EIR Level Review of Preliminary Grading Plan,
Alan E. Seward Engineering Geology, Inc.

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Geological And Geotechnical Consultants

GEOLOGIC/GEOTECHNICAL REPORT
EIR-Level Review of Preliminary Grading Plan
For The Master's College Master Plan
(Master Case 04-476)
Newhall, California

Prepared for:

Impact Sciences
803 Camarillo Springs Road, Suite A
Camarillo, California 93012

Job No: 07-2160I
Dated February 15, 2007

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TABLE OF CONTENTS

TABLE OF CONTENTS

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February 15, 2007 Job No.: 07-2160I

Impact Sciences
803 Camarillo Springs Road, Suite A
Camarillo, California 93012

Attention: Ms. Minta Schaefer

Subject: **GEOLOGIC/GEOTECHNICAL SUMMARY REPORT**
EIR Level Review the Preliminary Grading Plan for The Master's College Master Plan
(Master Case 04-476)

Project: The Master's College Master Plan EIR
Master Caser 04-496
City of Santa Clarita, California

Dear Ms. Schaefer:

This geologic and geotechnical evaluation of the subject site for The Master's College Master Plan is provided for incorporation into an Environmental Impact Report (EIR). The Preliminary Grading Plan addresses proposed development of a site in the southeastern portion of the Santa Clarita Valley, west of California Highway 14 between Placerita Canyon Road and San Fernando Road. This report summarizes our opinions regarding geologic and geotechnical conditions at the site and their effects on development of the site.

1.0 SCOPE OF INVESTIGATION

This report summarizes geologic and geotechnical conditions in the vicinity of the subject site and provides general geotechnical recommendations for submittal in an Environmental Impact Report. Potential impacts caused by the proposed development have been identified. Mitigation measures to lesson or avoid impacts are also suggested in this report.

This investigation included the following tasks:

1. Review of pertinent in-house data compiled by this office.

2. Review of the published references and the reports by Gorian and Associates, Inc. (GAI) listed at the end of this report.

3. Review of oil well data in the Munger Map Book, California-Alaska, Oil and Gas Fields, 2003.

4. Review of the following aerial photographs:

YEAR	PHOTOS	SCALE	AGENCY
1928	E-190, E-191, E-192, E-217, and E-218	1"=2,000' (±)	Fairchild

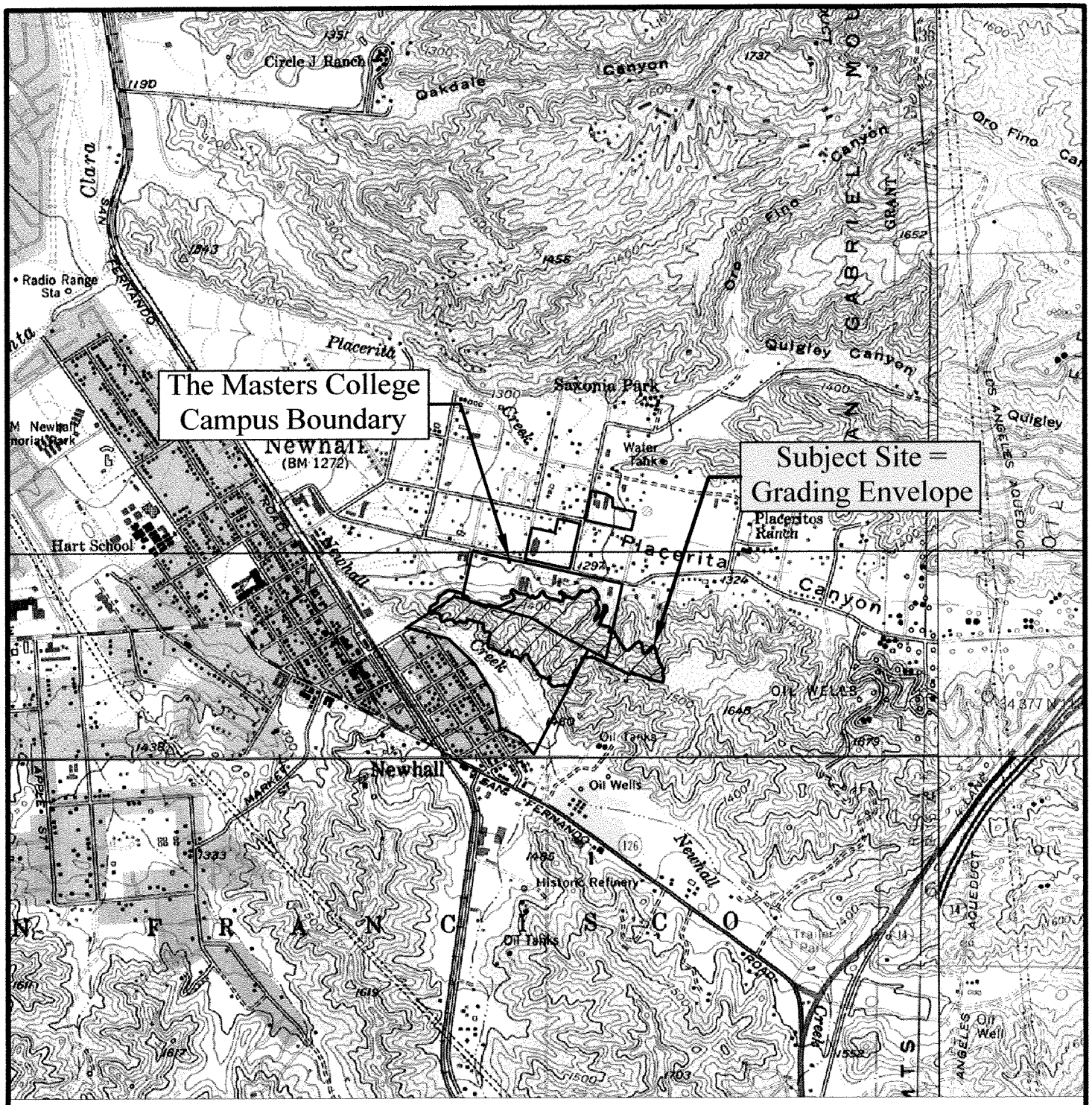
5. Review of the Geotechnical Map prepared by GAI, dated January 17, 2007. This map used the undated 1"=100' scale Preliminary Grading Plan prepared by Ganfors and Associates, Inc. as a base map. We used the Geotechnical Map as a base map for our Geologic/Geotechnical EIR Summary Map (Plate I). We make no representation regarding the accuracy of the Gorian and Ganfors maps.

6. Limited site visit by representatives of our firm on February 6, 2007.

7. Preparation of a Location Map, Geologic/Geotechnical Summary Map, figures, and this Report.

2.0 BACKGROUND

This report is based largely on information contained in the referenced reports by Gorian Associates, Inc. (GAI) who are the Geologic/Geotechnical Consultant of Record that was retained by Master's College to evaluate the Preliminary Grading Plan. This grading plan has been prepared for the expansion plan of Master's College, which will include extension of Dockweiler Drive, construction of multi-family houses, and a superpad for future campus expansion. **For consistency and to facilitate you in the compilation of the EIR, we have directly quoted large portions of GAI's October 5, 2005 report in *italics* where we are in agreement with their findings and have added additional information or analyses, where appropriate.**



Source: U.S. Geological Survey Newhall, Oat Mountain, San Fernando and Mint Canyon Quadrangles, Dated 1952 Photorevised 1969, Dated 1952 Photorevised 1969, Dated 1966 Photorevised 1988, Dated 1960 Photorevised 1980 Minor Revision 1994 Respectively

Approximate Scale: 1"=2,000'

NOTE: THIS IS NOT A SURVEY OF THE PROPERTY

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LOCATION MAP

Job No.: 2160I	*Date: 2/15/07*

3.0 SITE DESCRIPTION

"The Master's College is located at 21726 Placerita Canyon Road in the Santa Clarita area of the County of Los Angeles, California". "The irregularly shaped hillside property is situated between Placerita Canyon Road to the north and Newhall Creek to the south. Existing residential homes are located just off site to the east-southeast. Dockweiler Drive extends from the existing residential homes towards the west where it terminated on the top of the east-west trending ridge."

"The area of the proposed residential development is located on the generally southeast-northwest trending bedrock hillside areas and at the toe of the hillside on both northern and southern sides. The hillside areas are moderately steep rolling bedrock ridges and ridge spurs with slope gradients ranging from approximately 2(h):1(v) on the sides of the hillside to nearly level on the top of the ridges. The hillside areas are covered with a moderate to dense growth of seasonal weeds and grasses with scattered patches of native shrubbery."

"The southern side of the hillside adjacent to Newhall Creek has several alluvial filled tributary canyons that drain westward towards the adjacent creek. One of these southerly draining incised ravines has been filled with artificial fill in association with the underlying Metropolitan Water District (MWD) waterline (Foothill Feeder/ Placerita Tunnel). The MWD waterline is approximately 20 feet in diameter and traverses the property in the northwest-southeast trend on the southern side of the hillside. Based on our understanding, the waterline is tunneled under the western portion of the site (see Plate 1). The cover over this tunnel appears to vary from approximately 125 feet in the hillside areas to 50 feet in the area of the filled drainage that is currently used as a playfield by the college."

"Vegetation observed within the southern portion of the property includes coastal sage scrub assemblages, yucca, seasonal grasses and oak trees."

"The northern side of the hillside has been developed for the college including dorms, classrooms, administration buildings, and surface parking and drive areas. Incised drainages on the northern side of the hillside are filled with mature oak trees and these drainages flow towards the north to existing storm drain structures. Total relief in the area of the proposed development is on the order of 260 feet."

4.0 PROPOSED DEVELOPMENT

4.1 Grading

The proposed development shown on the attached Preliminary Grading Plan consists of extending Dockweiler Drive to the west across the subject site. Typical cut and fill grading techniques will be utilized to construct the road grades and the associated slopes descending to the north and south of the road. Retaining walls have also been proposed to attain the proposed road grades within the proposed grading envelope.

In addition to the extension of Dockweiler Drive, a large building pad (super pad) is proposed for the future expansion of the Master's College campus between Dockweiler Drive and the existing campus. An additional building pad with associated cut and fill slopes and retaining walls is proposed south of Dockweiler Drive for the future construction of 16 multi-family homes. Access to the multi-family homes will be via the westerly extension of Deputy Jake Drive, which will connect to Dockweiler Drive as shown on the Preliminary Grading Plan. The future construction of the buildings on the proposed subject site will be performed in phases as described in detail in the Master Plan document. This report addresses the proposed grading within the envelope shown on the Preliminary Grading Plan. Portions of this grading will extend beyond the campus boundary, as shown on the attached Location Map. The area of the proposed grading envelope is hereby referred to as the subject site.

We understand that the proposed grading shown on the Preliminary Grading Plan will include movement of approximately 1,000,000 cubic yards of earth and that cut and fill volumes will be balanced on the subject site.

4.2 Buildings

The scope of work of this report does not specifically address buildings proposed in the Master Plan. However, the following information regarding proposed buildings is provided for information purposes.

<u>New Campus Building Structures or Building Expansions</u> located outside of the area covered by the Preliminary Grading Plan are within areas mapped as artificial fill (af) by GAI. This artificial fill overlies alluvial deposits. Geotechnical investigation will be

required for the Grading Plan and/or Building Plan phases in order to characterize the artificial fill and alluvial deposits at these proposed building locations.

Buildings No. 44 and No. 2x (per Master Plan, Figure 3-1) are proposed in an area within the proposed grading envelope that was mapped by GAI as artificial fill. Geotechnical investigation will be required for the Grading Plan and/or Building Plan phases in order to characterize the artificial fill at these proposed building locations.

Proposed Buildings No. 40, 41, and 42 and the 16 multi-family buildings will be located entirely within the proposed grading envelope shown on the Preliminary Grading Plan. At completion of grading, the proposed locations of these buildings will be underlain by bedrock or by compacted fill that are suitable for support of the foundations of the buildings. Buildings located over expansive soils and/or over cut/fill transition areas will need to be evaluated at the Grading Plan phase.

4.3 MWD Easement

The proposed grading shown on the Preliminary Grading Plan encroaches into the Metropolitan Water District (MWD) easement. The proposed encroachment includes construction of a 25-ft high, 2:1 (h:v) fill slope that will overlie existing fill present in the MWD easement. It is our understanding that permission for this encroachment needs to be obtained from MWD.

The condition of the existing MWD fill needs to be evaluated, including its ability to support the proposed fill slope.

5.0 GEOLOGY

5.1 Regional Geology

"The subject site is situated within the Transverse Range Geomorphic Province, in the eastern portion of the Ventura Basin which is separated from the Soledad Basin and the Ridge Basin by the active San Gabriel fault zone. This fault zone traverses the area in a generally northwest-southeast trend approximately 9,000 feet to the north of the site. The Ventura Basin was subsequently filled with sediments eroding from the adjacent uplifted bedrock blocks which form the surrounding mountains. These sediments, which consist primarily of sand and gravel, contain abundant granitic and volcanic rocks suggesting a

source in the San Gabriel and Santa Susana Mountains. The Saugus Formation is a continental deposit overlying marine Pico Formation of Pliocene age and overlain by upper Pleistocene deposits of the ancestral Santa Clara River (South Coast Geological Society, 1982) including the Pacoima Formation."

5.2 Geomorphology

The site topography is dominated by a west to northwesterly trending ridge, with minor canyon spurs and swales that descend to its western terminus at Newhall Creek. South of the ridgeline, the site topography descends to Newhall Creek adjacent to the southwest project boundary. North of the ridgeline, the site topography descends to the alluvial valley floor of Placerita Canyon. Slope gradients in the hillside areas of the site are moderate with an average gradient of about 2:1 (h:v). Ground surface elevations range from about 1275 ft at the westernmost portion of the site to about 1530 ft at a high point along the existing ridgeline at the easternmost portion of the site. The topography of the site is shown on the attached Location Map.

5.3 Geologic Units

5.3.1 Saugus Formation (TQs)

"Bedrock of the Plio-Pleistocene-age Saugus Formation underlies the Pacoima Formation to the maximum depth explored. The Saugus Formation is commonly exposed on the southern side of the subject hillside area and in the northeastern portion of the site where not covered with the draping Pacoima Formation. The Saugus Formation represents paleo-Santa Clara River floodplain deposits and adjacent interfingering tributary and alluvial fan sediments (CDMG, 1987)."

"The Saugus Formation, as encountered during our subsurface exploration, generally consists of yellowish brown silty to clayey fine-to coarse-grained sandstone units are friable. Granitics, metavolcanics, quartzite and Pelona schist clasts were noted. Locally, the sandstone is interbedded with yellowish brown clayey siltstone to sandy siltstone and reddish brown to yellowish brown mudstone (mudstone consists of particles 1/3 sand, 1/3 silt and 1/3 clay) to sandy claystone in a damp to moist condition."

5.3.2 Pacoima Formation (Qp)

"Bedrock of the Quaternary-age Pacoima Formation mantles the majority of the upper reaches of the generally northwest-southeast trending ridge and drapes over the hillside on the northern side of the toe of the hillside. This formation has been designated as "Older Dissected Surficial Sediments or Qog" after Dibblee, 1996; however these "high terrace deposits of sand and gravel" have been assigned to the Pacoima Formation (of Oakeshott, 1958) by Treiman (CDMG, 1987). For this report, the nomenclature used by Treiman will be used."

"The Pacoima Formation, as encountered in our exploratory bucket auger borings, was found to vary in thickness from 5 feet (B-6) to more than 70½ feet (B-5). These bedrock materials were encountered in all of the bucket auger borings with the exception of B-10. The bedrock generally consists of light yellowish brown to yellowish brown to brown silty to clayey fine- to coarse-grained sandstone with some gravel, cobbles and rare boulders in a damp to moist and commonly friable condition. Locally the sandstone is interbedded with yellowish brown clayey siltstone to sandy claystone in a moist to very moist condition. Clasts incorporated in this formation generally consist of subangular to well rounded metavolcanics, granitics, and quartzite. The sandstone units are locally crossbedded and locally have magnetite laminations. Bedding is generally crude to locally well defined."

"The Pacoima Formation represents a period of basin filling with sediments derived from the erosion of the Santa Susana Mountains and northern sources, interfingering with sediments derived from the paleo-Santa Clara River (CDMG, 1987)."

5.3.3 Alluvium (Qal)

"Quaternary-age alluvium typically fills the bottom of the valley floors and portions of the incised drainages. These water transported materials are easily visible in the Newhall Creek area and locally on the site where erosion has exposed these deposits. Alluvium was encountered in all three of the hollow stem auger borings (HS-1 through HS-3) and was found to vary in thickness from 17½ feet (HS-1) to 34 feet (HS-3). The alluvium was further evaluated by excavating six (6) backhoe trenches in the incised drainages on the southern side of the hillside and was found to vary in thickness from 1½ feet (T-8) to 8½ feet (T-3)."

"The alluvium on the northern side (HS-1) of the hillside area generally consists of dark gray silty fine sand in a damp and loose condition grading downward to yellowish brown clayey fine to coarse sand with some gravel and cobbles in a damp and dense condition. The lower portion of the alluvium generally consists of light yellowish brown silty fine to coarse sand with gravel in a slightly moist and dense condition."

"The alluvium on the southern side (HS-2, HS-3) of the site adjacent to Newhall Creek generally consists of very dark grayish brown to brown grading to yellowish brown fine sand to silty sand to gravelly sand in a damp to moist and loose to very dense condition locally interstratified with dark reddish brown to brown sandy to clayey silt in a damp and hard condition."

"The backhoe trenches were excavated just uphill from the hollow stem borings and in drainages inaccessible to a drill rig. These trenches encountered alluvium generally consisting of brown silty fine to coarse sand in a porous, damp and loose condition overlying brown to yellowish brown clayey fine to coarse sand with gravel to boulders in a damp and medium dense condition yet porous with pores to 1/8". Typically, the base of the alluvium is defined with a cobble to boulder lag deposit and a sharp erosional contact with the underlying bedrock."

5.3.4 Stream Channel Deposits (Qsc)

"Soil deposits in the active Newhall Creek are referred to as stream channel deposits. These deposits were not investigated, as they are not within any area of the proposed construction. However, based on visual examination, these deposits generally consist of sand and gravel in a damp and loose condition. These materials are similar to the alluvium; however, the stream channel deposits have been reworked during periods of heavy runoff."

5.3.5 Colluvium (Slopewash)

"Soils that have been deposited under the influence of gravity are referred to as colluvium. Colluvium is commonly deposited down slope faces and in incised ravines. Colluvium was encountered in boring B-10, which was located in an incised ravine that was subsequently covered with artificial fill. The colluvium was found to be on the order of 3½ feet in thickness in B-10 and consisted of very dark grayish brown clayey sand

with some gravel and cobbles in a moist and medium dense condition. The contact with the underlying bedrock is gradational over 12 inches."

5.3.6 Topsoil

"Topsoil generated from the in-place weathering of the bedrock materials typically mantles the bedrock materials. The topsoil encountered in boring B-5 and trenches T-1 and T-2 is on the order of 1 to 1½ feet in thickness and generally consists of brown silty fine to coarse sand with some gravel and cobbles in a damp and medium dense condition. Seasonal weeds and grasses typically extend their root systems through the topsoil materials."

5.3.7 Artificial Fill (af)

"Artificial fill associated with construction of the existing college is generally confined to the northern side of the hillside in close proximity to the existing buildings and access roadways. These fill deposits were not a part of the scope of work and therefore were not investigated. The approximate limits of the artificial fill are shown on the attached Geotechnical Map (Plate 1)."

"Artificial fill was encountered in our hollow stem boring HS-1, which was excavated in an area currently used to dispose of soils and construction debris within the college property. The artificial fill here was found to be 2½ feet in thickness and generally consists of dark gray silty fine to coarse sand with some concrete and asphaltic concrete debris in a damp and loose condition."

"Additional artificial fill deposits were encountered in boring B-10. This boring was located in the northeastern corner of the playfield on the southern side of the hillside. As previously noted, this playfield was manufactured as a result of "permanent required fill to an elevation of 1325" during the construction of the Placerita Tunnel based on a review of plans and profiles provided to us by the MWD. The current elevation of the playfield ranges from elevation 1325 to 1330, so it is possible that some minor artificial fill has been placed over the fills made by MWD. The artificial fill encountered in B-10 was found to be on the order of 5 feet in thickness and generally consists of brown clayey to silty fine to coarse sand with some gravel and cobbles in a damp and medium dense condition. Maximum depth of fill within the playfield area based on MWD plans is approximately 35 feet."

"Additional artificial fill deposits were encountered during the backhoe trenching operations. Artificial fill was encountered in Trench T-8 and was found to be on the order of 1 foot in thickness and generally consists of brown silty fine sand with concrete metal, and plastic debris in a damp and loose condition. The approximate limits of this deposit are shown on the attached Geotechnical Map (Plate 1)."

"Additional artificial fill deposits (previously engineered fill) are located in the southeastern portion of the site in association with the development of the adjacent residential Tract 53114 (Geolabs, 2003). A fill slope on the order of 100 feet in height aligned at a 2(h):1(v) with a maximum depth of approximately 50 feet descends offsite from Lots 1-5, Tract 53114 to the valley floor."

"Additional areas of artificial fill may exist on the site but were not investigated or mapped as they are concealed."

5.4 Landslides

"No landslides are present within or near the site nor are any shown on regional geologic maps. A suspected landslide previously delineated (Earth Systems, 2005) was investigated during our field exploration program and it was concluded that this postulated landslide does not exist. Trenches T-1 and T-2 were excavated at the top and toe of the postulated landslide and a thin soil cover over dense in-place sandstone was encountered. No evidence of landsliding was encountered (ie: thick soil development, scarp, graben soils, sheared clay)."

Based on our review of published references in our files and aerial photo evaluation, no landslides are present within or near the subject site.

5.5 Geologic Structure

"Structurally, based on field mapping, subsurface exploration and a review of pertinent geologic data, the Saugus Formation is inclined to the north-northwest at moderate angels (12° to 16° after CDMG, 1987) to low angles (2° to 10° after Dibblee, 1996). The Saugus Formation, as observed in outcrops and during downhole logging operations, is crudely bedded to locally well defined, but typically exhibits interfingering and grade laterally. The top of the Saugus Formation/ base of the Pacoima Formation is commonly a distinct erosional surface as observed in borings B-1, B-2, B-4, B-6, B-7, B-8, and B-9. The top of

the Saugus Formation appears to be a poorly developed paleosol consisting of reddish brown grading to yellowish brown mudstone with manganese oxide staining to sandy claystone to locally yellowish brown clayey to silty fine to coarse-grained sandstone to cemented sandy to clayey siltstone."

"Cross section 1-1' illustrates the relationship between the ridge capping Pacoima Formation and the underlying Saugus Formation. The cross section illustrates the apparent dip of the bedding of the Saugus Formation inclined in a northwesterly direction at low angles (1° to 7°) while the true dip is generally inclined in a northerly direction at low angles (2° to 10°). Some fluctuations in bedding including cross bedding were noted and appear to be the result of a fluctuating depositional environment, not tectonic activity."

"Structurally, the Pacoima Formation rests unconformably on the underlying Saugus Formation, however, locally appears to be conformable where both bedrock units are nearly horizontal. Based on a review of the CDMG map, the Pacoima Formation is horizontally bedded. Geologic data obtained from the downhole logging operations indicate that the bedrock is generally inclined in a northerly direction at low angles (0° to 10°), although some variation and fluctuation in bedding was noted with bedding inclined in a southerly and easterly direction also at low angles (3° to 7°). The base of this formation is usually a sharp yet irregular erosional contact that is nearly horizontal on the top of the ridges and inclined in a northerly direction at low to moderate angles (6° to 14°) where the bedrock drapes over the hillside to the north."

We are including Plate 2 (Geotechnical Cross Sections) from the GAI report dated October 5, 2005 which illustrates geologic conditions at the site. The Preliminary Grading Plan has been revised after Plate 2 was prepared.

The location of the site is overlaid on the 1"=2000' scale Geologic/Geotechnical Map by Diblee (1996).

5.6 Ground Water

"Groundwater was encountered as seepage in borings HS-1 at 17 feet, B-2 at 20 to 22 feet, B-6 at 22 feet, B-8 at 52 feet, B-9 at 23 to 24 and at 52 feet, and B-10 at 23 feet below the existing ground surface. Typically, the seepage was confined to silty fine to coarse-

grained sandstone units that are underlain by fine-grained materials such as claystone (mudstone) and siltstone. No other groundwater was observed on the site. No surface water was observed flowing in the adjacent Newhall Creek during our field exploration program."

Regional groundwater maps by Robson (1972) indicate that the subject site is located within an area where the alluvial aquifer is deeper than 100 ft beneath the alluvial surface. However, our review of Los Angeles County water well data indicates that historic high ground water was measured about 26 ft below the ground surface at Water Well No. 5872A, just south of the intersection of 4th Street and Newhall Creek, within the Campus boundary of Master's College. The approximate location of this well is shown on the Geologic/Geotechnical Summary Map. The area of proposed grading shown on the Preliminary Grading Plan occurs almost exclusively within areas underlain by bedrock and per Robson (1972) the bedrock aquifer is located at depths of more than 200 ft below the ground surface. The side canyons adjacent to Newhall Creek where grading is proposed contain shallow deposits of alluvium (3-9 ft in depth) that will be completely removed prior to the placement of compacted fill.

Canyon subdrains will be required in canyon areas in which fill will be placed and back drains will be required in all Stability Fills and Buttress Fills, in accordance with applicable grading codes. Due to the elevated nature of the subject site, ground water is not expected to significantly affect the project, provided that GAI's recommendations are implemented during construction.

We understand that potential for scour and flooding associated with Newhall Creek will be addressed by others.

6.0 POTENTIAL GEOLOGIC AND GEOTECHNICAL HAZARDS/CONSTRAINTS AND POSSIBLE MITIGATION MEASURES

6.1 Seismicity

6.1.1 Introduction

The subject site is located in the seismically active southern California region. Earthquake-related hazards typically include ground rupture, ground shaking, and ground failure.

6.1.2 Ground Rupture

The subject site is not located in any of State of California Alquist-Priolo Earthquake Fault Special Study Zones. The Los Angeles County Seismic Safety element does not show any faults at the subject site. Regional geologic maps do not show any active faults or potentially active faults (i.e., faults that have offset geologic materials in the last 11,000 years and last 1,000,000 million years respectively) on or trending towards the site. The closest known active fault (surface trace) to the site is the San Gabriel fault, which outcrops approximately 1.6 miles north of the subject site. Please refer to Figure 2 which shows the southern terminus of the Alquist-Priolo Fault Zone for the San Gabriel Fault.

"Faults identified as active or potentially active in published geologic literature (Hart, et. al, 1999) are not known to be present within or adjacent to the subject site. Our recent field exploration revealed no indication of active or potentially active faults."

6.1.3 Ground Shaking

The site is located in southern California, which is an **active** seismic area where large numbers of earthquakes are recorded each year. The area of the subject site experienced strong ground motion during the 1971 San Fernando earthquake (which was generated by the Sierra Madre-San Fernando fault), and more recently during the 1994 Northridge earthquake. **Table I** summarizes significant historical earthquakes that have occurred near the site.

TABLE I - SIGNIFICANT HISTORICAL EARTHQUAKES

EARTHQUAKE	SITE TO EPICENTER DISTANCE (MILES)	EARTHQUAKE MAGNITUDE*	DATE
Fort Tejon	96	7.9	1857
Kern City	51	7.7	1952
Santa Barbara	74	7.0	1812
San Fernando	7.0	6.6	1971
Northridge	11.6	6.7	1994

*Moment Magnitude for earthquakes with magnitude greater than 6 or for earthquakes that occurred after 1933. Local Magnitude for earthquakes with magnitude less than 6 or for earthquakes that occurred before 1933 or (S.C.E.C., 2000).

Table II summarizes potential earthquake sources near the site, including estimates of maximum moment magnitude that are considered geologically feasible for these sources, per the State of California (Peterson, et al, 1996).

TABLE II - SIGNIFICANT REGIONAL FAULTS

FAULT	MAXIMUM MOMENT MAGNITUDE	APPROXIMATE DISTANCE TO SITE * (MILES)
Santa Susana	6.6	0.0
San Gabriel	7.0	2.1
Sierra Madre-San Fernando	6.7	2.2
Holser	6.5	2.5
Northridge (East Oak Ridge)	6.9	3.4
San Andreas	7.8	20.4

* Approximate closest distance to surface trace.

Based on a probabilistic seismic hazard assessment (PSHA) performed by GAI using the computer program FRISKSP by Thomas F. Blake, the peak horizontal ground surface acceleration with a 10% probability of exceedance in 50 years (475-year return period) is estimated to be 0.75g for the alluvial portions of the site and 0.78g for areas of the site where rock of the Saugus Formation and Pacoima Formation outcrops or is located close to the ground surface.

Design response spectra for the site will need to be prepared for the Building Plan phase of development.

6.1.4 Ground Failure

Ground failure is a general term that refers to secondary, permanent ground deformation caused by strong earthquake shaking, including liquefaction of saturated granular deposits or fine-grained soils with low plasticity, lateral spreading, ground lurching, seismic settlement (dynamic densification) of loose, poorly consolidated materials, differential materials response, slope failure, sympathetic movement on weak bedding planes or non-causative faults, and shattered ridge effects. Potential for ground failure at the site is discussed below.

Most of the site is underlain by bedrock that is not susceptible to liquefaction. However, alluvium in the narrow tributary canyon areas in the southwestern portion of the site (see **Plate I**) is designated as potentially liquefiable on the State of California Seismic Hazard Zones Map (Newhall Quadrangle, 1998). Alluvium in the portions of canyons covered by the Preliminary Grading Plan where fill is proposed generally is dense beneath a depth of 9 ft. Ground water generally is not present in the alluvium at the subject site, although localized zones of perched water are present at depths as shallow as 17 ft. Based on the preceding factors, it appears that potential for liquefaction of alluvium in the tributary canyons is low.

Relatively loose granular alluvial soils that extend to depths as great as about 9 ft in portions of the tributary canyons areas where fill is proposed may be prone to dynamic densification as a result of future earthquake shaking. The potential for dynamic densification of these materials can be mitigated by removal of the materials and then replacing them as compacted fill. This removal and replacement would also mitigate potential for liquefaction of these materials in the event that they were to become saturated. Potential for seismic settlement (dynamic densification) is negligible in the bedrock portions of the site.

Earthquake-induced slope failures include activation and reactivation of landslides, rock falls, debris flows, and surficial failures. Localized areas of the site have potential for earthquake-induced slope instability, according to the State of California Seismic Hazard Zones Map (see **Figure 2**). Cut and fill grading proposed for the development will mitigate the hazard of earthquake-induced slope instability in almost all of these areas. Typical mitigation measures for slopes prone to earthquake-induced sliding include avoidance (setbacks), removal of surficial unstable materials, laying back slopes to a flatter gradient, buttressing, and diversion and/or collection of the expected volume of slide material by means of debris basins and/or impact walls. The relatively small slope areas at the site that will not be graded have favorably oriented bedding conditions and are considered to be grossly stable.

6.2 Slope Stability

6.2.1 Landslides

No existing deep seated landslides are known to occur on the subject site. If any landslides are encountered during future investigations or grading operations, they will

need to be investigated and remedial measures to stabilize them will have to be developed and implemented.

Stabilization, removal, or Building Setbacks can be used to mitigation landslide hazard if landslides are discovered adjacent to proposed development areas. Landslides that will not affect the proposed grading concept should be placed in designated Restricted Use Areas.

6.2.2 Cut Slopes

Gradients of the proposed cut slopes shown on the Preliminary Grading Plan are 2:1 (h:v) or flatter. The tallest proposed cut slope is approximately 95 ft high.

Eight cut slopes with a height of 20 ft or more are proposed on the Preliminary Grading Plan. We have designated these proposed cut slopes on the attached Summary Map as cut-slopes CS-1 through CS-8. Please refer to the Summary Map for orientations and heights of these slopes. Cut-slopes CS-1, CS-3, CS-4, CS-7, and CS-8 are considered to be grossly stable based on the geologic structure.

Per GAI, cut-slope CS-2 will exhibit daylighted bedding and requires a buttress.

Cut-slope CS-5 is partially located within an area mapped as artificial fill; this portion of cut-slope CS-5 is potentially grossly unstable. Therefore, stability of this slope should be investigated and evaluated at the Grading Plan phase. Cut-slope CS-5 is proposed adjacent to an existing building (Building No. 14, "Slight Hall"). Potential adverse effects of the slope on the existing building need to be evaluated. If the proposed cut slope would have adverse affect on the existing building, the adverse condition will need to be remediated either by reconfiguring the slope configuration or by use of shoring to support/protect the existing building.

The north facing portion of cut-slope CS-6 may expose daylighted bedding planes of the Pacoima and Saugus Formations and may be grossly unstable. Also, this slope will form the side slope of a water basin. Stability of this slope needs to be evaluated at the Grading Plan stage to evaluate if buttressing or stability fills are needed.

Due to the relatively low cohesion of the earth materials at the site, measures to mitigate surficial stability of all cut slopes at the site will be required (see Section 6.2.5 of this report).

Slopes less than 20 ft in height that exhibit adverse conditions, such as daylighted bedding, artificial fill, fill over cut, or sliver that cut less than 10 ft horizontally to daylight, can be mitigated using 15 to 20 ft wide stability fills.

Cut slopes that do not comply with the applicable agency's requirements for static loading and for pseudo-static earthquake loading will require corrective measures such as avoidance (setbacks), cutting back to a shallower angle, or buttressing with compacted fill.

6.2.3 Natural Slopes and Debris Flow Hazards

The proposed grading will eliminate natural slopes directly adjacent to the proposed areas of development. The natural slopes that will remain after the proposed grading has been performed do not pose a hazard to the proposed development or adjacent offsite properties.

6.2.4 Fill Slopes

Gradients of the proposed fill slopes are 2:1 (h:v) or flatter, with terrace drains every 25 vertical feet. The tallest proposed fill slope at the site is approximately 160 ft high. Based on the analysis performed by GAI, gross stability of this slope and of all smaller proposed fill slopes at the site, is satisfactory.

Buttresses constructed with compacted fill are one of the mitigation options for unstable cut slopes and compacted fill derived from the site is expected to have a lower shear strength than bedrock at the site. Therefore, global stability of the highest fill slope is the most critical slope for feasibility of the Preliminary Grading Plan.

Relatively low cohesion values were measured by GAI for remolded Saugus Formation materials, which are expected to comprise the majority of fills at the site. Therefore additional testing is required to evaluate surficial stability of fill slopes proposed in the Preliminary Grading Plan. It is worthwhile to note that fill composed of mixtures of native material types typically has higher shear strength than fill composed of just one

native material type. Therefore, the additional shear strength testing should be performed on samples that represent the mixture of materials that will be placed in the proposed fills.

If surficial stability of the proposed fill slopes is determined to be insufficient, measures to mitigate surficial stability of these slopes will be required (see Section 6.2.5 of this report).

6.2.5 Surficial Stability

The in-situ and remolded ultimate/residual cohesion values measured by GAI for the Saugus and Pacoima Formation bedrock at the site are relatively low. Therefore, the static factor of safety of infinite 2:1 (h:v) cut and fill slopes typically is less than 1.5. The following measures may be considered to mitigate surficial stability of proposed cut and fill slopes, as appropriate.

1. Avoidance.
2. Stability fills.
3. Flattening of slopes to 3:1 (h:v), or flatter.
4. Seeding/planting of slopes.
5. Guniting of slopes.
6. Mechanically Stabilized Earth (MSE) slopes.

6.3 Deep Fill Areas

Preliminary review of the Preliminary Grading Plan indicates that fill as deep as about 90 ft beneath final grade will be placed at the site. Fills deeper than 40 ft below proposed grade will need to be compacted to at least 93 percent of Maximum Dry Density (per ASTM Test Method D1557) in order to control settlement caused by the self-weight of overlying fill layers. Settlement of areas of fill that will be deeper than 40 ft should be monitored (by survey of settlement monuments) in order to evaluate when the settlement rate of the fill is small enough to permit issuance of building permits.

6.4 Retaining Walls

Retaining walls will be required to accommodate grade breaks proposed in the Preliminary Grading Plan, including:

- Individual walls up to about 20 ft in height.
- An individual wall up to about 28 ft in height adjacent to the existing water tank located south of Dockweiler Drive.
- Adjacent 20 ft high walls with a compound height of 40 ft, located in the side canyon south of the multi-family superpad.

Conventional, reinforced concrete, cantilever retaining walls may be used to create grade breaks. Cantilever retaining walls up to 20 ft in height may be supported on footing foundations that rest on compacted fill or on bedrock, provided that the footings are not constrained by existing structures, property lines, etc. However, it may be more practical to support 20-ft to 30-ft high retaining walls on cast-in-drill-hole (CIDH) pile foundations.

In general, specialized wall systems will be required to accommodate grade breaks larger than about 30 ft. These specialized wall systems may be categorized into "top-down" and "bottom-up" construction methodologies.

Stability of backcuts for retaining walls, particularly the wall that will be constructed adjacent to the existing water tank, must be evaluated from the viewpoints of wall stability and of impacts on adjacent infrastructure. The factor of safety for the backcut slope for retaining walls should be at least 1.25, including the effect of surcharge loading from construction equipment.

6.4.1 Top-Down Methodologies

Top-down construction methodologies consist of inserting linear stabilizing elements into the face of a slope, starting at the top and proceeding downward. Top-down construction methodologies such as Soil Nailing and Tensioned Tieback Anchors are typically used where backcuts are not feasible or practical (i.e., adjacent to property lines and existing infrastructure, buildings, etc.).

Soil nailing consists of drilling small-diameter holes at a relatively close spacing into the face of a slope, inserting steel rods into the holes, and then grouting the rods into the holes. In general, the nails are not tensioned. Nail installation proceeds from top of slope downwards and irregularities in the slope surface are excavated only after nails are installed above the elevation of a surface irregularity. Generally, wire screen is attached to the slope face and grouted with shotcrete in order to protect the slope face against

erosion, raveling, etc. Soil nailing can be performed on inclined and near-vertical slopes up to 50 ft, or higher. In general, soil nailing is most effective where a veneer of weak, disturbed, or weathered material covers more competent material.

Tensioned Tieback Anchor walls are constructed by installing a slurry wall (or a row of closely spaced drilled piles) in the ground near the top of the slope to be retained, then excavating down about 10-ft on the downhill face of the wall, then drilling holes into the slope for the anchors, then inserting steel rods or tendons into the holes, and then grouting the anchor rods/tendons into the holes. After the anchors are given sufficient time for the grout to set up (i.e., reach the design strength), the anchors are tensioned (against the wall) to their design loads and locked off. After tensioning of a row of anchors is completed, excavation is resumed and a subsequent row of anchors is installed below the previous row until the bottom of the exposed portion of the wall is reached. A variety of aesthetic finishes can be applied to the exposed portions of tieback walls. Depending on subsurface conditions, near-vertical tieback walls can be constructed up to about 100 ft in height. Tieback walls can be used to stabilize large blocks of material on a slope provided that the anchors reach into competent material behind the blocks.

6.4.2 Bottom-Up Methodologies

Bottom-up construction methodologies consist of first excavating a backcut into a slope that is to be retained, and then constructing a wall and placing backfill between the wall and the backcut. Mechanically Stabilized Earth (MSE) is a variety of bottom-up construction in which plastic or metal strips connected to the wall are embedded in the backfill as the backfill is raised. Inclusion of the strips in the backfill makes a MSE structure behave like a gravity retaining structure. MSE walls can be constructed at near-vertical inclinations to heights of up to about 90 ft. A variety of proprietary MSE systems with a selection of aesthetic finishes is available.

6.5 Hydroconsolidation (Collapse) Settlement

Rapidly buried, unsaturated, sediments such as slopewash and alluvium commonly contain extensive voids and, as a consequence, are subject to hydroconsolidation (collapse) settlement when inundated. Hydroconsolidation occurs when water enters sediments and reorients the sediment particles into a more compact arrangement with fewer and smaller voids. Structures constructed over deposits prone to hydroconsolidation settlement may

experience settlement-induced distress and damage. Potential for hydroconsolidation of soil deposits can be mitigated by removal and recompaction of the collapsible deposits.

Except for the dense alluvial soils in the vicinity of Boring HS-1, all alluvial soils will be removed from areas where fill is proposed on the Preliminary Grading Plan. Therefore, the risk of hydroconsolidation of alluvial soils at the site is negligible. The phenomenon of hydroconsolidation does not apply to the bedrock deposits that underlie most of the site. Further exploration should be performed at the Fine Grading phase to evaluate if hydroconsolidation-prone materials, such as slopewash (colluvium), are present in the areas of proposed fill that have not yet been investigated.

6.6 Erosion Potential and Drainage

Minor evidence of erosion was observed in soil that mantles slopes at the subject site. Bedrock at the site is expected to be less susceptible to erosion than the overlying soil material. However, fill, bedrock, and soil material at the site will be susceptible to erosion if drainage features to control sheet flow over the ground surface are not provided. The drainage features should be designed to prevent water from ponding on graded areas and from flowing over natural or constructed slopes, and should direct surface water to designed debris basins, where applicable. Debris material generated by erosion of site materials should be contained inside the site boundaries.

6.7 Construction Considerations

6.7.1 Rippability

Bedrock at the site is moderately to well consolidated. Therefore, it is anticipated that grading operations will be able to be performed using conventional equipment. Heavy single-shank ripping may be required for excavation of cut areas in the massive sandstone and conglomerate units of the Saugus Formations.

6.7.2 Oversize Material

Cobbles and small boulders are common in the alluvium and in the Pacoima and Saugus Formation bedrock at the site. Although this oversize material may make excavation operations in cut areas difficult for some types of equipment, it is not considered to be a

significant impediment to development of the site. Oversized material will require special treatment (placement in windrows in fill and/or removal from the project site).

6.7.3 Expansive Materials

Fine-grained units of the Saugus Formation are known to have significant expansion potentials when exposed to water. In addition, artificial fill, slopewash, and alluvium deposits present at the site may contain material with significant expansion potential. Expansive materials at the site should be evaluated by the Project Geotechnical Engineer during the grading plan stage of development. Expansion potential of site soils can be mitigated by controlling the water content and density of fill soils, by specifying embedment and reinforcement of structures, and by removing the expansive materials and replacing them with compacted material with low expansion potential.

6.7.4 Shrinking/Bulking Characteristics of Earth Materials

Typically, soil, slopewash (colluvium), fill, and alluvial deposits reduce in volume ("shrink") by up to about 10 percent when excavated and subsequently recompacted. In contrast, Pacoima Formation and Saugus Formation bedrock typically increases in volume ("bulk") by up to about 10 percent when excavated and recompacted. In order to evaluate the cut-fill balance of the proposed grading, shrinkage/bulking of on-site materials should be estimated during future planning stages.

6.7.5 Corrosion Potential of Site Materials to Concrete and Metals

Results of sulfate content testing presented in the GAI report (October 5, 2005) indicate that corrosivity of site bedrock materials to concrete is negligible. Therefore, conventional Type I or Type II Portland Cement may be used for manufacture of concrete. Supplemental sulfate content testing should be performed at the grading phase of work to evaluate corrosion potential of site materials to concrete.

Results of resistivity testing in the GAI report (October 5, 2005) indicate that corrosivity of site bedrock materials to buried metals is significant. Therefore, metal pipes and utilities in contact with site materials will have to be protected against corrosion.

6.8 Oil Wells

Based on data in the 2003 Munger Map book and the Division of Oil, Gas and Geothermal Resources Map No. 252, there are no known oil wells located on the subject site. If any undocumented oil or gas wells are encountered during grading operations, their locations should be surveyed and the current well conditions evaluated immediately.

7.0 PROJECT FEASIBILITY

The proposed development is feasible from the geologic and geotechnical standpoint and will be safe from geologic hazards provided that the geologic and geotechnical recommendations provided in this report, along with the requirements of the appropriate building and grading codes, are taken into account during the planning, design, and construction phases of the project.

8.0 CONCLUSIONS AND RECOMMENDATIONS

The following conclusions and recommendations summarize the primary geologic and geotechnical issues that may impact the proposed development:

1. Potential for primary ground rupture on a fault at the site is considered to be **very low to negligible**.

2. Based upon the probabilistic seismic hazard assessment performed by GAI, the peak horizontal ground surface acceleration for an earthquake with a 10% chance of exceedance in 50 years is expected to be 0.75g in alluvial portions of the site and 0.78g in portions of the site where bedrock outcrops or is present at shallow depth.

3. Alluvial areas located in small side canyons at the site are designated as potentially liquefiable on the State of California Seismic Hazard Zones Map of the Newhall Quadrangle (See Figure 2). However, all alluvial soils that will be located beneath areas of proposed fill in the vicinity of Borings HS-2 and HS-3 (see the Preliminary Grading Plan) are planned to be removed and all alluvial soils beneath planned removal depths in the vicinity of Boring HS-1 (see the Preliminary Grading Plan) are dense. Therefore, potential for liquefaction at the site during future earthquakes is low.

4. Due to the proposed grading at the site, very few natural slopes will remain. The natural slopes that will remain after the proposed grading has been performed will not pose a stability or debris flow hazard to the proposed development or offsite properties. Figure 2 shows the proposed grading envelope and the areas with potential for earthquake-induced landslides.

5. All alluvial soils that will be located beneath areas of proposed fill in the vicinity of Borings HS-2 and HS-3 (see the Preliminary Grading Plan) are planned to be removed and all alluvial soils beneath planned removal depths in the vicinity of Borings HS-1 (see the Preliminary Grading Plan) are dense. Therefore, potential for dynamic densification of alluvial materials at the site during future earthquakes is low. The potential for dynamic densification during future seismic events in portions of the site where bedrock outcrops or is located at shallow depth is negligible.

6. No landslides have been identified at the subject site. If unknown landslides are encountered during development, their potential impact should be evaluated, including development of mitigation measures such as avoidance (setbacks), construction setbacks, complete or partial removal, construction of buttresses, etc., where necessary. Restricted Use Areas will need to be established around any unmitigated landslides in open space areas that do not affect proposed development or adjacent properties.

7. Due to the low cohesion of in-situ site materials, surficial stability of all of the proposed cut slopes (CS-1 through CS-8) will need to be evaluated and remediated. In addition, proposed cut-slopes CS-2, CS-5, and CS-6 are suspected of, or known to have, adverse conditions with respect to their gross stability. Cut-slopes that do not comply with the applicable agency's stability requirements will require corrective measures, such as avoidance (setbacks), cutting back to a shallower angle, or constructing buttresses and/or shear keys with compacted fill.

8. Based on the results of limited Direct Shear testing of remolded site materials by GAI, surficial stability of the proposed 2:1 (h:v) fill slopes may be insufficient. Therefore, supplemental Direct Shear testing of likely fill materials needs to be performed. If it is determined that surficial stability of the proposed fill slopes is insufficient based on this supplemental testing, corrective measures will be required, such as avoidance, flatter slope inclinations, and MSE slope faces.

9. Based on the grading geometries proposed in the Preliminary Grading Plan, only minor natural slopes will remain at the completion of grading. Therefore, surficial stability of natural slopes is not expected to significantly impact the proposed development.

10. Rapidly buried silty and sandy sediments, such as slopewash and alluvium, are subject to hydroconsolidation (collapse) settlement when exposed to water. All slopewash materials will need to be removed during proposed grading operations and all alluvium beneath proposed fill areas will be removed and recompacted unless the alluvium is dense. Therefore, potential for hydroconsolidation of materials at the site is low. Supplemental subsurface investigation for evaluation of the depth and lateral extent of soils with significant hydroconsolidation potential will need to be performed at the Grading Plan phase of development for unexplored areas where fill will be placed. If other areas with hydroconsolidation-prone materials are discovered during grading operations, they can be mitigated by removing the hydroconsolidation prone materials and replacing them with compacted fill.

11. Planting and irrigation of cut slopes and fill slopes should be included in future design phases in order to improve surficial stability of slopes and to mitigate potential for erosion.

12. Bedrock at the site is moderately consolidated. Therefore, it is anticipated that grading operations will be able to be performed using conventional equipment. Excavation of portions of the massive sandstone and conglomerate units in the Saugus and Pacoima Formations may require heavy, single-shank ripping.

13. Cobbles and small boulders are present in the alluvium and in the Saugus and Pacoima Formation deposits at the site. Although this oversize material may make excavation operations in cut areas difficult for some types of equipment, it is not expected to be a significant impediment to development of the site. Oversized material will require special treatment (placement in fill and/or removal from the project site).

14. Most rock and soil materials that will be encountered during grading operations are expected have low expansion potential when exposed to water. However, materials with higher expansion potential may exist at the project site. Expansion potential of site materials will need to be evaluated in a subsequent Grading Plan phase. If expansion potential of some of the site materials is significant, the expansion potential can be mitigated by mixing the expansive soil with soil with low expansion potential, by

controlling water content and density of fill soils, and by specifying the embedment and reinforcement of structures.

15. Based on data provided in the GAI report, dated October 5, 2005 and on our experience, the following shrinkage and bulking factors may be used for evaluation of cut and fill quantities:
    - Existing artificial fill, colluvium, and alluvium are expected to reduce in volume (shrink) by as much as about 10 percent when excavated and subsequently compacted to the specified compaction density.
    - Pacoima and Saugus Formation materials are expected to increase in volume (bulk) by as much as 10 percent when excavated and subsequently compacted to the specified compaction density.

16. Based on results of resistivity testing by GAI, site materials are expected to be corrosive to buried metals.

9.0 LIMITATIONS

This report has been prepared by Allan E. Seward Engineering Geology, Inc. (AESEGI) for the exclusive use of Impact Sciences, Inc. for the specific site discussed herein. This report should not be considered to be transferable. Prior to use by others, AESEGI must be notified, since additional work may be required to update this report.

Additional investigation will be required to prepare recommendations for subsequent phases of development. In the event that any modifications in the design or location of the proposed development are planned, a written review by this firm will be required.

The proposed development is located in Southern California, a geologically and tectonically active region where large magnitude, potentially destructive earthquakes are common. Therefore, ground motions from moderate or large magnitude earthquakes could affect the project site during the design life of the proposed development.

Typically, faulting is confined to the area adjacent to a known fault. However, absolute assurance against future fault displacement is not possible in tectonically active regions because new faults can form over time as orientation and magnitude of deformational forces

change in the earth's crust. Therefore, the location and magnitude of ground surface rupture during a seismic event cannot be forecast.

In performing these professional services, AESEGI has used the degree of care and skill ordinarily exercised under similar circumstances by reputable geologists and geotechnical engineers practicing in this or similar localities. The information and recommendations presented in this report are based on results of subsurface investigation and laboratory testing performed by Gorian Associates, Inc. and on our experience and judgment. It should be recognized that subsurface conditions can vary in time, and laterally, and with depth at a given site. Since the conclusions and recommendations presented in this report are based on limited observations, our **conclusions** and **recommendations** are **professional opinions** and are **not meant** to be a control of nature. Therefore, AESEGI makes no other **warranty** either expressed or **implied**.

This report may not be duplicated without the written consent of this firm.

This opportunity to be of service is appreciated. If you have any questions regarding this report, please give us a call.

Respectfully submitted,

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The following Attachments complete this report.

Location Map		following page 2
References		
Portion of the Geologic Map by Dibblee (1996)		**Figure 1**
Seismic Hazard Zones Map by CGS		**Figure 2**
Geologic/Geotechnical EIR Summary Map	**Plate I**	(In Pocket)
Geotechnical Cross Sections	**Plate II**	(In Pocket)

Distribution: (2) Addressee (Via Email and Hardcopy)

REFERENCES

Published

Blake, T.F., 1988-1999 EQFAULT, v.2.2 A Computer Program for the deterministic Prediction of Peak Horizontal Acceleration From Digitized California Faults, User's Manual 79 P.

Blake, T.F., 1995a FRISKSP, A Computer Program for the Probabilistic Estimation of Peak Acceleration and Uniform Hazard Spectra Using 3-D Faults as Earthquake Sources, User's Manual 191 p.

Blake, T.F., 1995b, Preliminary Fault-Data for EQFAULT and FRISKSP, 71 p.

C.D.M.G., 1998, Seismic Hazard Zones Map of the Newhall Quadrangle, Los Angeles County, California: California Division of Mines and Geology

C.D.M.G., 1954, Geology of Southern California: California Division of Mines and Geology, Bulletin 170, Map Sheet 6

Dibblee, T.W., Jr., 1996, Geologic map of the Newhall Quadrangle, Los Angeles County, California: Dibblee Geological Foundation Map #DF-56.

Ehlig, P.L., 1973, History, Seismicity and Engineering Geology of the San Gabriel fault, in Geology, Seismicity and Environmental Impact: Association of Engineering Geologists Special Publication, October 1973, p. 247-251.

Hart, E.W., 1999, Fault-rupture hazard zones in California: California Division of Mines and Geology Special Publication 42, 24 p.

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

Kew, W.S.W., 1924, Geology and oil resources of a part of Los Angeles and Ventura Counties, California: U.S. Geological Survey Bulletin 753, 202 p.

Los Angeles City General Plan, 1990, Technical appendix to the safety element, hazard reduction in Los Angeles City, Vol. 1: Leighton and Associates with Sedway Cooke Associates.

Munger, K.R., ed., 1999. Munger Map Book, California and Alaska Oil and Gas Fields: Fortieth Edition, June 1999.

Petersen, M.D., Bryant, W.A., Cramer, C.H., Cao, T., Reichle, M.S., Frankel, A.D., Lienkaemper, J.J., McCrory, P.A., and Schwartz, D.P., 1996, Probabilistic Seismic Hazard Assessment for the State of California: California Department of Conservation Division of Mines and Geology Open-File Report 96-08, 33 p.

Real, C.R., Toppozada, T.R., and Parke, D.L., 1978, Earthquake Epicenter Map of California, showing events from 1900 through 1974 equal to or greater than magnitude 4.0 or intensity V: California Division of Mines and Geology Map Sheet 39.

Robson, 1972, Water-Resources Investigation using Analog Model Techniques in the Saugus-Newhall Area, Los Angeles City, California: U.S. Geological Survey Open File Report

REFERENCES

Southern California Earthquake Center (S.C.E.C.) 2000, Web Site: http//www.scecdc.scec.org/.

Southern California Earthquake Center (S.C.E.C.) 2002, "Recommended Procedures For Implementation of DMG Special Publication 117, Guidelines for Analyzing and Mitigating Landslide Hazards in California", June 2002, T. F. Blake, R.A. Hollingsworth, and J.P. Stewart.

Winterer, E.L., and Durham, D.L., 1962, Geology of southeastern Ventura Basis, Los Angeles City, California: U.S. Geological Survey Professional Paper 334-H, p. 275-366.

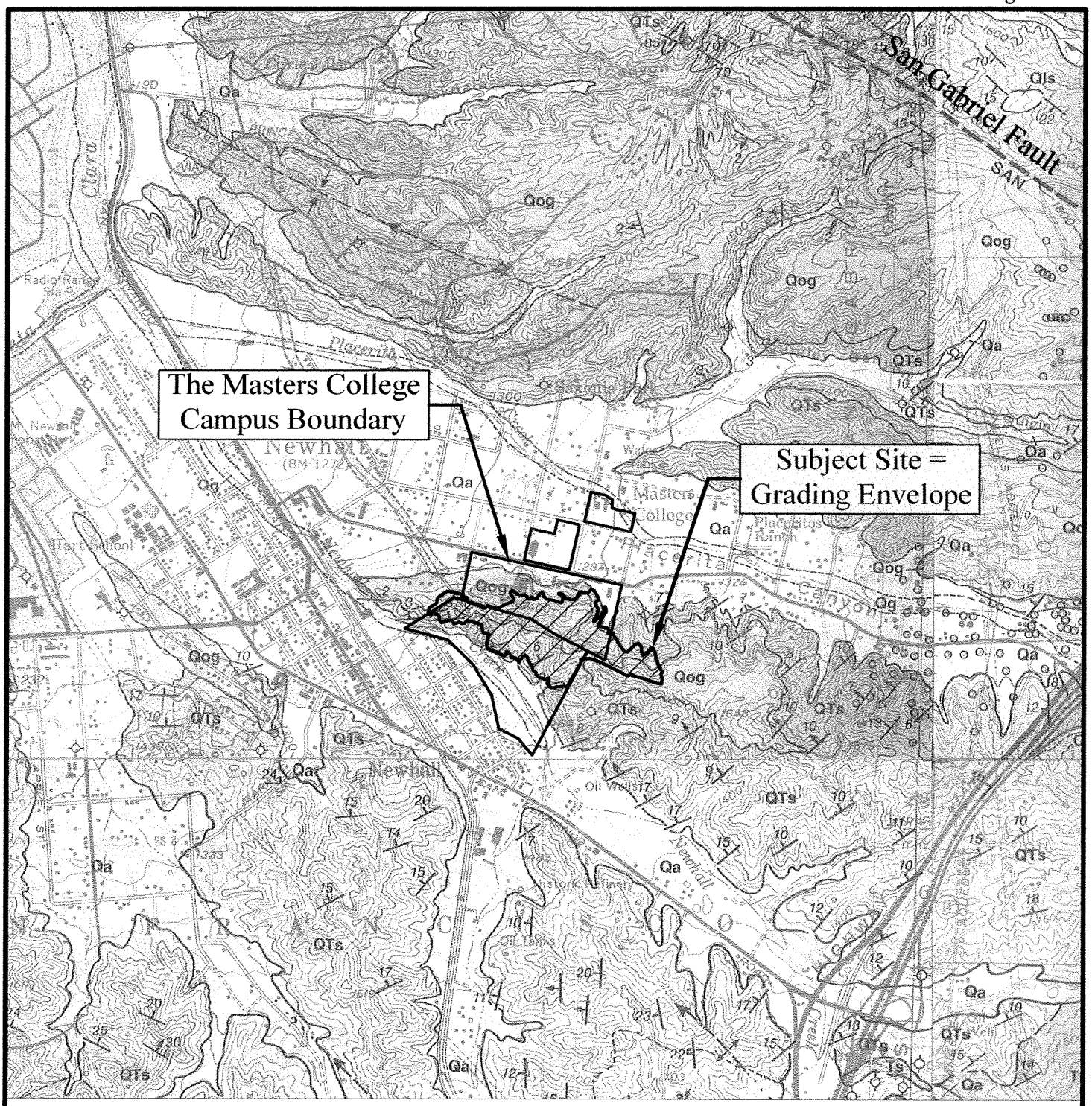
Ziony, J.I. and Yerkes, R. F., 1985, Evaluating Earthquake and Surface-Faulting Potential. U. S. Geological Survey Professional Paper 1360, p. 43-92.

Reports by Gorian Associates, Inc.

1. Preliminary Geotechnical Investigation
   The Master's College
   Santa Clarita, California
   Dated: October 5, 2005 – W.O. 2668-0-0-10 Log Number 23978

2. Preliminary Grading Plan Review
   The Master's College, Santa Clarita, California
   Dated: January 17, 2007 – W.O. 2668-0-0-100

Figure 1



Source: Dibblee, T. W. Jr., 1996. Geologic map of the Newhall quadrangle, 1992. Geologic map of the Oat Mountain quadrangle, 1991. Geologic map of the San Fernando quadrangle, 1996. Geologic map of the Mint Canyon quadrangle

Approximate Scale: 1"=2,000'

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DIBBLEE MAP

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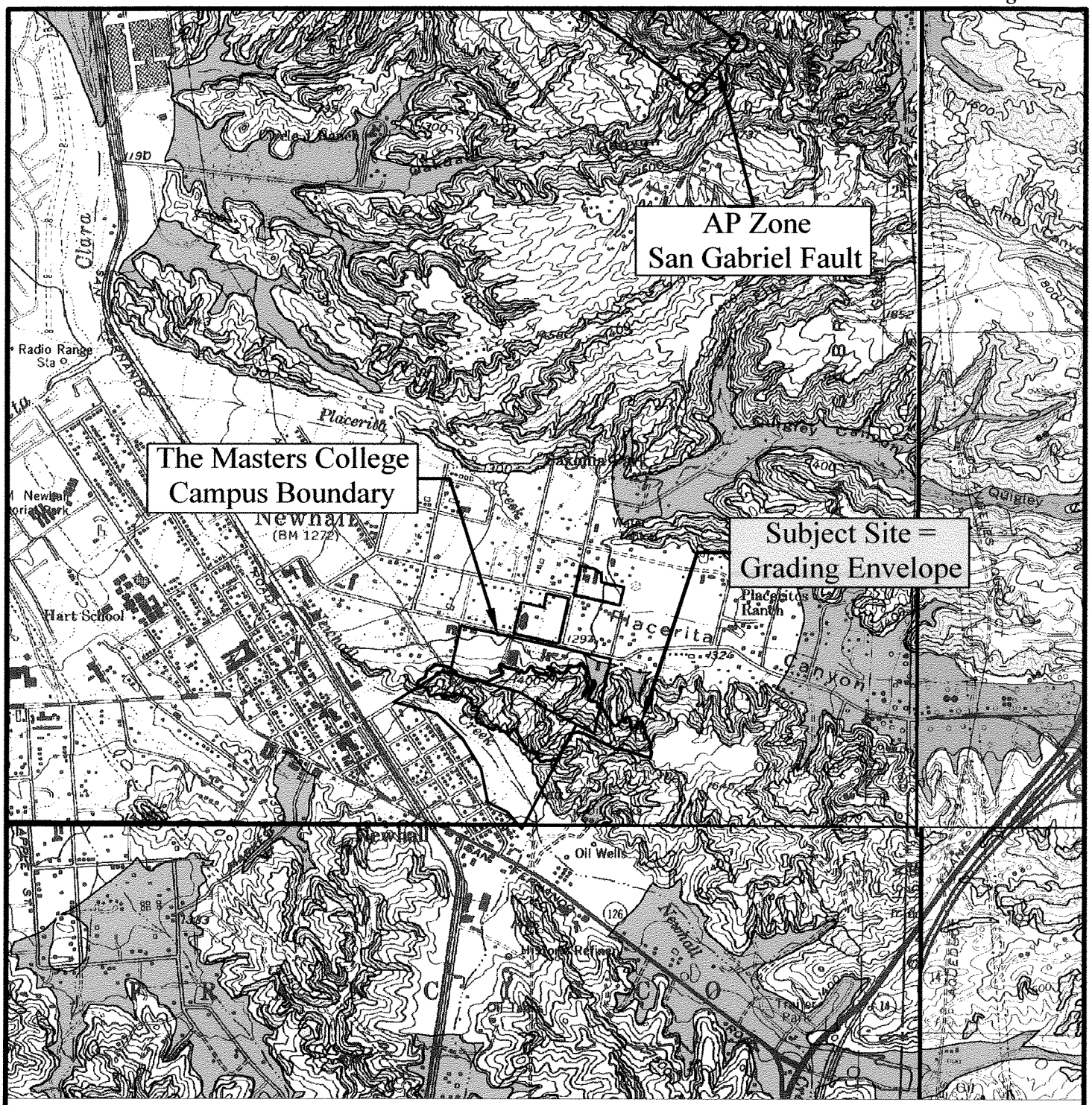
Figure 2



Compiled from CGS Seismic Hazard Zones Maps for Newhall Quad (1998), Oat Mountain Quad (1998), San Fernando Quad (1999) and Mint Canyon Quad (1999)
Earthquake Fault Zone Map for Newhall Quad (1995)

Approximate Scale: 1"=2,000'

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Seismic Hazard Zones Map

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