Preliminary Geotechnical Report

Hall Property
Encinitas, California

July 13, 2010
Geopacifica, Inc.

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July 13, 2010

City of Encinitas
Parks and Recreation Department
555 Vulcan Avenue
Encinitas, California 92024

Attention: Mr. John Frenken

Subject: Preliminary Geotechnical Investigation
Hall Property
425 Santa Fe Drive
Encinitas, California

References: See Appendix A

Dear Mr. Frenken:

INTRODUCTION

The following report summarizes the findings of our geologic and soils engineering investigation of performed on the subject property. The general location of the site is along the west side of I-5, south of Santa Fe Drive and north of Caretta Way (See Figure 1, Location Map) in Encinitas, California The purpose of this investigation was to assess the existing soil and geologic information at the property, perform a subsurface investigation and laboratory testing of obtained soil samples and provide geotechnical analysis and information on the composition, nature and integrity of the existing soils with regard to the proposed grading, development, retaining walls, improvements and proposed vertical seepage pits. This report provides recommendations and parameters with respect to the current design requirements.

This report is prepared for the use of the client, authorized agents, and should not be considered transferable. Before use and implementation for construction, Geopacifica should review the proposed development plans and specifications to insure compliance with the provisions and recommendations of this report. Following the review, additional work may be required to update this report.

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INTENT

The intent of this report is to aid in the design and in the completion of the project. Implementation of the advice presented in the "Conclusions and Recommendations" section of this report is presented to reduce the risk of damage to the existing and proposed improvements at the property. The professional opinions and geotechnical advice contained in this report are not intended to imply approval of the project or guarantee that unanticipated conditions will not be discovered during or after construction.

SCOPE

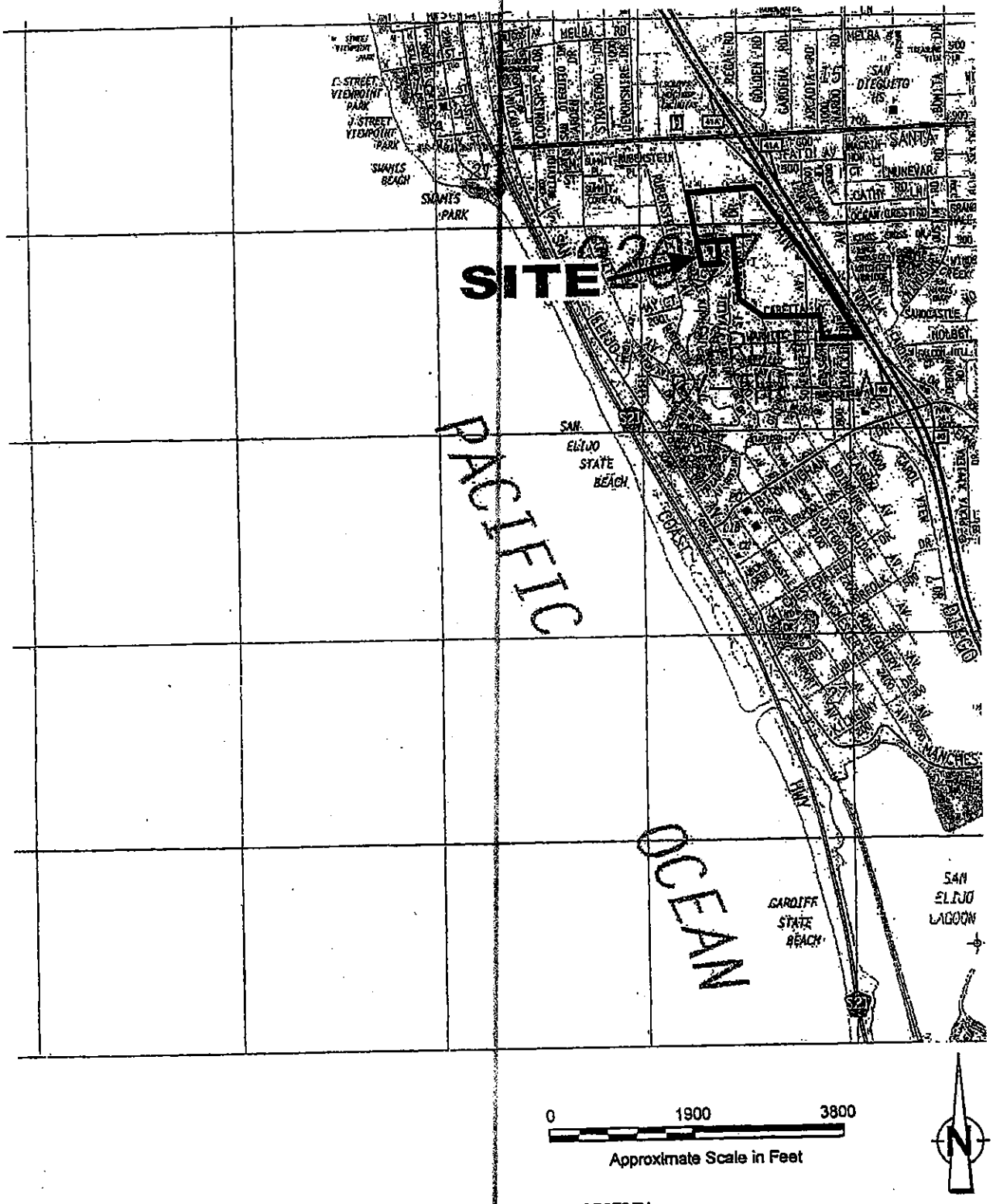
The scope of our investigation is limited to the area explored, which is shown on the site plan, Figure 1.

This investigation included the following:

- Review of pertinent, available geotechnical literature including topographic maps, aerial photographs, and existing environmental and geologic reports. Documents pertaining to the site vicinity, as well as documents reviewed for our site evaluation are listed in Appendix A-References.
- Geologic reconnaissance of the project study area, which included written and photographic documentation of the observed site conditions.
- Subsurface investigation consisting of the excavation of 22 backhoe pits to a maximum depth of 12 feet, two borings drilled to a maximum depth of 20 feet and three percolation test borings drilled to a maximum depth of 10 feet.
- Laboratory testing of bulk and relatively undisturbed soil samples obtained from the test pits and borings to determine the index properties of the soils (type, strength, etc.)
- Percolation testing of the native soils to evaluate the percolation rate for possible stormwater mitigation.
- Analysis and preparation of the report presenting conclusions and recommendations for the development of this site.

SITE LOCATION/DESCRIPTION

The project site consists of approximately 43 acres in the city of Encinitas which was formerly used as a commercial nursery. The property consists of an irregularly shaped parcel bounded by Interstate Highway 5 to the east, Santa Fe Plaza shopping center (and Santa Fe Drive) to the north, and residential properties to the south and west. All of the previously existing greenhouse structures have been demolished and all of the existing structures have been demolished.



REFERENCE: 2004 THOMAS GUIDE FOR SAN DIEGO COUNTY, STREET GUIDE AND DIRECTORY

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SITE LOCATION MAP

HALL COMMUNITY PARK
ENCINITAS, CALIFORNIA

PROJECT NO.	DATE

FIGURE 1

The site is relatively flat, with elevations generally between 180 feet above mean sea level (MSL) on the northern side of the site to approximately 220 feet MSL on the southern side of the site. Vegetation is generally limited to a light growth of grass and weeds on most areas of the site with some scattered bushes and trees. There are large stockpiles of recycled material on the southern portion of the site which was processed during the demolition of the site;

PROPOSED IMPROVEMENTS/PROJECT DESCRIPTION

Civil information regarding the project was provided by Ms. Stephanie Kellar of the City of Encinitas. Preliminary plans for the improvements to the existing area were utilized for the purposes of this report, subsurface investigation and preparation of the site plan.

Plan for the improvement of the Hall Community Park will consist of converting the former nursery site to a community park including a meeting center, baseball, soccer and other playing fields, basketball courts, picnic areas, walking trails, paved parking, extensive hardscape areas and drives. A new bridge for entry to the park will also be constructed over Interstate 5 to replace the existing Mackinnon Avenue Bridge. Details of the future grading indicate cuts and fills of from 5-10 feet. Because of the size of the park, recommended remediation measures and the actual design the actual amount of grading in cubic yards will be large.

GEOLOGY

The following sections present our findings relative to regional geology, site geology, groundwater, faulting and seismicity.

Regional Geologic Setting

The project area is situated in the coastal section of the Peninsular Ranges Geomorphic Province. This geomorphic province encompasses an area that expands approximately 900 miles from the Transverse Ranges and the Los Angeles Basin to 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 portion of the province that includes the project area consists generally of Tertiary- and Quaternary-age sedimentary rock.

The Peninsular Ranges Province is traversed by a group of sub-parallel faults and fault zones trending roughly northwest. Several of these faults, which are shown on Figure 3, Fault Location Map, are considered active faults. The Whittier-Elsinore, and San Jacinto faults are active fault systems located northeast of the project area and the

Rose Canyon, Agua Blanca-Coronado Bank and San Clemente faults are active 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.

Site Geology

Based on our literature review, including published geologic maps, and our field recommendations, the project site is generally underlain by fill ,terrace deposits and bedrock of the Del Mar Formation. The fill was placed in a pre-existing drainage extending from I-5 to an existing residential development (See Figure 2). Relatively shallow fills associated with the previous agricultural activity is present on various parts of the property (See Figure 2). The fill appears uncompacted. The remainder of the property is underlain by Terrace Deposits. The on-site materials observed by our field reconnaissance and supported by our subsurface investigation consist generally of light reddish brown to brown, weakly cemented, silty fine-grained sand and silty sand. The fill soils are derived from the Terrace Deposits. Not exposed onsite but encounter at 10-feet in Boring No. 1 was brown sandy siltstone of the Miocene Del Mar Formation.

Based on our review of published geologic maps and historic aerial photographs, as well as our site reconnaissance, no landslides or active faults were observed at the project site. Active faulting, however, has been mapped in the site region and could potentially impact the project site. A more detailed discussion of faulting and seismicity is presented in the Faulting and Seismicity section of the report.

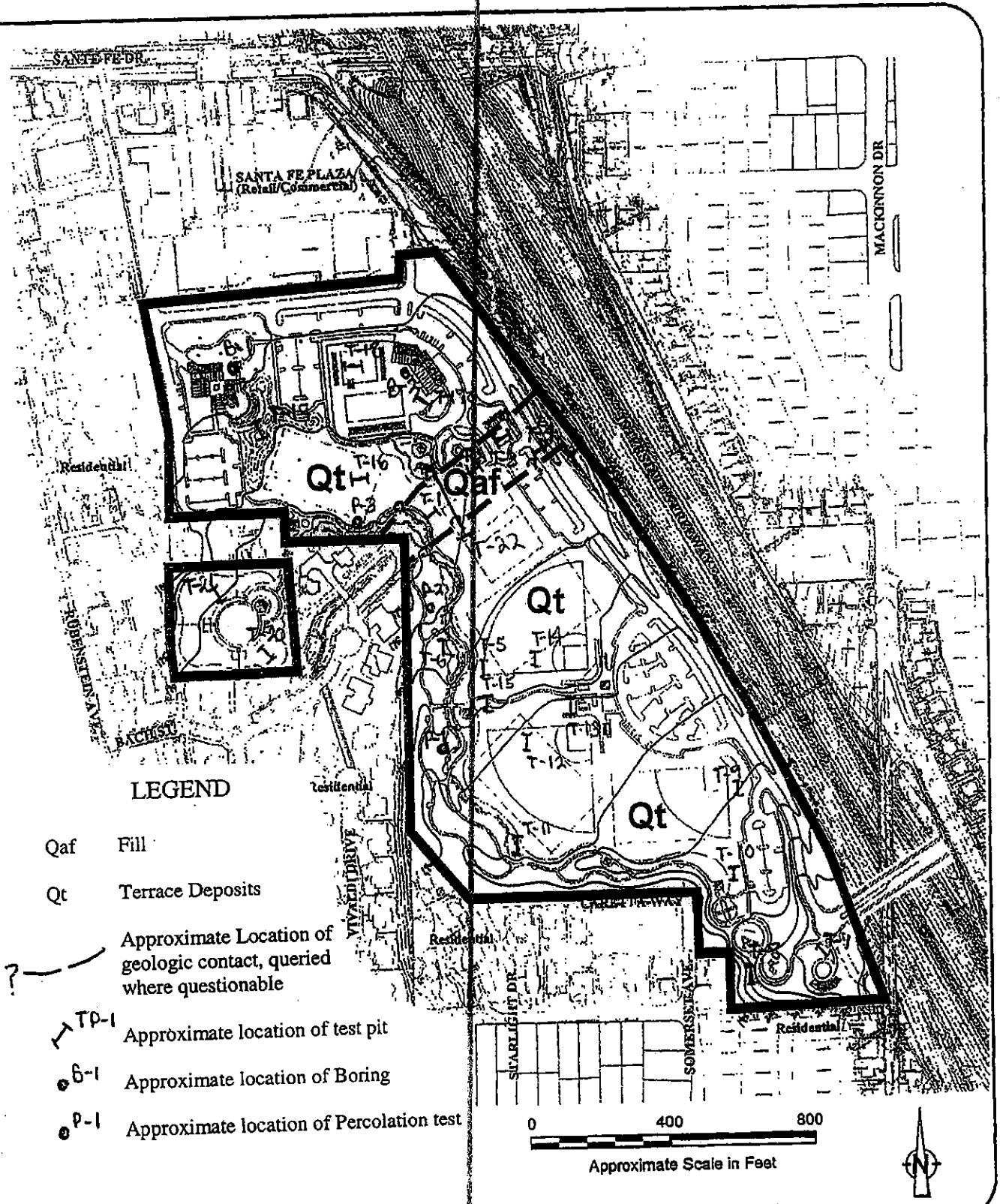
GROUNDWATER

Groundwater was not encountered in any of our borings or test pits. Based upon our investigation, investigations by others in the area and our experience with projects in adjacent areas, ground water will not be encountered on this project and is in excess of 100 feet below the ground surface. This does not preclude the possibility of seasonal perched groundwater due to heavy rainfall, irrigation or offsite water leakage.

FAULTING AND SEISMICITY

The project site is considered to be in a seismically active area. Based on our review of the referenced reports and geologic maps, as well as on our geologic field reconnaissance, the project site is not underlain by known active faults (i.e., faults that exhibit evidence of ground displacement during the last 11,000 years). The Rose Canyon Fault has been mapped approximately 2.5 miles west of the site.

Seismic hazards at the site are anticipated to be caused by ground shaking during



REFERENCE: PRELIMINARY GRADING STUDY, HALL PROPERTY CONCEPTUAL PLAN, CITY OF ENCINITAS., RJM DESIGN GROUP, INC.

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HALL COMMUNITY PARK
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FIGURE 2.

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seismic events on regional active faults. Figure 3 shows the locations of known active faults within 100 kilometers of the site. Commercially-available computer software was used to evaluate potential seismicity at the site. These programs determine the distance between the site and known faults based on the latitude and longitude of the site.

Deterministic Analysis: The program EQFAULT (Blake, 2000) was used to perform a deterministic seismic analysis of known active faults within 100 kilometer of the site. Deterministic analysis is conducted by assuming that each fault will rupture at the nearest distance to the site. The results do not have substantial statistical significance, but they are useful for indicating the relative contribution of each of the nearby faults to the total seismic risk at a site.

Probabilistic Analysis: The program FRISKSP (Blake, 200) was used to perform a probabilistic seismic analysis to estimate the potential peak ground acceleration (PGA) that structures at the site may experience. The analysis was conducted using the characteristic earthquake distribution of Youngs and Coppersmith (1985). An attenuation relationship for rock sites (Sadigh et at, 1997) was used. Based on the results of the analysis, the Design Basis Earthquake, defined as the ground motion having a 10 percent probability of being exceeded in 50 years (or a 475-year return period), is 0.34g. the Upper Bound Earthquake, defined as the ground motion having a 10 percent probability of being exceeded in 100 years (or a 949-year return period), is 0.51g.

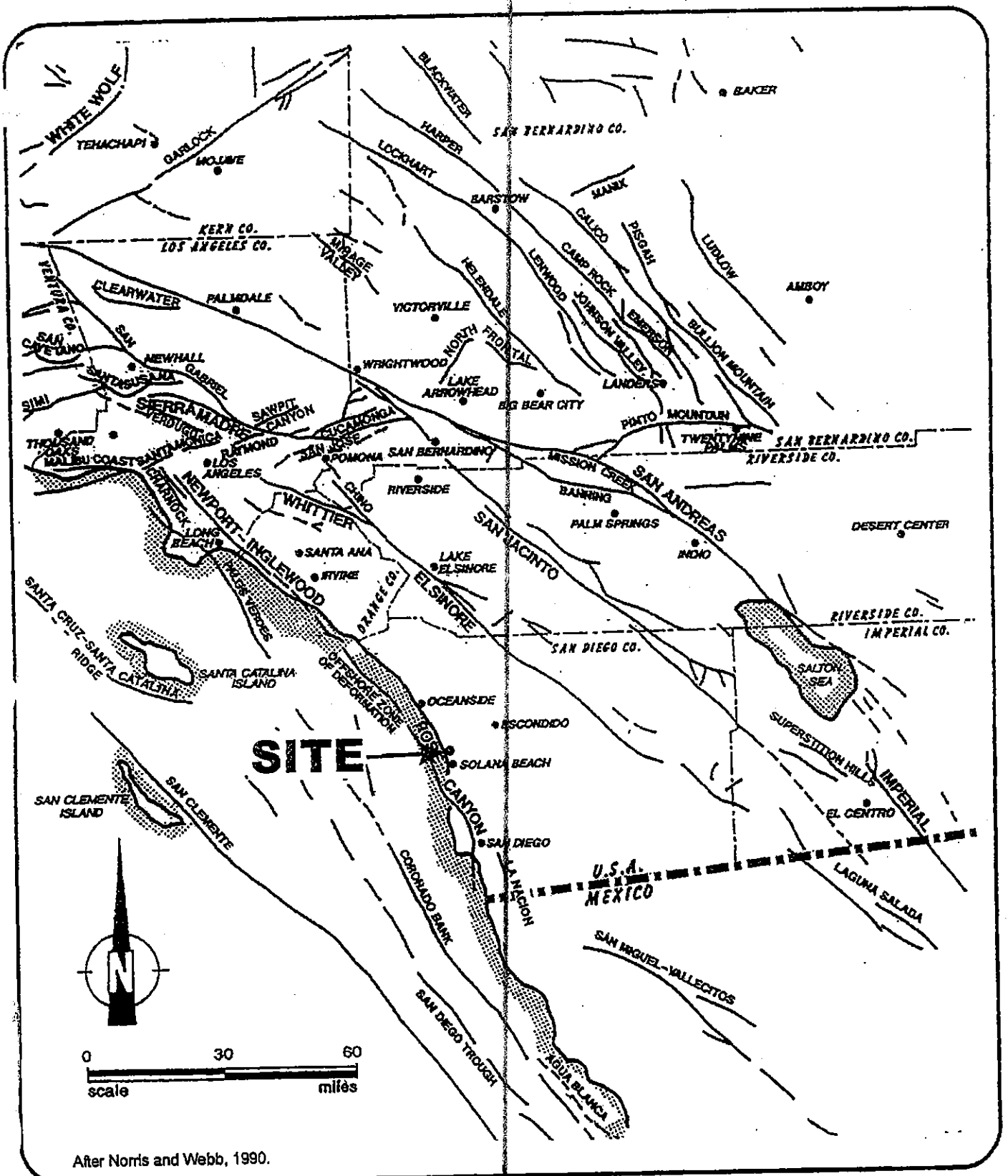
In general, hazards associated with seismic activity in the project area include strong ground motion, ground surface rupture, liquefaction, and seismically induced settlement. These potential hazards are discussed in the following sections.

Liquefaction, Seismically Induced Settlement, and Lateral Spreading

Liquefaction of cohesionless soils can be caused by strong vibratory motion due to earthquakes. Research and historical data indicate that loose granular soils and non-plastic silts that are saturated by a relatively shallow groundwater table are susceptible to liquefaction. Based on the dense nature of the subsurface materials and the lack of a groundwater table in the near surface, it is our opinion that the potential for liquefaction at the site is not a design consideration.

Landslides and Slope Stability

Landslides are deep-seated ground failures in which a large, accurate-shaped section of slope detaches and slides downhill. Landslides are not to be confused with minor slope failures (slumps), which are usually limited to the topsoil zone.



After Norris and Webb, 1990.

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FAULT LOCATION MAP

HALL COMMUNITY PARK
ENCINITAS, CALIFORNIA

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FIGURE 3

Based on the site geology and low-relief topographic conditions, it is our opinion that the hazard with respect to landsliding and slope instability is considered low.

SUBSURFACE EXPLORATION

The scope of our exploration has been based upon the information presented to us by the City of Encinitas. The scope of our investigation is limited to the area explored shown on the enclosed plot plan, Figure 2.

The site was explored on June10 and 14, 2010 with the aid of a rotary auger drill rig and a rubber-tired backhoe. 5 Exploratory Auger holes were drilled to depths ranging from approximately 5 feet to a depth of 20 feet below existing grades. 22 exploratory test pits were excavated from 4 feet to a depth of 12 feet below existing grades

The project engineer/geologist performed observation of the earth materials exposed in the excavations and provided written description of those observations onto the logs of the borings and test pits. Samples of the earth materials were secured, labeled, and returned to the laboratory for testing and analysis. Available geologic and soils engineering reports for the area were reviewed, including Geopacifica reports near the site.

The description of the different earth materials observed within the exploratory test excavations are shown on the logs of excavations in Appendix B, Logs of Borings and Test Pits.

The exploratory excavations were backfilled following our logging and sampling.

EARTH MATERIALS

GEOPACIFICA notes that the included Logs and descriptions reflect conditions at a particular time and location only, and subsurface conditions at other areas not explored may differ from those presented herein. Similarly, the soil profiles reflect conditions at a particular time and location only; different subsurface conditions may be encountered in other areas, which were not specifically explored as part of this project.

The soils excavated appear to divided into three categories:

1. Topsoil – The upper 6-inches in most areas consist of dry, loose, silty sand.
2. Fill – From 4 to 12 feet of soil derived from the Terrace Deposits are scatter over the site.
3. Terrace Deposits – Terrace Deposits exist across the site to the depths explored in both the Borings and Test pits. The Terrace Deposits consisted of brown and reddish brown sand, clayey sand and silty sand. The deposits were loose to medium dense and from dry to slightly moist.

4. Del Mar Formation – Bedrock of the Del Mar Formation was encounter at a depth of 10 feet in Boring No. 1. The Del Mar Formation consists of brown, sandy siltstone and is slightly moist and medium dense to dense.

The fill soils encountered during our exploration consist of dry, poorly compacted silts and sand mixtures. The upper topsoils consisted of loose to medium dense silty sands, silts minor clay seams underlain by medium dense to dense silty sand and clayey sands.

LABORATORY TESTING

Samples of representative earth materials were obtained from the exploratory excavations and transported to the laboratory for further testing and analysis. Please refer to the Appendix C detailing the laboratory testing procedures and results of testing.

The strength of the soils was determined by analyzing the laboratory results. The compaction character of the materials when used as compacted fill was determined by performing compaction tests in accordance with test method ASTM D:1557. The results of Laboratory testing are shown in the Appendix or on the Logs of Borings presented in Appendix B.

CONCLUSIONS AND RECOMMENDATIONS

General Findings

From a geotechnical engineering standpoint, it is our opinion that the subject site is suitable for its intended use and for the proposed development, provided the recommendations presented herein are implemented in design and construction of the project.

Recommendations

The following are our general recommendation for preparation of the site for development:

1. With the exception of strong seismic shaking, no significant geologic hazards were observed or are known to exist on the site that would adversely affect the proposed project.
2. Our field investigation indicated that the site is underlain by undocumented fill, topsoil and bedrock consisting of Terrace Deposits and the Del Mar Formation. The undocumented fill, topsoil and the upper portion(approximately 1-2 feet of the Terrace Deposits within the areas of planned development are not considered

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suitable for support of structural fill or structural loads in their present condition and will require remedial grading. Once remedial measures are performed these soils are suitable for reuse as fill and will be suitable to support any intended structure or other use.

3. Groundwater is not considered a factor in development and will not be encounted.
4. Based upon our review the proposed grading will be a "balanced" grading operation and import soils will not be necessary.
5. The proposed structures can be supported on conventional foundations and slab-on-grade foundations or a post tensioned foundation system.
6. The recycled material stockpiled on the site will be suitable for use as Class II base on any proposed streets, drives or hardscape.

Excavation and Soil Characteristics

1. The soil encountered in the field investigation is considered to have a "very Low" to "low" expansion potential (Expansion Index (EI) of 50 or less) as defined by Uniform Building Code (UBC) Table No. 18-1-B. Recommendations presented herein assume that the site well be graded such that soil with an EI of 50 or less will be present to a minimum depth of 3 feet below finish grade. If soil with an EI of greater than 50 is exposed near finish grade, modifications to recommended presented herein may be required.
2. Based upon the results of the field investigation and our experience the general area. The surficial soil can be excavated with moderate to heavy effort using conventional heavy-duty excavation equipment. Excavations within the Terrace Deposits will generally vary in difficulty depending on the depth and location of excavation.
3. We tested samples to determine the percentage of water-soluble sulfate content. Results from the test are presented in Appendix C and indicate that the sample posses "negligible" sulfate exposure to concrete structures as defined by UBC Table 19-A-4

Seismic Foundation Consideration (2007 CBC)

The site soil profile is Class D. The structural engineer should consider City/county local codes. California Building Code (CBC), seismic data presented in this report, the latest requirements of the Structural Engineers Association, and any other pertinent data in selecting design parameters. Table 2 presents those parameters.

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Table II

2007 CBC – SEISMIC PARAMETERS

Mapped Spectral Response Acceleration	S_S = 1.360g	S_1 = 0.510g
Site Coefficients (Class "D")	Fa = 1.00	Fv = 1.0
Maximum Considered Earthquake (MCE) Spectral Response Acceleration	S_{MS} = 1.360g	S_{M1} = 0.510g
Design Spectral Response Acceleration Parameters	Sps = 0.907g	S_{D1} = 0.340g
Seismic Design Category	D	

References:

- Earthquake.usgs.gov/research/hazmaps/design
- 2007 California Building Code, California Code of Regulations, Title 24, Part 2, Volume 2 of 2, Section 1613, Earthquake Loads

Site Preparation

In the areas to have improvements, all parking areas, drives, building areas, hardscape areas and retaining wall, the area should be overexcavated 2-feet and recompacted to a minimum of 90% relative compaction. In the area of paving, the upper 1 foot (subgrade) should be compacted to a minimum of 95% relative compaction.

In the areas of uncompacted fill the fill should be removed down to competent Terrace Deposits, the area scarified, watered and compacted, and the soil placed and recompacted to a minimum of 90% relative compaction. General grading recommendations are presented in Appendix D.

Earthwork and Grading (General)

Grading should be performed in accordance with the City of Encinitas Grading Ordinance, San Diego Regional Water Quality Control Board, the Grading and Earthwork Guidelines appended herein, and the latest edition of the Uniform Building Code (UBC). These specifications should be considered the project grading specifications.

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Prior to placing fill for structure support, all undocumented fill, loose, soft, porous, or other unsuitable soils should be removed to competent natural and replaced as properly engineered, compacted fill to the depth specified. After excavating as required, the exposed sub grade materials should be carefully observed by the City of Encinitas and our representative to verify the removal of all unsuitable deposits.

Subsequently, the exposed materials should be scarified to a depth of six inches (6"), brought to near-optimum moisture content, and compacted to a minimum of 90 percent of maximum dry density obtainable by the ASTM Designation D1557 method of maximum soil density testing.

To reduce the potential for differential of the compacted fill, pads that will receive structures and have a cut/fill transition should be undercut at least three feet and replaced with properly compacted fill.

No rocks or oversized material (> 6 inches) shall be placed within the upper 3 feet of the finish surface.

Earthwork Grading Factors

Estimates of embankment bulking and shrinkage factors are based on comparing laboratory compaction tests with the density of the material in its natural state as encountered in the exploratory excavations. Variations in natural soil density, as well as in compacted fill density, render shrinkage value estimates very approximate. Based upon our limited work performed to date, the shrinkage and bulking factors listed in Table III can be used as a basis for estimating the extent to which the on-site soils may shrink or swell(bulk) when excavated from their natural state and placed as compacted fills.

TABLE III

Soil Unit	Approximate shrink/Bulk Factor
Surficial Soil/Upper Terrace	10-15 Percent shrink
Uncompacted Fill	5-10 Percent shrink
Terrace Deposits	5-10 Percent bulk

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Foundation and Concrete Slabs-On-Grade Recommendations

The following foundation recommendations are for single story structures and are based upon being either on native Terrace Deposits or on compacted fill having an EI of less than 50.

The recommended design bearing value for supporting structures is 2000 pounds per square foot(PSF). The allowable pressures may be increased by one-third when considering loads of short duration such as wind or seismic forces.

Lateral forces can be resisted by a combination for lateral bearing pressure and lateral sliding resistance. Values of 150 psf/foot of embedment and 0.35 can be used for lateral bearing and the coefficient of lateral sliding, respectively. In combining the total lateral resistance, the passive pressure or the frictional resistance should be reduced by 50 percent. We recommend that the first foot of soil be neglected in the passive resistance calculations if the ground surface is not protected from erosion or disturbance by a slab, pavement or in some similar manner.

We recommend a minimum footing embedment of 18-inches with a minimum of two No. 4 bars, one placed near the top of the footing and one place near the bottom. The minimum recommended width of the footing is 12-inches. Footings should be designed in accordance with the structural engineer's requirements.

We recommend that the slab-on-grade be a minimum of 5-inches thick and reinforced with No. 3 reinforcing bars spaced 18 inches on center in both directions. The reinforcing steel should be placed in the upper 1/3 of the slab with at least 1 inch of concrete cover.

Vapor Transmission Through Slab

It is normal for the soil moisture content beneath slabs-on-ground to increase over time. Concrete slabs are permeable and moisture beneath the slab unless protective measures are taken. Capillary break layers and vapor barriers are commonly placed below slabs to limit vapor transmission through floor slabs where moisture sensitive flooring will be present. Appropriate design considerations and construction methods can reduce the amount of moisture beneath the slab. Specification of these items is not a geotechnical issue and should be addressed on the foundation plans by the structural engineer or architect.

We generally recommend that where moistures sensitive flooring is planned, the structural engineer or architect should consider specifying slab underlayment that is consistent with current recommendations and guidelines published by the American Concrete Institute (ACI) and Post-Tensioning Institute (PTI). Items that should be considered include the following:

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- Placement of a capillary break layer consisting of a minimum of 4 inches of compacted clean concrete sand or ¾" crushed rock beneath slabs.

- Placement of a plastic vapor retarder below the slab.

- Whether the slab will be poured directly on the vapor retarder or on la layer of sand will be placed above the vapor retarder[1].

- Use of concrete admixtures, application of a curing compound and/or temporary covering of plastic sheeting to minimize the potential for differential drying and slab curl.

Retaining Walls

The recommended design bearing value for supporting structures is 2,500 pounds per square foot (PSF). Prior to design of any appurtenant structures this design value this office should be contacted for verification of the bearing soils for the proposed structures.

We recommend that site retaining walls be designed to resist a triangular distribution of lateral earth pressure. Retaining walls should be designed by the project structural engineer, using the geotechnical parameters provided below. Site retaining walls, the following design parameters may be used.

At-Rest Pressure:	Equivalent fluid pressure of 60pcf. Assumes level retained ground and restrained walls.
Active Pressure:	equivalent fluid pressure of 35pcf for level backfill or 55 pcf for 2:1 sloping backfill. Assumes retained compacted backfill, no hydrostatic pressure, and walls will yield at the top about 0.2 percent of the wall height.

In conditions other than those described above apply to the project, we should be contacted for additional design parameters. In addition to the recommended earth and hydrostatic pressures, walls adjacent to vehicular traffic should be designed to resist a uniform lateral pressure equal to about one-third of the surcharge loading behind the wall. Walls should contain an adequate subdrain to reduce hydrostatic forces as shown on Figure 2.

Backfilling retaining walls with expansive soils can increase lateral pressures well beyond the active or at-rest pressures indicated above. We recommend that retaining walls be backfilled with free-draining, cohesionless soil having an expansion index of 20

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or less. The backfill area should include the zone defined by a 1:1 plane projected upward from the heel of the wall. Retaining wall backfill should be compacted to at least 90 percent relative compaction, based on ASTM D 1557 guidelines. Backfill should not be placed until walls have achieved adequate structural strength. Heavy compaction equipment which could cause distress to walls should not be used.

Seismic Wall Design

We recommend that seismic retaining wall design be conducted using the Mononabe-Okabe solution which incorporates a pseudo-static horizontal load. A "repeatable" or multi-cyclic value of two-thirds the Upper Bound of Design Basis peak ground acceleration (0.19g to 0.29g) is often used by engineers for pseudo-static seismic design. However, because the pseudo-static load is not directly related to peak ground acceleration, many local and state agencies recommend using an arbitrary seismic coefficient ranging from 0.10g to 0.15g.

We have provided geotechnical parameters for seismic wall design based on pseudo-static loads of 0.10g and 0.15g. The project structural engineer should determine which values are appropriate for use at the site. The results of our analyses are presented in Figures 4a and 4b, note that in the Mononabe-Okabe solution, the seismic load is superposed on the classical triangular active pressure wedge. The seismic load may be idealized as an inverted triangular pressure distribution with the resultant acting at a height of 0.6H form the base of the wall.

The Mononbe-Olabe solution is based on active earth pressures, and requires that the retaining walls are free to yield about 0.2 percent of the wall height. For retaining walls, we recommend that the equivalent seismic pressures (ye) and the earthquake pressure resultants (Fe) shown in Figures 4a and 4b be added to the at-rest earth pressure for seismic design of any restrained retaining walls at the site which are restrained from movement.

Proposed Vertical Seepage Pits

It is the intent of the developer of the site to utilize vertical seepage pits to take care of some of the storm water runoff. Two percolation tests were conducted to a depth of 10 feet in the area of potential seepage pits. The following were the results of those tests:

Percolation test hole P-1 = 12 minutes per inch(mpi)

Percolation test hole P-2 = 5 minutes per inch(mpi)

For design purposes we recommend a percolation rate of 10 minutes per inch.

INPUT PARAMETERS

Unit Weight of Soil (γ) [pcf]:	120
Backfill Soil Friction Angle (ϕ) [°]:	30
Wall Friction Angle (δ) [°]:	20
Soil Backfill Angle (α) [°]:	0
Wall Batter Angle (β) [°]:	90
Horizontal Acceleration (K_h) [g's]:	0.10
Vertical Acceleration (K_v) [g's]:	0.00

Active Pressure Resultant: $F_a = 1/2\ \gamma_a H^2$

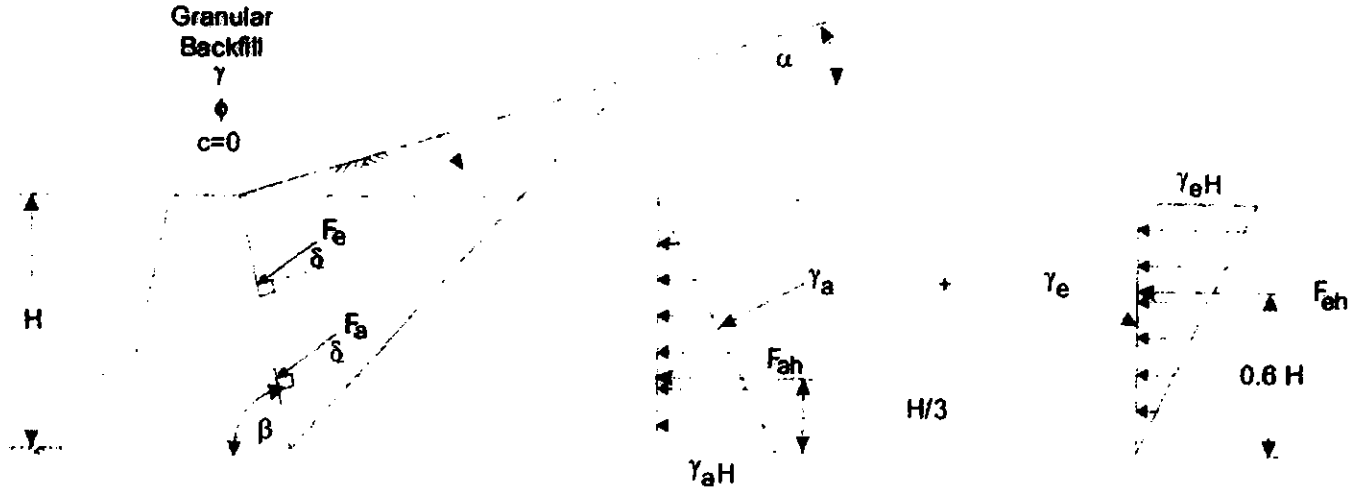
Earthquake Pressure Resultant: $F_e = 1/2\ \gamma_e H^2$

CALCULATED PARAMETERS

Active Pressure Coefficient (K_a):	0.35
Equivalent Fluid Pressure (γ_a) [pcf]:	42
Seismic Pressure Coefficient (K_{ae}):	0.43
Equivalent Fluid Pressure (γ_{ae}) [pcf]:	50
Equivalent Seismic Pressure (γ_e) [pcf]:	8

Horizontal Component of Active Pressure Resultant $F_{ah} = F_a \cos(\delta+90-\beta)$

Horizontal Component of Seismic Pressure Resultant $F_{eh} = F_e \cos(\delta+90-\beta)$



SEISMIC WALL LOADING (K_h = 0.10g)

FIGURE 4a

INPUT PARAMETERS

Unit Weight of Soil (γ) [pcf]:	120
Backfill Soil Friction Angle (ϕ) [°]:	30
Wall Friction Angle (δ) [°]:	20
Soil Backfill Angle (α) [°]:	0
Wall Batter Angle (β) [°]:	90
Horizontal Acceleration (K_h) [g's]:	0.15
Vertical Acceleration (K_v) [g's]:	0.00

CALCULATED PARAMETERS

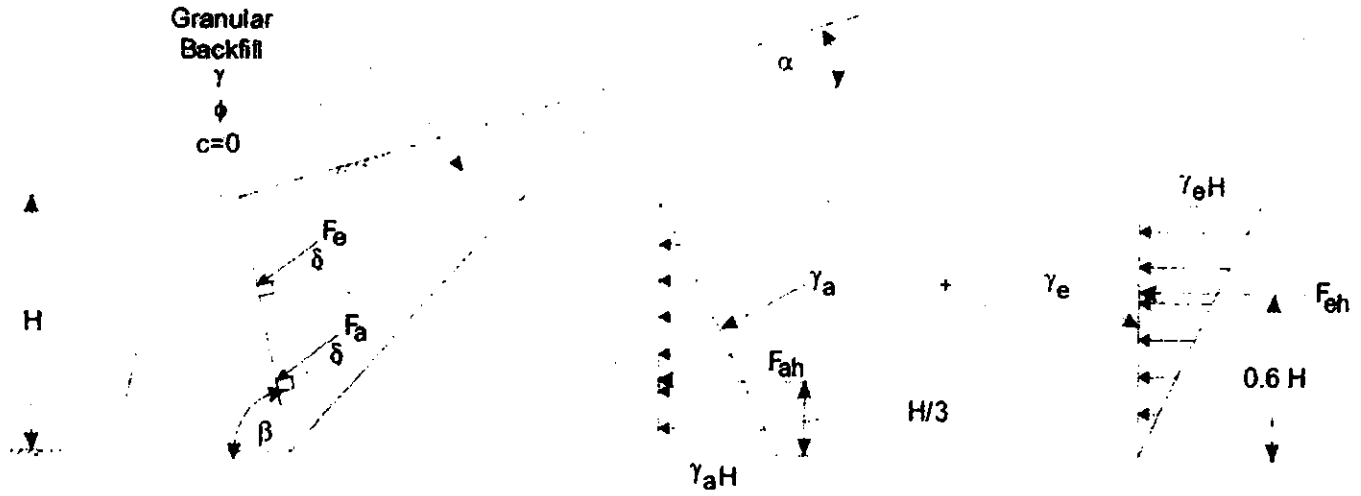
Active Pressure Coefficient (K_a):	0.35
Equivalent Fluid Pressure (γ_a) [pcf]:	42
Seismic Pressure Coefficient (K_{ae}):	0.47
Equivalent Fluid Pressure (γ_{ae}) [pcf]:	55
Equivalent Seismic Pressure (γ_e) [pcf]:	13

Active Pressure Resultant: $F_a = 1/2\ \gamma_a H^2$

Earthquake Pressure Resultant: $F_e = 1/2\ \gamma_e H^2$

Horizontal Component of Active Pressure Resultant $F_{ah} = F_a \cos(\delta+90-\beta)$

Horizontal Component of Seismic Pressure Resultant $F_{eh} = F_e \cos(\delta+90-\beta)$



SEISMIC WALL LOADING (K_h = 0.15g)

FIGURE 4.b

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For design of the seepage pit the Transmissivity of the site soil can be assumed to be:

T= 0.077 ft/min

And the hydraulic conductivity to be:

K = 3.89 x 10 cm/sec

If any additional information is needed, please contact this firm.

Subgrade, Subbase, and Aggregate Compaction

All aggregate base materials and subgrade materials where asphalt is to be placed on grade should be compacted to a minimum relative compaction of 95 percent of the laboratory standard. Subgrade areas underlying aggregate sections should also be compacted to a minimum relative compaction of 95 percent.

Flexible Pavement

In our pavement analysis, we have performed a single R-value test on a sample considered representative of the native silty and clayey sand encountered across the site. A laboratory R-value of 28 was obtained from the sample. Asphalt pavement designs presented in Table IV are based on an R-Value of 28 and a traffic index of 5. If Portland Cement Concrete Paving(PCC) is desired, Table V presents the minimum paving section. Any changes in traffic assumptions and indices will influence the recommended pavement sections accordingly.

Table IV

R-Value	Traffic Index	Asphalt Concrete (inches)	Aggregate Base Class II
28	5.0	4.0	6.0

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Table V

R-Value	Traffic Index	Portland Cement Concrete Paving	Aggregate Base
28	5.0	6.0	6.0

We recommend that the upper 12 inches of subgrade soil upon which the pavement section is to be placed be compacted to at least 95 percent relative compaction in accordance with ASTM D 1557 at 0 to 3 percent over optimum moisture content.

Site Observation

Any fill that is placed should be approved, tested and verified if used for engineered purposes. The geologist/engineer should observe excavations and temporary wall excavations. Should the observation reveal any unforeseen hazard, the geologist/engineer will provide additional recommendations.

Please advise GEOPACIFICA at least 48 hours prior to any required site visit. The approved plans and permits should be on the job site and available to the project consultant.

Please avoid misunderstandings or misinterpretation of this report by calling the project consultant with any questions.

LIMITATIONS

The materials observed on the project site appear to be representative of the area; however, soil and bedrock materials vary in character between excavations and natural outcrops or conditions exposed during site construction. Site conditions may vary due to seasonal changes or other factors.

Geopacifica assumes no responsibility or liability for work, testing or recommendations performed or provided by others. Since our recommendations are based the site conditions observed and encountered, and laboratory testing, our conclusion and recommendations are professional opinions, which are limited to the extent of the available data. Observations during construction are important to allow for any change in recommendations found to be warranted.

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These opinions have been derived in accordance with current standards of practice and no warranty is expressed or implied. Standards of practice are subject to change with time.

This opportunity to be of service is appreciated. Should you have any questions concerning this report or if we may be of further assistance, please do not hesitate to contact us.

Report prepared by:
GEOPACIFICA, INC

James F. Knowlton
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Enclosures: Site Location Map-Figure 1
Geotechnical Map-Figure 2
Fault Location Map-Figure 3
Seismic Retaining Wall Design – Figure 4a
Seismic Retaining Wall Design – Figure 4b
Appendix A – References
Appendix B - Boring Logs
Appendix C - Laboratory Testing
Appendix D - Recommendation Grading Procedures

APPENDIX A – REFERENCES

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

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Southern California Soil and Testing, 2003, Geotechnical Design Report, MacKinnon Avenue Bridge PSR/PR, Encinitas, san Diego County, California: dated September 2.

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United States Department of the Interior, Bureau of Reclamation, 1989, Earth Manual.

United States Geological Survey, 1967 (photo-revised 1975), Encinitas Quadrangle, California, San Diego County, 7.5-Minute Series (Topographic): Scale 1:24,000.

United States Geological Survey/California Geological Survey, 2003, Probabilistic Seismic Hazards Assessment Model for California.

AERIAL PHOTOGRAPHS

Source	Date	Flight	Numbers	Scale
USDA	4-11-53	AXN-8M	77 and 78	1:20.000

BACKHOE COMPANY: ATLAS | BUCKET SIZE: 24" | DATE: 6/10/10

DEPTH (FEET)	BAG SAMPLE	DENSITY TEST	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	SOIL CLASS. (U.S.C.S.)	SOIL DESCRIPTION
TEST PIT NO. 1						**ELEVATION 168**
0	X				SM	Fill Silty F-M sands, Reddish Brown, moist - v. moist, loose
						@2.5 - organics
5						@7.5 - roots, organics
					SC	Terrace Deposit Clayey Sands, Grey mottled brown - rootlets, v. moist, dense
10						BOB 9' No groundwater No Caving Backfilled
15						
TEST PIT NO. 2						**ELEVATION 172**
0					SM	Fill Silty F-M sands, Reddish Brown, moist, loose
						@4' - organics, woodchips, v.moist
5					SC	Terrace Deposit Clayey Sand, Greyish green, lighty mottled, loose, V.moist, rootlets porous
						@9' - moist Med. Dense - Dense
10						Dense
						BOT 12' No groundwater No caving Backfilled
15						

LOG OF TEST PITS

GEOPACIFICA | PROJECT NO. HALL PROPERTY | FIGURE NO. B-1

BACKHOE COMPANY: ATLAS | BUCKET SIZE: 24" | DATE: 6/10/10

TEST PIT NO. 3 — ELEVATION 175

DEPTH (FEET)	BAG SAMPLE	DENSITY TEST	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	SOIL CLASS. (U.S.C.S.)	SOIL DESCRIPTION
0					SM	Fill Silty Sand w/cobbles, reddish-brown, damp, loose @ 3' - broken irrigation pipe
5					SM	Terrace Deposit Silty F-M Sand w/some clay, damp, mod dense @ 6' - becoming moist, dense
10						BOT 7' No groundwater No caving
15						

TEST PIT NO. 4 — ELEVATION 174

DEPTH (FEET)	BAG SAMPLE	DENSITY TEST	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	SOIL CLASS. (U.S.C.S.)	SOIL DESCRIPTION
0					SM	Fill Silty Sand w/cobbles, reddish brown, damp-moist, m. dense @ 4' becoming v. moist
5					SM SC	Terrace Deposit Silty F-M sands w/some clay reddish brown mottled grey moist, dense
10						BOT 5' No groundwater No caving Backfilled
15						

LOG OF TEST PITS

GEOPACIFICA | PROJECT NO. HALL PROPERTY | FIGURE NO. B-2

BACKHOE COMPANY: ATLAS | BUCKET SIZE: 24" | DATE: 6/10/10

DEPTH (FEET)	BAG SAMPLE	DENSITY TEST	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	SOIL CLASS. (U.S.C.S.)	SOIL DESCRIPTION
TEST PIT NO. 5						**ELEVATION 185**
0					SM	Terrace Deposit Sandstone, Reddish Brown/mottled grey well indurated, moist, very dense
5						BOT 3' No groundwater No caving Backfilled
10						
15						
TEST PIT NO. 6						**ELEVATION 178**
0					SM/SC	Fill Silty Sand w/clay cobbles, reddish brown, damp, loose
5						@ 6' - roots, organics
					SM/SC	Terrace Deposit Silty F-M sands, some clay, lighty indurated, damp, firm.
10						@ 7' becoming well indurated, moist, V.Dense sandstone. BOT 7' No groundwater No caving Backfilled
15						

LOG OF TEST PITS

GEOPACIFICA | PROJECT NO. HALL PROPERTY | FIGURE NO. B -3

BACKHOE COMPANY: ATLAS | BUCKET SIZE: 24" | DATE: 6/10/10

DEPTH (FEET)	BAG SAMPLE	DENSITY TEST	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	SOIL CLASS (U.S.C.S.)	SOIL DESCRIPTION
TEST PIT NO. 7						**ELEVATION 217**
0					SM	Top Soil Silty F-M sands, light reddish brown, damp loose, rootlets, pourous.
					SM/SC	Terrace Deposits Silty F-M sands w/some clay reddish brown, moist, mod dense, rootlets lighty pourous @ 4' - becoming dense
5						BOT 5' No groundwater No caving
10						
15						
TEST PIT NO. 8						**ELEVATION 197**
0					SM	Top Soil Silty F-M Sand, Reddish Brown, damp, loose
					SM/	Terrace Deposit Silty/Clayey sand, Reddish brown, moist, dense
5						BOT 3' No groundwater No caving
10						
15						

LOG OF TEST PITS

GEOPACIFICA | PROJECT NO. HALL PROPERTY | FIGURE NO. B-4

BACKHOE COMPANY: ATLAS | BUCKET SIZE: 24" | DATE: 6/10/10

DEPTH (FEET)	BAG SAMPLE	DENSITY TEST	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	SOIL CLASS. (U.S.C.S.)	SOIL DESCRIPTION
TEST PIT NO. 9						**ELEVATION 193**
0					SM	Top Soil Silty F-M sands light reddish brown, damp, loose
5					SM/SC	Terrace Deposits Silty F-M sand w/some clay reddish brown, moist, mod dense
						@ 8' - becoming F-C sands well indurated sandstone V. dense
10						BOT 10' No groundwater No caving Backfilled
15						
TEST PIT NO. 10						**ELEVATION 188**
0					SC	Top Soil Clayey Sands, dark brown, damp, soft, dessicated, rootlets
5					SC	Terrace Deposit Clayey sands dark brown moist, med. dense, slighty dessicated. @4' - rootlets, slighty pourous @ 6' becoming dense - v. dense
10						BOT 7' No groundwater No caving
15						

LOG OF TEST PITS

GEOPACIFICA | PROJECT NO. HALL PROPERTY | FIGURE NO. B-5

BACKHOE COMPANY: ATLAS | BUCKET SIZE: 24" | DATE: 6/10/10

TEST PIT NO. 11 — ELEVATION 190

DEPTH (FEET)	BAG SAMPLE	DENSITY TEST	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	SOIL CLASS (U.S.C.S.)	SOIL DESCRIPTION
0					SC	Top Soil Clayey sand, damp, loose
					SC	Terrace Clayey sands, dark brown med. loose, dessicated, mottlets, pourous
5						@ 4' becoming brown mottled grey moist dense @ 5' becoming med. course sands.
						BOT 6' No groundwater No caving Backfilled
10						
15						

Fill @ Edge of Pad:

TEST PIT NO. 12 — ELEVATION 184.5

0					SC	Fill Clayey sands, dark brown, very dessicated, loose. Fill extends over pad edge 6' south into pad.
5					SC	Terrace clayey F-C sands, moist, brown, dense
						BOT 6' No groundwater No caving Backfilled
10						
15						

LOG OF TEST PITS

GEOPACIFICA | PROJECT NO. HALL PROPERTY | FIGURE NO. B- 6

BACKHOE COMPANY: ATLAS BUCKET SIZE: 24" DATE: 6/11/10

TEST PIT NO. 13 ELEVATION 185

DEPTH (FEET)	BAG SAMPLE	DENSITY TEST	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	SOIL CLASS. (U.S.C.S.)	SOIL DESCRIPTION
0					SC	Top Soil Dark brown, clayey sands, damp, loose, dessicated
5					SM/SC	Terrace Deposit Silty/clayey F-C sands reddish brown mottled grey, moist mod dense
10						BOT 8' No groundwater No caving Backfilled
15						

TEST PIT NO. 14 ELEVATION 185

0					SM/SC	Fill Silty/clayey F-M sands, Reddish brown moist, loose
5	X					@ 5' Layer of grey fat clay 12" thick
10					SM/SC	Terrace Deposit Silty/clayey F-M sands, reddish brown moist, dense
15						BOT 11', No groundwater, No caving @ 50' South clay at 5'(7 feet thick) Terrace at 12' @ 90' South clay at 4' (3feet thick) Terrace at 7' @ 130' South clay at 2' (3 feet thick) Terrace at 5' @ 60' South - same @ 200' clay at 0' - 3' End of fill

LOG OF TEST PITS

GEOPACIFICA | PROJECT NO. HALL PROPERTY | FIGURE NO. B - 7

BACKHOE COMPANY: ATLAS | BUCKET SIZE: 24" | DATE: 6/11/10

DEPTH (FEET)	BAG SAMPLE	DENSITY TEST	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	SOIL CLASS. (U.S.C.S.)	SOIL DESCRIPTION
TEST PIT NO. 15						**ELEVATION 183**
0					SC	Top Soil
					SC	Terrace Clayey F-M sands, dark reddish brown, dessicated, pourous rootlets, loose
						@ 4' becoming reddish brown, moist dense
5						BOT 5'
						No groundwater
						No caving
10						
15						
TEST PIT NO. 16						**ELEVATION 169**
0					SC	Top Soil
					SC	Terrace dark brown clayey F-M sands damp, loose, dessicated, pourous, rootlets.
5						@ 4' becoming reddish brown mottled grey clayey sands, moist, dense
						BOT 6'
						No groundwater
						No caving
10						
15						

LOG OF TEST PITS

GEOPACIFICA | PROJECT NO. HALL PROPERTY | FIGURE NO. B - 8

BACKHOE COMPANY: ATLAS | BUCKET SIZE: 24" | DATE: 6/11/10

TEST PIT NO. 17 — ELEVATION 172

DEPTH (FEET)	BAG SAMPLE	DENSITY TEST	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	SOIL CLASS. (U.S.C.S.)	SOIL DESCRIPTION
0					SC	Top Soil
					SC	Terrace Dark brown F-M clayey sands damp, loose, dessicated, rootlets slighty pourous
						@ 3' becoming moist, firm
5						BOT 5'
10						
15						

TEST PIT NO. 18 — ELEVATION 177

0					SC	Terrace dark brown sandy clay damp loose, dessicated, rootlets
					SC	Reddish brown clayey sands, moist, mod dense
						@ 4' becoming dense
5						BOT 5' No groundwater No caving
10						
15						

LOG OF TEST PITS

GEOPACIFICA | PROJECT NO. HALL PROPERTY | FIGURE NO. B-9

BACKHOE COMPANY: ATLAS | BUCKET SIZE: 24" | DATE: 6/11/10

DEPTH (FEET)	BAG SAMPLE	DENSITY TEST	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	SOIL CLASS. (U.S.C.S.)	SOIL DESCRIPTION
TEST PIT NO. 19						**ELEVATION 177**
0					SC	Fill Clayey sands, dark brown, damp loose @ 3' plastic
5					SC	Terrace Brown clayey sands, moist dense
10						BOT 6' No groundwater No caving
15						
TEST PIT NO. 20						**ELEVATION 162**
0					SC	Top Soil - Dark brown, clay sand loose, dump
5					SC	Terrace Clayey F-M sands, brown mottled grey, moist, Firm
10						BOT 5' No groundwater No caving
15						

LOG OF TEST PITS

GEOPACIFICA | PROJECT NO. HALL PROPERTY | FIGURE NO. B -10

BACKHOE COMPANY: ATLAS BUCKET SIZE: 24" DATE: 6/11/10

DEPTH (FEET)	BAG SAMPLE	DENSITY TEST	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	SOIL CLASS. (U.S.C.S.)	SOIL DESCRIPTION
						TEST PIT NO. 21 ELEVATION 166
0					SC	Top Soil Dark brown, clayey sands, loose damp
					SC	Terrace clay F-M sands, brown mottled grey, moist, firm
5						BOT 4' No groundwater No caving
10						
15						
						TEST PIT NO. 22 ELEVATION 168
0						Fill investigation perpendicular to 54" RCP Fill extends 20' North of 54" SD - 6'-7' deep as most. Fill runs south 10' from SD at an average depth of 4'
5						
10						
15						

LOG OF TEST PITS

GEOPACIFICA | PROJECT NO. HALL PROPERTY | FIGURE NO. B -11

DRILLING COMPANY: SCOTT'S DRILLING RIG: CME 55 DATE: 6/14/10

BORING DIAMETER: 8" DRIVE WEIGHT: 140lbs DROP: 30" ELEVATION: 184

BORING NO. B-1

DEPTH (FEET)	BAG SAMPLE	DRIVE SAMPLE	BLOWS/FOOT	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	SOIL CLASS. (U.S.C.S.)	SOIL DESCRIPTION
0	X	■	35			SC	Terrace Deposit Reddish brown F-L clayey sands moist dense
5		■	33				@ 5' becoming more clayey Fe & Mg stains rootlets
							@ 9' becoming v. moist
10		■	61			ML	Del Mar Formation - tan mottled brown Fine sandy silt, damp, v. dense
15							
20							BOB 20'
							No groundwater
							No caving
							Backfilled
25							
30							

BORING LOG

GEOPACIFICA | PROJECT NO. HALL PROPERTY | FIGURE NO. B -12

DRILLING COMPANY: SCOTT'S DRILLING RIG: CME55 DATE: 6/14/10

BORING DIAMETER: 8" DRIVE WEIGHT: 140lbs DROP: 30" ELEVATION: 173

BORING NO. B-2

DEPTH (FEET)	BAG SAMPLE	DRIVE SAMPLE	BLOWS/FOOT	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	SOIL CLASS. (U.S.C.S.)	SOIL DESCRIPTION
0	X					SC	Terrace Deposit Dark brown clayey sands moist, med. dense
							@ 4' becoming reddish brown F - C sands
5		■	25				
							@ 10' mottled grey dense
10		■	41				
15							
20		■	38				BOB 20' No groundwater No caving Backfilled
25							
30							

BORING LOG

GEOPACIFICA | PROJECT NO. HALL PROPERTY | FIGURE NO. B - 13

DRILLING COMPANY: SCOTT'S DRILLING RIG: CME 55 DATE: 6/14/10

BORING DIAMETER: DRIVE WEIGHT: DROP: ELEVATION:

DEPTH (FEET)	BAG SAMPLE	DRIVE SAMPLE BLOWS/FOOT	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	SOIL CLASS. (U.S.C.S.)	BORING NO. P-1 Percolation Test Hole SOIL DESCRIPTION
0						Top Soil: Dry silt, sand loose
						Terrace Deposit: Reddish brown, sand, silt, moist, medium dense
5						
10						Total depth 10' No water No caving
15						
20						
25						
30						

BORING LOG

GEOPACIFICA | PROJECT NO. HAL PROPERTY | FIGURE NO. B - 14

DRILLING COMPANY: SCOTT's DRILLING RIG: CME 55 DATE: 6/14/10

BORING DIAMETER: DRIVE WEIGHT: DROP: ELEVATION:

DEPTH (FEET)	BAG SAMPLE	DRIVE SAMPLE BLOWS/FOOT	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	SOIL CLASS. (U.S.C.S.)

BORING NO. P-2

Percolation Test Hole

SOIL DESCRIPTION

0

Fill - Dark v. moist clayey sand, loose organic odor

5

10

Terrace Deposit Reddish brown clayey sands

Hole not used for Percolation testing

15

20

25

30

BORING LOG

GEOPACIFICA | PROJECT NO. HALL PROPERTY | FIGURE NO. B - 15

DRILLING COMPANY: SCOTT'S DRILLING RIG: CME 55 DATE: 6/14/10

BORING DIAMETER: DRIVE WEIGHT: DROP: ELEVATION:

DEPTH (FEET)	BAG SAMPLE	DRIVE SAMPLE	BLOWS/FOOT	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	SOIL CLASS. (U.S.C.S.)

BORING NO. P - 3

Percolation Test Boring

SOIL DESCRIPTION

0 — Top Spil: light brown, sandy silt, dry, loose

Terrace Deposit: brown to reddish brown, sandy silt, moist, medium dense to dense.

5

10

Total Depth 10'
No water
No caving

15

20

25

30

BORING LOG

GEOPACIFICA | PROJECT NO. HALL PROPERTY | FIGURE NO. B - 16

APPENDIX C

Laboratory Testing Procedures and Test Results

Chloride Content: Chloride content was tested in accordance with Caltrans Test Method CT422. The results are presented below:

Sample Location	Chloride Content, ppm
B-1 @ 5'	72

Direct Shear Tests: A direct shear test were performed on selected remolded sample which were soaked for a minimum of 24 hours under a surcharge equal to the applied normal force during testing. After transfer of the sample to the shear box and reloading of the sample, the pore pressures set up in the sample (due to the transfer) were allowed to dissipate for a period of approximately 1 hour prior to application of shearing force. The samples were tested under various normal loads utilizing a motor-driven, strain-controlled, direct-shear testing apparatus at a strain rate of 0.05 inches per minute. After a shear strain of 0.2 inches, the motor was stopped and the sample was allowed to "relax" for approximately 15 minutes. The stress drop during the relaxation period was recorded. It is anticipated that, in a majority of samples tested, the 15 minutes relaxing of the samples is sufficient to allow dissipation of pore pressures that may have set up in the samples due to shearing. The drained peak strength was estimated by deducting the shear force reduction during the relaxation period from the peak shear values. The results of direct shear test are presented on the attached figure.

Minimum Resistivity and pH Tests: Minimum resistivity and pH tests were performed in general accordance with Caltrans Test Method CT643 for Steel or CT532 for concrete and standard geochemical methods. The results are presented in the table below:

Sample Location	Sample Description	pH	Minimum Resistivity (ohms-cm)
B-2 @ 5'	Silty SAND	7.8	12,500

"R"-Value: The resistance "R"-value was determined by the California Materials Method CT301 for base, Subbase, and basement soils. The samples were prepared and exudation pressure and "R"-value determined. The graphically determined "R"-value at exudation pressure of 300 psi is reported.

Sample Location	Sample Description	R-Value
Various	Silty SAND	28

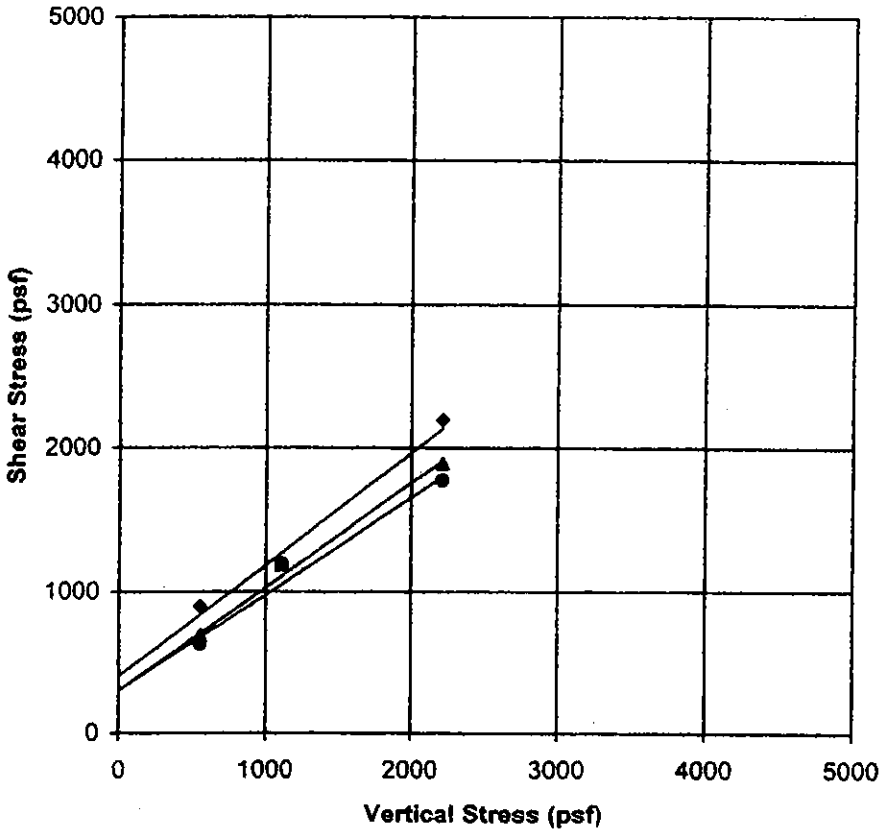
Soluble Sulfates: The soluble sulfate contents of selected samples were determined by standard geochemical methods (Caltrans Test Method CT417). The test results are presented in the table.

Sample Location	Sample Description	Sulfate Content %	Potential Degree of Sulfate Attack*
B-2 @ 0-3'	SAND	Less than 0.015	Neglisible

*Based on the 2001 edition of the California Building Code, Table No. 19A-A-4, prepared by the California Building Standards Commission (CBSC, 2001).

Maximum Dry Density Test (ASTM D1557): The maximum dry density and optimum moisture content of selected samples were determined in accordance with ASTM Test Method D1557. The test results are presented below:

Sample Location	Sample Description	Maximum Dry Density (pcf)	Optimum Moisture Content (%)
B-1 @ 0-3'	SAND	114.0	12.9



Sample Location B-1 @ 0'-3' Deformation Rate **0.05 in/min**

Sample Depth (feet) **Remolded**

Sample Description Terrace Deposits

Average Strength Parameters

Peak	Friction Angle, ϕ'_{peak} (deg)	**38**	**Relaxed**	Friction Angle, $\phi'_{relaxed}$ (deg)	**34**
	Cohesion, c'_{peak} (psf)	**400**		Cohesion, $c'_{relaxed}$ (psf)	**300**
@0.2 in.	Friction Angle, $\phi'_{@0.2"}$ (deg)	**36**			
	Cohesion, $c'_{@0.2"}$ (psf)	**300**			

DIRECT SHEAR SUMMARY

Project No.
Project Name Hall Property

GEOTECHNICAL GUIDELINES FOR GRADING PROJECTS

TABLE OF CONTENTS

GEOTECHNICAL GUIDELINES FOR GRADING PROJECTS

A. GENERAL

A1. The guidelines contained herein and the standard details attached hereto represent this firm's standard recommendations for grading and other associated operations on construction projects. These guidelines should be considered a portion of the project specifications.

A2. All plates attached hereto shall be considered as part of these guidelines.

A3. The Contractor should not vary from these guidelines without prior recommendation by the Geotechnical Consultant and the approval of the Client or his authorized representative. Recommendations by the Geotechnical Consultant and/or Client should not be considered to preclude requirements for approval by the controlling agency prior to the execution of any changes.

A4. These Standard Grading Guidelines and Standard Details may be modified and/or superseded by recommendations contained in the text of the preliminary geotechnical report and/or subsequent reports.

A5. If disputes arise out of the interpretation of these grading guidelines or standard details, the Geotechnical Consultant shall provide the governing interpretation.

B. DEFINITIONS OF TERMS

B1. **ALLUVIUM** - unconsolidated detrital deposits resulting from flow of water, including sediments deposited in river beds, canyons, flood plains, lakes, fans at the foot of slopes and estuaries.

B2. **AS-GRADED (AS-BUILT)** - the surface and subsurface conditions at completion of grading.

B3. **BACKCUT** - a temporary construction slope at the rear of earth-retaining structures such as buttresses, shear keys, stabilization fills or retaining walls.

B4. **BACKDRAIN** - generally a pipe and gravel or similar drainage system placed behind earth-retaining structures such as buttresses, stabilization fills and retaining walls.

B5. **BEDROCK** - a more or less solid, relatively undisturbed rock in place either at the surface or beneath superficial deposits of soil.

B6. **BENCH** - a relatively level step and near vertical rise excavated into sloping ground on which fill is to be placed.

B7. **BORROW (Import)** - any fill material hauled to the project site from off-site areas.

B8. **BUTTRESS FILL** - a fill mass, the configuration of which is designed by engineering calculations to stabilize a slope exhibiting adverse geologic features. A buttress is generally specified by minimum key width and depth and by maximum backcut angle. A buttress normally contains a backdrainage system.

B9. **CIVIL ENGINEER** - the Registered Civil Engineer or consulting firm responsible for preparation of the grading plans, surveying, and verifying as-graded topographic conditions.

B10. **CLIENT** - the Developer or his authorized representative who is chiefly in charge of the project. He shall have the responsibility of reviewing the findings and recommendations made by the Geotechnical Consultant and shall authorize the Contractor and/or other consultants to perform work and/or provide services.

B11. **COLLUVIUM** - generally loose deposits usually found near the base of slopes and brought there chiefly by gravity through slow continuous downhill creep (also see Slope Wash).

B12. **COMPACTION** - densification of a fill by mechanical means.

B13. **CONTRACTOR** - a person or company under contract or otherwise retained by the Client to perform demolition, grading and other site improvements.

B14. **DEBRIS** - all products of clearing, grubbing, demolition, contaminated soil material unsuitable for reuse as compacted fill and/or any other material so designated by the Geotechnical Consultant.

B15. **ENGINEERING GEOLOGIST** - a Geologist holding a valid certificate of registration in the specialty of Engineering Geology.

B16. **ENGINEERED FILL** - a fill of which the Geotechnical Consultant or his representative, during grading, has made sufficient tests to enable him to conclude that the fill has been placed in substantial compliance with the recommendations of the Geotechnical Consultant and the governing agency requirements.

B17. **EROSION** - the wearing away of the ground surface as a result of the movement of wind, water and/or ice.

B18. **EXCAVATION** - the mechanical removal of earth materials.

B19. **EXISTING GRADE** - the ground surface configuration prior to grading.

B20. **FILL** - any deposits of soil, rock, soil-rock blends or other similar materials placed by man.

B21. **FINISH GRADE** - the ground surface configuration at which time the surface elevations conform to the approved plan.

B22. **GEOFABRIC** - any engineering textile utilized in geotechnical applications including subgrade stabilization and filtering.

B23. **GEOLOGIST** - a representative of the Geotechnical Consultant educated and trained in the field of geology.

B24. **GEOTECHNICAL CONSULTANT** - the Geotechnical Engineering and Engineering Geology consulting firm retained to provide technical services for the project. For the purpose of these guidelines, observations by the Geotechnical Consultant include observations by the Soil Engineer, Geotechnical Engineer, Engineering Geologist and those performed by persons employed by and responsible to the Geotechnical Consultants.

B25. **GEOTECHNICAL ENGINEER** - a licensed Civil Engineer who applies scientific methods, engineering principles and professional experience to the acquisition, interpretation and use of knowledge of materials of the earth's crust for the evaluation of engineering problems. Geotechnical Engineering encompasses many of the engineering aspects of soil mechanics, rock mechanics, geology, geophysics, hydrology and related sciences.

B26. **GRADING** - any operation consisting of excavation, filling or combinations thereof and associated operations.

B27. **LANDSLIDE DEBRIS** - material, generally porous and of low density, produced from instability of natural or man-made slopes.

B28. **MAXIMUM DENSITY** - standard laboratory test for maximum dry unit weight. Unless otherwise specified, the maximum dry unit weight shall be determined in accordance with ASTM Method of Test D 1557-78.

B29. **OPTIMUM MOISTURE** - test of moisture content at the maximum density.

B30. **RELATIVE COMPACTION** - the degree of compaction (expressed as a percentage) of dry unit weight of a material as compared to the maximum dry unit weight of the material.

B31. **ROUGH GRADE** - the ground surface configuration at which time the surface elevations approximately conform to the approved plan.

B32. **SITE** - the particular parcel of land where grading is being performed.

B33. **SHEAR KEY** - similar to 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 grading encroaching into the lower portion of the slope.

B34. **SLOPE** - an inclined ground surface the steepness of which is generally specified as a ratio of horizontal to vertical (e.g. 2:1).

B35. **SLOPE WASH** - soil and/or rock material that has been transported down a slope by mass wasting assisted by runoff water not confined by channels (also see Colluvium).

B36. **SOIL** - naturally occurring deposits of sand, silt, clay, etc. or combinations thereof.

B37. **SOIL ENGINEER** - licensed Civil Engineer experienced in soil mechanics (also see Geotechnical Engineer).

B38. **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 minimum key width and depth and by maximum backcut angle. A stabilization fill may or may not have a backdrainage system specified.

B39. **SUBDRAIN** - generally a pipe and gravel or similar drainage system placed beneath a fill in the alignment of canyons or former drainage channels.

B40. **SLOUGH** - loose, noncompacted fill material generated during grading operations.

B41. **TAILINGS** - nonengineered fill which accumulates on or adjacent to equipment haul-roads.

B42. **TERRACE** - relatively level step constructed in the face of a graded slope surface for drainage control and maintenance purposes.

B43. **TOPSOIL** - the presumably fertile upper zone of soil which is usually darker in color and loose.

B44. **WINDROW** - a string of large rock buried within engineered fill in accordance with guidelines set forth by the Geotechnical Consultant.

C. OBLIGATIONS OF PARTIES

C1. The Geotechnical Consultant should provide observation and testing services and should make evaluations to advise the Client on geotechnical matters. The Geotechnical Consultant should report his findings and recommendations to the Client or his authorized representative.

C2. The Client should be chiefly responsible for all aspects of the project. He or his authorized representative has the responsibility of reviewing the findings and recommendations of the Geotechnical Consultant. He shall authorize or cause to have authorized the Contractor and/or other consultants to perform work and/or provide services. During grading the Client or his authorized representative should remain on-site or should remain reasonably accessible to all concerned parties in order to make decisions necessary to maintain the flow of the project.

C3. The Contractor should be responsible for the safety of the project and satisfactory completion of all grading and other associated operations on construction projects, including but not limited to earthwork in accordance with the project plans, specifications and controlling agency requirements. During grading, the Contractor or his authorized representative should remain on-site. Overnight and on days off, the Contractor should remain accessible.

D. SITE PREPARATION

D1. The Client, prior to any site preparation or grading, should arrange and attend a meeting among the Grading Contractor, the Design Engineer, the Geotechnical Consultant, representatives of the appropriate governing authorities as well as any other concerned parties. All parties should be given at least 48 hours notice.

D2. Clearing and grubbing should consist of the removal of vegetation such as brush, grass, wood, stumps, trees, roots of trees and otherwise deleterious natural materials from the areas to be graded. Clearing and grubbing should extend to the outside of all proposed excavation and fill areas.

D3. Demolition should include removal of buildings, structures, foundations, reservoirs, utilities (including underground pipelines, septic tanks, leach fields, seepage pits, cisterns, mining shafts, tunnels, etc.) and other man-made surface and subsurface improvements from the areas to be graded. Demolition of utilities should include proper capping and/or rerouting pipelines at the project perimeter and cutoff and capping of wells in accordance with the requirements of the governing authorities and the recommendations of the Geotechnical Consultant at the time of demolition.

D4. Trees, plants or man-made improvements not planned to be removed or demolished should be protected by the Contractor from damage or injury.

D5. Debris generated during clearing, grubbing and/or demolition operations should be wasted from areas to be graded and disposed off-site. Clearing, grubbing and demolition operations should be performed under the observation of the Geotechnical Consultant.

D6. The Client or Contractor should obtain the required approvals from the controlling authorities for the project prior, during and/or after demolition, site preparation and removals, etc. The appropriate approvals should be obtained prior to proceeding with grading operations.

E. SITE PROTECTION

E1. Protection of the site during the period of grading should 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 should not be considered to preclude that portion or adjacent areas from the requirements for site protection until such time as the entire project is complete as identified by the Geotechnical Consultant, the Client and the regulating agencies.

E2. The Contractor should be responsible for the stability of all temporary excavations. Recommendations by the Geotechnical Consultant pertaining to temporary excavations (e.g., backcuts) are made in consideration of stability of the completed project and, therefore, should not be considered to preclude the responsibilities of the Contractor. Recommendations by the Geotechnical Consultant should not be considered to preclude more restrictive requirements by the regulating agencies.

E3. Precautions should be taken during the performance of site clearing, excavations and grading to protect the work site from flooding, ponding or inundation by poor or improper surface drainage. Temporary provisions should be made during the rainy season to adequately direct surface drainage away from and off the work site. Where low areas cannot be avoided, pumps should be kept on hand to continually remove water during periods of rainfall.

E4. During periods of rainfall, plastic sheeting should be kept reasonably accessible to prevent unprotected slopes from becoming saturated. Where necessary during periods of rainfall, the Contractor should install checkdams, desilting basins, rip-rap, sand bags or other devices or methods necessary to control erosion and provide safe conditions.

E5. During periods of rainfall, the Geotechnical Consultant should be kept informed by the Contractor as to the nature of remedial or preventative work being performed (e.g., pumping, placement of sandbags or plastic sheeting, other labor, dozing, etc.).

E6. Following periods of rainfall, the Contractor should contact the Geotechnical Consultant and arrange a walkover of the site in order to visually assess rain-related damage. The Geotechnical Consultant may also recommend excavations and testing in order to aid in his assessments. At the request of the Geotechnical Consultant, the Contractor shall make excavations in order to evaluate the extent of rain-related damage.

E7. Rain-related damage should be considered to include, but may not be limited to, erosion, silting, saturation, swelling, structural distress and other adverse conditions identified by the Geotechnical Consultant. Soil adversely affected should be classified as unsuitable materials and should be subject to overexcavation and replacement with compacted fill or other remedial grading as recommended by the Geotechnical Consultant.

E8. Relatively level areas, where saturated soils and/or erosion gullies exist to depths of greater than 1.0 foot, should be overexcavated to unaffected, competent material. Where less than 1.0 foot in depth, unsuitable materials may be processed in-place to achieve near-optimum moisture conditions, then thoroughly recompacted in accordance with the applicable specifications. If the desired results are not achieved, the affected materials should be overexcavated, then replaced in accordance with the applicable specifications.

E9. In slope areas where saturated soil and/or erosion gullies exist to depths of greater than 1.0 foot, they should be overexcavated and replaced as compacted fill in accordance with the applicable specifications. Where affected materials exist to depths of 1.0 foot or less below proposed finished grade, remedial grading by moisture conditioning in-place, followed by thorough recompaction in accordance with the applicable grading guidelines herein, may be attempted. If the desired results are not achieved, all affected materials should be overexcavated and replaced as compacted fill in accordance with the slope repair recommendations herein. As field conditions dictate, other slope repair procedures may be recommended by the Geotechnical Consultant.

F. EXCAVATIONS

F1. Unsuitable Materials

F1.1. Materials which are unsuitable should be excavated under observation and recommendations of the Geotechnical Consultant. Unsuitable materials include, but may not be limited to, dry, loose, soft, wet, organic, compressible natural soils and fractured, weathered, soft bedrock and non-engineered or otherwise deleterious fill materials.

F1.2. Material identified by the Geotechnical Consultant as unsatisfactory due to its moisture content should be overexcavated, watered or dried, as needed, and thoroughly blended to a uniform near-optimum moisture condition (as per Guidelines G2.1) prior to placement as compacted fill.

F2. Cut Slopes

F2.1. Unless otherwise recommended by the Geotechnical Consultant and approved by the regulating agencies, permanent cut slopes should not be steeper than 2:1 (horizontal to vertical).

F2.2. If excavations for cut slopes expose loose, cohesionless, significantly fractured or otherwise unsuitable material, overexcavation and replacement of the unsuitable materials with a compacted stabilization fill should be accomplished as recommended by the Geotechnical Consultant. Unless otherwise specified by the Geotechnical Consultant, stabilization fill construction should conform to the requirements of the Standard Details.

F2.3. The Geotechnical Consultant should review cut slopes during excavation. The Geotechnical Consultant should be notified by the Contractor prior to beginning slope excavations.

F2.4. If, during the course of grading, adverse or potentially adverse geotechnical conditions are encountered which were not anticipated in the preliminary report, the Geotechnical Consultant should explore, analyze and make recommendations to treat these problems.

F2.5. When cut slopes are made in the direction of the prevailing drainage, a non-erodible diversion swale (brow ditch) should be provided at the top-of-cut.

F3. Pad Areas

F3.1. All lot pad areas, including side yard terraces, above stabilization fills or buttresses should be overexcavated to provide for a minimum of 3 feet (refer to Standard Details) of compacted fill over the entire pad area. Pad areas with both fill and cut materials exposed and pad areas containing both very shallow (less than 3 feet) and deeper fill should be overexcavated to provide for a uniform compacted fill blanket with a minimum of 3 feet in thickness (refer to Standard Details). Cut areas exposing significantly varying material types should also be overexcavated to provide for at least a 3-foot thick compacted fill blanket. Geotechnical conditions may require greater depth of overexcavation. The actual depth should be delineated by the Geotechnical Consultant during grading.

F3.2. For pad areas created above cut or natural slopes, positive drainage should be established away from the top-of-slope. This may be accomplished utilizing a berm and/or an appropriate pad gradient. A gradient in soil areas away from the top-of-slopes of 2 percent or greater is recommended.

G. COMPACTED FILL

All fill materials should be compacted as specified below or by other methods specifically recommended by the Geotechnical Consultant. Unless otherwise specified, the minimum degree of compaction (relative compaction) should be 90 percent of the laboratory maximum density.

G1. Placement

G1.1. Prior to placement of compacted fill, the Contractor should request a review by the Geotechnical Consultant of the exposed ground surface. Unless otherwise recommended, the exposed ground surface should then be scarified (6 inches minimum), watered or dried as needed, thoroughly blended to achieve near-optimum moisture conditions, then thoroughly compacted to a minimum of 90 percent of the maximum density. The review by the Geotechnical Consultant should not be considered to preclude requirement of inspection and approval by the governing agency.

G1.2. Compacted fill should be placed in thin horizontal lifts not exceeding 8 inches in loose thickness prior to compaction. Each lift should be watered or dried as needed, thoroughly blended to achieve near optimum moisture conditions, then thoroughly compacted by mechanical methods to a minimum of 90 percent of laboratory maximum dry density. Each lift should be treated in a like manner until the desired finished grades are achieved.

G1.3. The Contractor should have suitable and sufficient mechanical compaction equipment and watering apparatus on the job site to handle the amount of fill being placed in consideration of moisture retention properties of the materials . If necessary, excavation equipment should be "shut down" temporarily in order to permit proper compaction of fills. Earthmoving equipment should only be considered a supplement and not substituted for conventional compaction equipment.

G1.4. When placing fill in horizontal lifts adjacent to areas sloping steeper than 5:1 (horizontal to vertical), horizontal keys and vertical benches should be excavated into the adjacent slope area. Keying and benching should be sufficient to provide at least 6-foot wide benches and a minimum of 4 feet of vertical bench height within the firm natural ground, firm bedrock, or engineered compacted fill. No compacted fill should be placed in an area subsequent to keying and benching until the area has been reviewed by the Geotechnical Consultant. Material generated by the benching operation should be moved sufficiently away from the bench area to allow for the recommended review of the horizontal bench prior to placement of fill. Typical keying and benching details have been included within the accompanying Standard Details.

G1.5. 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 false slope, benching should be conducted in the same manner as above described. At least a 3-foot vertical bench should be established within the firm core of adjacent approved compacted fill prior to placement of additional fill. Benching should proceed in at least 3-foot vertical increments until the desired finished grades are achieved.

G1.6. Fill should be tested for compliance with the recommended relative compaction and moisture conditions. Field density testing should conform to ASTM Method of Test D 1556-64, D 2922-78 and/or D 2937-71. Tests should be provided for about every 2 vertical feet of 1,000 cubic yards of fill placed. Actual test intervals may vary as field conditions dictate. Fill found not to be in conformance with the grading recommendations should be removed or otherwise handled as recommended by the Geotechnical Consultant.

G1.7. The Contractor should assist the Geotechnical Consultant and/or his representative by digging test pits for removal determinations and/or for testing compacted fill.

G1.8. As recommended by the Geotechnical Consultant, the Contractor should "shut down" or remove grading equipment from an area being tested.

G1.9. The Geotechnical Consultant should maintain a plan with estimated locations of field tests. Unless the client provides for actual surveying of test locations, the estimated locations by the Geotechnical Consultant should only be considered rough estimates and should not be utilized for the purpose of preparing cross-sections showing test locations or in any case for the purpose of after-the-fact evaluating of the sequence of fill placement.

G2. Moisture

G2.1. For field testing purposes, "near-optimum" moisture will vary with material type and other factors including compaction procedure. "Near-optimum" may be specifically recommended in Preliminary Investigation Reports and/or may be evaluated during grading. As a preliminary guideline, "near-optimum" should be considered from 1 percent below to 3 percent above optimum.

G2.2. Prior to placement of additional compacted fill following an overnight or other grading delay, the exposed surface or previously compacted fill should be processed by scarification, watered or dried as needed, thoroughly blended to near-optimum moisture conditions, then recompacted to a minimum of 90 percent of laboratory maximum dry density. Where wet or other dry or otherwise unsuitable materials exist to depths of greater than 1 foot, the unsuitable materials should be overexcavated.

G2.3. Following a period of flooding, rainfall or overwatering by other means, no additional fill should be placed until damage assessments have been made and remedial grading performed as described under Section E6 herein.

G3. Fill Material

G3.1. Excavated on-site materials which are acceptable to the Geotechnical Consultant may be utilized as compacted fill, provided trash, vegetation and other deleterious materials are removed prior to placement.

G3.2. Where import materials are required for use on-site, the Geotechnical Consultant should be notified at least 72 hours in advance of importing, in order to sample and test materials from proposed borrow sites. No import materials should be delivered for use on-site without prior sampling and testing by Geotechnical Consultant.

G3.3. Where oversized rock 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 placed in disposal rows should be placed with sufficient fines to fill voids. The rock should be compacted in lifts to an unyielding condition. The disposal area should be covered with at least 3 feet of compacted fill which is free of oversized material. The upper 3 feet should be placed in accordance with the guidelines for compacted fill herein.

G3.4. Rocks 12 inches in maximum dimension and smaller may be utilized within the compacted fill, provided they are placed in such manner that nesting of the rock is avoided. Fill should be placed and thoroughly compacted over and around all rock. The amount of rock should not exceed 40 percent by dry weight passing the 3/4-inch sieve size. The 12-inch and 40 percent recommendations herein may vary as field conditions dictate.

G3.5. During the course of grading operations, rocks or similar irreducible materials greater than 12 inches maximum dimension (oversized material), may be generated. These rocks should not be placed within the compacted fill unless placed as recommended by the Geotechnical Consultant.

G3.6. Where rocks or similar irreducible materials of greater than 12 inches but less than 4 feet of maximum dimension are generated during grading or otherwise desired to be placed within an engineered fill, special handling in accordance with the accompanying Standard Details is recommended. Rocks greater than 4 feet should be broken down or disposed of off-site. Rocks up to 4 feet maximum dimension should be placed below the upper 10 feet of any fill and should not be closer than 20 feet

to any slope face. These recommendations could vary as locations of improvements dictate. Where practical, oversized material should not be placed below areas where structures or deep utilities are proposed. Oversized material should be placed in windrows on a clean, overexcavated or unyielding compacted fill or firm natural ground surface. Select native or imported granular soil (S.E. 30 or higher) should be placed and thoroughly flooded over and around all windrowed rock, such that voids are filled. Windrows of oversized materials should be staggered so that successive strata of oversized material are not in the same vertical plane.

The Contractor should be aware that the placement of rock in windrows will significantly slow the grading operation and may require additional equipment and/or special equipment.

G3.7. It may be possible to dispose of individual larger rock as field conditions dictate and as recommended by the Geotechnical Consultant at the time of placement.

G3.8. Material that is considered unsuitable by the Geotechnical Consultant should not be utilized in the compacted fill.

G3.9. During grading operations, placing and mixing the materials from the cut and/or borrow areas may result in soil mixtures which possess unique physical properties. Testing may be required of samples obtained directly from the fill areas in order to verify conformance with the specifications. Processing of these additional samples may take two or more working days. The Contractor may elect to move the operation to other areas within the project, or may continue placing compacted fill pending laboratory and field test results. Should he elect the second alternative, fill placed is done so at the Contractor's risk.

G3.10. Any fill placed in areas not previously reviewed and evaluated by the Geotechnical Consultant, and/or in other areas, without prior notification to the Geotechnical Consultant, may require removal and recompaction at the Contractor's expense. Determination of overexcavations should be made upon review of field conditions by the Geotechnical Consultant.

G4. Fill Slopes

G4.1. Unless otherwise recommended by the Geotechnical Consultant and approved by the regulating agencies, permanent fill slopes should not be steeper than 2:1 (horizontal to vertical).

G4.2. Except as specifically recommended otherwise or as otherwise provided for in these grading guidelines (Reference G4.3), compacted fill slopes should be overbuilt and cut back to grade, exposing the firm, compacted fill inner core. The actual amount of overbuilding may vary as field conditions dictate. If the desired results are not achieved, the existing slopes should be overexcavated and reconstructed under the guidelines of the Geotechnical Consultant. The degree of overbuilding shall be increased until the desired compacted slope surface condition is achieved. Care should be taken by the Contractor to provide thorough mechanical compaction to the outer edge of the overbuilt slope surface.

G4.3. Although no construction procedure produces a slope free from risk of future movement, overfilling and cutting back of slope to a compacted inner core is, given no other constraints, the most desirable procedure. Other constraints, however, must often be considered. These constraints may include property lines situations, access, the critical nature of the development and cost. Where such constraints are identified, slope face compaction on slopes of 2:1 (horizontal to vertical) or flatter may be attempted as a second best alternative by conventional construction procedures including backrolling techniques upon specific recommendation by the Geotechnical Consultant.

Fill placement should proceed in thin lifts (i.e., 6 to 8-inch loose thickness). Each lift should be moisture conditioned and thoroughly compacted. The desired moisture condition should be maintained and/or reestablished, where necessary, during the period between successive lifts. Selected lifts should be tested to ascertain that desired compaction is being achieved. Care should be taken to extend compactive effort to the outer edge of the slope.

Each lift should extend horizontally to the desired finished slope surface or more as needed to ultimately establish desired grades. Grade during construction should not be allowed to roll off at the edge of the slope. It may be helpful to elevate slightly the outer edge of the slope. Slough resulting from the placement of individual lifts should not be allowed to drift down over previous lifts. At intervals not exceeding 4 feet in vertical slope height or the capability of available equipment, whichever is less, fill slopes should be thoroughly backrolled utilizing a conventional sheepsfoot-type roller. Care should be taken to maintain the desired moisture conditions and/or reestablish same as needed prior to backrolling. Upon achieving final grade, the slopes should again be moisture-conditioned and thoroughly backrolled. The use of a side-boom roller will probably be necessary and vibratory methods are strongly recommended. Without delay, so as to avoid (if possible) further moisture conditioning, the slopes should then be grid-rolled to achieve a relatively smooth surface and uniformly compact condition.

In order to monitor slope construction procedures, moisture and density tests should be taken at regular intervals. Failure to achieve the desired results will likely result in a recommendation by the Geotechnical Consultant to overexcavate the slope surfaces followed by reconstruction of the slopes utilizing over-filling and cutting back procedures and/or further attempt at the conventional backrolling approach. Other recommendations may also be provided which would be commensurate with field conditions.

G4.4. Where placement of fill above a natural slope or above a cut slope is proposed, the fill slope configuration as presented in the accompanying Standard Details should be adopted.

G4.5. For pad areas above fill slopes, positive drainage should be established away from the top-of-slope. This may be accomplished utilizing a berm and pad gradient of at least 2 percent in soil areas.

G5. Off-Site Fill

G5.1. Off-site fill should be treated in the same manner as recommended in these specifications for site preparation, excavation, drains, compaction, etc.

G5.2. Off-site canyon fill should be placed in preparation for future additional fill, as shown in the accompanying Standard Details.

G5.3. Off-site fill subdrains temporarily terminated (up canyon) should be surveyed for future relocation and connection.

H. DRAINAGE

H1. Canyon subdrain systems specified by the Geotechnical Consultant should be installed in accordance with the Standard Details.

H2. Typical subdrains for compacted fill buttresses, slope stabilizations or sidehill masses, should be installed in accordance with the specifications of the accompanying Standard Details.

H3. Roof, pad and slope drainage should be directed away from slopes and areas of structures to suitable disposal areas via non-erodible devices (i.e., gutters, downspouts, concrete swales).

H4. For drainage over soil areas immediately away from structures (i.e., within 4 feet), a minimum of 4 percent gradient should be maintained. Pad drainage of at least 2 percent should be maintained over soil areas. Pad drainage may be reduced to at least 1 percent for projects where no slopes exist, either natural or man-made, of greater than 10 feet in height and where no slopes are planned, either natural or man-made, steeper than 2:1 (horizontal to vertical slope ratio).

H5. Drainage patterns established at the time of fine grading should be maintained throughout the life of the project. Property owners should be made aware that altering drainage patterns can be detrimental to slope stability and foundation performance.

I. STAKING

I1. In all fill areas, the fill should be compacted prior to the placement of the stakes. This is particularly important on fill slopes. Slope stakes should not be placed until the slope is thoroughly compacted (back-rolled). If stakes must be placed prior to the completion of compaction procedures, it must be recognized that they will be removed and/or demolished at such time as compaction procedures resume.

I2. In order to allow for remedial grading operations, which could include overexcavations or slope stabilization, appropriate staking offsets should be provided. For finished slope and stabilization backcut areas, we recommend at least a 10-foot setback from proposed toes and tops-of-cut.

J. MAINTENANCE

J1. Landscape Plants

In order to enhance surficial slope stability. slope planting should be accomplished at the completion of grading. Slope planting should consist of deep-rooting vegetation requiring little watering. Plants native to the southern California area and plants related to native plants are generally desirable. Plants native to other semi-arid and arid areas may also be appropriate. A Landscape Architect would be the best party to consult regarding actual types of plants and planting configuration.

J2. Irrigation

J2.1 Irrigation pipes should be anchored to slope faces, not placed in trenches excavated into slope faces.

J2.2 Slope irrigation should be minimized. If automatic timing devices are utilized on irrigation systems, provision should be made for interrupting normal irrigation during periods of rainfall.

J2.3 Though not a requirement, consideration should be given to the installation of near-surface moisture monitoring control devices. Such devices can aid in the maintenance of relatively uniform and reasonably constant moisture conditions.

J2.4 Property owners should be made aware that overwatering of slopes is detrimental to slope stability.

J3. Maintenance

J3.1 Periodic inspections of landscaped slope areas should be planned and appropriate measures should be taken to control weeds and enhance growth of the landscape plants. Some areas may require occasional replanting and/or reseeding.

J3.2 Terrace drains and downdrains should be periodically inspected and maintained free of debris. Damage to drainage improvements should be repaired immediately.

J3.3 Property owners should be made aware that burrowing animals can be detrimental to slope stability. A preventative program should be established to control burrowing animals.

J3.4 As a precautionary measure, plastic sheeting should be readily available, or kept on hand, to protect all slope areas from saturation by periods of heavy or prolonged rainfall. This measure is strongly recommended, beginning with the period of time prior to landscape planting.

J4. Repairs

J4.1 If slope failures occur, the Geotechnical Consultant should be contacted for a field review of site conditions and development of recommendations for evaluation and repair.

J4.2 If slope failures occur as a result of exposure to periods of heavy rainfall, the failure area and currently unaffected areas should be covered with plastic sheeting to protect against additional saturation.

J4.3 In the accompanying Standard Details, appropriate repair procedures are illustrated for superficial slope failures (i.e., occurring typically within the outer 1 foot to 3 feet of a slope face).

K. TRENCH BACKFILL

K1. Utility trench backfill should, unless otherwise recommended, be compacted by mechanical means. Unless otherwise recommended, the degree of compaction should be a minimum of 90 percent of the laboratory maximum density.

K2. As an alternative, granular material (sand equivalent greater than 30) may be thoroughly jetted in-place. Jetting should only be considered to apply to trenches no greater than 2 feet in width and 4 feet in depth. Following jetting operations, trench backfill should be thoroughly mechanically compacted and/or wheelrolled from the surface.

K3. Backfill of exterior and interior trenches extending below a 1:1 (horizontal to vertical) projection from the outer edge of foundations should be mechanically compacted to a minimum of 90 percent of the laboratory maximum density.

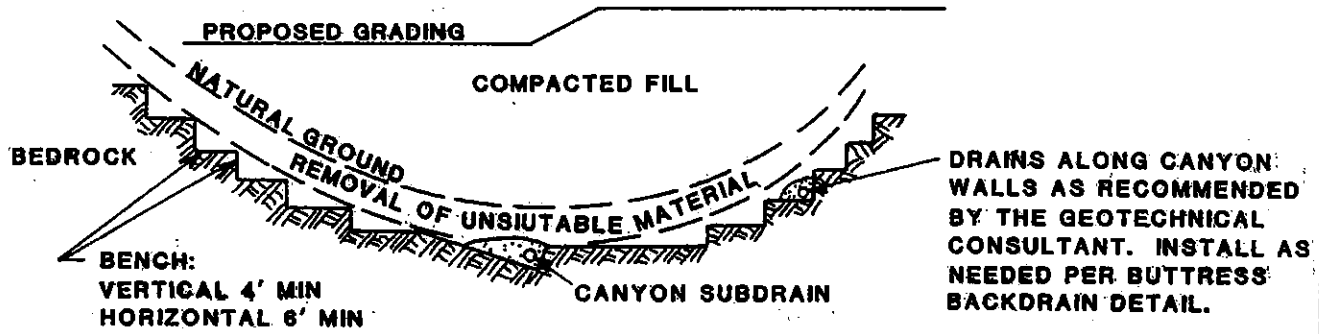
K4. Within slab areas, but outside the influence of foundations, trenches up to 1 foot wide and 2 feet deep may be backfilled with sand and consolidated by jetting, flooding or by mechanical means. If on-site materials are utilized, they should be wheelrolled, tamped or otherwise compacted to a firm condition. For minor interior trenches, density testing may be deleted or spot testing may be elected if deemed necessary, based on review of backfill operations during construction.

K5. If utility contractors indicate that it is undesirable to use compaction equipment in close proximity to a buried conduit, the Contractor may elect the utilization of lightweight mechanical compaction equipment and/or shading of the conduit with clean, granular material, which would be thoroughly jetted in-place above the conduit, prior to initiating mechanical compaction procedures. Other methods of utility trench compaction may also be appropriate, upon review by the Geotechnical Consultant at the time of construction.

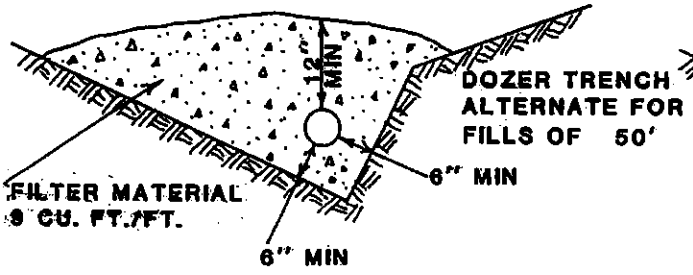
K6. In cases where clean granular materials are proposed for use in lieu of native materials or where flooding or jetting is proposed, the procedure should be considered subject to review by the Geotechnical Consultant.

K7. Clean granular backfill and/or bedding are not recommended in slope areas unless provisions are made for a drainage system to mitigate the potential build-up of seepage forces.

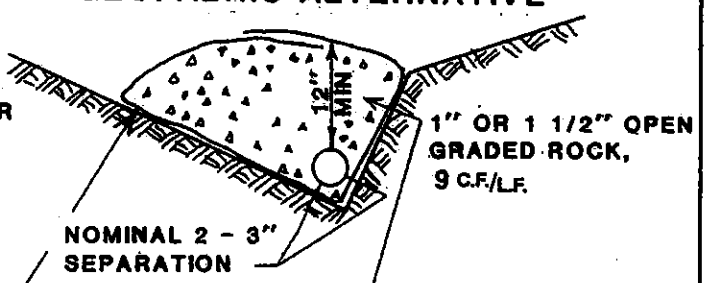
CANYON SUBDRAIN



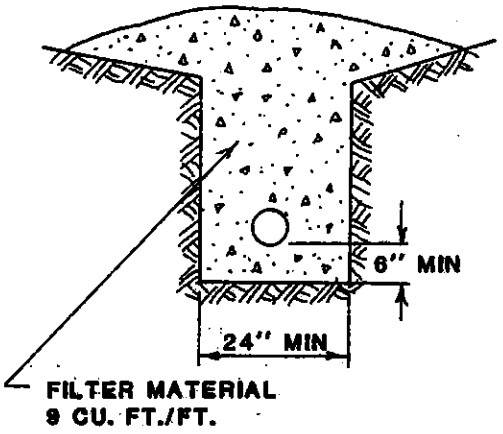
DOZER TRENCH



GEOFABRIC ALTERNATIVE



BACKHOE TRENCH



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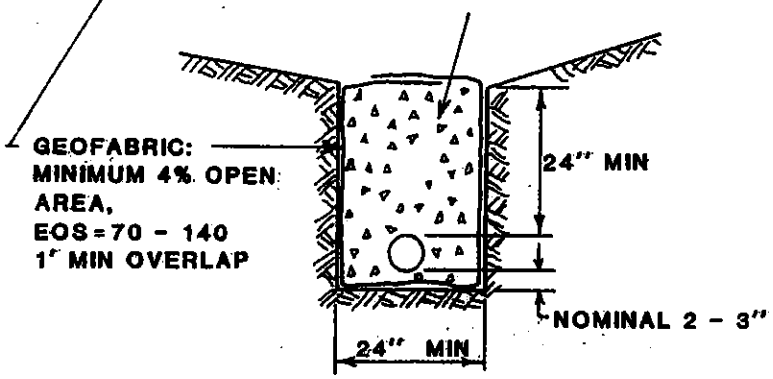


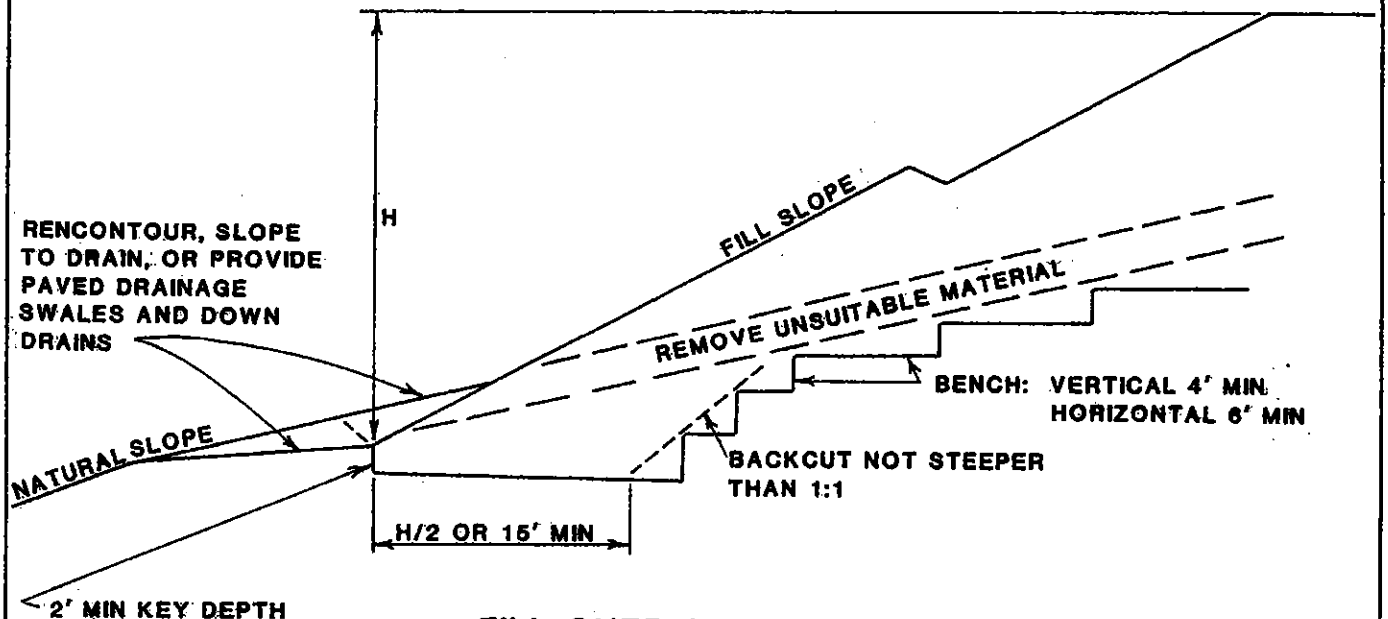
Notes:

1. Pipe should be 4" minimum diameter, 6" minimum for runs of 500', 8" minimum for runs of 1000' or greater.
2. Pipe should be Schedule 40 PVC for fills less than 100', Schedule 80 for fills to 150'. Upstream ends should be capped.
3. Pipe should have 8 uniformly spaced 3/8" perforations per foot placed at 90° offset on underside of pipe. Final 20 foot of pipe should be nonperforated.
4. Filter material should be California Class II Permeable Material.
5. Appropriate gradient should be provided for drainage; 2% minimum is recommended.
6. For the Geofabric Alternatives and gradients of 4% or greater, pipe may be omitted from the upper 500'. For runs of 500', 1000', and 1500' or greater, 4", 6", and 8" pipe, respectively, should be provided.
7. Concrete cutoff wall shall be installed at end of perforated pipe.

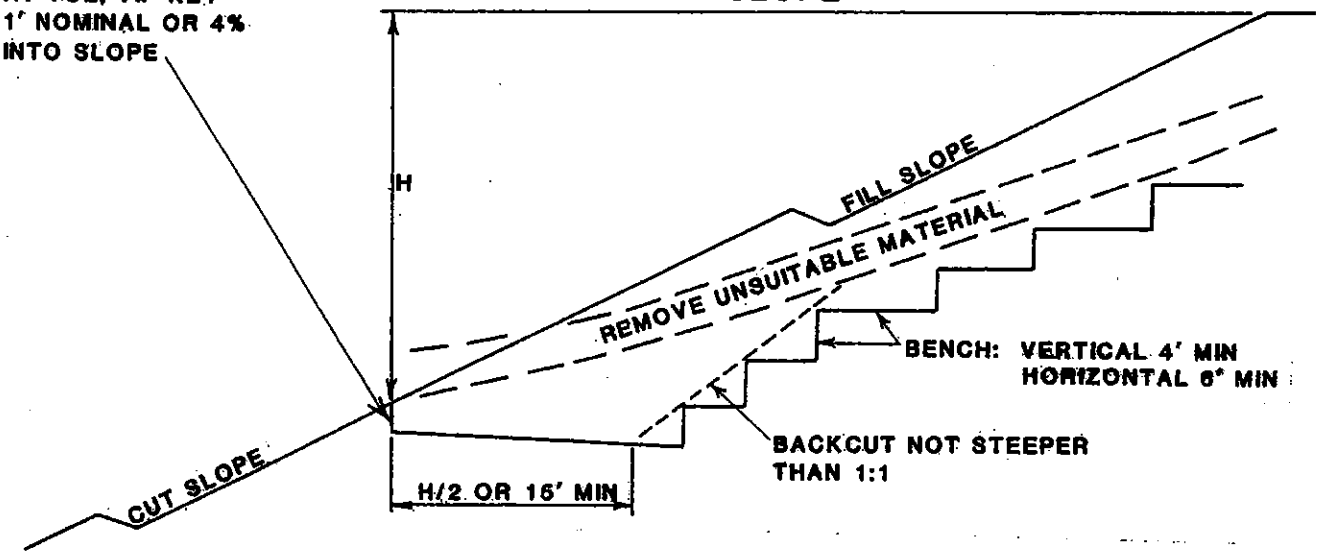
STANDARD DETAIL NO. 1

GEOPACIFICA	PROJECT NO.	FIGURE NO.

FILL OVER NATURAL SLOPE



FILL OVER CUT SLOPE



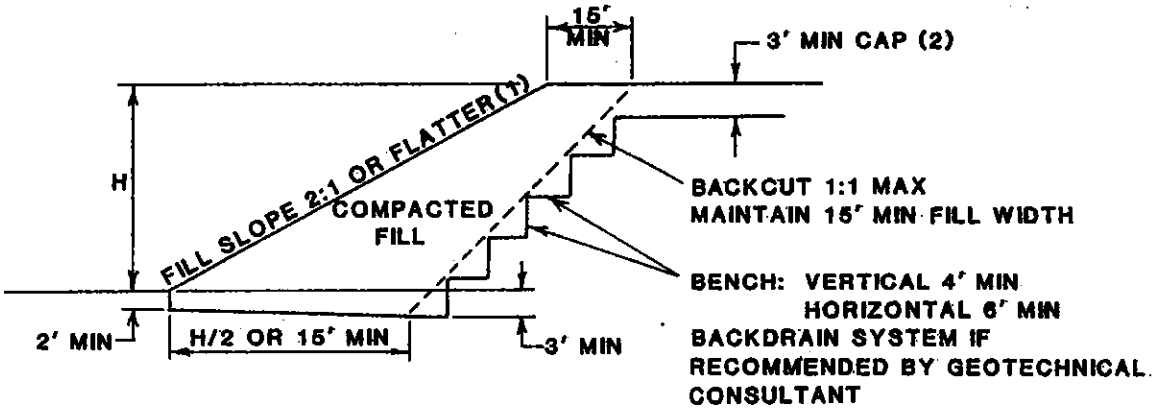
Notes:

1. If overfilling and cutting back to grade is adopted, 15' fill width may be reduced to 12' minimum. In no case should the fill width be less than 1/2 the height of fill remaining.
2. Backdrain as recommended by Geotechnical Consultant per Buttress Backdrain Detail.

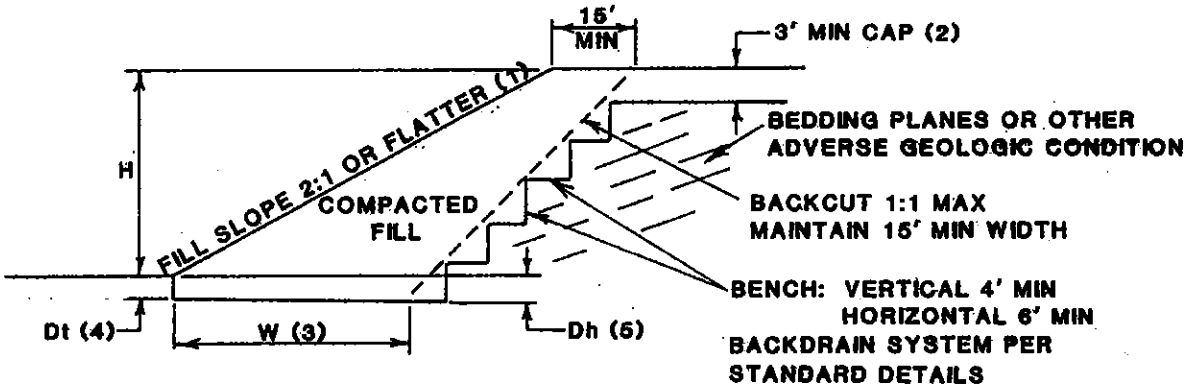
STANDARD DETAIL NO. 2

GEOPACIFICA	PROJECT NO.	FIGURE NO.

STABILIZATION FILL



BUTTRESS FILL



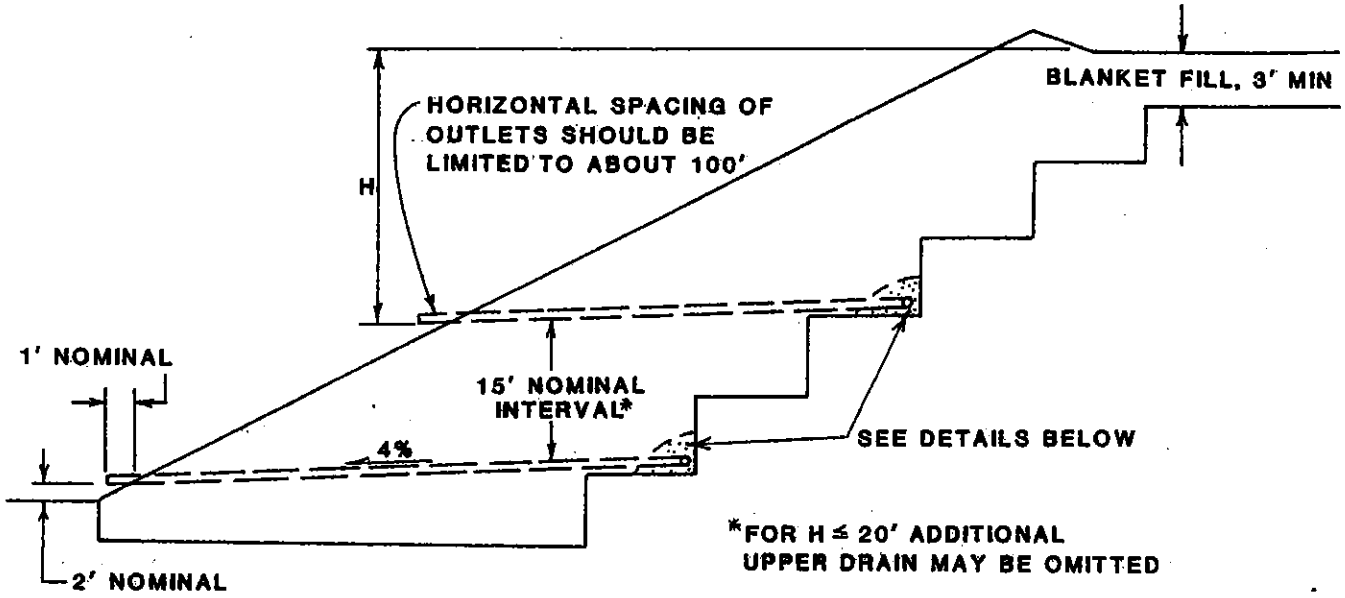
Notes:

1. If overfilling and cutting back to grade is adopted, 15' may be reduced to 12'. In no case should the fill width be less than half the fill height remaining.
2. A 3' blanket fill shall be provided above stabilization and buttress fills. The thickness may be greater as recommended by the Geotechnical Consultant.
3. W = designed width of key.
4. D_t = designed depth of key at toe.
5. D_h = depth of key at heel; unless otherwise specified, $D_h = D_t + 1$ foot.

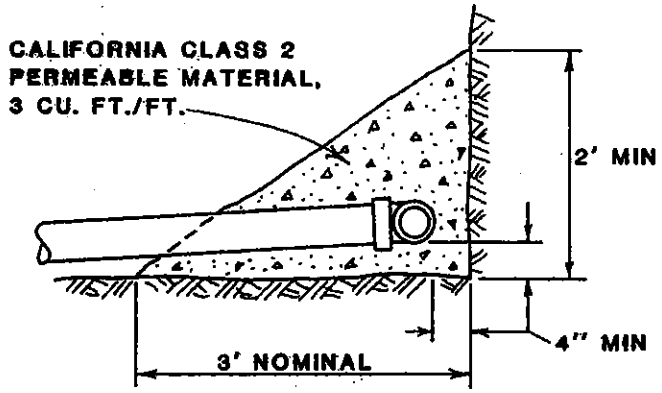
STANDARD DETAIL NO. 3

GEOPACIFICA	PROJECT NO.	FIGURE NO.

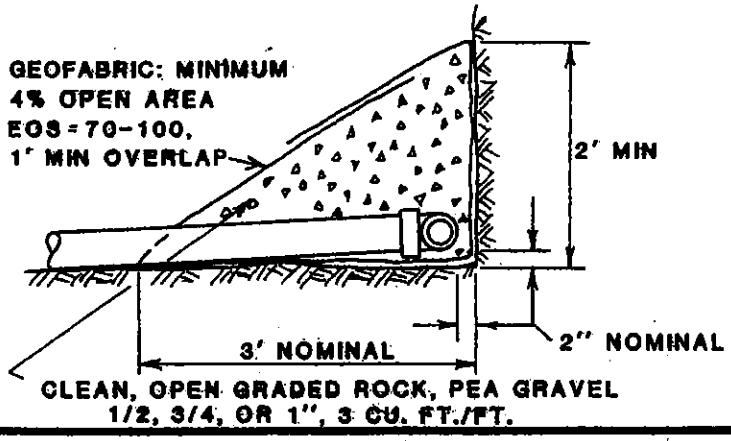
BUTTRESS BACKDRAIN SYSTEM



CONVENTIONAL BACKDRAIN



GEOFABRIC ALTERNATIVE



Notes:

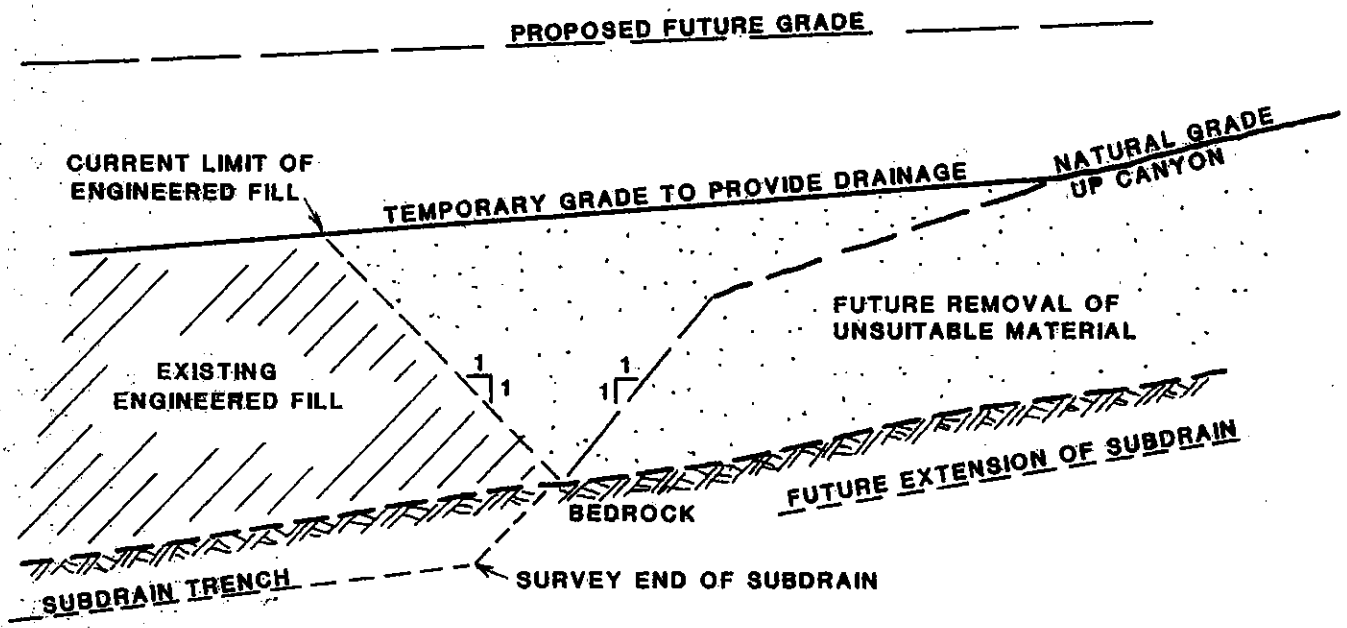
1. Pipe should be 4" diameter Schedule 40 PVC.
2. Gradients should be 4% or greater.
3. Cap all upstream ends.
4. Trenches for outlet pipes should be backfilled with compacted native soil.
5. Backdrain pipe should have 8 uniformly spaced perforations per foot placed 90° offset on underside of pipe. Outlet pipe should be non-perforated.
6. For the geofabric alternative the backdrain pipe may be omitted provided at least 20 feet (i.e. 10' each side of outlet) of perforated pipe is provided to lead into each outlet.
7. At each outlet the geofabric should be appropriately overlapped (1') at cuts in fabric or otherwise sealed or taped around the pipe.

STANDARD DETAIL NO. 4

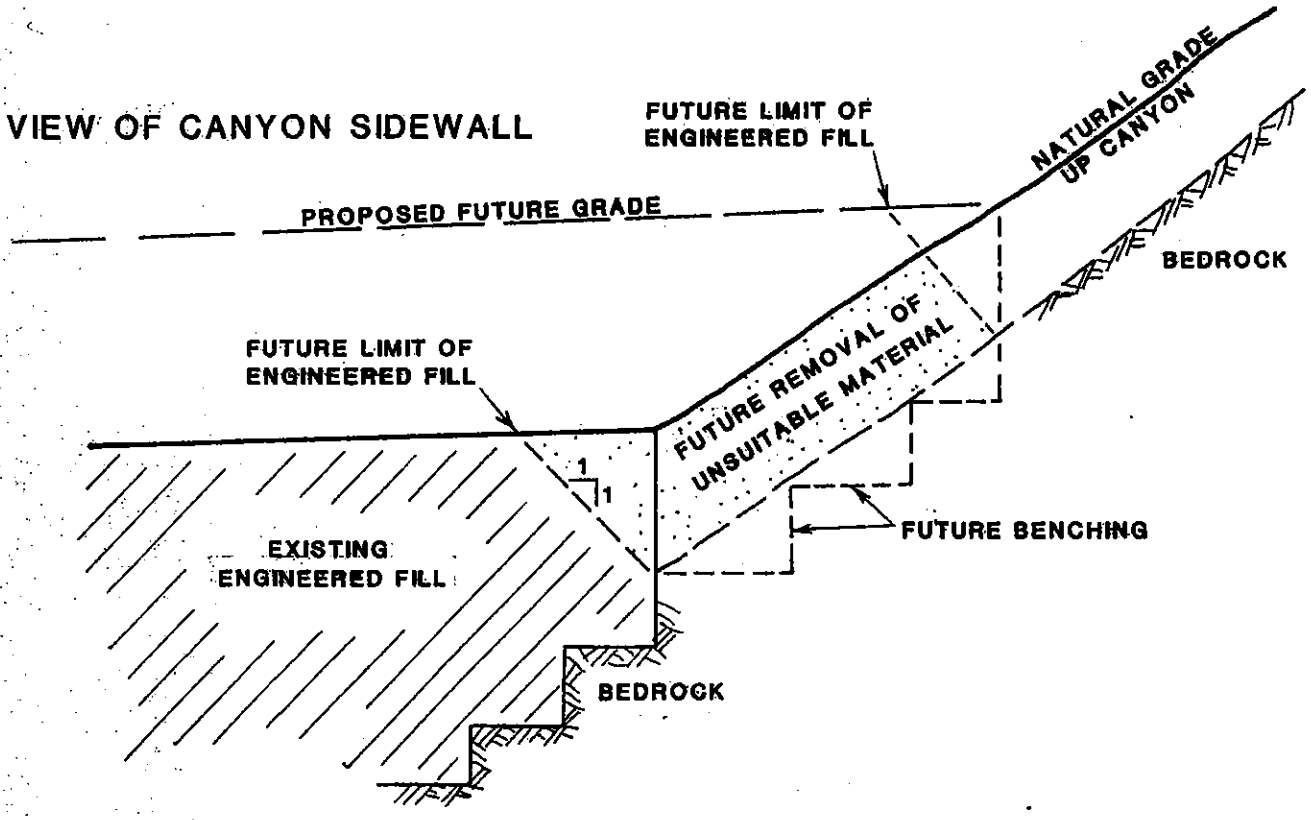
GEOPACIFICA	PROJECT NO.	FIGURE NO.

FUTURE CANYON FILL

VIEW ALONG CANYON



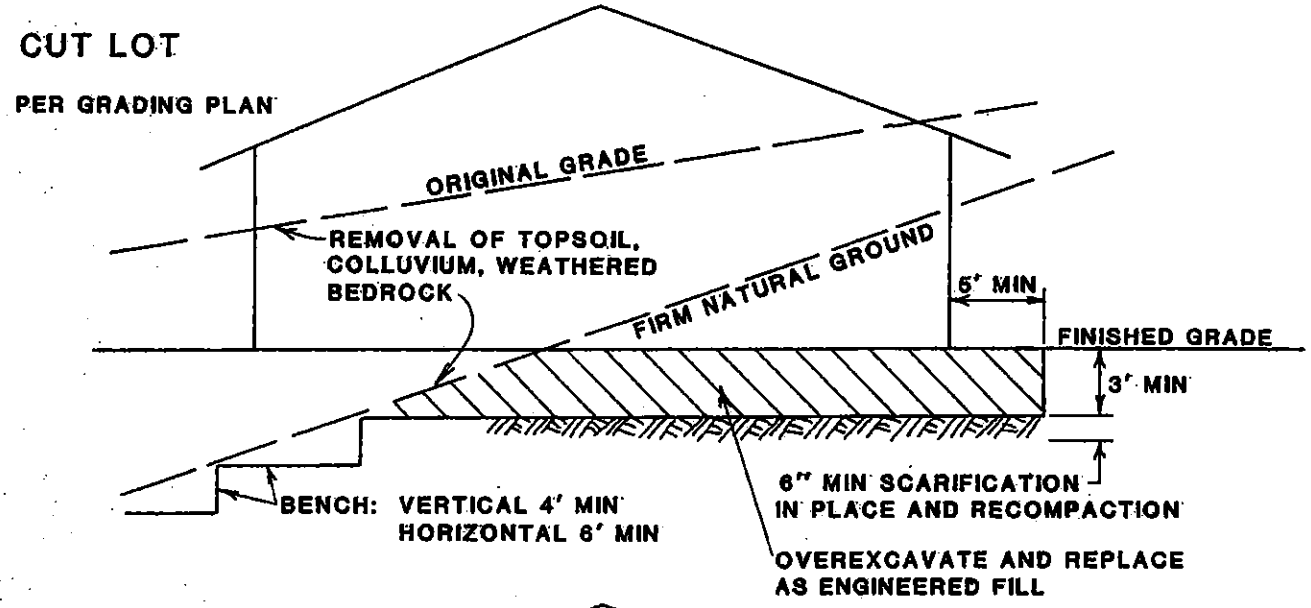
VIEW OF CANYON SIDEWALL

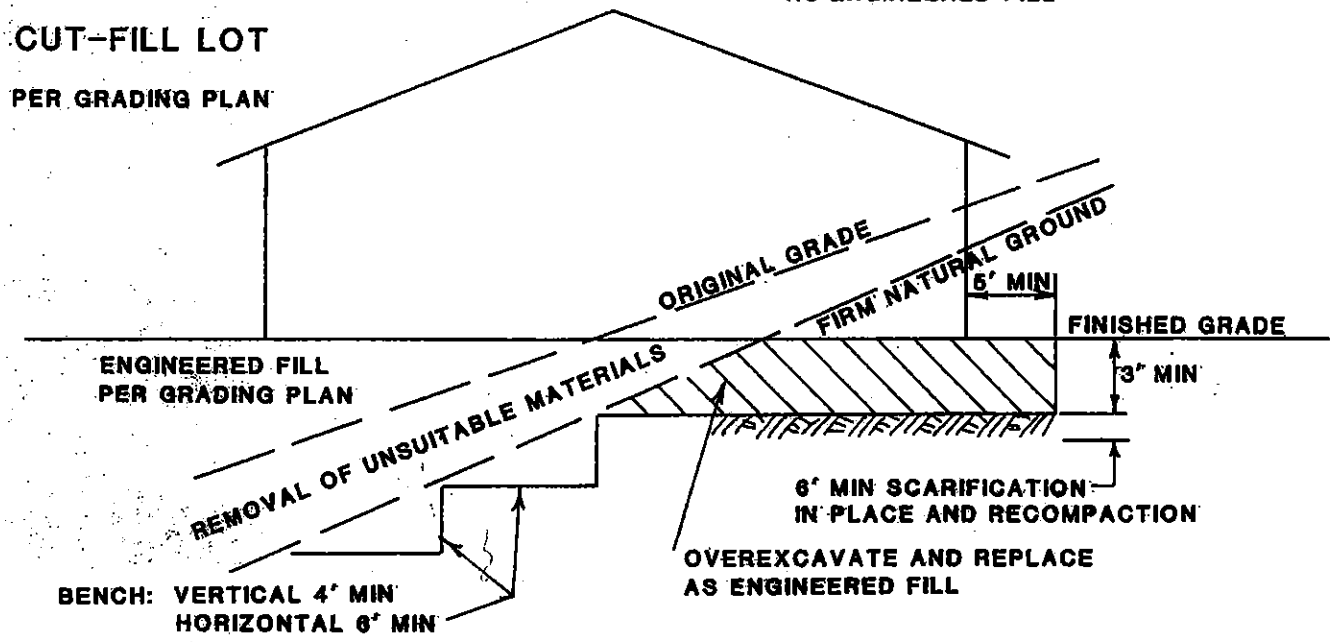


STANDARD DETAIL NO. 5

GEOPACIFICA	PROJECT NO.	FIGURE NO.

TRANSITION LOT OVEREXCAVATION





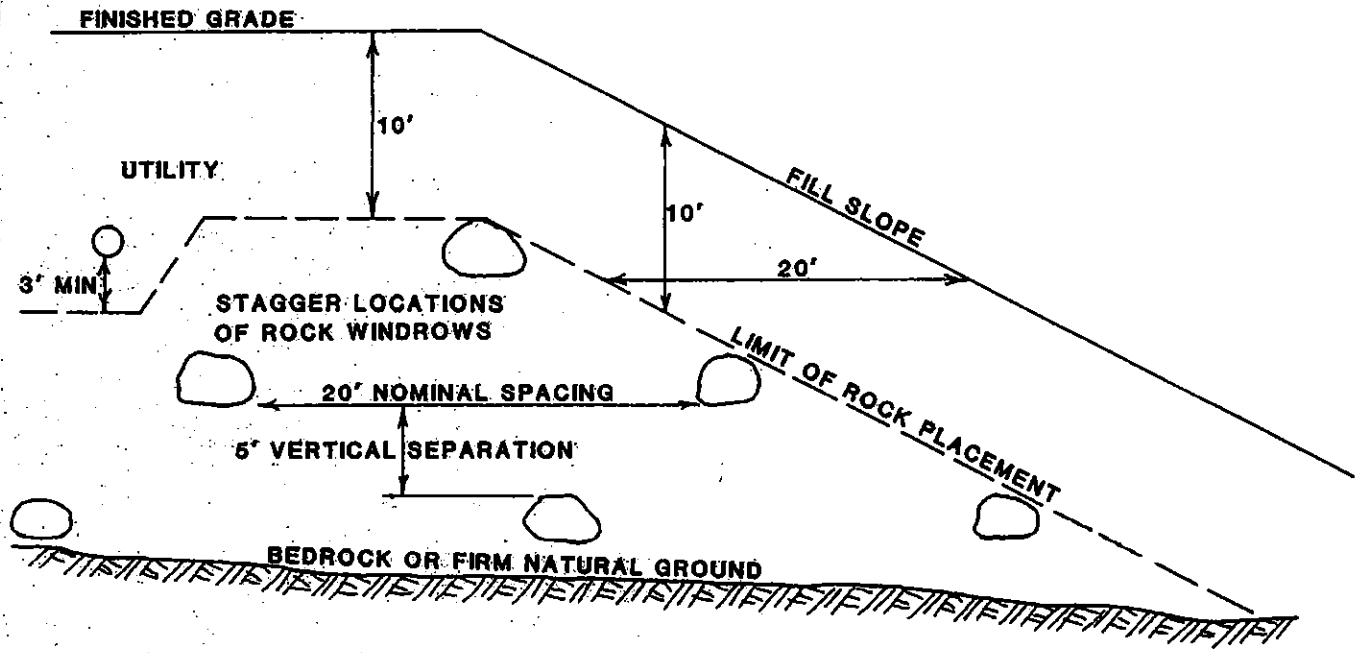
Notes:

1. Topsoil, colluvium, weathered bedrock and otherwise unsuitable materials should be removed to firm natural ground as identified by the Geotechnical Consultant.
2. The minimum depth of overexcavation should be considered subject to review by the Geotechnical Consultant. Steeper transitions may require deeper overexcavation.
3. The lateral extent of overexcavation should be 5' minimum but may include the entire lot as recommended by the Geotechnical Consultant.
4. The contractor should notify the Geotechnical Consultant in advance of achieving final grades (i.e. within 5') in order to evaluate overexcavation recommendations. Additional staking may be requested to aid in the evaluation of overexcavations.

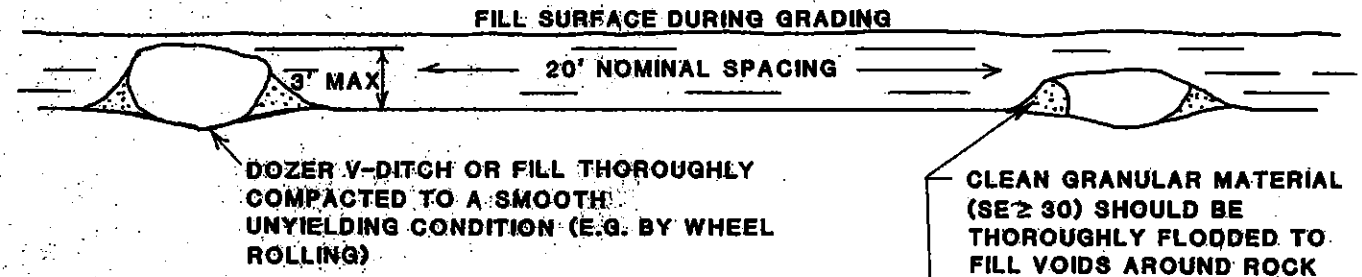
STANDARD DETAIL NO. 6

GEOPACIFICA	PROJECT NO.	FIGURE NO.

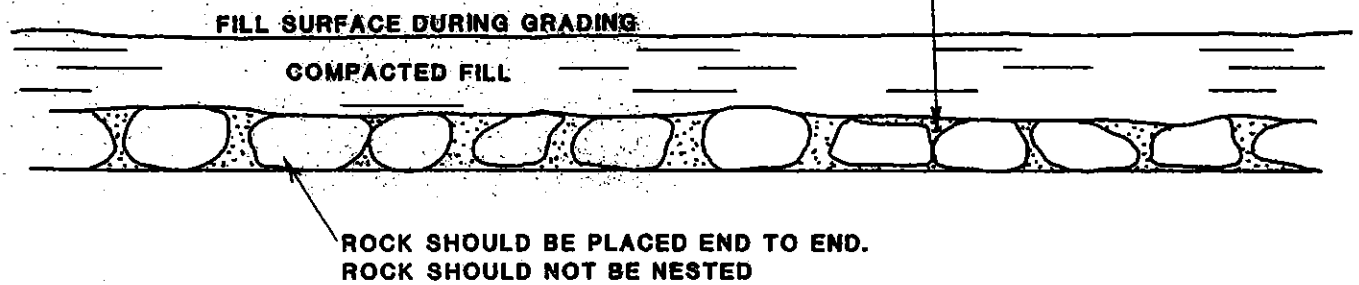
ROCK DISPOSAL



WINDROW SECTION



WINDROW PROFILE



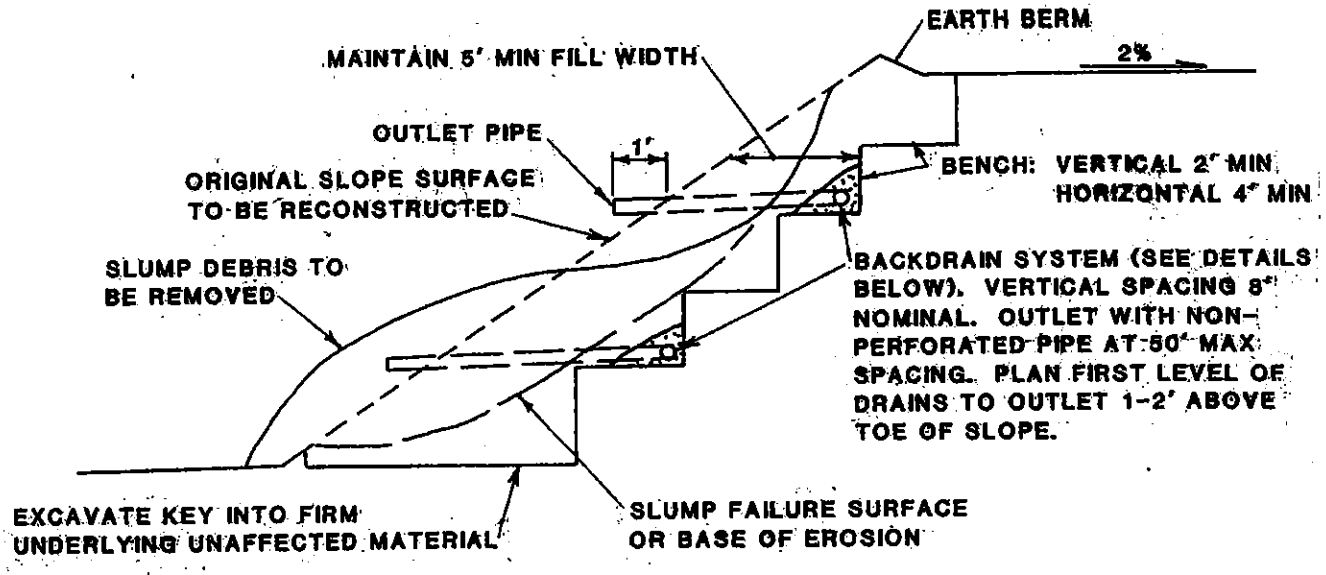
Notes:

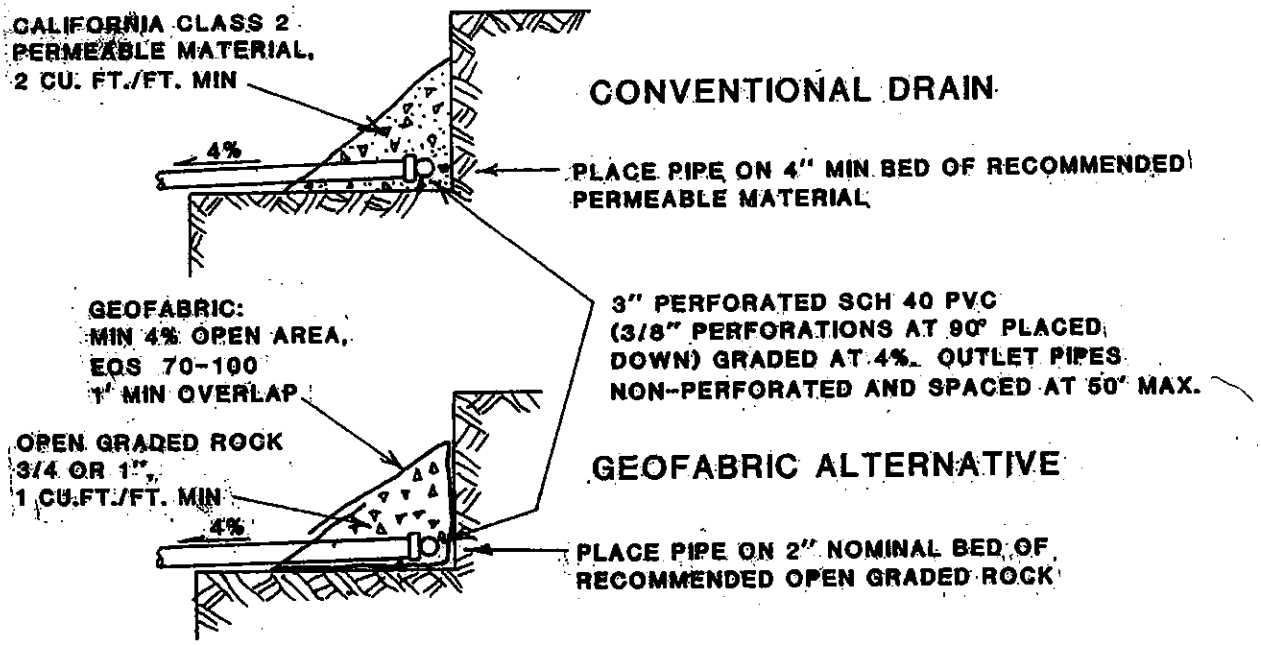
1. Following placement of rock, flooding of granular material and placement of compacted fill adjacent to windrow, each windrow should be thoroughly compacted from the surface.
2. The contractor should provide plans to the Geotechnical Consultant prepared by surveys documenting the location of buried rock.
3. Disposal in streets may be subject to more restrictive requirements by the governing authorities.

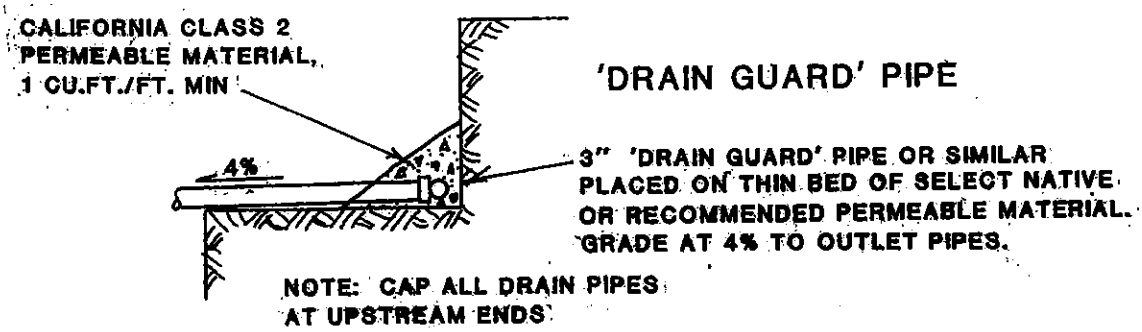
STANDARD DETAIL NO. 7

GEOPACIFICA	PROJECT NO.	FIGURE NO.

MINOR SLOPE REPAIR



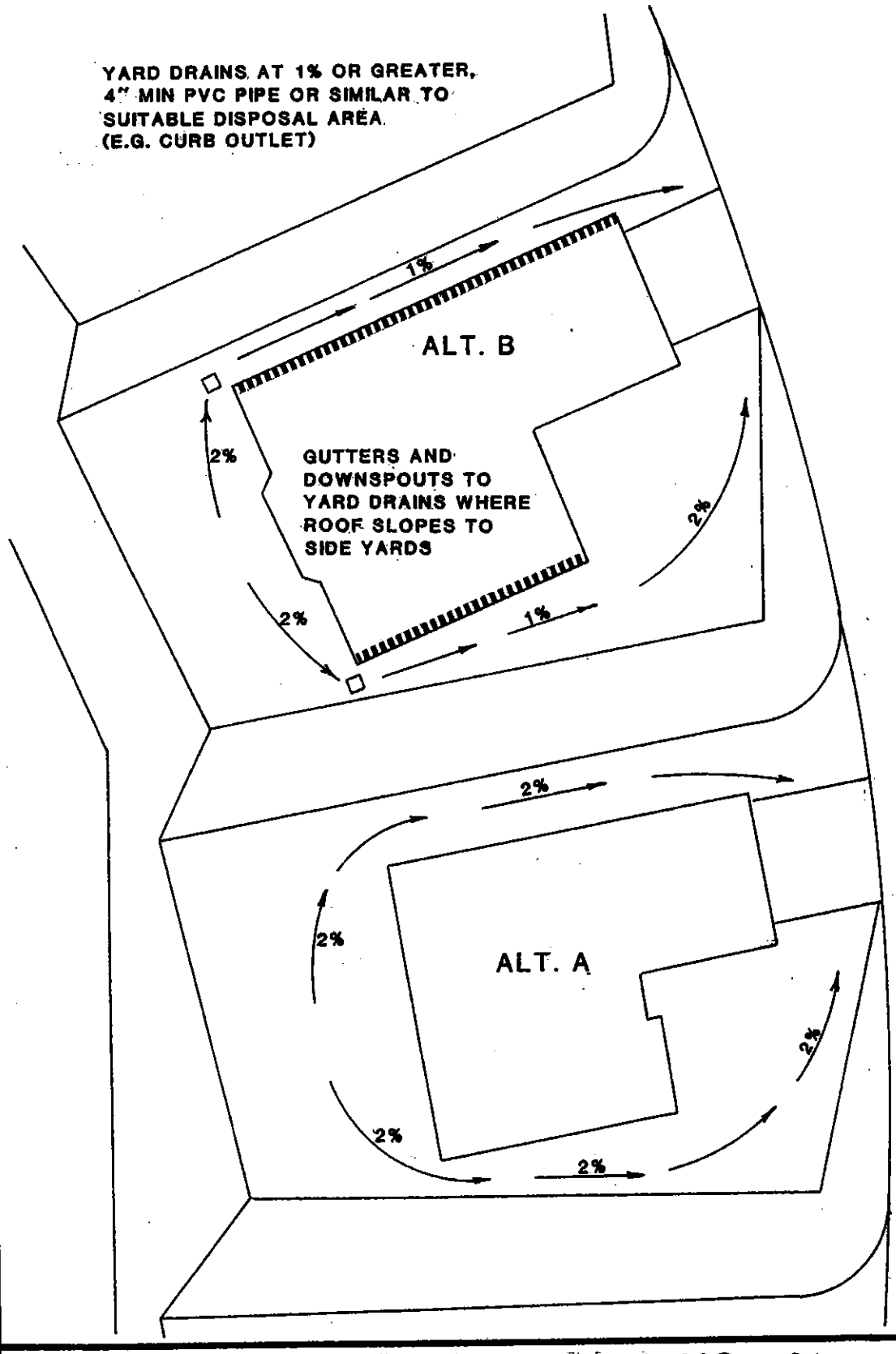




STANDARD DETAIL NO. 8

GEOPACIFICA	PROJECT NO.	FIGURE NO.

LOT DRAINAGE



Notes:

1. Drainage into swale areas should be at 2% gradient. Directly away from buildings should be at 4%.
2. For "flatland" tracts, drainage may be limited to 1% minimum.

STANDARD DETAIL NO. 9

GEOPACIFICA	PROJECT NO.	FIGURE NO.

GEOPACIFICA
GEOTECHNICAL
CONSULTANTS

August 19, 2010

City of Encinitas
555 Vulcan Avenue
Encinitas, California 92024

Attention: Mr. John Frenken

Subject: Addendum to Geotechnical Investigation
Hall Property
425 Santa Fe Drive
Encinitas, California

References: Preliminary Geotechnical Investigation, Hall Property, 425 Santa Fe Drive, Encinitas, California, by Geopacifica, Inc., dated July 13, 2010

Dear Mr. Frenken:

INTRODUCTION

The following report adds to or corrects the findings of our geologic and soils engineering investigation of performed on the subject property and presented in our geotechnical report of July 13, 2010. Input from the structural and civil engineer and an additional building detail needing additional foundation recommendations prompted the present report. This report provides recommendations and parameters with respect to the current design requirements.

This report is prepared for the use of the client, authorized agents, and should not be considered transferable. Before use and implementation for construction, Geopacifica should review the proposed development plans and specifications to insure compliance with the provisions and recommendations of this report. Following the review, additional work may be required to update this report.

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GEOPACIFICA
GEOTECHNICAL
CONSULTANTS

Proposed Partial Two Story Structure

I was given a preliminary design for a structure("tuck-under" concession area) that would have a portion of the structure being two-story. I recommend that the two-story portion of the structure have a footing design utilizing a minimum 24-inch deep by 15-inch wide foundation. Also, isolated column footings should have a minimum of width of 24-inches and a minimum depth of 24-inches. If these recommendations are implemented, I do not anticipate any problems with differential settlement between the one and two-story structure.

Bulking Factor for Terrace Deposits

The bulking factor for the Terrace Deposits should be corrected to read 0-5%.

Pavement Design

The A.C. pavement design can be modified to allow for 3-inches A.C. over 4-inches Class II base for the parking stalls. All drives shall have the recommended 4-inches A.C. over 6-inches Class II base.

Recommended Bearing Capacity

The recommended bearing capacity for both structures and retaining walls is 2500 psf.

Controlling Jurisdiction

The 2007 edition of the California Building Code is the controlling code for design.

The abovementioned corrections/additions were based on input for the various consultants through e-mails and phone conversations. If there are any additional comments, please do not hesitate to call.

Sincerely,

James F. Knowlton
RCE 55754 CEG 1045

GEOPACIFICA
GEOTECHNICAL
CONSULTANTS

September 7, 2010

City of Encinitas
555 Vulcan Avenue
Encinitas, California 92024

Attention: Mr. John Frenkin

Subject: 2nd Addendum to Geotechnical Investigation
Hall Property
425 Santa Fe Drive
Encinitas, California

References: Preliminary Geotechnical Investigation, Hall Property, 425 Santa Fe Drive, Encinitas, California, by Geopacifica, Inc., dated July 13, 2010

Addendum to Geotechnical Investigation, Hall Property, 425 Santa Fe Drive, Encinitas, California, by Geopacifica, Inc., dated August 19, 2010

Progress Drawing, Proposed Wall Details and Sections, Sections C-0.3, by MCE Consultants, Undated

Dear Mr. Frenkin:

INTRODUCTION

The following report adds to the findings of our geologic and soils engineering investigation of performed on the subject property and presented in our geotechnical report of July 13, 2010 and Addendum report, dated August 19, 2010. Input from the structural and civil engineer and an additional plan showing wall details needing additional foundation recommendations prompted the present report. This report provides recommendations and parameters with respect to the current design requirements.

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GEOPACIFICA
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CONSULTANTS

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Embedment Recommendations for Conventional Footings on Top of Slopes

Structures that cannot tolerate differential settlement(such as foundations, concrete decks, walls, etc.) should not be located within 7 feet of the top of slopes. Structures that must be located in this zone should have footings extended in depth such that the outer bottom edge of the footings extended in depth such that the outer bottom edge of the footings is at least 7 feet horizontally from the slope face.

Pier Footing Recommendations (If Utilized)

If the structural engineer desires to utilize a pier footing to support the proposed walls or fences the following parameters are presented:

The piers should be a minimum of 12 inches in diameter and embedded a minimum of 5 feet into the prepared subgrade. The ultimate load capacity of piers should be based on a skin friction of 750 psf and a factor of safety of 2.5 should be applied to calculate allowable load capacity. The upper 2 feet of the pile should be ignored when calculating the uplift resistance of the pier. The calculated allowable uplift load for a 12 inch diameter pier embedded a minimum of 5 feet into the prepared subgrade is around 3.0 kips. The allowable uplift resistance can be estimated at 80% of the vertical capacity of the pier. The allowable bearing capacities may be increased by 33 percent for transient loading such as from wind or a seismic event.

The abovementioned additions were based on input for the various consultants through e-mails and phone conversations. If there are any additional comments, please do not hesitate to call.

Sincerely,

James F. Knowlton
RCE 55754 CEG 1045

GEOPACIFICA
GEOTECHNICAL
CONSULTANTS

October 11, 2010

City of Encinitas
555 Vulcan Avenue
Encinitas, California 92024

Attention: Mr. John Frenken

Subject: Review of Building Foundation Plans
Hall Property
425 Santa Fe Drive
Encinitas, California

References: Preliminary Geotechnical Investigation, Hall Property, 425 Santa Fe Drive, Encinitas, California, by Geopacifica, Inc., dated July 13, 2010

Addendum to Geotechnical Investigation, Hall Property, 425 Santa Fe Drive, Encinitas, California, by Geopacifica, Inc., dated August 19, 2010

Park Improvement Plans, Hall Property, Sheets SN1, SN2, S1.0-S6.0, SD1.0-SD4.0, by James Mickart, Undated

Dear Mr. Frenken:

INTRODUCTION

The following letter report is a review of the foundation plans for the North and South Restrooms, Trash Enclosures and Retaining wall plans for proposed Improvements to the Hall Property located at 425 Santa Fe Drive, Encinitas, CA. The preliminary Park Improvement Plans were prepared by James Mickart, Architect. I have reviewed the foundation designs in respect to the findings and recommendations of our geologic and soils engineering investigation performed on the subject property and presented in our geotechnical report of July 13, 2010 and addendum report, dated August 19, 2010.

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GEOPACIFICA
GEOTECHNICAL
CONSULTANTS

This report is prepared for the use of the client, authorized agents, and should not be considered transferable. Before use and implementation for construction, Geopacifica should review the proposed development plans and specifications to insure compliance with the provisions and recommendations of this report.

Based upon my review of the pertinent sheets covering the foundation details with respect to the foundation recommendations presented in my reference reports I find that the wall and foundation details are in accordance with Geopacifica report recommendations and are approved.

Sincerely,

James F. Knowlton
RCE 55754 CEG 1045

GEOPACIFICA
GEOTECHNICAL
CONSULTANTS

November 12, 2010

City of Encinitas
555 Vulcan Avenue
Encinitas, California 92024

Attention: Mr. John Frenken

Subject: 3rd Addendum to Geotechnical Investigation
Temporary Slopes
Hall Property
425 Santa Fe Drive
Encinitas, California

References: Preliminary Geotechnical Investigation, Hall Property, 425 Santa Fe Drive, Encinitas, California, by Geopacifica, Inc., dated July 13, 2010

Addendum to Geotechnical Investigation, Hall Property, 425 Santa Fe Drive, Encinitas, California, by Geopacifica, Inc., dated August 19, 2010

2nd Addendum to Geotechnical Investigation, Hall Property, 425 Santa Fe Drive, Encinitas, CA, by Geopacifica, Inc., dated September 7, 2010

Dear Mr. Frenken:

INTRODUCTION

The following report adds to the findings of our geologic and soils engineering investigation of performed on the subject property and presented in our geotechnical report of July 13, 2010 and Addendum reports, dated August 19 and September 7, 2010. Requests for recommendations for temporary slopes prompted this additional report.

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GEOTECHNICAL
CONSULTANTS

This report is prepared for the use of the client, authorized agents, and should not be considered transferable. Before use and implementation for construction, Geopacifica should review the proposed development plans and specifications to insure compliance with the provisions and recommendations of this report. Following the review, additional work may be required to update this report.

Temporary Construction Slopes

Temporary construction slopes, both cut and fill, may be constructed at a minimum slope ratio of 1:1(horizontal to vertical) or flatter to a maximum height of 20 feet. Excavations for removals, drainage devices, debris basins and other localized conditions should be evaluated on an individual basis by the soils engineer and engineering geologist for variance from this recommendation. However, for localized removals for conditions as described above, slopes can be excavated up to a ¾:1 slope angle. Due to the nature of the materials anticipated, the engineering geologist should observe all excavations and fill conditions. The geotechnical engineer should be notified of all proposed temporary construction cuts, and upon review, appropriate recommendations should be presented.

The abovementioned additions were based on input for the various consultants through e-mails and phone conversations. If there are any additional comments, please do not hesitate to call.

Sincerely,

James F. Knowlton
RCE 55754 CEG 1045

GEOPACIFICA
GEOTECHNICAL
CONSULTANTS

July 28, 2011

City of Encinitas
555 Vulcan Avenue
Encinitas, California 92024

Attention: Ms. Stephanie Kellar

Subject: 4th Addendum to Geotechnical Investigation
On-Site Class II Base Testing/Pavement Recommendations
Hall Property
425 Santa Fe Drive
Encinitas, California

References: Preliminary Geotechnical Investigation, Hall Property, 425 Santa Fe Drive, Encinitas, California, by Geopacifica, Inc., dated July 13, 2010

Addendum to Geotechnical Investigation, Hall Property, 425 Santa Fe Drive, Encinitas, California, by Geopacifica, Inc., dated August 19, 2010

2nd Addendum to Geotechnical Investigation, Hall Property, 425 Santa Fe Drive, Encinitas, CA, by Geopacifica, Inc., dated September 7, 2010

3rd Addendum to Geotechnical Investigation, Hall Property, 425 Santa Fe Drive, Encinitas, CA by Geopacifica, Inc., dated November 12, 2010

Dear Ms. Kellar:

INTRODUCTION

The following report adds to the findings of our geologic and soils engineering investigation of performed on the subject property and presented in our geotechnical report of July 13, 2010 and Addendum reports, dated August 19, September 7 and November 12, 2011. Requests for testing of the onsite manufactured base and recommendations for paving prompted this additional report.

This report is prepared for the use of the client, authorized agents, and should not be considered transferable. Before use and implementation for construction, Geopacifica should review the proposed development plans and specifications to insure compliance with the provisions and recommendations of this report. Following the review, additional work may be required to update this report.

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GEOPACIFICA
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CONSULTANTS

Testing of On-Site Manufactured Class II Base

During the demolition of the on-site structures all of the concrete recovered from those structures and any other miscellaneous concrete was crushed and screened to Class II base specifications. Geopacifica, Inc. obtained three samples of the on-site material for laboratory testing. The samples were tested for R-Value, gradation, sand equivalent(SE) and durability. These results were compared to the minimum requirements for Class II base as required by the California Department of Transportation(Cal-Trans). The results of those tests are included as Appendix A – Laboratory Testing.

In summary, all three samples met the requirements for R-Value and Sand Equivalent. Two samples met the gradation requirement with one sample exceeding the amount of fines(passing the 200 sieve) by two percent. We have some reservations regarding the gradation testing because upon visual observation of the material some of the "rocks" were Portland cement pieces. Although the durability tests passed we have the same reservations regarding the long term durability of the base material because of the possible degradation of the Portland cement pieces.

We would recommend that this base can be used as a class II base, but only in the parking lot areas. We understand that the parking lots may be constructed with base only and AC paving placed in the future. We recommend 12-inches of the manufactured base be utilized for the parking lot areas for this "temporary" situation.

Pavement Recommendations for Roads and Parking Lots

Based upon our preliminary R-Value testing of the onsite materials and our experience with similar materials in subdivisions adjacent and close to this property we recommend that a pavement section of 4-inches AC over 8-inches of Class II base be utilized as the structural section for paving. This section is recommended for the parking areas and for the access roads.

Sincerely,

James F. Knowlton
RCE 55754 CEG 1045

APPENDIX A

GEOPACIFICA	PROJECT NO.	FIGURE NO. 1

PHYSICAL PROPERTIES OF AGGREGATES

Client: City of Encinitas
RECYCLED AGGREGATE BASE

Job No:
Lab/Invoice No:
Date of Report: June 28, 2011
Reviewed By:

Project: Hall Property
Location: Encinitas — Sampled By: JFK — Date: June 8, 2011
Type of Aggregate: Class II A/B — Submitted By: — Date:
Source of Aggregate: Site Demo — Authorized By: — Date:

Sieve Analysis, ASTM C134

Sieve Size	% Passing Accumulative	Specifications
2½"		
2"		
1½		
1	100	100
3/4	98	90 - 100
1/2	80	
3/8	64	
#4	47	35 - 60
#8	36	
#16	27	
#30	19	10 - 30
#50	14	
#100	10	
#200	5.2	2 - 9
Finer than 200 ASTM C117		

Test Standards are ASTM unless otherwise noted

Test		Results	Specifications	Test STD
% Crushed Particles		97.2		ASTM 692
Soundness By				
Sodium Sulfate				ASTM C-88
Durability Index		35	35 Min	
R-Value		80	78 Min	
Deleterious Particles				
Resistance to Abrasion	% Wear, 100 Rev			C131 Grading
	% Wear, 500 Rev			
	% Wear, Rev			C535 Grading
	% Wear, 1000 Rev			
				ASTM D-1883
Liquid Limit Plasticity Index		Non-Plastic		
Cleanness Value				Calif. 227
Sand Equivalent Value		40	25 Min	Calif. 217
Moisture Density Relations	Max. Dry Density, pcf	126.5		☐ D698 ☒ D1557 ☐ AASHTO T99 ☐ AASHTO T180
	Optimum Moisture, %	8.0		
	Method			
Specific Gravity	Absorption, %			
	Bulk (Dry)			☐ C127 ☐ C128
	Bulk (SSD)			
	Apparent			

CONFORMS *

* Contains concrete pieces

GEOPACIFICA	PROJECT NO.	FIGURE NO. 2

PHYSICAL PROPERTIES OF AGGREGATES

Client: City of Encinitas
RECYCLED AGGREGATE BASE

Job No:
Lab/Invoice No:
Date of Report: June 28, 2011
Reviewed By:

Project: Hall Property
Location: Encinitas — Sampled By: JFK — Date: June 8, 2011
Type of Aggregate: Class II A/B — Submitted By: — Date:
Source of Aggregate: Site Demo — Authorized By: — Date:

Sieve Analysis, ASTM C134

Sieve Size	% Passing Accumulative	Specifications
2½"		
2"		
1½		
1	100	100
3/4	95	90 - 100
1/2	83	
3/8	66	
#4	49	35 - 60
#8	35	
#16	30	
#30	22	10 - 30
#50	17	
#100	13	
#200	8.2	2 - 9
Finer than 200 ASTM C117		

Test Standards are ASTM unless otherwise noted

Test		Results	Specifications	Test STD
% Crushed Particles		96.5		ASTM 692
Soundness By				
Sodium Sulfate				ASTM C-88
Durability Index		36	35 Min	
R-Value		82	78 Min	
Deleterious Particles				
Resistance to Abrasion	% Wear, 100 Rev			C131 Grading
	% Wear, 500 Rev			
	% Wear, Rev			C535 Grading
	% Wear, 1000 Rev			
				ASTM D-1883
Liquid Limit Plasticity Index		Non-Plastic		
Cleanness Value				Calif. 227
Sand Equivalent Value		45	25 Min	Calif. 217
Moisture Density Relations	Max. Dry Density, pcf	124.6		☐ D698 ☒ D1557 ☐ AASHTO T99 ☐ AASHTO T180
	Optimum Moisture, %	8.4		
	Method			
Specific Gravity	Absorption, %			☐ C127 ☐ C128
	Bulk (Dry)			
	Bulk (SSD)			
	Apparent			

CONFORMS *

* Contains Concrete pieces

GEOPACIFICA	PROJECT NO.	FIGURE NO. 3

PHYSICAL PROPERTIES OF AGGREGATES

Client: City of Encinitas
RECYCLED AGGREGATE BASE

Job No:
Lab/Invoice No:
Date of Report:
Reviewed By:

Project: Hall Property
Location: Encinitas — Sampled By: JFK — Date: June 8, 2011
Type of Aggregate: Class II A/B — Submitted By: — Date:
Source of Aggregate: Site Demo — Authorized By: — Date:

Sieve Analysis, ASTM C134

Sieve Size	% Passing Accumulative	Specifications
2½"		
2"		
1½		
1	100	100
3/4	97	90 - 100
1/2	81	
3/8	65	
#4	50	35 - 60
#8	40	
#16	31	
#30	23	10 - 30
#50	18	
#100	14	
#200	9.2	2 - 9
Finer than 200 ASTM C117		

Test Standards are ASTM unless otherwise noted

Test		Results	Specifications	Test STD
% Crushed Particles		97.0		ASTM 692
Soundness By				
Sodium Sulfate				ASTM C-88
Durability Index		35	35 Min	
R-Value		79	78 Min	
Deleterious Particles				
Resistance to Abrasion	% Wear, 100 Rev			C131 Grading
	% Wear, 500 Rev			
	% Wear, Rev			C535 Grading
	% Wear 1000 Rev			
				ASTM D-1883
Liquid Limit Plasticity Index		Non-Plastic		
Cleanness Value				Calif. 227
Sand Equivalent Value		42	25 Min	Calif 217
Moisture Density Relations	Max. Dry Density, pcf	127.0		☐ D698 ☒ D1557 ☐ AASHTO T99 ☐ AASHTO T180
	Optimum Moisture, %	7.9		
	Method			
Specific Gravity	Absorption, %			☐ C127 ☐ C128
	Bulk (Dry)			
	Bulk (SSD)			
	Apparent			

CONFORMS *

* Contains concrete pieces

GEOPACIFICA
GEOTECHNICAL
CONSULTANTS

August 8, 2011

City of Encinitas
555 Vulcan Avenue
Encinitas, California 92024

Attention: Mr. John Frenken

Subject: Request for Additional Funds
Geotechnical Consulting and Review
Hall Property
425 Santa Fe Drive
Encinitas, California

References: Preliminary Geotechnical Investigation, Hall Property, 425 Santa Fe Drive, Encinitas, California, by Geopacifica, Inc., dated July 13, 2010

Addendums to Geotechnical Investigation, Hall Property, 425 Santa Fe Drive, Encinitas, California, by Geopacifica, Inc., dated August 8 & 19, 2010, Sept. 9, 2010 and July 28, 2011

Dear Mr. Frenken:

Since our original preliminary geotechnical investigation, Geopacifica has prepared 4 addendum reports, the latest being July 28 of this year. We have been requested to perform a grading plan and building plan review of the current plans for this project. Funds for our original consulting contract have been depleted and we are requesting additional funds to complete our requested review and costs for our latest addendum #4(pavement design and laboratory testing). We are requesting an additional $3000.00 in additional funds to complete all of our work.

Sincerely,

James F. Knowlton
RCE 55754 CEG 1045

REGISTERED PROFESSIONAL ENGINEER
JAMES F. KNOWLTON
NO. 055754
EXP. _____
CIVIL
STATE OF CALIFORNIA

CERTIFIED ENGINEERING GEOLOGIST
JAMES F. KNOWLTON
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GEOPACIFICA
GEOTECHNICAL
CONSULTANTS

September 8, 2011

City of Encinitas
555 Vulcan Avenue
Encinitas, California 92024

Attention: Ms. Stephanie Kellar

Subject: 5th Addendum to Geotechnical Investigation
Property Line Wall Recommendations
Hall Property
425 Santa Fe Drive
Encinitas, California

References: Preliminary Geotechnical Investigation, Hall Property, 425 Santa Fe Drive, Encinitas, California, by Geopacifica, Inc., dated July 13, 2010

Addendum to Geotechnical Investigation, by Geopacifica, Inc., dated August 19, 2010

2nd Addendum to Geotechnical Investigation, by Geopacifica, Inc., dated September 7, 2010

3rd Addendum to Geotechnical Investigation, by Geopacifica, Inc., dated November 12, 2010

4th Addendum to Geotechnical Investigation, by Geopacifica, Inc. dated July 28, 2011

Dear Ms. Kellar:

The following report adds to the findings of our geologic and soils engineering investigation of performed on the subject property and presented in our geotechnical report of July 13, 2010 and Addendum reports, dated August 19, September 7 and November 12, 2011 and July 28, 2011. Requests for property line wall foundation recommendations prompted this report.

This report is prepared for the use of the client, authorized agents, and should not be considered transferable. Before use and implementation for construction, Geopacifica should review the proposed development plans and specifications to insure compliance with the provisions and recommendations of this report. Following the review, additional work may be required to update this report.

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GEOPACIFICA
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Property Wall Recommendations

Information regarding the proposed walls was provided by ADS, structural engineers and Eric Chastain of RJM Design Group Inc.

The following foundation recommendations are for freestanding property line and are based upon being either on native Terrace Deposits or on compacted fill having on EI of less than 50.

The recommended design bearing value for the walls is 2500 pounds per square foot (PSF). The allowable pressures may be increased by one-third when considering loads of short duration such as wind or seismic forces.

A coefficient of 0.35 may be used for sliding.

1. Lateral Resistance:
   a) Passive earth pressure may be computed as an equivalent fluid having a density of 250 pounds per square foot per foot of depth, to a maximum earth pressure of 2500 pounds per square foot.
   b) When combining passive pressure and frictional resistance, the passive pressure component should be reduced by one-third.
2. Set Backs:
   a) The outside bottom edge of all footings for settlement sensitive structures should be set back a minimum of seven (7) feet from the face of any descending slope.

Lateral forces can be resisted by a combination for lateral bearing pressure and lateral sliding resistance. We recommend that the first foot of soil be neglected in the passive resistance calculations if the ground surface is not protected from erosion or disturbance by a slab, pavement or in some similar manner.

We recommend a minimum footing embedment of 18-inches with a minimum of two No. 4 bars, one placed near the top of the footing and one place near the bottom. The minimum recommended width of the footing is 12-inches. Footings should be designed in accordance with the structural engineer's requirements.

The abovementioned additions were based on input for the various consultants through e-mails and phone conversations. If there are any additional comments, please do not hesitate to call.

Sincerely,

Chris Lillback

Chris E. Lillback
RCE 35007

GEOPACIFICA
GEOTECHNICAL
CONSULTANTS

September 15, 2011

City of Encinitas
555 Vulcan Avenue
Encinitas, California 92024

Attention: Ms. Stephanie Kellar

Subject: 6th Addendum to Geotechnical Investigation
Review of Revised Wall Foundation Plans
Hall Property – Encinitas Community Park
425 Santa Fe Drive
Encinitas, California

References: Preliminary Geotechnical Investigation, Hall Property, 425 Santa Fe Drive, Encinitas, California, by Geopacifica, Inc., dated July 13, 2010

Addendum to Geotechnical Investigation, Hall Property, 425 Santa Fe Drive, Encinitas, California, by Geopacifica, Inc., dated August 19, 2010

2nd Addendum to Geotechnical Investigation, dated September 7, 2010

5th Addendum to Geotechnical Investigation, dated September 5, 2011

Wall Design and Foundation Plans, Encinitas Community Park, Drawing No. 10630-G, by ADS, undated

Dear Ms. Kellar:

INTRODUCTION

The following report adds to the findings of our geologic and soils engineering investigation of performed on the subject property and presented in our geotechnical report of July 13, 2010 and Addendum reports, dated August 19, September 7, 2010 and September 5, 2011. This report presents our review of the revised wall plans prepared by ADS.

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GEOPACIFICA
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CONSULTANTS

This report is prepared for the use of the client, authorized agents, and should not be considered transferable. Before use and implementation for construction, Geopacifica should review the proposed development plans and specifications to insure compliance with the provisions and recommendations of this report.

Review of Wall and Foundation Plans

Based upon our review of the plans submitted by ADS for the proposed walls and foundations the consultant is in conformance with the recommendations of our Geotechnical Report and those recommendations contained in Addendum #5 by Geopacifica, Inc. The wall designs are approved from a geotechnical standpoint.

Sincerely,

James F. Knowlton
RCE 55754 CEG 1045

REGISTERED PROFESSIONAL ENGINEER
JAMES F. KNOWLTON
NO. 055754
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CIVIL
STATE OF CALIFORNIA

CERTIFIED ENGINEERING GEOLOGIST
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