PRELIMINARY GEOTECHNICAL EVALUATION
PROPOSED INDUSTRIAL PARK
Christian Wheeler Engineering, January 21, 2005

CHRISTIAN WHEELER
ENGINEERING

REPORT OF PRELIMINARY GEOTECHNICAL EVALUATION

PROPOSED WELD BOULEVARD INDUSTRIAL PARK
WELD BOULEVARD AND CUYAMACA STREET
EL CAJON, CALIFORNIA

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January 21, 2005

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CWE 2040960.01

SUBJECT: REPORT OF PRELIMINARY GEOTECHNICAL INVESTIGATION, PROPOSED INDUSTRIAL PARK, WELD BOULEVARD AND CUYAMACA STREET, EL CAJON, CALIFORNIA.

Ladies and Gentlemen:

In accordance with your request and our Proposal dated March 18, 2004, we have completed a preliminary geotechnical investigation for the proposed industrial park. We are presenting herewith a report of our findings.

It is our opinion and professional judgment that no geotechnical conditions exist on the subject property which would preclude the development of the industrial buildings as presently proposed, provided the recommendations presented herein are followed. The two conditions that will have the most significant impact on the development of the site are the presence of relatively deep alluvial deposits in the northeast portion of the site that will require removal and replacement as structural fill and hard rock granitics, which include many large surface boulders and most likely large buried boulders, that will require special handling and placement, and possible blasting or splitting.

We expect that blasting will be required in the southwest corner of the site for the lower approximately 9 to 13 feet of the proposed cut. At the northeast corner of the site, the alluvial deposits extended to a depth of approximately 18 feet and groundwater was found at a depth of about 12.5 feet. In this area, our recommendation is to remove the alluvium to approximately 2 feet above the water table and to replace it as compacted fill. It will be necessary to monitor the fill to determine when the alluvial soils that are left in place are consolidated, which should take about one month to complete.

From a geologic prospective, the site was found to be relatively free of geologic hazards. The most likely geologic hazard to affect the site is ground shaking due to seismic activity along one of the regional active earthquake faults. Building construction in accordance with the most recent requirements of the Uniform Building Code and other governmental agencies should provide for an acceptable level of life safety for the proposed industrial site.

If you have any questions after reviewing this report, please do not hesitate to contact our office. This opportunity to be of professional service is sincerely appreciated.

Respectfully submitted,

CHRISTIAN WHEELER ENGINEERING

Charles H. Christian, RGE #215 Curtis R. Burdett, CEG # 1090

CHC:CRB:scc:shv

cc: (6) Submitted
(1) County of San Diego- Department of Public Works, Airport Administration

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PRELIMINARY GEOTECHNICAL INVESTIGATION

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WELD BOULEVARD AND CUYAMACA STREET
EL CAJON, CALIFORNIA

INTRODUCTION AND PROJECT DESCRIPTION

This report presents the results of a preliminary geotechnical investigation performed for an industrial park which is located north of Weld Boulevard and west of Cuyamaca Street, in the County of San Diego, near El Cajon, California. The following Figure Number 1 presents a vicinity map showing the location of the property.

We understand that the property is to be developed into a 4-lot, 6-building industrial park with a new relatively short cul-de-sac street that enters the property from Weld Boulevard. The structures are expected to consist of tilt-up concrete structures supported by conventional shallow foundations and with on-grade concrete floor slabs. Grading is expected to consist of cuts on the order of about 40 feet and fills on the order of 15 feet. Slopes are proposed at an inclination of 2:1, horizontal to vertical. Site retaining walls up to about 10 feet high may also be constructed on the project.

To assist in the preparation of this report, we were provided with a grading plan prepared by Burkett and Wong, Engineers and Surveyors. A copy of this plan was used as the base for our Site Plan and Geologic Map and is included herewith as Plate Number 1.

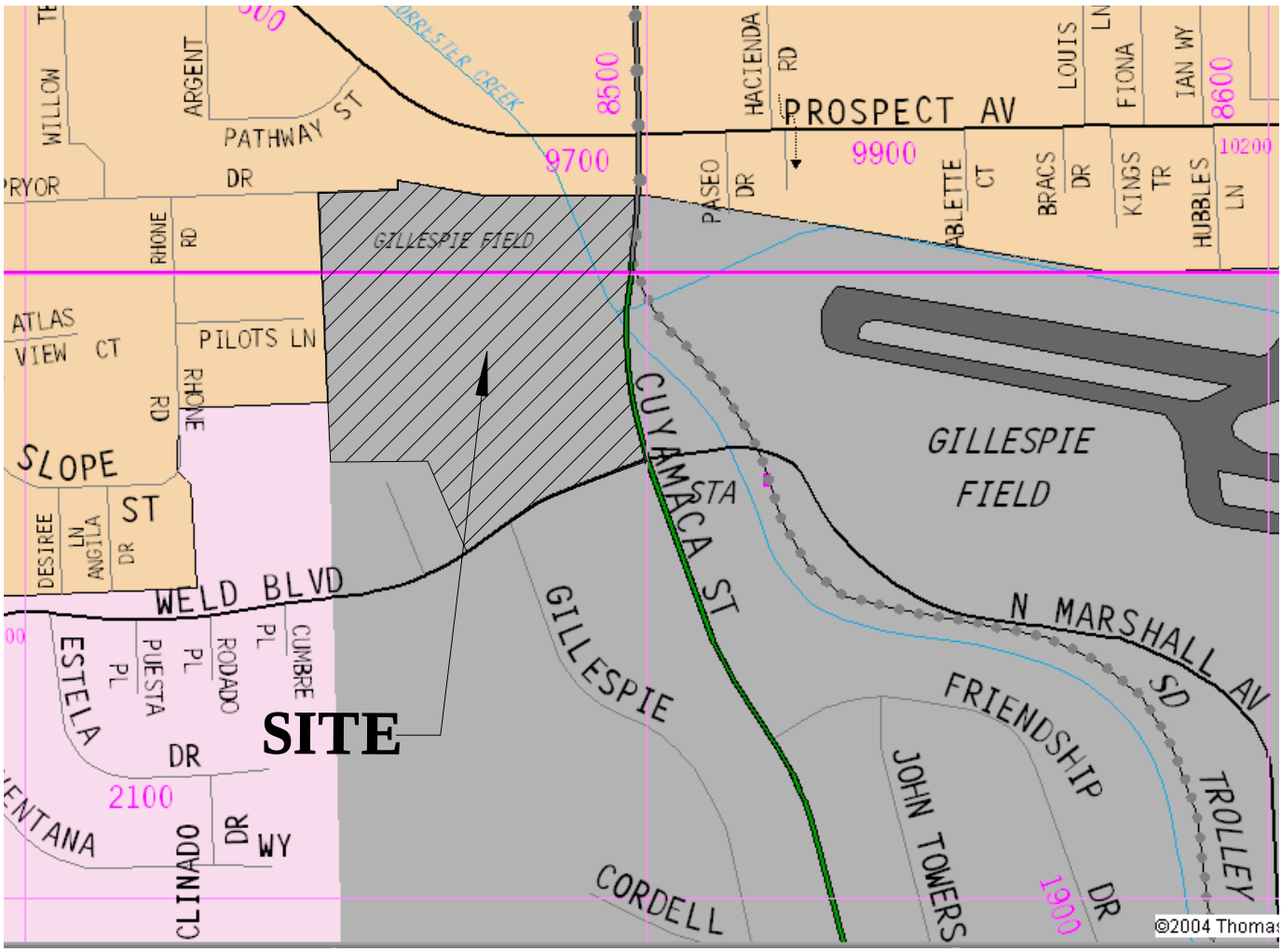
This report has been prepared for the exclusive use of Pacific Scene Commercial and their design consultants for specific application to the project described herein. Should the project be modified, the conclusions and recommendations presented in this report should be reviewed by Christian Wheeler Engineering for conformance with our recommendations and to determine if any additional subsurface investigation, laboratory testing and/or recommendations are necessary. Our professional services have been performed, our findings obtained and our recommendations prepared in accordance with generally accepted engineering principles and practices. This warranty is in lieu of all other warranties, express or implied.

SITE VICINITY MAP

(Adapted from Thomas Brothers Maps)

PROPOSED WELD BOULEVARD INDUSTRIAL PARK
WELD BOULEVARD AND CUYAMACA STREET
EL CAJON, CALIFORNIA

North



PROJECT SCOPE

Our preliminary geotechnical investigation consisted of surface reconnaissance, subsurface exploration, obtaining representative soil samples, laboratory testing, analysis of the field and laboratory data and review of relevant geologic literature. Our scope of service did not include assessment of hazardous substance contamination, recommendations to prevent floor slab moisture intrusion or the formation of mold within the structure, or any other services not specifically described in the scope of services presented below. More specifically, the intent of this analysis was to:

a) Explore the subsurface conditions of the site to the depths influenced by the proposed construction;

b) Evaluate, by laboratory tests, the engineering properties of the various strata that may influence the proposed construction, including bearing capacities, expansive characteristics and settlement potential;

c) Describe the general geology at the site including possible geologic hazards that could have an effect on the site development, and provide the seismic design parameters as required by the most recent edition of the Uniform Building Code;

d) Address potential construction difficulties that may be encountered due to soil and hard rock conditions, groundwater or geologic hazards, and provide recommendations concerning these problems;

e) Address the rippability of the granitic rock materials in proposed cut areas, and discuss the probability of generating oversize rock during the proposed excavations in the granitic rock;

f) Develop soil engineering criteria for site preparation and grading, including recommendations for oversize rock disposal, and address the stability of cut and fill slopes;

g) Recommend an appropriate foundation system for the type of structure anticipated and develop soil engineering design criteria for the recommended foundation design;

h) Provide design criteria for unrestrained masonry retaining walls;

i) Present our opinions in this written report, which includes in addition to our findings and recommendations, a site plan showing the location of our subsurface explorations, logs of the test pits and seismic traverses, and a summary of our laboratory test results.

Although tests for the presence of soluble sulfates within the soils that may be in contact with reinforced concrete were performed as part of the scope of our services, it should be understood Christian Wheeler Engineering does not practice corrosion engineering. If such an analysis is considered necessary, we recommend that the client retain an engineering firm that specializes in this field to consult with them on this matter. The results of these tests should only be used as a guideline to determine if additional testing and analysis is necessary.

FINDINGS

SITE DESCRIPTION

The subject site is an irregular parcel of land located north of Weld Boulevard and west of Cuyamaca Street, in the El Cajon area of San Diego County. The topography of the property consists of gently sloping areas within the majority of the site, with relatively high, steeply sloping areas within the northwestern and southeastern portions of the site. An upper, relatively flat pad is located within the southwestern corner of the property. This upper area is being used by the County and at this point in time, is not considered part of the project area. There is an approximately 30-foot-high fill slope separating the upper and lower areas. The lower level includes most of the property and is the portion that is the subject of this proposal. About a third of this area is presently being utilized as a golf driving range. San Diego Precast is currently using the northerly quarter of the property. The rest of the lower portion of the site is undeveloped and is not being used. A vacant, triangular-shaped portion of the parcel, located in the northeast corner of the subject site, between the Forrester Creek concrete drainage channel and Cuyamaca Street, is also not considered as part of the proposed project area. Several large rock outcrops exist along the toe of the fill slope in the

southwesterly portion of site and a relatively moderate-size granitic knob exists in the central portion of the lower area, east of the driving range. Several large granitic boulders up to 10 feet in diameter can be observed on and around the knob in the center of the project area. Additionally, the tops of several granitic boulders were noted within the eastern portion of the site, as indicated on Plate No. 1. Due to the dense wild grasses that covered a majority of the undeveloped portion of the site, we were unable to identify any other granitic outcrops that may be above the surface; however, due to the close proximity of the granitic hillside, we anticipate that there may be a few smaller boulders at or near the surface throughout the site that may be encountered during site preparation and grading. In the driving range area, the landscaping varies from thick turf to bare dirt. Site elevations range from approximately 405 to 430 feet Mean Sea Level within the upper pad and 345 to 375 feet Mean Sea Level within the lower pad. According to the plans that were provided and used as our Site Plan and Geologic Map (Plate No. 1), the site's topography was drawn from data gathered in the late 1980's. Minor grade changes may have occurred since this time.

GENERAL GEOLOGY AND SUBSURFACE CONDITIONS

GEOLOGIC SETTING AND SOIL DESCRIPTION: The subject site is located in the Foothills Physiographic Province of San Diego County. Based upon the results of our limited exploration and analysis of readily available, pertinent geologic literature, the site appears to be generally underlain by Cretaceous-age granitic materials overlain by a relatively thick layer of Quaternary-age younger and older alluvium that is capped by a thin veneer of residual soil and in some areas by minor amounts of man-placed fill. These materials are described below:

ARTIFICIAL FILL: Man-placed fill materials were documented within the our exploratory boring B3 and our trench T-16, and observed with a fill wedge within the eastern third of the existing driving range pad. The fill wedge appears to have an approximate thickness of up to five feet, while the fill slope in the area of boring B3 appears to be approximately 10 to 20 feet thick. The materials comprising the fill layer are expected to consist of the natural materials from the surrounding area, generally consisting of medium brown, silty sand (SM) and sandy clay (CL). The fill material is considered unsuitable in its present condition to support fill and/or settlement-sensitive improvements, but may be used for structural fill material.

RESIDUAL SOIL: Natural residual soil was noted at the surface in test trenches T2, T5, T9, and T13. The residual soil layer had an approximate thickness ranging from two to five feet.

The materials comprising the residual soil layer generally consisted of medium brown, silty sand (SM) and clayey sand (SC) that was typically damp and loose. The residual soil is considered unsuitable in its present condition to support fill and/or settlement-sensitive improvements, but may be used for structural fill material.

YOUNGER ALLUVIUM (Qyal): Quaternary-age younger alluvial deposits were encountered within our test trench numbers T3, T4, T6, T7, T8, T10, T11, T12, T14, T15, and T16, and within our borings B1 and B2. Within borings B1 and B2, drilled near the northeast corner of the proposed warehouse building, and the northeast corner of the project area, the younger alluvium layer extended to a depth of 18 feet below the existing grade. Within each of our other test trenches where younger alluvium was encountered, the alluvium layer extended to depths ranging from approximately 1 foot to as much as 14 feet below existing site grades.

In general, the younger alluvium consists of relatively recent deposits of medium brown, silty sand (SM) overlying a dark brown to medium reddish brown, sandy clay (CL) and light grayish-brown to reddish-brown clayey sand (SC). These younger alluvial materials were noted to be generally damp to moist above the perched water table and saturated below, and were loose to medium dense and soft to medium stiff. The younger alluvial materials are considered unsuitable in their present condition to support fill and/or settlement-sensitive improvements. We expect the clayey portions of the younger alluvium to be moderately to highly expansive, and therefore, should be kept a minimum of five feet below proposed pad grade if used as structural fill material.

OLDER ALLUVIUM (Qoal): Quaternary-age older alluvial deposits were encountered within our test trenches T-4, T-11, and T-12. Within these test trenches, the older alluvium layer was just below the younger alluvium at depths ranging from six to nine feet below the existing grade. The older alluvium layer was approximately two to three feet thick and was found to be overlying weathered granitic rock.

In general, the older alluvium consists of deposits of light grayish-brown to light reddish-brown, clayey sand (SC). The alluvium was noted to be generally moist above the water table and saturated below, and were medium dense. The older alluvial materials are considered suitable in their present condition to support fill and/or settlement-sensitive improvements.

GRANITICS (Kgr): The site is ultimately underlain by Cretaceous-age granitic materials associated with the Southern California Batholith. The uppermost portions of the encountered granitics in our trenches were highly weathered or decomposed and were noted to consist of reddish-brown and medium grayish-brown, silty sands (SM) that were moist and dense to very dense. Within boring number B3, and test trenches number T1, T3, T5, T9, and T13, the drill rig and backhoe encountered practical refusal at 28, 6, 10, 8, 9, and 10 feet, respectively, below existing grades.

The granitic knob located near the center of the site and the sloping hillsides near the northwest and southwest corners of the site are expected to be removed and cut back, respectively. In addition to our borings and test trenches in these areas, five seismic refraction traverses were performed in order to assess the rippability of the underlying granitic rock. The results of the analysis are presented in the "Rippability Characteristics" section below.

The proposed slope within the southwest corner of the site will require cuts on the order of 32 to 34 feet. According to the results of the seismic refraction testing, the upper 15 to 20 feet are rippable, and both marginally rippable and non-rippable below this. Due to the lower velocities within the non-rippable range, blasting of the non-rippable bedrock materials is likely to produce primarily sand, gravel and cobble-size materials up to 12 inches; however, minor amounts of angular and/or oversized materials with little to no fines may also be produced and may require special handling and placement.

GROUNDWATER: Perched groundwater was encountered within the younger alluvium above the more competent underlying granitic materials. The groundwater was noted at depths ranging from approximately 12 feet to 12½ feet below the existing site grades within the northeast portion of the site, adjacent to Forrester Creek. Provided our recommendations presented in the "Grading and Earthwork" portion of this report, groundwater will not encountered during construction.

TECTONIC SETTING: No major faults are known to traverse the subject site but it should be noted that much of Southern California, including the San Diego County area, is characterized by a series of Quaternary-age fault zones which typically consist of several individual, en echelon faults that generally strike in a northerly to northwesterly direction. Some of these fault zones (and the individual faults within the zones) are classified as active while others are classified as only potentially active, according to the criteria of the California Division of Mines and Geology. Active fault zones

are those which have shown conclusive evidence of faulting during the Holocene Epoch (the most recent 11,000 years) while potentially active fault zones have demonstrated movement during the Pleistocene Epoch (11,000 to 1.6 million years before the present) but no movement during Holocene time.

A review of available geologic maps indicates that the active Rose Canyon Fault Zone is located approximately 19 kilometers west of the subject site. Other active fault zones in the region that could possibly affect the site include the Coronado Bank Fault Zone to the southwest and the San Jacinto, Elsinore and San Andreas Fault Zones to the northeast.

GEOLOGIC HAZARDS

GROUND SHAKING: A likely geologic hazard to affect the site is ground shaking as a result of movement along one of the major active fault zones mentioned above. The maximum ground accelerations that would be attributed to a maximum magnitude earthquake occurring along the nearest fault segments of selected fault zones that could affect the site are summarized in the following Table I.

TABLE I: MAXIMUM GROUND ACCELERATIONS

Fault Zone	Distance	Maximum Magnitude Earthquake	Maximum Ground Acceleration
Rose Canyon	19 km	6.9 magnitude	0.17 g
Coronado Bank	41 km	7.4 magnitude	0.12 g
Elsinore-Julian	47 km	7.1 magnitude	0.09 g
Earthquake Valley	55 km	6.5 magnitude	0.06 g
Newport-Inglewood	55 km	6.9 magnitude	0.08 g

Probable ground shaking levels at the site could range from slight to moderate, depending on such factors as the magnitude of the seismic event and the distance to the epicenter. It is likely that the site will experience the effects of at least one moderate to large earthquake during the life of the proposed structures.

LANDSLIDE POTENTIAL AND SLOPE STABILITY: As part of our study we reviewed the publication, "Landslide Hazards in the Southern Part of the San Diego Metropolitan Area**"** by Tan, 1995. This reference is a comprehensive study that classifies San Diego County into areas of relative landslide susceptibility. According to this publication, the northeastern portion of the subject site, adjacent to Cuyamaca Street, is located in Area 2 and the southwestern portion of the site is located in Subarea 3-1. Area 2 is considered to be "marginally susceptible" to slope instability hazards and

includes gentle to moderate slopes where the slope angles are less than 15 degrees. Area 3 is considered to be "generally susceptible to slope instability hazards; slopes within the 3-1 classification are considered at or near their stability limits due to steep slopes and can be expected to fail locally when adversely modified. Sites within this classification are located outside the boundaries of known landslides but contain observably unstable slopes that may be underlain by weak materials and/or adverse geologic structure. Due to the competent nature of the underlying granitic rock and the relatively moderate inclinations of the on-site slopes, the potential for deep-seated landsliding is considered to be very low.

LIQUEFACTION: The near-surface soils encountered at the site are not considered susceptible to liquefaction due to such factors as soil density, grain-size distribution and the absence of shallow groundwater conditions.

FLOODING: The northeastern portion of the site near the Forrester Creek is located within both the 100 and 500-year floodplain according to the maps prepared by the Federal Emergency Management Agency (Panel 1653F). Therefore, it will be necessary to raise this portion of the site to minimize the flooding hazard.

TSUNAMIS: Tsunamis are great sea waves produced by submarine earthquakes or volcanic eruptions. The site will not be affected by a tsunami.

SEICHES: Seiches are periodic oscillations in large bodies of water such as lakes, harbors, bays or reservoirs. Due to the site's location, it will not be affected by seiches.

RIPPABILITY CHARACTERISTICS

SEISMIC TRAVERSE: Five seismic refraction traverses were performed using a Nimbus Instruments Model ES-125 single channel signal enhancement seismograph. The location of the seismic traverses are shown on the site plan included herewith as Plate Number 1. The results of the seismic traverse are summarized below in Table II. Our interpretations are based on the rippability characteristics of granitic rock as described hereinafter. The apparent velocities were measured at each end of the seismic traverses, and the seismic traverses performed in the opposite directions are designated with the letter "R" after the traverse number. The seismograph's depth of investigation is closely related to the length of the seismic traverse. For a particular length of traverse, e.g. 100 feet, using a ratio of 3:1 between the length and depth, we conclude that this 100-foot length of survey line

will detect materials of varying density to a depth of approximately 33 feet. The length of traverses in this survey were 60 to 120 feet.

TABLE II

RESULTS OF SEISMIC REFRACTION TRAVERSE

Traverse Number	Apparent Velocities	Comments
Traverse No. 1 (northwest end)		
0'-1.5'	909 ft/sec.	Loose Residual Soils
1.5'-11.8'	1,971 ft/sec.	Rippable Granitic Rock
11.8'-33'	3,559 ft/sec	Rippable Granitic Rock
Traverse No. 1R (southeast end)		
0'-3.4'	1,100 ft/sec.	Loose Residual Soils
3.4'-11.5'	2,488 ft/sec.	Rippable Granitic Rock
11.5'-33'	2,923 ft/sec	Rippable Granitic Rock
Traverse No. 2 (south end)		
0'-5.4'	1,192 ft/sec	Rippable Granitic Rock
5.4'-33'	3,380 ft/sec	Rippable Granitic Rock
Traverse No. 2R (north end)		
0'-5.4'	1,185 ft/sec	Rippable Granitic Rock
5.4'-33'	3,231 ft/sec	Rippable Granitic Rock
Traverse No. 3 (west end)		
0'-1.5'	571 ft/sec.	Loose Residual Soils
1.5'-9.6'	2,000 ft/sec.	Rippable Granitic Rock
9.6'-20'	2,857 ft/sec	Rippable Granitic Rock
Traverse No. 3R (east end)		
0'-4.9'	818 ft/sec.	Loose Residual Soils
4.9'-11.9'	2,636 ft/sec.	Rippable Granitic Rock
11.9'-20'	3,500 ft/sec	Rippable Granitic Rock
Traverse No. 4 (southeast end)		
0'-2.8'	778 ft/sec.	Loose Residual Soils
2.8'-31.1'	3,571 ft/sec.	Rippable Granitic Rock
31.1'-40'	6,500 ft/sec	Non-Rippable Granitic Rock
Traverse No. 4R (northwest end)		
0'-2.1'	385 ft/sec.	Loose Residual Soils
2.1'-4.5'	2,000 ft/sec.	Rippable Granitic Rock
4.5'-40'*	4,826 ft/sec	Marginally Rippable Granitic Rock

* Possible near surface granitic hard-rock floater

Traverse No. 5 (southeast end)

0'-5.3'	892 ft/sec.	Loose Residual Soils
5.3'-19'	2,136 ft/sec.	Rippable Granitic Rock
19'-26.5'	7,273 ft/sec	Non-Rippable Granitic Rock

Traverse No. 5R (northwest end)

0'-3'	952 ft/sec.	Loose Residual Soils
3'-15.3'	2,000 ft/sec.	Rippable Granitic Rock
15.3'-26.5'	5,125 ft/sec	Marginally Rippable Granitic Rock

RIPPABILITY CHARACTERISTICS OF GRANITIC ROCK: The following presents a discussion of the velocity ranges used to determine the boundaries of rippable, marginally rippable, and non-rippable granitic rock. The evaluations given are based on using a Caterpillar D-9 dozer or equivalent for the excavations. Use of lesser or smaller equipment for excavations will change the given evaluations. Excavation is dependent to a great degree on the condition and type of excavation equipment and on operator technique, as well as on rock weathering and fracturing.

RIPPABLE CONDITION (0 - 4,500 ft./sec.): This velocity range indicates rippable materials, which may consist of decomposed granitics at lower velocities to only slightly decomposed, fractured rock at the higher velocities. Although considered to be rippable, materials may be produced by excavation that will not be usable as structural fill. However, the material may be usable as structural fill if processed by adding fines. Experience has shown that material within the range of 4,000 to 4,500 fps most often consists of severely to moderately fractured rock with little fines or no fines and sizeable quantities of plus three-inch material.

For materials within the velocity range of from 3,500 to 4,500 fps, rippability will be difficult for backhoes and other light trenching equipment.

MARGINALLY RIPPABLE CONDITION (4,500 - 5,500 ft./sec.): Excavations in this range would be extremely time consuming or impractical and would produce fractured rock with little or no fines with or without blasting. The higher velocities will most likely require blasting. Trenching equipment might not function well and trench excavations, even with larger track mounted excavators, will be very time consuming. In the higher range of this category, trenching may not be economically practical.

NON-RIPPABLE CONDITION (5,500 ft./sec. and Greater): Granitic rock with seismic velocities over 5,500 feet per second may include moderately to slightly fractured rock which will

require blasting for excavations. The materials produced by blasting will consist of a high percentage of oversize and angular rock and few fines.

SEISMIC TRAVERSE LIMITATIONS: The results of the seismic survey for this investigation reflect rippability conditions only for the area of the traverse. However, the conditions of the various soil-rock units appear to be similar for the remainder of the site and may be assumed to possess similar characteristics.

Our reporting is presently limited in that refraction seismic surveys do not allow for prediction of a percentage of expectable oversize or hardrock floaters. Subsurface variations in the degree of weathered rock to fractured rock are not accurately predictable. Excavation is dependent to a great degree on the condition and type of excavation equipment and on operator technique, as well as on rock weathering and fracturing.

The seismic refraction method requires that materials become increasingly dense with depth. In areas where denser, higher velocity materials are underlain by lower velocity materials, the lower velocity materials would not be indicated by our survey.

All of the velocities used as upper limits for rippability are subject to fluctuation depending upon such local variations in rock conditions as:

a) Fractures, faults, and planes of weakness of any kind.
b) Weathering and degree of decomposition.
c) Brittleness and crystalline nature.
d) Grain size.

Further, the range of rippability using Caterpillar equipment may be increased using different equipment. However, it should be noted that ripping of higher velocity materials may become totally dependent on the time available and the economics of the project. Ripping of higher velocity materials can be achieved, but it may become economically infeasible.

DISCUSSION OF RESULTS OF SEISMIC TRAVERSES: Our seismic refraction traverses, performed at the site, indicated that the granitic rock materials that underlie the majority of the site are generally rippable to a depth of at least 30 feet below existing grade. However, in the southeast portion of the site, where cuts of up to 34 feet are expected, the granitic rock materials are generally

rippable to a depth of at least 15 to 20 feet below existing grades and marginally to non-rippable below 15 to 20 feet (see cross sections on Plate Nos. 2 and 3). In the area of the proposed cuts, the approximate elevation of the marginally and non-rippable materials are expected at approximately 381 feet and 377 Mean Sea Level, respectively, near the toe of the proposed cut slope, where the proposed pad grade is expected to be 368 feet M.S.L. In addition, the fully exposed and partially buried boulders at the surface within the eastern and southwestern portions of the site are expected to require splitting and/or blasting to excavate. It should also be noted that zones of granitic hardrock and hardrock "floaters" are expected to be encountered below the surface within the decomposed granitic rock, as anticipated in seismic refraction traverse ST-4R, that will likely also require splitting and/or blasting. Due to the lower velocities within the non-rippable range, blasting of the non-rippable bedrock materials is likely to produce primarily sand, gravel and cobble-size materials up to 12 inches; however, minor amounts of angular and/or oversized materials with little to no fines may also be produced and may require special handling and placement.

CONCLUSIONS

It is our opinion and professional judgment that no geotechnical conditions exist on the subject property which would preclude the development of the industrial buildings as presently proposed, provided the recommendations presented herein are followed. The two conditions that will have the most significant impact on the development of the site are the presence of relatively deep alluvial deposits in the northeast portion of the site that will require removal and replacement as structural fill and hard rock granitics, which include many large surface boulders and most likely large buried boulders, that will require special handling and placement, and possible blasting or splitting.

We expect that blasting will be required in the southwest corner of the site for the lower approximately 9 to 13 feet of the proposed cut. At the northeast corner of the site, the alluvial deposits extended to a depth of approximately 18 feet and groundwater was found at a depth of about 12.5 feet. In this area, our recommendation is to remove the alluvium to approximately 2 feet above the water table and to replace it as compacted fill. It will be necessary to monitor the fill to determine when the alluvial soils that are left in place are consolidated, which should take about one month to complete.

From a geologic prospective, the site was found to be relatively free of geologic hazards. The most likely geologic hazard to affect the site is ground shaking due to seismic activity along one of the regional active earthquake faults. Building construction in accordance with the most recent

requirements of the Uniform Building Code and other governmental agencies should provide for an acceptable level of life safety for the proposed industrial site.

RECOMMENDATIONS

GRADING AND EARTHWORK

GENERAL: All grading should conform to the guidelines presented in Appendix Chapter A33 of the Uniform Building Code, the minimum requirements of the County of San Diego, and the recommended Grading Specifications and Special Provisions attached hereto, except where specifically superseded in the text of this report. Prior to grading, a representative of Christian Wheeler Engineering should be present at the pre-construction meeting to provide additional grading guidelines, if necessary, and to review the earthwork schedule.

OBSERVATION OF GRADING: Continuous observation by the Geotechnical Consultant is essential during the site preparation and grading operations to confirm conditions anticipated by our investigation, to allow adjustments in design criteria to reflect actual field conditions exposed, and to determine that the grading proceeds in general accordance with the recommendations contained herein.

CLEARING AND GRUBBING: Site grading should begin with the removal of all existing improvements and vegetation and other deleterious materials from the portions of the site that will be graded and/or will receive improvements. At this time, the site vegetation appears to be limited to low grasses and scattered small to medium trees and native brush. Discing of vegetation into the surficial soils is not considered an acceptable method of removal of vegetation. In addition, all underground utilities installed for the existing driving range facilities should be removed and the resulting depressions cleaned of loose and disturbed soils and backfilled with compacted fill material. All vegetation and other deleterious debris resulting form the clearing, grubbing and demolishing should be disposed of off-site.

SITE PREPARATION: After clearing and grubbing, site preparation should begin with the removal of all fill material, topsoil, subsoil, and younger alluvial deposits in the areas to be graded or that will support settlement sensitive improvements. In the areas of the proposed structures and street, the younger alluvium should be removed to the granitic bedrock, older alluvium, or to at least two feet above the groundwater table, whichever is less. It can be anticipated that the removals of younger alluvial deposits over most of the site, except the northeast corner, will generally be about 5

to 7 feet below existing grade. Areas that are paved and intended for parking or driveway access, removals should extend to a depth of four feet below subgrade.

TRANSITION LOT UNDERCUT: It is anticipated that a transition between cut and fill material will fall within building pads A, C, E and F. We recommend that the cut portion of the pad be over-excavated by a depth of five feet and said material replaced as uniformly compacted fill. Undercut areas should be sloped at least two percent toward the fill area of the lot to prevent water that seeps into the ground from becoming perched above the natural soils. It can be noted that undercutting will be necessary where the granite knoll crops out northeast of the driving range office, the shallow granitic area near the northeastern-most industrial building, and on the southerly and westerly side of the large warehouse building. The undercut area should extend at least eight feet outside the perimeter of the proposed buildings.

PROCESSING OF FILL AREAS: Prior to placing any new fill soils or constructing any new improvements in areas that have been cleaned out to receive fill, the exposed soils should be scarified to a depth of 12 inches, moisture conditioned, and compacted to at least 90 percent relative compaction. In areas to support fill slopes, keys should be cut into the competent supporting materials. The keys should be at least twelve feet wide and be sloped back into the hillside at least two percent. The keys should extend at least one foot into the competent supporting materials. Where the existing ground has a slope of 5:1 (horizontal to vertical) or steeper, it should be benched into as the fill extends upward from the keyways. The benching should remove all topsoils, residual soils, and weathered documented fill and formational soils, and should create level areas on which to place the fill material.

EXCAVATION CHARACTERISTICS: Based on the results of the five seismic refraction traverses performed during our field investigation, it appears that most of the granitic bedrock material will be rippable to the anticipated excavation depths. However, in the southwest portion of the site, where cuts of up to 34 feet are expected, the granitic rock materials are generally rippable to a depth of at least 15 to 20 feet below existing grades and marginally to non-rippable below 15 to 20 feet. In addition, it should be noted that there are many large hard rock granitic boulders on the surface of the site, and potentially buried below the surface of the site, that may need to be blasted apart or split in order to move. Special handling and placement will also be required if this material is to be included within structural fills.

DISPOSAL OF OVERSIZE ROCK: Oversize rock in grading operations is defined herein as rocks over 12 inches in diameter. Oversize rocks may be placed around the site in landscape areas, broken down into rocks smaller than 12 inches and used in fills, placed in specially designated, pre-approved non-structural fill areas, placed in structural fills, or disposed of off site. If the oversize rock is placed in a designated non-structural fill area, it should be placed in uniform lifts across the fill area in an un-nested manner. Prior to placing each lift, decomposed granitics with a Sand Equivalent (SE) of at least 25 should be spread over the rock. This material should be flooded into the voids between the rocks and should cover the rock by at least six inches.

The following provides our recommendations for placement of oversize rock in structural fills.

1) No oversize rock should be placed within ten (10) feet, measured horizontally, from the face of fill slopes.

2) No oversize rock should be placed within five (5) feet of finish pad grade on fill pads. In addition, no rock should be placed within one (1) foot of the bottom of the lowest utilities on the lot and below proposed pool areas.

3) Oversize rock up to two feet in average dimension may be placed in uniform lifts across the fill area in an un-nested manner. Prior to placing each subsequent lift, decomposed granitics with a Sand Equivalent (SE) of at least 25 should be spread over the rock. This material should be flooded into the voids between the rocks and should cover the rock by at least six inches. The top of each lift should be smoothed out with a dozer and be wheel rolled with a loaded scraper or other suitable heavy compaction equipment approved by the geotechnical consultant.

4) Rocks two to four feet in average dimension may be placed in windrows. The windrows should be at least 12 feet apart to allow compaction equipment to move between the rows. As the fill is brought up between the windrows, decomposed granitics with a SE of at least 25 should be flooded between and around the rocks to fill all voids. There should be at least one foot of cover over the top of windrows before the next windrows are started. The windrows placed above previously placed windrows should be staggered halfway between the lower windrows.

5) Rocks larger than two feet in average dimension may also be individually placed. This placement should consist of excavating a trench or ditch to a depth of at least one-third the diameter of the rock and rolling the rock into the excavation. Such rocks should be spaced at least 12 feet apart in order to allow compaction equipment to move around the rock. As the fill is brought up around the rock, decomposed granitics with a SE of at least 25 should be flooded against the lower third of the rock. Above this, the compaction equipment should compact the fill against and over the rock.

6) Sufficient compaction effort should be made such that all fill material placed around and between the oversize rocks is compacted to at least 90 percent of maximum dry density as determined by ASTM D1557-91.

The placement of all fill and all oversize rock disposal, including flooding, should be continuously observed by the Geotechnical Consultant. This is required to allow us to provide a professional opinion after grading that the fill and rock disposal was done in accordance with the recommendations contained herein.

SELECT GRADING: Except for the clayey alluvial soils, the on-site soils exposed in our subsurface explorations are considered to be non-detrimentally expansive. Non-detrimentally expansive soils are defined herein as soils with an expansion index less than 50. The clayey, topsoil/subsoil and alluvial deposits encountered during grading that is proposed to be used as fill material should be placed at least five (5) feet below finish pad grade, or it should be mixed with other on-site soils to produce a non-detrimentally expansive mixture of soil. Wherever detrimentally expansive soil is determined to occur naturally within four feet of finish pad grade, it should be removed and replaced with non-detrimentally expansive material.

TEMPORARY SLOPES: We anticipate that temporary excavation slopes for retaining walls, if any, will be less than about 10 feet in height. For unconfined excavations, the lower 5 feet may be cut vertical; the portions of the excavation above 5 feet should be sloped at an inclination of 0.75:1. If deeper excavations are required, specific recommendations will be provided when the soils and site conditions can be identified. Deep, temporary confined excavations, such as for underground utilities, should use sloping sides, shoring, or “trench boxes” during construction, or any other approved construction technique to assure stability of the excavations.

The contractor is solely responsible for designing and constructing stable, temporary excavations and may need to shore, slope, or bench the sides of trench excavations as required to maintain the stability of the excavation sides where the friable sands are exposed. The contractor's "responsible person", as defined in the OSHA Construction Standards for Excavations, 29 CFR, Part 1926, should evaluate the soil exposed in the excavations as part of the contractor's safety process. In no case should slope height, slope inclination, or excavation depth, including utility trench excavation depth, exceed those specified in local, state, and federal safety regulations.

FILL SLOPE CONSTRUCTION: All fill slopes should be constructed at an inclination of 2:1 or flatter (horizontal to vertical). Compaction of slopes should be performed by back-rolling with a sheepsfoot compactor at vertical intervals of four feet or less as the fill is being placed, and track-walking the face of the slope when the slope is completed. As an alternative, the fill slopes may be overfilled by at least three feet and then cut back to the compacted core at the design line and grade. Keys should be made at the toe of fill slopes in accordance with the recommendations presented above under "Compaction and Method of Filling".

COMPACTION AND METHOD OF FILLING: All structural fill placed at the site should be compacted to a relative compaction of at least 90 percent of maximum dry density as determined by ASTM Laboratory Test D1557-91. Fills should be placed at or slightly above optimum moisture content, in lifts six to eight inches thick, with each lift compacted by mechanical means. Fills should consist of approved earth material, free of trash or debris, roots, vegetation, or other materials determined to be unsuitable by our soil technicians or project geologist. Fill material should be free of rocks or lumps of soil in excess of twelve inches in maximum dimension. However, in the upper two feet of pad grade, no rocks or lumps of soil in excess of six inches should be allowed. Based upon the results of our subsurface exploration and laboratory testing, all of the on-site soils appear suitable for use as fill material.

Fills should be benched into all temporary slopes and into competent natural soils when the natural slope is steeper than an inclination of 5:1 (horizontal to vertical). Keys should be constructed at the toe of all fill slopes. The keys should extend at least 12 inches into firm natural ground and should be sloped back at least two percent into the slope area. Slope keys should have a minimum width of 12 feet.

Utility trench backfill within five feet of the proposed structures and beneath driveways, concrete flatwork, and pavements should be compacted to a minimum of 90 percent of its maximum dry

density. The upper twelve inches of subgrade beneath paved areas should be compacted to 95 percent of its maximum dry density. This compaction should be obtained by the paving contractor just prior to placing the aggregate base material and should not be part of the mass grading requirements.

All grading and fill placement should be performed in accordance with the city of El Cajon Grading Ordinance, the Uniform Building Code, and the attached Recommended Grading Specifications and Special Provisions attached hereto as Appendix B.

IMPORTED FILL MATERIAL: At this time, it is anticipated that the site earthwork will balance and that there will not be a need to import fill material. However, if it is found necessary to import fill material, the soils to be imported should be evaluated and approved by the geotechnical consultant prior to being imported. At least two working days notice of a potential import source should be given to the Geotechnical Consultant so that appropriate testing can be accomplished. The type of material considered most desirable for import is granular material containing some silt or clay binder, which has an expansion index of less than 50, less than 25 percent larger than the standard #4 sieve, and less than 25 percent finer than the standard # 200 sieve. However, if necessary, soils with a moderate expansion index (50 to 90) may be imported.

SURFACE DRAINAGE: Surface runoff into downslope natural areas and graded areas should be minimized. Where possible, drainage should be directed to suitable disposal areas via non-erodible devices such as paved swales, gunited brow ditches, and storm drains. Pad drainage should be designed to collect and direct surface water away from proposed structures and the top of slopes and toward approved drainage areas. For earth areas, a minimum gradient of one percent should be maintained.

EROSION CONTROL: The placement of cohesionless soils within ten feet of the face of slopes should be avoided. Slopes should be planted as soon as feasible after grading. Sloughing, deep rilling and slumping of surficial soils may be anticipated if slopes are left unplanted for a long period of time, especially during the rainy season. Irrigation of slopes should be carefully monitored to verify that only the minimum amount necessary to sustain plant life is used. Over-irrigating could be extremely erosive and should be avoided.

FOUNDATION RECOMMENDATIONS

GENERAL: Based on our findings to date, the proposed industrial buildings may be supported by conventional continuous and isolated spread footings. The following recommendations are considered the minimum based on soil conditions and are not intended to be lieu of structural considerations. All foundations should be designed by a qualified structural engineer.

FOUNDATION DIMENSIONS: Spread footings supporting the proposed industrial buildings should have a minimum embedment of 18 inches below the finish pad grades. Continuous footings should have a minimum width of 15 inches. Isolated footings should have minimum widths of 24 inches. Retaining wall footings should be embedded at least 18 inches below finish grade and should have a minimum width of 24 inches.

BEARING CAPACITY: Conventional spread footings, with the above recommended minimum dimensions, may be designed using an allowable soil bearing pressure of 3,000 pounds per square foot. The allowable bearing value can be increased by 350 psf and 800 psf for each additional foot of foundation width and depth, respectively, up to a maximum of 6,000 psf. Additionally, the bearing capacity for the footings may be increased by one-third for combinations of temporary loads such as those due to wind or seismic loads.

FOOTING REINFORCING: Reinforcement requirements for foundations should be provided by a structural engineer. However, based on the anticipated soil conditions, we recommend that the minimum reinforcing for new continuous footings consist of at least two No. 5 bars positioned three inches above the bottom of the footing and two No. 5 bars positioned approximately two inches below the top of the footing.

LATERAL LOAD RESISTANCE: Lateral loads against foundations may be resisted by friction between the bottom of the footing and the supporting soil, and by the passive pressure against the footing. The coefficient of friction between concrete and soil may be considered to be 0.40. The passive resistance may be considered to be equal to an equivalent fluid weight of 350 pounds per cubic foot. This assumes the footings are poured tight against competent formational soil. If a combination of the passive pressure and friction is used, the friction value should be reduced by one-third.

SETTLEMENT CHARACTERISTICS: The anticipated differential settlement is expected to be less than about 1 inch over a horizontal distance of 40 feet, provided the recommendations presented

in this report are followed. It should be recognized that minor cracks normally occur in concrete slabs and foundations due to shrinkage during curing or redistribution of stresses; therefore, some cracks should be anticipated. Such cracks are not necessarily an indication of excessive vertical movements.

EXPANSIVE CHARACTERISTICS: Provided the recommendations presented in the "Select Fill" section of this report are followed, the anticipated foundation soils are expected to have a "low" expansion index. The recommendations contained in this report reflect this condition.

SOLUBLE SUFATES: The water soluble sulfate content was determined for representative soil samples from the site in accordance with California Test Method 417. Soil with a soluble sulfate content of 0.10-0.20 is considered moderate. Soils with a soluble sulfate content of less than 0.1 percent are considered to be negligible and no special recommendations are needed. The results of this test indicate that the representative soil samples had soluble sulfate contents of 0.001, 0.004 and 0.010 percent, which are considered "negligible".

FOUNDATION PLAN REVIEW: The foundation plans should be submitted to this office for review in order to ascertain that the recommendations of this report have been implemented, and that no additional recommendations are needed due to changes in the anticipated construction.

FOUNDATION EXCAVATION OBSERVATION: All foundation excavations should be observed by the Geotechnical Consultant prior to placement of reinforcement steel and formwork to determine if the foundation recommendations presented herein are complied with and to confirm the soil conditions are as anticipated by our investigation. All footing excavations should be excavated neat, level and square. All loose or unsuitable material should be removed prior to the placement of concrete.

SEISMIC DESIGN PARAMETERS

Based on the results of our deterministic Seismic Hazard Analysis, the Maximum Ground Acceleration at the site is estimated to be 0.38 g (based upon a Maximum Magnitude Earthquake of 6.9 magnitude along the Rose Canyon Fault Zone). For structural design purposes, a damping ratio not greater than 5 percent of critical dampening, and Soil Profile Type S_c are recommended (UBC Table 16-J). Based upon the site's location at approximately 19 kilometers from the Rose Canyon Fault Zone (Type B Fault), Near Source Factors N_a equal to 1.10 and N_v equal to 1.33 are also

applicable. These values, along with additional seismically related design parameters obtained from the Uniform Building Code (UBC) 1997 edition, Volume II, Chapter 16, are presented below in Table II.

TABLE III: SEISMIC DESIGN PARAMETERS

UBC Chapter 16 Table No.	Seismic Parameter	Recommended Value
16-I	Seismic Zone Factor Z	0.40
16-J	Soil Profile Type	S_c
16-Q	Seismic Coefficient C_a	0.40 N_a
16-R	Seismic Coefficient C_v	0.56 N_v
16-S	Near Source Factor N_a	1.10
16-T	Near Source Factor N_v	1.33
16-U	Seismic Source Type	B

ON-GRADE SLABS

INTERIOR SLABS: Since the floor slab in the industrial buildings will likely be subject to high loads, the slab thickness and reinforcing should be specified by a structural engineer. However, as a minimum, we recommend that the on-grade concrete floor slabs for the industrial buildings have a minimum thickness of 5 inches. Also as a minimum, we recommend that the minimum slab reinforcing for the industrial buildings consist of at least No. 4 bars spaced at 18 inches on center each way. The reinforcing bars should be supported by chairs and be positioned in the center of the slab.

MOISTURE PROTECTION FOR INTERIOR SLABS: In industrial space areas that are not covered by moisture-sensitive floor covering and where high slab loads are anticipated, it may be desired to not install the typical sand blanket under the floor slab. In cases like this, it is sometimes specified to construct a layer of crushed aggregate base in lieu of the sand blanket. As a minimum for this, we recommend that the layer of crushed aggregate base material be at least 6 inches thick. Where a moisture sensitive floor covering is proposed, such as in office areas, we suggest that a subslab moisture retarder, consisting of at least a two-inch-thick blanket of clean, coarse sand overlain by a layer of 10-mil visqueen be installed. The visqueen should be overlain by another two-inch-thick layer of coarse, clean sand. The sand should have less than ten percent and five percent passing the No. 100 and No. 200 sieves, respectively. Our experience indicates that this moisture barrier should allow the transmission of from about six to twelve pounds of moisture per 1000 square feet per day through the on-grade slab. This may be an excess amount of moisture for some

types of floor covering. If additional protection is considered necessary, the concrete mix can be designed to help reduce moisture emission through the floor slab.

EXTERIOR CONCRETE FLATWORK: Exterior slabs, not subject to traffic loads, should have a minimum thickness of four inches. Reinforcement and control joints should be constructed in exterior concrete flatwork to reduce the potential for cracking and movement. Joints should be placed in exterior concrete flatwork to help control the location of shrinkage cracks. Spacing of control joints should be in accordance with the American Concrete Institute specifications.

EARTH RETAINING WALLS

PASSIVE PRESSURE: The passive pressure for the prevailing soil conditions may be considered to be 350 pounds per square foot per foot of depth. This pressure may be increased one-third for seismic loading. The coefficient of friction for concrete to properly compacted select fill soil may be assumed to be 0.40 for the resistance to lateral movement. When combining frictional and passive resistance, the friction should be reduced by one-third. The upper 12 inches of exterior retaining wall footings should not be included in passive pressure calculations where abutted by landscaped areas.

ACTIVE PRESSURE: The active soil pressure for the design of unrestrained earth retaining structures with a level backfill, and non-detrimentally expansive soil backfill, may be assumed to be equivalent to the pressure of a fluid weighing 35 pounds per cubic foot. An additional 13 pounds per cubic foot should be added to said value for 2:1 (horizontal to vertical) sloping backfill. These pressures do not consider any other surcharge. If any are anticipated, this office should be contacted for the necessary increase in soil pressure. These values assume a drained backfill condition.

WATERPROOFING AND SUBDRAINS: Waterproofing details should be provided by the project architect. A suggested wall subdrain detail is provided on the attached Plate Number 35. We recommend that the Geotechnical Consultant observe all retaining wall subdrains to verify proper construction.

BACKFILL: All backfill soils should be compacted to at least 90 percent relative compaction. Expansive or clayey soils should not be used for backfill material. The wall should not be backfilled until the masonry has reached an adequate strength.

PRELIMINARY PAVEMENT SECTIONS

TRAFFIC INDEX: Based on the higher volume of truck traffic anticipated, a Traffic Index of 8.0 has been applied to the pavement for the public cul-de-sac leading into the property, which is identified as Gillespie Way. This Traffic Index should be verified by the County of San Diego. For the paved areas around the industrial building, which we assume will be subjected to a much lower volume of traffic and smaller trucks, we have assumed a Traffic Index of 6.0. If heavy truck traffic is expected around the larger building, a Traffic Index of at least 7.0 should apply.

R-VALUE TEST: Two R-Value tests were performed on the soil anticipated to be present at the subgrade elevation. The results of this test indicate an R-Value of 5 or less in the central portion of the site near the proposed cul-de-sac and an R-value of 70 in the southern portion of the site near Weld Boulevard. Based on the laboratory test results and the composition of the on-site soils, we have assumed a minimum R-value of 15 for the subgrade. Since an evaluation of the supporting characteristics of the actual subgrade soils can only be provided after the completion of grading, the following pavement section should be considered preliminary and should be used for planning purposes only. Final pavement designs should be evaluated after R-value tests have been performed in the actual subgrade material.

PRELIMINARY STRUCTURAL SECTION: Based on the above parameters, it was determined that the structural pavement section for the public street (Gillespie Way) should consist of 4.0 inches of asphalt concrete on 17.0 inches of Crushed Aggregate Base material. For the area of the industrial buildings, the structural pavement section should consist of 3.0 inches of asphalt concrete pavement on 12 inches of Crushed Aggregate Base. For the area of around the larger building, the structural pavement section should consist of 3.0 inches of asphalt concrete pavement on 15 inches of Crushed Aggregate Base. Where tractor trailers will park, such as around the warehouse, we recommend that Portland cement concrete (PCC) be used as a pavement surface. As a minimum, the concrete pavement should have a minimum thickness of 8 inches.

Crushed Aggregate Base (CAB) material should conform with the requirements set forth in Section 200-2.2 of the Standard Specifications for Public Works Construction, or with Section 26-1.02A of the CalTrans specifications. All aggregate base material should be compacted to at least 95 percent of its maximum dry density as determined by ASTM Test D1557-91. In addition, just prior to placing the aggregate base material the subgrade soils should be scarified to a depth of 12 inches,

moisture conditioned to near optimum moisture content, and compacted to at least 95 percent of its maximum dry density.

All methods of construction of the asphalt pavement should conform to good engineering and construction practices and to the minimum standards set forth by the County of San Diego.

LIMITATIONS

REVIEW, OBSERVATION AND TESTING

The recommendations presented in this report are contingent upon our review of final plans and specifications. Such plans and specifications should be made available to the geotechnical engineer and engineering geologist so that they may review and verify their compliance with this report and with the Uniform Building Code.

It is recommended that Christian Wheeler Engineering be retained to provide continuous soil engineering services during the earthwork operations. This is to verify compliance with the design concepts, specifications or recommendations and to allow design changes in the event that subsurface conditions differ from those anticipated prior to start of construction.

UNIFORMITY OF CONDITIONS

The recommendations and opinions expressed in this report reflect our best estimate of the project requirements based on an evaluation of the subsurface soil conditions encountered at the subsurface exploration locations and on the assumption that the soil conditions do not deviate appreciably from those encountered. It should be recognized that the performance of the foundations and/or cut and fill slopes may be influenced by undisclosed or unforeseen variations in the soil conditions that may occur in the intermediate and unexplored areas. Any unusual conditions not covered in this report that may be encountered during site development should be brought to the attention of the geotechnical engineer so that he may make modifications if necessary.

CHANGE IN SCOPE

This office should be advised of any changes in the project scope or proposed site grading so that we may determine if the recommendations contained herein are appropriate. This should be verified in writing or modified by a written addendum.

TIME LIMITATIONS

The findings of this report are valid as of this date. Changes in the condition of a property can, however, occur with the passage of time, whether they be due to natural processes or the work of man on this or adjacent properties. In addition, changes in the Standards-of-Practice and/or Government Codes may occur. Due to such changes, the findings of this report may be invalidated wholly or in part by changes beyond our control. Therefore, this report should not be relied upon after a period of two years without a review by us verifying the suitability of the conclusions and recommendations.

PROFESSIONAL STANDARD

In the performance of our professional services, we comply with that level of care and skill ordinarily exercised by members of our profession currently practicing under similar conditions and in the same locality. The client recognizes that subsurface conditions may vary from those encountered at the locations where our borings, surveys, and explorations are made, and that our data, interpretations, and recommendations be based solely on the information obtained by us. We will be responsible for those data, interpretations, and recommendations, but shall not be responsible for the interpretations by others of the information developed. Our services consist of professional consultation and observation only, and no warranty of any kind whatsoever, express or implied, is made or intended in connection with the work performed or to be performed by us, or by our proposal for consulting or other services, or by our furnishing of oral or written reports or findings.

CLIENT'S RESPONSIBILITY

It is the responsibility of the client, or their representatives to ensure that the information and recommendations contained herein are brought to the attention of the structural engineer and architect for the project and incorporated into the project's plans and specifications. It is further

their responsibility to take the necessary measures to insure that the contractor and his subcontractors carry out such recommendations during construction.

FIELD EXPLORATIONS

Nineteen subsurface explorations consisting of three borings drilled using a CME 55 truck-mounted drill rig on December 13, 2004 and sixteen test trenches excavated with a Catepillar 430 D Backhoe on July 9, 2004, and five seismic traverses run on both July 9 and December 14, 2004 were made at the locations indicated on the site plan included herewith as Plate Numbers 1. The fieldwork was conducted under the observation and direction of our engineering geology personnel.

The explorations were carefully logged when made. The boring logs are presented on the following Plate Numbers 4 through 9 and the test trench logs are presented on the following Plate Numbers 10 through 25. The soils are described in accordance with the Unified Soils Classification. In addition, a verbal textural description, the wet color, the apparent moisture and the density or consistency are provided. The density of granular soils is given as very loose, loose, medium dense, dense or very dense. Bulk samples of disturbed soil were collected from the test pit excavations and transported to the laboratory for testing.

LABORATORY TESTING

Laboratory tests were performed in accordance with the generally accepted American Society for Testing and Materials (ASTM) test methods or suggested procedures. A brief description of the tests performed is presented below.

a) **CLASSIFICATION:** Field classifications were verified in the laboratory by visual examination. The final soil classifications are in accordance with the Unified Soil Classification System.

b) **MOISTURE-DENSITY:** In-place moisture contents and dry densities were determined for representative soil samples. This information was an aid to classification and permitted recognition of variations in material consistency with depth. The dry unit weight is determined in pounds per cubic foot, and the in-place moisture content is determined as a percentage of the soil's dry weight. The results are summarized in the boring and trench logs attached herein as Plate Nos. 4 through 25.

c) **COMPACTION TEST:** The maximum dry density and optimum moisture content of a sample of near-surface material to be used as fill was determined in the laboratory in accordance with ASTM Standard Test D-1557-91, Method A. The results of this test are presented on Plate Number 31.

d) **DIRECT SHEAR TEST:** A direct shear test was performed to determine the failure envelope based on yield shear strength. The shear box was designed to accommodate a sample having a diameter of 2.375 inches or 2.50 inches and a height of 1.0 inch. Samples were saturated and tested at different vertical loads. The shear stress was applied at a constant rate of strain of approximately 0.05 inch per minute. The results of the shear test are presented on Plate Number 31.

e) **EXPANSION INDEX TEST:** An Expansion Index test on a remolded sample was performed on a representative sample of the soil present at finish grade. The test was performed on the portion of the sample passing the #4 standard sieve. The sample was brought to optimum moisture content and then dried back to a constant moisture content for 12 hours at 230 $\pm$ 9 degrees Fahrenheit. The specimen was then compacted in a 4-inch-diameter mold in two equal layers by means of a tamper, then trimmed to a final height of 1 inch, and brought to a saturation of approximately 50 percent. The specimen was placed in a consolidometer with porous stones at the top and bottom, a total normal load of 12.63 pounds was placed (144.7 psf), and the samples were allowed to consolidate for a period of 10 minutes. The sample was saturated, and the change in vertical movement was recorded until the rate of expansion became nominal. The expansion index is reported on Plate Number 31 as the total vertical displacement times 1000.

f) **GRAIN SIZE DISTRIBUTION:** The grain size distribution was determined from representative soil samples in accordance with ASTM D422. The results of these tests are presented below and on Plate Number 32.

g) **CONSOLIDATION TEST:** A consolidation test was performed on a selected "undisturbed" sample. The consolidation apparatus was designed to accommodate a 1-inch-high by 2.375-inch or 2.500-inch diameter soil sample laterally confined by a brass ring. Porous stones were placed in contact with the top and bottom of the sample to permit the addition of pore fluid during testing. Loads were applied to the sample in a geometric progression, after vertical movement ceased, resulting deformations were

recorded. The percent consolidation is reported as the ratio of the amount of vertical compression to the original sample height. The test sample was inundated at some point in the test cycle to determine its behavior under the anticipated loads as soil moisture increases. In addition, at a selected vertical load, time versus settlement was recorded to determine the time rate characteristics of the soil. The results of the consolidation and time rate tests are presented in the form of curves on Plate Numbers 33 and 34.

h) **SOLUBLE SULFATES:** The soluble sulfate content was determined for samples of soil likely to be present at the foundation level. The soluble sulfate content was determined in accordance with California Test Method 417. The results are presented on Plate Number 32.

i) **R-VALUE**: Two R-Value tests were performed on samples of soil likely to be present at the finish subgrade elevation. The R-Value tests were performed in accordance with California Test Method 301. The results of the R-Value test are presented on Plate Number 32.

GRADING PLAN

SCALE: " 1"=60'-0"

NORTH

LEGEND

DESCRIPTION	SYMBOL
FILL SLOPE	TOP OF SLOPE / TOE OF SLOPE
CUT SLOPE	V 2:1 V
FINISH CONTOUR	467
DIRECTION OF FLOW	-
PROPOSED STORM DRAIN PIPE	
PROPOSED CATCH BASIN	□
PROPOSED CLEAN OUT	○
PROPOSED LOT LINE	
PROPOSED CURB & GUTTER	
PROPOSED SPOT ELEVATION	X 245.0
PROPOSED WATER MAIN	W
PROPOSED SEWER MAIN	S
PROPOSED SEWER MANHOLE	●

LEGEND

- T-16 — APPROXIMATE TRENCH LOCATION
- B-3 — APPROXIMATE BORING LOCATION
- ST-5 — APPROXIMATE LOCATION OF SEISMIC REFRACTION TRAVERSE
- B — B' — GEOLOGIC CROSS SECTION
- ? — GEOLOGIC CONTACT (QUERIED WHERE INFERRED)
- Qaf — ARTIFICIAL FILL
- Qyal — YOUNGER ALLUVIUM
- Kgr — GRANITIC ROCK
- NOT A PART OF THE SUBJECT PROJECT
- 10.0 — DEPTH OF ESTIMATED REMOVALS FROM EXISTING GRADE (FEET)
- 12.0 / 346.0 — DEPTH TO GROUND WATER FROM EXISTING GRADE OVER GROUND WATER ELEVATION (FEET)

CHRISTIAN WHEELER ENGINEERING
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WELD BOULEVARD INDUSTRIAL PARK	
BY: CHC/TW/MS	DATE: 01-07-05
JOB NO.: 2040960.1	PLATE NO.: 1

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PRELIMINARY DRAWINGS
THE ARCHITECT ASSUMES NO RESPONSIBILITY FOR CONTRACT BIDS MADE FROM THESE DRAWINGS. THESE ARE SCHEMATIC DESIGN DRAWINGS ONLY AND ARE SUBJECT TO REVISION. CONTRACT DOCUMENTS AND BID DOCUMENTS SHALL BE ISSUE AT A LATER DATE.

OWNER REVIEW

Date Issued	Remarks
09/08/04	OWNER REVIEW

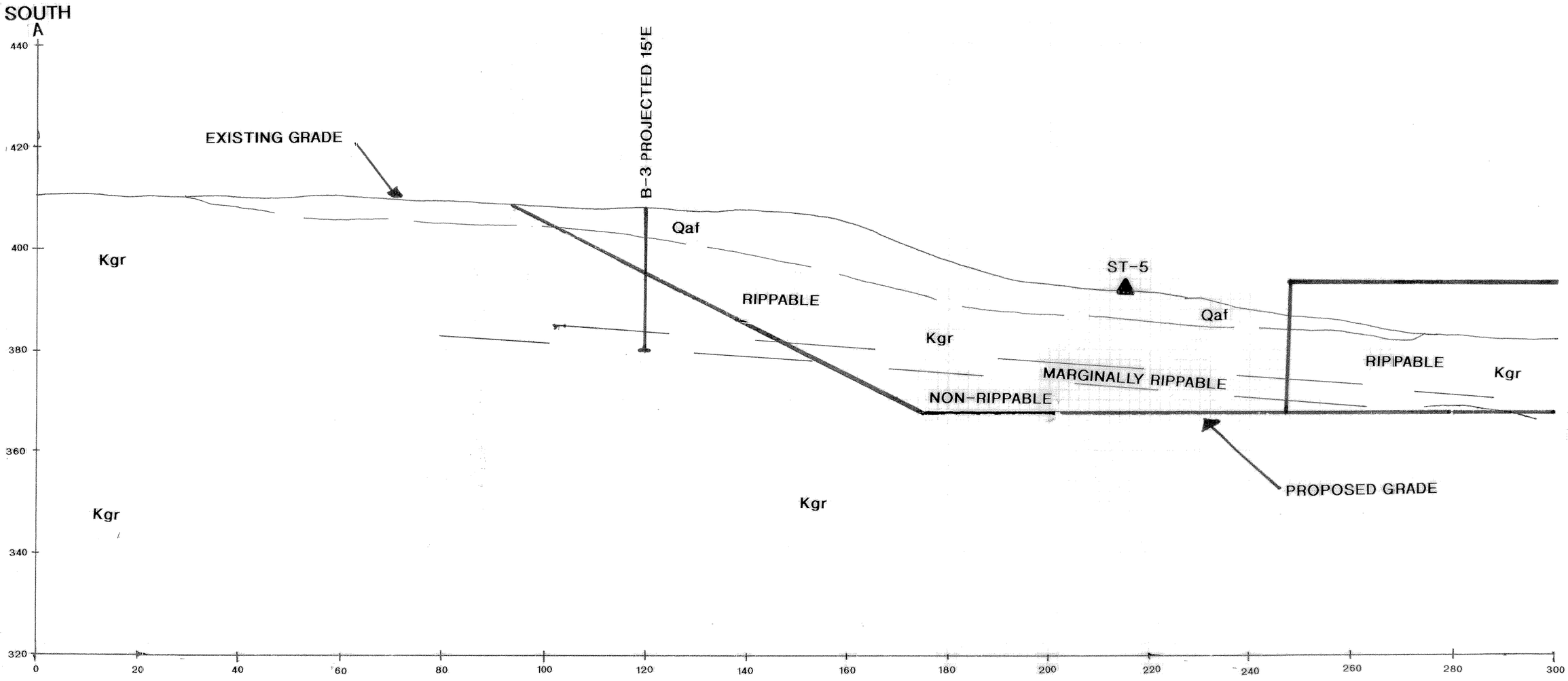
Client
PACIFIC SCENE HOMES

Project
FORRESTER CREEK INDUSTRIAL PARK

Project No. ADD PROJECT #

Sheet Title:

Sheet No.



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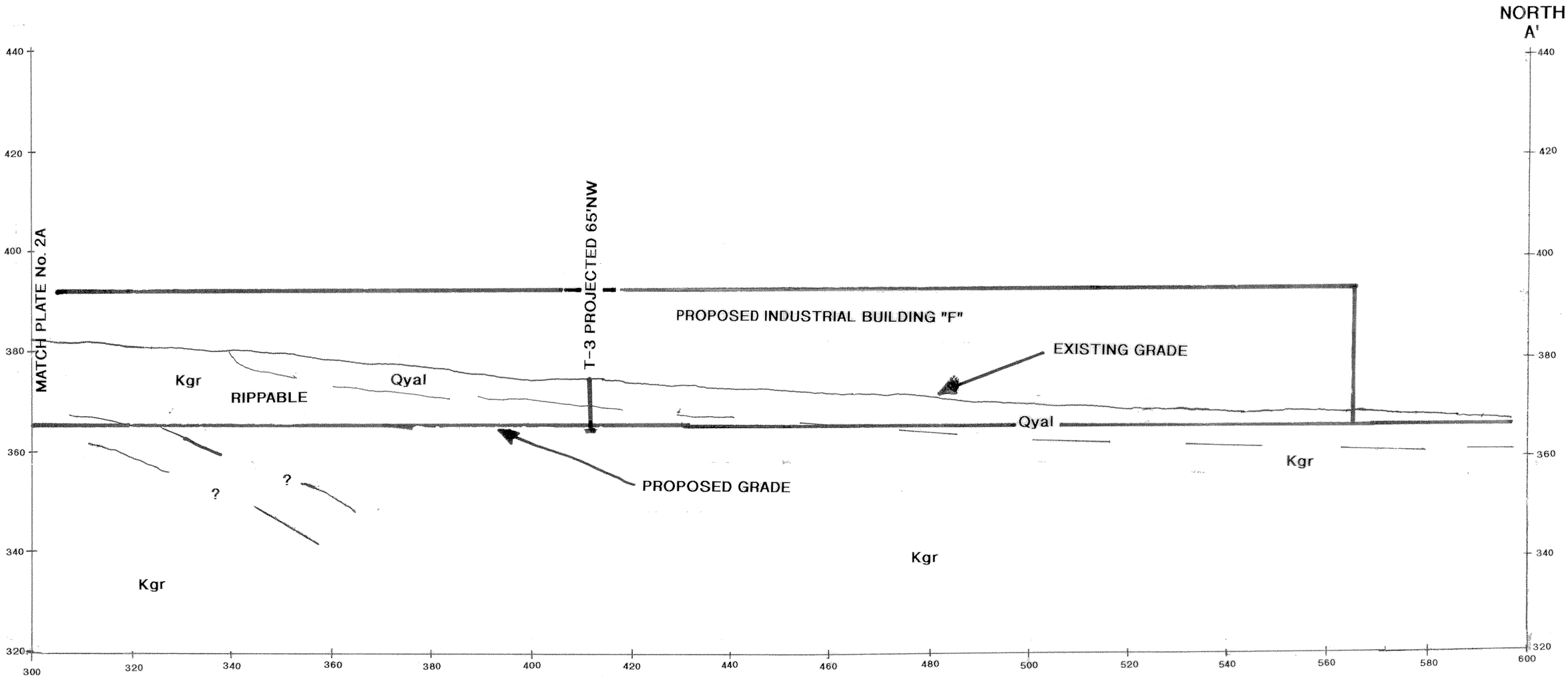
WELD BOULEVARD INDUSTRIAL PARK

BY: CHC/TW/MS	DATE: 01-06-05
JOB NO.: 2040960	PLATE NO.: 2A



SCALE 1"=20'

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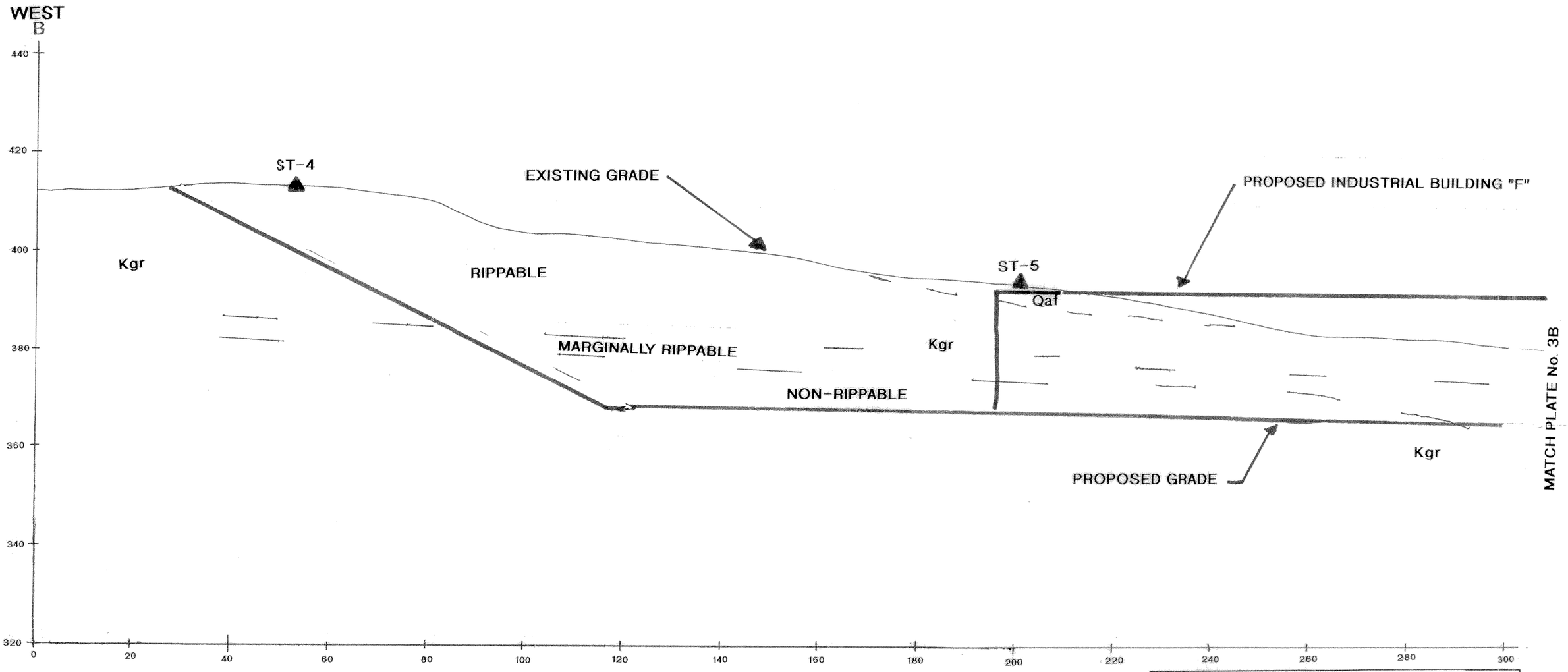
WELD BOULEVARD INDUSTRIAL PARK	
BY: CHC/TW/MS	DATE: 01-06-05
JOB NO.: 2040960	PLATE NO.: 2B



SCALE 1"=20'

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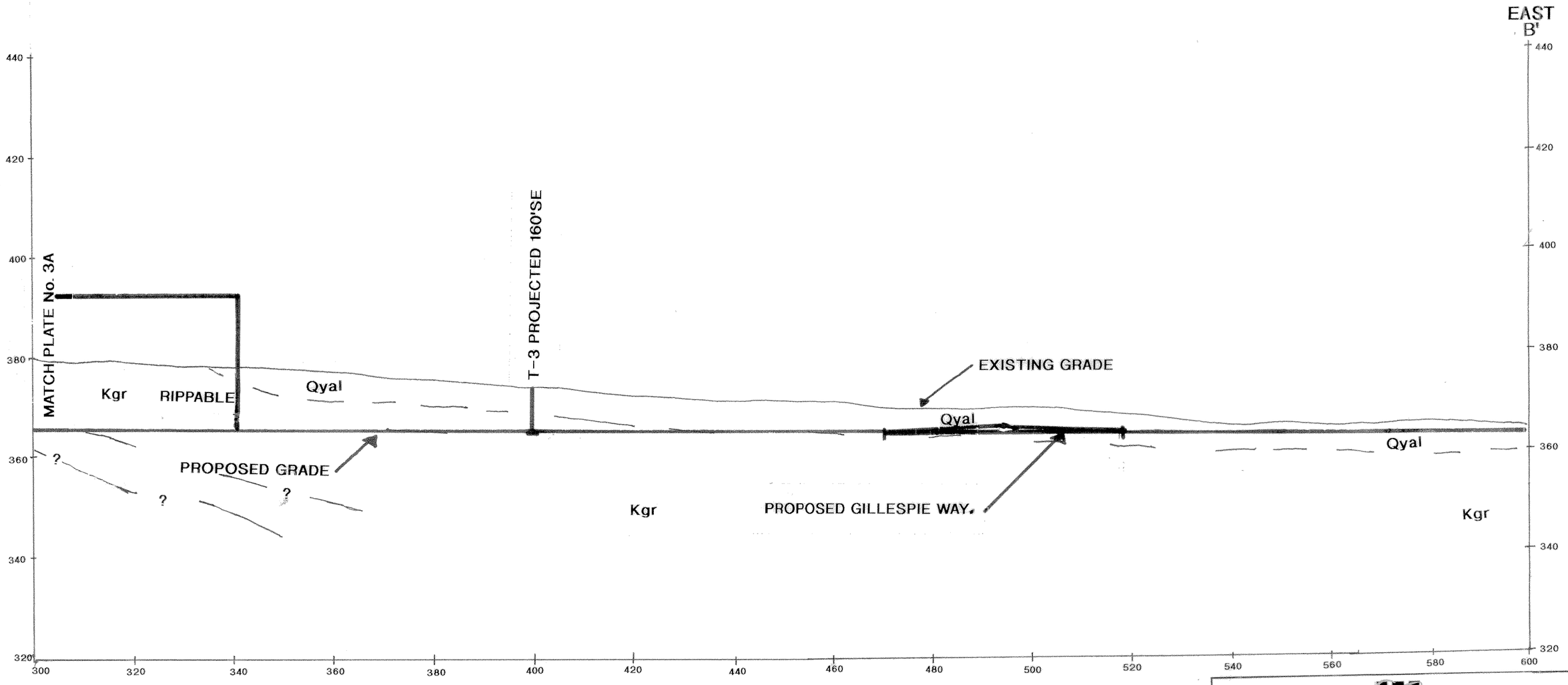
WELD BOULEVARD INDUSTRIAL PARK

BY:	CHC/TW/MS	DATE:	01-06-05
JOB NO.:	2040960	PLATE NO.:	3A



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WELD BOULEVARD INDUSTRIAL PARK

BY: CHC/TW/MS	DATE: 01-06-05
JOB NO.: 2040960	PLATE NO.: 3B

LOG OF TEST BORING NUMBER B-1

Date Excavated:	12/13/2004	Logged by:	WM
Equipment:	CME55	Project Manager:	CHC
Existing Elevation:	346.0 feet	Depth to Water:	12 feet
Finish Elevation:	354.5 feet	Drive Weight:	140 lbs./30"

DEPTH (feet)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: SAMPLE TYPE	SAMPLES: BULK	PENETRATION (blows/foot)	MOISTURE (%)	DRY UNIT WT. (pcf)	LABORATORY TESTS
2		**Artificial Fill (Qaf):** Dark brown, moist, loose, SANDY CLAY (SC-CL). Expansion Index = 4 (very low)						EI
4		**Younger Alluvium (Qyal):** Reddish-brown, moist, stiff, SANDY CLAY-CLAYEY SAND (SC-CL).						
6		Dark brown, moist, stiff, SANDY CLAY (CL). Expansion Index = 54 (medium)	Cal		20			SA, EI Cons.
10			Cal		22			Cons.
12		At 12 feet becomes saturated.						
16		Light grayish-brown, saturated, loose to medium dense, SILTY SAND (SM), with some gravel.	Cal*		63	14.6	121.5	SA
18			SPT*		40			
20		**Weathered Granitic Rock (Kgr):** Dark grayish-brown, saturated, dense, SILTY SAND-WELL GRADED SAND (SM-SW).	SPT		50/4"			

Boring continued on Plate No. 5.

* - Pushing Rock

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PROPOSED WELD BOULEVARD INDUSTRIAL PARK
Weld Boulevard & Cuyamaca Street, El Cajon, California

BY:	HF	DATE:	January 2005
JOB NO. :	2040960	PLATE NO.:	4

LOG OF TEST BORING NUMBER B-1 (Continued)

Date Excavated:	12/13/2004	Logged by:	WM
Equipment:	CME55	Project Manager:	CHC
Existing Elevation:	346.0 feet	Depth to Water:	12 feet
Finish Elevation:	354.5 feet	Drive Weight:	140 lbs./30"

DEPTH (feet)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: SAMPLE TYPE	SAMPLES: BULK	PENETRATION (blows/foot)	MOISTURE (%)	DRY UNIT WT. (pcf)	LABORATORY TESTS
22		**Weathered Granitics (Kgr):** Dark grayish-brown, saturated, very dense, SILTY SAND-WELL GRADED SAND (SM-SW), with some gravel.						
24								
26			Cal		50/6"			
		Boring terminated at 25½ feet.						
28								
30								
32								
34								
36								
38								
40								

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PROPOSED WELD BOULEVARD INDUSTRIAL PARK
Weld Boulevard & Cuyamaca Street, El Cajon, California

BY:	HF	DATE:	January 2005
JOB NO. :	2040960	PLATE NO.:	5

LOG OF TEST BORING NUMBER B-2

Date Excavated:	12/13/2004	Logged by:	WM
Equipment:	CME55	Project Manager:	CHC
Existing Elevation:	347.0 feet	Depth to Water:	12.5 feet
Finish Elevation:	353.0 feet	Drive Weight:	140 lbs./30"

DEPTH (feet)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: SAMPLE TYPE	SAMPLES: BULK	PENETRATION (blows/foot)	MOISTURE (%)	DRY UNIT WT. (pcf)	LABORATORY TESTS
2		**Artificial Fill (Qaf):** Dark brown, moist, loose, SILTY SAND (SM), with some gravel.						
4		**Younger Alluvium (Qyal):** Reddish-brown, moist, very stiff, SANDY CLAY (CL).						
6			Cal		36	13.3	116.9	
8								
10		At 10 feet becomes dark brown.						
12	▽		Cal		27	23.9	98.5	
		At 12½ feet becomes saturated.						
14			Cal		39	19.7	106.7	
16		Light grayish-brown, saturated, loose, SILTY SAND (SM), with some gravel.	SPT		2			
18								
20		**Weathered Granitics (Kgr):** Grayish-brown, saturated, very dense, SILTY SAND-WELL GRADED SAND (SM-SW).	SPT		38			

Boring continued on Plate No. 7.

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PROPOSED WELD BOULEVARD INDUSTRIAL PARK
Weld Boulevard & Cuyamaca Street, El Cajon, California

BY:	HF	DATE:	January 2005
JOB NO. :	2040960	PLATE NO.:	6

LOG OF TEST BORING NUMBER B-2 (Continued)

Date Excavated:	12/13/2004	Logged by:	WM
Equipment:	CME55	Project Manager:	CHC
Existing Elevation:	347.0 feet	Depth to Water:	12 feet
Finish Elevation:	353.0 feet	Drive Weight:	140 lbs./30"

DEPTH (feet)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: SAMPLE TYPE	SAMPLES: BULK	PENETRATION (blows/foot)	MOISTURE (%)	DRY UNIT WT. (pcf)	LABORATORY TESTS
		Weathered Granitics (Kgr): Grayish-brown, saturated, very dense,	SPT		50/4½"			
22		SILTY SAND-WELL GRADED SAND (SM-SW).						
		Boring terminated at 21 feet.						
24								
26								
28								
30								
32								
34								
36								
38								
40								

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PROPOSED WELD BOULEVARD INDUSTRIAL PARK
Weld Boulevard & Cuyamaca Street, El Cajon, California

BY:	HF	DATE:	January 2005
JOB NO. :	2040960	PLATE NO.:	7

LOG OF TEST BORING NUMBER B-3

Date Excavated:	12/13/2004	Logged by:	WM
Equipment:	CME55	Project Manager:	CHC
Existing Elevation:	407.5 feet	Depth to Water:	N/A
Finish Elevation:	395.0 feet	Drive Weight:	140 lbs./30"

DEPTH (feet)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: SAMPLE TYPE	SAMPLES: BULK	PENETRATION (blows/foot)	MOISTURE (%)	DRY UNIT WT. (pcf)	LABORATORY TESTS
2		**Artificial Fill (Qaf):** Dark brown, moist, loose, SANDY CLAY (CL).						
4								
6		**Weathered Granitics (Kgr):** Grayish-brown, moist, very dense, SILTY SAND-WELL GRADED SAND (SM-SW).						SA, MD, DS
8								
10								
12								
14								
16		At 15 feet becomes light grayish-brown, damp.						
18		At 18 feet becomes dark grayish-brown.						
20								

Boring continued on Plate No. 9.

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PROPOSED WELD BOULEVARD INDUSTRIAL PARK
Weld Boulevard & Cuyamaca Street, El Cajon, California

BY:	HF	DATE:	January 2005
JOB NO. :	2040960	PLATE NO.:	8

LOG OF TEST BORING NUMBER B-3 (Continued)

Date Excavated:	12/13/2004	Logged by:	WM
Equipment:	CME55	Project Manager:	CHC
Existing Elevation:	407.5 feet	Depth to Water:	N/A
Finish Elevation:	395.0 feet	Drive Weight:	140 lbs./30"

DEPTH (feet)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: SAMPLE TYPE	SAMPLES: BULK	PENETRATION (blows/foot)	MOISTURE (%)	DRY UNIT WT. (pcf)	LABORATORY TESTS
22		**Weathered Granitics (Kgr):** Light to dark grayish-brown, damp, very dense, SILTY SAND-WELL GRADED SAND (SM-SW).						
24								
26								
28		Refusal at 28 feet.						
30								
32								
34								
36								
38								
40								

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PROPOSED WELD BOULEVARD INDUSTRIAL PARK
Weld Boulevard & Cuyamaca Street, El Cajon, California

BY:	HF	DATE:	January 2005
JOB NO. :	2040960	PLATE NO.:	9

LOG OF TEST TRENCH NUMBER T-1

Date Excavated:	4/5/2004	Logged by:	TSW
Equipment:	Backhoe Cat 430D	Project Manager:	CHC
Existing Elevation:	378.0 feet	Depth to Water:	N/A
Finish Elevation:	378.0 feet	Drive Weight:	N/A

DEPTH (feet)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: SAMPLE TYPE	SAMPLES: BULK	PENETRATION (blows/foot)	MOISTURE (%)	DRY UNIT WT. (pcf)	LABORATORY TESTS
0		**Weathered Granitic Rock (Kgr):** Medium gray to medium reddish-brown, damp to moist, dense, SILTY SAND (SM), medium to very coarse-grained.						R-Value
2		At 3½ feet becomes dense to very dense.						
4								
6		Practical refusal at 6 feet.						
8								
10								
12								
14								
16								
18								
20								

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PROPOSED WELD BOULEVARD INDUSTRIAL PARK
Weld Boulevard and Cuyamaca Street, El Cajon, California

BY:	HF	DATE:	January 2005
JOB NO. :	2040960	PLATE NO.:	10

LOG OF TEST TRENCH NUMBER T-2

Date Excavated:	4/5/2004	Logged by:	TSW
Equipment:	Backhoe Cat 430D	Project Manager:	CHC
Existing Elevation:	382.0 feet	Depth to Water:	N/A
Finish Elevation:	370.5 feet	Drive Weight:	N/A

DEPTH (feet)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: SAMPLE TYPE	SAMPLES: BULK	PENETRATION (blows/foot)	MOISTURE (%)	DRY UNIT WT. (pcf)	LABORATORY TESTS
2		**Residual Soil:** Medium brown, damp to moist, loose to medium dense, SILTY SAND (SM), fine to coarse-grained.	CK			4.1	126.9	
4		**Weathered Granitics (Kgr):** Dark gray and reddish-brown, damp to moist, dense, SILTY SAND (SM), medium to very coarse-grained. D - VD @ 4'	CK			2.8	145.6	
6		Practical refusal at 5 feet.						
8								
10								
12								
14								
16								
18								
20								

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PROPOSED WELD BOULEVARD INDUSTRIAL PARK
Weld Boulevard and Cuyamaca Street, El Cajon, California

BY:	HF	DATE:	January 2005
JOB NO. :	2040960	PLATE NO.:	11

LOG OF TEST TRENCH NUMBER T-3

Date Excavated:	4/5/2004	Logged by:	TSW
Equipment:	Backhoe Cat 430D	Project Manager:	CHC
Existing Elevation:	372.0 feet	Depth to Water:	N/A
Finish Elevation:	363.5 feet	Drive Weight:	N/A

DEPTH (feet)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: SAMPLE TYPE	SAMPLES: BULK	PENETRATION (blows/foot)	MOISTURE (%)	DRY UNIT WT. (pcf)	LABORATORY TESTS
2		**Younger Alluvium (Qyal):** Medium brown, damp to moist, loose to medium dense, SILTY SAND (SM).	CK			6.4	114.3	
4		Dark gray to medium reddish-brown, moist, medium stiff, SANDY	CK					
6		CLAY (CL).	CK			6.1	127.8	
8		**Weathered Granitics (Kgr):** Dark gray to medium reddish-brown, damp to moist, dense, SILTY SAND (SM), medium to very coarse-grained. At 8 feet becomes dense to very dense.						
10		Practical refusal at 10 feet.						
12								
14								
16								
18								
20								

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PROPOSED WELD BOULEVARD INDUSTRIAL PARK
Weld Boulevard and Cuyamaca Street, El Cajon, California

BY:	HF	DATE:	January 2005
JOB NO. :	2040960	PLATE NO.:	12

LOG OF TEST TRENCH NUMBER T-4

Date Excavated:	4/5/2004	Logged by:	TSW
Equipment:	Backhoe Cat 430D	Project Manager:	CHC
Existing Elevation:	363.0 feet	Depth to Water:	N/A
Finish Elevation:	362.0 feet	Drive Weight:	N/A

DEPTH (feet)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: SAMPLE TYPE	SAMPLES: BULK	PENETRATION (blows/foot)	MOISTURE (%)	DRY UNIT WT. (pcf)	LABORATORY TESTS
0		**Younger Alluvium (Qyal):** Medium brown, damp to moist, loose, SILTY SAND (SM).						
2		Medium brown to medium reddish-brown, moist, soft to medium stiff/loose to medium dense, SANDY CLAY-CLAYEY SAND (CL/SC).	CK			14.8	108.2	SA, EI, MD, SS, DS
4								
6		At 5 feet becomes medium stiff/medium dense. Expansion Index = 49 (Low to Medium)	CK			14.1	106.0	
8		**Older Alluvium (Qoal):** Medium reddish-brown and medium brown, moist, medium dense to dense, SILTY CLAYEY SAND (SC).	CK			8.5	122.3	
10		**Weathered Granitics (Kgr):** Medium to dark gray and medium reddish-brown, moist, dense, SILTY SAND (SM), medium to coarse-grained.	CK					
12		Test trench terminated at 11½ feet.						
14								
16								
18								
20								

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PROPOSED WELD BOULEVARD INDUSTRIAL PARK
Weld Boulevard and Cuyamaca Street, El Cajon, California

BY:	HF	DATE:	January 2005
JOB NO. :	2040960	PLATE NO.:	13

LOG OF TEST TRENCH NUMBER T-5

Date Excavated:	4/5/2004	Logged by:	TSW
Equipment:	Backhoe Cat 430D	Project Manager:	CHC
Existing Elevation:	370.0 feet	Depth to Water:	N/A
Finish Elevation:	362.5.0 feet	Drive Weight:	N/A

DEPTH (feet)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: SAMPLE TYPE	SAMPLES: BULK	PENETRATION (blows/foot)	MOISTURE (%)	DRY UNIT WT. (pcf)	LABORATORY TESTS
2		**Residual Soil:** Medium brown, damp, very loose to loose, SILTY SAND (SM).						
4		**Weathered Granitics (Kgr):** Medium reddish-brown and dark gray, damp to moist, dense, SILTY SAND (SM), medium to very coarse-grained. At 4 feet becomes dense to very dense.						SA, MD, SS, DS
8		Practical refusal at 8 feet.						
10								
12								
14								
16								
18								
20								

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PROPOSED WELD BOULEVARD INDUSTRIAL PARK
Weld Boulevard and Cuyamaca Street, El Cajon, California

BY:	HF	DATE:	January 2005
JOB NO. :	2040960	PLATE NO.:	14

LOG OF TEST TRENCH NUMBER T-6

Date Excavated:	4/5/2004	Logged by:	TSW
Equipment:	Backhoe Cat 430D	Project Manager:	CHC
Existing Elevation:	352.0 feet	Depth to Water:	N/A
Finish Elevation:	361.5 feet	Drive Weight:	N/A

DEPTH (feet)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: SAMPLE TYPE	SAMPLES: BULK	PENETRATION (blows/foot)	MOISTURE (%)	DRY UNIT WT. (pcf)	LABORATORY TESTS
2		**Younger Alluvium (Qyal):** Dark reddish-brown, damp to moist, stiff to very stiff, SANDY CLAY (CL).	CK			17.0	111.1	EI
		At 2½ feet becomes moist, medium stiff.						
4		Expansion Index = 69 (Medium)	CK			11.0	114.4	
6		**Weathered Granitics (Kgr):** Medium reddish-brown and dark gray, damp to moist, dense, SILTY SAND (SM).						
8		Test trench terminated at 7 feet.						
10								
12								
14								
16								
18								
20								

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PROPOSED WELD BOULEVARD INDUSTRIAL PARK
Weld Boulevard and Cuyamaca Street, El Cajon, California

BY:	HF	DATE:	January 2005
JOB NO. :	2040960	PLATE NO.:	15

LOG OF TEST TRENCH NUMBER T-7

Date Excavated:	4/5/2004	Logged by:	TSW
Equipment:	Backhoe Cat 430D	Project Manager:	CHC
Existing Elevation:	353.0 feet	Depth to Water:	N/A
Finish Elevation:	357.0 feet	Drive Weight:	N/A

DEPTH (feet)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: SAMPLE TYPE	SAMPLES: BULK	PENETRATION (blows/foot)	MOISTURE (%)	DRY UNIT WT. (pcf)	LABORATORY TESTS
		Younger Alluvium (Qyal): Medium brown, moist, loose, SILTY SAND (SM).						
2		Medium brown to reddish-brown, moist, stiff to medium stiff, SANDY CLAY (CL).	CK			15.0	111.4	
4								
6		At 5 feet becomes medium stiff to stiff.	CK			14.9	111.3	
		Weathered Granitics (Kgr): Medium gray to medium reddish-brown, moist, dense, SILTY SAND (SM).	CK					
8		Test trench terminated at 8 feet.						
10								
12								
14								
16								
18								
20								

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PROPOSED WELD BOULEVARD INDUSTRIAL PARK
Weld Boulevard and Cuyamaca Street, El Cajon, California

BY:	HF	DATE:	January 2005
JOB NO. :	2040960	PLATE NO.:	16

LOG OF TEST TRENCH NUMBER T-8

Date Excavated:	4/5/2004	Logged by:	TSW
Equipment:	Backhoe Cat 430D	Project Manager:	CHC
Existing Elevation:	355.0 feet	Depth to Water:	N/A
Finish Elevation:	357.5 feet	Drive Weight:	N/A

DEPTH (feet)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: SAMPLE TYPE	SAMPLES: BULK	PENETRATION (blows/foot)	MOISTURE (%)	DRY UNIT WT. (pcf)	LABORATORY TESTS
0		**Younger Alluvium (Qyal):** Medium brown, damp to moist, loose, SILTY SAND (SM).						
2		Medium reddish-brown, moist, stiff to medium stiff, SANDY CLAY (CL).	CK			17.1	103.1	R-Value
4								
6		**Weathered Granitics (Kgr):** Grayish-brown and reddish-brown, damp to moist, dense, SILTY SAND (SM), medium to very coarse-grained. At 9 feet becomes dense to very dense.	CK					
8								
10		Test trench terminated at 9 feet.						
12								
14								
16								
18								
20								

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PROPOSED WELD BOULEVARD INDUSTRIAL PARK
Weld Boulevard and Cuyamaca Street, El Cajon, California

BY:	HF	DATE:	January 2005
JOB NO. :	2040960	PLATE NO.:	17

LOG OF TEST TRENCH NUMBER T-9

Date Excavated:	4/5/2004	Logged by:	TSW
Equipment:	Backhoe Cat 430D	Project Manager:	CHC
Existing Elevation:	372.0 feet	Depth to Water:	N/A
Finish Elevation:	363.0 feet	Drive Weight:	N/A

DEPTH (feet)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: SAMPLE TYPE	SAMPLES: BULK	PENETRATION (blows/foot)	MOISTURE (%)	DRY UNIT WT. (pcf)	LABORATORY TESTS
2		**Residual Soil:** Medium brown, damp to moist, loose to medium dense, SILTY SAND (SM), with gravels and cobbles.	CK					
4		Medium reddish-brown, damp to moist, loose to medium dense, SILTY SAND/CLAYEY SAND (SM-SC).	CK					
6		**Weathered Granitics (Kgr):** Medium grayish-brown and reddish-brown, damp to moist, dense, SILTY SAND (SM), medium to very coarse-grained.	CK					
8		At 7 feet becomes dense to very dense.	CK					
10		Practical refusal at 9 feet.						
12								
14								
16								
18								
20								

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PROPOSED WELD BOULEVARD INDUSTRIAL PARK
Weld Boulevard and Cuyamaca Street, El Cajon, California

BY:	HF	DATE:	January 2005
JOB NO. :	2040960	PLATE NO.:	18

LOG OF TEST TRENCH NUMBER T-10

Date Excavated:	4/5/2004	Logged by:	TSW
Equipment:	Backhoe Cat 430D	Project Manager:	CHC
Existing Elevation:	366.0 feet	Depth to Water:	N/A
Finish Elevation:	365.0 feet	Drive Weight:	N/A

DEPTH (feet)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: SAMPLE TYPE	SAMPLES: BULK	PENETRATION (blows/foot)	MOISTURE (%)	DRY UNIT WT. (pcf)	LABORATORY TESTS
0		**Younger Alluvium (Qyal):** Medium to dark brown, damp to moist, loose, SILTY SAND (SM).						
2		Medium to dark brown, moist, stiff to medium stiff, SANDY CLAY (CL).						
4		**Weathered Granitics (Kgr):** Dark gray and medium reddish-brown, damp to moist, stiff to medium stiff, SILTY SAND (SM).						
6		Test trench terminated at 4 feet.						
8								
10								
12								
14								
16								
18								
20								

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PROPOSED WELD BOULEVARD INDUSTRIAL PARK
Weld Boulevard and Cuyamaca Street, El Cajon, California

BY:	HF	DATE:	January 2005
JOB NO. :	2040960	PLATE NO.:	19

LOG OF TEST TRENCH NUMBER T-11

Date Excavated:	4/5/2004	Logged by:	TSW
Equipment:	Backhoe Cat 430D	Project Manager:	CHC
Existing Elevation:	362.0 feet	Depth to Water:	N/A
Finish Elevation:	363.5 feet	Drive Weight:	N/A

DEPTH (feet)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: SAMPLE TYPE	SAMPLES: BULK	PENETRATION (blows/foot)	MOISTURE (%)	DRY UNIT WT. (pcf)	LABORATORY TESTS
2		**Artificial Fill (Qaf):** Medium to dark brown, damp to moist, loose to medium dense, SILTY SAND (SM).	CK			5.4	118.1	
4		**Younger Alluvium (Qyal):** Medium brown, moist, loose to medium dense, SILTY SAND (SM).						
6		8" layer of gravel and cobble at 5 feet.	CK			17.5	103.3	
8		Medium to dark reddish-brown, moist, medium stiff, SANDY CLAY (CL).						
10		**Older Alluvium (Qoal):** Light grayish-brown to medium reddish-brown, moist, medium dense to dense, CLAYEY SAND (SC).	CK			13.4	114.4	
12		**Weathered Granitics (Kgr):** Medium reddish-brown and dark gray, damp to moist, dense, SILTY SAND (SM).						
14		Test trench terminated at 14 feet.						
16								
18								
20								

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PROPOSED WELD BOULEVARD INDUSTRIAL PARK
Weld Boulevard and Cuyamaca Street, El Cajon, California

BY:	HF	DATE:	January 2005
JOB NO. :	2040960	PLATE NO.:	20

LOG OF TEST TRENCH NUMBER T-12

Date Excavated:	4/5/2004	Logged by:	TSW
Equipment:	Backhoe Cat 430D	Project Manager:	CHC
Existing Elevation:	359.0 feet	Depth to Water:	N/A
Finish Elevation:	362.0 feet	Drive Weight:	N/A

DEPTH (feet)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: SAMPLE TYPE	SAMPLES: BULK	PENETRATION (blows/foot)	MOISTURE (%)	DRY UNIT WT. (pcf)	LABORATORY TESTS
0		**Younger Alluvium (Qyal):** Medium brown, moist, loose, SILTY SAND (SM).						
2		Dark brown, moist to very moist, stiff to medium stiff, SANDY CLAY (CL).	CK					
4		At 4 feet becomes medium stiff.	CK					
6		8" layer of gravel and cobble at 5½ feet.						
8		**Older Alluvium (Qoal):** Medium to dark reddish-brown, moist, medium dense to dense, GRAVELLY CLAYEY SAND (SC).	CK			9.7	121.3	
10		**Weathered Granitic Rock (Kgr):** Reddish-brown and dark gray, damp to moist, dense, SILTY SAND (SM).						
12		Test trench terminated at 10 feet.						
14								
16								
18								
20								

CHRISTIAN WHEELER
Engineering

PROPOSED WELD BOULEVARD INDUSTRIAL PARK
Weld Boulevard and Cuyamaca Street, El Cajon, California

BY:	HF	DATE:	January 2005
JOB NO. :	2040960	PLATE NO.:	21

LOG OF TEST TRENCH NUMBER T-13

Date Excavated:	4/5/2004	Logged by:	TSW
Equipment:	Backhoe Cat 430D	Project Manager:	CHC
Existing Elevation:	368.0 feet	Depth to Water:	N/A
Finish Elevation:	362.0 feet	Drive Weight:	N/A

DEPTH (feet)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: SAMPLE TYPE	SAMPLES: BULK	PENETRATION (blows/foot)	MOISTURE (%)	DRY UNIT WT. (pcf)	LABORATORY TESTS
2		**Residual Soil:** Medium brown, damp to moist, loose, SILTY SAND (SM), with some cobbles up to 24" in diameter.						
4								
6		**Weathered Granitic Rock (Kgr):** Light to medium reddish-brown and dark gray, damp to moist, dense, SILTY SAND (SM), fine to coarse-grained. At 8 feet becomes dense to very dense.						
8								
10		Practical refusal at 10 feet.						
12								
14								
16								
18								
20								

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PROPOSED WELD BOULEVARD INDUSTRIAL PARK
Weld Boulevard and Cuyamaca Street, El Cajon, California

BY:	HF	DATE:	January 2005
JOB NO. :	2040960	PLATE NO.:	22

LOG OF TEST TRENCH NUMBER T-14

Date Excavated:	4/5/2004	Logged by:	TSW
Equipment:	Backhoe Cat 430D	Project Manager:	CHC
Existing Elevation:	348.0 feet	Depth to Water:	12.0 feet
Finish Elevation:	352.0 feet	Drive Weight:	N/A

DEPTH (feet)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: SAMPLE TYPE	SAMPLES: BULK	PENETRATION (blows/foot)	MOISTURE (%)	DRY UNIT WT. (pcf)	LABORATORY TESTS
0		**Younger Alluvium (Qyal):** Medium brown, moist, loose, SILTY SAND (SM).						
2		Medium to reddish-brown, very moist, stiff to medium stiff, SANDY CLAY (CL).	CK			23.2	96.1	SA, EI, MD, SS, DS
4								
6			CK			104.4	16.0	
8								
10		At 9½ feet becomes medium stiff.	CK			18.5	98.6	
12		Light reddish-brown and light grayish-brown, very moist, medium dense, CLAYEY SAND (SC). Groundwater at 12 feet. Becomes saturated.	CK			16.7	99.9	
14		**Weathered Granitics (Kgr):** Medium to dark gray, saturated, dense, SILTY SAND (SM), medium to coarse-grained.						
16		Test trench terminated at 15 feet.						
18								
20								

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PROPOSED WELD BOULEVARD INDUSTRIAL PARK
Weld Boulevard and Cuyamaca Street, El Cajon, California

BY:	HF	DATE:	January 2005
JOB NO. :	2040960	PLATE NO.:	23

LOG OF TEST TRENCH NUMBER T-15

Date Excavated:	4/5/2004	Logged by:	TSW
Equipment:	Backhoe Cat 430D	Project Manager:	CHC
Existing Elevation:	354.0 feet	Depth to Water:	N/A
Finish Elevation:	358.5 feet	Drive Weight:	N/A

DEPTH (feet)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: SAMPLE TYPE	SAMPLES: BULK	PENETRATION (blows/foot)	MOISTURE (%)	DRY UNIT WT. (pcf)	LABORATORY TESTS
0		**Younger Alluvium (Qyal):** Reddish-brown, damp to moist, loose, SILTY SAND (SM).						
2		**Weathered Granitics (Kgr):** Reddish-brown and dark brown, damp to moist, dense, SILTY SAND (SM).						
4		Practical refusal at 3 feet.						
6								
8								
10								
12								
14								
16								
18								
20								

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PROPOSED WELD BOULEVARD INDUSTRIAL PARK
Weld Boulevard and Cuyamaca Street, El Cajon, California

BY:	HF	DATE:	January 2005
JOB NO. :	2040960	PLATE NO.:	24

LOG OF TEST TRENCH NUMBER T-16

Date Excavated:	4/5/2004	Logged by:	TSW
Equipment:	Backhoe Cat 430D	Project Manager:	CHC
Existing Elevation:	346.0 feet	Depth to Water:	12.5 feet
Finish Elevation:	354.0 feet	Drive Weight:	N/A

DEPTH (feet)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: SAMPLE TYPE	SAMPLES: BULK	PENETRATION (blows/foot)	MOISTURE (%)	DRY UNIT WT. (pcf)	LABORATORY TESTS
		Artificial Fill (Qaf): Light to medium brown, damp to moist, dense, SILTY SAND (SM).						
2		**Younger Alluvium (Qyal):** Dark brown, moist, stiff, SANDY CLAY (CL	CK					
4		At 2½ feet becomes medium stiff.	CK			16.7	105.2	
6		At 6 feet becomes medium reddish-brown and medium brown.						
8		Medium reddish-brown and medium brown, moist, loose to medium dense, CLAYEY SAND (SC).	CK			18.1	104.1	
10		At 8 feet becomes medium dense, with some precipitate staining.	CK			17.4	110.1	
			CK			17.7	109.5	
12		Light gray and medium reddish-brown, moist to very moist, medium dense, CLAYEY SAND (SC).	CK			16.0	110.9	
14		Groundwater at 12½ feet. Becomes saturated.						
		Test trench terminated at 14 feet.						
16								
18								
20								

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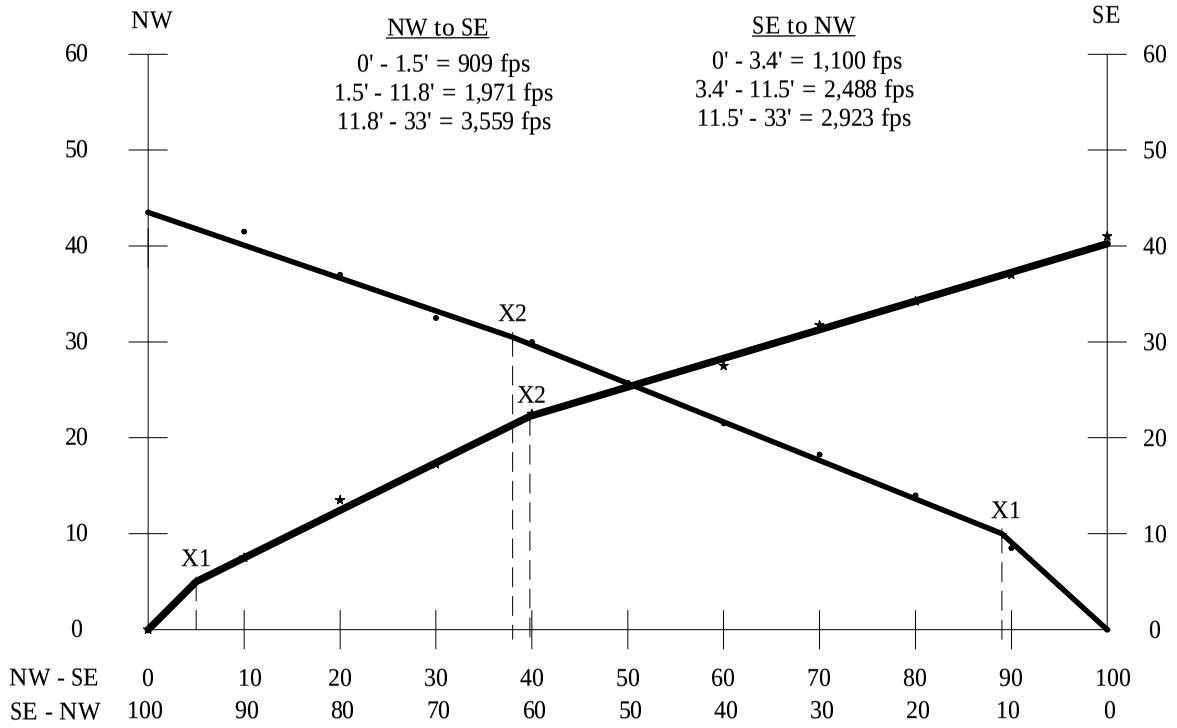
PROPOSED WELD BOULEVARD INDUSTRIAL PARK
Weld Boulevard and Cuyamaca Street, El Cajon, California

BY:	HF	DATE:	January 2005
JOB NO. :	2040960	PLATE NO.:	25

PLOT OF SEISMIC TRAVERSE - 1



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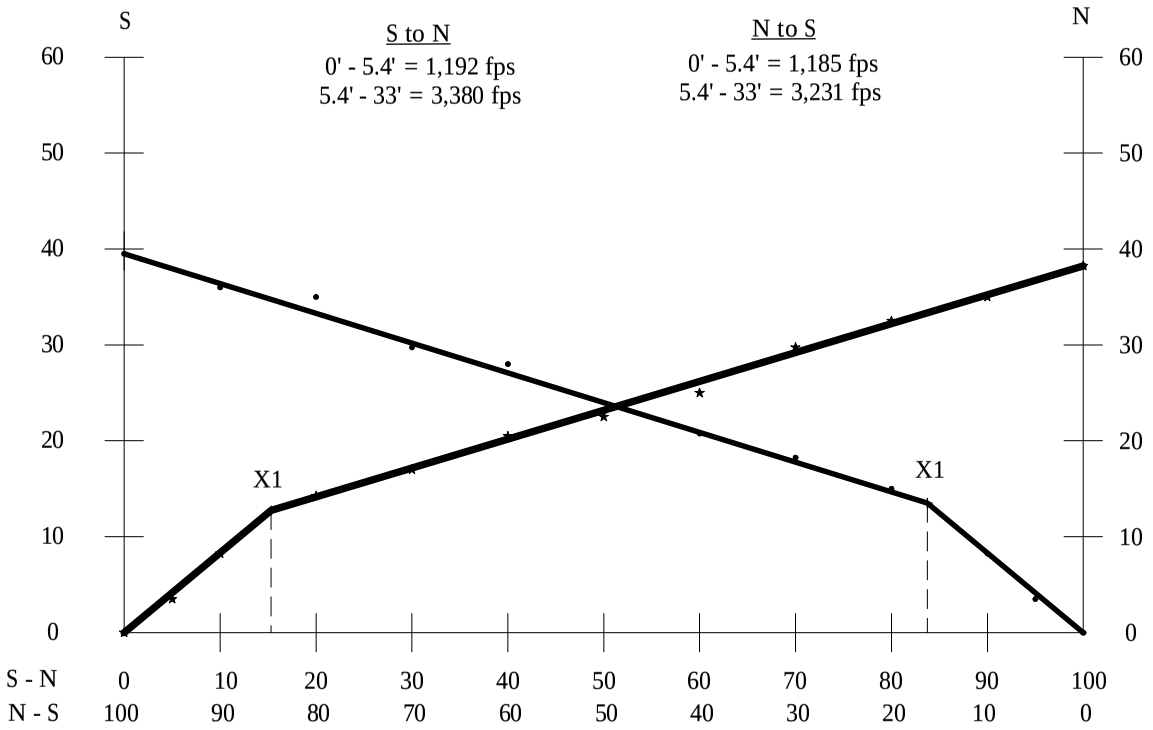
PROPOSED WELD BOULEVARD INDUSTRIAL PARK
Weld Boulevard and Cuyamaca Street, El Cajon, California

BY: SHV	DATE: January 2005
JOB NO.: 2040960	PLATE NO.: 26

PLOT OF SEISMIC TRAVERSE - 2



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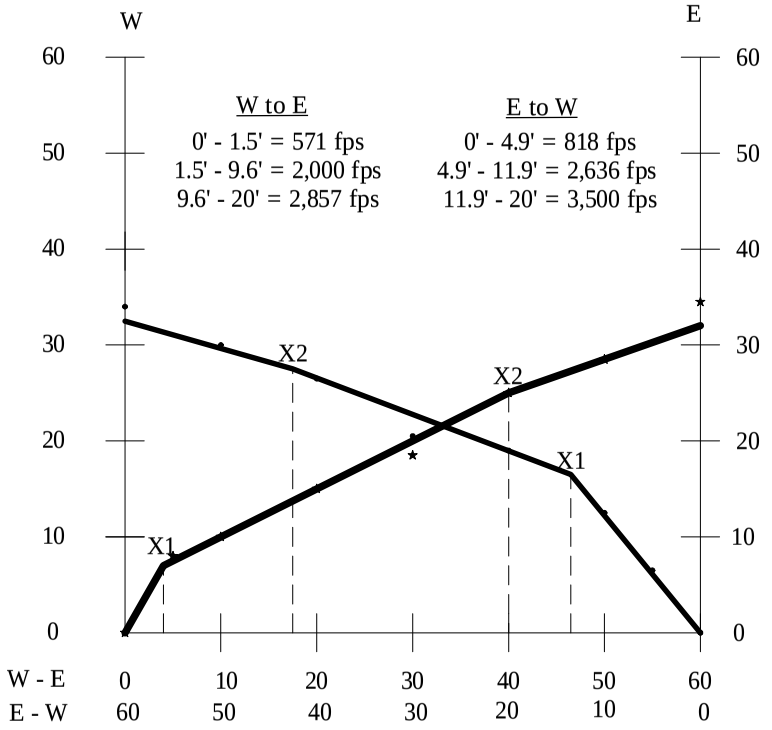
PROPOSED WELD BOULEVARD INDUSTRIAL PARK
Weld Boulevard and Cuyamaca Street, El Cajon, California

BY: SHV	DATE: January 2005
JOB NO.: 2040960	PLATE NO.: 27

PLOT OF SEISMIC TRAVERSE - 3



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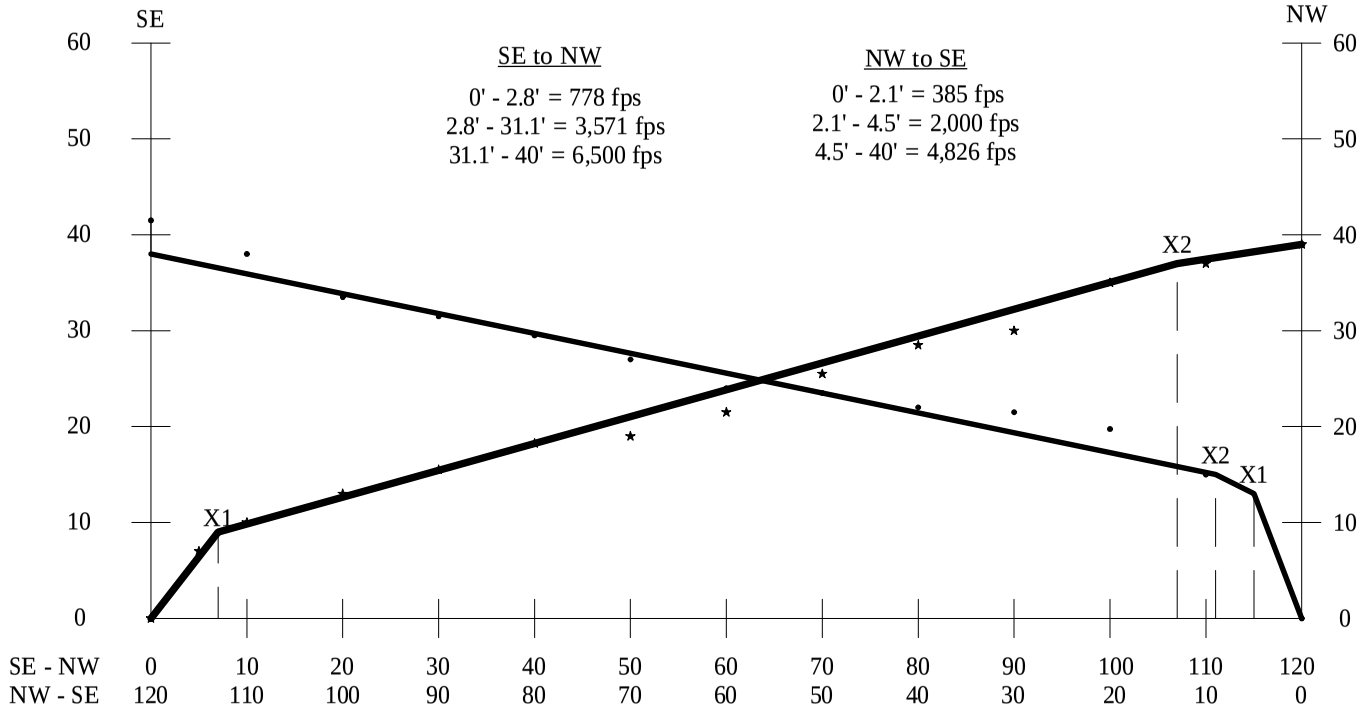
Weld Boulevard and Cuyamaca Street, El Cajon, California

BY: SHV	DATE: January 2005
JOB NO.: 2040960	PLATE NO.: 28

PLOT OF SEISMIC TRAVERSE - 4



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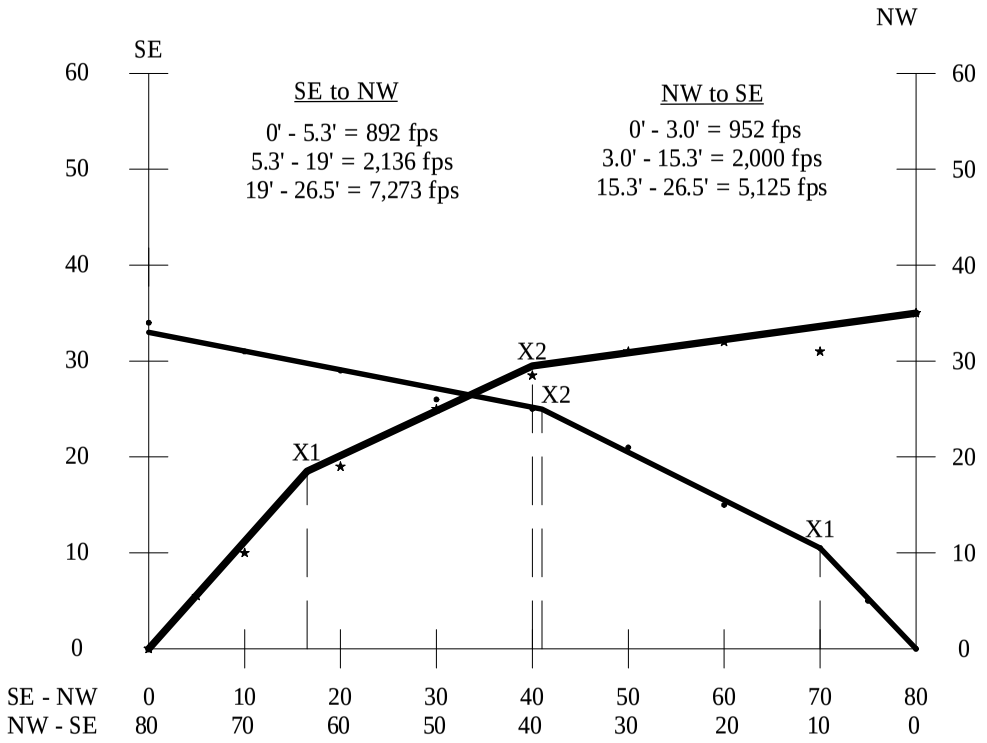
Weld Boulevard and Cuyamaca Street, El Cajon, California

BY: SHV	DATE: January 2005
JOB NO.: 2040960	PLATE NO.: 29

PLOT OF SEISMIC TRAVERSE - 5



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PROPOSED WELD BOULEVARD INDUSTRIAL PARK
Weld Boulevard and Cuyamaca Street, El Cajon, California

BY: SHV	DATE: January 2005
JOB NO.: 2040960	PLATE NO.: 30

LABORATORY TEST RESULTS

PROPOSED WELD BOULEVARD INDUSTRIAL PARK

WELD BOULEVARD AND CUYAMACA STREET

EL CAJON, CALIFORNIA

MAXIMUM DRY DENSITY AND OPTIMUM MOISTURE CONTENT (ASTM D1557)

Sample Location:	**Boring B-3 @ 5'-15'**	**Trench T-4 @ 1'-6'**	**Trench T-5 @ 2'-8'**
Sample Description:	Gray, silty sand (SM)	Brown, clayey sand (SC)	Light tan, silty sand (SM)
Maximum Density:	135.1 pcf	125.7 pcf	131.6 pcf
Optimum Moisture:	6.7 %	10.7 %	7.9 %

Sample Location:	**Trench T-14 @ 1'-6'**
Sample Description:	Brown, sandy clay (CL)
Maximum Density:	111.4 pcf
Optimum Moisture:	14.4 %

DIRECT SHEAR (ASTM D3080)

Sample Location:	**Boring B-3 @ 5'-15'**	**Trench T-4 @ 1'-6'**	**Trench T-5 @ 2'-8'**
Sample Type:	Remolded to 90 %	Remolded to 90 %	Remolded to 90 %
Friction Angle:	37°	21°	39°
Cohesion:	125 psf	350 psf	100 psf

Sample Location:	**Trench T-14 @ 1'-6'**
Sample Type:	Remolded to 90 %
Friction Angle:	13°
Cohesion:	800 psf

EXPANSION INDEX (ASTM D4829)

Sample Location:	**Boring B-1 @ 0'-3'**	**Boring B-1 @ 5'-12'**	**Trench T-4 @ 1'-6'**
Initial Moisture:	14.5 %	8.6 %	9.0 %
Initial Dry Density:	99.3 pcf	109.9 pcf	108.0 pcf
Final Moisture:	21.1 %	20.7 %	23.3 %
Expansion Index:	4 (very low)	54 (medium)	49 (low)

Sample Location:	**Trench T-6 @ 2'**	**Trench T-14 @ 1'-6'**
Initial Moisture:	9.6 %	13.2 %
Initial Dry Density:	108.7 pcf	98.7 pcf
Final Moisture:	25.9 %	33.5 %
Expansion Index:	69 (medium)	100 (high)

LABORATORY TEST RESULTS, Continued

GRAIN-SIZE DISTRUBUTION (ASTM D422)

Sample Location:	**Boring B-1 @ 5'-12'**	**Boring B-1 @ 16.5'-17.5'**	**Boring B-3 @ 5'-15'**
Sieve Size	*Percent Passing*	*Percent Passing*	*Percent Passing*
1"	--	100	--
¾"	--	90	--
½"	--	86	--
3/8"	--	83	100
#4	100	78	95
#8	98	71	78
#16	95	61	57
#30	91	45	41
#50	79	27	28
#100	60	16	18
#200	45	10	11
0.05mm	36	--	--
0.005mm	18	--	--
0.001mm	12	--	--

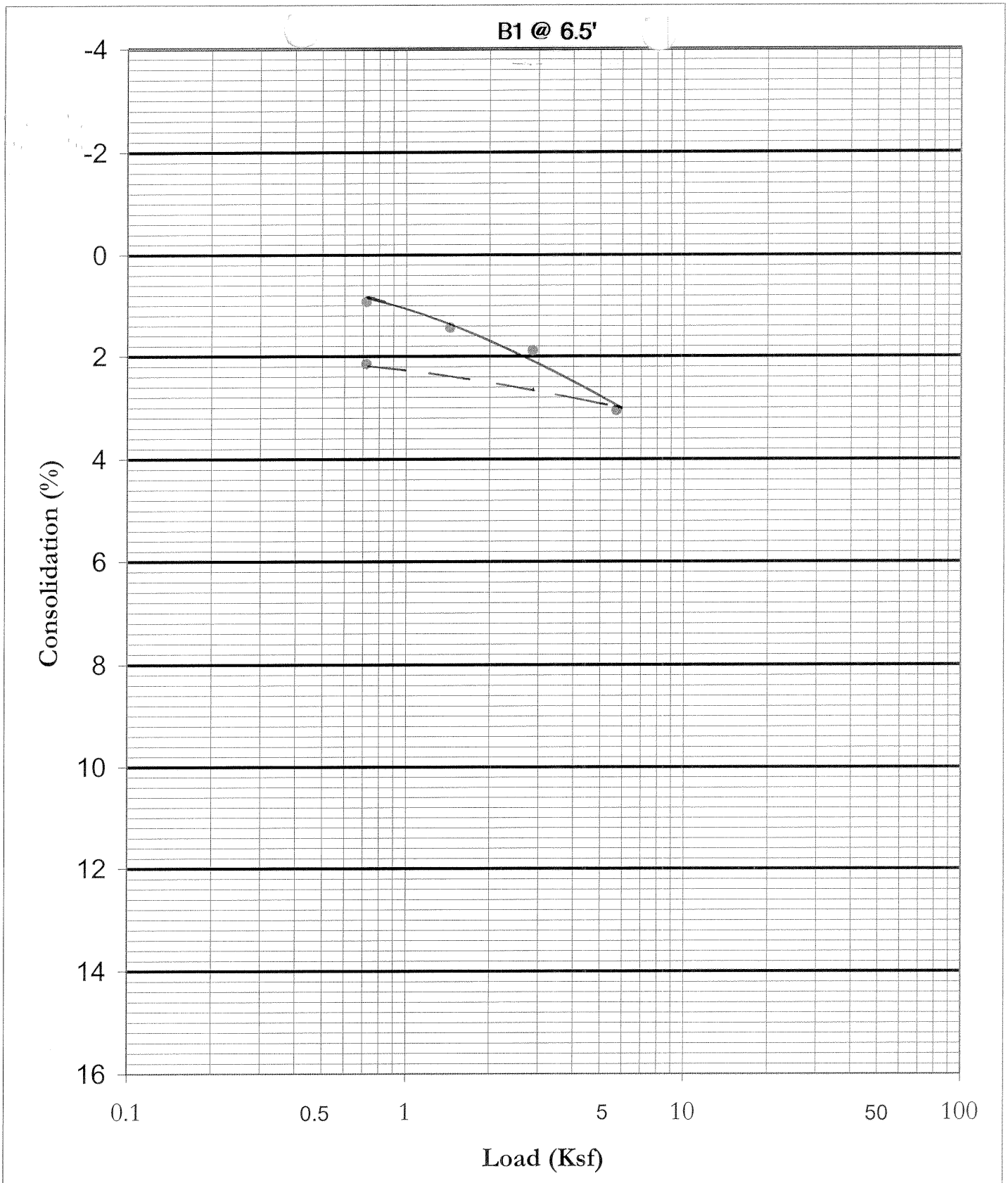
Sample Location:	**Trench T-4 @ 1'-6'**	**Trench T-5 @ 2'-8'**	**Trench T-14 @ 1'-6'**
Sieve Size	*Percent Passing*	*Percent Passing*	*Percent Passing*
1"	--	--	--
¾"	--	--	--
½"	--	--	--
3/8"	--	--	--
#4	100	100	100
#8	98	87	100
#16	90	64	98
#30	80	45	94
#50	66	30	86
#100	49	17	75
#200	37	10	66
0.05mm	--	--	--
0.005mm	--	--	--
0.001mm	--	--	--

SOLUBLE SULFATES (CALIFORNIA TEST 417)

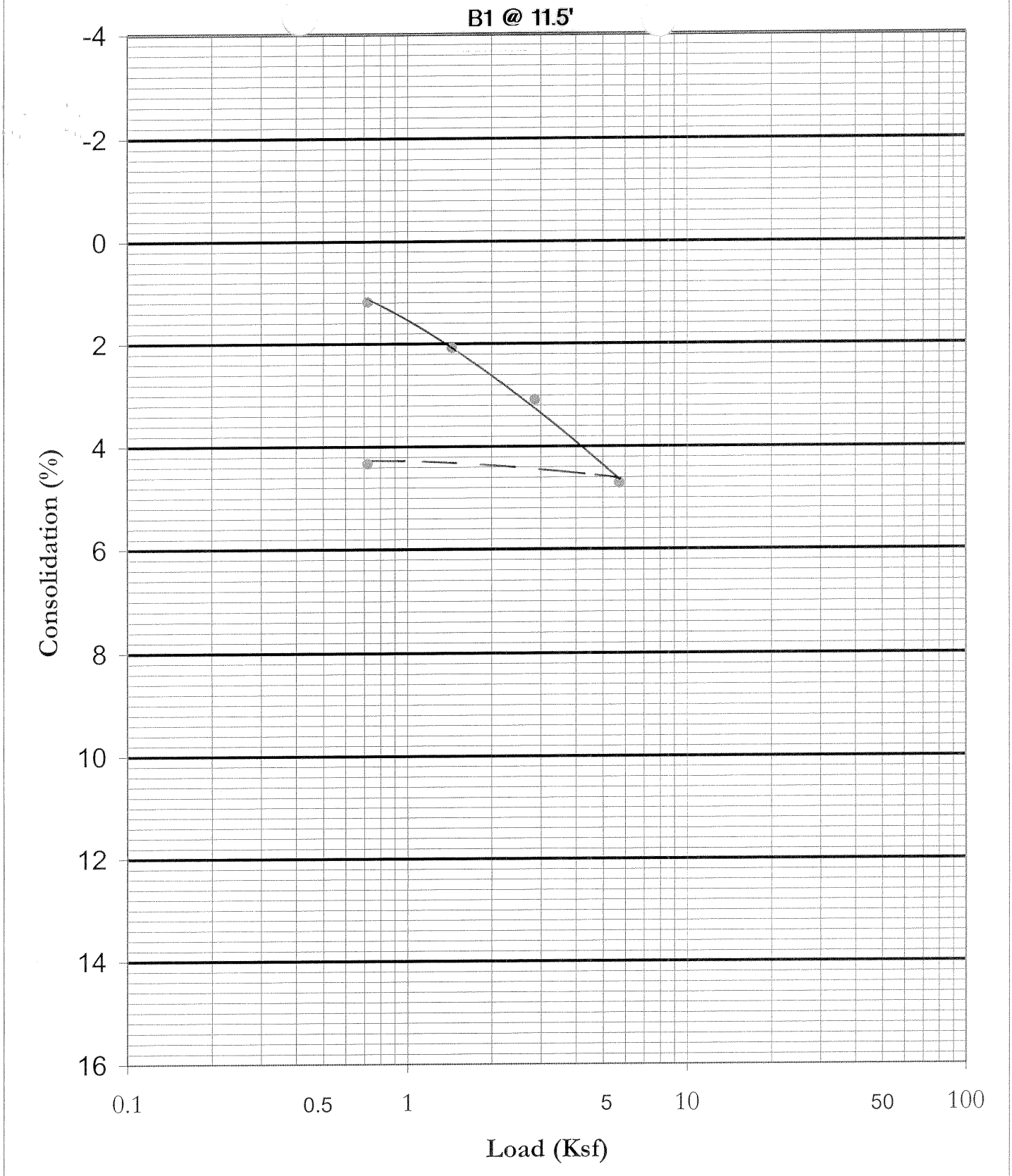
Sample Location	**Trench T-4 @ 1'-6'**	**Trench T-5 @ 2'-8'**	**Trench T-14 @ 1'-6'**
Soluble Sulfate	0.004 % (SO_4)	0.001 % (SO_4)	0.010 % (SO_4)

RESISTANCE VALUE (CALIFORNIA TEST 301)

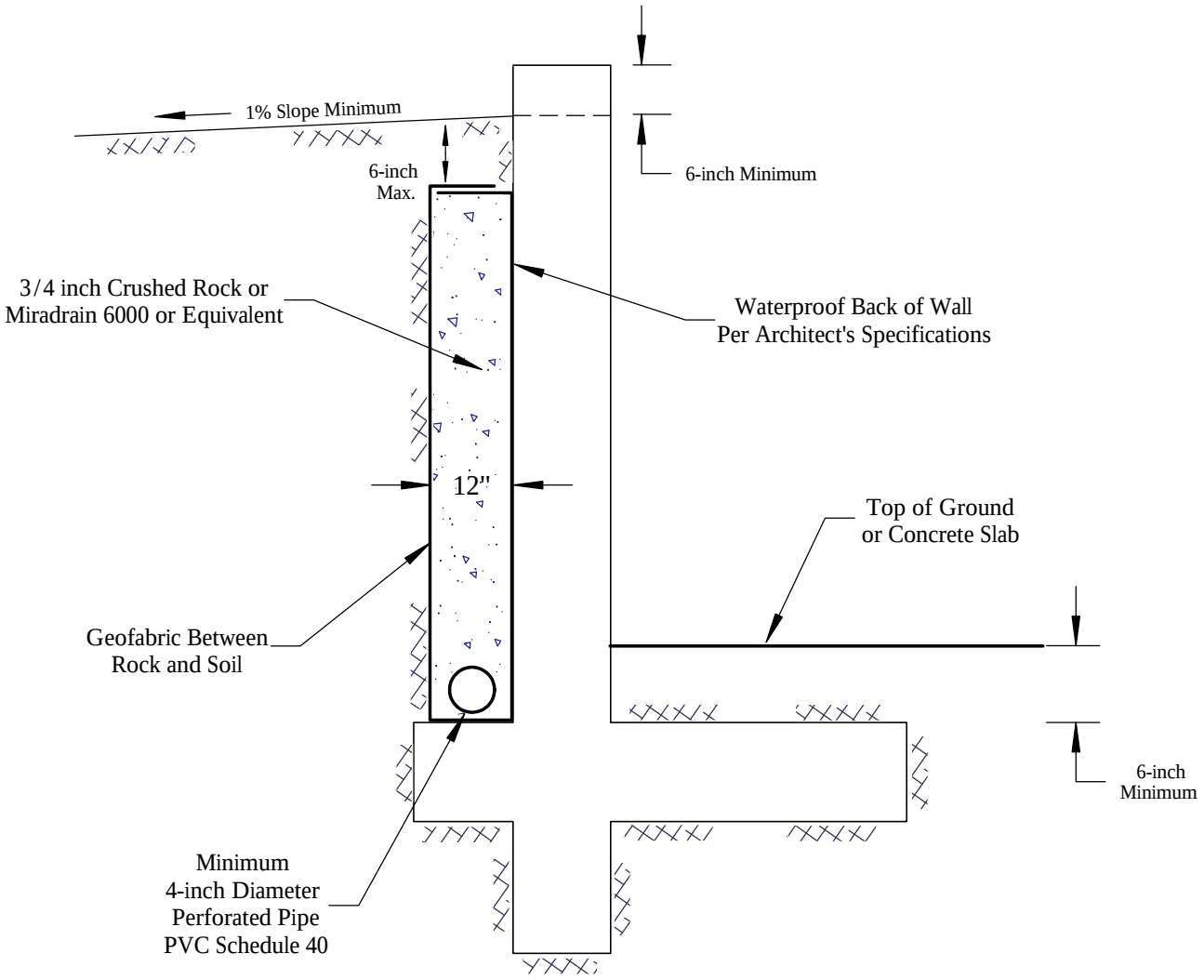
Sample Location	**Trench T-1 @ 0'-4'**	**Trench T-8 @ 1'-5'**
by Exudation	70	5
by Expansion	73	N/A
at Equivalent	70	5



CHRISTIAN WHEELER ENGINEERING	BY: SHV	DATE: January 2005
	JOB NUMBER: 2040960	PLATE NUMBER: 33



CHRISTIAN WHEELER ENGINEERING	BY: SHV	DATE: Jan-05
	JOB NUMBER: 204960	PLATE NUMBER: 34



RETAINING WALL SUBDRAIN DETAIL

No Scale

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PROPOSED WELD BOULEVARD INDUSTRIAL PARK
Weld Boulevard and Cuyamaca Street, El Cajon, California

BY: SHV	DATE: January 2005
JOB NO.: 2040960	PLATE NO.: 35

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RECOMMENDED GRADING SPECIFICATIONS - GENERAL PROVISIONS

PROPOSED WELD BOULEVARD INDUSTRIAL PARK
WELD BOULEVARD AND CUYAMACA STREET
EL CAJON, CALIFORNIA

GENERAL INTENT

The intent of these specifications is to establish procedures for clearing, compacting natural ground, preparing areas to be filled, and placing and compacting fill soils to the lines and grades shown on the accepted plans. The recommendations contained in the preliminary geotechnical investigation report and/or the attached Special Provisions are a part of the Recommended Grading Specifications and shall supersede the provisions contained hereinafter in the case of conflict. These specifications shall only be used in conjunction with the geotechnical report for which they are a part. No deviation from these specifications will be allowed, except where specified in the geotechnical report or in other written communication signed by the Geotechnical Engineer.

OBSERVATION AND TESTING

Christian Wheeler Engineering shall be retained as the Geotechnical Engineer to observe and test the earthwork in accordance with these specifications. It will be necessary that the Geotechnical Engineer or his representative provide adequate observation so that he may provide his opinion as to whether or not the work was accomplished as specified. It shall be the responsibility of the contractor to assist the Geotechnical Engineer and to keep him appraised of work schedules, changes and new information and data so that he may provide these opinions. In the event that any unusual conditions not covered by the special provisions or preliminary geotechnical report are encountered during the grading operations, the Geotechnical Engineer shall be contacted for further recommendations.

If, in the opinion of the Geotechnical Engineer, substandard conditions are encountered, such as questionable or unsuitable soil, unacceptable moisture content, inadequate compaction, adverse weather, etc., construction should be stopped until the conditions are remedied or corrected or he shall recommend rejection of this work.

Tests used to determine the degree of compaction should be performed in accordance with the following American Society for Testing and Materials test methods:

Maximum Density & Optimum Moisture Content - ASTM D-1557-91
Density of Soil In-Place - ASTM D-1556-90 or ASTM D-2922

All densities shall be expressed in terms of Relative Compaction as determined by the foregoing ASTM testing procedures.

PREPARATION OF AREAS TO RECEIVE FILL

All vegetation, brush and debris derived from clearing operations shall be removed, and legally disposed of. All areas disturbed by site grading should be left in a neat and finished appearance, free from unsightly debris.

After clearing or benching the natural ground, the areas to be filled shall be scarified to a depth of 6 inches, brought to the proper moisture content, compacted and tested for the specified minimum degree of compaction. All loose soils in excess of 6 inches thick should be removed to firm natural ground which is defined as natural soil which possesses an in-situ density of at least 90 percent of its maximum dry density.

When the slope of the natural ground receiving fill exceeds 20 percent (5 horizontal units to 1 vertical unit), the original ground shall be stepped or benched. Benches shall be cut to a firm competent formational soil. The lower bench shall be at least 10 feet wide or 1-1/2 times the equipment width, whichever is greater, and shall be sloped back into the hillside at a gradient of not less than two (2) percent. All other benches should be at least 6 feet wide. The horizontal portion of each bench shall be compacted prior to receiving fill as specified herein for compacted natural ground. Ground slopes flatter than 20 percent shall be benched when considered necessary by the Geotechnical Engineer.

Any abandoned buried structures encountered during grading operations must be totally removed. All underground utilities to be abandoned beneath any proposed structure should be removed from within 10 feet of the structure and properly capped off. The resulting depressions from the above described procedure should be backfilled with acceptable soil that is compacted to the requirements of the Geotechnical Engineer. This includes, but is not limited to, septic tanks, fuel tanks, sewer lines or leach lines, storm drains and water lines. Any buried structures or utilities not to be abandoned should be brought to the attention of the Geotechnical Engineer so that he may determine if any special recommendation will be necessary.

All water wells which will be abandoned should be backfilled and capped in accordance to the requirements set forth by the Geotechnical Engineer. The top of the cap should be at least 4 feet below finish grade or 3

feet below the bottom of footing whichever is greater. The type of cap will depend on the diameter of the well and should be determined by the Geotechnical Engineer and/or a qualified Structural Engineer.

FILL MATERIAL

Materials to be placed in the fill shall be approved by the Geotechnical Engineer and shall be free of vegetable matter and other deleterious substances. Granular soil shall contain sufficient fine material to fill the voids. The definition and disposition of oversized rocks and expansive or detrimental soils are covered in the geotechnical report or Special Provisions. Expansive soils, soils of poor gradation, or soils with low strength characteristics may be thoroughly mixed with other soils to provide satisfactory fill material, but only with the explicit consent of the Geotechnical Engineer. Any import material shall be approved by the Geotechnical Engineer before being brought to the site.

PLACING AND COMPACTION OF FILL

Approved fill material shall be placed in areas prepared to receive fill in layers not to exceed 6 inches in compacted thickness. Each layer shall have a uniform moisture content in the range that will allow the compaction effort to be efficiently applied to achieve the specified degree of compaction. Each layer shall be uniformly compacted to the specified minimum degree of compaction with equipment of adequate size to economically compact the layer. Compaction equipment should either be specifically designed for soil compaction or of proven reliability. The minimum degree of compaction to be achieved is specified in either the Special Provisions or the recommendations contained in the preliminary geotechnical investigation report.

When the structural fill material includes rocks, no rocks will be allowed to nest and all voids must be carefully filled with soil such that the minimum degree of compaction recommended in the Special Provisions is achieved. The maximum size and spacing of rock permitted in structural fills and in non-structural fills is discussed in the geotechnical report, when applicable.

Field observation and compaction tests to estimate the degree of compaction of the fill will be taken by the Geotechnical Engineer or his representative. The location and frequency of the tests shall be at the Geotechnical Engineer's discretion. When the compaction test indicates that a particular layer is at less than the required degree of compaction, the layer shall be reworked to the satisfaction of the Geotechnical Engineer and until the desired relative compaction has been obtained.

Fill slopes shall be compacted by means of sheepsfoot rollers or other suitable equipment. Compaction by sheepsfoot roller shall be at vertical intervals of not greater than four feet. In addition, fill slopes at a ratio of two horizontal to one vertical or flatter, should be trackrolled. Steeper fill slopes shall be over-built and cut-back to finish contours after the slope has been constructed. Slope compaction operations shall result in all fill material six or more inches inward from the finished face of the slope having a relative compaction of at least 90 percent of maximum dry density or the degree of compaction specified in the Special Provisions section of this specification. The compaction operation on the slopes shall be continued until the Geotechnical Engineer is of the opinion that the slopes will be surficially stable.

Density tests in the slopes will be made by the Geotechnical Engineer during construction of the slopes to determine if the required compaction is being achieved. Where failing tests occur or other field problems arise, the Contractor will be notified that day of such conditions by written communication from the Geotechnical Engineer or his representative in the form of a daily field report.

If the method of achieving the required slope compaction selected by the Contractor fails to produce the necessary results, the Contractor shall rework or rebuild such slopes until the required degree of compaction is obtained, at no cost to the Owner or Geotechnical Engineer.

CUT SLOPES

The Engineering Geologist shall inspect cut slopes excavated in rock or lithified formational material during the grading operations at intervals determined at his discretion. If any conditions not anticipated in the preliminary report such as perched water, seepage, lenticular or confined strata of a potentially adverse nature, unfavorably inclined bedding, joints or fault planes are encountered during grading, these conditions shall be analyzed by the Engineering Geologist and Geotechnical Engineer to determine if mitigating measures are necessary.

Unless otherwise specified in the geotechnical report, no cut slopes shall be excavated higher or steeper than that allowed by the ordinances of the controlling governmental agency.

ENGINEERING OBSERVATION

Field observation by the Geotechnical Engineer or his representative shall be made during the filling and compaction operations so that he can express his opinion regarding the conformance of the grading with acceptable standards of practice. Neither the presence of the Geotechnical Engineer or his representative or

the observation and testing shall release the Grading Contractor from his duty to compact all fill material to the specified degree of compaction.

SEASON LIMITS

Fill shall not be placed during unfavorable weather conditions. When work is interrupted by heavy rain, filling operations shall not be resumed until the proper moisture content and density of the fill materials can be achieved. Damaged site conditions resulting from weather or acts of God shall be repaired before acceptance of work.

RECOMMENDED GRADING SPECIFICATIONS - SPECIAL PROVISIONS

RELATIVE COMPACTION: The minimum degree of compaction to be obtained in compacted natural ground, compacted fill, and compacted backfill shall be at least 90 percent. For street and parking lot subgrade, the upper six inches should be compacted to at least 95 percent relative compaction.

EXPANSIVE SOILS: Detrimentally expansive soil is defined as clayey soil which has an expansion index of 50 or greater when tested in accordance with the Uniform Building Code Standard 29-2.

OVERSIZED MATERIAL: Oversized fill material is generally defined herein as rocks or lumps of soil over 6 inches in diameter. Oversized materials should not be placed in fill unless recommendations of placement of such material is provided by the Geotechnical Engineer. At least 40 percent of the fill soils shall pass through a No. 4 U.S. Standard Sieve.

TRANSITION LOTS: Where transitions between cut and fill occur within the proposed building pad, the cut portion should be undercut a minimum of one foot below the base of the proposed footings and recompacted as structural backfill. In certain cases that would be addressed in the geotechnical report, special footing reinforcement or a combination of special footing reinforcement and undercutting may be required.