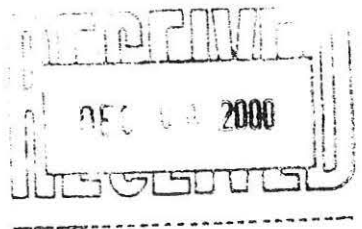


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G E O T E C H N I C A L R E P O R T



GEOTECHNICAL INVESTIGATION REPORT
on
CORDES RANCH
Patterson Pass & Schulte Roads
San Joaquin County, California
for
GOLDEN STATE DEVELOPERS, INC.



By

KC ENGINEERING COMPANY

Project No. VV545-00

30 October 2000

Project No.	Project Title
00006.01	GSD / CORDES RANCH
SOIL REPORT	
☐ Test	☐ Bid
☐ Construction	

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KC ENGINEERING COMPANY
A SUBSIDIARY OF MATERIALS TESTING, INC.

Project No. VV545-00
30 October 2000

Mr. Bob Collins
Golden State Developers, Inc.
10 Crow Canyon Court, #110
San Ramon, CA 94583

Subject: Proposed Commercial, Industrial & Residential Development
Cordes Ranch Business Park
Patterson Pass & Schulte Roads
San Joaquin County, California
GEOTECHNICAL INVESTIGATION REPORT

Dear Mr. Collins:

In accordance with your authorization, **KC ENGINEERING COMPANY** has performed a field and laboratory investigation of the surface and subsurface soil conditions at the subject site of the proposed development located in San Joaquin County, California. This investigation was performed in general conformance with our proposal dated 7 September 2000.

The accompanying report presents our conclusions and recommendations based on our investigation. Our findings indicate that the site is physically suitable for the proposed industrial, commercial and residential development and related improvements provided the recommendations of this report are carefully followed and incorporated into the project plans and specifications..

Should you have any questions relating to the contents of this report or should you require additional information, please contact our office at your convenience.



Respectfully Submitted,
KC ENGINEERING CO.

David V. Cymanski, P.E.
Principal Engineer

Copies: 6 to GSD

TABLE OF CONTENTS

Page No.

LETTER OF TRANSMITTAL

GEOTECHNICAL INVESTIGATION REPORT

Introduction	5
Site Location and Description	5
Proposed Construction	7
Field Investigation	7
Laboratory Investigation	8
Soils Conditions	9
Site Geology & Seismicity	10

DISCUSSIONS AND CONCLUSIONS	12
General	12
Fault Rupture	12
Ground Shaking	12
Liquefaction Potential	13
Settlement/Compressible Soils	14
Expansive Soil	14
Slope Stability	14
Soil Shrinkage Potential	15
Soil Corrosivity	15
Retention Basins	16

RECOMMENDATIONS	17
Grading	17
Cut and Fill Slopes	20
Proposed Subdrainage	22
Drainage	22
Foundations	23
Slab-on-Grade Construction	27
Pavement Design	28
Retaining Walls	30
Underground Utility Construction	32

REFERENCE MATERIAL	33
LIMITATIONS AND UNIFORMITY OF CONDITIONS	34
APPENDIX	35
Figure 1 – USGS Vicinity Map	
Figure 2 - Site Plan	
Figures 3-64 - Logs of Test Boring	
Laboratory Test Results	

GEOTECHNICAL INVESTIGATION REPORT

Introduction

The purpose of this report for the proposed commercial, industrial and residential development known as Cordes Ranch was to determine the surface and subsurface soil conditions and to evaluate potential geologic hazards. Based on the results of this investigation, criteria were established for the grading of the site, the design of foundations for the proposed structures, and the construction of other related facilities on the property.

Our investigation included the following:

- a. Review of published soils and geologic literature and relevant CDMG geologic maps for the site;
- b. Site reconnaissance by the Geologist and Soil Engineer;
- c. Drilling sixty-one (61) exploratory borings and sampling the subsurface soils;
- d. Laboratory testing of the recovered samples to determine their engineering characteristics;
- e. Analysis of the data and formulation of conclusions and recommendations;
- f. Preparation of this written report.

Site Location and Description

The subject site is located southeast of the junction of Interstate 580 and 205 in San Joaquin County, California, as shown on Figure #1, "Vicinity Map" of the Appendix. The rectangular shaped site comprises approximately 1,228-acres of rural ranch and agriculture land. The site is bounded on the north and east by similar ranch and agricultural land, on the south by Schulte Road, and on the west by Patterson Pass/Mountain House Road. It is noted that Hansen Road bisects the center of the property in a north-south direction. A residence, sheds, barns and associated out structures are located in the central portion of the site and on the west side of Hansen Road. The Delta Mendota

Canal crosses the southwestern corner of the site. A PG&E high voltage power line crosses the northwestern corner of the site. An earthen irrigation canal crosses the northeastern corner. Two underground pipeline easements cross the site in a northwesterly direction as shown on Figure #1. It is our understanding that the western pipeline easement contains a high pressure petroleum pipe operated by Chevron and two high pressure natural gas pipes operated by PG&E. The eastern pipeline easement contains an abandoned Shell oil pipe. A number of fences cross the property for cattle control. In addition, a number of underground irrigation pipelines cross the site.

The topography of the site appears to be relatively flat, but it actually gently slopes to the east and northeast from an elevation of approximately 220 feet above mean sea level on the southwest corner to 85 feet on the northeast corner, as shown on the USGS Vicinity Map, Figure #1. It is noted that a number of natural drainage swales cross the site from the southwest to the northeast. In general, the drainage swales are relatively broad in width and about five (5) to ten (10) feet deep. The most notable drainage swale on the western portion of the property has seasonal flows due to storm drainage water from the Safeway and King Lyons properties south of Schulte Road. The storm drainage water flows through the swale towards a man-made basin just north of the PG&E tower easement. A few other natural drainage basins are located across the site. A number of man-made irrigation storage ponds are located adjacent to the earthen irrigation canal on the northeastern portion of the property. It should be noted that the northeastern corner of the 98-acre parcel, west of Hansen Road, has been filled with about six (6) vertical feet of soil material. The current ranch owner, Mr. Cordes, stated that the area was filled in the mid 1950's to provide a level field for crops. In addition, Mr. Cordes stated that the northern half of the property, east of Hansen road was also leveled in the mid 1950's. At the time of our investigation, vegetation across the site consisted of native grasses and weeds on the west side of Hansen Road and on the western half of the property east of Hansen Road. Vegetation on the far eastern portion of the property consisted of alfalfa crops.

This description is based on a site reconnaissance by the Project Engineer and a Preliminary Site Plan prepared by RVC & Associates, dated January 2000.

Proposed Construction

Currently, the property is proposed to be developed to include approximately 856-acres for industrial development, 125-acres for easements and streets, 102-acres for commercial buildings, 85-acres for residential construction, and 60 acres for parks, storm ponds and a sewer treatment plant. It is our understanding that the initial site improvements will consist of constructing a number of retention ponds, a sewer treatment plant, underground utilities and roadways.

Field Investigation

The field investigation for this project was conducted in two phases. The first phase consisted of a preliminary field investigation of the site which was performed on 14 August 2000 and included a reconnaissance of the site and the drilling of eight (8) exploratory borings. The second phase of the field investigation was conducted over the period of five days during the first two weeks of October 2000 and included additional reconnaissance of the site and the drilling of fifty-three (53) exploratory borings. The borings were performed at the approximate locations shown on Figure #2, Site Plan. In addition, all borings were logged by our Project Soil Engineer.

The borings were drilled to a maximum depth of thirty-five (35) feet below the existing ground surface. The drilling was performed with a Mobile B2400 & Mobile B3500 drill rigs using four-inch and six-inch diameter continuous flight augers respectively. Visual classifications were made from the auger cuttings and the samples obtained in the field. As the drilling proceeded, relatively undisturbed core samples were obtained within each major soil strata by means of a 2-1/2 or 3 inch O.D., split-tube sampler, containing thin brass liners, into the soil bottom. The sampler was driven into the in-situ soils under the impact of a 140 pound hammer having a free fall of 30 inches. The number of blows required to advance the sampler 12 inches into the soil bottom were adjusted to the standard penetration resistance (N-Value). When the sampler was withdrawn from the boring bottom, the brass liners containing the relatively undisturbed samples were removed, examined for identification purposes, labeled and sealed to preserve the natural or in-situ moisture content.

The samples were returned to our laboratory for examination and testing. Classifications made in the field were modified after further examination and testing in the laboratory.

The stratification of the soils, descriptions, location of undisturbed soil samples, laboratory test results and standard penetration resistance are shown on the respective "Logs of Test Borings" contained within the Appendix.

Laboratory Investigation

The laboratory testing program was directed towards providing sufficient information for the determination of the engineering characteristics of the site soils. The recommendations outlined in this report are formulated based on a review and analysis of the field and laboratory test results.

Moisture content and dry unit weight tests (ASTM D2937) were performed on undisturbed soil samples to determine the consistency of the soil and moisture variation throughout the explored soil profile and to estimate the compressibility of the underlying soils.

The strength parameters of the foundation soils were determined from unconfined compression tests (ASTM D2166) and direct shear tests (ASTM D3080). Standard field penetration resistance (N-Values) also assisted in the determination of strength, bearing capacity and compressibility. The standard penetration resistance values are recorded on the respective "Logs of Test Borings".

The expansion and potential liquefaction characteristics of the subsurface soils were evaluated by means of Atterberg Limits tests performed in accordance with ASTM D4318-93 and Particle Size Distribution Tests (ASTM C136). Long hydrometer tests ASTM D422 were also performed to assist in classification.

The permeability characteristics of the subsurface soils in areas of proposed retention ponds were determined from hydraulic conductivity tests in accordance with ASTM D5084-91.

R-value testing was performed on materials representative of the upper three (3) feet or proposed subgrade for the street areas. The tests were performed in conformance with Cal Test 301.

The soil corrosivity and sulfate characteristics were determined on soil samples representative of the site.

A summary of all laboratory test results is presented on the attached "Logs of Test Borings" and/or laboratory data sheets of the Appendix.

Soil Conditions

The subsurface soil conditions at the site are relatively uniform and generally consist of moderately to critically expansive, firm to very stiff silty clays in the upper three (3) to eight (8) feet. It is noted that very stiff silty clay materials extend to greater depths in the natural drainage swale areas as noted in borings #15, #22 and #38. The surface clays are underlain by varying layers of stiff to very stiff silty and sandy clays and clayey silts or medium dense to dense clayey, silty and gravelly sands to the maximum depth explored of thirty-five (35) feet. In addition, the sand, silt and clay materials generally increase in stiffness with depth. Liquefiable and/or collapsible soil conditions were not encountered in the upper thirty-five (35) feet of the sixty-one (61) borings drilled across the site.

During our field investigation, groundwater was encountered in borings #6, #48, #49 and #51 at depths ranging from fourteen (14) to eighteen (18) feet below the ground surface. Groundwater was not encountered in the other borings. The groundwater found in these borings is likely attributed to recent crop irrigation and appears to consist of perched water within a permeable sandy clay layer. It is noted that Mr. Cordes stated that the static groundwater level was approximately sixty (60) feet below the surface as measured in his water wells. Fluctuations in the groundwater table are anticipated with variations in seasonal rainfall and the subsurface stratigraphy.

A more thorough description and stratification of the soils encountered are presented on the respective "Logs of Test Borings", Appendix. The approximate locations of these borings are shown on Figure 2, "Site Plan".

Site Geology & Seismicity

The geologic deposits at the site have been mapped as Holocene aged alluvial fan deposits, consisting of undifferentiated silts, clays, sands and gravel that have been eroded off of the local topographic highs. These descriptions are based on our review of the CDMG Geologic Map of the San Francisco – San Jose Quadrangle, by Bortugno et al. 1990. The materials encountered during our investigation generally correlate with previous geologic mapping.

Seismicity in the Tracy area is related to activity on the San Andreas system of active faults and the Coast Range – Sierra Block Boundary. There are no known active or inactive faults crossing the Cordes Ranch site as map by CDMG. The nearest known fault is the Midway Fault, located approximately two (2) miles southwest of the site. The nearest known active fault shown on the Geologic Map of the San Francisco – San Jose Quadrangle (1990) is the Vernalis Fault, which appears to be associated with the Coast Range – Sierra Block Boundary. The Vernalis Fault is located approximately six (6) miles northeast of the site. The maximum probable earthquake for the Coast Range Sierra Block Boundary (CDMG, 1996) is a Richter magnitude 7.0 event. However, the Fault Activity Map of California published by (CDMG, 1994) indicates that the Vernalis Fault is no longer considered an active fault. The 1994 map shows the nearest known active fault as the Marsh Creek Fault, located approximately nine and one-half (9.5) miles southwest of the site. The maximum probable earthquake for the Marsh Creek Fault (CDMG, 1992) is a Richter magnitude 7.25 event. Other principal active faults in the vicinity are the Verona Fault, 17 miles south-southwest; the Calaveras Fault, 22 miles southwest; the Hayward Fault, 29 miles southwest; and the San Andreas Fault, approximately 48 miles southwest of the site. The California Department of Conservation, Division of Mines and Geology (CDMG) has defined an active fault as one that has had surface displacement in the last 11,000 years, or has experienced earthquakes in recorded history. These faults have the potential to generate moderate to severe ground shaking at the site. Properly designed structures utilizing current Uniform Building Code seismic requirements should perform adequately on the subject site.

The following Uniform Building Code seismic criteria is derived utilizing the Vernalis Fault as the nearest known active fault. Based on our review of the published maps and CDMG Open-File

Report 92-1, the following Uniform Building Code earthquake design criteria should be used by the Structural Engineer:

Soil Profile Type:	S_D	Seismic Zone:	4
Seismic Zone Factor:	0.40	Seismic Source Type:	A
Seismic Coefficients:	$C_a = 0.44N_a$, $C_v = 0.64N_v$		
Near Source Factors:	$N_a = 1.2$, $N_v = 1.6$		

DISCUSSIONS AND CONCLUSIONS

General

Based on our review of the referenced geologic maps and the results of our field and laboratory investigations, it is the opinion of **KC ENGINEERING COMPANY** that the Cordes Ranch site is suitable for the proposed industrial, commercial and residential development from a geologic and geotechnical standpoint. The primary geotechnical concerns for the project include potential differential movements of building foundations and other surface improvements due to the highly expansive surface soils. The highly expansive near surface clays can result in soil volume changes and excessive uplift pressures with variations in moisture content. Therefore, these conditions should be mitigated by proper foundation design and construction and proper site drainage.

Fault Rupture

The active faults closest to the site are the Vernalis Fault and Marsh Creek Fault, located 6 miles northeast and 9.5 miles southwest of the site, respectively depending on the published CDMG map referenced. Historically, fault rupture tends to occur along lines of previous faulting and is most likely to occur in the future on the active faults in the region. Because active faults are not present within the site, the risk of fault rupture within the site is very low. The site is not within one of the Alquist-Priolo Earthquake Fault Zones established by the State of California.

Ground Shaking

The Cordes Ranch lies within a seismically active region that includes much of western California. The principal faults in the area are capable of generating large earthquakes that could produce strong to violent ground shaking in the area. The recent increase in earthquake activity in the San Francisco Bay Region Faults suggests that the region is entering a period of increased seismic activity that could include one or more large and destructive earthquakes. As such, strong earthquake-related ground shaking is considered likely to occur at the site during the life of the project.

In the event of an earthquake, seismic risk to structures will depend on the characteristics of the earthquake, the distance to the earthquake epicenter, the subsurface conditions underlying the structure and its immediate vicinity, and the characteristics of the structure. All structures should be designed to resist strong ground shaking in accordance with the applicable building codes.

The intensity of ground shaking can be amplified by local geologic conditions. Areas most susceptible to a significant amplification of ground shaking are underlain by soft sediments. Because such materials are not present at the site, significant amplification of ground shaking is unlikely.

Liquefaction Potential

Soil liquefaction is a phenomenon in which loose and saturated cohesionless soils are subject to a temporary, but essentially total loss of shear strength, because of pore pressure build-up under the reversing cyclic shear stresses associated with earthquakes. Soils typically found most susceptible to liquefaction are saturated and loose, fine to medium grained sand having a uniform particle range and less than 5% fines passing the No. 200 sieve.

The data used for evaluating liquefaction potential of the subsurface soils consisted of the in-situ Standard Penetration resistance values (N_1)₆₀ values, the grain-size distribution, unit weights, in-situ moisture contents, the groundwater level and the location of the site to the nearest active fault and the predicted ground surface acceleration. The in-situ penetration resistance of the clayey sand and sandy clay materials generally indicates a relative density which is medium dense to dense. The soil gradation of this material reveals greater than 13 percent silt and clay fines pass the No. 200 sieve. Based on the field and laboratory results, we have determined that the soils at the site do not meet the criteria for liquafiable soils as set forth by California Division of Mines and Geology. Therefore, it is our opinion that the potential for liquefaction and associated hazards at this site are considered low to nil.

Settlement/Compressible Soil

Settlement is a common occurrence generally associated with soft clays or silts and unconsolidated loose saturated sands and gravels. Our field and laboratory investigations did not reveal soft and/or loose subsurface deposits with the potential for settlement.

Expansive Soil

Based on the results of the field and laboratory testing program, the site's existing foundation soils are considered to be highly to critically expansive and subject to volume changes due to moisture fluctuations. The expansive soils identified on this site can be mitigated through standard grading practices and/or slight modification of structure foundation depths and loading. It is imperative that the recommendations regarding design of foundations, provisions to reduce damage to foundations, and/or exterior slabs, and preventative measures regarding wetting/saturation of foundation soils be followed closely. Recommendations for minimizing the risk of damage due to expansive soils are included herein.

Slope Stability

Due to the flat lying nature of the site and the minimal topographic relief across the site, landsliding and/or slumping is not expected to occur unless unstable slopes are created during the site grading process. Materials encountered onsite are suitable as fill material in properly engineered fill slopes. Cut and fill slopes are anticipated to be less than twenty (20) feet in vertical height and can be expected to be stable at inclinations of 2:1 (horizontal to vertical). Cut slopes created for the purposes of water retention ponds or sewer treatment ponds are expected to be stable at a inclination of 3:1 (horizontal to vertical) or flatter. Construction of cut and/or fill slopes should be completed under the direction of a Soils Engineer and in accordance with the grading recommendations provided in this report.

Soil Shrinkage Potential

As a portion of our laboratory analysis, maximum density/optimum moisture compactions curves were completed in accordance with ASMT D1557-91 on three representative samples of the near surface materials encountered at the site. The maximum dry densities from these curves were then compared with the in-place densities of forty-one selected samples of soils encountered in the upper six (6) feet at the site to help evaluate the approximate soil shrinkage or swell after excavation and compaction. The samples were evaluated at 92% relative compaction assuming a minimum of 90% of maximum dry density for most areas of the site.

Calculations for shrinkage/swell in the upper six (6) feet of the site's soils compacted to 92% of maximum dry density range from -16.4% to 30.5%. Based on our evaluation, it is estimated that shrinkage encountered during site grading process will range from 5% to 15%. It should be noted that the shrinkage values indicated above are only an estimate and may vary depending on uniformity of soils across the site, type of compaction equipment and methods used and changes in quantity of material available or not available during grading process.

Soil Corrosivity

During our drilling operations, three soil samples were collected and submitted to M. J. Schiff & Associates, Inc. for soil corrosivity and sulfate testing. Testing of the samples was completed for resistivity, pH along with chemical analyses for soluble salts. Result of the analysis are provided in the Appendix. The following table presents the soil corrosivity requirements by the American Water Works Association.

AWWA TEST PROCEDURES	AWWA TEST REQUIREMENTS	Test Method
Minimum Resistivity ohm-cm	>1000	Cal 643
pH	5-10	Cal 643
Water Soluble Chloride, mg. Cl/Kg. Soil	500 Max	EPA 300
Water Soluble Sulfate, mg. SO ₄ /Kg. Soil	2000 Max	EPA 300

ND = Not detected

The soil analyzed from the site fell within the specified criteria as put forth by the AWWA. In addition, the sulfate test results indicate "Negligible" exposure conditions as identified by UBC Table 19-A-4 "Requirements for Concrete Exposed to Sulfate-Containing Solutions".

Retention Basins

It is our understanding that drainage of collected storm water is proposed to be dealt with by the construction of a number of large retention basins along the northern portions of the property. The soils in the areas of the proposed retention ponds generally consists of very stiff, highly expansive silty clays underlain by interbedded medium dense to dense clayey sands and sandy clays or silts.

Permeability tests completed on tube samples from these areas resulted in hydraulic conductivities ranging from 3.4×10^{-4} centimeters per second (cm/sec) to 5.9×10^{-9} cm/sec. Empirical estimates can also be made from the particle size analysis tests performed in these areas. Hard silts and sandy clays underlie some of these areas at variable depths as noted in our borings which may act as relatively impermeable barriers to vertical flow infiltrating water. Lateral flow of infiltrating water can also be expected to occur at slower rates. The basins typically become less permeable with age due to sedimentation that occurs which will also reduce vertical and lateral flows of infiltrating water. Considering the wide range of permeability, care must be exercised in selecting the location of the basins.

RECOMMENDATIONS

Grading

A substantial amount of earthwork is anticipated for the proposed development. At this time, a grading plan is not available, but cuts and fill are anticipated to be on the order of twenty (20) feet or less.

All grading and foundation plans for the project, as prepared by the design engineer, must be reviewed by the Soil Engineer prior to contract bidding or submittal to governmental agencies to ensure that the following geotechnical recommendations are properly incorporated and utilized in design.

KC ENGINEERING CO. should be notified at least two working days prior to site clearing, grading, and/or foundation operations on the property. This will give the Soil Engineer ample time to discuss the problems that may be encountered in the field and coordinate the work with the contractor.

Field observation and testing during the grading and/or foundation operations must be provided by representatives of **KC ENGINEERING CO.** to form an opinion regarding the adequacy of the site preparation, the acceptability of fill materials and the extent to which the earthwork construction and the degree of compaction comply with the specification requirements. Any work related to the grading and/or foundation operations performed without the full knowledge and under the direct observation of the Soil Engineer will render the recommendations of this report invalid.

Considering the expansive condition of the near surface soils, grading activities during the rainy season will be hampered by excessive moisture. Chemical stabilization and/or lime treatment of the existing near surface soils may be required to grade the site during winter months. It is recommended that grading be performed during the drier months to minimize potential compaction problems.

Prior to grading, the surface of the site should be stripped to remove all existing vegetation and/or other deleterious materials. It is estimated that stripping depths of about one (1) to two (2) inches may be necessary, however, the actual depth of stripping should be determined in the field by the Soil Engineer. Stripped material from the site may not be used as engineered fill but may be stockpiled and used later for landscaping purposes.

Any existing undesirable items which do not meet the requirements of engineered fill (fence posts, wood, trash, debris, buried septic tanks, irrigation pipes, old foundations, etc.) should be excavated and removed from the site. Any resulting excavations, due to debris removal, should be properly backfilled with engineered fill. Should the location of any localized excavation be found to underlie any structure, such as in the over-excavation areas, then the backfill should be compacted to a minimum relative compaction of 95% or the excavation be widened to extend 5 feet beyond the proposed structure footprint and compacted to 90%.

It is recommended that erosion gullies in the drainage swale areas be over-excavated to competent material as determined by the Soil Engineer in the field and be backfilled with compacted engineered fill. The existing man-made drainage basins and irrigation ponds will also need to be over-excavated to remove loose deposits. This work should be performed under the observation and direction of the Soil Engineer.

Following site stripping and subexcavation as required, all areas should be scarified a minimum depth of twelve (12) inches and compacted to a minimum degree of relative compaction of 90% at 2 to 5 percent above optimum moisture content as determined by ASTM D1557-91 Laboratory Test Procedure. It is noted that substantial desiccation or shrinkage cracking of the near surface soils were noted during our investigation. It is noted that surface processing should extend to the depth of shrinkage cracking which may be on the order of three (3) feet in the late summer months. After recompacting the native soils, the site may be brought to the desired finished grades by placing engineered fill in lifts of 8 inches in uncompacted thickness and compacting to a relative compaction of 90% in accordance with the aforementioned test procedure.

Should select import material be used to establish the proper grades for the proposed development, the import material should be approved by the Soil Engineer before it is brought to the site and should meet the following requirements:

- a. Have an R-Value of not less than 25;
- b. Have a Plasticity Index not higher than 15;
- c. Not more than 15% passing the No. 200 sieve;
- d. No rocks larger than 6 inches in maximum size.

Import material meeting the requirements stated above should be compacted to a minimum relative compaction of at least 90% at a moisture content slightly above optimum as determined by ASTM D1557-91 Laboratory Test Procedure. All engineered fill should be placed in lifts not exceeding 8 inches in uncompacted thickness.

All fill material shall be approved by the Soil Engineer. The material shall be a soil or soil-rock mixture which is free from organic matter or other deleterious substances. The fill material shall not contain rocks or lumps over 6 inches in greatest dimension and not more than 15% larger than 2-1/2 inches. Materials from the site below the stripping depth are suitable for use in fills provided the above requirements are met. The fill materials shall be placed in uniform lifts of not more than 8 inches in uncompacted thickness. Each layer shall be spread evenly and shall be thoroughly blade mixed during the spreading to obtain uniformity of material in each layer. Before compaction begins, the fill shall be brought to a water content that will permit proper compaction by either (a) aerating the material if it is too wet, or (b) spraying the material with water if it is too dry.

Compaction shall be by footed rollers or other types of acceptable compacting rollers. Rollers shall be of such design that they will be able to compact the fill to the specified density. Rolling shall be accomplished while the fill material is within the specified moisture content range. Rolling of each layer shall be continuous over its entire area and the roller shall make sufficient trips to ensure that the required density has been obtained. No ponding or jetting shall be permitted.

The standard test used to define maximum densities and optimum moisture content of all compaction work shall be the Laboratory Test procedure ASTM D1557-91 and field tests shall be

expressed as a relative compaction in terms of the maximum dry density and optimum moisture content obtained in the laboratory by the foregoing standard procedure. Field density and moisture tests shall be made in each compacted layer by the Soil Engineer in accordance with Laboratory Test Procedure ASTM D2922-81 and D3017-88, respectively. When footed rollers are used for compaction, the density and moisture tests shall be taken in the compacted material below the surface disturbed by the roller. When these tests indicate that the compaction requirements on any layer of fill, or portion thereof, has not been met, the particular layer, or portion thereof, shall be reworked until the compaction requirements have been met.

No soil shall be placed or compacted during periods of rain nor on ground which contains free water. Soil which has been soaked and wetted by rain or any other cause shall not be compacted until completely drained and until the moisture content is within the limits herein before described or approved by the Soil Engineer. Approval by the Soil Engineer shall be obtained prior to continuing the grading operations.

Cut and Fill Slopes

Based on the material strength characteristics, cut and fill slopes should not be steeper than 2:1 (horizontal to vertical). Interior cut slopes for proposed retention basin areas should not be steeper than 3:1. All cut slopes over 5 vertical feet must be observed by the project Engineering Geologist. Where unstable cut slope conditions are encountered, the slope should be buttressed as noted above. Slopes should be rounded at the upper extremities. All engineered fills should extend a minimum of ten (10) feet laterally from the proposed building foundations.

Where fill is to be placed on an existing slope having a surface gradient steeper than 6:1 (horizontal to vertical), the surface soils are to be removed and these areas keyed and benched horizontally into competent bedrock soil materials prior to placement of engineered fill. A toe key excavation should be placed at the base of all such fills. This key should be a minimum of 15 feet in width and 3 to 5 feet in height cut into competent materials and sloped into the hillside at a gradient of no less than 5%. Specific keyway locations and dimensions will be determined by the Soil Engineer and Geologist during field grading operations. Subsequent keyed benches should be placed at vertical intervals no greater than 10 feet and should have a width of no less than 10 feet.

Fill slopes must be compacted during the grading operations. The previously noted compaction requirements should be followed for fill slopes. The slopes should be built by over-constructing the slope face and cutting back the loose surface materials to a firm adequately compacted design grade. Track-walking of slope surfaces does not provide adequate soil density and is an unacceptable method of slope compaction.

Cut and fill slopes may experience severe erosion when grading is halted during rainy weather. Before work is stopped, a positive gradient away from the slopes must be established to carry the surface runoff water away from the slopes to areas where erosion and sediment can be controlled.

Concrete lined drainage facilities should be constructed above all cut and fill slopes greater than fifteen (15) feet in vertical height or where the natural drainage is directed toward the slopes from large drainage areas above. The purpose of the drainage facilities is to divert the excess surface runoff from the slopes and, consequently, minimize sloughing or erosion of the slope surfaces.

The slope gradients are based on strength characteristics of the materials under conditions of normal moisture content that would result from rain water falling directly on the slope, and as a result of the proposed leach field, but do not take into consideration the additional seepage forces from springs or subsurface water areas. Areas of observed seepage, as discovered during grading operations, should be provided with subsurface drains below the surface of the slope as directed by the Soil Engineer. Subsurface drainage facilities may include gravel blankets, rock-filled trenches, or subdrains as directed by the Soil Engineer. Due to the nature of the site soils, slopes may experience severe erosion when grading is halted by heavy rain. Therefore, before work is stopped, a positive gradient away from the slopes should be provided to carry the surface runoff water away from the slopes and to areas to where flow can be controlled.

After the completion of the slope grading, erosion protection must be provided. Hydro-seeding and/or slope planting, preferably with deep-rooted native plants requiring little to no irrigation, must be provided on all exposed surfaces of cut and fill slopes. Graded slopes should not be left exposed through a winter season without the completion of erosion control measures and slope planting.

Proposed Subdrainage

It will be necessary to install subsurface drains beneath the fills to be placed in fill slope keyways, cut slope buttresses, and swale areas, particularly, where boggy areas are encountered and in all other seepage areas where disclosed during the grading operations. This is necessary to provide drainage to these areas and to ensure stability of the fills and provide a stable base for placement of fill, where required. It is recommended that all subsurface drains be constructed with six (6) inch diameter SDR 35 (fills less than 30 feet) or 23.5 (fills greater than 30 feet) perforated solid wall pipe and be surrounded by Cal Trans Section 68-1.025 Class II Permeable Drain Rock. All subdrains should be a minimum of sixteen (16) inches wide and four (4) feet in vertical height or greater as determined in the field by the Soil Engineer.

Drainage

It is recommended that liberal positive surface drainage be provided for the site. The most important factor affecting the performance of structures situated upon expansive soils is the proper design, implementation, and maintenance of surface drainage. Expansive soils will expand upon wetting and shrink upon drying. The degree of this kind of volume change depends on the soils expansion potential and the degree to which the moisture content of the soil changes over time. The native soils at the site have a very high potential to undergo volume changes. To reduce the potential for distress to the structure due to movement resulting from swelling and shrinking of the foundation soil, the following surface drainage measures are recommended:

- a. Liberal building pad and parking lot slopes and surface drainage must be provided to remove all storm water from the pad and to prevent storm and/or irrigation water from ponding next to or seeping beneath the structures and/or parking areas. Where asphalt or concrete is not provided adjacent to the structure, then all finished grades should be compacted and sloped at a minimum 4% gradient away from the exterior foundation for a minimum distance of four (4) feet. All pavement areas must also be provided with positive drainage measures as determined by the project Civil Engineer.

- b. Should roof gutters be used, downspouts from the gutters should be provided. The downspouts should be connected to a closed pipe system to carry storm water away from the structure and graded areas. In doing this, the possibility of soil saturation adjacent to the foundation and engineered fills is reduced. Downspout water may be allowed to discharge directly onto hardscape areas provided positive drainage is maintained.
- c. Site drainage should be designed by the project Civil Engineer. Civil engineering, hydraulic engineering, and surveying expertise is necessary to design proper surface drainage to assure that the flow of water is directed away from the foundations.
- d. Over-irrigation of plants is a common source of water migrating beneath a structure. Consequently, the amount of irrigation should not be any more than the amount necessary to support growth of the plants. Foliage requiring little irrigation (drip system) is recommended for the areas immediately adjacent to the structure.
- e. Landscape mounds or concrete flatwork should not be constructed to block or obstruct the surface drainage paths. The Landscape Architect or other landscaper should be made aware of these landscaping recommendations and should implement them as designed. The surface drainage facilities should be constructed by the contractor as designed by the Civil Engineer.

Foundations

Based on the results of the field and laboratory testing program, the site's existing near surface foundation soils are considered to be highly expansive and subject to volume changes due to moisture fluctuations. It is imperative that the recommendations regarding design of foundations, provisions to reduce damage to foundations, and/or exterior slabs, and preventative measures regarding wetting/saturation of foundation soils be followed closely. The proposed new structures can be satisfactorily supported on a properly designed foundation systems provided that the site is prepared as previously recommended in the Grading section of this report.

It is anticipated that the proposed residential structures will require foundation systems consisting of pier and grade beam systems or thickened structure mat slabs, either conventionally reinforced or post-tensioned, while foundation systems for industrial and commercial building are anticipated to consist of deepened spread footings or thickened structure mat slabs systems. When actual building locations and loading conditions are known, then each structure location should be reviewed by the Soil Engineer and site specific design criteria provided. It should be noted that site specific foundation investigations may be required for critical structures. In addition, the foundation recommendations presented herein are limited to structures of three-stories and less. Recommendations for each of the above foundations systems are provided below.

The near surface soils were also identified with "negligible" sulfate concentrations per Table 19-A-4 of the UBC. Therefore, special concrete requirements including Type V cement and high compressive strength concrete is not required.

Pier and Grade Beam

Pier and grade beam foundations may be utilized to support residential and other specialized structures. The piers should have a minimum diameter of twelve (12) inches and should extend a minimum depth of eight (8) feet below pad grade. The piers should be designed on the basis of skin friction acting between the soil and that portion of the pier that extends below a depth of two (2) feet from pad grade. For the soils at the site, an allowable skin friction value of 500 p.s.f. can be used for combined dead and live loads. This value can be increased by one-third for total loads which include wind or seismic forces. Reinforced concrete grade beams should be used to support the perimeter walls and interior bearing walls of the building structure. Reinforcing steel should be provided as necessary for structural support and continuity of the piers and grade beam. Pier spacing should be determined as required by the load distribution, but minimum spacing should not be less than three (3) pier diameters, center to center.

Passive pressures can be assumed to act against a lateral projected area of twice the pier diameter times the length, neglecting the upper two (2) feet. It is recommended that a passive pressure equivalent to that of a fluid weighing 300 p.c.f. be used.

Due to the expansive near surface soils, the foundation system be designed to resist the effects of uplift pressures. It is recommended that an uplift pressure of 2,000 p.s.f. be applied to the bottom of the foundation grade beams. Uplift pressures may be resisted by the dead load of the structure and an adhesion value of 400 p.s.f. acting along the sides of the drilled piers. Care must be exercised during concrete placement to prevent mushrooming of pier tops and creating a surface area in which the swelling soil may exert uplift forces. In addition, the grade beam should be designed and constructed to a minimum width.

Structural Mats

Structural mat foundations utilizing conventional reinforcement or post-tensioning may be designed for residential and commercial structures. Based on an Effective Plasticity Index of 30, it is recommended that a thickened structural mat foundation, utilizing conventional reinforcement, be designed with a minimum edge cantilever length (l_c) of seven (7.0) feet over an interior clear span or unsupported length of fourteen (14) feet. This specified cantilever length was determined in accordance with the Section 1815 of the 1997 Uniform Building Code. The structural mat should have a minimum thickness of ten (10) inches and be designed by a Structural Engineer.

Post-tensioned structural mat slabs may also be utilized for the proposed structures. Based on the results of our laboratory testing program and the resulting criteria determined from the UBC Section 1816 and the manual "Design and Construction of Post-Tensioned Slabs-On-Ground" by the Post-Tensioning Institute, 1996, the following design parameters are recommended:

a. Edge Moisture Variation Distance:

$$E_m(\text{Edge Lift}) = 3.0 \text{ feet}$$

$$E_m(\text{Center Lift}) = 5.5 \text{ feet}$$

b. Differential Movement:

$$Y_m(\text{Edge Lift}) = 1.0 \text{ inches}$$

$$Y_m(\text{Center Lift}) = 4.0 \text{ inches}$$

c. Slab Subgrade Coefficient = 0.75

In addition, the following recommendations should be incorporated into the design and construction for either of the above structural mat foundation systems:

- a) An allowable bearing capacity of 1,000 p.s.f. should be utilized and may be increased by one-third to resist short-term wind and seismic loading.
- b) To resist lateral loading, a coefficient of friction of 0.30 may be used.
- c) All areas to receive slabs should be thoroughly soaked prior to placing the waterproof membrane. This work should be performed under the observation of the Soil Engineer and approved prior to concrete placement.
- d) The reinforcement and/or cables shall be placed in the center of the slab unless otherwise designated by the Structural Engineer.
- e) The slab foundations should be underlain by a minimum of two (2) inches of wetted sand, underlain by a heavy duty waterproof membrane placed on the prepared subgrade soils. A coarse sand or fine gravel material may be required during the winter season. The waterproof membrane should be placed under the sand cushion and lapped adequately to provide a continuous waterproof barrier under the entire slab. A twelve (12) inch wide section of the visqueen may be eliminated around the perimeter to provide additional friction resistance for lateral loading.
- f) The slabs should be thickened at the edges so as to extend below the top of the sand cushion and rest on grade.
- f) Garage slabs and front porch slabs should be designed as part of the mat foundation system as recommended above.

Spread Footing

Spread footing foundations may be utilized for proposed commercial and industrial structures. The continuous and isolated footings for the structures should have minimum depth of thirty (30) inches below the lowest adjacent pad grade. Design bearing pressures for footings should not exceed 2,300 p.s.f. due to dead loads, 2,800 p.s.f. due to dead plus live loads, and 3,700 p.s.f. due to all loads which include wind or seismic. Perimeter footings are to be reinforced with a minimum of two No. 4 bars, one at the top and one near the bottom of the footing. Additional reinforcement may be as required by the project Structural Engineer and in accordance with structural building code requirements. Due to the potential differential settlement, the spread footing foundation systems should be designed to resist an estimated differential settlement of one-half (1/2) inch.

To accommodate lateral building loads, the passive resistance of the foundation soil can be utilized. The passive soil pressures can be assumed to act against the front face of the footing below a depth of one (1) foot below the ground surface. It is recommended that a passive pressure equivalent to that of a fluid weighing 300 p.c.f. be used. For design purposes, an allowable friction coefficient of 0.32 can be assumed at the base of the spread footings.

The Soil Engineer should review the foundation plans and calculations prior to submittal to ensure conformance to these recommendations and be present to observe the foundation excavations.

Slab-on-Grade Construction

Interior slabs and exterior concrete flatwork placed on the expansive soils may experience some cracking due to moisture variations within the underlying soils and the resulting shrink/swell phenomenon. To reduce the potential cracking of the slabs-on-grade, the following recommendations are made:

- a. Interior floor slabs for structures should be a minimum of five (5) inches thick. Concrete slabs in vehicular or traffic areas should be a minimum of six (6) inches thick and are addressed in the Pavement Section of this report. These slabs should

- be reinforced with a minimum of #4 rebar at sixteen (16) inches on center and/or as designed by the Structural Engineer.
- b. All areas to receive slabs should be soaked to saturation prior to placing of concrete. This work should be done under the observation of the Soil Engineer to ensure that the upper twelve inches has fully expanded.
 - c. Four (4) inches of gravel or clean crushed rock material should be placed between the finished subgrade and slabs to serve as a capillary break between the subsoil and the slab.
 - d. All slabs should be properly reinforced to meet structural design criteria. The reinforcement shall be placed in the center of the slab unless otherwise designated by the design engineer.
 - e. Slabs supporting floor coverings, such as tile, linoleum or carpet, should be provided with measures to prevent condensation caused by temperature differentials from harming floor coverings. One way to protect the floor covering is to place a heavy duty waterproof membrane between the granular layer and the floor slab. In addition, two inches of wetted sand should be placed over the membrane to minimize puncture and facilitate curing of the concrete. The sand and the membrane are to be placed over the 4-inch layer of gravel or crushed rock recommended herein.
 - f. Also, interior and exterior slabs should be provided with tool joints or crack control strips to control expansion and contraction of the concrete. The joints should extend along the middle of the slab in both directions.

Pavement Design

The proposed driveway, roadway and vehicle and truck traffic or parking areas should be paved with either asphalt concrete (AC) or portland cement concrete (PCC) surfaces. Recommendations

for both pavement surfaces are presented below. We emphasize that the performance of the pavement is critically dependent upon adequate and uniform compaction of the subgrade soils, as well as engineered fill and utility trench backfill within the limits of pavements.

Preparation of Subgrade: After underground utilities have been placed in the areas to receive pavement, the upper eight (8) inches of the subgrade soil shall be scarified, moisture conditioned and compacted to a minimum relative compaction of 95% at 1% to 4% above optimum moisture content in accordance with the grading recommendations specified in this report.

Aggregate Base: All aggregate base (AB) material placed subsequently should also be compacted to a minimum relative compaction of 95% based on the ASTM Test Procedure D1557-91. The construction of the pavement in the street, roadway and parking areas should conform to the requirements set forth by the latest Standard Specifications of the Department of Transportation of the State of California. The recommended aggregate base thicknesses for asphalt pavements are noted in the table below. The minimum aggregate base thickness for the shop slab areas and portland cement concrete pavements is six (6) compacted inches.

Asphalt Concrete: Based on the lowest R-Value of seven (7), obtained in accordance with the California Standard Specification Procedure Test Method 301 and a range of traffic indices, the recommended pavement sections for asphalt concrete surfaces are summarized in the table below. It should be noted that additional R-Value tests should be performed after mass grading and underground construction operations to evaluate local conditions and to possibly provide a more economical design. The appropriate traffic index (TI) will be determined by the project Civil Engineer or City Engineer.

R-Value	Traffic Index (TI)	Asphalt Concrete (inches)	Class II Aggregate Base (inches) (1)
7	4.5	2.5	9.5
7	5.0	2.5	11.0
7	5.5	3.0	12.0

7	6.0	3.0	14.0
7	6.5	3.5	15.0
7	7.0	4.0	15.5
7	8.0	4.5	18.5
7	9.0	5.5	20.5

NOTES:

- (1) Minimum R-Value = 78
- (2) R-Value: Resistance Value
- (3) All layers in compacted thickness to CalTrans Standard Specifications.

Portland Cement Concrete: Where PCC pavement areas are utilized, the concrete should be poured on the compacted aggregate base layer described above. The concrete should be designed by the project Structural Engineer and be a minimum of six (6) inches thick and reinforced with a minimum of #4 rebar spaced at sixteen (16) inches on center, each way. Additional reinforcement may be required by the Structural Engineer.

Retaining Walls

If retaining walls are required, such as at truck loading dock wells, mechanics pits or other areas, the following design parameters should be utilized in the design and construction of the proposed wall. It is pointed out that drainage of the dock well and mechanics pit should be provided.

Retaining walls up to 10 feet in height should be designed to resist lateral pressures exerted from a media having an equivalent fluid weight as follows:

Gradient of Back Slope	Equivalent Fluid Weight (p.c.f.) Unrestrained	Passive Resistance (p.c.f.)	Coefficient of Friction
Flat	45	300	0.32
2:1	60	300	0.32

In addition, walls restrained at the top should be designed to resist an additional uniform pressure of 100 p.s.f. If surcharge loads are expected near the back of the wall, an additional uniform pressure equal to one-half the surcharge pressure should be assumed to act against the back of the wall.

The above criteria are based on fully-drained conditions. For these conditions, it is recommended that a filter material blanket consisting of Cal Trans Class 2 Permeable Drainrock be placed behind the wall. The blanket should be a minimum of twelve (12) inches thick and should extend the full height of the wall. If the excavated area behind the wall exceeds twelve (12) inches, the entire excavated space behind the 12-inch blanket should consist of compacted engineered fill or gravel blanket material. A 4-inch diameter perforated pipe should be installed in the bottom of the filter blanket and should be underlain by at least four (4) inches of filter type material. Adequate gradient shall be provided to discharge water that collects behind the wall to an controlled discharge system away from the foundations of any nearby structures and/or engineered fills.

The retaining walls should be founded on a continuous spread footing foundation extending a minimum of twenty-four (24) inches below grade. The footings should be designed for an allowable dead plus live load bearing capacity of 2,000 p.s.f. This value may be increased by one-third for short-term wind and seismic effects. To resist lateral loading, the above passive resistance may act against the front face of the footing and a coefficient of friction of 0.35 may be used.

Underground Utility Construction

Utility trenches extending underneath all traffic areas must be backfilled with native or approved import material and compacted to relative compaction of 90% to within 6 inches of the subgrade. The upper 6 inches should be compacted to 95% relative compaction in accordance with Laboratory Test Procedure ASTM D1557-91. The San Joaquin County Standard Specifications should also be followed. It is pointed out that the native materials are geotechnically suitable for backfill in utility trenches, excluding the pipe bedding and shading gravel materials. It is our opinion that the native backfill, when properly placed and compacted, provides a uniformity of conditions beneath roadways. Varying soil conditions within street right-of-ways increase the potential for differential movement which can result in pavement distress.

Applicable safety standards require that trenches in excess of 5 feet must be properly shored or that the walls of the trench slope back to provide safety for installation of lines. If trench wall sloping is performed, the inclination should vary with the soil type. The underground contractor should request an opinion from the Soil Engineer as to the type of soil and the resulting inclination.

With respect to state-of-the-art construction or local requirements, utility lines are generally bedded with granular materials. These materials can convey surface or subsurface water beneath the structures. It is therefore recommended that all utility trenches which possess the potential to transport water, i.e., backfilled with granular material, be sealed with a compacted impervious cohesive soil material or lean concrete where the trench enters/exits the building perimeter. This impervious seal should extend a minimum of 2 feet away from the building perimeter.

REFERENCE MATERIAL

Report References

Report entitled: "Geotechnical Feasibility Report"

By: KC Engineering

Dated: 29 August 2000

Geologic References

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

Wagner, D. L., Bortugno, E. J. and McJunkin, R. D. 1990, *Geologic Map of the San Francisco – San Jose Quadrangle*: California Division of Mines and Geology, Map No. 5A, 1:250,000, 5 sheets.

Peak Acceleration From Maximum Credible Earthquakes in California: California Division of Mines and Geology, Open File Report 92-1.

California Fault Parameters, San Francisco Bay Area Faults: Draft 1996, California Division of Mines and Geology, Open File Report 96-08.

LIMITATIONS AND UNIFORMITY OF CONDITIONS

1. It should be noted that it is the responsibility of the owner or his representative to notify **KC ENGINEERING CO.**, in writing, a minimum of two working days before any clearing, grading, or foundation excavations can commence at the site.
2. The recommendations of this report are based upon the assumption that the soil conditions do not deviate from those disclosed in the borings and/or test pits and from a reconnaissance of the site. Should any variations or undesirable conditions be encountered during the development of the site, **KC ENGINEERING CO.**, will provide supplemental recommendations as dictated by the field conditions.
3. This report is issued with the understanding that it is the responsibility of the owner, or his representative, to ensure that the information and recommendations contained herein are brought to the attention of the Architect and Engineer for the project and incorporated into the plans and that the necessary steps are taken to see that the Contractor and Subcontractors carry out such recommendations in the field.
4. At the present date, the findings of this report are valid for the property investigated. With the passage of time, significant changes in the conditions of a property can occur due to natural processes or works of man on this or adjacent properties. In addition, legislation or the broadening of knowledge may result in changes in applicable standards. Changes outside of our control may render this report invalid, wholly or partially. Therefore, this report should not be considered valid after a period of two (2) years without our review, nor should it be used, or is it applicable, for any properties other than those investigated.
5. Notwithstanding all the foregoing, applicable codes must be adhered to at all times.

APPENDIX

Vicinity Map

Site Plan

Log of Test Borings

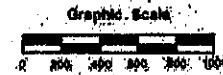
Laboratory Test Results



Project No. VV545-00,
Patterson Pass & Shulte Roads
San Joaquin County, California
Figure No. 1 "SITE LOCATION MAP"

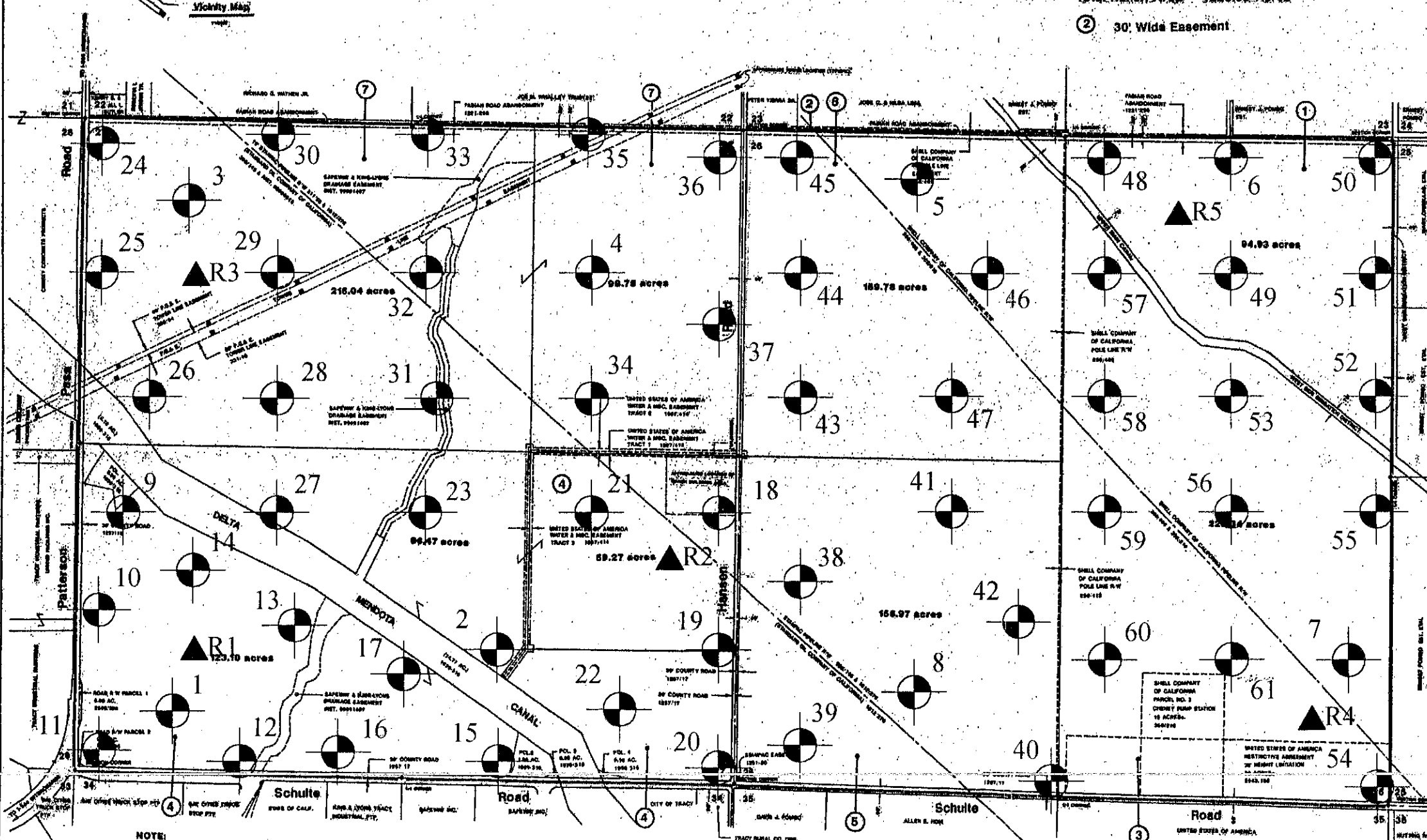
Preliminary Site Review Plan
THE CORDES RANCH
 San Joaquin County California

JANUARY 2000



Ranch Areas

Assessor's Number	Area
⑦ 209-120-04	216.04 acres
⑦ 209-120-05	98.78 acres
⑧ 209-220-08	159.78 acres
① 209-220-07	94.93 acres
③ 209-220-03	223.34 acres
⑤ 209-220-04	159.97 acres
④ 209-120-06	96.47 acres
④ 209-120-03	123.10 acres
④ 209-120-07	59.27 acres
Total Ranch Area	1228.68 Acres
②	30' Wide Easement



LEGEND

- Approximate Boring Location
- Approximate Bulk Surface Sample Location

NOTE:
 THIS SITE REVIEW PLAN WAS COMPILED FROM SAN JOAQUIN COUNTY ASSESSOR'S PLAT INFORMATION, TITLE REPORT INFORMATION (FIRST AMERICAN TITLE COMPANY OF STOCKTON ORDER NO. 181883-1P, DATED 10/18/99) AND VARIOUS SUPPLEMENTAL MAPS. THIS MAP REPRESENTS A PRELIMINARY REVIEW OF DOCUMENTS REFERENCED IN SAID TITLE REPORT AND INFORMATION SHOWN ON SAID MAPS AND DELINEATES THE BOUNDARY, EASEMENTS, AND KNOWN PHYSICAL CONSTRAINTS. THE PURPOSE OF THIS PRELIMINARY SITE REVIEW IS TO IDENTIFY THOSE PERMANENT AND TEMPORARY EASEMENTS AND PHYSICAL CONSTRAINTS THAT MAY AFFECT THE PLANNING AND ENGINEERING OF THE SITE FOR DEVELOPMENT PURPOSES. THE LOCATIONS OF THE INFORMATION SHOWN ON THIS MAP IS PRELIMINARY ONLY AND SHOULD BE CONFIRMED BY AN AEA AND TOPOGRAPHIC SURVEY OF THE RANCH AREA. TAXES, PRIVATE FINANCIAL AND AGRICULTURAL AGREEMENTS, LEASES, AND WILLIAMSON ACT CANCELLATION STATUS ARE NOT ADDRESSED IN THIS REVIEW.

Project No. VV545-00
 Cordes Ranch @ Patterson Pass & Schulte Roads
 San Joaquin County, California
FIGURE NO. 2 - "SITE PLAN"

KC ENGINEERING COMPANY
 865 Cotting Lane, Suite A
 Vacaville, CA 95688



RVC RICHARD V. CECCHI AND ASSOCIATES
 PLANNING AND SETTLEMENT PROCESSING CONSULTANTS
 TRACY, CALIFORNIA (925) 835-4849

LOG OF TEST BORING

BORING 1

Boring No: 1
Date Drilled: 8/14/00
Elevation: N/A
Logged by: DVC

Project No: WV545

Water Level: N/A

After: N/A

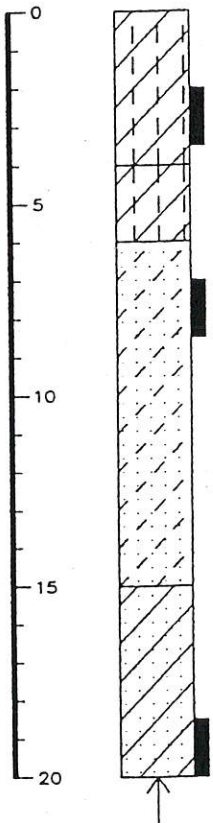
ELEV	SOIL SYMBOLS SAMPLER SYMBOLS	USCS	SOIL DESCRIPTION	REMARKS	Sample No.	Blows foot	Density Dry-pcf	Moisture Percent
DEPTH								
0		CH	Brown Silty CLAY, dry to moist, stiff	LL = 61% PI = 39	1-1	15	100.3	18.1
5		CL	Light Brown Silty CLAY, moist, stiff					
10		SC	Light Brown Clayey SAND, moist, medium dense	- # 200 = 34.7%	1-2	19	105.1	9.2
15		CL	Light Brown Sandy CLAY, moist, medium dense, very stiff					
20			Boring Terminated @ 20' No Groundwater encountered		1-3	23	107.3	17.0

Figure Number 3

LOG OF TEST BORING

BORING 2

Boring No: 2

Project No: WV545

Date Drilled: 8/14/00

Elevation: N/A

Logged by: DVC

Water Level: N/A

After: N/A

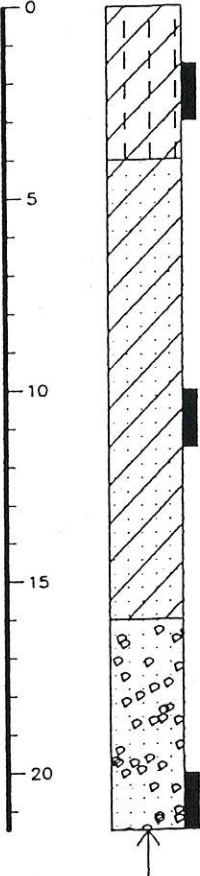
ELEV	SOIL SYMBOLS SAMPLER SYMBOLS	USCS	SOIL DESCRIPTION	REMARKS	Sample No.	Blows foot	Density Dry-pcf	Moisture Percent
DEPTH								
0		CH	Dark Brown Silty CLAY, dry to moist, stiff	LL =55% PI =36	2-1	16	86.3	13.7
5		SC	Light Brown Sandy CLAY, moist, very stiff					
10					2-2	31	108.0	13.5
15			Dense Drilling					
20		SW	Brown & Gray Gravelly SAND, dense, moist		2-3	37		
			Boring Terminated @ 21.5' No Groundwater encountered					

Figure Number 4

LOG OF TEST BORING

BORING 3

Project No: WV545

Boring No: 3

Date Drilled: 8/14/00

Elevation: N/A

Logged by: DVC

Water Level: N/A

After: N/A

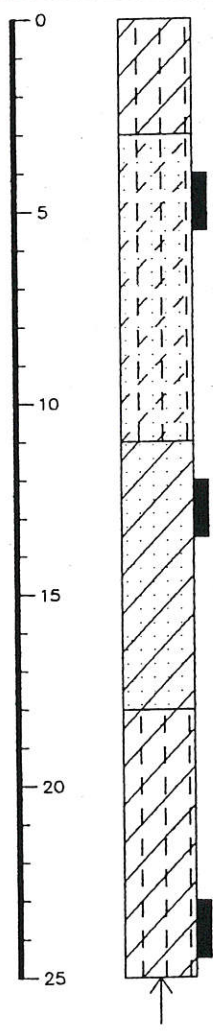
ELEV	SOIL SYMBOLS SAMPLER SYMBOLS	USCS	SOIL DESCRIPTION	REMARKS	Sample No.	Blows foot	Density Dry-pcf	Moisture Percent
DEPTH								
0		CH	Dark Brown Silty CLAY, dry to moist, stiff					
5		SM/ ML	Light Brown Clayey Silty fine SAND, dry to moist, medium dense		3-1	9	106.5	6.7
10		CL	Brown Sandy CLAY, moist, very stiff	- # 200 = 89.6%	3-2	19	110.1	16.7
15		CL	Brown Silty CLAY, moist very stiff		3-3	28	85.1	35.2
20								
25				Boring Terminated @ 25' No Groundwater encountered				

Figure Number 5

LOG OF TEST BORING

BORING 4

Project No: WV545

Boring No: 4

Date Drilled: 8/14/00

Elevation: N/A

Logged by: DVC

Water Level: N/A

After: N/A

ELEV	SOIL SYMBOLS SAMPLER SYMBOLS	USCS	SOIL DESCRIPTION	REMARKS	Sample No.	Blows foot	Density Dry-pcf	Moisture Percent
DEPTH								
0		CL	Brown Silty CLAY, dry to moist, stiff	LL = 45% PI = 26	4-1	16	92.2	12.0
5		ML	Light Brown Clayey SILT moist, stiff					
10		SM	Light Brown & Gray Silty SAND, fine to medium grained, moist, medium dense with minor clay	- # 200 = 13%	4-2	13	97.4	6.6
15			As Above, dense		4-3	33		
			Boring Terminated @ 18.5' No Groundwater encountered					

Figure Number 6

LOG OF TEST BORING

BORING 5

Project No: VV545

Boring No: 5

Date Drilled: 8/14/00

Elevation: N/A

Logged by: DVC

Water Level: N/A

After: N/A

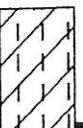
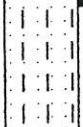
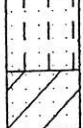
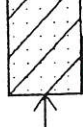
ELEV	SOIL SYMBOLS SAMPLER SYMBOLS	USCS	SOIL DESCRIPTION	REMARKS	Sample No.	Blows foot	Density Dry-pcf	Moisture Percent
DEPTH								
0		CH	Brown Silty CLAY, dry to moist, stiff					
5		ML	Light Brown Clayey Sandy SILT, moist		5-1	11		
10		SM	Light Brown & Gray Silty SAND, moist, dense		5-2	33	112.6	7.3
15		CL	Light Brown Sandy CLAY, moist, very stiff					
20					5-3	30	107.9	19.4
			Boring Terminated @ 21.5' No Groundwater encountered					

Figure Number 7

LOG OF TEST BORING

BORING 6

Boring No: 6
Date Drilled: 8/14/00
Elevation: N/A
Logged by: DVC

Project No: WV545

Water Level: 14 Feet

After: At Time of Drilling

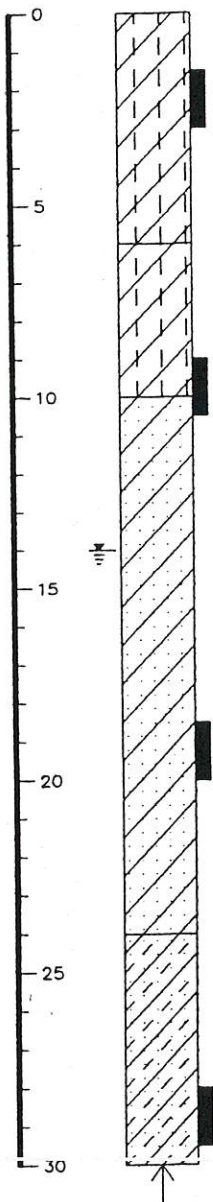
ELEV	SOIL SYMBOLS SAMPLER SYMBOLS	USCS	SOIL DESCRIPTION	REMARKS	Sample No.	Blows foot	Density Dry-pcf	Moisture Percent
DEPTH								
0		CH	Dark Brown Silty CLAY, moist, stiff	Qu = 7500 + psf	6-1	18	102.6	18.7
5		CH	Brown Silty CLAY, moist, stiff					
10		CL	Brown & Gray Sandy CLAY stiff, wet, fine to medium grained	- # 200 = 53.6%	6-2	10	101.8	20.7
15			As Above	- #200 = 58.5%	6-3	19	105.2	19.8
20		CL/ SC	Brown Sandy CLAY/Clayey SAND, moist, very stiff					
25					6-4	43	101.9	19.4
30			Boring Terminated @ 30' Groundwater @ 14'					

Figure Number 8

LOG OF TEST BORING

BORING 7

Project No: W545

Boring No: 7

Date Drilled: 8/14/00

Elevation: N/A

Logged by: DVC

Water Level: N/A

After: N/A

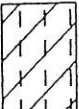
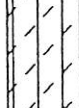
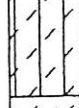
ELEV	SOIL SYMBOLS SAMPLER SYMBOLS	USCS	SOIL DESCRIPTION	REMARKS	Sample No.	Blows foot	Density Dry-pcf	Moisture Percent
DEPTH								
0		CH	Brown Silty CLAY, dry to moist, stiff					
5		ML	Light Brown Clayey SILT moist, stiff		7-1	36	107.6	14.0
10			As Above		7-2	36		
15								
20			Light Brown Clayey SAND dense, moist		7-3	31	105.0	20.5
			Boring Terminated @ 21.5' No Groundwater encountered					

Figure Number 9

LOG OF TEST BORING

BORING 8

Project No: W545

Boring No: 8

Date Drilled: 8/14/00

Elevation: N/A

Logged by: DVC

Water Level: N/A

After: N/A

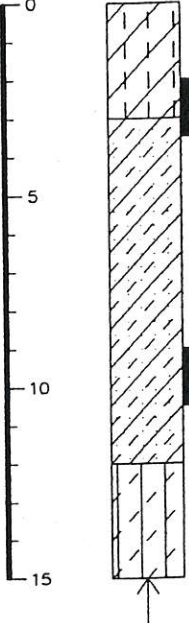
ELEV	SOIL SYMBOLS SAMPLER SYMBOLS	USCS	SOIL DESCRIPTION	REMARKS	Sample No.	Blows foot	Density Dry-pcf	Moisture Percent
DEPTH								
0		CH	Dark Brown Silty CLAY, dry to moist, stiff		8-1	27		
5		CL/SC	Brown Sandy CLAY/CLAYEY SAND, moist, very stiff, with caliche streaks					
10			As Above		8-2	51	109.9	14.4
15		ML	Light Brown CLAYEY SILT, hard, moist					
			Boring Terminated @ 15' No Groundwater encountered					

Figure Number 10

LOG OF TEST BORING

BORING 9

Project No: VV545

Boring No: 9

Date Drilled: 10/5/00

Elevation: N/A

Logged by: DVC

Water Level: N/A

After: N/A

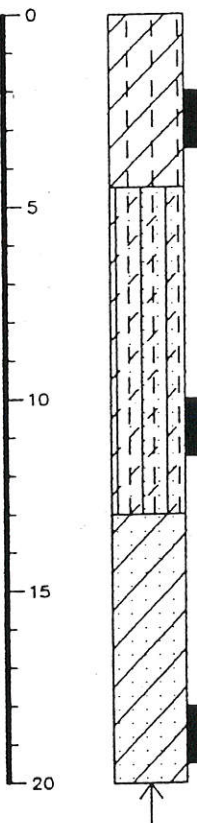
ELEV	SOIL SYMBOLS SAMPLER SYMBOLS	USCS	SOIL DESCRIPTION	REMARKS	Sample No.	Blows foot	Density Dry-pcf	Moisture Percent
DEPTH								
0		CL/ CH	Dark Brown Silty CLAY, dry to moist, with minor gravels	LL = 38% PI = 17	9-1	12	99.3	7.0
5		ML	Light Brown Clayey Silty SAND/Sandy SILT, moist, very dense/hard					
10					9-2	57		
15			Alternating layers of Light Brown Clays & White Sands fine grained, very dense, moist					
20			Boring Terminated @ 20' No Groundwater encountered		9-3	50	107.7	9.3

Figure Number 11

LOG OF TEST BORING

BORING 10

Project No: WV545

Boring No: 10

Date Drilled: 10/5/00

Elevation: N/A

Logged by: DVC

Water Level: N/A

After: N/A

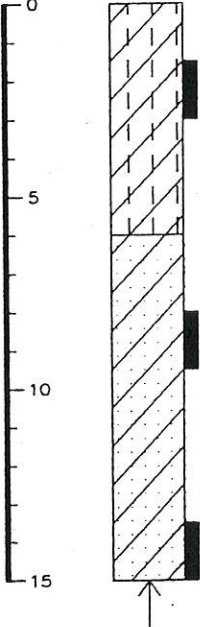
ELEV	SOIL SYMBOLS SAMPLER SYMBOLS	USCS	SOIL DESCRIPTION	REMARKS	Sample No.	Blows foot	Density Dry-pcf	Moisture Percent
DEPTH								
0		CL/CH	Dark Brown Silty CLAY, desiccated then moist, stiff		10-1	18		
5		CL	Light Brown Sandy CLAY stiff, fine to medium grained, dry to moist	- #200 = 66%	10-2	12		11.6
10					10-3	15	105.0	8.4
15			Boring Terminated @ 15' No Groundwater encountered					

Figure Number 12

LOG OF TEST BORING

BORING 11

Project No: WV545

Boring No: 11

Date Drilled: 10/5/00

Elevation: N/A

Logged by: DVC

Water Level: N/A

After: N/A

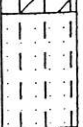
ELEV	SOIL SYMBOLS SAMPLER SYMBOLS	USCS	SOIL DESCRIPTION	REMARKS	Sample No.	Blows foot	Density Dry-pcf	Moisture Percent
DEPTH								
0		CL/ CH	Dark Brown Silty CLAY, dry, stiff, with minor sand		11-1	24		17.1
5		SM	Light Brown Silty SAND, medium dense					
10		SC	Light to Medium Brown Clayey SAND/Sandy CLAY, very dense/hard, moist, with isolated layers of fine gravel		11-2	55	110.4	18.7
15		CL	Medium Brown Sandy Silty CLAY, with minor gravels, moist, very stiff					
20			Boring Terminated @ 20' No Groundwater encountered					

Figure Number 13

LOG OF TEST BORING

BORING 12

Project No: VV545

Boring No: 12

Date Drilled: 10/5/00

Elevation: N/A

Logged by: DVC

Water Level: N/A

After: N/A

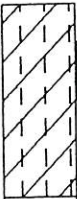
ELEV	SOIL SYMBOLS SAMPLER SYMBOLS	USCS	SOIL DESCRIPTION	REMARKS	Sample No.	Blows foot	Density Dry-pcf	Moisture Percent
DEPTH								
0		CL/ CH	Dark Brown Silty CLAY, dry, stiff with some sands and caliche seams	Minor Re- covery	12-1	12		
5		SM	Light Brown Silty SAND, dry medium dense, fine to medium grained		12-2	13	108.8	8.1
10								
15		CL	Medium Brown Sandy Silty CLAY, moist, stiff		12-3	27	96.4	15.4
20			Boring Terminated @ 20' No Groundwater encountered					

Figure Number 14

LOG OF TEST BORING

BORING 13

Project No: VV545

Boring No: 13

Date Drilled: 10/5/00

Elevation: N/A.

Logged by: DVC

Water Level: N/A

After: N/A

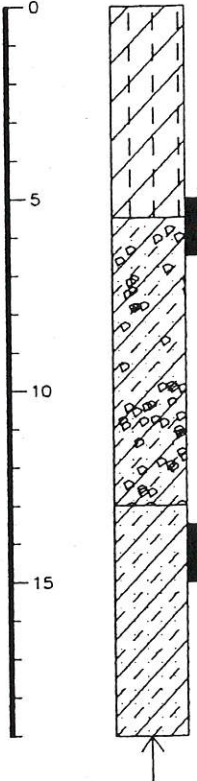
ELEV	SOIL SYMBOLS SAMPLER SYMBOLS	USCS	SOIL DESCRIPTION	REMARKS	Sample No.	Blows foot	Density Dry-pcf	Moisture Percent
DEPTH								
0		CL	Dark Brown Silty CLAY, dry, to moist, stiff					
5		SC/ SM	Light to Medium Brown Clayey Silty SAND, with minor fine gravels, fine grained sand to coarse		13-1	77		8.4
10		CL/ SC	Medium Brown Sandy CLAY/ Clayey SAND, moist, very stiff		13-2	20	97.8	22.4
15								
			Boring Terminated @ 19' No Groundwater encountered					

Figure Number 15

LOG OF TEST BORING

BORING 14

Project No: WV545

Boring No: 14

Date Drilled: 10/5/00

Elevation: N/A

Logged by: DVC

Water Level: N/A

After: N/A

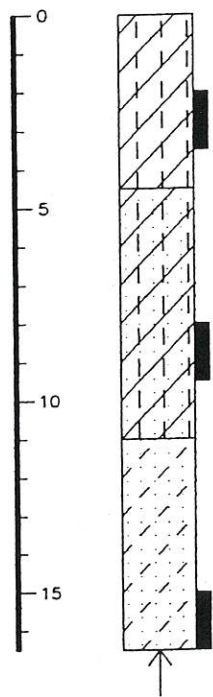
ELEV	SOIL SYMBOLS SAMPLER SYMBOLS	USCS	SOIL DESCRIPTION	REMARKS	Sample No.	Blows foot	Density Dry-pcf	Moisture Percent
DEPTH								
0		CL/ CH	Dark Brown Silty CLAY, dry, stiff	Minor Re- covery	14-1	23		
5		CL	Dark Brown Silty CLAY with Sand, moist, very stiff		14-2	17	99.0	11.6
10		SC	Light Brown Clayey SAND, medium grained, medium dense		14-3	19	104.3	4.5
15		Boring Terminated @ 16.5' No Groundwater encountered						

Figure Number 16

LOG OF TEST BORING

BORING 15

Project No: WV545

Boring No: 15

Date Drilled: 10/5/00

Elevation: N/A.

Logged by: DVC

Water Level: N/A

After: N/A

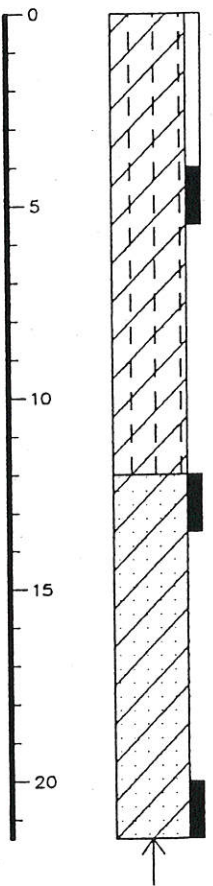
ELEV	SOIL SYMBOLS SAMPLER SYMBOLS	USCS	SOIL DESCRIPTION	REMARKS	Sample No.	Blows foot	Density Dry-pcf	Moisture Percent
DEPTH								
0		CH	Dark Brown CLAY, dry desiccated top 3"	LL = 54% PI = 34				14.5
5			moist, As Above	C = 241psf $\phi = 16.7^\circ$	15-1	18	105.1	18.5
10		CL	Medium Brown Sandy CLAY, moist, very stiff		15-2	22	106.8	19.9
15			Light Brown, very moist		15-3	56		
20			Boring Terminated @ 21.5' No Groundwater encountered					

Figure Number 17

LOG OF TEST BORING

BORING 16

Boring No: 16

Project No: WV545

Date Drilled: 10/5/00

Elevation: N/A

Logged by: DVC

Water Level: N/A

After: N/A

ELEV	SOIL SYMBOLS SAMPLER SYMBOLS	USCS	SOIL DESCRIPTION	REMARKS	Sample No.	Blows foot	Density Dry-pcf	Moisture Percent
DEPTH								
0		CL/ CH	Dark Brown Silty CLAY, dry, to moist, stiff		16-1	15		
5		SM	Light Brown fine Silty SAND dry, medium dense, with some coarse gravel					
10				Bulk Sample 10'-15' - #200 = 19%	16-2			4.6
15			dense					
			As Above		16-3	40		
			Boring Terminated @ 18' No Groundwater encountered					

Figure Number 18

LOG OF TEST BORING

BORING 17

Boring No: 17

Project No: VV545

Date Drilled: 10/5/00

Elevation: N/A

Logged by: DVC

Water Level: N/A

After: N/A

ELEV	SOIL SYMBOLS SAMPLER SYMBOLS	USCS	SOIL DESCRIPTION	REMARKS	Sample No.	Blows foot	Density Dry-pcf	Moisture Percent
DEPTH								
0		CL/ CH	Dark Brown Silty CLAY, with minor sands, dry, stiff		17-1	12	98.4	7.8
5		SM/ SC	Light Brown Silty SAND, dry medium dense, with occasional clay layers		17-2	18		11.1
10								
15					17-3			
			Boring Terminated @ 16.5' No Groundwater encountered					

Figure Number 19

LOG OF TEST BORING

BORING 18

Boring No: 18

Project No: WV545

Date Drilled: 10/5/00

Elevation: N/A

Logged by: DVC

Water Level: N/A

After: N/A

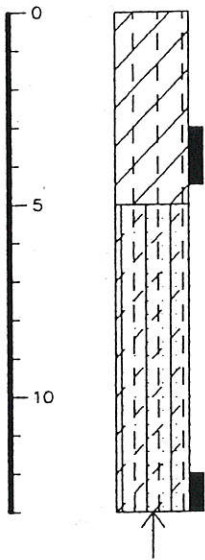
ELEV	SOIL SYMBOLS SAMPLER SYMBOLS	USCS	SOIL DESCRIPTION	REMARKS	Sample No.	Blows foot	Density Dry-pcf	Moisture Percent	
DEPTH									
0		CL/ CH	Dark Brown Silty CLAY, dry	Qu = 2565psf	18-1	11	93.5	9.6	
5		ML/ SM	Light Brown Clayey SILT/ Silty SAND, dry to moist, medium dense						
10									
			Boring Terminated @ 13' No Groundwater encountered		18-2	77			

Figure Number 20

LOG OF TEST BORING

BORING 19

Project No: VV545

Boring No: 19

Date Drilled: 10/5/00

Elevation: N/A

Logged by: DVC

Water Level: N/A

After: N/A

ELEV	SOIL SYMBOLS SAMPLER SYMBOLS	USCS	SOIL DESCRIPTION	REMARKS	Sample No.	Blows foot	Density Dry-pcf	Moisture Percent
DEPTH								
0		CL/ CH	Dark Brown Silty CLAY, dry, stiff					
5		SM	Light Brown Silty SAND, medium dense, fine grained		19-1	15	95.9	6.1
10		SC/ CL	Medium Brown Sandy CLAY/ Clayey SAND, dense, moist		19-2	44		13.3
15			As Above, dense drilling Boring Terminated @ 15' No Groundwater encountered					

Figure Number 21

LOG OF TEST BORING

BORING 20

Project No: VV545

Boring No: 20

Date Drilled: 10/5/00

Elevation: N/A

Logged by: DVC

Water Level: N/A

After: N/A

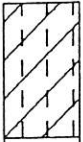
ELEV	SOIL SYMBOLS SAMPLER SYMBOLS	USCS	SOIL DESCRIPTION	REMARKS	Sample No.	Blows foot	Density Dry-pcf	Moisture Percent
DEPTH								
0		CL/ CH	Dark Brown Silty CLAY, dry to slightly moist, stiff					
5		SM	Light Brown Silty SAND, fine to medium grained, dry dense		20-1	32	112.7	12.1
10		CL	Light Brown Sandy CLAY, moist, very stiff					
15					20-2	45	113.2	16.4
								
			Boring Terminated @ 16.5' No Groundwater encountered					

Figure Number 22

LOG OF TEST BORING

BORING 21

Boring No: 21

Project No: WV545

Date Drilled: 10/6/00

Elevation: N/A

Logged by: DVC

Water Level: N/A

After: N/A

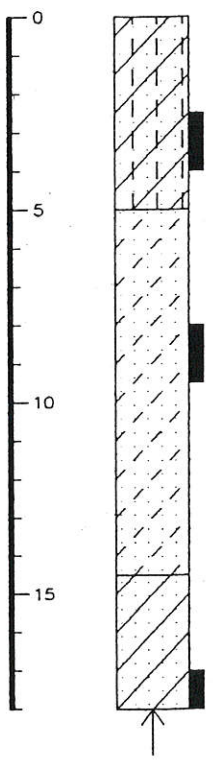
ELEV	SOIL SYMBOLS SAMPLER SYMBOLS	USCS	SOIL DESCRIPTION	REMARKS	Sample No.	Blows foot	Density Dry-pcf	Moisture Percent
DEPTH								
0		CL/ CH	Dark Brown Sandy Silty CLAY dry, stiff, with caliche streaks	C = 2611psf Ø = 19"	21-1	22	110.7	21.6
5		SC	Medium Brown Clayey SAND, moist, medium dense		21-2	38		13.5
10			coloring to Light Brown					
15		CL	Light Brown Sandy CLAY, moist, hard		21-3	50-6"		
			Boring Terminated @ 18' No Groundwater encountered					

Figure Number 23

LOG OF TEST BORING

BORING 22

Boring No: 22

Project No: WV545

Date Drilled: 10/6/00

Elevation: N/A

Logged by: DVC

Water Level: N/A

After: N/A

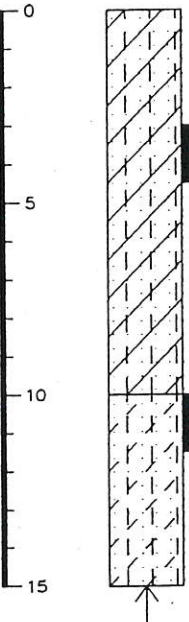
ELEV	SOIL SYMBOLS SAMPLER SYMBOLS	USCS	SOIL DESCRIPTION	REMARKS	Sample No.	Blows foot	Density Dry-pcf	Moisture Percent
DEPTH								
0		CL/ CH	Dark Brown Silty CLAY with some Sands, dry to moist, very stiff		22-1	12		
5								
10		SM/ SC	Dark Brown Clayey Silty SAND, dense, slightly moist		22-2	35	108.9	8.5
15			Boring Terminated @ 15' No Groundwater encountered					

Figure Number 24

LOG OF TEST BORING

BORING 23

Project No: VV545

Boring No: 23

Date Drilled: 10/6/00

Elevation: N/A

Logged by: DVC

Water Level: N/A

After: N/A

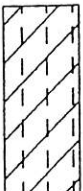
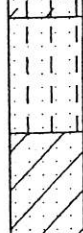
ELEV	SOIL SYMBOLS SAMPLER SYMBOLS	USCS	SOIL DESCRIPTION	REMARKS	Sample No.	Blows foot	Density Dry-pcf	Moisture Percent
DEPTH								
0		CL/ CH	Dark Brown Silty CLAY, dry to moist, stiff	Bulk Sample 0'-4'				
5		SM	Dark Brown Clayey Silty SAND slightly moist, medium dense	- #200 = 49%	23-1	10	93.8	12.6
10								
15		SM	Brown Silty SAND		23-2	17	102.7	5.5
20		CL	Medium Brown fine Sandy CLAY, very stiff, moist					
			Boring Terminated @ 20' No Groundwater encountered					

Figure Number 25

LOG OF TEST BORING

BORING 24

Boring No: 24

Project No: WV545

Date Drilled: 10/6/00

Elevation: N/A.

Logged by: DVC

Water Level: N/A

After: N/A

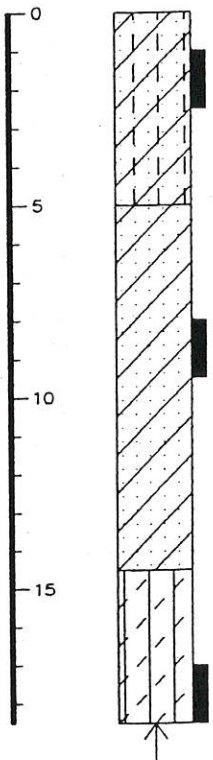
ELEV	SOIL SYMBOLS SAMPLER SYMBOLS	USCS	SOIL DESCRIPTION	REMARKS	Sample No.	Blows foot	Density Dry-pcf	Moisture Percent
DEPTH								
0		CL/CH	Brown Silty CLAY with Sands dry to moist, stiff		24-1	14		
5		CL	Light to Medium Brown Sandy CLAY, moist, stiff		24-2	25	95.6	9.0
10		ML	Medium Brown Clayey SILT, moist, very stiff		24-3	25	88.8	30.4
15			Boring Terminated @ 18.5' No Groundwater encountered					
				Qu = 3370psf - #200 = 85%				

Figure Number 26

LOG OF TEST BORING

BORING 25

Boring No: 25

Project No: VV545

Date Drilled: 10/6/00

Elevation: N/A

Logged by: DVC

Water Level: N/A

After: N/A

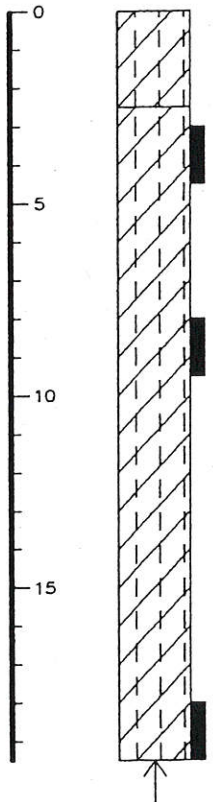
ELEV	SOIL SYMBOLS SAMPLER SYMBOLS	USCS	SOIL DESCRIPTION	REMARKS	Sample No.	Blows foot	Density Dry-pcf	Moisture Percent
DEPTH								
0		CH	Dark Brown Silty CLAY, dry to moist, stiff					
3		CH	Light Brown & Orange Silty CLAY, moist, hard with caliche seams	LL =59% PI =36	25-1	14	90.9	26.7
10					25-2	28	97.1	25.2
15		CL	Colors to Grayish Brown		25-3	30		
			Boring Terminated @ 19.5' No Groundwater encountered					

Figure Number 27

LOG OF TEST BORING

BORING 26

Boring No: 26

Project No: VV545

Date Drilled: 10/6/00

Elevation: N/A

Logged by: DVC

Water Level: N/A

After: N/A

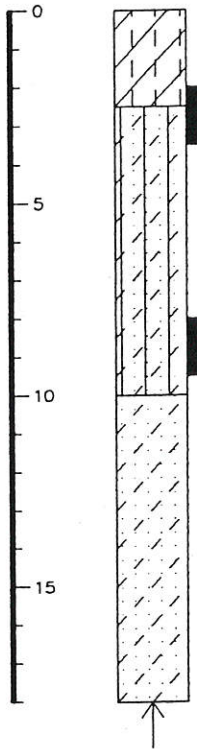
ELEV	SOIL SYMBOLS SAMPLER SYMBOLS	USCS	SOIL DESCRIPTION	REMARKS	Sample No.	Blows foot	Density Dry-pcf	Moisture Percent
DEPTH								
0		CL/ CH	Dark Brown Silty CLAY, dry to moist, stiff					
5		SC/ ML	Light to Medium Brown Clayey SILT/SAND, hard, moist		26-1	12		4.9
10		SC	Light to Medium Brown Clayey SAND, dense, moist		26-2	50-6"		
15								
			Boring Terminated @ 18' No Groundwater encountered					

Figure Number 28

LOG OF TEST BORING

BORING 27

Boring No: 27

Project No: VV545

Date Drilled: 10/6/00

Elevation: N/A

Logged by: DVC

Water Level: N/A

After: N/A

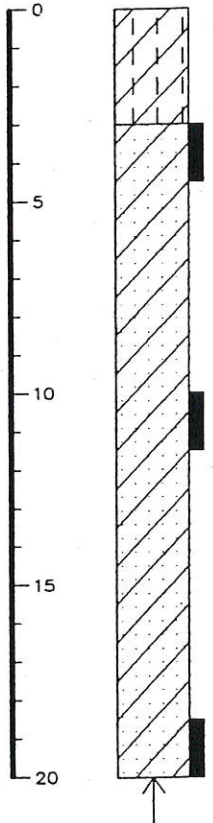
ELEV	SOIL SYMBOLS SAMPLER SYMBOLS	USCS	SOIL DESCRIPTION	REMARKS	Sample No.	Blows foot	Density Dry-pcf	Moisture Percent
DEPTH								
0		CL	Dark Brown Silty CLAY, dry to moist, stiff					
5		CL	Light Brown Sandy CLAY, moist, very stiff		27-1	9	97.1	10.7
10				- #200 = 79%	27-2	17	106.0	16.9
15			with isolated sand layers					
20			As Above		27-3	35		
			Boring Terminated @ 20' No Groundwater encountered					

Figure Number 29

LOG OF TEST BORING

BORING 28

Project No: VV545

Boring No: 28

Date Drilled: 10/6/00

Elevation: N/A

Logged by: DVC

Water Level: N/A

After: N/A

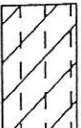
ELEV	SOIL SYMBOLS SAMPLER SYMBOLS	USCS	SOIL DESCRIPTION	REMARKS	Sample No.	Blows foot	Density Dry-pcf	Moisture Percent
DEPTH								
0		CL/ CH	Dark Brown Silty CLAY, dry to slightly moist, stiff					
5		SC	Light Brown Clayey SAND, very dense, mixed with some fine gravels		28-1	73		13.5
10		CL	Light to Medium Brown Sandy CLAY, hard, moist					
15					28-2	32	116.3	13.6
			Boring Terminated @ 15.5' No Groundwater encountered					

Figure Number 30

LOG OF TEST BORING

BORING 29

Project No: VV545

Boring No: 29

Date Drilled: 10/6/00

Elevation: N/A.

Logged by: DVC

Water Level: N/A

After: N/A

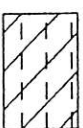
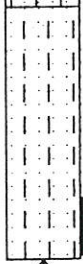
ELEV	SOIL SYMBOLS SAMPLER SYMBOLS	USCS	SOIL DESCRIPTION	REMARKS	Sample No.	Blows foot	Density Dry-pcf	Moisture Percent
DEPTH								
0		CL/ CH	Dark Brown Silty CLAY, dry to slightly moist, stiff					
5		ML	Light Brown Sandy SILT, hard, moist	- #200 = 62%	29-1	28	115.1	13.6
10		SW	Gray Silty SAND, fine to coarse grained, dense, moist					
15					29-2	77		4.0
				Boring Terminated @ 16.5' No Groundwater encountered				

Figure Number 31

LOG OF TEST BORING

BORING 30

Boring No: 30

Project No: W545

Date Drilled: 10/6/00

Elevation: N/A

Logged by: DVC

Water Level: N/A

After: N/A

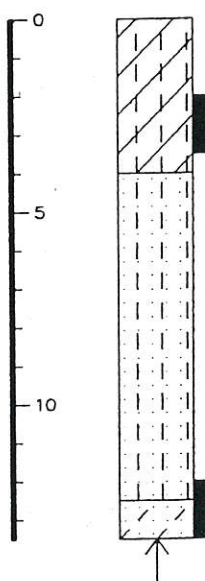
ELEV	SOIL SYMBOLS SAMPLER SYMBOLS	USCS	SOIL DESCRIPTION	REMARKS	Sample No.	Blows foot	Density Dry-pcf	Moisture Percent
DEPTH								
0		CL	Dark Brown Silty CLAY, dry to slightly moist, stiff	Qu = 1094psf	30-1	7	105.9	20.0
5		SW	Light Brown Silty SAND, fine to coarse grained, moist, medium dense to dense					
10		SC	Light Brown Clayey SAND, medium grained, moist, dense		30-2	31	94.3	10.0
		Boring Terminated @ 13.5' No Groundwater encountered						

Figure Number 32

LOG OF TEST BORING

BORING 31

Boring No: 31

Project No: WV545

Date Drilled: 10/11/00

Elevation: N/A

Logged by: DVC

Water Level: N/A

After: N/A

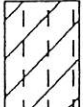
ELEV	SOIL SYMBOLS SAMPLER SYMBOLS	USCS	SOIL DESCRIPTION	REMARKS	Sample No.	Blows foot	Density Dry-pcf	Moisture Percent
DEPTH								
0		CL	Dark Brown Silty CLAY, dry to moist, stiff					
5		SC	Light Brown Clayey SAND, medium dense, slightly moist, with some gravels		31-1	11	92.8	11.8
10					31-2	13	88.8	13.3
15		SM/ SC	Light Brown Clayey Silty SAND, dense, moist					
20					31-3	47		
			Boring Terminated @ 21.5' No Groundwater encountered					

Figure Number 33

LOG OF TEST BORING

BORING 32

Boring No: 32

Project No: VV545

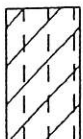
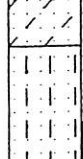
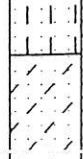
Date Drilled: 10/11/00

Elevation: N/A

Logged by: DVC

Water Level: N/A

After: N/A

ELEV	SOIL SYMBOLS SAMPLER SYMBOLS	USCS	SOIL DESCRIPTION	REMARKS	Sample No.	Blows foot	Density Dry-pcf	Moisture Percent
DEPTH								
0		CL/ CH	Brown Silty CLAY, moist, stiff					
5		CL	Light Brown Sandy CLAY, moist, dense, fine grained		32-1	47	114.7	11.3
10		SC	Light Brown Clayey SAND, dense, moist					
15				- #200 = 31.8%	32-2	40		
20		SM	Gray Brown Silty SAND, moist, medium dense, fine to medium grained	Perm = 3.4E-04 cm/sec	32-3B 32-3A	27	109.5	9.8
25								
30		SC	Light Brown Clayey SAND, moist, very dense					
								

Boring
Continues

Figure Number 34

LOG OF TEST BORING

BORING 32

Project No: VV545

Boring No: 32

Date Drilled: 10/11/00

Elevation: N/A

Logged by: DVC

Water Level: N/A

After: N/A

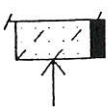
ELEV	SOIL SYMBOLS SAMPLER SYMBOLS	USCS	SOIL DESCRIPTION	REMARKS	Sample No.	Blows foot	Density Dry-pcf	Moisture Percent
DEPTH								
30			----- Boring Terminated @ 31' No Groundwater encountered		32-4	50-6"		

Figure Number 35

LOG OF TEST BORING

BORING 33

Project No: VV545

Boring No: 33

Date Drilled: 10/11/00

Elevation: N/A

Logged by: DVC

Water Level: N/A

After: N/A

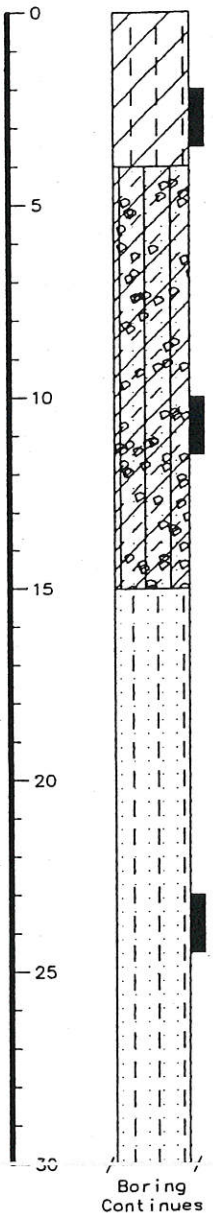
ELEV	SOIL SYMBOLS SAMPLER SYMBOLS	USCS	SOIL DESCRIPTION	REMARKS	Sample No.	Blows foot	Density Dry-pcf	Moisture Percent
DEPTH								
0		CL/ CH	Brown Silty CLAY, dry, stiff	Qu = 3415psf	33-1	8	94.8	11.0
5		ML/ SC	Tan to Light Brown Clayey SILT or Clayey SAND, moist, stiff, with some gravels, fine grained					
10					33-2	42		
15		SM	Light Brown Silty SAND, moist, dense to very dense, fine to coarse grained					
20								
25					33-3	50-6"		
30								
	Boring Continues							

Figure Number 36

LOG OF TEST BORING

BORING 33

Project No: WV545

Boring No: 33

Date Drilled: 10/11/00

Elevation: N/A

Logged by: DVC

Water Level: N/A

After: N/A

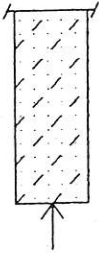
ELEV	SOIL SYMBOLS SAMPLER SYMBOLS	USCS	SOIL DESCRIPTION	REMARKS	Sample No.	Blows foot	Density Dry-pcf	Moisture Percent
DEPTH								
30		SC	Light Brown Clayey SAND, very dense, moist					
35			Boring Terminated @ 35' No Groundwater encountered					

Figure Number 37