy trucks. For design we have assumed Traffic Indices (TI) of 5.0, 6.0, and 7.0 for site pavements. We recommend that the geotechnical consultant re-evaluate the pavement design, based on the R-value of the subgrade material exposed at the time of construction. The preliminary recommended pavement sections are as follows:

Table 4 – Recommended Preliminary Pavement Sections

Traffic Index	R-Value	Asphalt Concrete (in)	Class 2 Aggregate Base (in)
5.0	49	3.0	4.0
6.0	49	3.0	5.0
7.0	49	4.0	5.0

As indicated, these values assume traffic indices of 5.0, 6.0, and 7.0 for site pavements. In addition, we recommend that the upper 12 inches of the subgrade be compacted to a relative compaction of 95 or more percent relative density as evaluated by the current version of ASTM D 1557. If traffic loads are different from those assumed, the pavement design should be re-evaluated.

8.15. Concrete Pavement Design

We recommend that the upper 12 inches of the subgrade be compacted to a relative compaction of 95 percent of the laboratory Proctor dry density as evaluated by ASTM D 1557. In addition, the Class 2 aggregate base should also be compacted to a relative compaction of 95 percent.

We suggest that consideration be given to using Portland cement concrete pavements in areas where dumpsters will be stored and where refuse trucks will stop and load. Experience indicates that refuse truck traffic can significantly shorten the useful life of AC sections. We recommend that in these areas, 6 inches of 600 psi flexural strength Portland cement concrete reinforced with No. 3 bars, 18-inches on center, be placed over 6 inches or more of Class 2 aggregate base compacted to a relative compaction of 95 percent.

8.16. Site Drainage

Surface drainage should be provided to divert water away from structures and off of pavement surfaces. Surface water should not be permitted to drain toward the structures or to pond adjacent to foundations or on pavement areas. Positive drainage is defined as a slope of 2 percent or more for a distance of 5 feet or more away from the structures.

8.17. Pre-Construction Conference

We recommend that a pre-construction conference be held. The owner or the owner's representative, the agency representatives, the civil engineer, Ninyo & Moore, and the contractor should be in attendance to discuss the plans and the project.

8.18. Plan Review and Construction Observation

The conclusions and recommendations presented in this report are based on analysis of observed conditions in widely spaced exploratory excavations. If conditions are found to vary from those described in this report, the geotechnical consultant should be notified and additional recommendations will be provided upon request. The project geotechnical consultant should review the final project drawings and specifications prior to the commencement of construction. Ninyo & Moore should perform appropriate observation and testing services during construction operations.

The recommendations provided in this report are based on the assumption that Ninyo & Moore will provide geotechnical observation and testing services during construction. In the event that it is decided not to utilize the services of Ninyo & Moore during construction, we request that the selected consultant provide the client with a letter (with a copy to Ninyo & Moore) indicating that they fully understand Ninyo & Moore's recommendations, and that they are in full agreement with the design parameters and recommendations contained in this report. Construction of proposed improvements should be performed by qualified subcontractors utilizing appropriate techniques and construction materials.

9. LIMITATIONS

The field evaluation and geotechnical analyses presented in this geotechnical report have been conducted in general accordance with current practice and the standard of care exercised by geotechnical consultants performing similar tasks in the project area. No warranty, expressed or implied, is made regarding the conclusions, recommendations, and opinions presented in this report. There is no evaluation detailed enough to reveal every subsurface condition. Variations may exist and conditions not observed or described in this report may be encountered during construction. Uncertainties relative to subsurface conditions can be reduced through additional subsurface exploration. Additional subsurface evaluation will be performed upon request. Please also note that our evaluation was limited to assessment of the geotechnical aspects of the project, and did not include evaluation of structural issues, environmental concerns, or the presence of hazardous materials.

This document is intended to be used only in its entirety. No portion of the document, by itself, is designed to completely represent any aspect of the project described herein. Ninyo & Moore should be contacted if the reader requires additional information or has questions regarding the content, interpretations presented, or completeness of this document.

This report is intended for design purposes only. It does not provide sufficient data to prepare an accurate bid by contractors. It is suggested that the bidders and their geotechnical consultant perform an independent evaluation of the subsurface conditions in the project areas. The independent evaluations may include, but not be limited to, review of other geotechnical reports prepared for the adjacent areas, site reconnaissance, and additional exploration and laboratory testing.

Our conclusions, recommendations, and opinions are based on an analysis of the observed site conditions. If geotechnical conditions different from those described in this report are encountered, our office should be notified, and additional recommendations, if warranted, will be provided upon request. It should be understood that the conditions of a site could change with time as a result of natural processes or the activities of man at the subject site or nearby sites. In addition, changes to the applicable laws, regulations, codes, and standards of practice may occur due to government action or the broadening of knowledge. The findings of this report may, therefore, be invalidated over time, in part or in whole, by changes over which Ninyo & Moore has no controls.

This report is intended exclusively for use by the client. Any use or reuse of the findings, conclusions, and/or recommendations of this report by parties other than the client is undertaken at said parties' sole risk.

10. SELECTED REFERENCES

Blake, Thomas F., 2000, FRISKSP Version 4.00, Probabilistic Earthquake Hazard Analysis Computer Program.

California Building Standards Commission, 2001, California Building Code, Title 24, Part 2, Volumes 1 and 2.

California Department of Conservation Division of Mines and Geology, 1999, Seismic Shaking Hazards Maps of California: Map Sheet 48.

California Department of Transportation (Caltrans), 2003, Corrosion Guidelines, Version 1.0, Division of Engineering Services, Materials Engineering and Testing Services, Corrosion Technology Branch: dated September.

California Division of Mines and Geology (CDMG), 1998, Maps of Known Active Fault Near-Source Zones in California and Adjacent Portions of Nevada: International Conference of Building Officials.

International Conference of Building Officials (ICBO), 1997, Uniform Building Code (UBC): Whittier, California.

Jennings, C.W., 1994, Fault Activity Map of California and Adjacent Areas: California Division of Mines and Geology, California Geologic Data Map Series, Map No. 6, Scale 1:750,000.

Norris, R.M., and Webb, R.W., 1990, Geology of California, Second Edition: John Wiley & Sons, Inc.

Public Works Standards, Inc., 2000, "Greenbook," Standard Specifications for Public Works Construction.

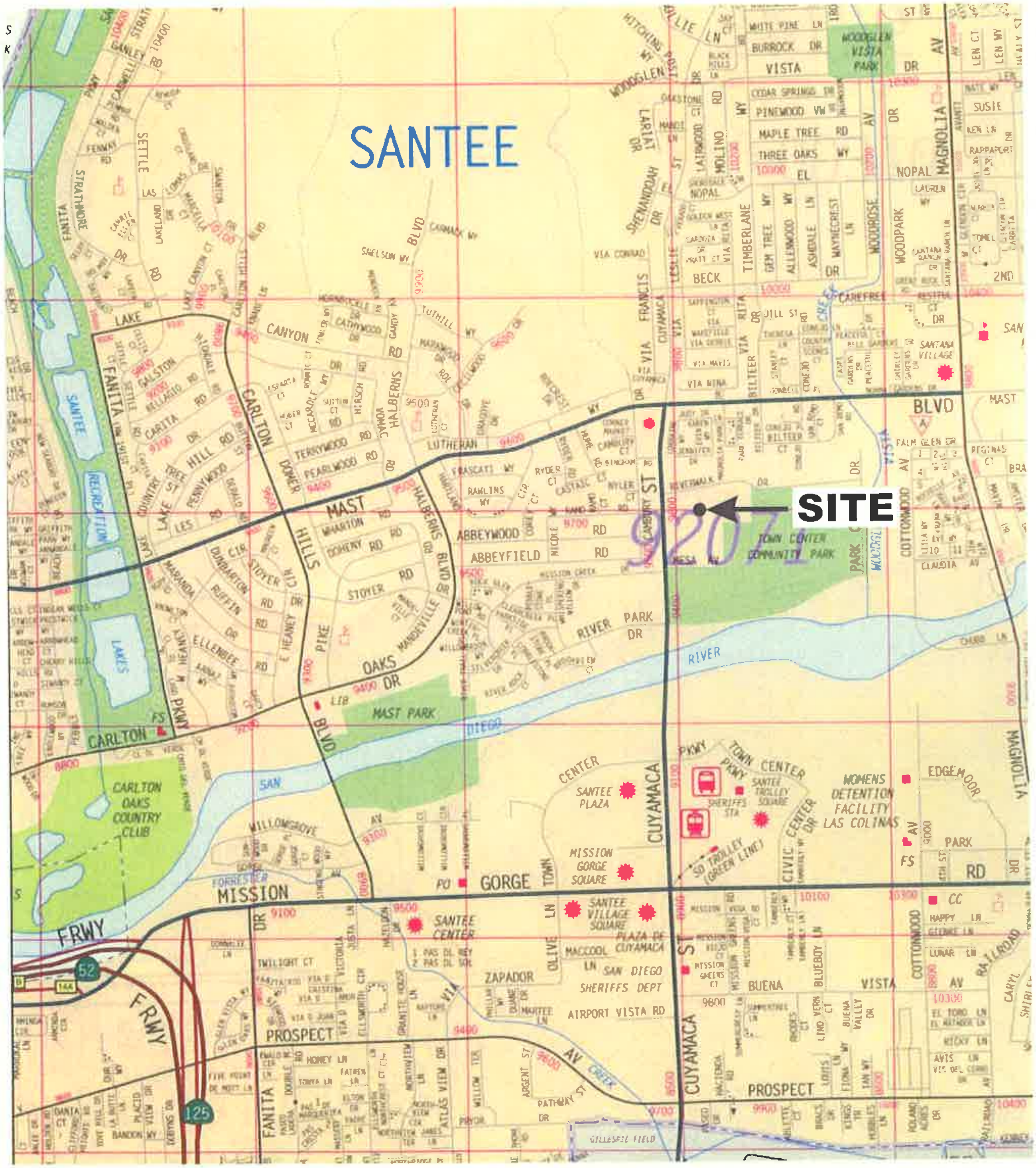
Tan, S.S., 2002, Geologic Map of the El Cajon 7.5' Quadrangle, San Diego County, California, Scale 1:24,000.

Treiman, J.A., 1993, The Rose Canyon Fault Zone, Southern California: California Division of Mines and Geology, Open-File Report 93-02.

United States Federal Emergency Management Agency (FEMA), 1997, Flood Insurance Rate Map (FIRM), No. 06073C1651 F: dated June 19.

United States Geological Survey/California Geological Survey, 2002 (Revised April 2003), Probabilistic Seismic Hazards Assessment (PSHA) Model, World Wide Web, http://www.consrv.ca.gov/CGS/rghm/pshamap/pshamain.html.

AERIAL PHOTOGRAPHS				
Source	**Date**	**Flight**	**Numbers**	**Scale**
USDA	4-14-53	AXN-9M	69 & 70	1:20,000



REFERENCE: 2007 THOMAS GUIDE FOR SAN DIEGO COUNTY, STREET GUIDE AND DIRECTORY.

0 1900 3800

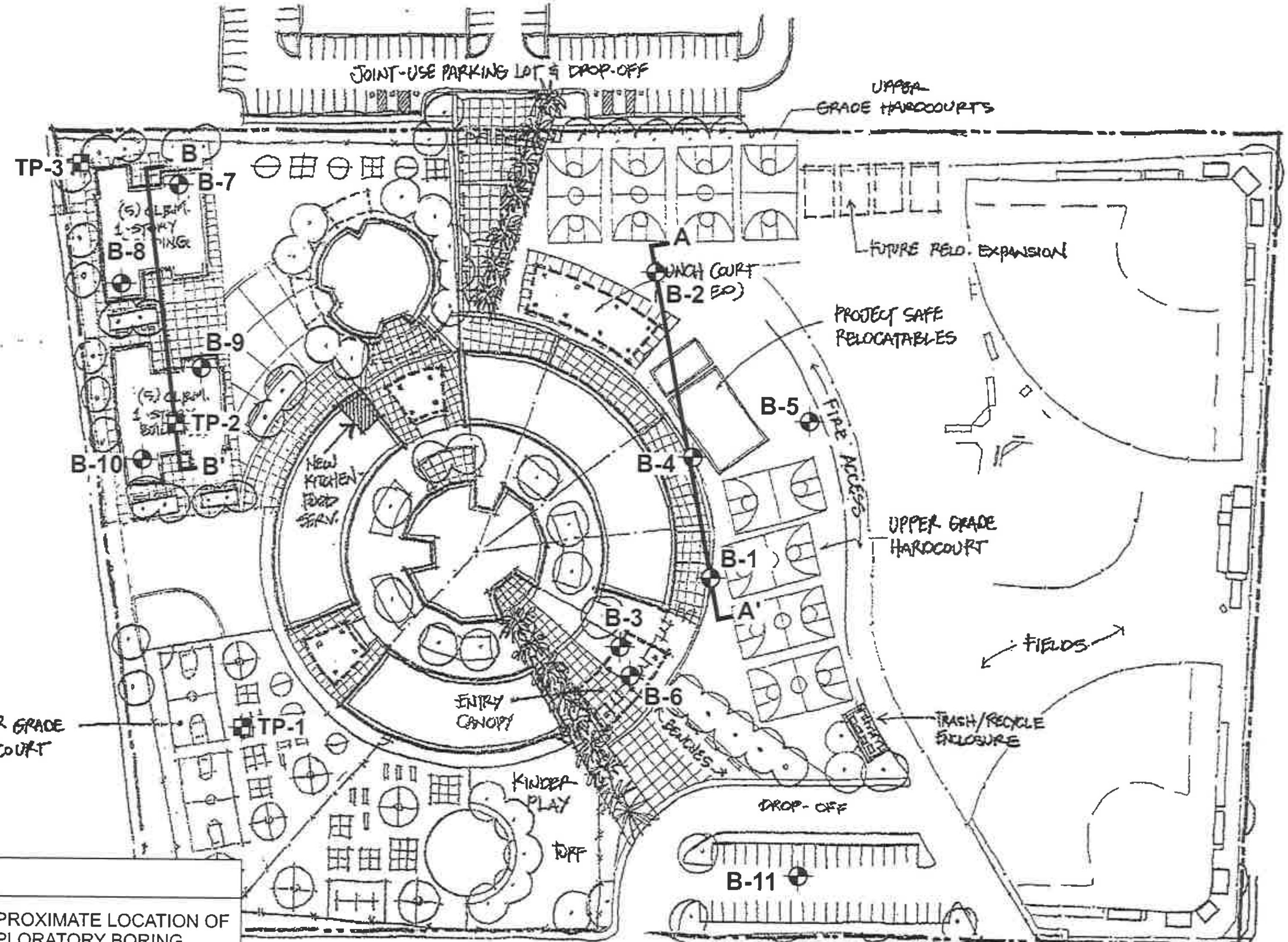
APPROXIMATE SCALE IN FEET

N

NOTE: ALL DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE.

106113001 slm fig 1

Ninyo & Moore		SITE LOCATION MAP	FIGURE
PROJECT NO.	DATE	RIO SECO SCHOOL SANTEE, CALIFORNIA	1
106113001	9/07		



LEGEND

- B-6 APPROXIMATE LOCATION OF EXPLORATORY BORING
- TP-3 APPROXIMATE LOCATION OF EXPLORATORY TEST PIT
- B B' GEOLOGIC CROSS SECTION

N

APPROXIMATE SCALE

0 120 240 FEET

NOTE: ALL DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE

REFERENCE: RIO SECO SCHOOL, SPROTTE + WATSON.

Ninyo & Moore

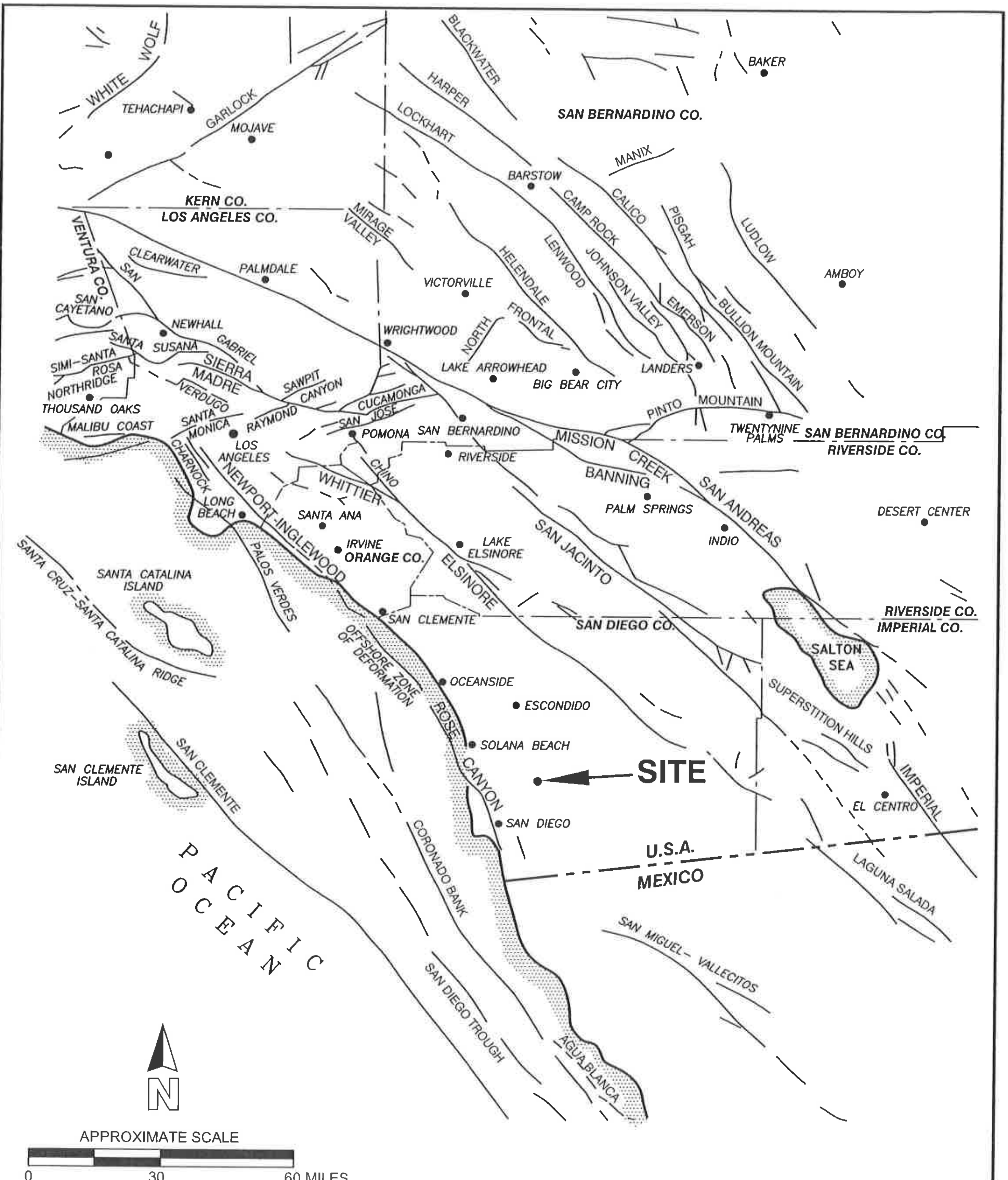
PROJECT NO.	DATE
106113001	9/07

BORING LOCATION MAP

RIO SECO SCHOOL
SANTEE, CALIFORNIA

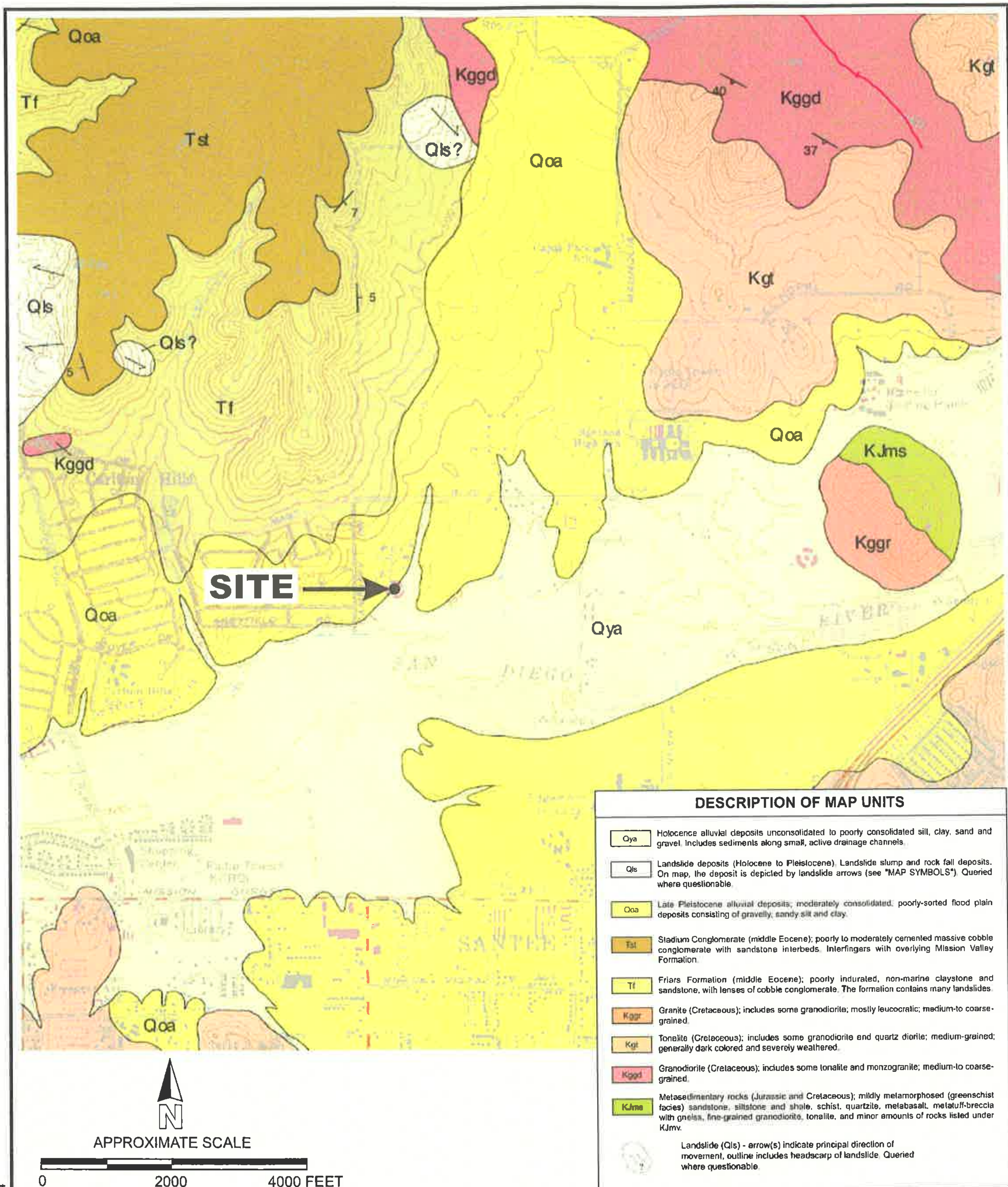
FIGURE 2

106113001 blm fig 2



NOTE: ALL DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE

Ninyo & Moore		FAULT LOCATION MAP	FIGURE
PROJECT NO.	DATE	RIO SECO SCHOOL SANTEE, CALIFORNIA	3
106113001	9/07		

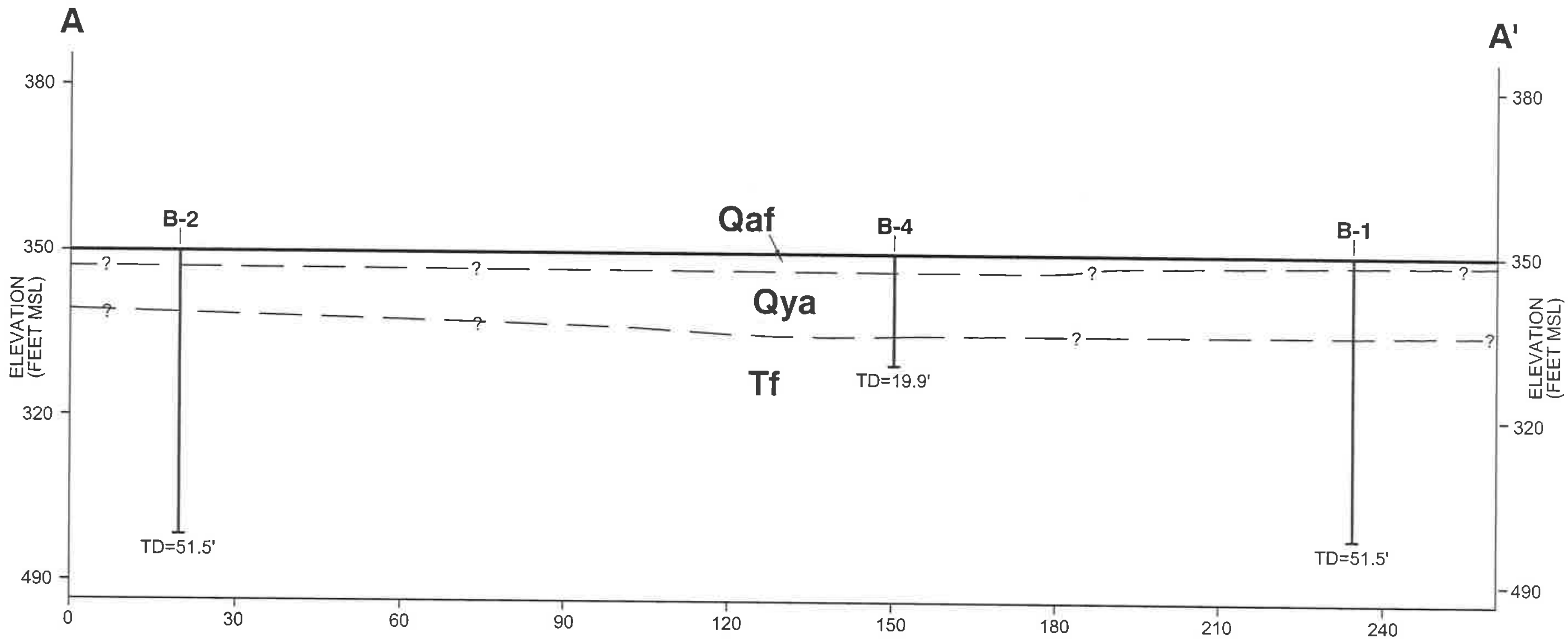


NOTE: ALL DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE.

REFERENCE: U.S.G.S., GEOLOGIC MAP OF THE EL CAJON 7.5' QUADRANGLE, SAN DIEGO COUNTY, CALIFORNIA, DATED 2002.

106113001 geol fig 4

Ninyo & Moore		GEOLOGIC MAP	FIGURE
PROJECT NO.	DATE	RIO SECO SCHOOL SANTEE, CALIFORNIA	4
106113001	9/07		



LEGEND

B-4 TD=19.9'	APPROXIMATE LOCATION OF EXPLORATORY BORING TD=TOTAL DEPTH IN FEET
Qaf	FILL
Qya	YOUNGER ALLUVIUM
Tf	FRIARS FORMATION
—?—	APPROXIMATE LOCATION OF GEOLOGIC CONTACT QUERIED WERE QUESTIONABLE

APPROXIMATE SCALE

0 30 60 FEET

NOTE: ALL DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE

Ninyo & Moore

PROJECT NO.	DATE
106113001	9/07

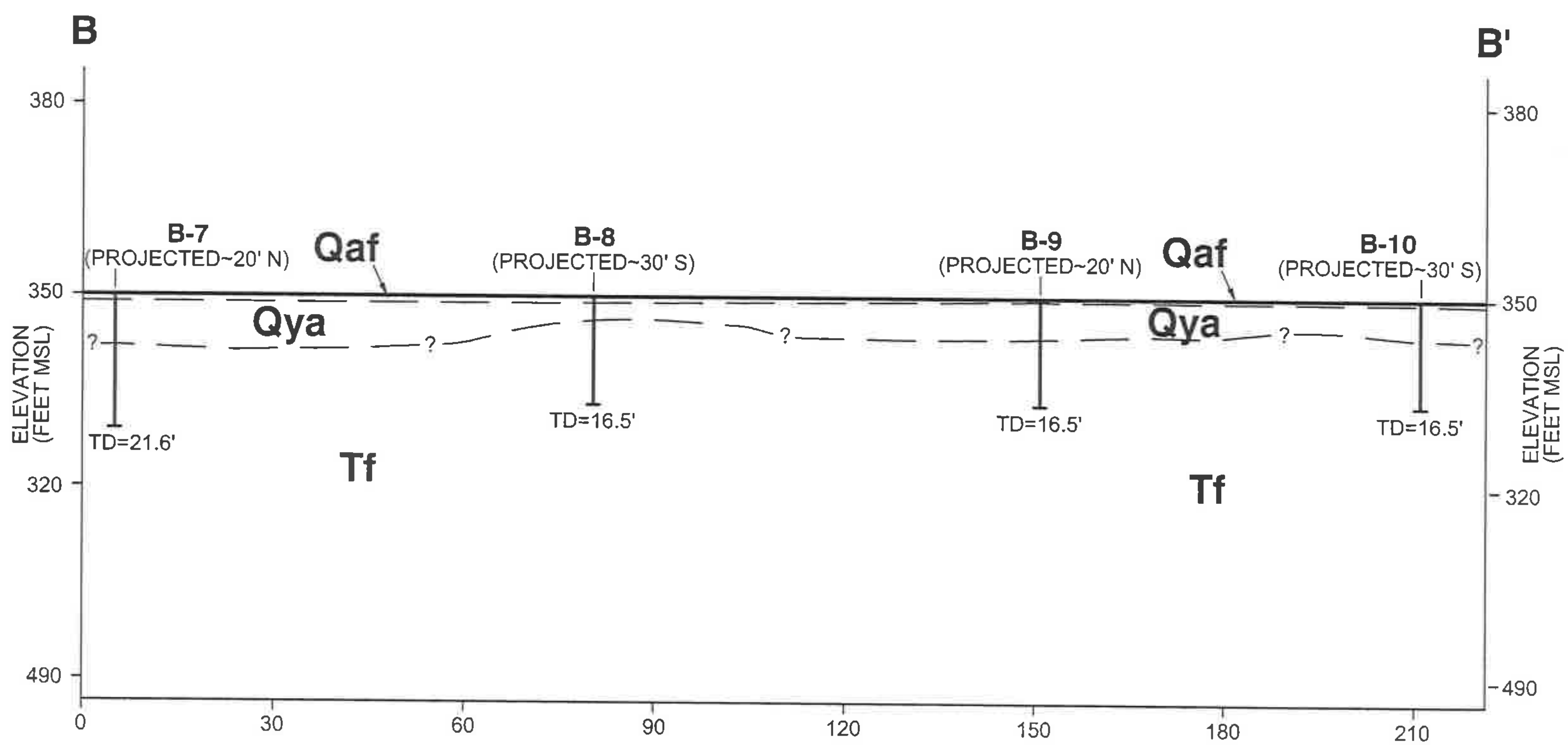
GEOLOGIC CROSS SECTION

RIO SECO SCHOOL
SANTEE, CALIFORNIA

FIGURE

5

106113001 xsec a-a' fig 5



LEGEND	
B-10 TD=16.5'	APPROXIMATE LOCATION OF EXPLORATORY BORING TD=TOTAL DEPTH IN FEET
Qaf	FILL
Qya	YOUNGER ALLUVIUM
Tf	FRIARS FORMATION
?	APPROXIMATE LOCATION OF GEOLOGIC CONTACT QUERIED WERE QUESTIONABLE

NOTE: ALL DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE

APPROXIMATE SCALE

0 30 60 FEET

Ninyo & Moore		GEOLOGIC CROSS SECTION	FIGURE
PROJECT NO.	DATE	RIO SECO SCHOOL SANTEE, CALIFORNIA	6
106113001	9/07		

106113001 xsec b-b' fig 6

APPENDIX A

BORING LOGS AND TEST PIT LOGS

Field Procedure for the Collection of Disturbed Samples
Disturbed soil samples were obtained in the field using the following methods.

Bulk Samples
Bulk samples of representative earth materials were obtained from the drill cuttings of the exploratory excavations. The samples were bagged and transported to the laboratory for testing.

The Standard Penetration Test (SPT) Sampler
Disturbed drive samples of earth materials were obtained by means of a SPT sampler. The sampler is composed of a split barrel with an external diameter of 2 inches and an unlined internal diameter of 1-3/8 inches. The sampler was driven into the ground 12 to 18 inches with a 140-pound hammer free-falling from a height of 30 inches in general accordance with ASTM D 1586-99. The blow counts were recorded for every 6 inches of penetration; the blow counts reported on the logs are those for the last 12 inches of penetration. Soil samples were observed and removed from the sampler, bagged, sealed and transported to the laboratory for testing.

Field Procedure for the Collection of Relatively Undisturbed Samples
Relatively undisturbed soil samples were obtained in the field using the following method.

The Modified Split-Barrel Drive Sampler
The sampler, with an external diameter of 3.0 inches, was lined with 1-inch long, thin brass rings with inside diameters of approximately 2.4 inches. The sample barrel was driven into the ground with the weight of a 140-pound hammer, in general accordance with ASTM D 3550-84. The driving weight was permitted to fall freely. The approximate length of the fall, the weight of the hammer, and the number of blows per foot of driving are presented on the boring logs as an index to the relative resistance of the materials sampled. The samples were removed from the sample barrel in the brass rings, sealed, and transported to the laboratory for testing.

BORING LOG EXPLANATION SHEET

DEPTH (feet)	SAMPLES (Bulk / Driven)	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	
0							Bulk sample.
							Modified split-barrel drive sampler.
							No recovery with modified split-barrel drive sampler.
							Sample retained by others.
							Standard Penetration Test (SPT).
5							No recovery with a SPT.
		XX/XX					Shelby tube sample. Distance pushed in inches/length of sample recovered in inches.
							No recovery with Shelby tube sampler.
							Continuous Push Sample.
			♀				Seepage.
10			⊽				Groundwater encountered during drilling.
			▼				Groundwater measured after drilling.
						SM	ALLUVIUM: Solid line denotes unit change.
							Dashed line denotes material change.
15							Attitudes: Strike/Dip b: Bedding c: Contact j: Joint f: Fracture F: Fault cs: Clay Seam s: Shear bss: Basal Slide Surface sf: Shear Fracture sz: Shear Zone sbs: Sheared Bedding Surface
20							The total depth line is a solid line that is drawn at the bottom of the boring.

Ninyo & Moore

BORING LOG

EXPLANATION OF BORING LOG SYMBOLS

PROJECT NO.	DATE	FIGURE
	Rev. 01/03	

DATE DRILLED 6/22/07 BORING NO. B-1

GROUND ELEVATION 350' ± (MSL) SHEET 1 OF 3

METHOD OF DRILLING 8" HOLLOW STEM AUGER (CME 75 - BAJA EXPLORATIONS)

DRIVE WEIGHT 140 LBS. (AUTO-TRIP HAMMER) DROP 30"

SAMPLED BY CAT LOGGED BY CAT REVIEWED BY RI

DEPTH (feet)	SAMPLES Bulk / Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0						SM	FILL: Dark brown, damp, medium dense, silty fine SAND; trace coarse sand; scattered plant debris.
						SM	ALLUVIUM: Brown, damp to moist, loose, silty fine to medium SAND; cohesionless; micaceous.
		18					
5		14	17.8	87.8			Wet.
						CL	Brown, moist, stiff, fine to coarse sandy CLAY; micaceous.
10		18	20.3	106.5			Moist to wet.
15							FRIARS FORMATION: Light gray and light brown (mottled), moist, weakly indurated, fine- to coarse-grained sandy CLAYSTONE.
		16	31.7	92.2			
20							

Ninyo & Moore

BORING LOG

RIO SECO SCHOOL
SANTEE, CALIFORNIA

PROJECT NO.	DATE	FIGURE
106113001	9/07	A-1

DATE DRILLED	6/22/07	BORING NO.	B-1	
GROUND ELEVATION	350' ± (MSL)	SHEET	2	OF 3
METHOD OF DRILLING	8" HOLLOW STEM AUGER (CME 75 - BAJA EXPLORATIONS)			
DRIVE WEIGHT	140 LBS. (AUTO-TRIP HAMMER)	DROP	30"	
SAMPLED BY	CAT	LOGGED BY	CAT	REVIEWED BY RI

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
20		■	19					FRIARS FORMATION: (Continued) Light gray and light brown (mottled), damp to moist, weakly indurated, fine- to coarse-grained sandy CLAYSTONE.
								Light olive, damp, moderately cemented, fine-grained, sandy SILTSTONE.
25		■	48					
30		■	78					
35		◤	20	▽				Light green.
40								

Ninyo & Moore

BORING LOG		
RIO SECO SCHOOL SANTEE, CALIFORNIA		
PROJECT NO.	DATE	FIGURE
106113001	9/07	A-2

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
40		■	22					FRIARS FORMATION: (Continued) Light green, damp to moist, moderately to strongly indurated, fine- to coarse-grained sandy CLAYSTONE.
45				▼				
50		■	86					Light bluish green; scattered zones of claystone.
55								Total depth = 51.5 feet. Groundwater was measured at a depth of approximately 35 feet in the borehole during drilling. Groundwater was measured at a depth of approximately 47 feet in the borehole immediately after drilling. Groundwater may rise to a level higher than that measured in the borehole due to relatively slow rate of seepage in clay and several other factors as discussed in the report. Please refer to the report for groundwater monitoring recommendations. Backfilled with approximately 18.0 cubic feet of bentonite grout on 6/22/07.
60								

DATE DRILLED 6/22/07 BORING NO. B-1

GROUND ELEVATION 350' ± (MSL) SHEET 3 OF 3

METHOD OF DRILLING 8" HOLLOW STEM AUGER (CME 75 - BAJA EXPLORATIONS)

DRIVE WEIGHT 140 LBS. (AUTO-TRIP HAMMER) DROP 30"

SAMPLED BY CAT LOGGED BY CAT REVIEWED BY RI

Ninyo & Moore

BORING LOG

RIO SECO SCHOOL
SANTEE, CALIFORNIA

PROJECT NO.	DATE	FIGURE
106113001	9/07	A-3

DATE DRILLED	6/22/07
BORING NO.	B-2
GROUND ELEVATION	350' ± (MSL)
SHEET	1 OF 3
METHOD OF DRILLING	8" HOLLOW STEM AUGER (CME 75 - BAJA EXPLORATIONS)
DRIVE WEIGHT	140 LBS. (AUTO-TRIP HAMMER)
DROP	30"
SAMPLED BY	CAT
LOGGED BY	CAT
REVIEWED BY	RI

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0							SC	FILL: Dark reddish brown, damp, medium dense, clayey, fine to medium SAND.
							CL	ALLUVIUM: Light brown, damp, stiff, fine to coarse sandy CLAY; some red staining.
5		■	15	32.2	88.2			Wet.
10		■	63	28.5	96.0			
								FRIARS FORMATION: Reddish brown and gray, damp, weakly cemented, clayey, gravelly, fine- to coarse-grained SANDSTONE; gravel up to 2" in diameter.
15		■	68/11"					
								Light green, damp, weakly to moderately cemented, fine- to medium-grained sandy SILTSTONE; trace coarse-grained sand; abundant red staining.
20								

DATE DRILLED 6/22/07 BORING NO. B-2

GROUND ELEVATION 350' ± (MSL) SHEET 2 OF 3

METHOD OF DRILLING 8" HOLLOW STEM AUGER (CME 75 - BAJA EXPLORATIONS)

DRIVE WEIGHT 140 LBS. (AUTO-TRIP HAMMER) DROP 30"

SAMPLED BY CAT LOGGED BY CAT REVIEWED BY RI

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
20		◤	31					FRIARS FORMATION: (Continued) Light green, damp, weakly to moderately cemented, fine- to medium-grained sandy SILTSTONE; less sandy; some clay.
25								
30		◤	37					Less clay; some fine sand.
35				▽				
40								

Ninyo & Moore

BORING LOG RIO SECO SCHOOL SANTEE, CALIFORNIA		
PROJECT NO.	DATE	FIGURE
106113001	9/07	A-5

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
40		▼	83			//////		FRIARS FORMATION: (Continued) Light green, damp, moderately to strongly cemented, fine to medium sandy SILTSTONE.
45						//////		
50		▼	50			//////		Some clay; less sand.
								Total depth = 51.5 feet. Groundwater was measured at a depth of approximately 35 feet in the borehole during drilling. Groundwater may rise to a level higher than that measured in the borehole due to relatively slow rate of seepage in clay and several other factors as discussed in the report. Please refer to the report for groundwater monitoring recommendations. Backfilled with approximately 18.0 cubic feet of bentonite grout on 6/22/07.
55								
60								

DATE DRILLED 6/22/07 BORING NO. B-2
GROUND ELEVATION 350' ± (MSL) SHEET 3 OF 3
METHOD OF DRILLING 8" HOLLOW STEM AUGER (CME 75 - BAJA EXPLORATIONS)
DRIVE WEIGHT 140 LBS. (AUTO-TRIP HAMMER) DROP 30"
SAMPLED BY CAT LOGGED BY CAT REVIEWED BY RI

Ninyo & Moore

BORING LOG
RIO SECO SCHOOL
SANTEE, CALIFORNIA

PROJECT NO.	DATE	FIGURE
106113001	9/07	A-6

DATE DRILLED	6/26/07	BORING NO.	B-3
GROUND ELEVATION	350' ± (MSL)	SHEET 1	OF 1
METHOD OF DRILLING	MANUAL		
DRIVE WEIGHT	N/A	DROP	N/A
SAMPLED BY DLP	LOGGED BY DLP	REVIEWED BY	RI

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0							SM	FILL: Light brown, damp to moist, medium dense, silty SAND; roots up to 1/8" in diameter; micaceous.
5								
							CH	ALLUVIUM: Dark brown, moist, stiff, silty CLAY; micaceous.
10				♀				Moist to wet (some seepage).
15								FRIARS FORMATION: Gray, moist, weakly indurated, sandy CLAYSTONE.
								Total depth = 15.5 feet. Seepage encountered at approximately 10 feet in the borehole during drilling. Groundwater, though not encountered at the time of drilling, may rise to a higher level due to seasonal variations in precipitation and several other factors as discussed in the report. Backfilled with approximately 5.0 cubic feet of bentonite on 6/26/07.
20								

Ninyo & Moore

BORING LOG

RIO SECO SCHOOL
SANTEE, CALIFORNIA

PROJECT NO.	DATE	FIGURE
106113001	9/07	A-7

DATE DRILLED 6/22/07	BORING NO. B-4	
GROUND ELEVATION 350' ± (MSL)	SHEET 1 OF 2	
METHOD OF DRILLING 8" HOLLOW STEM AUGER (CME 75 - BAJA EXPLORATIONS)		
DRIVE WEIGHT 140 LBS. (AUTO-TRIP HAMMER)	DROP 30"	
SAMPLED BY CAT	LOGGED BY CAT	REVIEWED BY RI

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0								ASPHALT: Approximately 6" thick.
	X						SM	FILL: Dark brown, damp, medium dense, silty, fine to medium SAND; some fine gravel.
	X						SM	ALLUVIUM: Dark grayish brown, damp, loose, silty, fine to medium SAND; cohesionless; micaceous.
5		X	11					
							CL	Brown, moist, stiff, fine to coarse sandy CLAY; scattered gravel.
10		X	17	23.8	100.5			Wet.
15								FRIARS FORMATION: Light grayish green, damp, weakly to moderately cemented, fine- to medium-grained sandy SILTSTONE.
20		X	30					

Ninyo & Moore

BORING LOG
RIO SECO SCHOOL
SANTEE, CALIFORNIA

PROJECT NO.	DATE	FIGURE
106113001	9/07	A-8

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.

DATE DRILLED 6/22/07 BORING NO. B-4

GROUND ELEVATION 350' ± (MSL) SHEET 2 OF 2

METHOD OF DRILLING 8" HOLLOW STEM AUGER (CME 75 - BAJA EXPLORATIONS)

DRIVE WEIGHT 140 LBS. (AUTO-TRIP HAMMER) DROP 30"

SAMPLED BY CAT LOGGED BY CAT REVIEWED BY RI

DESCRIPTION/INTERPRETATION

20

Total depth = 19.9 feet.

Groundwater not encountered. Groundwater, though not encountered at the time of drilling, may rise to a higher level due to seasonal variations in precipitation and several other factors as discussed in the report.

Backfilled with approximately 6.7 cubic feet of bentonite on 6/22/07.

25

30

35

40

Ninyo & Moore

BORING LOG

RIO SECO SCHOOL
SANTEE, CALIFORNIA

PROJECT NO.	DATE	FIGURE
106113001	9/07	A-9

DATE DRILLED 6/22/07 BORING NO. B-5

GROUND ELEVATION 350' ± (MSL) SHEET 1 OF 2

METHOD OF DRILLING 8" HOLLOW STEM AUGER (CME 75 - BAJA EXPLORATIONS)

DRIVE WEIGHT 140 LBS. (AUTO-TRIP HAMMER) DROP 30"

SAMPLED BY CAT LOGGED BY CAT REVIEWED BY RI

DEPTH (feet)	SAMPLES (Bulk / Driven)	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0	Bulk (0–5)				GW	FILL: Dark grayish brown, damp, medium dense, silty, fine to coarse sandy GRAVEL.
					SM	Dark reddish brown, damp, medium dense, silty, fine SAND; micaceous.
					CL	ALLUVIUM: Brown, damp, stiff, fine to coarse sandy CLAY.
5	Driven	14				
					SC	Reddish brown, damp to moist, medium dense, clayey, fine to medium SAND; scattered gravel.
10	Driven	23	14.8	108.2		Moist.
						FRIARS FORMATION: Light olive brown, damp, moderately indurated, fine- to coarse-grained sandy CLAYSTONE; few fine gravel.
						Reddish brown, damp to moist, weakly cemented, clayey fine- to medium-grained SANDSTONE; few fine gravel.
15	Driven	33				Light olive brown, damp, moderately indurated, fine- to coarse-grained, sandy CLAYSTONE; few fine gravel.
	Driven	54				
20						Light olive gray, damp, moderately cemented, fine-grained sandy SILTSTONE.

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DATE DRILLED 6/22/07 BORING NO. B-5
								GROUND ELEVATION 350' ± (MSL) SHEET 2 OF 2
								METHOD OF DRILLING 8" HOLLOW STEM AUGER (CME 75 - BAJA EXPLORATIONS)
								DRIVE WEIGHT 140 LBS. (AUTO-TRIP HAMMER) DROP 30"
								SAMPLED BY CAT LOGGED BY CAT REVIEWED BY RI
								DESCRIPTION/INTERPRETATION
20								Total depth = 19.9 feet. Groundwater not encountered. Groundwater, though not encountered at the time of drilling, may rise to a higher level due to seasonal variations in precipitation and several other factors as discussed in the report. Backfilled with approximately 6.7 cubic feet of bentonite on 6/22/07.
25								
30								
35								
40								

Ninyo & Moore

BORING LOG

RIO SECO SCHOOL
SANTEE, CALIFORNIA

PROJECT NO.	DATE	FIGURE
106113001	9/07	A-11

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0							SM	FILL: Light brown, damp, medium dense, silty SAND; micaceous; roots up to 1/8" in diameter.
5				3.4	96.8			
							CH	ALLUVIUM: Dark brown, moist, stiff, silty CLAY; micaceous.
10				24.6	98.8			Wet.
				♀				Some seepage.
								Moist to wet.
15				20.0	104.0			
								FRIARS FORMATION: Gray, moist, weakly undurated, sandy CLAYSTONE.
								Total depth = 16.5 feet. Seepage encountered at approximately 12 feet in the borehole during drilling. Groundwater, though not encountered at the time of drilling, may rise to a higher level due to seasonal variations in precipitation and several other factors as discussed in the report. Backfilled with approximately 5.6 cubic feet of bentonite on 6/26/07.
20								

DATE DRILLED 6/26/07 BORING NO. B-6

GROUND ELEVATION 350' ± (MSL) SHEET 1 OF 1

METHOD OF DRILLING MANUAL

DRIVE WEIGHT N/A DROP N/A

SAMPLED BY DLP LOGGED BY DLP REVIEWED BY RI

Ninyo & Moore

BORING LOG

RIO SECO SCHOOL
SANTEE, CALIFORNIA

PROJECT NO.	DATE	FIGURE
106113001	9/07	A-12

DATE DRILLED	8/17/07	BORING NO.	B-7
GROUND ELEVATION	350' ± (MSL)	SHEET 1 OF 2	
METHOD OF DRILLING	8" HOLLOW STEM AUGER (CME 75 - BAJA EXPLORATIONS)		
DRIVE WEIGHT	140 LBS. (AUTO-TRIP HAMMER)	DROP	30"
SAMPLED BY	MAH	LOGGED BY MAH	REVIEWED BY RI

DEPTH (feet)	SAMPLES (Bulk / Driven)	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0							ASPHALT CONCRETE: Approximately 5.5" thick.
						SM	FILL: Brown, damp, loose, silty fine SAND.
						CL	ALLUVIUM: Dark brown, moist, stiff, silty CLAY.
							Few scattered gravel (less than 1").
5		75	11.3	118.9			Hard.
							Moist to wet; many round to subround gravel and cobbles in shoe; approximately 3" diameter.
		25	27.9	98.7			Wet; very stiff.
							FRIARS FORMATION: Light olive-gray, moist, weakly indurated, fine to coarse sandy CLAYSTONE.
10							Mottled dark brown and olive.
		46					Light olive to light gray, moist, weakly cemented, clayey SILTSTONE.
15		21					Light olive, moist, weakly cemented, clayey SILTSTONE/ silty CLAYSTONE.
20							

Ninyo & Moore

BORING LOG

RIO SECO SCHOOL
SANTEE, CALIFORNIA

PROJECT NO.	DATE	FIGURE
106113001	9/07	A-13

DATE DRILLED 8/17/07	BORING NO. B-7
GROUND ELEVATION 350' ± (MSL)	SHEET 2 OF 2
METHOD OF DRILLING 8" HOLLOW STEM AUGER (CME 75 - BAJA EXPLORATIONS)	
DRIVE WEIGHT 140 LBS. (AUTO-TRIP HAMMER)	DROP 30"
SAMPLED BY MAH LOGGED BY MAH	REVIEWED BY RI

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
20		■	55					FRIARS FORMATION: (Continued) Light olive, moist, weakly cemented, clayey SILTSTONE. Scattered clay lenses and red staining.
								Total Depth = 21.5 feet. Groundwater not encountered. Groundwater, though not encountered at the time of drilling, may rise to a higher level due to seasonal variations in precipitation and several other factors as discussed in the report. Boring backfilled with approximately 8.0 cubic feet of hydrated bentonite shortly after drilling on 8/17/07.
25								
30								
35								
40								

DATE DRILLED	8/17/07	BORING NO.	B-8
GROUND ELEVATION	350' ± (MSL)	SHEET	1 OF 1
METHOD OF DRILLING	8" HOLLOW STEM AUGER (CME 75 - BAJA EXPLORATIONS)		
DRIVE WEIGHT	140 LBS. (AUTO-TRIP HAMMER)	DROP	30"
SAMPLED BY	MAH	LOGGED BY	MAH
REVIEWED BY	RI		

DEPTH (feet)	SAMPLES (Bulk / Driven)	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0						ASPHALT CONCRETE: Approximately 4.5" thick.
	Bulk				SM	FILL: Brown, damp to moist, loose, silty SAND; micaceous.
	Bulk				CL	ALLUVIUM: Dark brown, moist, stiff, silty CLAY.
	Bulk					Dark brown to light gray (mottled).
	Bulk					FRIARS FORMATION: Light green to gray (mottled), moist, weakly cemented, fine sandy SILTSTONE; trace clay. Few scattered gravel.
5	Driven	83	17.4	102.4		
	Bulk					Light grayish green, moist, weakly cemented, silty fine- to coarse-grained SANDSTONE.
10	Driven	39				Mottled reddish brown.
15	Driven	65				Silty; trace clay.
						Total Depth = 16.5 feet. Groundwater not encountered. Groundwater, though not encountered at the time of drilling, may rise to a higher level due to seasonal variations in precipitation and several other factors as discussed in the report. Boring backfilled with approximately 6.0 cubic feet of hydrated bentonite shortly after drilling on 8/17/07.
20						

Ninyo & Moore

BORING LOG

RIO SECO SCHOOL
SANTEE, CALIFORNIA

PROJECT NO.	DATE	FIGURE
106113001	9/07	A-15

DATE DRILLED	8/17/07	BORING NO.	B-9
GROUND ELEVATION	350' ± (MSL)	SHEET 1 OF 1	
METHOD OF DRILLING	8" HOLLOW STEM AUGER (CME 75 - BAJA EXPLORATIONS)		
DRIVE WEIGHT	140 LBS. (AUTO-TRIP HAMMER)	DROP	30"
SAMPLED BY MAH	LOGGED BY MAH	REVIEWED BY	RI

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0	■						SM	FILL: Brown, dry to damp, loose, silty SAND.
	■						CL	ALLUVIUM: Dark gray to dark brown, moist, stiff, silty CLAY; abundant rootlets; red staining.
	■							Trace coarse sand; few scattered carbonate nodules.
5		■	16					Sandy.
		■	23					FRIARS FORMATION: Light gray to light brown, moist, weakly indurated, fine to coarse sandy CLAYSTONE.
								Reddish brown.
10		■	40					Brown. Cobble in shoe (approximately 4" diameter).
15		■	40					Light gray; silty CLAYSTONE.
								Total Depth = 16.5 feet. Groundwater not encountered. Groundwater, though not encountered at the time of drilling, may rise to a higher level due to seasonal variations in precipitation and several other factors as discussed in the report. Boring backfilled with approximately 6.0 cubic feet of hydrated bentonite shortly after drilling on 8/17/07.
20								

Ninyo & Moore

BORING LOG

RIO SECO SCHOOL
SANTEE, CALIFORNIA

PROJECT NO.	DATE	FIGURE
106113001	9/07	A-16

DATE DRILLED	8/17/07	BORING NO.	B-10
GROUND ELEVATION	350' ± (MSL)	SHEET 1 OF 1	
METHOD OF DRILLING	8" HOLLOW STEM AUGER (CME 75 - BAJA EXPLORATIONS)		
DRIVE WEIGHT	140 LBS. (AUTO-TRIP HAMMER)	DROP	30"
SAMPLED BY	MAH	LOGGED BY MAH	REVIEWED BY RI

DEPTH (feet)	SAMPLES Bulk / Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0	Bulk				SM	FILL: Brown, dry to damp, loose, silty SAND.
	Bulk				CL	ALLUVIUM: Dark brown, moist, stiff, silty CLAY; micaceous.
5	Driven	13	28.0	88.0		Mottled light gray. Wet; scattered carbonate nodules.
	Driven	29	31.7	89.8		FRIARS FORMATION: Light olive green, wet, weakly indurated, clayey SILTSTONE.
10	Driven	57				Pinkish brown to light olive brown (mottled).
						Pinkish brown to light olive brown (mottled), moist, weakly cemented, clayey SILTSTONE.
15	Driven	21				
						Total Depth = 16.5 feet. Groundwater not encountered. Groundwater, though not encountered at the time of drilling, may rise to a higher level due to seasonal variations in precipitation and several other factors as discussed in the report. Boring backfilled with approximately 6.0 cubic feet of hydrated bentonite shortly after drilling on 8/17/07.
20						

Ninyo & Moore

BORING LOG

RIO SECO SCHOOL
SANTEE, CALIFORNIA

PROJECT NO.	DATE	FIGURE
106113001	9/07	A-17

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DATE DRILLED 8/17/07 BORING NO. B-11
								GROUND ELEVATION 350' ± (MSL) SHEET 1 OF 1
								METHOD OF DRILLING 8" HOLLOW STEM AUGER (CME 75 - BAJA EXPLORATIONS)
								DRIVE WEIGHT 140 LBS. (AUTO-TRIP HAMMER) DROP 30"
								SAMPLED BY MAH LOGGED BY MAH REVIEWED BY RI
								DESCRIPTION/INTERPRETATION
0								ASPHALT CONCRETE: Approximately 6.0" thick.
							SM	FILL: Brown, damp to moist, loose, silty SAND; micaceous.
5								Total Depth = 4.0 feet. Groundwater not encountered. Groundwater, though not encountered at the time of drilling, may rise to a higher level due to seasonal variations in precipitation and several other factors as discussed in the report. Boring backfilled with approximately 1.0 cubic foot of hydrated bentonite shortly after drilling on 8/17/07.
10								
15								
20								

Ninyo & Moore

BORING LOG

RIO SECO SCHOOL
SANTEE, CALIFORNIA

PROJECT NO.	DATE	FIGURE
106113001	9/07	A-18

Ninyo & Moore

TEST PIT LOG

RIO SECO SCHOOL
SANTEE, CALIFORNIA

PROJECT NO.	DATE
106113001	9/07

DATE EXCAVATED 7/26/07 TEST PIT NO. TP-1

GROUND ELEVATION 350' ± (MSL) LOGGED BY FOM

METHOD OF EXCAVATION DEER 410G BACKHOE

LOCATION NORTHERLY EDGE OF SCHOOL CAMPUS

DEPTH (FEET)	SAMPLES: Bulk	SAMPLES: Driven	SAMPLES: Sand Cone	MOISTURE (%)	DRY DENSITY (PCF)	CLASSIFICATION U.S.C.S.	DESCRIPTION
0						SM	FILL: Light brown, dry to damp, loose, silty fine SAND.
						CL	ALLUVIUM: Dark brown, moist, stiff, silty CLAY with numerous roots; omnidirectional slickensides; carbonate nodules.
2							
							FRIARS FORMATION: Pinkish brown to light olive brown (mottled), moist, weakly indurated, silty CLAYSTONE.
4							
							Total Depth = 5 feet. Groundwater not encountered. Groundwater, though not encountered at the time of drilling, may rise to a higher level due to seasonal variations in precipitation and several other factors as discussed in the report. Backfilled shortly after drilling on 7/26/07.
6							
8							
10							
12							

SCALE = 1 in./2 ft.

FIGURE A-19

Ninyo & Moore

TEST PIT LOG

RIO SECO SCHOOL
SANTEE, CALIFORNIA

PROJECT NO.	DATE
106113001	9/07

DATE EXCAVATED 7/26/07 TEST PIT NO. TP-2

GROUND ELEVATION 350' ± (MSL) LOGGED BY FOM

METHOD OF EXCAVATION DEER 410G BACKHOE

LOCATION SEE LOCATION MAP

DEPTH (FEET)	SAMPLES: Bulk	SAMPLES: Driven	SAMPLES: Sand Cone	MOISTURE (%)	DRY DENSITY (PCF)	CLASSIFICATION U.S.C.S.	DESCRIPTION
0						SM	FILL: Light brown, dry to damp, loose, silty fine SAND.
						CL	Light olive and dark brown, moist, stiff, silty CLAY.
						CL	ALLUVIUM: Dark brown, moist, stiff, silty CLAY with scarce rounded gravel to 3"; omnidirectional slickensides; carbonate nodules; scarce fine to coarse sand.
2							
4							
							FRIARS FORMATION: Light brown to olive brown, moist, weakly indurated, silty CLAYSTONE.
6							
				♀			@ 7' minor seepage; wet.
8							Total Depth = 8 feet. Groundwater seepage was measured at a depth of approximately 7.0 feet in the borehole during drilling. Groundwater may rise to a level higher than that measured in the borehole due to seasonal variations in precipitation and several other factors as discussed in the report. Backfilled shortly after drilling on 7/26/07.
10							
12							

SCALE = 1 in./2 ft.

FIGURE A-20

Ninyo & Moore

TEST PIT LOG

RIO SECO SCHOOL
SANTEE, CALIFORNIA

PROJECT NO.	DATE
106113001	9/07

DATE EXCAVATED 7/26/07 TEST PIT NO. TP-3

GROUND ELEVATION 350' ± (MSL) LOGGED BY FOM

METHOD OF EXCAVATION DEER 410G BACKHOE

LOCATION SEE LOCATION MAP

DEPTH (FEET)	SAMPLES: Bulk	SAMPLES: Driven	SAMPLES: Sand Cone	MOISTURE (%)	DRY DENSITY (PCF)	CLASSIFICATION U.S.C.S.	DESCRIPTION
0						SM	FILL: Light brown, dry, loose, silty fine SAND; scattered gravel.
2							
4						CL	ALLUVIUM: Dark brown, moist, stiff, silty CLAY with scarce fine to coarse sand and cobbles to 4"; omnidirectional slickensides; carbonate nodules.
6							
8							
				♀			FRIARS FORMATION: Light olive brown and light brown (mottled), moist, intensely weathered, silty CLAYSTONE.
10							Total Depth = 10 feet. Groundwater seepage was measured at a depth of approximately 9.5 feet in the borehole during drilling. Groundwater may rise to a level higher than that measured in the borehole due to seasonal variations in precipitation and several other factors as discussed in the report.
12							

SCALE = 1 in./2 ft.

Ninyo & Moore

TEST PIT LOG

RIO SECO SCHOOL
SANTEE, CALIFORNIA

PROJECT NO.	DATE
106113001	9/07

DATE EXCAVATED 7/26/07 TEST PIT NO. TP-3

GROUND ELEVATION 350' ± (MSL) LOGGED BY FOM

METHOD OF EXCAVATION DEER 410G BACKHOE

LOCATION SEE LOCATION MAP

DEPTH (FEET)	SAMPLES: Bulk	SAMPLES: Driven	SAMPLES: Sand Cone	MOISTURE (%)	DRY DENSITY (PCF)	CLASSIFICATION U.S.C.S.	DESCRIPTION
12							Backfilled shortly after drilling on 7/26/07.
14							
16							
18							
20							
22							
24							

SCALE = 1 in./2 ft.

FIGURE A-22

APPENDIX B

LABORATORY TESTING

Classification

Soils were visually and texturally classified in accordance with the Unified Soil Classification System (USCS) in general accordance with ASTM D 2488-93. Soil classifications are indicated on the logs of the exploratory borings in Appendix A.

In-Place Moisture and Density Tests

The moisture content and dry density of relatively undisturbed samples obtained from the exploratory borings were evaluated in general accordance with ASTM D 2937-94. The test results are presented on the logs of the exploratory borings in Appendix A.

Gradation Analysis

A gradation analysis test was performed on a selected representative soil sample in general accordance with ASTM D 422-63. The grain-size distribution curve is shown on Figure B-1. The test result was utilized in evaluating the soil classifications in accordance with the Unified Soil Classification System.

Atterberg Limits

Tests were performed on selected representative fine-grained soil samples to evaluate the liquid limit, plastic limit, and plasticity index in general accordance with ASTM D 4318-05. These test results were utilized to evaluate the soil classification in accordance with the Unified Soil Classification System. The test results and classifications are shown on Figure B-2.

Consolidation Tests

Consolidation tests were performed on selected relatively undisturbed soil samples in general accordance with ASTM D 2435-04. The samples were inundated during testing to represent adverse field conditions. The percent of consolidation for each load cycle was recorded as a ratio of the amount of vertical compression to the original height of the sample. The results of the tests are summarized on Figure B-3.

Direct Shear Tests

Two direct shear tests were performed on remolded samples in general accordance with ASTM D 3080-98 to evaluate the shear strength characteristics of the selected materials. The samples were inundated during shearing to represent adverse field conditions. The results are shown on Figures B-4 and B-5.

Expansion Index Tests

The expansion indices of selected materials were evaluated in general accordance with U.B.C. Standard No. 18-2. The specimens were molded under a specified compactive energy at approximately 50 percent saturation (plus or minus 1 percent). The prepared 1-inch thick by 4-inch diameter specimens were loaded with a surcharge of 144 pounds per square foot and was inundated with tap water. Readings of volumetric swell were made for a period of 24 hours. The results of these tests are presented on Figure B-6.

Proctor Density Test

The maximum dry density and optimum moisture content of two selected representative soil samples were evaluated using the Modified Proctor method in general accordance with ASTM D 1557-02. The results of these tests are summarized on Figures B-7 and B-8.

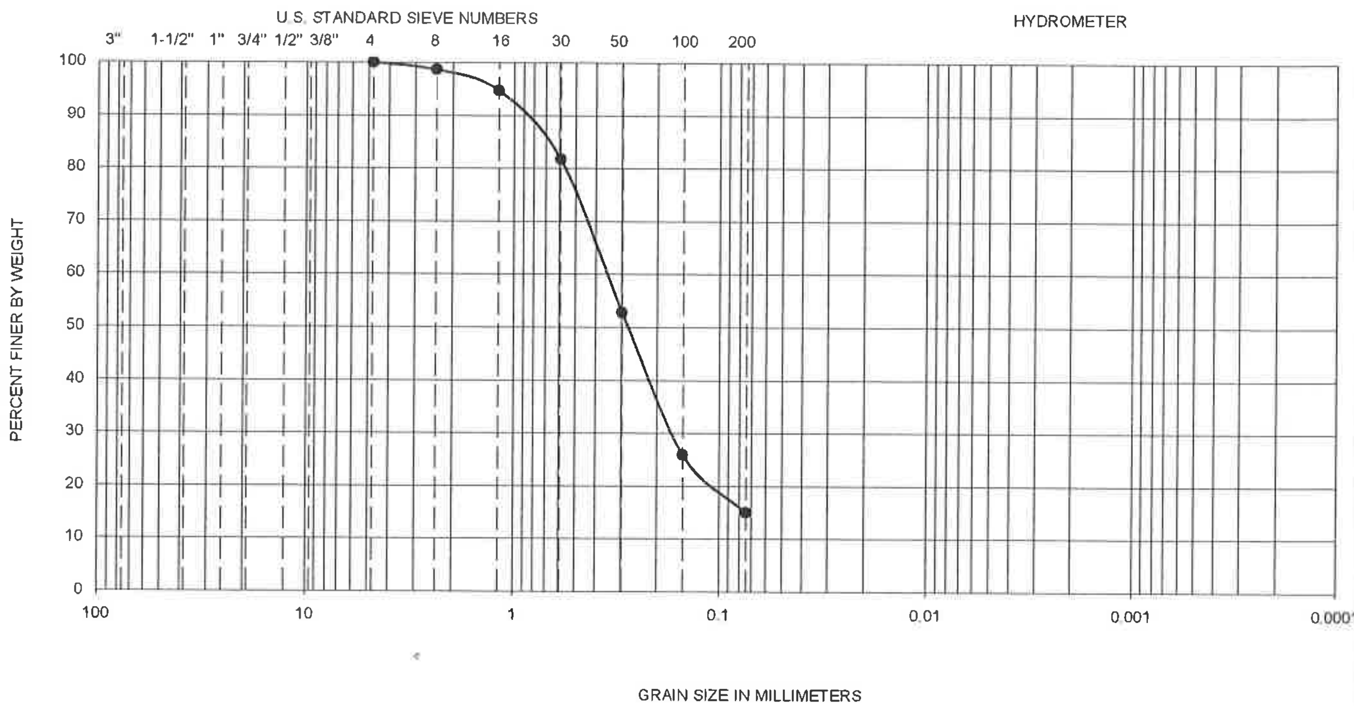
Soil Corrosivity Tests

Soil pH, and electrical resistivity tests were performed on representative samples in general accordance with CT 643. The chloride content of the selected samples were evaluated in general accordance with CT 422. The sulfate content of the selected samples were evaluated in general accordance with CT 417. The test results are presented on Figure B-9.

R-Value

The resistance value, or R-value, for site soils was evaluated in general accordance with California Test (CT) 301. Samples were prepared and evaluated for exudation pressure and expansion pressure. The equilibrium R-value is reported as the lesser or more conservative of the two calculated results. The test results are shown on Figure B-10.

GRAVEL		SAND			FINES	
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay



Symbol	Hole No.	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	Passing No. 200 (%)	U.S.C.S
●	B-4	5.0-6.5	--	--	--	--	--	--	--	--	15	SM

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422-63 (02)

Ninyo & Moore

GRADATION TEST RESULTS

FIGURE B-1

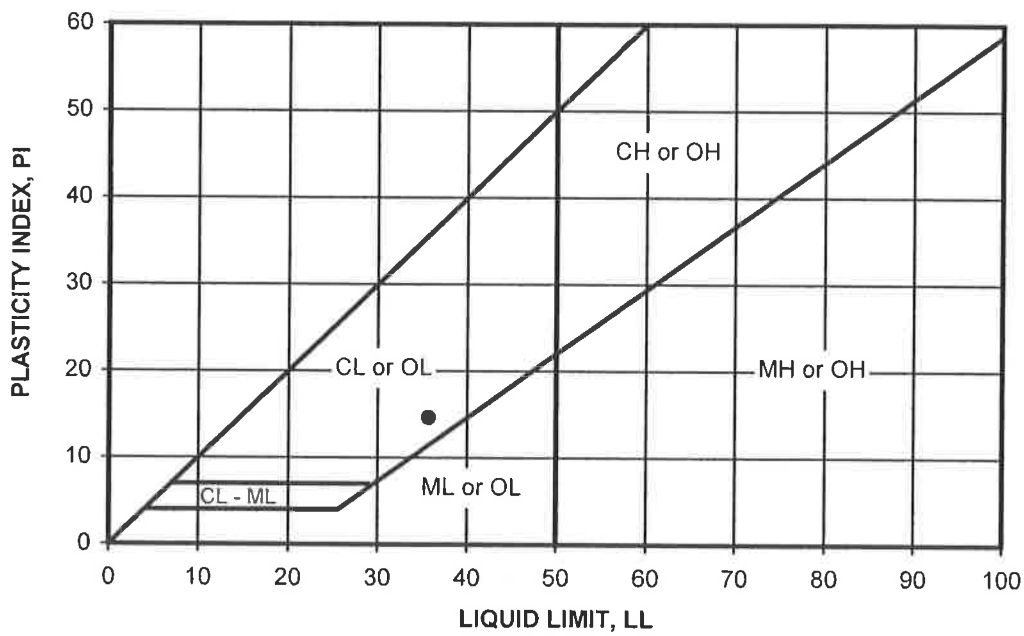
PROJECT NO.	DATE
106113001	9/07

RIO SECO SCHOOL
SANTEE, CALIFORNIA

106113001 SIEVE B-4 @ 5.0-6.5.xls

SYMBOL	LOCATION	DEPTH (FT)	LIQUID LIMIT, LL	PLASTIC LIMIT, PL	PLASTICITY INDEX, PI	USCS CLASSIFICATION (Fraction Finer Than No. 40 Sieve)	USCS (Entire Sample)
●	B-9	0.0-5.0	36	21	15	CL	CL

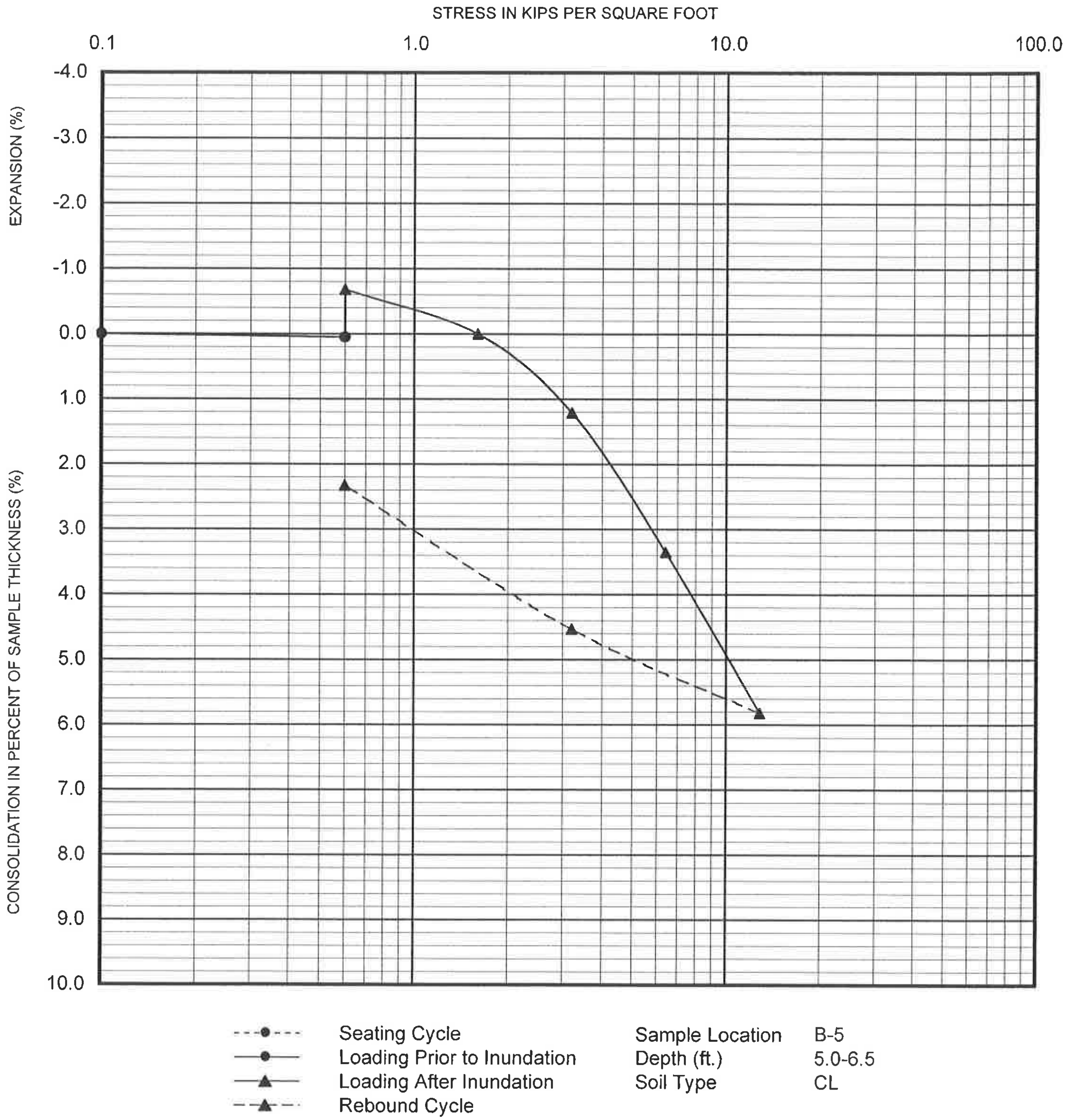
NP - INDICATES NON-PLASTIC



PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 4318-05

Ninyo & Moore	ATTERBERG LIMITS TEST RESULTS	FIGURE
PROJECT NO. 106113001 / DATE 9/07	RIO SECO SCHOOL SANTEE, CALIFORNIA	B-2

106113001 ATTERBERG.xls

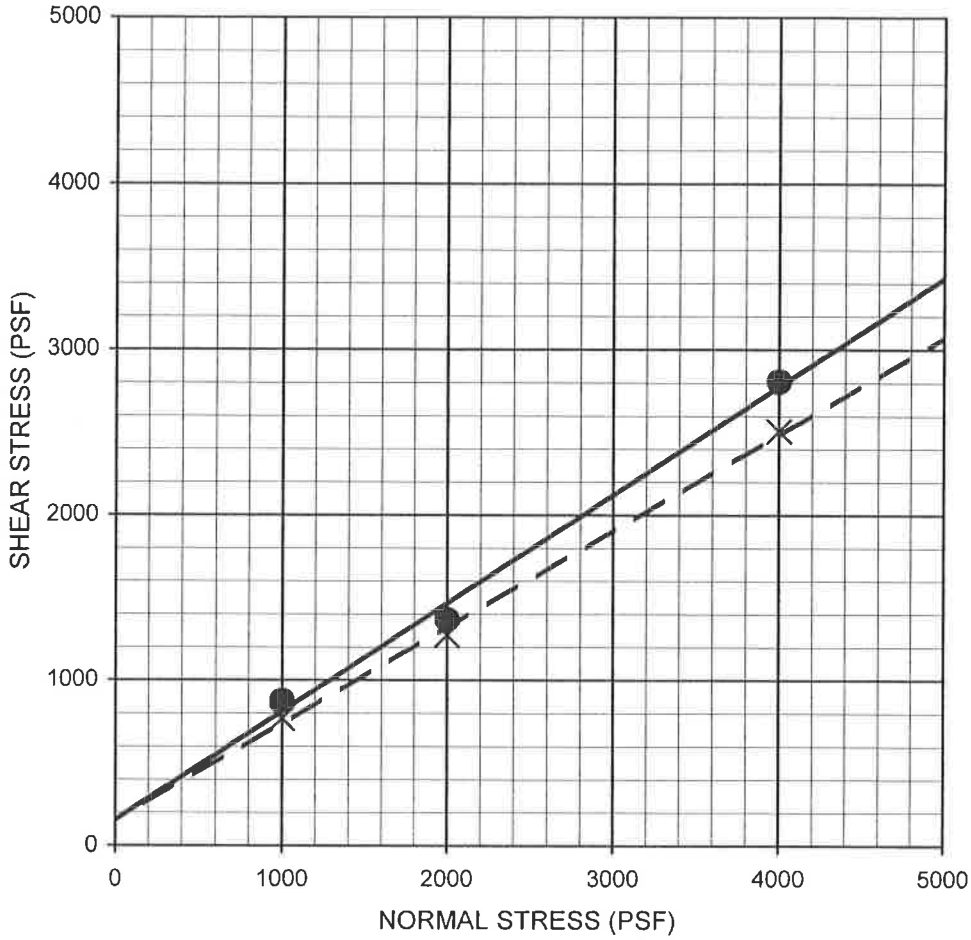


Sample Location	B-5
Depth (ft.)	5.0-6.5
Soil Type	CL

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 2435-04

Ninyo & Moore		CONSOLIDATION TEST RESULTS	FIGURE
PROJECT NO.	DATE	RIO SECO SCHOOL SANTEE, CALIFORNIA	B-3
106113001	9/07		

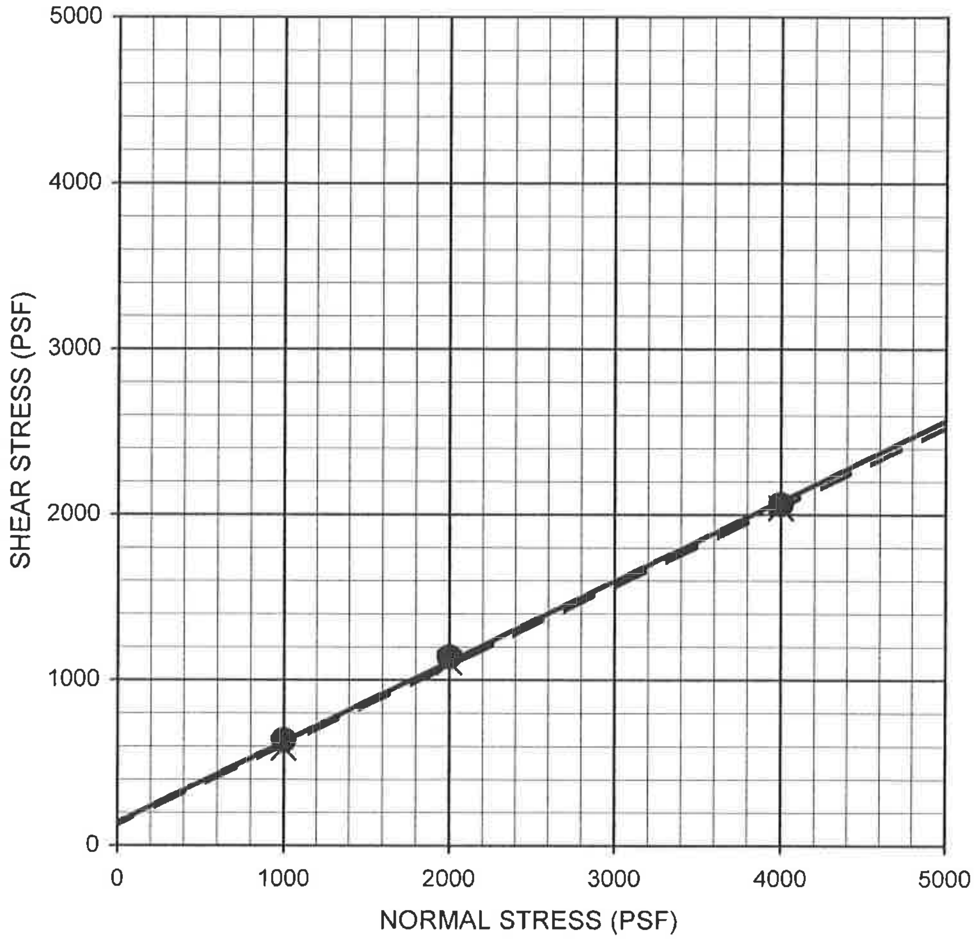
106113001 CONSOLIDATION B-5 @ 5.0-6.5.xls



Description	Symbol	Sample Location	Depth (ft)	Shear Strength	Cohesion, c (psf)	Friction Angle, ϕ (degrees)	Soil Type
Remolded @ 90% Relative Compaction	——●——	B-1	0.0-5.0	Peak	160	33	SM
	- - X - -	B-1	0.0-5.0	Ultimate	150	30	SM

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 3080-04

Ninyo & Moore		DIRECT SHEAR TEST RESULTS	FIGURE
PROJECT NO.	DATE	RIO SECO SCHOOL SANTEE, CALIFORNIA	B-4
106113001	9/07		



Description	Symbol	Sample Location	Depth (ft)	Shear Strength	Cohesion, c (psf)	Friction Angle, ϕ (degrees)	Soil Type
Remolded @ 90% Relative Compaction	—●—	B-8	0.5-5.0	Peak	170	25	CL
	- - X - -	B-8	0.5-5.0	Ultimate	140	25	CL

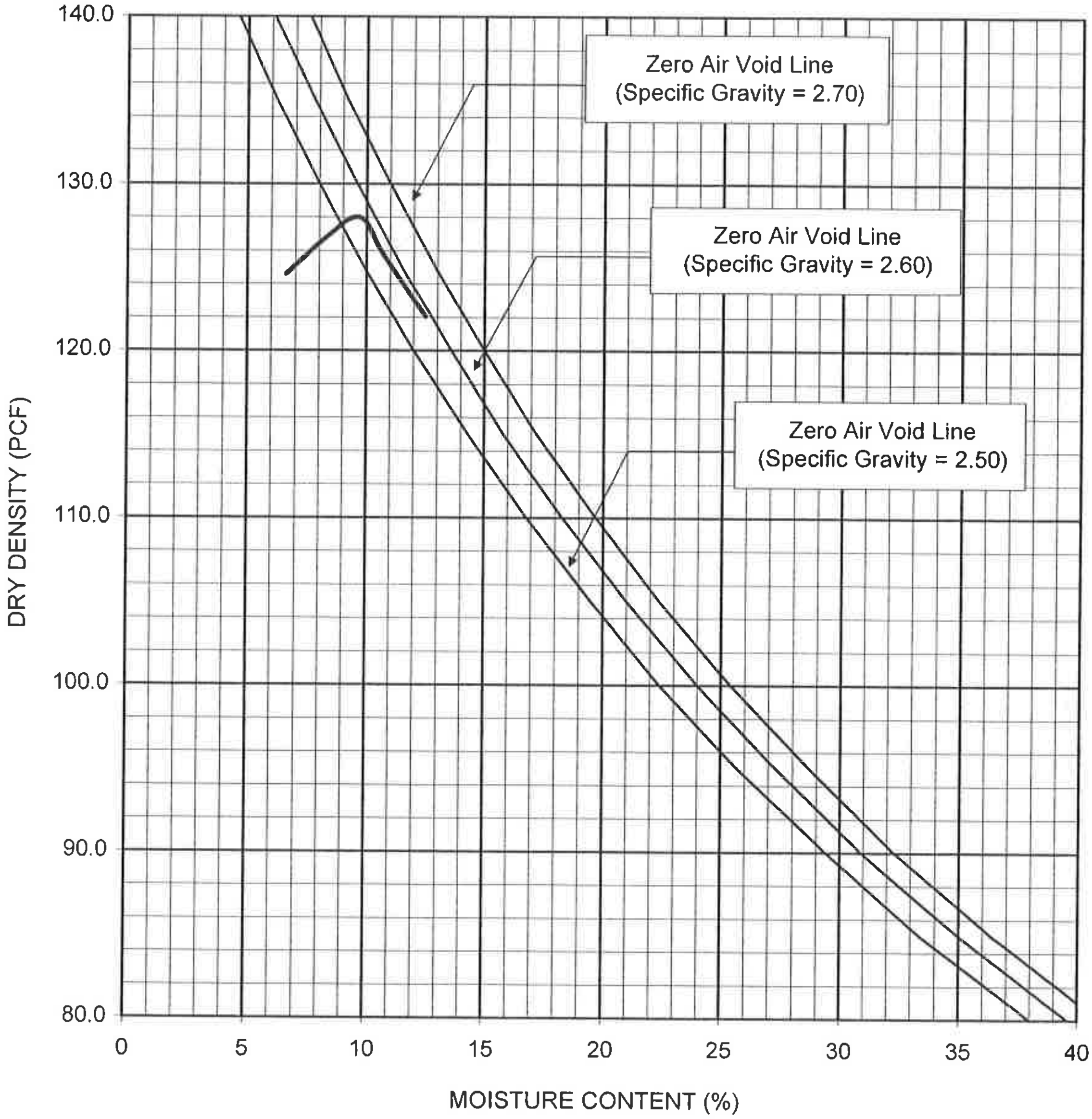
PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 3080-04

Ninyo & Moore		DIRECT SHEAR TEST RESULTS	FIGURE
PROJECT NO.	DATE	RIO SECO SCHOOL SANTEE, CALIFORNIA	B-5
106113001	9/07		

SAMPLE LOCATION	SAMPLE DEPTH (FT)	INITIAL MOISTURE (%)	COMPACTED DRY DENSITY (PCF)	FINAL MOISTURE (%)	VOLUMETRIC SWELL (IN)	EXPANSION INDEX	POTENTIAL EXPANSION
B-1	10.0-15.0	13.1	99.4	23.2	0.057	57	Medium
B-6	6.5-10.0	12.4	100.6	32.9	0.112	112	High
B-7	0.5-5.0	12.0	101.7	30.8	0.121	121	High

PERFORMED IN GENERAL ACCORDANCE WITH ☑ UBC STANDARD 18-2 ☐ ASTM D 4829-03

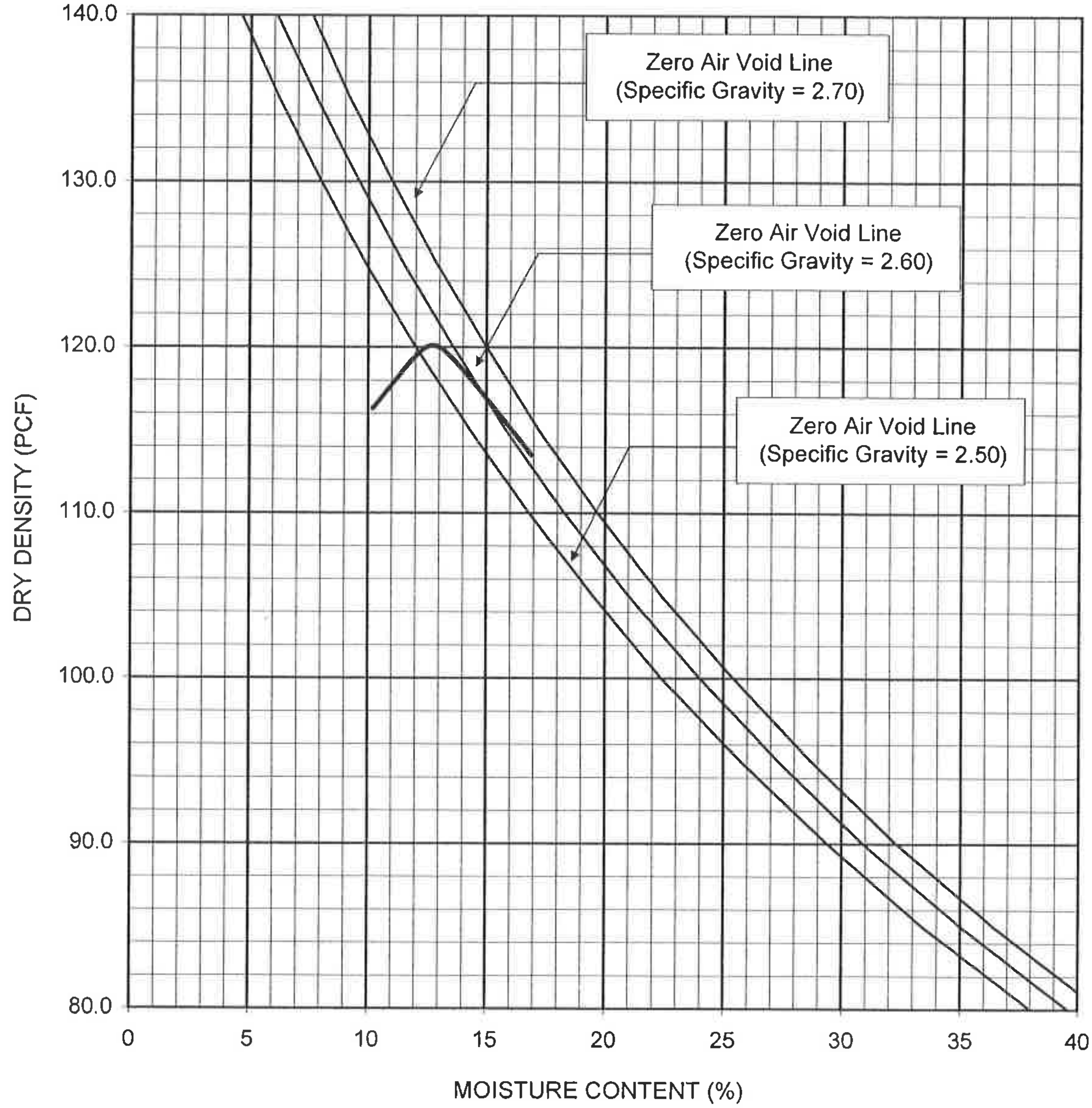
Ninyo & Moore		EXPANSION INDEX TEST RESULTS	FIGURE
PROJECT NO.	DATE	RIO SECO SCHOOL SANTEE, CALIFORNIA	B-6
106113001	9/07		



Sample Location	Depth (ft)	Soil Description	Maximum Dry Density (pcf)	Optimum Moisture Content (%)
B-1	0.0-5.0	Brown Silty SAND (SM)	128.0	9.5
Dry Density and Moisture Content Values Corrected for Oversize (ASTM D 4718-87)			N/A	N/A

PERFORMED IN GENERAL ACCORDANCE WITH ☑ ASTM D 1557-02 ☐ ASTM D 698-00a METHOD ☑ A ☐ B ☐ C

Ninyo & Moore		PROCTOR DENSITY TEST RESULTS	FIGURE
PROJECT NO.	DATE	RIO SECO SCHOOL SANTEE, CALIFORNIA	B-7
106113001	9/07		



Sample Location	Depth (ft)	Soil Description	Maximum Dry Density (pcf)	Optimum Moisture Content (%)
B-8	0.5-5.0	Silty CLAY (CL)	120.0	13.0
Dry Density and Moisture Content Values Corrected for Oversize (ASTM D 4718-87)			N/A	N/A

PERFORMED IN GENERAL ACCORDANCE WITH ☑ ASTM D 1557-02 ☐ ASTM D 698-00a METHOD ☑ A ☐ B ☐ C

Ninyo & Moore		PROCTOR DENSITY TEST RESULTS	FIGURE
PROJECT NO.	DATE	RIO SECO SCHOOL SANTEE, CALIFORNIA	B-8
106113001	9/07		

SAMPLE LOCATION	SAMPLE DEPTH (FT)	pH [1]	RESISTIVITY [1] (Ohm-cm)	SULFATE CONTENT [2]		CHLORIDE CONTENT [3] (ppm)
				(ppm)	(%)	
B-1	2.0-3.5	5.9	11,390	10	0.001	55
B-2	5.0-6.5	8.0	1,740	930	0.093	645
B-10	0.0-5.0	7.2	160	780	0.078	2800

[1] PERFORMED IN GENERAL ACCORDANCE WITH CALIFORNIA TEST METHOD 643
[2] PERFORMED IN GENERAL ACCORDANCE WITH CALIFORNIA TEST METHOD 417
[3] PERFORMED IN GENERAL ACCORDANCE WITH CALIFORNIA TEST METHOD 422

Ninyo & Moore		CORROSIVITY TEST RESULTS	FIGURE
PROJECT NO.	DATE	RIO SECO SCHOOL SANTEE, CALIFORNIA	B-9
106113001	9/07		

SAMPLE LOCATION	SAMPLE DEPTH (FT)	SOIL TYPE	R-VALUE
B-11	0.5-4.0	SM	49

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 2844-01/CT 301

Ninyo & Moore		R-VALUE TEST RESULTS	FIGURE
PROJECT NO.	DATE	RIO SECO SCHOOL SANTEE, CALIFORNIA	B-10
106113001	9/07		

APPENDIX C

TYPICAL EARTHWORK GUIDELINES

TABLE OF CONTENTS

TYPICAL EARTHWORK GUIDELINES

1. GENERAL

These guidelines and the standard details attached hereto are presented as general procedures for earthwork construction for sites having slopes less than 10 feet high. They are to be utilized in conjunction with the project grading plans. These guidelines are considered a part of the geotechnical report, but are superseded by recommendations in the geotechnical report in the case of conflict. Evaluations performed by the consultant during the course of grading may result in new recommendations which could supersede these specifications and/or the recommendations of the geotechnical report. It is the responsibility of the contractor to read and understand these guidelines as well as the geotechnical report and project grading plans.

1.1. The contractor shall not vary from these guidelines without prior recommendations by the geotechnical consultant and the approval of the client or the client's authorized representative. Recommendations by the geotechnical consultant and/or client shall not be considered to preclude requirements for approval by the jurisdictional agency prior to the execution of any changes.

1.2. The contractor shall perform the grading operations in accordance with these specifications, and shall be responsible for the quality of the finished product notwithstanding the fact that grading work will be observed and tested by the geotechnical consultant.

1.3. It is the responsibility of the grading contractor to notify the geotechnical consultant and the jurisdictional agencies, as needed, prior to the start of work at the site and at any time that grading resumes after interruption. Each step of the grading operations shall be observed and documented by the geotechnical consultant and, where needed, reviewed by the appropriate jurisdictional agency prior to proceeding with subsequent work.

1.4. If, during the grading operations, geotechnical conditions are encountered which were not anticipated or described in the geotechnical report, the geotechnical consultant shall be notified immediately and additional recommendations, if applicable, may be provided.

1.5. An as-graded report shall be prepared by the geotechnical consultant and signed by a registered engineer and registered engineering geologist. The report documents the geotechnical consultants' observations, and field and laboratory test results, and provides conclusions regarding whether or not earthwork construction was performed in accordance with the geotechnical recommendations and the grading plans. Recommendations for foundation design, pavement design, subgrade treatment, etc., may also be included in the as-graded report.

1.6. For the purpose of evaluating quantities of materials excavated during grading and/or locating the limits of excavations, a licensed land surveyor or civil engineer shall be retained.

1.7. Definitions of terms utilized in the remainder of these specifications have been provided in Section 11.

2. OBLIGATIONS OF PARTIES

The parties involved in the projects earthwork activities shall be responsible as outlined in the following sections.

2.1. The client is ultimately responsible for each of the aspects of the project. The client or the client's authorized representative has a responsibility to review the findings and recommendations of the geotechnical consultant. The client shall authorize the contractor and/or other consultants to perform work and/or provide services. During grading the client or the client's authorized representative shall remain on site or remain reasonably accessible to the concerned parties to make the decisions that may be needed to maintain the flow of the project.

2.2. The contractor is responsible for the safety of the project and satisfactory completion of grading and other associated operations, including, but not limited to, earthwork in accordance with the project plans, specifications, and jurisdictional agency requirements. During grading, the contractor or the contractor's authorized representative shall remain on site. The contractor shall further remain accessible during non-working hours, including at night and during days off.

2.3. The geotechnical consultant shall provide observation and testing services and shall make evaluations to advise the client on geotechnical matters. The geotechnical consultant shall report findings and recommendations to the client or the client's authorized representative.

2.4. Prior to proceeding with any grading operations, the geotechnical consultant shall be notified two working days in advance to schedule the needed observation and testing services.

2.4.1. Prior to any significant expansion or reduction in the grading operation, the geotechnical consultant shall be provided with two working days notice to make appropriate adjustments in scheduling of on-site personnel.

2.4.2. Between phases of grading operations, the geotechnical consultant shall be provided with two working days notice in advance of commencement of additional grading operations.

3. SITE PREPARATION

Site preparation shall be performed in accordance with the recommendations presented in the following sections.

3.1. The client, prior to any site preparation or grading, shall arrange and attend a pre-grading meeting between the grading contractor, the design engineer, the geotechnical consultant, and representatives of appropriate governing authorities, as well as any other involved parties. The parties shall be given two working days notice.

3.2. Clearing and grubbing shall consist of the substantial removal of vegetation, brush, grass, wood, stumps, trees, tree roots greater than ½-inch in diameter, and other deleterious materials from the areas to be graded. Clearing and grubbing shall extend to the outside of the proposed excavation and fill areas.

3.3. Demolition in the areas to be graded shall include removal of building structures, foundations, reservoirs, utilities (including underground pipelines, septic tanks, leach fields, seepage pits, cisterns, etc.), and other manmade surface and subsurface improvements, and the backfilling of mining shafts, tunnels and surface depressions. Demolition of utilities shall include capping or rerouting of pipelines at the project perimeter, and abandonment of wells in accordance with the requirements of the governing authorities and the recommendations of the geotechnical consultant at the time of demolition.

3.4. The debris generated during clearing, grubbing and/or demolition operations shall be removed from areas to be graded and disposed of off site at a legal dump site. Clearing, grubbing, and demolition operations shall be performed under the observation of the geotechnical consultant.

3.5. The ground surface beneath proposed fill areas shall be stripped of loose or unsuitable soil. These soils may be used as compacted fill provided they are generally free of organic or other deleterious materials and evaluated for use by the geotechnical consultant. The resulting surface shall be evaluated by the geotechnical consultant prior to proceeding. The cleared, natural ground surface shall be scarified to a depth of approximately 8 inches, moisture conditioned, and compacted in accordance with the specifications presented in Section 5 of these guidelines.

4. REMOVALS AND EXCAVATIONS

Removals and excavations shall be performed as recommended in the following sections.

4.1. Removals

4.1.1. Materials which are considered unsuitable shall be excavated under the observation of the geotechnical consultant in accordance with the recommendations contained herein. Unsuitable materials include, but may not be limited to, dry, loose, soft, wet, organic, compressible natural soils, fractured, weathered, soft bedrock, and undocumented or otherwise deleterious fill materials.

4.1.2. Materials deemed by the geotechnical consultant to be unsatisfactory due to moisture conditions shall be excavated in accordance with the recommendations of the geotechnical consultant, watered or dried as needed, and mixed to a generally uniform moisture content in accordance with the specifications presented in Section 5 of this document.

4.2. Excavations

4.2.1. Temporary excavations no deeper than 5 feet in firm fill or natural materials may be made with vertical side slopes. To satisfy California Occupational Safety and Health Administration (CAL OSHA) requirements, any excavation deeper than 5 feet shall be shored or laid back at a 1:1 inclination or flatter, depending on material type, if construction workers are to enter the excavation.

5. COMPACTED FILL

Fill shall be constructed as specified below or by other methods recommended by the geotechnical consultant. Unless otherwise specified, fill soils shall be compacted to 90 percent relative compaction, as evaluated in accordance with ASTM Test Method D 1557.

5.1. Prior to placement of compacted fill, the contractor shall request an evaluation of the exposed ground surface by the geotechnical consultant. Unless otherwise recommended, the exposed ground surface shall then be scarified to a depth of approximately 8 inches and watered or dried, as needed, to achieve a generally uniform moisture content at or near the optimum moisture content. The scarified materials shall then be compacted to 90 percent relative compaction. The evaluation of compaction by the geotechnical consultant shall not be considered to preclude any requirements for observation or approval by governing agencies. It is the contractor's responsibility to notify the geotechnical consultant and the appropriate governing agency when project areas are ready for observation, and to provide reasonable time for that review.

5.2. Excavated on-site materials which are in general compliance with the recommendations of the geotechnical consultant may be utilized as compacted fill provided they are generally free of organic or other deleterious materials and do not contain rock fragments greater than 6 inches in dimension. During grading, the contractor may encounter soil types other than those analyzed during the preliminary geotechnical study. The geotechnical consultant shall be consulted to evaluate the suitability of any such soils for use as compacted fill.

5.3. Where imported materials are to be used on site, the geotechnical consultant shall be notified three working days in advance of importation in order that it may sample and test the materials from the proposed borrow sites. No imported materials shall be delivered for use on site without prior sampling, testing, and evaluation by the geotechnical consultant.

5.4. Soils imported for on-site use shall preferably have very low to low expansion potential (based on UBC Standard 18-2 test procedures). Lots on which expansive soils may be exposed at grade shall be undercut 3 feet or more and capped with very low to low expansion potential fill. Details of the undercutting are provided in the Transition and Undercut Lot Details, Figure B of these guidelines. In the event expansive soils are present near the ground surface, special design and construction considerations shall be utilized in general accordance with the recommendations of the geotechnical consultant.

5.5. Fill materials shall be moisture conditioned to near optimum moisture content prior to placement. The optimum moisture content will vary with material type and other factors. Moisture conditioning of fill soils shall be generally uniform in the soil mass.

5.6. Prior to placement of additional compacted fill material following a delay in the grading operations, the exposed surface of previously compacted fill shall be prepared to receive fill. Preparation may include scarification, moisture conditioning, and recompaction.

5.7. Compacted fill shall be placed in horizontal lifts of approximately 8 inches in loose thickness. Prior to compaction, each lift shall be watered or dried as needed to achieve near optimum moisture condition, mixed, and then compacted by mechanical methods, using sheepsfoot rollers, multiple-wheel pneumatic-tired rollers, or other appropriate compacting rollers, to the specified relative compaction. Successive lifts shall be treated in a like manner until the desired finished grades are achieved.

5.8. Fill shall be tested in the field by the geotechnical consultant for evaluation of general compliance with the recommended relative compaction and moisture conditions. Field density testing shall conform to ASTM D 1556-00 (Sand Cone method), D 2937-00 (Drive-Cylinder method), and/or D 2922-96 and D 3017-96 (Nuclear Gauge method). Generally, one test shall be provided for approximately every 2 vertical feet of fill placed, or for approximately every 1000 cubic yards of fill placed. In addition, on slope faces one or more tests shall be taken for approximately every 10,000 square feet of slope face and/or approximately every 10 vertical feet of slope height. Actual test intervals may vary as field conditions dictate. Fill found to be out of conformance with the grading recommendations shall be removed, moisture conditioned, and compacted or otherwise handled to accomplish general compliance with the grading recommendations.

5.9. The contractor shall assist the geotechnical consultant by excavating suitable test pits for removal evaluation and/or for testing of compacted fill.

5.10. At the request of the geotechnical consultant, the contractor shall "shut down" or restrict grading equipment from operating in the area being tested to provide adequate testing time and safety for the field technician.

5.11. The geotechnical consultant shall maintain a map with the approximate locations of field density tests. Unless the client provides for surveying of the test locations, the locations shown by the geotechnical consultant will be estimated. The geotechnical consultant shall not be held responsible for the accuracy of the horizontal or vertical locations or elevations.

5.12. Grading operations shall be performed under the observation of the geotechnical consultant. Testing and evaluation by the geotechnical consultant does not preclude the need for approval by or other requirements of the jurisdictional agencies.

5.13. Fill materials shall not be placed, spread or compacted during unfavorable weather conditions. When work is interrupted by heavy rains, the filling operation shall not be resumed until tests indicate that moisture content and density of the fill meet the project specifications. Regrading of the near-surface soil may be needed to achieve the specified moisture content and density.

5.14. Upon completion of grading and termination of observation by the geotechnical consultant, no further filling or excavating, including that planned for footings, foundations, retaining walls or other features, shall be performed without the involvement of the geotechnical consultant.

5.15. Fill placed in areas not previously viewed and evaluated by the geotechnical consultant may have to be removed and recompacted at the contractor's expense. The depth and extent of removal of the unobserved and undocumented fill will be decided based upon review of the field conditions by the geotechnical consultant.

5.16. Off-site fill shall be treated in the same manner as recommended in these specifications for on-site fills. Off-site fill subdrains temporarily terminated (up gradient) shall be surveyed for future locating and connection.

6. OVERSIZED MATERIAL

Oversized material shall be placed in accordance with the following recommendations.

6.1. During the course of grading operations, rocks or similar irreducible materials greater than 6 inches in dimension (oversized material) may be generated. These materials shall not be placed within the compacted fill unless placed in general accordance with the recommendations of the geotechnical consultant.

6.2. Where oversized rock (greater than 6 inches in dimension) or similar irreducible material is generated during grading, it is recommended, where practical, to waste such material off site, or on site in areas designated as "nonstructural rock disposal areas." Rock designated for disposal areas shall be placed with sufficient sandy soil to generally fill voids. The disposal area shall be capped with a 5-foot thickness of fill which is generally free of oversized material.

6.3. Rocks 6 inches in dimension and smaller may be utilized within the compacted fill, provided they are placed in such a manner that nesting of rock is not permitted. Fill shall be placed and compacted over and around the rock. The amount of rock greater than 3/4-inch in dimension shall generally not exceed 40 percent of the total dry weight of the fill mass, unless the fill is specially designed and constructed as a "rock fill."

6.4. Rocks or similar irreducible materials greater than 6 inches but less than 4 feet in dimension generated during grading may be placed in windrows and capped with finer materials in accordance with the recommendations of the geotechnical consultant, the approval of the governing agencies, and the Oversized Rock Placement Detail, Figure D, of these guidelines. Selected native or imported granular soil (Sand Equivalent of 30 or higher) shall be placed and flooded over and around the windrowed rock such that voids are filled. Windrows of oversized materials shall be staggered so that successive windrows of oversized materials are not in the same vertical plane. Rocks greater than 4 feet in dimension shall be broken down to 4 feet or smaller before placement, or they shall be disposed of off site.

7. SLOPES

The following sections provide recommendations for cut and fill slopes.

7.1. Cut Slopes

7.1.1. The geotechnical consultant shall observe cut slopes during excavation. The geotechnical consultant shall be notified by the contractor prior to beginning slope excavations.

7.1.2. If, during the course of grading, adverse or potentially adverse geotechnical conditions are encountered in the slope which were not anticipated in the preliminary evaluation report, the geotechnical consultant shall evaluate the conditions and provide appropriate recommendations.

7.2. Fill Slopes

7.2.1. When placing fill on slopes steeper than 5:1 (horizontal:vertical), topsoil, slope wash, colluvium, and other materials deemed unsuitable shall be removed. Near-horizontal keys and near-vertical benches shall be excavated into sound bedrock or firm fill material, in accordance with the recommendation of the geotechnical consultant. Keying and benching shall be accomplished. Compacted fill shall not be placed in an area subsequent to keying and benching until the area has been observed by the geotechnical consultant. Where the natural gradient of a slope is less than 5:1, benching is generally not recommended. However, fill shall not be placed on compressible or otherwise unsuitable materials left on the slope face.

7.2.2. Within a single fill area where grading procedures dictate two or more separate fills, temporary slopes (false slopes) may be created. When placing fill adjacent to a temporary slope, benching shall be conducted in the manner described in Section 7.2.1. A 3-foot or higher near-vertical bench shall be excavated into the documented fill prior to placement of additional fill.

7.2.3. Unless otherwise recommended by the geotechnical consultant and accepted by the Building Official, permanent fill slopes shall not be steeper than 2:1 (horizontal:vertical). The height of a fill slope shall be evaluated by the geotechnical consultant.

7.2.4. Unless specifically recommended otherwise, compacted fill slopes shall be overbuilt and cut back to grade, exposing firm compacted fill. The actual amount of overbuilding may vary as field conditions dictate. If the desired results are not achieved, the existing slopes shall be overexcavated and reconstructed in accordance with the recommendations of the geotechnical consultant. The degree of overbuilding may be increased until the desired compacted slope face condition is achieved. Care shall be taken by the contractor to provide mechanical compaction as close to the outer edge of the overbuilt slope surface as practical.

7.2.5. If access restrictions, property line location, or other constraints limit overbuilding and cutting back of the slope face, an alternative method for compaction of the slope face may be attempted by conventional construction procedures including backrolling at intervals of 4 feet or less in vertical slope height, or as dictated by the capability of the available equipment, whichever is less. Fill slopes shall be backrolled utilizing a conventional sheeps foot-type roller. Care shall be taken to maintain the specified moisture conditions and/or reestablish the same, as needed, prior to backrolling.

7.2.6. The placement, moisture conditioning and compaction of fill slope materials shall be done in accordance with the recommendations presented in Section 5 of these guidelines.

7.2.7. The contractor shall be ultimately responsible for placing and compacting the soil out to the slope face to obtain a relative compaction of 90 percent as evaluated by ASTM D 1557 and a moisture content in accordance with Section 5. The geotechnical consultant shall perform field moisture and density tests at intervals of one test for approximately every 10,000 square feet of slope.

7.2.8. Backdrains shall be provided in fill as recommended by the geotechnical consultant.

7.3. Top-of-Slope Drainage

7.3.1. For pad areas above slopes, positive drainage shall be established away from the top of slope. This may be accomplished utilizing a berm and pad gradient of 2 percent or steeper at the top-of-slope areas. Site runoff shall not be permitted to flow over the tops of slopes.

7.3.2. Gunite-lined brow ditches shall be placed at the top of cut slopes to redirect surface runoff away from the slope face where drainage devices are not otherwise provided.

7.4. Slope Maintenance

7.4.1. In order to enhance surficial slope stability, slope planting shall be accomplished at the completion of grading. Slope plants shall consist of deep-rooting, variable root depth, drought-tolerant vegetation. Native vegetation is generally desirable. Plants native to semiarid and arid areas may also be appropriate. Large-leafed ice plant should not be used on slopes. A landscape architect shall be consulted regarding the actual types of plants and planting configuration to be used.

7.4.2. Irrigation pipes shall be anchored to slope faces and not placed in trenches excavated into slope faces. Slope irrigation shall be maintained at a level just sufficient to support plant growth. Property owners shall be made aware that over watering of slopes is detrimental to slope stability. Slopes shall be monitored regularly and broken sprinkler heads and/or pipes shall be repaired immediately.

7.4.3. Periodic observation of landscaped slope areas shall be planned and appropriate measures taken to enhance growth of landscape plants.

7.4.4. Graded swales at the top of slopes and terrace drains shall be installed and the property owners notified that the drains shall be periodically checked so that they may be kept clear. Damage to drainage improvements shall be repaired immediately. To reduce siltation, terrace drains shall be constructed at a gradient of 3 percent or steeper, in accordance with the recommendations of the project civil engineer.

7.4.5. If slope failures occur, the geotechnical consultant shall be contacted immediately for field review of site conditions and development of recommendations for evaluation and repair.

8. TRENCH BACKFILL

The following sections provide recommendations for backfilling of trenches.

8.1. Trench backfill shall consist of granular soils (bedding) extending from the trench bottom to 1 foot or more above the pipe. On-site or imported fill which has been evaluated by the geotechnical consultant may be used above the granular backfill. The cover soils directly in contact with the pipe shall be classified as having a very low expansion potential, in accordance with UBC Standard 18-2, and shall contain no rocks or chunks of hard soil larger than 3/4-inch in diameter.

8.2. Trench backfill shall, unless otherwise recommended, be compacted by mechanical means to 90 percent relative compaction as evaluated by ASTM D 1557. Backfill soils shall be placed in loose lifts 8-inches thick or thinner, moisture conditioned, and compacted in accordance with the recommendations of Section 5. of these guidelines. The backfill shall be tested by the geotechnical consultant at vertical intervals of approximately 2 feet of backfill placed and at spacings along the trench of approximately 100 feet in the same lift.

8.3. Jetting of trench backfill materials is generally not a recommended method of densification, unless the on-site soils are sufficiently free-draining and provisions have been made for adequate dissipation of the water utilized in the jetting process.

8.4. If it is decided that jetting may be utilized, granular material with a sand equivalent greater than 30 shall be used for backfilling in the areas to be jetted. Jetting shall generally be considered for trenches 2 feet or narrower in width and 4 feet or shallower in depth. Following jetting operations, trench backfill shall be mechanically compacted to the specified compaction to finish grade.

8.5. Trench backfill which underlies the zone of influence of foundations shall be mechanically compacted to 90 percent or greater relative compaction, as evaluated by ASTM D 1557-02. The zone of influence of the foundations is generally defined as the roughly triangular area within the limits of a 1:1 (horizontal:vertical) projection from the inner and outer edges of the foundation, projected down and out from both edges.

8.6. Trench backfill within slab areas shall be compacted by mechanical means to a relative compaction of 90 percent, as evaluated by ASTM D 1557. For minor interior trenches, density testing may be omitted or spot testing may be performed, as deemed appropriate by the geotechnical consultant.

8.7. When compacting soil in close proximity to utilities, care shall be taken by the grading contractor so that mechanical methods used to compact the soils do not damage the utilities. If the utility contractors indicate that it is undesirable to use compaction equipment in close proximity to a buried conduit, then the grading contractor may elect to use light mechanical compaction equipment or, with the approval of the geotechnical consultant, cover the conduit with clean granular material. These granular materials shall be jetted in place to the top of the conduit in accordance with the recommendations of Section 8.4 prior to initiating mechanical compaction procedures. Other methods of utility trench compaction may also be appropriate, upon review by the geotechnical consultant and the utility contractor, at the time of construction.

8.8. Clean granular backfill and/or bedding materials are not recommended for use in slope areas unless provisions are made for a drainage system to mitigate the potential for buildup of seepage forces or piping of backfill materials.

8.9. The contractor shall exercise the specified safety precautions, in accordance with OSHA Trench Safety Regulations, while conducting trenching operations. Such precautions include shoring or laying back trench excavations at 1:1 or flatter, depending on material type, for trenches in excess of 5 feet in depth. The geotechnical consultant is not responsible for the safety of trench operations or stability of the trenches.

9. DRAINAGE

The following sections provide recommendations pertaining to site drainage.

9.1. Roof, pad, and slope drainage shall be such that it is away from slopes and structures to suitable discharge areas by nonerodible devices (e.g., gutters, downspouts, concrete swales, etc.).

9.2. Positive drainage adjacent to structures shall be established and maintained. Positive drainage may be accomplished by providing drainage away from the foundations of the structure at a gradient of 2 percent or steeper for a distance of 5 feet or more outside the building perimeter, further maintained by a graded swale leading to an appropriate outlet, in accordance with the recommendations of the project civil engineer and/or landscape architect.

9.3. Surface drainage on the site shall be provided so that water is not permitted to pond. A gradient of 2 percent or steeper shall be maintained over the pad area and drainage patterns shall be established to remove water from the site to an appropriate outlet.

9.4. Care shall be taken by the contractor during grading to preserve any berms, drainage terraces, interceptor swales or other drainage devices of a permanent nature on or adjacent to the property. Drainage patterns established at the time of finish grading shall be maintained for the life of the project. Property owners shall be made very clearly aware that altering drainage patterns may be detrimental to slope stability and foundation performance.

10. SITE PROTECTION

The site shall be protected as outlined in the following sections.

10.1. Protection of the site during the period of grading shall be the responsibility of the contractor unless other provisions are made in writing and agreed upon among the concerned parties. Completion of a portion of the project shall not be considered to preclude that portion or adjacent areas from the need for site protection, until such time as the project is finished as agreed upon by the geotechnical consultant, the client, and the regulatory agency.

10.2. The contractor is responsible for the stability of temporary excavations. Recommendations by the geotechnical consultant pertaining to temporary excavations are made in consideration of stability of the finished project and, therefore, shall not be considered to preclude the responsibilities of the contractor. Recommendations by the geotechnical consultant shall also not be considered to preclude more restrictive requirements by the applicable regulatory agencies.

10.3. Precautions shall be taken during the performance of site clearing, excavation, and grading to protect the site from flooding, ponding, or inundation by surface runoff. Temporary provisions shall be made during the rainy season so that surface runoff is away from and off the working site. Where low areas cannot be avoided, pumps shall be provided to remove water as needed during periods of rainfall.

10.4. During periods of rainfall, plastic sheeting shall be used as needed to reduce the potential for unprotected slopes to become saturated. Where needed, the contractor shall install check dams, desilting basins, riprap, sandbags or other appropriate devices or methods to reduce erosion and provide recommended conditions during inclement weather.

10.5. During periods of rainfall, the geotechnical consultant shall be kept informed by the contractor of the nature of remedial or precautionary work being performed on site (e.g., pumping, placement of sandbags or plastic sheeting, other labor, dozing, etc.).

10.6. Following periods of rainfall, the contractor shall contact the geotechnical consultant and arrange a walk-over of the site in order to visually assess rain-related damage. The geotechnical consultant may also recommend excavation and testing in order to aid in the evaluation. At the request of the geotechnical consultant, the contractor shall make excavations in order to aid in evaluation of the extent of rain-related damage.

10.7. Rain- or irrigation-related damage shall be considered to include, but may not be limited to, erosion, silting, saturation, swelling, structural distress, and other adverse conditions noted by the geotechnical consultant. Soil adversely affected shall be classified as "Unsuitable Material" and shall be subject to overexcavation and replacement with compacted fill or to other remedial grading as recommended by the geotechnical consultant.

10.8. Relatively level areas where saturated soils and/or erosion gullies exist to depths greater than 1 foot shall be overexcavated to competent materials as evaluated by the geotechnical consultant. Where adverse conditions extend to less than 1 foot in depth, saturated and/or eroded materials may be processed in-place. Overexcavated or in-place processed materials shall be moisture conditioned and compacted in accordance with the recommendations provided in Section 5. If the desired results are not achieved, the affected materials shall be overexcavated, moisture conditioned, and compacted until the specifications are met.

10.9. Slope areas where saturated soil and/or erosion gullies exist to depths greater than 1 foot shall be overexcavated and replaced as compacted fill in accordance with the applicable specifications. Where adversely affected materials exist to depths of 1 foot or less below proposed finished grade, remedial grading by moisture conditioning in-place and compaction in accordance with the appropriate specifications may be attempted. If the desired results are not achieved, the affected materials shall be overexcavated, moisture conditioned, and compacted until the specifications are met. As conditions dictate, other slope repair procedures may also be recommended by the geotechnical consultant.

10.10. During construction, the contractor shall grade the site to provide positive drainage away from structures and to keep water from ponding adjacent to structures. Water shall not be allowed to damage adjacent properties. Positive drainage shall be maintained by the contractor until permanent drainage and erosion reducing devices are installed in accordance with project plans.

11. DEFINITIONS OF TERMS

ALLUVIUM:	Unconsolidated detrital deposits deposited by flowing water; includes sediments deposited in river beds, canyons, flood plains, lakes, fans at the foot of slopes, and in estuaries.
AS-GRADED (AS-BUILT):	The site conditions upon completion of grading.
BACKCUT:	A temporary construction slope at the rear of earth-retaining structures such as buttresses, shear keys, stabilization fills, or retaining walls.
BACKDRAIN:	Generally a pipe-and-gravel or similar drainage system placed behind earth-retaining structures such as buttresses, stabilization fills, and retaining walls.
BEDROCK:	Relatively undisturbed in-place rock, either at the surface or beneath surficial deposits of soil.
BENCH:	A relatively level step and near-vertical riser excavated into sloping ground on which fill is to be placed.
BORROW (IMPORT):	Any fill material hauled to the project site from off-site areas.
BUTTRESS FILL:	A fill mass, the configuration of which is designed by engineering calculations, to retain slopes containing adverse geologic features. A buttress is generally specified by a key width and depth and by a backcut angle. A buttress normally contains a back drainage system.
CIVIL ENGINEER:	The Registered Civil Engineer or consulting firm responsible for preparation of the grading plans and surveying, and evaluating as-graded topographic conditions.
CLIENT:	The developer or a project-responsible authorized representative. The client has the responsibility of reviewing the findings and recommendations made by the geotechnical consultant and authorizing the contractor and/or other consultants to perform work and/or provide services.
COLLUVIUM:	Generally loose deposits, usually found on the face or near the base of slopes and brought there chiefly by gravity through slow continuous downhill creep (see also Slope Wash).
COMPACTION:	The densification of a fill by mechanical means.

CONTRACTOR:	A person or company under contract or otherwise retained by the client to perform demolition, grading, and other site improvements.
DEBRIS:	The products of clearing, grubbing, and/or demolition, or contaminated soil material unsuitable for reuse as compacted fill, and/or any other material so designated by the geotechnical consultant.
ENGINEERED FILL:	A fill which the geotechnical consultant or the consultant's representative has observed and/or tested during placement, enabling the consultant to conclude that the fill has been placed in substantial compliance with the recommendations of the geotechnical consultant and the governing agency requirements.
ENGINEERING GEOLOGIST:	A geologist registered by the state licensing agency who applies geologic knowledge and principles to the exploration and evaluation of naturally occurring rock and soil, as related to the design of civil works.
EROSION:	The wearing away of the ground surface as a result of the movement of wind, water, and/or ice.
EXCAVATION:	The mechanical removal of earth materials.
EXISTING GRADE:	The ground surface configuration prior to grading; original grade.
FILL:	Any deposit of soil, rock, soil-rock blends, or other similar materials placed by man.
FINISH GRADE:	The as-graded ground surface elevation that conforms to the grading plan.
GEOFABRIC:	An engineering textile utilized in geotechnical applications such as subgrade stabilization and filtering.
GEOTECHNICAL CONSULTANT:	The geotechnical engineering and engineering geology consulting firm retained to provide technical services for the project. For the purpose of these specifications, observations by the geotechnical consultant include observations by the geotechnical engineer, engineering geologist and other persons employed by and responsible to the geotechnical consultant.

GEOTECHNICAL ENGINEER: A licensed civil engineer and geotechnical engineer, registered by the state licensing agency, who applies scientific methods, engineering principles, and professional experience to the acquisition, interpretation, and use of knowledge of materials of the earth's crust to the resolution of engineering problems. Geotechnical engineering encompasses many of the engineering aspects of soil mechanics, rock mechanics, geology, geophysics, hydrology, and related sciences.

GRADING: Any operation consisting of excavation, filling, or combinations thereof and associated operations.

LANDSLIDE DEPOSITS: Material, often porous and of low density, produced from instability of natural or manmade slopes.

OPTIMUM MOISTURE: The moisture content that is considered optimum relative to correction operations obtained from ASTM test method D 1557.

RELATIVE COMPACTION: The degree of compaction (expressed as a percentage) of a material as compared to the dry density obtained from ASTM test method D 1557.

ROUGH GRADE: The ground surface configuration at which time the surface elevations approximately conform to the project plan.

SHEAR KEY: Similar to a subsurface buttress; however, it is generally constructed by excavating a slot within a natural slope in order to stabilize the upper portion of the slope without encroaching into the lower portion of the slope.

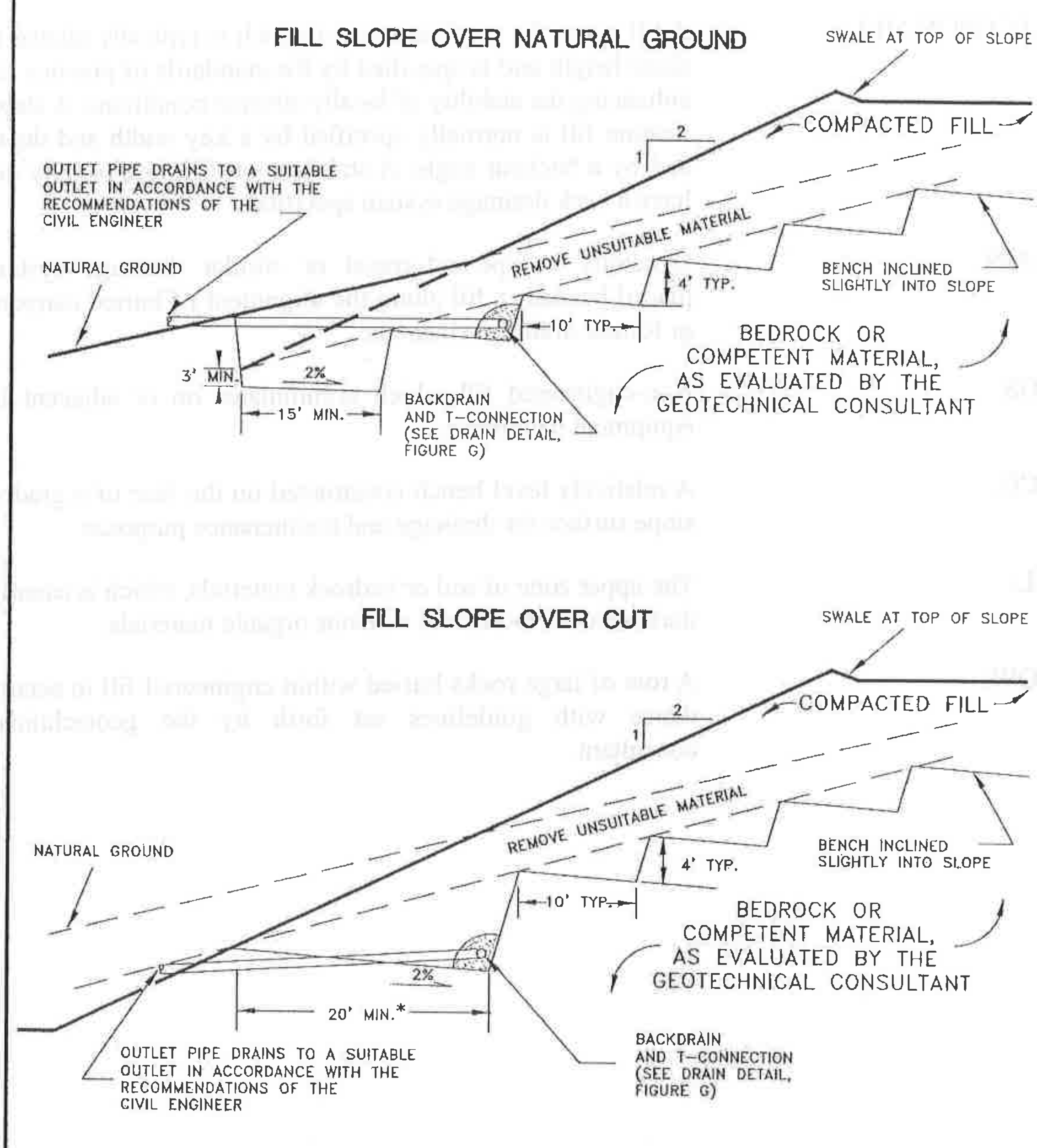
SITE: The particular parcel of land where grading is being performed.

SLOPE: An inclined ground surface, the steepness of which is generally specified as a ratio of horizontal units to vertical units.

SLOPE WASH: Soil and/or rock material that has been transported down a slope by gravity assisted by the action of water not confined to channels (see also Colluvium).

SLOUGH: Loose, uncompacted fill material generated during grading operations.

SOIL:	Naturally occurring deposits of sand, silt, clay, etc., or combinations thereof.
STABILIZATION FILL:	A fill mass, the configuration of which is typically related to slope height and is specified by the standards of practice for enhancing the stability of locally adverse conditions. A stabilization fill is normally specified by a key width and depth and by a backcut angle. A stabilization fill may or may not have a back drainage system specified.
SUBDRAIN:	Generally a pipe-and-gravel or similar drainage system placed beneath a fill along the alignment of buried canyons or former drainage channels.
TAILINGS:	Non-engineered fill which accumulates on or adjacent to equipment haul roads.
TERRACE:	A relatively level bench constructed on the face of a graded slope surface for drainage and maintenance purposes.
TOPSOIL:	The upper zone of soil or bedrock materials, which is usually dark in color, loose, and contains organic materials.
WINDROW:	A row of large rocks buried within engineered fill in accordance with guidelines set forth by the geotechnical consultant.



*MINIMUM KEY WIDTH DIMENSION. ACTUAL WIDTH SHOULD BE PROVIDED BY GEOTECHNICAL CONSULTANT BASED ON EVALUATION OF SITE-SPECIFIC GEOTECHNICAL CONDITIONS.

NOTES: CUT SLOPE SHALL BE CONSTRUCTED PRIOR TO PLACEMENT OF FILL.
SLOPE DRAINAGE SHOULD BE PROVIDED IN ACCORDANCE WITH RECOMMENDATIONS PRESENTED ON FIGURE E

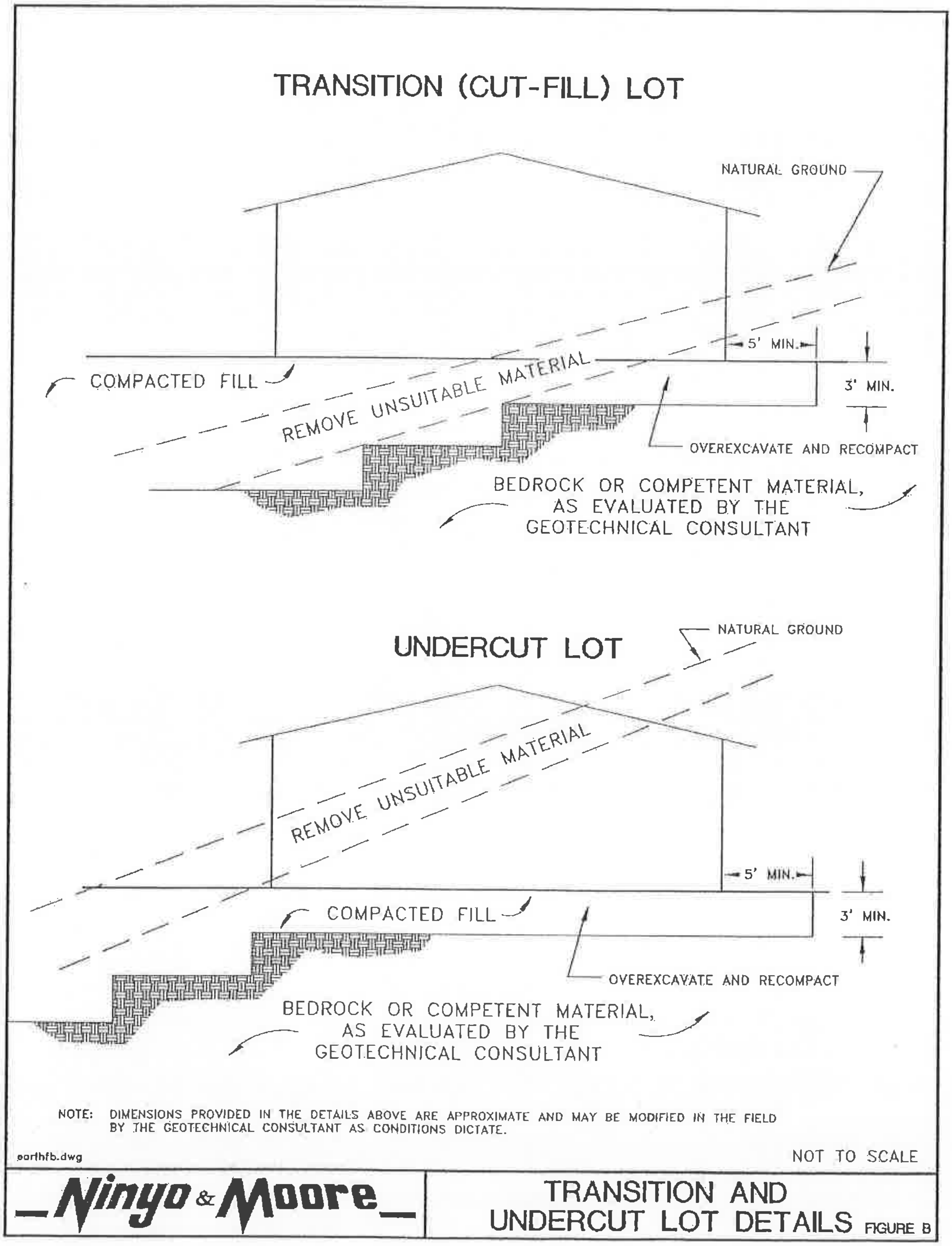
earthfa.dwg

NOT TO SCALE

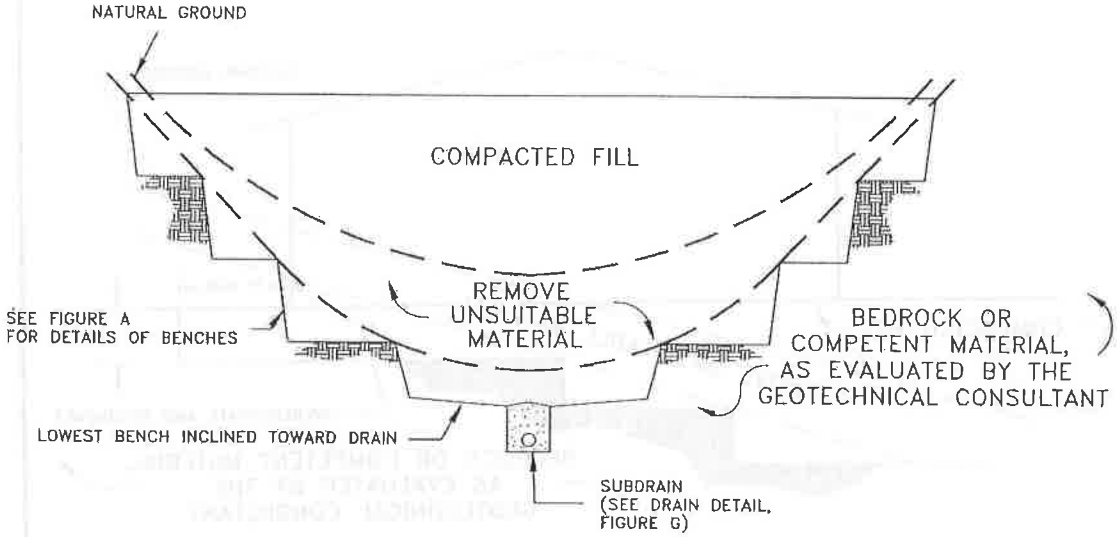
Ninyo & Moore

FILL SLOPE OVER NATURAL GROUND OR CUT

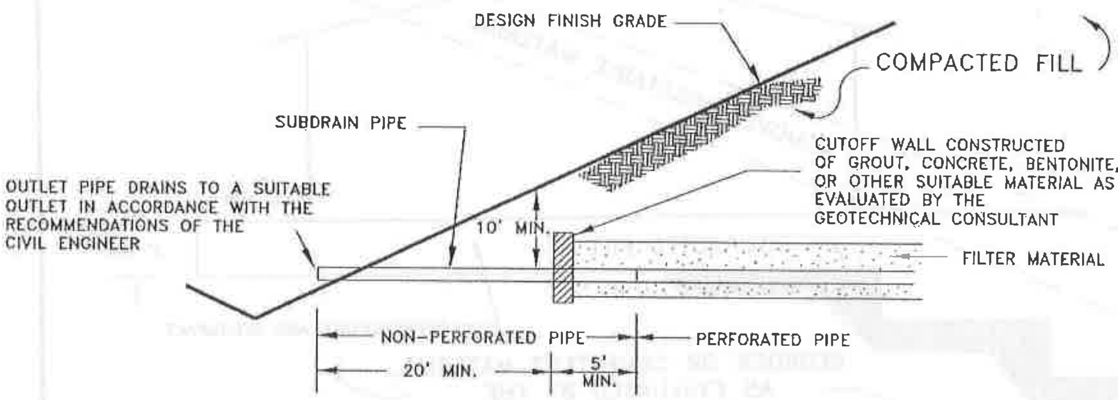
FIGURE A


TRANSITION (CUT-FILL) LOT
NATURAL GROUND
REMOVE UNSUITABLE MATERIAL
5' MIN.
COMPACTED FILL
3' MIN.
OVEREXCAVATE AND RECOMPACT
BEDROCK OR COMPETENT MATERIAL, AS EVALUATED BY THE GEOTECHNICAL CONSULTANT
UNDERCUT LOT
NATURAL GROUND
REMOVE UNSUITABLE MATERIAL
5' MIN.
COMPACTED FILL
3' MIN.
OVEREXCAVATE AND RECOMPACT
BEDROCK OR COMPETENT MATERIAL, AS EVALUATED BY THE GEOTECHNICAL CONSULTANT
NOTE: DIMENSIONS PROVIDED IN THE DETAILS ABOVE ARE APPROXIMATE AND MAY BE MODIFIED IN THE FIELD BY THE GEOTECHNICAL CONSULTANT AS CONDITIONS DICTATE.
earthfb.dwg
NOT TO SCALE
Ninyo & Moore
TRANSITION AND UNDERCUT LOT DETAILS
FIGURE B

CANYON SUBDRAIN



DETAIL OF CANYON SUBDRAIN TERMINATION



earthfc.dwg

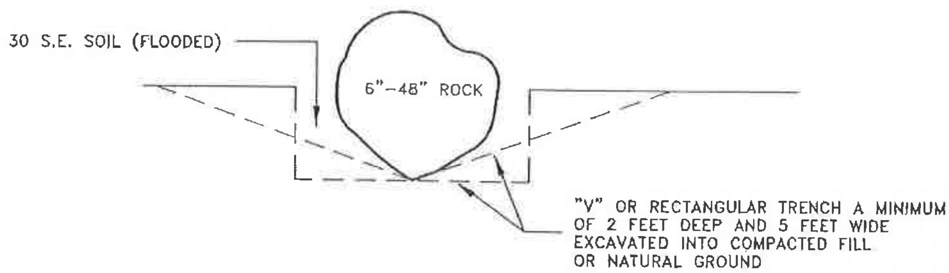
NOT TO SCALE

Ninyo & Moore

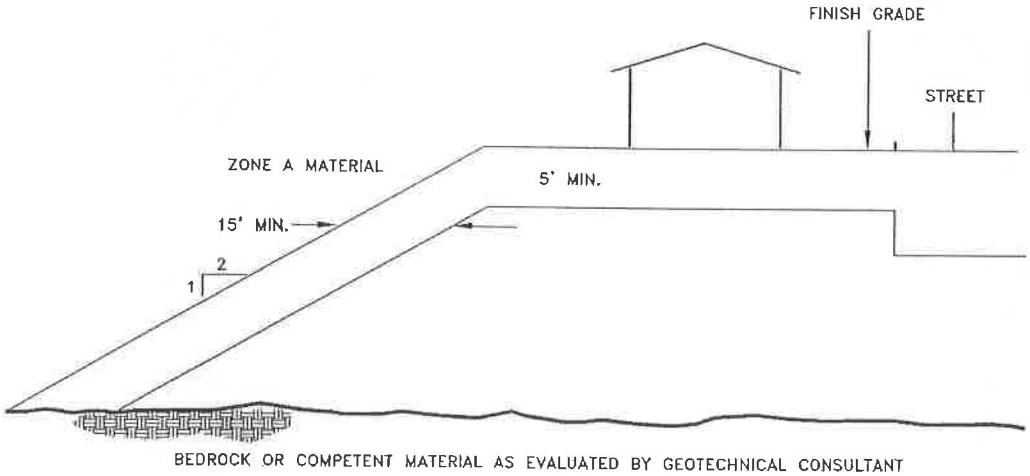
CANYON SUBDRAIN DETAIL

FIGURE C

WINDROW SECTION



PAD SECTION



ZONE A: COMPACTED FILL WITH ROCK FRAGMENTS NO GREATER THAN 6 INCHES IN DIAMETER.

ZONE B: COMPACTED FILL WITH ROCK FRAGMENTS BETWEEN 6 AND 48 INCHES IN DIAMETER MAY BE PLACED IN STAGGERED WINDROWS UP TO 100' LONG IN THIS ZONE AND SURROUNDED BY GRANULAR SOIL (30 SAND EQUIVALENT) DENSIFIED BY FLOODING. ROCK FRAGMENTS LESS THAN 6 INCHES IN DIAMETER MAY BE PLACED IN COMPACTED FILL SOIL.

earthfd flat.dwg

NOT TO SCALE

Ninyo & Moore

OVERSIZED ROCK PLACEMENT DETAIL

FIGURE D