DRAFT
ENVIRONMENTAL IMPACT REPORT

# Mountaingate

**Vesting Tentative Tract No. 53072**

# VOLUME II
## APPENDICES

Los Angeles City EIR 99-3251-SUB
**State Clearinghouse No.**

J U L Y  2 0 0 3

# DRAFT
# ENVIRONMENTAL IMPACT REPORT
# Mountaingate

**Vesting Tentative Tract No. 53072**

# VOLUME II
## APPENDICES
Volume II of III

Los Angeles City EIR 99-3251-SUB
**State Clearinghouse No.**

Lead Agency:

City of Los Angeles
Department of City Planning
Environmental Review Section
200 N. Spring Street, Suite 763
Los Angeles, California 90012

Applicant:

Castle & Cooke, Inc.
300 W. Potrero Road
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# X. APPENDICES

## Volume II of III

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2ND REVISED DETAIL VESTING TENTATIVE TRACT MAP NO. 53072
(SCALE OF 1 INCH = 100 FEET)
CITY OF LOS ANGELES, CALIFORNIA

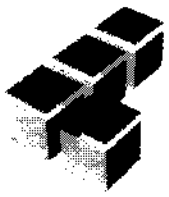
Prepared for:

**Castle & Cooke California, Inc.**
300 West Potrero Road
Thousand Oaks, California 91361

Volume 1 of 2

Project Number 030381-002

March 18, 2003



LEIGHTON AND ASSOCIATES, INC.
A LEIGHTON GROUP COMPANY

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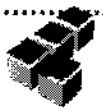

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Distribution: (2) Addressee
(1) Psomas
Attention: Mr. Jeff Ray
(1) Slosson and Associates
Attention: Mr. Thomas Slosson
(1) Mesa Contracting Corporation
Attention: Mr. Ron McAmis
(2) Impact Sciences
Attention: Mr. Tony Locacciato
(2) City of Los Angeles Department of Building and Safety, Grading Section
Attn: Mr. David Hsu

Leighton and Associates, Inc.
A LEIGHTON GROUP COMPANY

March 18, 2003

Project Number 030381-002

To: Castle & Cooke California, Inc.
300 West Potrero Road
Thousand Oaks, California 91361

Attention: Mr. Frans Bigelow

Subject: Geotechnical Investigation Report, 2nd Revised Detail Vesting Tentative Tract Map No. 53072 (Scale of 1 inch = 100 feet), City of Los Angeles, California.

In accordance with your request and authorization, Leighton and Associates, Inc., (Leighton) has conducted a geotechnical investigation and prepared a geotechnical investigation report for the residential development that is planned on Vesting Tentative Tract 53072 in the City of Los Angeles, California. Details of this investigation, together with our findings, conclusions and recommendations, are presented in the attached report.

This report supersedes the previous Leighton's report dated November 30, 2001, Project Number 030381-001, 3 Volumes (Leighton, 2001), previously submitted to the City of Los Angeles, Department of Building and Safety, Grading Division.

Thank you for this opportunity to be of service. Should you have any questions, please do not hesitate to contact this office.

Respectfully submitted,

LEIGHTON AND ASSOCIATES, INC.

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# 1. INTRODUCTION

This report presents the results of a geotechnical investigation performed by Leighton and Associates, Inc., (Leighton) for Vesting Tentative Tract 53072, a planned residential development in the Santa Monica Mountains, approximately 0.5 miles west of the I-405 Freeway, in the City of Los Angeles, California (Figure 1).

Leighton's work was based on the available 2nd Revised Detailed Vesting Tentative Tract Map No. 53072 prepared by Psomas, Inc., dated February 2003, at a scale of 1-inch equals 100 feet. This map was use as the base map for the attached Geotechnical Map, Plate 1.

The purpose of the geotechnical investigation was to evaluate geotechnical conditions at the site with respect to the planned development, and to provide preliminary geotechnical recommendations for design and construction.

## 2. SITE DESCRIPTION

The project site constitutes approximately 21 acres of predominantly undeveloped hillside terrain in the southeastern portion of the Santa Monica Mountains. Within this area, the proposed development is planned on two north/south-trending ridges that are separated by a canyon approximately 200 feet to 400 feet in depth. The west ridge will accommodate the southern extension of Canyonback Road; the east ridge will accommodate the southern extension of Stony Hill Drive. The ridges are bordered by steep (typically 1.5:1 horizontal: vertical; [h:v] and steeper) natural descending slopes.

The western and southern margins of the site are bounded by undeveloped terrain. The eastern margin of the site is bounded by the Mission Canyon landfills. The northern site boundary is bounded by an existing residential development.

Limited grading has occurred on the western ridge for an access road to a City of Los Angeles Department of Water and Power water tank (G. A. Nicholl and Associates, Inc., 1980b). In addition, a portion of a side-hill buttress fill was constructed at the northern perimeter of the project site, south of the existing Mountain Crest Lane (G. A. Nicholl and Associates, Inc., 1981b).

On the eastern ridge, grading occurred to generate fill materials for the now closed Mission Canyon landfills to the east and southeast of the site. The closest distance of the landfill to the planned development is approximately 100 feet at the southeastern margin of the proposed development. After the closure of the landfills, probes were installed on the eastern ridge of the project site (off-site from the landfill) to assess the potential migration of landfill gas to off-site locations (Geomatrix, 2000). The approximate locations of the probes are shown on the Geotechnical Map (Plate 1), of this report.

Two storm drains currently outlet on the site: a storm drain outlets on the descending natural slope to the south of the existing residential structures, southwest of the current terminus of the Stoney Hill Road. At this location, an erosional gully has been created. The second drain outlets on the west-facing natural slope on the north side of proposed Lot 15.

# 3. PLANNED DEVELOPMENT

## 3.1 General

The planned development will be located on two north/south-trending ridges, one of which extends from the current southern terminus of Canyonback Road and one which extends from the current southern terminus of Stoney Hill Drive (See Figure 1).

## 3.2 Streets and Lots

Based on our review of the 2nd Revised Detailed Vesting Tentative Tract Map No. 53072 (Psomas, 2003), the project site will be developed to accommodate twenty-nine residential lots (Lots 1 through 29) for single-family residential housing. Twenty-two single-family lots (Lots 1 to 22) are planned on the eastern ridge and seven single-family lots (Lots 23 to 29) are planned on the western ridge. The proposed infrastructure at the project site will consist of the southerly extensions of Canyonback and Stoney Hill Roads along the western and eastern ridges, respectively.

## 3.3 Slopes

Several internal cut slopes are designed in between many of the proposed lots at the project site. These slopes will range in height from approximately 10 feet to 20 feet and will have a gradient of approximately 2:1 (horizontal: vertical; h:v). The highest cut slopes are proposed on the western ridge. In this area, a 100± feet high slope of variable gradient (2:1 [h:v], and flatter) is located to the south of Lot 27. Another 80± feet high cut slope is designed at a 2:1 (h:v) gradient to descend to Lot 24.

There are two large designed fill slopes. An approximately 200-foot high, 2:1 (h:v) fill slope is designed to descend from Lots 15-21 on the eastern ridge, and an approximately 300-foot high, variable gradient (2:1 [h:v], and flatter), fill slope is designed to descend from Lots 23 and 26 on the western ridge.

The designed grading will leave a number of natural slopes that border the planned development. The highest natural slope is located at the southerly portion of the proposed development on the eastern ridge. This natural slope is approximately 475-foot high and will descend to the southwest from a non-structural pad located at the end of the proposed Stoney Hill Road extension. Other natural slopes that will remain on the eastern ridge include the east-facing descending slopes to the east from Lots 1 to 11. These natural slopes range in height from approximately 130 feet to 190 feet.

On the western ridge, the descending natural slopes to the west of the proposed development range in height from approximately 120 feet to 420 feet. The descending natural slope to the east of Lot 27 is approximately 150 feet high.

## 3.4 Cut and Fill

Designed grades will generally be achieved by cutting of the existing ridges. The deepest designed cut is approximately 80 feet on the western ridge, west of Lot 27; the deepest designed cut on the eastern ridge ranges from approximately 35 feet to 40 feet to create the pad of planned Lots 2 through 6.

Significant fills at the site are generally only planned to create two fill slopes. The thickest planned fill on the western ridge is approximately 65 feet under the fill slope that is planned to descend to the southeast from Lots 23 through 26. The thickest designed fill on the eastern ridge is approximately 80 feet under the proposed buttress fill slope that is planned to descend to the southwest from Lots 15 through 21.

## 3.5 Retaining Walls

Numerous retaining walls have been designed at the site both internally, and along, the perimeter of proposed development. Several internal retaining walls are proposed between Lots 1 through 6, Lots 8 through 11, Lots 12 through 16, Lots 18 through 22 and between Lots 24 and 25. Two other retaining walls are planned along the eastern and southeastern perimeters of Lot 23 and along the east side of the proposed extension of Canyonback Road, between Lots 23 and 24. In general, these planned retaining walls range in height from approximately 5 feet to 15 feet.

## 3.6 Detention Basin

A detention basin is proposed at the confluence of the toes of the two large fill slopes that descend from the eastern and western ridges.

## 4. BACKGROUND AND PURPOSE

The project site has been the subject of previous field investigations conducted by G. A. Nicholl and Associates, Inc., in connection with the previously planned larger development of Tentative Tract 44958, which encompassed the project site (1987a, b; 1988 a, b, c; 1989). Subsequently, the planned development was reduced in size to be similar to the currently proposed development. At that time, "Geotechnical Environmental Impact Reports" (EIR's) for the new development, Tentative Tract 52428, were prepared G. A. Nicholl and Associates, Inc., (1997; 1998a, b) which relied on the results generated by prior geotechnical reports for Tentative Tract 44958. Tentative Tract 52428 was then re-designated Tentative Tract 53072 and a new EIR was prepared G.A. Nicholl and Associates, Inc., (1999).

In response to its review of the 1999 report by G. A. Nicholl and Associates, Inc., the City of Los Angeles, Department of Building and Safety (2000) and the City of Los Angeles Department of Public Works (2001) requested that a complete geology and soils report be prepared for the planned development that demonstrates the stability of the proposed development.

The purpose of Leighton's subject investigation was to perform a specific geotechnical investigation for the planned development of Tentative Tract 53072 and develop preliminary geotechnical recommendations and design remedial measures for site stability.

## 5. SCOPE OF WORK

Leighton executed the following scope of work:

- Reviewed readily available pertinent published geologic maps and reports from our in-house library (see Appendix a);
- Reviewed available geotechnical reports prepared by G. A. Nicholl and Associates, Inc. and others for the project site and adjacent areas (see Appendix A);
- Reviewed pertinent aerial photographs available in our in-house library;
- Reviewed the files of the City of Los Angeles for other pertinent geotechnical reports and other pertinent documents for the site;
- Participated in three meetings with the City of Los Angeles Department of Building and Safety to discuss the planned development;
- Contacted other geotechnical consultants for sites near the project site, and personnel from the State of California, California Geological Survey (formerly the Department of Conservation, Division of Mines and Geology) in order to obtain and review information that could be directly applied to the planned development;
- Performed geologic mapping the site;
- Staked the proposed boring locations and obtained subsurface utility clearance from Underground Services Alert;
- Excavated, sampled and logged twenty-one bucket-auger borings to depths ranging from 15 feet to 100 feet below the existing ground surface;
- Down-hole logged each bucket-auger boring;
- Selected soil samples considered representative of the subsurface materials at the site for laboratory testing purposes;
- Assigned and conducted laboratory tests on selected samples to determine moisture content / in-situ dry density, maximum dry density / moisture content, expansion index, direct shear, gradation, and Atterberg limits;
- Coordinated and directed two geophysical seismic refraction surveys at the site to assess the rippability of the bedrock and further characterized the existing landslides impacting the project site;

- Conducted a deterministic and probabilistic seismic hazard analysis for the site;
- Collated data and performed geotechnical analyses using the field and laboratory data to evaluate geotechnical conditions that may impact the proposed development; and,
- Prepared this report that presents our findings, conclusions and geotechnical recommendations regarding the planned site development.

## 6. FIELD INVESTIGATION

A subsurface field exploration was performed at the site by Leighton between March 12, 2001 and August 1, 2002. Twenty-one bucket-auger borings were excavated, sampled, and down-hole logged. Previous subsurface field investigations had also been performed by G. A. Nicholl and Associates, Inc., between 1985 and 1988 which consisted of 19 bucket-auger borings, 6 test pits, and one dozer trench (see Appendix A). The locations of Leighton's borings and G. A. Nicholl and Associates, Inc.'s exploratory excavations are shown on the Geotechnical Map (Plate 1)

In addition, SubSurface Surveys conducted two geophysical seismic refraction surveys at the site under the direction of Leighton between May 2001 and August 2002 (SubSurface Surveys, 2001 and 2002). The first geophysical survey was intended to assess the rippability of the bedrock at the site. The second geophysical survey was aimed to provide further subsurface characterization of the existing landslides. The approximate locations of the geophysical survey lines are shown on the Geotechnical Map (Plate 1). The geophysical reports prepared by SubSurface Surveys, which include the results of the geophysical seismic refraction surveys and seismic refraction plots, and Leighton's geological interpretations of the seismic refraction plots are included in Appendix C.

## 7. LABORATORY TESTING

Based on subsurface conditions observed at the locations of Leighton's borings, selected samples of subsurface materials were tested in the laboratory to determine relevant engineering properties. Tests that were performed, descriptions of the test procedures, and the test results are provided in Appendix D. The test results of other consultant's laboratory testing programs are also included in Appendix D.

# 8. GEOLOGIC CONDITIONS

## 8.1 Physiography

The project site is located in the southeastern portion of the Santa Monica Mountains, within the Transverse Ranges Geomorphic Province (Figure 1). The site consists of two prominent north/south-trending ridge lines and an intervening canyon that drains to the south. In general, the site has very steep natural slopes and deeply incised canyons.

The topography of the site ranges from approximately 1,090 feet above mean sea level (msl) in the southeastern portion of the site, to approximately 1,695 feet above msl in the southwestern portion of the site (Plate 1, Geotechnical Map).

## 8.2 Site Geology

The bedrock formations at the site include the Jurassic-age Santa Monica Slate Formation and the Miocene-age Modelo Formation. The surficial earth units at the site consist of artificial fill (certified and uncertified), colluvium, alluvium, and slump and landslide deposits.

The surface and subsurface extent of the bedrock units, the artificial fill, and the slump and landslide deposits are shown on the Geotechnical Map (Plate 1) and on the Geotechnical Cross-Sections A-A' through X-X', BB-BB', DD-DD', LL-LL', and UU-UU' (Plates 2 through 4).

Brief descriptions of each of the earth units that were encountered at the site are as follows:

- **Artificial Fill ($Af_L$)**: Uncertified artificial fill including landfill materials exists to the east of proposed Lots 1 through 10 and is associated with the now closed Mission Canyon Landfills (Plate 1).

- **Certified Artificial Fill ($Af_C$)**: Certified artificial fill was placed adjacent to, and near, the existing water tank on the western ridge. A 20-foot high landscape fill was constructed on the southwestern side of the tank pad, and a 17-foot deep shear key was constructed across the access road, approximately 200 feet north of the tank, to stabilize the upper portion of slump deposit (Qs). Another area of certified artificial is located in the northern perimeter of the project site, south of the existing Mountain Crest Lane. In this area, a side-hill shear key and fill were constructed to mitigate stability concerns related to Landslide Qls-7 on the existing off-site residential development to the north. These two fill areas and associated earthwork construction were observed and documented by G. A. Nicholl and Associates, Inc., (1981a and 1981b).

- **Colluvium (Qcol)**: Although not delineated on the Geotechnical Map (Plate 1), colluvial deposits are present on the site. They consist of thin, loose soil accumulations on slope flanks. This material is comprised of loose mixtures of silty clay, clayey silt, and silty sand with gravel and cobbles.

- **Alluvium (Qal)**: Alluvial deposits at the site were not explored during our investigation due to the very steep terrain to get to the canyon bottoms. The existing canyons are narrowed with steep canyon walls. During our site reconnaissance, localized areas with bedrock outcrops were observed at the canyon bottoms, suggesting a predominant erosional environment rather than a depositional environment. Based on our surface field observations, it is anticipated that thickness of the alluvium could range between 5 to 15 feet, with the thickest alluvium being at the intersection of the two existing drainages (in the general area of the proposed desilting basin).

- **Slump Deposits (Qs)**: A slump deposit is mapped to the south of the proposed development on the western ridge, in the vicinity of the existing water tank. G. A. Nicholl and Associates, Inc.'s Borings B-12 and B-13 were drilled in the upper portion of this feature (1987b) and encountered 13 feet and 5 feet (respectively) of slump material overlying undisturbed bedrock. The slump materials observed in these two borings consisted of disturbed slate with open and clay infilled fractures and highly fractured zones.

- **Slump Deposit? (Qs?) /Landslide Deposit? (Qls-?)**: A questionable slump/landslide deposit is mapped on the west-facing natural slope, generally between proposed Lot 22 and the existing residential structures at the existing terminus of the Stoney Hill Road on the eastern ridge. This feature was previously mapped as slump by G. A. Nicholl and Associates, Inc. (1987b). However, the materials observed in Boring B-1-03 drilled in the upper portion of this featured by G. A. Nicholl and Associates, Inc., were described as "Landslide Materials" in the upper 7.5 feet of this boring. Therefore, to clarify this inconsistency, three additional borings were drilled within this feature (Borings LB-13, LB-16, and LB-17). In these three borings, a much thicker zone of disturbed slate (generally moderately to highly fractured with open fractures up to 2- to 3-inches wide and approximately 2 feet deep) were observed in the upper 15.5 feet, 38 feet, and 23 feet, respectively. However, no distinct failure surfaces were observed at the respective depths in these borings; rather, a transitional interval was observed between the fractured slate above and a significantly more coherent slate (i.e., massive, hard, and much less fractured slate rock) below.

In addition to these three borings, two seismic refraction survey lines (SL-4 and SL-5) were performed across the width and the length of this feature to further characterized its subsurface conditions (SubSurface Surveys, 2002). In general, the results appear to indicate a relatively irregular thickness of this feature that pinches in and out laterally as compared with better defined slide surface signature obtained from the seismic lines that transected the existing landslides (Qls-1, through Qls-4), located on the western ridge. In addition, the topography in this area lacks typical geomorphic indicators of a landslide (such as bulging or hummocky topography); rather, the topography is hollowed with steep slopes (at approximate slope gradients of 1:1 / h:v), suggesting relatively higher rates of erosion than the adjacent slopes to the north and south of this area. Based on our field and down-hole observations, and the results of the seismic refraction surveys conducted within this feature, the materials observed in within this feature appear to be disturbed by down slope bedrock creep rather than by landsliding. However, because of the thickness observed within this feature, averaging between 20 to 30 feet, this feature appears to be too thick to define it as a slump. Hence, our interpretations in calling this feature a questionable slump/landslide deposit. However, in the slope stability analyses for this natural slope, this feature was treated as a landslide for conservative purposes (see Section 10.6 for additional discussion).

- **Landslides (Qls):** Nine landslides (Qls-1 through Qls-9) have been mapped at the project site. The majority of these landslides occur on the west-facing slopes and appear to have been facilitated by the pervasive, westerly-dipping foliation and clay seams in the Santa Monica Slate Formation bedrock.

  - Landslide Qls-1 is located in the vicinity of the northwestern perimeter of the proposed development at the site. This landslide descends to the west-northwest of Lot 29. Leighton's Boring LB-7 was drilled in the upper portion of this feature and it encountered approximately 20 feet of landslide materials overlying undisturbed Santa Monica Slate Formation bedrock. However, this landslide could reach as much as 30 feet in thickness as shown on Cross-Section A-A' (Plate 2).

Landslide Qls-2 and its subsidiary Landslide Qls-2a are located in the vicinity of the western-northwestern perimeter of the proposed development, northwest of Lot 28. These two landslides appear to be the northern most landslides of a much larger landslide complex mapped in these area, which includes Landslides Qls-3, Qls-3a, and Qls-4 (see Plate 1, Geotechnical Map). Three G. A. Nicholl and Associates, Inc.'s borings (B-5, B-10 and B-14) were drilled in the upper portion of Landslide Qls-2 and encountered approximately 19 feet, 56 feet and possibly 11 feet of landslide materials (respectively). Leighton's Boring LB-19, drilled within the upper portion of Landslide Qls-2a, encountered approximately 46 feet of landslide materials associated with Qls-2a and approximately 10 feet of landslide materials associated with Qls-2. The basal rupture surfaces of these two landslides consist of a well-developed, medium to dark gray clay. The rupture surfaces ranged in thickness between ¼-inch and 2-inches thick and were logged as moist, firm to stiff, with polished surfaces. The subsurface configuration of these landslides is shown on Cross-Sections B-B', BB-BB', and C-C' (Plate 2).

Landslide Qls-3 and its subsidiary Landslide Qls-3 are located to the west of Lot 28 and to the south of, and adjacent to, Landslides Qls-2 and Qls-2a at the western perimeter of the proposed development. The general area of Qls-3 was previously mapped as slump deposits by G. A. Nicholl and Associates, Inc., as also described in the log of Boring B-11 drilled within this feature. Leighton drilled three additional borings (LB-10, LB-11, and LB-18) to further characterize this slump feature. Borings LB-10, LB-11, and LB-18 encountered approximately 22 feet, 68 feet and 12 feet (respectively) of landslide materials overlying undisturbed Santa Monica Slate Formation bedrock. The basal rupture surface observed in Borings LB-10 and LB-11 at 22 feet and 67.8 feet below the ground surface consisted of 1/8-inch and 2- to 3-inches thick clay and gravelly clay, respectively. Boring LB-18 could not be advanced below the slide due to very hard conditions and auger refusal encountered during the drilling.

Boring LB-20 was drilled in the upper portion of Landslide Qls-3a and approximately 62 feet (total depth of the boring) of landslide, materials were observed in this boring. This boring could not be advanced below the slide materials due to the drill depth limitations of the limited access rig used to excavate this boring.

The subsurface configuration of these landslides is shown on Cross-Sections D-D', DD-DD', and W-W' (Plates 2 and 4).

- Landslide Qls-4 is located approximately 200 feet to the west of the proposed development and to the south of, and adjacent to, Landslides Qls-3 and Qls-3a. Leighton's Boring LB-9 was drilled in the upper portion of this landslide and approximately 26 feet of landslide materials were observed in this boring. The basal rupture surface of Landslide Qls-4 consists of a ½-inch thick clay that was logged as moist and firm to stiff. The subsurface configuration of this landslide is shown on Cross-Sections L-L' and LL-LL' (Plate 3).

- Landslide Qls-5 is located to the southeast of Lots 26 and 27 at the western portion of the site. This landslide has not been explored by drilling. Its estimated subsurface configuration is shown on Cross-Section F-F' (Plate 2).

- Landslide Qls-6 is located to the southeast of Lot 23 at the western portion of the site. Leighton's Boring LB-12 was drilled in the upper portion of this landslide and encountered approximately 44 feet of landslide materials overlying undisturbed Santa Monica Slate Formation bedrock. The basal rupture surface of Landslide Qls-6 consists of a ¼- to ½-inch thick olive gray and well-developed clay. The subsurface configuration of this landslide is shown on Cross-Section F-F' (Plate 2).

- Landslide Qls-7 descends to the south on the northern margin of the tract, south of the existing Mountain Crest Lane, and does not impact the planned development. Three borings have been previously drilled in this landslide (DH-1, DH-2 and DH-3 by Geotechnical Associates, in 1979, as referenced by G. A. Nicholl and Associates, Inc., 1987b) although these borings were not located for review during this study. The northern portion of the landslide was stabilized with a shear key and fill during grading for the off-site development (G. A. Nicholl and Associates, Inc., 1981b). The subsurface configuration of this landslide is shown on Cross-Section T-T' (Plate 4)

- Landslide Qls-8 descends to the west on the west flank of the eastern ridge and underlies portions of the proposed Lots 17 through 20. Boring B-5-03, drilled near the upper portion of this landslide, encountered approximately 18 feet of landslide materials overlying undisturbed Santa Monica Slate Formation bedrock. Boring B-2 drilled down-slope of Boring B-5-03, encountered at least 96 feet of landslide material. Undisturbed bedrock was not encountered. (G. A. Nicholl and Associates, Inc., 1987b). Leighton's Borings LB-14 and LB-15 encountered approximately 67 and 78 feet of landslide materials (respectively) overlying undisturbed Santa Monica Slate Formation bedrock. The basal rupture surface of Landslide Qls-8 consists of a 1- to 3-inch thick dark gray and well-developed gravelly clay that was logged as moist, firm to stiff, and moderately plastic. The subsurface configuration of this landslide is shown on Cross-Sections H-H' and N-N' (Plate 3)

- Landslide Qls-9 is located to the south of, and adjacent to, Landslide Qls-8, and it underlies portions of the proposed Lots 15, 16, and a small portion of Lot 14. Boring LB-2 encountered 39 feet of landslide materials overlying undisturbed Santa Monica Slate Formation bedrock. The basal rupture surface of Landslide Qls-9 consists of a 4- to 8-inch thick dark gray and orange brown silty clay that was logged as wet, firm, and plastic. The subsurface configuration of this landslide is shown on Cross-Section Q-Q' (Plate 4).

- **Modelo Formation (Tm)**: The Modelo Formation bedrock caps much of the western ridge. The bedrock units of the Modelo Formation, as observed on the outcrops and in the exploratory excavations, consist of weakly to well cemented, hard to very hard, massively bedded, fine- to medium-grained sandstones and silty sandstones, with thinly bedded siltstones and clayey siltstones, with localized claystone interbeds.

- **Santa Monica Slate (Jsm)**: The Santa Monica Slate Formation bedrock is stratigraphically the lowest and oldest unit that is exposed, and predominantly underlies the majority of the project site. This bedrock formation generally consists of medium to dark gray slate and phyllite. The unit varies from strongly foliated (due to remnant bedding and a preferred orientation of platy micaceous minerals) to weakly foliated and massive in appearance. As noted by G. A. Nicholl and Associates, Inc., (1987b), and as confirmed during this study, foliations are characteristically pervasive throughout the formation, but are not generally continuous planes. The Santa Monica Slate Formation was logged as hard to very hard with localized shearing and irregular quartzite veins sub-parallel to, and/or crosscutting, primary foliation structure. The formation was observed jointed and fractured, and weathers to dark orange-brown silt and clay along fractures and faults.

## 8.3 Ground Water

Regional ground water was not encountered during Leighton's field investigation, or during previous field investigations performed by others (G. A. Nicholl and Associates, Inc., 1987b). However, minor water seeps were encountered in G. A. Nicholl and Associates, Inc.'s Borings B-3 at 59 feet below the ground surface (bgs) and B-2-3 at 9 feet bgs; and in Leighton's Borings LB-3 at 79.5 feet bgs, LB-7 at 83 feet bgs, LB-11 at 65 feet bgs, LB-14 at several depths between 43 feet and 80 feet bgs, and in Boring LB-17 at 62 feet and 63 feet bgs. Heavy seepage was observed at the bottom of Boring LB-17 and the water level surface rose to 66 feet bgs.

No surface water was observed at the bottom of the deeply incised canyons during our field mapping at the site. However, relatively dense hydrophilic vegetation was observed along the canyon bottoms and it is expected that perched ground water of limited extent will be encountered during grading in these canyons.

## 8.4 Structure

In general, bedding of the Modelo Formation strikes northeast, and dips to the southeast at angles typically ranging from 6° to 27°. Foliation within the Santa Monica Slate Formation is generally irregular in orientation and extent, although predominantly tends to strike north-south and dip to the west at angles varying from 8° to 45°, with localized steeper dip angles. Jointing / fracturing in both the Modelo Formation and the Santa Monica Slate Formation tends to be very steeply dipping, or near vertical.

In order to properly depict bedrock attitudes in the Modelo Formation, foliations in the Santa Monica slate (which include the shears that were generally observed along foliation planes), and joints/fractures in both bedrock types, stereonet analyses were performed using the available structural data obtained from the borings and field mapping at the site. The results of our stereonet analyses were used to depict the representative dip angles of bedding, foliation, and fractures on the attached Geotechnical Cross-Sections (Plates 2 through 4).

## 8.5 Faulting

G.A Nicholl and Associates (1987b) has mapped several near-vertical faults that trend northeast southwest across the site, each with a normal sense of movement. The faults are presumably secondary features associated with regional folding of the Santa Monica Mountains and do not give any indication of being active. One of the faults was encountered in field exploration at the site (Test Pit T-5 of G. A. Nicholl, 1987b); the fault plane did not displace the overlying colluvium. This fault was also exposed on temporary cut made to gain access to Boring LB-12. At this location, this fault did not displace the overlaying colluvium.

The site does not lie within an Alquist-Priolo Earthquake Fault Zone and does not lie on-trend with any such zone.

# 9. SEISMIC HAZARD ASSESSMENT

## 9.1 General

A deterministic seismic hazard assessment was performed for the planned construction in accordance with State of California Guidelines (California Division of Mines and Geology, 1975; 1986a,b). Two locations were selected at the site: 34.1050°N latitude, 118.5073°W longitude to represent the western ridge, and 34.1024°N latitude, 118.5115°W longitude, to represent the eastern ridge given the two different bedrock types that outcrop under the planned pads of each ridge. Seismic hazard was then assessed with respect to each of the ridges at the site.

The subsurface conditions investigated and tested by this office, coupled with data gathered by Subsurface Surveys (2001) (principally, the bedrock shear wave velocities at the site) were used to derive the appropriate site classifications for use in each attenuation relationship when deriving estimated site ground motions (see following sections).

## 9.2 Faulting

The site lies within the western portion of the Transverse Ranges Geomorphic Province, which is characterized by west-trending compressional (thrust and reverse) faults and mountain ranges, and terminates at the Peninsular Ranges Geomorphic Province to the south.

Faults within California are classified as active, potentially active, or inactive. An active fault is classified as one that has moved in Holocene time (the last 11,000 years). A fault that has moved during the last 1.6 to 2 million years (Pleistocene time), but has not been proven by direct evidence to have either moved, or not moved within the last 11,000 years is considered to be potentially active. Any fault proven to be older than 11,000 years are classified as inactive. Alquist-Priolo Earthquake Fault Zone Maps delineate active faults and potentially active faults that are considered by the State Geologist to be "sufficiently active" and "well-defined" and require additional studies prior to construction with the Earthquake Fault zone. The site is not located in an Alquist-Priolo Earthquake Fault Zone.

A search was made for all of the known active and potentially active faults within a 62-mile (100-km) radius of the site using the computer program EQFAULT (Blake 2000a), which contains a database of faults compiled jointly by the California Division of Mines and Geology, and the United States Geological Survey. The results of the search are provided in Appendix F. The results indicate that the closest active fault to the site is the Santa Monica Fault approximately 2.1 miles to the south.

## 9.3 Historic Seismicity

In order to tabulate significant historic earthquakes that could have impacted the site within a radius of 62 miles (100 km), the computer program EQSEARCH (Blake 2000a) was used.

Based on the results of EQSEARCH, the largest magnitude earthquake to have occurred was the 1952, M=7.7, Arvin-Tehachapi Earthquake, the epicenter of which was located approximately 68.9 miles northeast of the site.

In order to estimate the maximum historic peak horizontal ground acceleration (PHGA) that could have been recorded at the site, the attenuation relationship of Boore, et al., (1997) was used, because this relationship tends to produce higher values than those of other relationships. The results suggest that PHGA is of 0.245g and 0.185g (for the west and east ridges, respectively) is the maximum that could have been historically induced at the site.

## 9.4 Peak Horizontal Ground Acceleration

The current edition of the Uniform Building Code (UBC 1997) states that the minimum standard for design of structures is a ground motion that has a 10% chance of exceedance in a 50-year time period, i.e. a ground motion that has a 475-year average return period. In order to estimate this ground motion, a probabilistic seismic hazard analysis (PSHA) was performed for the site using the computer program FRISKSP (Blake, 2000b).

The PSHA considered various magnitudes of earthquakes that major active or potentially active faults within a 100-km radius of the site could produce along their respective fault lengths. The fault parameters that were used were derived jointly by the California Division of Mines and Geology and the United States Geological Survey (Petersen, et al., 1996), and are recommended for use by UBC 1997.

In order to assess the ground motion that could be induced at the site, the attenuation relationships of Boore, et al. (1997), Campbell and Bozorgnia (1997), Sadigh, et al. (1997), and Abrahamson and Silva (1997) were used. An attenuation relationship assesses how the amplitudes of ground motions decrease with distance from the source that generates the motions (i.e. an earthquake produced by a fault). Attenuation relationships are commonly derived from data from similar earthquake types and in similar geographic locales.

Ground motions were estimated with and without magnitude weighting during the analyses. Magnitude-weighting was used to adjust the analysis for the different durations of shaking that could occur at the site due to relatively minor earthquakes, as compared with major earthquakes; a magnitude-weighting factor of 1.0 for earthquakes of M=7.5 was used. This means that, in the PSHA, magnitudes of M=7.5 were weighted at 1.0, with lower magnitudes being weighted less than 1 (because of their shorter durations and lesser potential impact to the site), and magnitudes higher than M=7.5 being weighted greater than 1 (because of their longer durations and greater potential impact to the site).

The results that were derived from the use of the attenuation relationships were summed and averaged in order to estimate appropriate ground motions for use in design. The results of the PSHA are presented graphically in Appendix F. The following table summarizes the suggested peak horizontal ground acceleration (PHGA) values for the project site.

**TABLE 1**

**SUMMARY OF PEAK HORIZONTAL GROUND ACCELERATION**

| Attenuation Relationship | PHGA that has a 10% Chance of Exceedance in 50 Years | | | |
|---|---|---|---|---|
| | Non-Magnitude-Weighted PHGA | | Magnitude-Weighted PHGA | |
| | WEST RIDGE | EAST RIDGE | WEST RIDGE | EAST RIDGE |
| Boore et al (1997) | 0.452 | 0.351 | 0.352 | 0.255 |
| Campbell and Bozorgnia (1997) | 0.55 | 0.455 | 0.40 | 0.35 |
| Sadigh, et al. (1997) | 0.505 | 0.505 | 0.357 | 0.357 |
| Abrahamson and Silva (1997) | 0.652 | 0.655 | 0.455 | 0.458 |
| Recommended Average Estimated PHGA | 0.54 | 0.49 | 0.39 | 0.36 |

The magnitude-weighted values are appropriate for use in liquefaction analyses and certain types of landslide-displacement studies. The non-magnitude-weighted PHGA values are essentially used in all other cases.

The estimated PHGA's are appropriate for use during residential construction at the project site; they are not appropriate for use in the design of "critical" facilities such as, but not limited to, schools, hospitals, and water tanks.

# 10. FINDINGS; DISCUSSION; CONCLUSIONS

## 10.1 General

Based on our investigations and reviews of previous geotechnical investigations provided, we believe that the proposed site can be developed for its intended use provided the recommendations presented in this report are fully implemented in the design and construction of the proposed development. In our opinion, the proposed earthwork construction for the subject site will not adversely affect adjoining property, and will not be adversely affected by adjoining property, with all due and responsible precautions being taken, and will be safe from landslide, settlement, and/or slippage. Grading will not adversely affect the stability of off-site development.

## 10.2 Earth Materials

The onsite bedrock units encountered at the site consist of the Modelo Formation and the Santa Monica Slate Formation; these bedrock units will be exposed at the proposed pad grades. No existing fills are located in the proposed pad areas. Nine landslides, one slump deposit, and a suspected slump/landslide deposit have been mapped at the project site. The majority of these surficial features are adjacent to the proposed development. Limited amounts of alluvial materials are anticipated to be encountered at the bottom of the canyons located between the two development areas (western and eastern ridges). The existing alluvial, landslide and slump materials at the site are considered unsuitable for support of additional fill or structures and should be removed or mitigated.

The approximate extent of the existing earth materials onsite is shown on the attached Geotechnical Map, Plate 1.

## 10.3 Expansivity

Expansion potential testing was previously performed by others (G. A. Nicholl 1980c, 1980d, 1981a) on materials encountered in adjacent areas to the site. These test results indicate that the soils have a low to medium expansion potential. Confirmation testing should be performed on finish grade materials at the end of grading. For preliminary foundation design, we suggest assuming a Medium Expansion Index (EI in the 51-90 range).

## 10.4 Sulfate Content and Corrosion Potential

The National Association of Corrosion Engineers defines corrosion as, "a deterioration of a substance or its properties because of a reaction with its environment." From a geotechnical viewpoint, the "environment" is the prevailing foundation soils and the "substances" are reinforced concrete foundations or various types of metallic buried elements such as piles, pipes, etc., which are in contact with or within close vicinity of the soil. Tests previously performed, by others, on similar materials resulted in negligible to moderate soluble sulfate contents. Additional testing of the onsite materials should be performed at the completion of rough grading to verify this conclusion. Additional corrosion testing should be performed at the completion of rough grading and appropriate recommendations should be developed by a corrosion specialist as necessary.

## 10.5 Earthquake-Induced Soil Liquefaction and Settlement

Most of the site is underlain by bedrock. All existing alluvial/colluvial deposits within the canyons between the proposed development area should be removed (overexcavated) to competent native materials. Therefore, after those removals are performed the potential for liquefaction and related hazards at the site are expected to be low.

## 10.6 Earthquake-Induced Landslides

The site is located within an Earthquake Induced Landslide Seismic Hazards Zone (State of California, 1998b); the natural slopes are depicted as being susceptible to seismically induced landslides. However, based on our results of our slope stability analyses and the implementation of the recommended mitigation alternatives to meet the seismic code requirements, the potential for seismically induced landslide at the site is considered to be low.

## 10.7 Slope Stability

### 10.7.1 General

The proposed development at the site involves existing natural slopes and various-height cut and fill slopes at a gradient of 2:1 (h:v), or flatter. The site consists of nine landslides and two slumps generally located on the west-facing natural slopes. Slope stability analyses were performed on the existing natural slopes and the proposed manufactured slopes to evaluate the slope stability factors of safety for translational and rotational modes of failure. Geotechnical recommendations for mitigation measures were evaluated and recommended when the required factor of safety (1.5 and 1.1 for static and seismic loading conditions respectively) per the current City of Los Angeles building standards was not achieved.

The attached Appendix E includes more detailed information about shear strength parameters, as well as the methodology and assumptions used in the slope stability analyses. Slope stability analyses results and documentation are also included in Appendix E.

### 10.7.2 Cut and Fill Slopes

Cut slopes are planned between and on the boundary of some of the lots on the site. These slopes will range in height from 10 feet to 20 feet and will have a gradient of approximately 2:1 (horizontal:vertical; h:v). A cut slope up to approximately 75 feet in height is planned to descend at a 2:1 (h:v) gradient to Lot 24 on the western ridge.

Slope stability analyses of the proposed cut slopes considered the prevailing geologic conditions. The cut slopes (refer to Cross Sections P-P' and G-G') exhibit into-slope (favorable) bedding and, for the geologic conditions encountered, are inherently stable.

Two large fill slopes are planned. An approximately 210-foot high, 2:1 (h:v) fill slope is planned to descend from Lots 15 through 21 on the eastern ridge to the canyon below, and an approximately 290-foot high, variable gradient (2:1 [h:v], and shallower), fill slope is planned to descend from Lots 23 through 26 on the western ridge to the canyon below. Based on our stability analysis, proposed fill slopes are grossly stable as designed.

Surficial stability of the manufactured slopes at the site was evaluated assuming that seepage is parallel to the slope face. Shear strength parameters used in the surficial slope stability analyses were based on direct shear tests performed on remolded samples of on-site materials. Factors of safety greater than 1.5 were obtained. The stability analyses indicate that the on-site materials are adequate to achieve the required factor of safety.

### 10.7.3 Natural Slopes / Setback Zones

The planned grading will leave a number of slopes that border the planned development ungraded. The highest of these is an approximately 400-foot high natural slope on the eastern ridge that will descend to the southwest from Lots 11 and 12. Other natural slopes that will remain on the eastern ridge include an approximately 180-foot high natural slope that will descend from Lots 22, and natural slopes ranging in height from approximately 130 feet to 190 feet in height that will descend to the east from Lots 1 to 10.

On the western ridge, natural slopes will descend to the west from Lots 28 and 29 and will range in height from approximately 100 feet to 350 feet.

West-facing slopes are more prone to landslides than east-facing slopes because of localized out-of-slope-dipping foliation planes in the Santa Monica Slate Formation.

Slope stability analyses of the natural slopes that may impact the proposed development at locations of landslides, slumps and steeper slopes were evaluated for rotational and translational type of failures. Results of the slope stability analyses indicate where a

setback zone or remedial mitigation is necessary, as depicted on Plate 1. Setback lines were developed for the west-facing slopes. No inhabited structures should be located within the setback zone. Cross-sections M-M', N-N', H-H', I-I' and O-O' were analyzed to evaluate the slope descending off-site to the existing golf course; results of the analyses of these five sections indicate that this slope has a factor of safety of 1.5 or greater, and is considered to be grossly and surficially stable.

### 10.7.4 Landslide / Slump Mitigation Measures

In general, Lots 1 through 21, 23 through 27, the fire access road, and maintenance road to the existing tank site are all designed to be located beyond the slope stability analysis-developed setback line (Factor of Safety of 1.5 line); Lots 22, a portion of 21, 28 and 29 are proposed to be supported by caissons along the rear of the lots (outside the slump and landslide areas); Qls-6, Qls-8 and Qls-9, which affect Lots 14 through 21, are to be completely removed and replaced with a variable width keyway up to a maximum of approximately 100 feet wide by 5-foot deep (into competent material) keyway and rebuilt with a manufactured 2H:1V slope. Landslide Qls-6 should be removed prior to placement of fill for the proposed fill slope to the southeast of proposed Lots 23 through 25.

The following table lists the landslides and slumps, the associated cross-sections, the affected lots, and the recommended mitigation measures. The recommendations for the design keyway and design parameters for the caissons are provided in the following sections of this report.

**TABLE 2**

**SUMMARY OF LANDSLIDES &**
**SLUMPS & RECOMMENDED MITIGATION MEASURES**

| Landslide(Qls) /Slump (Qs) | Cross-Sections | Affected Lots | Recommended Mitigation Measures |
|---|---|---|---|
| Qls-1 | A-A' | 29 | Caissons required at rear of lot, outside the landslide limit to support 20 feet of material from the design grade to the failure surface. |
| Qls-2/2a | B-B' , C-C', BB-BB' | 24-28, Canyon Back Rd. | Setback line developed. Lots and road designed to be beyond the slope-stability-analysis-developed setback line. Caissons designed at rear of Lot 28 and adjacent to road, to support 40 feet of material from the design grade to the failure surface. Lots are planned outside the landslide limits. No grading within landslides. |
| Qls-3/3a | D-D', W-W', and DD-DD' | 24-28, Canyon Back Rd. | Setback line developed. Lots and road designed to be beyond the slope-stability-analysis-developed setback line. Caissons designed at rear of Lot 28 and adjacent to road, to support 30 feet of material from the design grade to the failure surface. Lots are planned outside the landslide limits. No grading within landslides. |
| Qls-4 | L-L', LL-LL' | Road to Tank Site | Setback line developed. Roadway designed to be beyond the slope-stability-analysis-developed setback line |
| Qls-5 and 6 | F-F' | Maintenance Road Fill | Complete removal of Landslide Qls-6, and only removal of upper surficial materials of Qls-5. Only minor amount of fills planned over Qls-5, which does not directly support the maintenance road fill. |
| Qls-7 | T-T' | Existing Residence | Side-hill shear key and buttress already constructed as mitigation for off-site development (G. A. Nicholl and Associates, 1981b). |
| Qls-8 and 9 | H-H', Q-Q', N-N' | 14-21 | 100-foot wide keyway 5-foot deep into competent material; remove all landslide material |
| Qs | Not Applicable | Existing Water Tank | Slump material outside the proposed development. Mitigation not required. |
| Qs?/Qls? | M-M', S-S', U-U', UU-UU' | 22 and existing three residential units at existing terminus of Stoney Hill Drive. | Caissons required at rear of lots, outside the slump area to support 20 feet of material from the design grade to the failure surface. Minor grading is planned within slump. A 3 to 5 foot cap of clayey material or other low-permeable layer should be placed over slump area to reduce the water infiltration. |

# 11. GENERAL RECOMMENDATIONS

## 11.1 General

Leighton's recommendations for the proposed development of the site are based on our understanding of the project. These recommendations are based on the assumption that the subsurface conditions do not deviate appreciably from those discovered during our geotechnical investigations. Our recommendations are based on the 2nd vesting Tentative Tract Map No. 53072 we reviewed and assume that the actual development will not deviate appreciably from the proposed development shown on that map. The nature of many sites is such that differing geotechnical and geological conditions can occur within small distances and under varying climatic conditions. Changes in subsurface conditions can and do occur over time. Therefore, the findings, conclusions, and recommendations presented in this report can be relied upon only if Leighton has the opportunity to observe the subsurface conditions during grading and construction of the project, in order to confirm that our preliminary findings are representative for the site. It is the responsibility of the Owner to bring any deviations or unexpected conditions observed to the attention of Leighton as soon as possible. In this way, any required supplemental recommendations can be made in a timely manner.

## 11.2 Geotechnical Observations During Grading

The geotechnical consultant should provide observation and testing services continuously for all geotechnical-related activities, including the following:

- All excavations, including excavations for buttresses, cut slopes, backcuts, and overexcavations;
- Subdrain installation; and,
- Placement of fills.

## 11.3 Review of Plans

As foundation, improvement, and 40-scale grading plans are finalized, and loads are known, they should be forwarded to the geotechnical consultant for review and verification of conformance with the intent of these recommendations.

# 12. SPECIFIC RECOMMENDATIONS

## 12.1 General

Geotechnical recommendations for site preparation and grading are provided in this section. All aspects of grading should be per the applicable City of Los Angeles building standards.

## 12.2 Grading and Earthwork

### 12.2.1 Site Clearing

Prior to grading and construction, any vegetation should be stripped, and trees should be removed. Surface obstructions, stockpiled and/or uncertified fills, miscellaneous debris, and any other deleterious material, should also be removed. Vegetal matter may be processed into mulch and stockpiled on site for use in landscaping areas. Otherwise, all such material should be hauled off-site.

Holes and depressions, resulting from the removal of any buried obstructions, and/or oversize rocks that extend below finished site grades or in zones of overexcavation, should be backfilled with compacted fill.

Any existing underground utilities or wells should be identified and abandoned per the current requirements of the City of Los Angeles, and any other regulatory agencies.

### 12.2.2 Removals

The purpose of removals is to clear all unsuitable materials at design grades and within areas to receive fill. Unsuitable materials include landslide material, slump material, colluvium, alluvium, highly compressible soils (i.e. materials that have relative compaction less than 90%), and/or disturbed/weathered bedrock.

The proposed grading plan indicates that fill is proposed in the canyon area located between the two ridges. Field exploration in these specific areas was not performed due to difficult accessibility. However, based on field geologic mapping, we expect alluvial deposits to be encountered at the bottom of these canyons. The thickness of these deposits is estimated to be on the order of 10 to15 feet or less. This is an approximation, and if more definite information about the anticipated removals at the bottom of the canyons is desired, additional exploration should be performed. In this case, grading will be required to provide access. We expect these relatively thin deposits of alluvium or colluvium to be unsuitable for support of fill. They should be removed to expose competent native material prior to the placement of fill.

Landslide debris (Qls-6, Qls-8 and Qls-9) within the proposed grading areas including both cut and fill areas, should be removed to expose competent bedrock materials. The surface material (upper few feet of loose material) within the areas of Qls-5 and northern portion of

Qs(?)/Qls(?) within the grading limits in the canyon bottoms should be removed, and replaced by engineered compacted fill.

The recommended depth of removals should be determined by the project geotechnical consultant. Deeper removals than what is anticipated may be required in local areas, depending on actually encountered geotechnical conditions.

### 12.2.3 Overexcavation

We recommend that the cut pads and cut portions of transition pads be overexcavated at least 5 feet below the planned grade and planned grades be achieved through the placement of engineered compacted fill. In general, building footings should be underlain by a minimum of 3 feet of compacted fill that is keyed into the underlying bedrock. The purpose and some of the benefits, of the overexcavation are as follows:

- Provide a cap of relatively uniform materials with similar engineering characteristics, therefore, reduce the potential for differential settlement and expansion between fill and bedrock materials.
- Hard bedrock may be exposed at the bottom of the proposed cut part of the pad. Over-excavation in these areas will facilitate future excavations for utilities, foundations, shallow spas and swimming pools.
- Landscaping will be difficult in cut areas exposing hard bedrock. Overexcavation will help in landscaping areas.

Overexcavation deeper than 5 feet may be warranted in certain areas of the graded transition pads. Therefore, the bottom of overexcavations should be observed by the project geotechnical consultant. The adequacy of the proposed overexcavation depth in certain areas of the site should be further evaluated when grading plans become available. For example, deeper overexcavation may need to be performed within parts of buildings spanning over areas underlain by substantial fill thickness differential in order to mitigate the potential for differential settlement.

The actual need for deeper excavation (if warranted) will be determined in the field by the project geotechnical consultant, based upon field.

If pools are planned and permitted in the future, deeper overexcavation of at least 10 feet below the pad grade may be warranted due to the hard bedrock material and difficulties of overexcavation with smaller grading equipment.

12.2.4 Subdrainage System Beneath Fill

Subdrains should be placed on a clean bedrock surface in canyon bottoms prior to fill placement, and constructed in accordance with our recommended guidelines as shown on Standard Detail C in Appendix H. Subdrain pipes ranging from 6 to 8 inches in diameter (8 inch for longer runs) and should extend to within 15 feet vertically of finished grade. Proposed subdrain and clean out locations are shown on Plate 1, but are subject to amendment based upon conditions encountered during grading. Since the toe portion of Qls-5 will not be completely removed, a gravel drain should be constructed prior to fill placement along the length of the toe of this landslide. This gravel drain should be connected down the canyon into the proposed 6 to 8 inch subdrain.

12.2.5 Fill Placement and Compaction

Prior to fill placement, the bottom of areas to receive fill should be scarified to a depth of between 8 to 12 inches, moisture conditioned to slightly above the optimum moisture content, and compacted to at least 90% relative compaction.

Fill materials should be moisture conditioned to approximately 2% above the optimum moisture content, placed in layers not exceeding 8 inches of uncompacted thickness, and compacted to at least 90% relative compaction.

All grading should be performed in accordance with the General Earthwork and Grading Specifications presented in Appendix H, unless specifically revised or amended in this report.

12.2.6 Fill Material

Most of earth materials generated from cuts or overexcavations at the site may be used as fill materials. However, fill materials should be free from trash, debris, rocks larger in size than 8 inches, and any other deleterious materials. Any existing concrete debris at the site should be hauled off-site.

Import fill (if any) should be similar to on-site materials, and should be approved by the project geotechnical consultant prior to hauling to the site.

12.2.7 Shrinkage/Bulking

The following preliminary estimated shrinkage/bulking factors and subsidence may be used for consideration of earthwork calculations: alluvium: 5%-10% shrinkage; Modelo Formation bedrock: 5% -10% bulking; Santa Monica Slate bedrock: 10%-15% bulking; landslide materials: 5% bulking. Subsidence is anticipated to be on the order of 0.1 ft.

These are preliminary estimates which may vary with depth of removal, stripping losses, field conditions at the time of grading, etc. (Handling losses, and reduction in volume due to removal of oversized material, are not included in the estimates.)

12.2.8 Excavating Conditions and Rippability

In our opinion, excavation of most of the bedrock material can be performed using heavy-duty excavation equipment in good condition (SubSurface Surveys, 2001 Appendix C). The contractor should plan on using heavy-duty excavation equipment, such as demolition hammers or rock rippers, for excavation in some portions of the Modelo and Santa Monica Formation, where zones of cemented sandstones and slate could be encountered.

12.2.9 Expansivity

We recommend assuming a Medium Expansion Index for the preliminary design of foundations and slabs. The Expansion Index values can be refined from testing of actual pad materials at the completion grading.

12.2.10 Sulfate Content / Cement Type

For planning purposes, concrete in contact with onsite soils should be designed in accordance with the moderate soluble sulfate category of Table 19-A-4 of the 1997 Uniform Building Code (UBC). Additional testing should be performed at the completion of rough grading to verify this conclusion.

12.2.11 Corrosion Testing

For planning purposes, onsite soils can be classified as moderately corrosive. Corrosion testing should be performed at the completion of rough grading to verify this conclusion.

12.3 Fill Slopes

Fill slopes are proposed at various locations of the site at a 2:1 (h:v) gradient or flatter. Fill slopes should be constructed in accordance with the recommendations of Appendix H.

The recommendation keyway associated with the removal of Landslides Qls-8 and Qls-9 will be variable in width, ranging from approximately 70 to100 feet, and should be excavated at least 5 feet into competent bedrock.

Fill slopes constructed on a sloping ground steeper than 5:1 (h:v) should have a keyway that extends into competent in-place materials, and should be benched into competent materials.

## 12.4 Caisson Design Parameters

### 12.4.1. Design Concept

The caisson-supported design system for this project is being developed for four separate areas within the proposed development. The caissons will be used to support Lots 28, 29, 22, and the last three existing residential structures adjacent to the subject tract at the existing terminus of Stoney Hill Drive, as shown on the attached Plate 1. The depth to the failure surface, which is the retained height of material, is 30 to 40 feet for Lot 28, and 20 feet for Lots 29, 22, and the three existing structural residential units at the current terminus of Stoney Hill Road.

Our recommended parameters and analyses are based on assuming the use of a caisson-supported system, for that portion of the landslide above the base of the slide plane, that is subjected only to lateral soil pressures from the retained soil. Our analyses and recommendations do not include lateral pressures induced by foundations located within 15 feet of the caisson location. Foundation loads induced on the caisson-supported system will need to be evaluated on a case-by-case basis, and the recommended lateral pressures and other design parameters revised accordingly.

The bedrock shear strength parameters, which should be used in the caisson design, are a cohesion of 1,500 pounds per square foot (psf), and a friction angle of 35 degrees. The attached pressure diagrams indicate that the material above the critical failure surface does not provide any additional lateral resistance. The caissons should be installed with the following preliminary construction considerations to avoid group effects: the caissons should be a minimum of 2 feet in diameter and installed at a minimum center-to-center spacing of 3 times the diameter of the caissons, maximum spacing should range between 6 to 10 feet; onsite soils will arch between piles of this maximum spacing. The installation of the caissons is critical to ensure successful resistance. Extreme care in drilling, placement of steel and concrete will be essential to the quality of the piles.

The design pressures are shown on Figures 1 through 3 in Appendix G.

### 12.4.2 Construction Considerations

Pile holes should be observed by the geotechnical consultant during construction, to verify that the piles are embedded in suitable materials, and to the expected embedment lengths in those materials. An uncased pile excavation should not be performed adjacent to a recently cast pile until the concrete in the recently cast pile has set. Excavations should be filled with concrete as soon as practical after cleanout and observation. If an excavation is left open overnight, an additional observation by the geotechnical consultant should be made prior to concrete placement, in case slaking (dessication and loss of strength) of the excavation walls has occurred. If slaking has occurred, the excavation should be freshened by reboring of the excavation prior to concrete placement.

### 12.4.3 Pile Bearing Capacity

Pile bearing capacity needed for the cantilever pile system is inconsequential; a nominal allowable axial downward bearing pressure of 5,000 lb/ft$^2$ may be used, if needed, for the cantilever pile design.

### 12.4.4 Other Considerations

Final design and spacing of the caisson system should be performed and optimized by the structural engineer based on design specific input and review by the geotechnical consultant. Additional analyses corresponding to the structural design can be provided as required by the structural engineer.

### 12.4.5 Temporary Excavations

All excavations for the proposed development should be performed per the current OSHA (Occupational Safety and Health Agency), and other regulatory agencies.

Leighton provides guidelines and recommendations for temporary excavations, taking into consideration that under the existing geotechnical/geologic, and groundwater conditions, backcut excavations should maintain a minimum factor of safety for temporary slope stability equal to or greater than 1.25. As a preliminary recommendations a slot cut method should be considered for the keyway excavation in the southern portion of Qs(?)/Qls(?) and Landslide Qls-8 below Lots 16 through 22. The actual minimum widths of the slot cuts will be determined during the 40-scale grading plan review. With that in mind, alternative excavation scenarios may be suggested by the grading contractor for our evaluation prior to grading to reduce risk of backcut failures. Ultimately, it is the grading contractor's responsibility to provide safe and stable backcut excavations.

### 12.4.6 Lagging

Removal of the mapped slump material will be required within the backyards of the last two exiting residential lots to expose competent material. Depending on the amount and lateral extent of the removals, permanent lagging may be required if the slump material is removed up to, or close to, the caisson locations. Lagging would be needed to support the newly placed compacted fill material between caissons. The minimum height, or vertical extent, and lateral extent of lagging will be determined during grading operations. Permanent lagging should be reinforced concrete sheets.

## 12.5 Probes Associated with Mission Canyon Landfill

The probes are currently located in the center of the eastern ridge (Plate 1), and will be impacted by the planned grading. Prior to grading, the probes should be removed and properly abandoned (or incorporated into the project design) in accordance with applicable regulatory requirements. It is beyond the scope of this report to assess the need for replacement probes. The abandonment and replacement of the subject probes should be addressed at the 40-scale design stage of the project and prior to the construction phase.

## 12.6 Foundations and Slabs on Grade

### 12.6.1 General

Based on our investigation and the site conditions, the proposed development may be supported with conventional foundations (shallow spread footings and conventional slab on grade). Recommendations for the conventional foundations and post-tensioned foundations or for post-tensioned slabs will be provided at the grading plan stage.

### 12.6.2 Foundation Settlement

Building pads will be overexcavated a minimum of 5 feet, and foundations will be founded into a newly placed compacted fill blanket that rests on bedrock. Foundations should be designed for a maximum anticipated settlement of ½ inch and a maximum differential settlement of ¼ inch over a span of approximately 30 feet. Lots 15 through 20 will have up to approximately 30 feet of compacted fill due to the removal of Landslides Qls-8 and 9 and the rebuilding of a 2H:1V slope. Foundations for Lots 15 through 20 should be designed for a maximum anticipated settlement of 1 inch, and a maximum differential settlement of 1/2 inch over a span of approximately 30 feet.

### 12.6.3 Foundation Setback

All foundations located close to slopes should have a minimum setback per Figure 18-1-1 of the 1997 UBC, or in accordance with the structural setback zone, whichever is greater. The setback distances should be measured from competent materials on the outer slope face, excluding any weathered and loose materials. An alternative setback request, as indicated in section 1806.5.6 of the 1997 UBC, can be recommended based on proper geotechnical evaluation and analysis, during the 40-scale plan review. Preliminary building setback recommendations on lots designed with the caisson supported system maybe considered as being H/3 but not exceeding 25'. The lots with this caisson supported system will be evaluated and included in an alternative setback request during the future 40 scale grading plan review stage.

### 12.6.4 Foundation Venting

At the grading plan stage, special provision for foundation venting systems in each slab should be considered for Lots 1-22 due to the proximity of the landfill to the east.

## 12.7 Seismic Design Parameters

The site lies within Seismic Zone 4, as defined in the UBC. Seismic design parameters will be generated at the grading plan review stage of the project.

## 12.8 Subsurface Drainage

Special attention must be paid to subsurface drainage in subsequent phases of this project, particularly in the lots were caissons are recommended and the areas in close proximity to existing landslide/slumps that would not be removed (such as Lots 22, 29 and 28, and the existing residences at the current terminus of Stoney Hill Road). Artificial sources of water, such as that from swimming pools and homeowner irrigation, must not be allowed to impact adjacent slopes. If pools are planned and permitted in the future, on the above Lots special design requirements and/or subsurface drainage systems will be required and homeowner notification is recommended. Pool plans should be reviewed by the geotechnical consultant to verify conformance to the geotechnical recommendations.

## 12.9 Surface Drainage

Pad drainage should be designed to collect and direct surface water away from structures to approved drainage facilities. A minimum downward gradient of approximately 2 percent should be maintained, and drainage should be directed toward approved swales or drainage facilities.

Positive drainage should be maintained in the areas and/or slopes adjacent to the mapped landslides (if not removed) on top of natural slopes. The potential surface water collected should be directed away from the areas and into proper drainage gutters or inlets.

Existing drains at the site which outlet onto the natural slopes in the vicinity of Lots 22, and Lot 15) should be abandoned and redirected away from the slopes to outlet at approved locations.

## 12.10 Asphalt Paving

Asphalt pavement depends on the R-value of subgrade materials and on the traffic index. Based on an assumed R-value of 20, tentative AC (asphalt concrete) paving sections for various traffic indices are provided below:

**TABLE 3**

**AC PAVEMENT**

| TI (assumed) | AC Surface Course (in) | Aggregate Base Course (in) |
|---|---|---|
| 4.5 | 3 | 5 |
| 5 | 3 | 6 |
| 5.5 | 3 | 8 |
| 6 | 4 | 8 |

The aggregate base material should conform to the specifications for Class 2 Aggregate Base (Caltrans) or Crushed Aggregate Base (Standard Specifications for Public Works Construction). The base material should be compacted to achieve a minimum relative compaction of 95 percent.

The subgrade should achieve a minimum relative compaction of 90 percent through the upper 12 inches.

The R-value should be obtained during the concluding stages of grading, and the final pavement section will then be designed accordingly.

The applicable TI values should be selected by the project civil engineer.

## 13. LIMITATIONS OF INVESTIGATION

Leighton's investigation was performed using the degree of care and skill ordinarily exercised, under similar circumstances, by reputable geotechnical consultants practicing in this or similar localities. No other warranty, expressed or implied, is made as to the conclusions and professional opinions included in this report.

The samples taken and used for testing, and the observations made, are believed representative of the area covered by the borings; however, soil and geologic conditions can vary significantly between exploratory excavations.

As in many projects, conditions revealed in excavations may be at variance with preliminary findings. If this occurs, the changed conditions must be evaluated by the geotechnical consultant and additional recommendations be obtained, as warranted.

The identification and testing of hazardous, toxic or contaminated materials were outside the scope of Leighton's work. Should such materials be encountered at any time, or their existence be suspected, all measures stipulated in local County, State and Federal regulations, as applicable, should be implemented.

This report is issued with the understanding that it is the responsibility of the owner, or of his representative, to ensure that the information and recommendations contained herein are brought to the attention of the necessary design consultants for the project and incorporated into the plans; and that the necessary steps are taken to see that the contractors carry out such recommendations in the field.

The findings of this report are considered valid as of the present date. However, changes in the condition of a property can occur with the passage of time, whether due to natural processes or the work of man on the subject or adjacent properties. In addition, changes in standards of practice may occur from legislation or the broadening of knowledge. Accordingly, the findings of this report may at some future time be invalidated wholly or partially by changes outside Leighton's control.

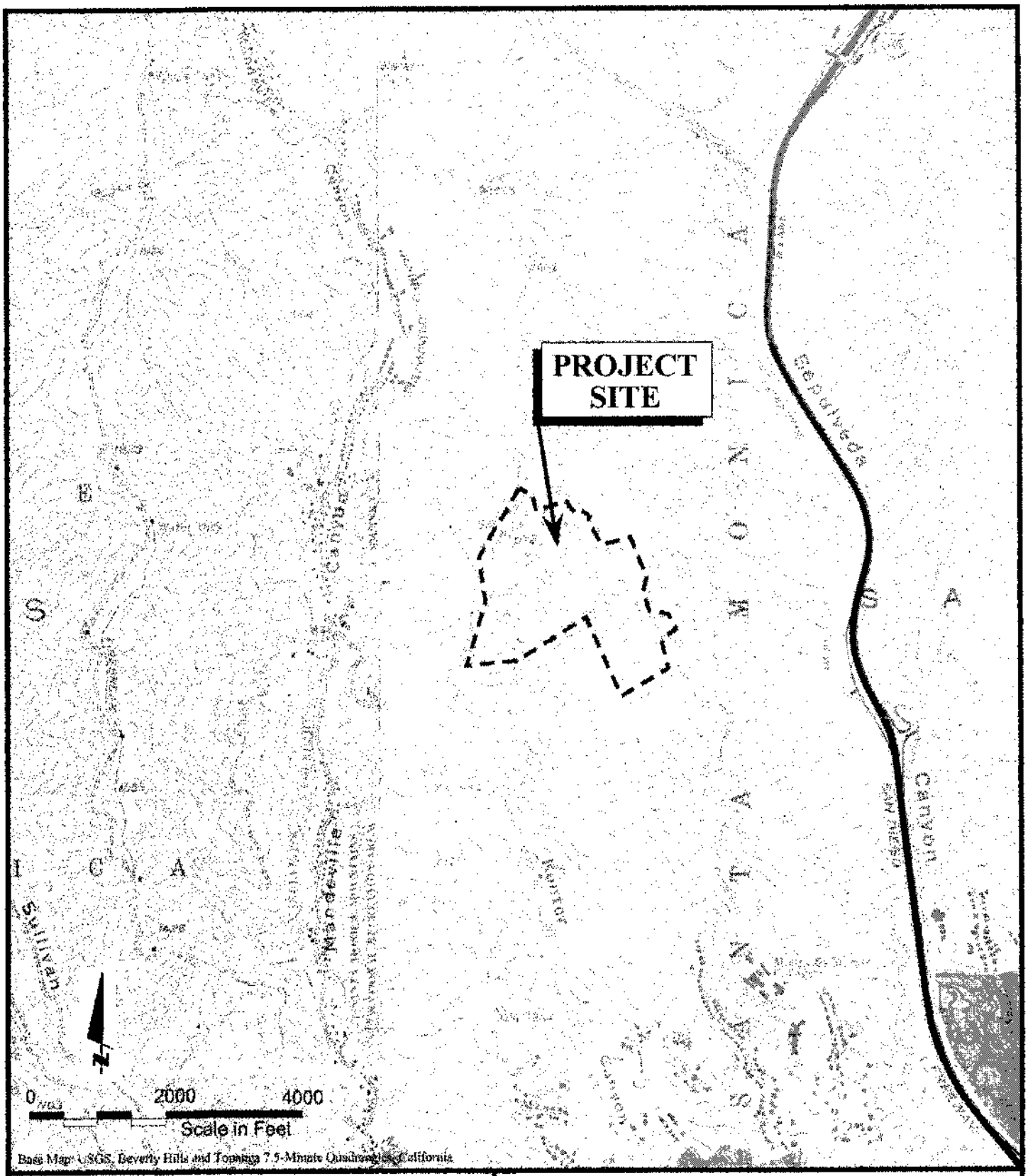
The conclusions and recommendations in this report are based in part upon data that were obtained from a limited number of observations, site visits, excavations, samples and tests. Such information is by necessity incomplete. The nature of many sites is that differing geotechnical or geological conditions can occur within small distances and under varying climatic conditions. Changes in subsurface conditions can and do occur over time. Therefore, the findings, conclusions, and recommendations presented in this report can be relied upon only if Leighton has the opportunity to observe the subsurface conditions during grading and construction of the project, in order to confirm that our preliminary findings are representative for the site.

This report is intended only for the use of Castle & Cooke California, Inc., and only as related expressly to the proposed development.

## 14. CLOSURE

If parties other than Leighton are engaged to provide construction geotechnical services, they must be notified that they will be required to assume complete responsibility for the geotechnical phase of the project by concurring with the findings and recommendations in this report or by providing alternative recommendations.

Any persons using this report for bidding or construction purposes should perform such independent investigations as they deem necessary to satisfy themselves as to the surface and subsurface conditions to be encountered and the procedures to be used in the performance of work on the subject site.




# SITE LOCATION MAP

Vesting Tentative Tract Map No. 53072
City of Los Angeles, California

| | |
|---|---|
| Project No. | 030381-002 |
| Scale (approx) | As Shown |
| Drafted By | JGS |
| Date | March, 2003 |

Leighton and Associates, Inc.
A LEIGHTON GROUP COMPANY

Figure No. 1

# APPENDIX A

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## APPENDIX A

REFERENCES

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# APPENDIX B

FIELD EXPLORATION PROGRAM – BORING AND TRENCH LOGS

# APPENDIX B

## FIELD EXPLORATION PROGRAM – BORING AND TRENCH LOGS

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Index

# APPENDIX B

## FIELD EXPLORATION PROGRAM – BORING AND TRENCH LOGS

### B-1 General

Prior to Leighton's field exploration, Leighton personnel carried out a reconnaissance of the site. The intended locations of the borings were slightly modified as dictated by the terrain.

Underground Service Alert (USA) was contacted to clear the drilling locations from existing utility lines. A visual survey was conducted to verify that the proposed borings would not encounter any subsurface utility lines. No underground lines were encountered during the drilling.

A D-6 dozer (supplied by Mesa Contracting Corporation) performed minor cuts and fills to create access roads and flat pads where borings were to be drilled.

### B-2 Drilling and Sampling

The subsurface conditions were explored by drilling twenty-one borings using a truck-mounted bucket-auger drill rig and a limited access (track-mounted) drill rig. A total of four borings were drilled with the limited access drill rig and 17 borings were drilled with the conventional (truck-mounted) drill rig. The diameter of the borings was 24 inches and the depth explored varied from 15 feet to 100 feet below the existing ground surface. Each boring was down-hole logged to depths that safety allowed under the direct supervision of a California-Certified Engineering Geologist. The borings are designated LB-1 to LB-21 and their approximate locations are shown on the Geotechnical Map, Plate 1. The drilling was performed by Tri-Valley Drilling and Roy Brothers Drilling between March 12, 2001 and August 1, 2002.

Relatively undisturbed ring samples were obtained at the depths indicated on the boring logs. The relatively undisturbed samples were obtained by driving a Modified California Split-Spoon Sampler into the bottom of the boring as it was being incrementally advanced. The number of blows to achieve a 12-inch penetration under a 30-inch drop of the kelly bar was recorded. The blow counts provide a measure of the density or consistency of the soils. Bulk samples were obtained from the surface of each boring and also from representative lithologic types that were encountered in the subsurface. Very hard sandstone was encountered in boring LB-6, LB-8, LB-18, and LB-21; where drilling was very difficult, sampling was not attempted.

The sampling rings were 2.41 inches in width (inside diameter [ID]) and 1 inch high. The ring samples were placed in plastic cans, labeled, and transported to the laboratory in cushioned containers. The bulk samples were transported in plastic bags, which were labeled.

All the borings were logged by a qualified Leighton representative under the supervision of a California-Certified Engineering Geologist. Visual observations were made of the materials at each sampling depth and checked against the materials encountered during down-hole logging to the depths that were down-hole logged in each boring.

The earth materials were classified visually, in substantial accordance with the Unified Soil Classification System (USCS).

Stratification lines on the logs represent the approximate boundaries between predominant types of soil materials. Stratification may contain differing soil materials, with transitions generally occurring gradually.

The borings were backfilled with native soils and tamped with the kelly bar.

The logs of the Leighton borings are presented in this appendix. In addition, the logs of borings, test pits and a dozer cut excavated by G.A. Nicholl and Associates, Inc., (1987b) are also included in this appendix.

# GEOTECHNICAL BORING LOG LB-1

**Date** 3-13-01 **Sheet** 1 of 3

**Project** Mountaingate, Tract 53072 **Project No.** 03-0381-001

**Drilling Co.** Tri-Valley Drilling **Type of Rig** Bucket-Auger

**Hole Diameter** 24" **Drive Weight** 1-28=5952 lbs, 28-55=3921 lbs, 55-84=2531 lbs, 84-114=1407 lbs **Drop** 12"

**Elevation Top of Hole** 1511' **Location** Refer to Geotechnical Map

| Elevation Feet | Depth Feet | Graphic Log (N S) | Attitudes | Sample No. | Blows Per Foot | Dry Density pcf | Moisture Content, % | Soil Class. (U.S.C.S.) | DESCRIPTION | Type of Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | **Logged By** ARH/GIM<br>**Sampled By** ARH | |
| 1510 | 0 | | | | | | | | **SANTA MONICA SLATE (Jsm):**<br>(0-28.2': very weathered) PHYLLITE: generally medium to dark grey (weathers rusty brown), slightly moist to moist along joints and fractures, hard, slightly to moderately fisslie along primary foliation direction; phyllitic luster along parting planes, abundant steeply dipping joints, some to abundant fractures open up to .25 inches with clay and calcium carbonate infill, occasional quartz veining | |
| | | | $F_0$: N17W, 41NE | | | | | | @ 2.2': 3" thick quartz vein | |
| 1505 | 5 | | $AS_1$: N30E, 15SE<br>$F_0$: N88W, 12NE | R-1 | 12 | 121.6 | 12.6 | | | |
| 1500 | 10 | | $F_0$/J: N62E, 16SE | R-2 | 10 | 128.1 | 2.9 | | rootlets observed to 10' bgs | |
| | | | | B-1 | | | | | very moist zone, wet along joints with silt and clay joint infill; very slight seepage from 13' to 22' | |
| 1495 | 15 | | J: N71W, 74SW<br>$F_0$: N42E, 19SE | R-3 | 11 | 137.6 | 3.6 | | | |
| 1490 | 20 | | $F_0$: N90E, 68N | R-4 | 3 | 114.8 | 8.8 | | | |
| 1485 | 25 | | J: N85E, 80NW<br>$F_0$: N23W, 4SW<br>$F_0$: N88E, 13SE<br>J: N77E, 78NW | R-5 | 9 | 129.5 | 3.0 | | @ 27': difficult drilling; drillers switch to carbide-tooth-bucket and using crowds<br>@ 28' formation becomes tighter, harder with fewer open and silt-lined fractures than above; | |
| | 30 | | | | | | | | | |

**SAMPLE TYPES:**

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

**TYPE OF TESTS:**

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

# GEOTECHNICAL BORING LOG LB-1

**Date** 3-13-01 **Sheet** 2 **of** 3

**Project** Mountaingate, Tract 53072 **Project No.** 03-0381-001

**Drilling Co.** Tri-Valley Drilling **Type of Rig** Bucket-Auger

**Hole Diameter** 24" **Drive Weight** 1-28=5952 lbs, 28-55=3921 lbs, 55-84=2531 lbs, 84-114=1407 lbs **Drop** 12"

**Elevation Top of Hole** 1511' **Location** Refer to Geotechnical Map

| Elevation Feet | Depth Feet | Graphic Log (N S) | Attitudes | Sample No. | Blows Per Foot | Dry Density pcf | Moisture Content, % | Soil Class. (U.S.C.S.) | DESCRIPTION | Type of Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| | 30 | | $F_0$: N89W, 16SW | R-6 | 24 | 131.7 | 6.3 | | Logged By ARH/GIM<br>Sampled By ARH | |
| 1480 | | | J: N88E,74NW<br>J18E, 86NW | | | | | | | |
| | 35 | | | R-7 | 36/9" | 133.0 | 1.6 | | | |
| 1475 | | | J: N29W, 78SW | | | | | | | |
| | 40 | | $F_0$: N16W, 27NE | R-8 | 35/10" | 125.8 | 2.0 | | | |
| 1470 | | | J: N22W, 84SW | | | | | | @ 42' formation becomes very hard, trace open fractures, very moist clay-lined fractures observed | |
| | 45 | | $F_0$: N78E, 85SE | R-9 | 34/4" | 119.5 | 2.9 | | | |
| 1465 | | | | | | | | | @46' slight seepage in 6" wide zone | |
| | | | | | | | | | @ 49' local quartz veining; irregular discontinuous veining | |
| | 50 | | $F_0$: N78E, 14SE | R-10 | 25/2" | | | | | |
| 1460 | | | | | | | | | 52.5'-54.5': slight seepage zone | |
| | 55 | | J: N84W, 43SW | R-11 | 33/7" | | | | | |
| 1455 | | | | | | | | | | |
| | 60 | | $F_0$: | | | | | | | |

**SAMPLE TYPES:**

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

**TYPE OF TESTS:**

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

# GEOTECHNICAL BORING LOG LB-1

**Date** 3-13-01 **Sheet** 3 **of** 3

**Project** Mountaingate, Tract 53072 **Project No.** 03-0381-001

**Drilling Co.** Tri-Valley Drilling **Type of Rig** Bucket-Auger

**Hole Diameter** 24" **Drive Weight** 1-28=5952 lbs, 28-55=3921 lbs, 55-84=2531 lbs, 84-114=1407 lbs **Drop** 12"

**Elevation Top of Hole** 1511' **Location** Refer to Geotechnical Map

| Elevation Feet | Depth Feet | Graphic Log (N S) | Attitudes | Sample No. | Blows Per Foot | Dry Density pcf | Moisture Content, % | Soil Class. (U.S.C.S.) | DESCRIPTION (Logged By ARH/GIM; Sampled By ARH) | Type of Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| 1450 | 60 | | N40W, 11SW<br>J: N81E, 76NW | R-12 | 52/3" | | | | no sample recovery<br><br>62'-64': slight seepage | |
| 1445 | 65 | | J: N19E, 64SE | R-13 | 47/9" | 139.4 | 3.2 | | | |
| 1440 | 70 | | $F_0$: N2E, 25SE<br>$F_0$: N5E, 62SE | R-14 | 45/3" | | | | @ 72': 12" wide fracture zone, continuous around hole with irregular upper and lower contacts | |
| 1435 | 75 | | | R-15 | 78/4" | 130.2 | 2.1 | | | |
| 1430 | 80 | | | R-16 | 77/8" | | | | | |
| 1425 | 85 | | | R-17 | 70/3" | | | | **Total depth drilled = 83 ft**<br>**Total depth sampled = 83 ft 3 inches**<br>**Total depth down-hole logged = 76 ft**<br>**Ground water not encountered**<br>**Seepage at 13 ft to 22 ft, 46 ft, 53 ft, and 63 ft**<br>**Boring backfilled with cuttings** | |
| | 90 | | | | | | | | | |

SAMPLE TYPES:
- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

# GEOTECHNICAL BORING LOG LB-2

**Date** 3-15-01 **Sheet** 1 **of** 4

**Project** Mountaingate, Tract 53072 **Project No.** 03-0381-001

**Drilling Co.** Tri-Valley Drilling **Type of Rig** Bucket-Auger

**Hole Diameter** 24" **Drive Weight** 0-28=5952 lbs, 28-55=3921 lbs, 55-84=2531 lbs, 84-114=1407 lbs **Drop** 12"

**Elevation Top of Hole** 1460' **Location** Refer to Geotechnical Map

| Elevation Feet | Depth Feet | Graphic Log (N S) | Attitudes | Sample No. | Blows Per Foot | Dry Density pcf | Moisture Content, % | Soil Class. (U.S.C.S.) | DESCRIPTION | Type of Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | **Logged By** ARH/GIM<br>**Sampled By** ARH | |
| 1460 | 0 | | | | | | | | **TOPSOIL:** very GRAVELLY SILT: dark orange brown, slightly moist, abundant rootlets, loose; sharp irregular bottom contact | |
| | | | J: N81E, 64SE | | | | | | **LANDSLIDE Qls-9:** very weathered and fractured SLATE/PHYLLITE: medium orange brown, slightly moist to moist, hard, very fractured and jumbled with little internal structure, abundant calcium carbonate veining and clay lining along fractures, rootlets observed to 10.6' | |
| | | | $F_0$: N74W, 24SW | | | | | | @ 1': quartz vein approximately 4" thick; irregular and discontinuous around hole | |
| 1455 | 5 | | | R-1 | 5 | 116.2 | 4.3 | | | |
| | | | $F_0$: N80E, 16NW | | | | | | @ 6' slight increase in moisture along fractures; moist to very moist | |
| | | | | B-1 | | | | | | |
| | | | J: N29W, 24NE | | | | | | | |
| 1450 | 10 | | | R-2 | 8 | 120.6 | 5.8 | | | |
| | | | | | | | | | @ 11' becomes very fractured, jumbled, and weathered GRAVELLY SANDY SILT: grey-brown, very moist, firm, cohesive, hacks easily, abundant calcium carbonate stringers | |
| | | | J: E-W, 74W | | | | | | | |
| 1445 | 15 | | | R-3 | 12 | 133.2 | 4.3 | | | |
| 1440 | 20 | | AF: N15W, 30-40SW | R-4 | 13 | 126.6 | 2.2 | | @ 19.6' prominent shear zone; sharp contact between orange-tan SLATE/PHYLLITE and underlying dark grey-brown GRAVELLY SANDY SILT | |
| | | | F: N14W, 54NE | | | | | | 22'-24.5': hard blocky zone; mostly intact, but very fractured | |
| 1435 | 25 | | | R-5 | 2 | 110.8 | 11.2 | | similar to above | |
| | | | J: N18E, | | | | | | | |
| 1430 | 30 | | | | | | | | | |

**SAMPLE TYPES:**

S SPLIT SPOON
R RING SAMPLE
B BULK SAMPLE
T TUBE SAMPLE
G GRAB SAMPLE
C CORE SAMPLE

**TYPE OF TESTS:**

DS DIRECT SHEAR
MD MAXIMUM DENSITY
CN CONSOLIDATION
CR CORROSION
SA SIEVE ANALYSIS
AL ATTERBERG LIMITS
EI EXPANSION INDEX
RV R-VALUE

# GEOTECHNICAL BORING LOG LB-2

**Date** 3-15-01 **Sheet** 2 **of** 4

**Project** Mountaingate, Tract 53072 **Project No.** 03-0381-001

**Drilling Co.** Tri-Valley Drilling **Type of Rig** Bucket-Auger

**Hole Diameter** 24" **Drive Weight** 1-28=5952 lbs, 28-55=3921 lbs, 55-84=2531 lbs, 84-114=1407 lbs **Drop** 12"

**Elevation Top of Hole** 1460' **Location** Refer to Geotechnical Map

| Elevation Feet | Depth Feet | Graphic Log (N S) | Attitudes | Sample No. | Blows Per Foot | Dry Density pcf | Moisture Content, % | Soil Class. (U.S.C.S.) | DESCRIPTION | Type of Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | **Logged By** ARH/GIM<br>**Sampled By** ARH | |
| 1430 | 30 | | 64SE | R-6 | 15 | 133.6 | 5.9 | | 31.0'-33.5': very moist zone | |
| | | | S: N68-78E, 38SE | | | | | | 33.5'-38': slight seepage zone | |
| 1425 | 35 | | | R-7<br>B-3 | 13 | 125.3 | 10.5 | | | |
| | | | SP: N81E, 44SE<br>SP: N73E, 59SE<br>SP: N60W, 35SE | | | | | | 37.2'-39.0': rupture zone/slide planes; SILTY CLAY: dark grey and orange-brown, wet, firm, varies from 4" to 8" thick, very plastic; sheared, gravelly, brecciated zone, polished surfaces observed | |
| 1420 | 40 | | SP: N61-74W, 40SW<br>F: N73E, 59SE | R-8 | 42/6" | | | | **SANTA MONICA SLATE (Jsm):**<br>PHYLLITE: generally orange-brown to grey, moist to wet along joints and fractures, hard to very hard, poor parting along primary foliation direction (massive appearance); from 0-28.2' very weathered, phyllitic luster along unweathered parting planes, joints and fractures lined with manganese dioxed and calcium carbonate, occasional quartz veining | |
| 1415 | 45 | | J: N42E, 69SE | R-9 | 15/3" | 111.2 | 3.0 | | | |
| 1410 | 50 | | $F_o$: N72E, 39NW | R-10 | 19/2" | | | | | |
| | | | F/SP: N84W, 36SW | | | | | | @ 54.2': 2"-3" thick continuous clay layer within a 1.4' wide fault/brecciated zone | |
| 1405 | 55 | | J: N39E, 34SE | R-11 | 28/11" | | | | | |
| | | | | B-2 | | | | | | |
| 1400 | 60 | | | | | | | | | |

**SAMPLE TYPES:**

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

**TYPE OF TESTS:**

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
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- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

# GEOTECHNICAL BORING LOG LB-2

**Date** 3-15-01 **Sheet** 3 **of** 4

**Project** Mountaingate, Tract 53072 **Project No.** 03-0381-001

**Drilling Co.** Tri-Valley Drilling **Type of Rig** Bucket-Auger

**Hole Diameter** 24" **Drive Weight** 0-28=5952 lbs, 28-55=3921 lbs, 55-84=2531 lbs, 84-114=1407 lbs **Drop** 12"

**Elevation Top of Hole** 1460' **Location** Refer to Geotechnical Map

| Elevation Feet | Depth Feet | Graphic Log (N S) | Attitudes | Sample No. | Blows per Foot | Dry Density pcf | Moisture Content, % | Soil Class. (U.S.C.S.) | DESCRIPTION | Type of Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| 1400 | 60 | | | R-12 | 50/5" | | | | **Logged By** ARH/GIM<br>**Sampled By** ARH | |
| 1395 | 65 | | J: N66W, 69NE<br>J: N18E, 49SE<br>$F_p$: N29W, 20SW | R-13 | 56/6" | 126.8 | 4.3 | | | |
| 1390 | 70 | | J: N84W, 90 | R-14 | 50/3" | 111.8 | 3.7 | | @ 72' abundant gypsum stringers | |
| 1385 | 75 | | | R-15 | 67/5" | 114.3 | 3.7 | | @ 75.3' silty soft, nonindurated zone, 6" wide, irregular distinct upper and lower contacts, discontinuous around hole | |
| 1380 | 80 | | $AF_q$: N30W, 19SW | R-16 | 48/6" | | | | | |
| 1375 | 85 | | | R-17 | 50/3" | | | | @ 84.9'-85.3': fractured quartz vein with gypsum joint infill<br>@ 85' no sample recovery<br>87.5'-96': slight to moderate seepage from along fractures | |
| 1370 | 90 | | | | | | | | | |

**SAMPLE TYPES:**

S SPLIT SPOON
R RING SAMPLE
B BULK SAMPLE
T TUBE SAMPLE
G GRAB SAMPLE
C CORE SAMPLE

**TYPE OF TESTS:**

DS DIRECT SHEAR
MD MAXIMUM DENSITY
CN CONSOLIDATION
CR CORROSION
SA SIEVE ANALYSIS
AL ATTERBERG LIMITS
EI EXPANSION INDEX
RV R-VALUE

# GEOTECHNICAL BORING LOG LB-2

**Date** 3-15-01 **Sheet** 4 **of** 4

**Project** Mountaingate, Tract 53072 **Project No.** 03-0381-001

**Drilling Co.** Tri-Valley Drilling **Type of Rig** Bucket-Auger

**Hole Diameter** 24" **Drive Weight** 1-28=5952 lbs, 28-55=3921 lbs, 55-84=2531 lbs, 84-114=1407 lbs **Drop** 12"

**Elevation Top of Hole** 1460' **Location** Refer to Geotechnical Map

| Elevation Feet | Depth Feet | Graphic Log (N S) | Attitudes | Sample No. | Blows Per Foot | Dry Density pcf | Moisture Content, % | Soil Class. (U.S.C.S.) | DESCRIPTION | Type of Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| 1370 | 90 | | J: N44E, 77SE | R-18 | 39/5" | | | | formation is very hard, medium grey, tight, difficult to hack out joint and foliation planes | |
| 1365 | 95 | | J: N69E, 63NW | R-19 | 50/1" | | | | | |
| 1360 | 100 | | | R-20 | 56/6" | | | | **Total depth drilled = 100 ft**<br>**Total depth sampled = 100.5 ft**<br>**Total depth down-hole logged = 96 ft**<br>**Ground water not encountered**<br>**Seepage at 36 ft and 92 ft**<br>**Boring backfilled with cuttings** | |
| 1355 | 105 | | | | | | | | | |
| 1350 | 110 | | | | | | | | | |
| 1345 | 115 | | | | | | | | | |
| 1340 | 120 | | | | | | | | | |

**Logged By** ARH/GIM

**Sampled By** ARH

SAMPLE TYPES:
- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
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- RV R-VALUE

# GEOTECHNICAL BORING LOG LB-3

**Date** 3-19-01 **Sheet** 1 **of** 3

**Project** Mountaingate, Tract 53072 **Project No.** 03-0381-001

**Drilling Co.** Tri-Valley Drilling **Type of Rig** Bucket-Auger

**Hole Diameter** 24" **Drive Weight** 0-28=5952 lbs, 28-55=3921 lbs, 55-84=2531 lbs, 84-114=1407 lbs **Drop** 12"

**Elevation Top of Hole** 1482' **Location** Refer to Geotechnical Map

| Elevation Feet | Depth Feet | Graphic Log (N / S) | Attitudes | Sample No. | Blows Per Foot | Dry Density pcf | Moisture Content, % | Soil Class. (U.S.C.S.) | DESCRIPTION | Type of Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | **Logged By** ARH/GIM<br>**Sampled By** ARH | |
| 1480 | 0 | | | | | | | | SANTA MONICA SLATE (Jsm):<br>SLATE/PHYLLITE: generally orange-brown and grey, slightly moist, hard, very fractured, few to some quartz veins, silty matrix around gravel to boulder sized angular clasts; mostly faulted, brecciated, and weathered with some coherent well-indurated interlayers, calcium carbonate lined joints | |
| | 5 | | $F_o$: N62W, 30NE<br>$F_o$: N19W, 22NE<br>J: N7W, 54NE | R-1 | 2 | 120.9 | 3.4 | | @ 6.3': 2"-7" thick discontinuous quartz vein | |
| 1475 | | | | | | | | | | |
| | 10 | | | R-2 | 8 | 125.9 | 7.1 | | | |
| 1470 | | | | | | | | | | |
| | 15 | | J: N87E, 31NW | R-3 | 7 | 130.5 | 4.0 | | @ 16.5' very slight seepage | |
| 1465 | | | | | | | | | | |
| | | | $F_o$: N21W, 32NE | | | | | | @19' becomes harder and more intact | |
| | 20 | | J: N60W, 76NE<br>N31E, 59NW | R-4 | 8 | 135.0 | 5.9 | | | |
| 1460 | | | | | | | | | | |
| | | | | | | | | | contact irregular and indistinct | |
| | 25 | | N44W, 74SW | R-5 | 12 | 122.7 | 8.5 | | @25' grades to SLATE: medium orange brown with grey zones, slightly moist, very hard, blocky fracture, weakly foliated | MD |
| 1455 | | | | B-1 | | | | | | |
| | | | J: N48W, 42NE | | | | | | | |
| | 30 | | | | | | | | | |

**SAMPLE TYPES:**

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

**TYPE OF TESTS:**

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

# GEOTECHNICAL BORING LOG LB-3

**Date** 3-19-01 **Sheet** 2 **of** 3

**Project** Mountaingate, Tract 53072 **Project No.** 03-0381-001

**Drilling Co.** Tri-Valley Drilling **Type of Rig** Bucket-Auger

**Hole Diameter** 24" **Drive Weight** 1-28=5952 lbs, 28-55=3921 lbs, 55-84=2531 lbs, 84-114=1407 lbs **Drop** 12"

**Elevation Top of Hole** 1482' **Location** Refer to Geotechnical Map

| Elevation Feet | Depth Feet | Graphic Log (N S) | Attitudes | Sample No. | Blows Per Foot | Dry Density pcf | Moisture Content, % | Soil Class. (U.S.C.S.) | DESCRIPTION | Type of Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| | 30 | | | R-6 | 37/6" | 118.4 | 4.8 | | **Logged By** ARH/GIM<br>**Sampled By** ARH | |
| | | | J: N63W, 66SW | | | | | | | |
| 1450 | | | | | | | | | | |
| | 35 | | | R-7 | 16 | 127.8 | 6.4 | | HORNFELS/SLATE: orange brown, slightly moist, hard, ravels easily; gravel and boulder sized clasts with a silt matrix | |
| 1445 | | | | | | | | | | |
| | | | $F_0$: N14W, 11SW | | | | | | | |
| | 40 | | | R-8 | 28 | 128.1 | 3.4 | | | |
| | | | N38W, 73SW | | | | | | @ 41' prominent joint set | |
| 1440 | | | | | | | | | | |
| | | | | | | | | | @ 43' grades to PHYLLITE: dark grey, hard to very hard, moderately fissile with moderately defined foliation in zones | |
| | 45 | | $J/F_0$: N47E, 22NW | R-9 | 26 | 119.0 | 3.4 | | | |
| 1435 | | | | | | | | | | |
| | 50 | | J: N34W, 74SW | R-10 | 29 | 123.3 | 9.2 | | | |
| 1430 | | | | | | | | | | |
| | | | | | | | | | brecciated zone, with gravel, sand, silt and clay sized particles, abundant calcium carbonate-lined surfaces near the base of the brecciated zone | |
| | 55 | | | R-11 | 46/6" | | | | below fault formation is very hard and intact; difficult to hack out foliation and joint planes | |
| 1425 | | | | | | | | | | |
| | 60 | | | | | | | | | |

**SAMPLE TYPES:**

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

**TYPE OF TESTS:**

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
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- RV R-VALUE

# GEOTECHNICAL BORING LOG LB-3

**Date** 3-19-01 **Sheet** 3 of 3

**Project** Mountaingate, Tract 53072 **Project No.** 03-0381-001

**Drilling Co.** Tri-Valley Drilling **Type of Rig** Bucket-Auger

**Hole Diameter** 24" **Drive Weight** 1-28=5952 lbs, 28-55=3921 lbs, 55-84=2531 lbs, 84-114=1407 lbs **Drop** 12"

**Elevation Top of Hole** 1482' **Location** Refer to Geotechnical Map

| Elevation Feet | Depth Feet | Graphic Log (N S) | Attitudes | Sample No. | Blows Per Foot | Dry Density pcf | Moisture Content, % | Soil Class. (U.S.C.S.) | DESCRIPTION | Type of Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| | 60 | | $F_6$: N32E, 69SE | R-12 | 70/5" | 122.7 | 15.3 | | Logged By ARH/GIM<br>Sampled By ARH | |
| 1420 | | | | | | | | | | |
| | 65 | | J: N29E, 66SE | R-13 | 69/9" | 130.3 | 4.2 | | | |
| 1415 | | | $F_6$: N77W, 29NE | | | | | | | |
| | 70 | | | R-14 | 74/10" | 139.1 | 3.3 | | | |
| 1410 | | | | | | | | | very fissile zone, weathered, abundant calcium carbonate | |
| | 75 | | J: N25E, 85SE | R-15 | 51/6" | 118.9 | 5.4 | | PHYLLITE: similar to above | |
| 1405 | | | | | | | | | | |
| | 80 | | J: N72W, 87NE | R-16 | 48/5" | 124.6 | 6.5 | | @ 79.5' rapid seepage; standing water up to 79.5' | |
| 1400 | | | | | | | | | | |
| | 85 | | | R-17 | 50/6" | 125.3 | 10.7 | | **Total depth drilled = 85 ft**<br>**Total depth sampled = 85.5 ft**<br>**Total depth down-hole logged = 79.5 ft**<br>**Ground water not encountered**<br>**Seepage at 16.5 ft and 80 ft**<br>**Boring backfilled with cuttings** | |
| 1395 | | | | | | | | | | |
| | 90 | | | | | | | | | |

**SAMPLE TYPES:**

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

**TYPE OF TESTS:**

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
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**LEIGHTON AND ASSOCIATES, INC.**

# GEOTECHNICAL BORING LOG LB-4

**Date** 3-19-01 **Sheet** 1 of 4

**Project** Mountaingate, Tract 53072 **Project No.** 03-0381-001

**Drilling Co.** Tri-Valley Drilling **Type of Rig** Bucket-Auger

**Hole Diameter** 24" **Drive Weight** 1-28=5952 lbs, 28-55=3921 lbs, 55-84=2531 lbs, 84-114=1407 lbs **Drop** 12"

**Elevation Top of Hole** 1474' **Location** Refer to Geotechnical Map

| Elevation Feet | Depth Feet | Graphic Log (N — S) | Attitudes | Sample No. | Blows Per Foot | Dry Density pcf | Moisture Content, % | Soil Class. (U.S.C.S.) | DESCRIPTION | Type of Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | **Logged By** ARH/GIM<br>**Sampled By** ARH | |
| 1470 | 0 | | | | | | | | **SANTA MONICA SLATE (Jsm):**<br>interzoned HORNFELS, SLATE, and PHYLLITE: generally dark grey with orange-brown staining along joints, dry to very moist along fractures and joints, hard to very hard<br>SLATE/HORNFELS: dark grey with orange-brown staining along fractures, very hard, abundant calcium carbonate stringers, poor to moderate parting along foliation | |
| | 5 | | | R-1 | 18 | 141.6 | 3.8 | | | |
| | | | J: N77E, 88NW | | | | | | | |
| 1465 | | | J: N87W, 26SW | | | | | | @ 9' becomes increasingly jointed | |
| | 10 | | | R-2 | 19 | 119.4 | 11.4 | | @ 11' slight seepage along prominent joint<br>grades to BRECCIA: gravelly sandy silt [matrix] with angular gravel to boulder sized PHYLLITE/SLATE clasts: orange-brown and grey (banding, zoning, and mottling), slightly moist to moist, very firm, cohesive, ravels easily when hacked | |
| | | | J: N21E, 54NW | | | | | | | |
| 1460 | | | | | | | | | | |
| | 15 | | | R-3 | 14 | 121.4 | 7.6 | | | |
| | | | $F_o$: N89W, 21SW<br>J: N48W, 66SW | | | | | | grades to SLATE: similar to above; relatively intact | |
| 1455 | | | | | | | | | | |
| | 20 | | | R-4 | 23/4" | 126.6 | 7.9 | | | |
| | | | | | | | | | @ 22' abundant calcium carbonate lined joints, increased moisture along fractures, slightly brecciated and weathered | |
| | | | | | | | | | @ 23.3 slight seepage | |
| 1450 | | | | | | | | | | |
| | 25 | | $F_o$: N57E, 51NW | R-5 | 21/9" | 122.3 | 8.2 | | contact between grey gravelly siltstone/breccia and orange brown orange hornfels/slate, continous around hole | |
| | | | | | | | | | @ 28' slight seepage and grades to SLATE: grey, moderately hard, platey and moderately fissile, slightly weathered, slightly phyllitic luster | |
| 1445 | | | AJ: | | | | | | | |
| | 30 | | | | | | | | | |

**SAMPLE TYPES:**

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

**TYPE OF TESTS:**

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
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- RV R-VALUE

# GEOTECHNICAL BORING LOG LB-4

**Date** 3-19-01 **Sheet** 2 of 4

**Project** Mountaingate, Tract 53072 **Project No.** 03-0381-001

**Drilling Co.** Tri-Valley Drilling **Type of Rig** Bucket-Auger

**Hole Diameter** 24" **Drive Weight** 0-28=5952 lbs, 28-55=3921 lbs, 55-84=2531 lbs, 84-114=1407 lbs **Drop** 12"

**Elevation Top of Hole** 1474' **Location** Refer to Geotechnical Map

| Elevation Feet | Depth Feet | Graphic Log (N S) | Attitudes | Sample No. | Blows Per Foot | Dry Density pcf | Moisture Content, % | Soil Class. (U.S.C.S.) | DESCRIPTION | Type of Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| | 30 | | N40W, 27NE | R-6 | 36\10" | 140.8 | 1.5 | | Logged By ARH/GIM<br>Sampled By ARH | |
| | | | $F_o$: N23E, 40SE | | | | | | | |
| 1440 | | | | | | | | | | |
| | 35 | | | R-7 | 28 | 142.5 | 1.5 | | @ 35.5 grades to HORNFELS: dark chocolate grey-brown, slightly moist to damp, very hard, poor parting, very weakly foliated | |
| | | | J: N18W,41SW | | | | | | | |
| 1435 | | | | | | | | | | |
| | 40 | | | R-8 | 39 | 124.7 | 2.7 | | | |
| | | | $F_o$: N6E, 21NW | | | | | | | |
| | | | J: N27E, 71SE | | | | | | | |
| 1430 | | | | | | | | | PHYLLITE: similar to above HORNFELS, platey, moderately fissile, scattered zones with microcrystalline pyrite along parting surfaces | |
| | 45 | | | R-9 | 33/10" | 133.8 | 2.1 | | | |
| | | | | | | | | | @47' discontinous quartz vein, approximately .75" thick exposed on east wall | |
| 1425 | | | | | | | | | | |
| | 50 | | | R-10 | 42/10" | 135.4 | 1.7 | | | |
| 1420 | | | | | | | | | | |
| | 55 | | J: N64W, 90 | R-11 | 22 | 143.6 | 3.8 | | | |
| | | | J: N30E, 28NW | | | | | | @ 57' becomes harder, more massive appearance, with poor parting along weak foliation; SLATE/PHYLLITE | |
| 1415 | | | | | | | | | | |
| | 60 | | | | | | | | | |

**SAMPLE TYPES:**

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

**TYPE OF TESTS:**

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
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- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

# GEOTECHNICAL BORING LOG LB-4

**Date** 3-19-01 **Sheet** 3 of 4

**Project** Mountaingate, Tract 53072 **Project No.** 03-0381-001

**Drilling Co.** Tri-Valley Drilling **Type of Rig** Bucket-Auger

**Hole Diameter** 24" **Drive Weight** 0-28=5952 lbs, 28-55=3921 lbs, 55-84=2531 lbs, 84-114=1407 lbs **Drop** 12"

**Elevation Top of Hole** 1474' **Location** Refer to Geotechnical Map

| Elevation Feet | Depth Feet | Graphic Log (N S) | Attitudes | Sample No. | Blows Per Foot | Dry Density pcf | Moisture Content, % | Soil Class. (U.S.C.S.) | DESCRIPTION | Type of Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| | 60 | | | R-12 | 43 | 110.5 | 1.9 | | **Logged By** ARH/GIM<br>**Sampled By** ARH | |
| | | | $F_0$: N80W, 11SW | | | | | | | |
| 1410 | | | J: N32E, 47SE | | | | | | 63'-67': increase in pyrite along joints<br>63.3-74.0': very hard, massive appearance, very difficult to hack | |
| | 65 | | | R-13 | 60/5" | 125.7 | 2.6 | | | |
| 1405 | | | | | | | | | | |
| | 70 | | J: N53E, 84NW | R-14 | 70/4" | | | | | |
| 1400 | | | J:N30W, 69SW | | | | | | | |
| | 75 | | | R-15 | 50/3" | | | | | |
| 1395 | | | | B-1 | | | | | @ 78' slight seepage | |
| | 80 | | $F_0$: N38W, 14SW | R-16 | 67/10" | 132.3 | 3.5 | | @79' a 4" wide shear/fault, SANDY CLAY/CLAYEY SAND with a .25" to .5" thick continuos CLAY: dark grey, very moist, very plastic, moderately firm | |
| | | | J:N24W, 41NE | | | | | | SLATE: dark grey, moist along fractures, very hard, abundant irregular quartz veining | |
| 1390 | | | | | | | | | | |
| | 85 | | | R-17 | 70/6" | 123.3 | 2.2 | | | |
| 1385 | | | | | | | | | | |
| | 90 | | | | | | | | | |

**SAMPLE TYPES:**

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

**TYPE OF TESTS:**

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

# GEOTECHNICAL BORING LOG LB-4

**Date** 3-19-01 **Sheet** 4 **of** 4

**Project** Mountaingate, Tract 53072 **Project No.** 03-0381-001

**Drilling Co.** Tri-Valley Drilling **Type of Rig** Bucket-Auger

**Hole Diameter** 24" **Drive Weight** 1-28=5952 lbs, 28-55=3921 lbs, 55-84=2531 lbs, 84-114=1407 lbs **Drop** 12"

**Elevation Top of Hole** 1474' **Location** Refer to Geotechnical Map

| Elevation Feet | Depth Feet | Graphic Log (N S) | Attitudes | Sample No. | Blows Per Foot | Dry Density pcf | Moisture Content, % | Soil Class. (U.S.C.S.) | DESCRIPTION | Type of Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| | 90 | | | R-18 | 95/9" | | | | **Logged By** ARH/GIM<br>**Sampled By** ARH | |
| | | | $F_0$: N3W, 40NE | | | | | | | |
| 1380 | | | $F_0$: N18W, 26NE | | | | | | | |
| | 95 | | | R-19 | 73/4" | | | | | |
| 1375 | | | | | | | | | | |
| | 100 | | | R-20 | 35/1" | | | | | |
| | | | | | | | | | **Total depth drilled = 100'**<br>**Total depth sampled = 100.1'**<br>**Total depth down-hole logged = 96 ft**<br>**Ground water not encountered**<br>**Seepage at 23.3 ft, 28 ft, and 78 ft**<br>**Boring backfilled with cuttings** | |
| 1370 | | | | | | | | | | |
| | 105 | | | | | | | | | |
| 1365 | | | | | | | | | | |
| | 110 | | | | | | | | | |
| 1360 | | | | | | | | | | |
| | 115 | | | | | | | | | |
| 1355 | | | | | | | | | | |
| | 120 | | | | | | | | | |

**SAMPLE TYPES:**

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

**TYPE OF TESTS:**

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
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# GEOTECHNICAL BORING LOG LB-5

**Date** 3-26-01 **Sheet** 1 **of** 4

**Project** Mountaingate, Tract 53072 **Project No.** 03-0381-001

**Drilling Co.** Tri-Valley Drilling **Type of Rig** Bucket-Auger

**Hole Diameter** 24" **Drive Weight** 0-28=5952 lbs, 28-55=3921 lbs, 55-84=2531 lbs, 84-114=1407 lbs **Drop** 12"

**Elevation Top of Hole** 1478' **Location** Refer to Geotechnical Map

| Elevation Feet | Depth Feet | Graphic Log (N S) | Attitudes | Sample No. | Blows Per Foot | Dry Density pcf | Moisture Content, % | Soil Class. (U.S.C.S.) | DESCRIPTION | Type of Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | **Logged By** ARH/GIM<br>**Sampled By** ARH | |
| | 0 | | | | | | | | **SANTA MONICA SLATE (Jsm):**<br>PHYLLITE and WEATHERED PHYLLITE: generally medium to dark grey with orange-brown weathered zones, slightly moist to wet along fractures, hard to very hard, varies from massive to fissile with moderate luster/ sheen along primary foliation, abundant steeply dipping joints and joint sets, few open fractures | |
| 1475 | | | | | | | | | | |
| | 5 | | $F_o$: N36W, 33NE<br>J: N26E, 86NW | R-1 | 22 | 132.9 | 5.8 | | | |
| 1470 | | | J: N80E, 79NW | | | | | | @ 7' increased moisture; prominent joint faces exposed from 5.7' to 8.0', and 6.8' to 8,3' | |
| | 10 | | | R-2 | 16/6" | 110.8 | 5.7 | | @9' slight seepage | |
| | | | $F_o$: N18W, 29NE | | | | | | roodets oberved down to 11' | |
| 1465 | | | | | | | | | @12' becomes harder, intact, poor parting, weak foliation, jointed, hacks into rhombohedral shapes<br>13' -16' minor caving and widening of hole; abundant clay lined joints | |
| | 15 | | J: N11E, 41SE<br>J: N77W, 85SW | R-3 | 30/11" | 143.7 | 2.0 | | | |
| 1460 | | | $F_o$: N83W, 19NE<br>$F_o$: N69W, 5NE | B-1 | | | | | increasingly fissile and fractured | |
| | 20 | | | R-4 | 39/11" | 118.7 | 10.3 | | | |
| 1455 | | | | | | | | | | |
| | 25 | | $J_1$: N79W, 79SW | B-3 | | | | | two subparallel joints extend from 24.0' and 27.7' up hole, intersect, and exit at approximately 17' on the northeast side of boring; J1: open to .25" @ 24.0'; $J_2$: open .75" at 27.7'; joints narrow with less depth,<br>$J_1$ and $J_2$ are lined with CLAY: medium grey, very moist, very plastic, soft | |
| | | | | R-5 | 12 | 121.8 | 3.9 | | | |
| | | | $J_2$: N49W, 71SW | B-3 | | | | | | |
| 1450 | | | | | | | | | J2 truncates at 27.7 against lusterous PHYLLITE with well defined foliation and parting | |
| | 30 | | | | | | | | | |

**SAMPLE TYPES:**

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

**TYPE OF TESTS:**

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

# GEOTECHNICAL BORING LOG LB-5

**Date** 3-26-01 **Sheet** 2 **of** 4

**Project** Mountaingate, Tract 53072 **Project No.** 03-0381-001

**Drilling Co.** Tri-Valley Drilling **Type of Rig** Bucket-Auger

**Hole Diameter** 24" **Drive Weight** 0-28=5952 lbs, 28-55=3921 lbs, 55-84=2531 lbs, 84-114=1407 lbs **Drop** 12"

**Elevation Top of Hole** 1478' **Location** Refer to Geotechnical Map

| Elevation Feet | Depth Feet | Graphic Log (N S) | Attitudes | Sample No. | Blows Per Foot | Dry Density pcf | Moisture Content, % | Soil Class. (U.S.C.S.) | DESCRIPTION | Type of Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| | 30 | | | R-6 | 31/4" | 110.0 | 2.9 | | Logged By ARH/GIM<br>Sampled By ARH | |
| 1445 | | | | | | | | | @ 33" formation is harder, more coherenet than above | |
| | 35 | | J: N65E, 77SE | R-7 | 25/6" | 121.1 | 2.8 | | @ 35' slight seepage | |
| 1440 | | | | | | | | | @ 37' to 41': slight seepage all around hole | |
| | 40 | | J: N29W, 42NE | R-8 | 32/5" | 123.5 | 2.7 | | | |
| 1435 | | | $F_0$: N54W, 32NE | | | | | | | |
| | 45 | | | R-9 | 40 | 133.9 | 4.2 | | @47' grades to more massive PHYLLITE with poor parting/foliation; very difficult to hack out planes, very hard | |
| 1430 | | | | | | | | | | |
| | 50 | | J: N86E, 61NW | R-10 | 35/5" | 115.6 | 6.9 | | | |
| 1425 | | | | | | | | | | |
| | 55 | | | R-11 | 35/5" | 123.8 | 4.9 | | | |
| 1420 | | | | | | | | | | |
| | 60 | | | | | | | | | |

SAMPLE TYPES:
- S SPLIT SPOON
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- B BULK SAMPLE
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- G GRAB SAMPLE
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TYPE OF TESTS:
- DS DIRECT SHEAR
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# GEOTECHNICAL BORING LOG LB-5

**Date** 3-26-01 **Sheet** 3 of 4

**Project** Mountaingate, Tract 53072 **Project No.** 03-0381-001

**Drilling Co.** Tri-Valley Drilling **Type of Rig** Bucket-Auger

**Hole Diameter** 24" **Drive Weight** 0-28=5952 lbs, 28-55=3921 lbs, 55-84=2531 lbs, 84-114=1407 lbs **Drop** 12"

**Elevation Top of Hole** 1478' **Location** Refer to Geotechnical Map

| Elevation Feet | Depth Feet | Graphic Log (N S) | Attitudes | Sample No. | Blows Per Foot | Dry Density pcf | Moisture Content, % | Soil Class. (U.S.C.S.) | DESCRIPTION (Logged By ARH/GIM; Sampled By ARH) | Type of Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| | 60 | | | R-12 | 43/11" | 123.9 | 7.0 | | | |
| 1415 | | | | | | | | | | |
| | 65 | | | R-13 | 32/6" | 125.1 | 8.5 | | @ 64' becomes more fractured with some scattered quartz veins observed, very hard, platey and fissile | |
| 1410 | | | | | | | | | | |
| | 70 | | | R-14 | 46/3" | 109.6 | 10.4 | | PHYLLITE: medium orange-brown, wet along closed joints, very hard, abundant calcium carbonate | |
| 1405 | | | | | | | | | @73' sharp irregular contact orange-brown zone | |
| | 75 | | J: N21E, 90 | R-15 | 46/6" | 111.8 | 3.5 | | @ 76' sharp color change to medium brown; similar to above | |
| 1400 | | | | | | | | | | |
| | 80 | | | R-16 | 58/6" | 110.7 | 9.8 | | | |
| 1395 | | | | | | | | | | |
| | 85 | | | R-17 | 62/6" | 127.6 | 4.0 | | @ 85' a 1.0' thick zone SLATE: orange-brown, very hard, blocky fracture, very jointed, fractured, foliation poorly defined | |
| 1390 | | | | | | | | | @ 87' moderate to rapid seepage | |
| | 90 | | | B-2 | | | | | | |

**SAMPLE TYPES:**

S SPLIT SPOON
R RING SAMPLE
B BULK SAMPLE
T TUBE SAMPLE
G GRAB SAMPLE
C CORE SAMPLE

**TYPE OF TESTS:**

DS DIRECT SHEAR
MD MAXIMUM DENSITY
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# GEOTECHNICAL BORING LOG LB-5

**Date** 3-26-01 **Sheet** 4 **of** 4

**Project** Mountaingate, Tract 53072 **Project No.** 03-0381-001

**Drilling Co.** Tri-Valley Drilling **Type of Rig** Bucket-Auger

**Hole Diameter** 24" **Drive Weight** 1-28=5952 lbs, 28-55=3921 lbs, 55-84=2531 lbs, 84-114=1407 lbs **Drop** 12"

**Elevation Top of Hole** 1478' **Location** Refer to Geotechnical Map

| Elevation Feet | Depth Feet | Graphic Log (N S) | Attitudes | Sample No. | Blows Per Foot | Dry Density pcf | Moisture Content, % | Soil Class. (U.S.C.S.) | DESCRIPTION | Type of Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| | 90 | | | R-18 | 63/6" | 119.5 | 12.3 | | Logged By ARH/GIM<br>Sampled By ARH | |
| 1385 | | | | | | | | | ground water/ standing water @ 91.3' due to seepage accumulation | |
| | 95 | | | R-19 | 73/4" | | | | | |
| 1380 | | | | | | | | | | |
| | 100 | | | R-20 | 73/4" | | | | | |
| 1375 | | | | | | | | | **Total depth drilled = 100 ft**<br>**Total depth sampled = 100 ft 4 inches**<br>**Total depth down-hole logged = 91 ft 4 inches**<br>**Ground water not encountered**<br>**Seepage at 9 ft, 38 ft, and 90 ft**<br>**Boring backfilled with cuttings** | |
| | 105 | | | | | | | | | |
| 1370 | | | | | | | | | | |
| | 110 | | | | | | | | | |
| 1365 | | | | | | | | | | |
| | 115 | | | | | | | | | |
| 1360 | | | | | | | | | | |
| | 120 | | | | | | | | | |

**SAMPLE TYPES:**

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

**TYPE OF TESTS:**

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
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# GEOTECHNICAL BORING LOG LB-6

**Date** 3-27-01 **Sheet** 1 of 2

**Project** Mountaingate, Tract 53072 **Project No.** 03-0381-001

**Drilling Co.** Tri-Valley Drilling **Type of Rig** Bucket-Auger

**Hole Diameter** 24" **Drive Weight** 1-28=5952 lbs, 28-55=3921 lbs, 55-84=2531 lbs, 84-114=1407 lbs **Drop** 12"

**Elevation Top of Hole** 1563' **Location** Refer to Geotechnical Map

| Elevation Feet | Depth Feet | Graphic Log (N S) | Attitudes | Sample No. | Blows Per Foot | Dry Density pcf | Moisture Content, % | Soil Class. (U.S.C.S.) | DESCRIPTION | Type of Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | | | | | | | | **Logged By** ARH/GIM **Sampled By** ARH | |
| | | | | | | | | | **TOPSOIL/COLLUVIUM:** gravelly SILTY CLAY: medium orange brown, slightly moist, firm, plastic, trace pinhole voids, trace sand; west side of hole only, distinct bottom and lateral contact | |
| | | | J: N66W, 90 | | | | | | | |
| 1560 | | | | B-1 | | | | | **MODELO FORMATION (Tm):** SILTSTONE: light orange-brown, slightly moist, very firm; @ 5' joint with .25" thick calcium carbonate infill, slightly cemented, cohesive @ 2.8' : SILTY CLAYSTONE: chocolate-brown, damp, hard to very hard, nonplastic | |
| | 5 | | B: N61W, 11SW | R-1 | 4 | 101.6 | 23.4 | | | |
| | | | | | | | | | SILTY SANDSTONE: very fine-grained, light buff brown to cream with light orange-brown stained zones, massively bedded, easily friable, moderately cohesive | |
| 1555 | | | AB: N60E, 16SE | | | | | | @ 7.0': .25" thick CLAYSTONE: chocolate brown, damp, nonplastic, curviplanar, continuous around hole, non-plastic, hard | |
| | | | | B-2 | | | | | | |
| | 10 | | | R-2 | 2 | 105.2 | 10.0 | | | |
| 1550 | | | | | | | | | | |
| | 15 | | | R-3 | 2 | 106.1 | 10.3 | | 15.3'-23.4': iron staining along near-vertical, closed joints | |
| 1545 | | | | | | | | | | |
| | 20 | | | R-4 | 3 | 109.5 | 11.4 | | | |
| 1540 | | | | | | | | | | |
| | 25 | | | R-5 | 3 | 110.8 | 13.1 | | | |
| 1535 | | | J: 56E, 55NW | | | | | | 1.8"-2.5" thick CLAYEY SILTSTONE: medium brown, damp, very firm, nonplastic, discontinuous around hole, faint polished surfaces observed @ 28' grades to SILTY SANDSTONE: light orange-brown, damp, hard, easily friable | |
| | 30 | | | | | | | | | |

**SAMPLE TYPES:**

S SPLIT SPOON
R RING SAMPLE
B BULK SAMPLE
T TUBE SAMPLE
G GRAB SAMPLE
C CORE SAMPLE

**TYPE OF TESTS:**

DS DIRECT SHEAR
MD MAXIMUM DENSITY
CN CONSOLIDATION
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# GEOTECHNICAL BORING LOG LB-6

**Date** 3-27-01 **Sheet** 2 of 2

**Project** Mountaingate, Tract 53072 **Project No.** 03-0381-001

**Drilling Co.** Tri-Valley Drilling **Type of Rig** Bucket-Auger

**Hole Diameter** 24" **Drive Weight** 1-28=5952 lbs, 28-55=3921 lbs, 55-84=2531 lbs, 84-114=1407 lbs **Drop** 12"

**Elevation Top of Hole** 1563' **Location** Refer to Geotechnical Map

| Elevation Feet | Depth Feet | Graphic Log (N S) | Attitudes | Sample No. | Blows Per Foot | Dry Density pcf | Moisture Content, % | Soil Class. (U.S.C.S.) | DESCRIPTION | Type of Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| | 30 | | J: N74E, 44NW | R-6 | 33/7" | 109.0 | 8.9 | | @ 29.8' sharp irregular contact<br>SILTSTONE: medium brown, damp, very hard, well cemented, massive | |
| 1530 | | | J: N53E, 74NW | | | | | | | |
| | 35 | | J: N64E, 6NW | R-7 | 18 | 116.5 | 6.6 | | very difficult drilling wtih crowds, core-bucket, and carbide-tooth-bucket; approximate drilling rate from 37' to 45' was 2.2' per hour<br>SANDSTONE: medium to dark orange-brown, slightly moist along joints, very hard, very well cemented and indurated, some steeply dipping open fractures with mineral deposition along cleaved surfaces | DS |
| 1525 | | | J: N3E, 75NW | B-3 | | | | | 34.6'-44.7' open fracture; upper limit of fracture a 34.6' truncates against overlying SANDSTONE<br>southwest wall: exposed fracture is a maximum of 10" wide @ 36.0'; fractures observed open to at least 8' laterally along strike<br>northeast wall: fracture is generally 4" to 6" wide, maximum of 10" wide @ 35.5', closed from 40' to total depth<br>fracture exposures narrow with depth. | |
| | 40 | | J: N66E, 75NW | | | | | | | |
| 1520 | | | J: N3E, 75NW | | | | | | | |
| | 45 | | J: N50E, 74NW | | | | | | @ 45 ft practical refusal | |
| 1515 | | | | | | | | | **Total depth drilled = 45 ft**<br>**Total depth sampled = 38 ft**<br>**Total depth down-hole logged = 42 ft**<br>**Ground water and seepage not encountered**<br>**Boring backfilled with cuttings** | |
| | 50 | | | | | | | | | |
| 1510 | | | | | | | | | | |
| | 55 | | | | | | | | | |
| 1505 | | | | | | | | | | |
| | 60 | | | | | | | | | |

**SAMPLE TYPES:**

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
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- G GRAB SAMPLE
- C CORE SAMPLE

**TYPE OF TESTS:**

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
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# GEOTECHNICAL BORING LOG LB-7

**Date** 3-29-01 **Sheet** 1 **of** 4

**Project** Mountaingate, Tract 53072 **Project No.** 03-0381-001

**Drilling Co.** Tri-Valley Drilling **Type of Rig** Bucket-Auger

**Hole Diameter** 24" **Drive Weight** 1-28=5952 lbs, 28-55=3921 lbs, 55-84=2531 lbs, 84-114=1407 lbs **Drop** 12"

**Elevation Top of Hole** 1512' **Location** Refer to Geotechnical Map

| Elevation Feet | Depth Feet | Graphic Log (N S) | Attitudes | Sample No. | Blows Per Foot | Dry Density pcf | Moisture Content, % | Soil Class. (U.S.C.S.) | DESCRIPTION | Type of Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | **Logged By** ARH/GIM<br>**Sampled By** ARH | |
| 1510 | 0 | | | | | | | | **LANSLIDE Qls-1:**<br>generally jumbled and very weathered SLATE and PHYLLITE clasts within SILT and CLAYEY SILT matrix: medium orange brown and grey, moist, firm, massive appearance; mostly gravel-sized clasts | |
| | 5 | | | R-1 | 2 | 118.2 | 12.2 | | | DS |
| 1505 | | | | | | | | | rootlets observed to 6.4' | |
| | | | | B-1 | | | | | @7.8' SILTY CLAY/CLAYEY SILT: blue-grey and rusty orange, moist, slightly firm, 6" thick, slightly plastic, discontinuous laminations, appears sheared | |
| | 10 | | | R-2 | push/12" | 116.4 | 5.2 | | very weathered SLATE/PHYLLITE: dark brown-grey, moist, slightly hard, easily friable, SANDY SILT matrix between gravel to mostly boulder-sized clasts, jigsaw texture, appears jumbled | |
| 1500 | | | | | | | | | | |
| | 15 | | | R-3 | 2 | 120.3 | 12.1 | | | |
| 1495 | | | | | | | | | | |
| | 20 | | C: N74W, 40SW | R-4 | 17/9" | 133.6 | 6.0 | | **SANTA MONICA SLATE (Jsm):**<br>PHYLLITE: generally dark grey, weathers medium orange-brown, slightly moist to wet along fractures, hard to very hard, abundant steeply dipping joints and joint sets, primary foliation moderately to well developed, some fissile zones | |
| 1490 | | | J: N27E, 64SE<br>J: N16W, 77NE<br>$F_0$: N2E, 22NW | | | | | | | |
| | 25 | | J: N26E, 16NW | R-5 | 15 | 132.0 | 2.1 | | @24.6' formation is strongly foliated, and very jointed | |
| 1485 | | | J: N19E, 53SE | | | | | | | |
| | 30 | | $F_0$: N24E, | | | | | | | |

**SAMPLE TYPES:**

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G GRAB SAMPLE
C CORE SAMPLE

**TYPE OF TESTS:**

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RV R-VALUE

# GEOTECHNICAL BORING LOG LB-7

**Date** 3-29-01 **Sheet** 2 **of** 4

**Project** Mountaingate, Tract 53072 **Project No.** 03-0381-001

**Drilling Co.** Tri-Valley Drilling **Type of Rig** Bucket-Auger

**Hole Diameter** 24" **Drive Weight** 1-28=5952 lbs, 28-55=3921 lbs, 55-84=2531 lbs, 84-114=1407 lbs **Drop** 12"

**Elevation Top of Hole** 1512' **Location** Refer to Geotechnical Map

| Elevation Feet | Depth Feet | Graphic Log (N S) | Attitudes | Sample No. | Blows Per Foot | Dry Density pcf | Moisture Content, % | Soil Class. (U.S.C.S.) | DESCRIPTION (Logged By ARH/GIM; Sampled By ARH) | Type of Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| | 30 | | 31NW | R-6 | 29 | 133.2 | 3.4 | | | |
| 1480 | | | J: N23E, 65SE | | | | | | @32' sharp irregular contact<br>formation has blocky fracture, foliation weakly defined, very jointed and weathered with silt and clay infill | |
| | 35 | | | R-7 | 26 | 126.1 | 4.4 | | | |
| 1475 | | | J: N86W,87SW | | | | | | @37.1' formation is more intact<br>abundant steeply-dipping joints; mostly massive PHYLLITE | |
| | 40 | | | R-8 | 42/6" | 119.1 | 3.8 | | | |
| 1470 | | | $F_o$: N52E, 14NW | | | | | | | |
| | 45 | | | R-9 | 34 | 128.2 | 2.7 | | | |
| 1465 | | | J: N12W, 67NE | | | | | | @47' color change to orange brown | |
| | | | $F_o$: N35E, 26SE | | | | | | | |
| | 50 | | J: N9W, 69NE | R-10 | 34/6" | 115.2 | 3.7 | | | |
| 1460 | | | | | | | | | @51' color change to grey | |
| | | | | B-2 | | | | | | |
| | 55 | | $F_o$: N60E, 21NW | R-11 | 40/10" | 129.2 | 2.2 | | | |
| 1455 | | | J: N11W, 72NE | | | | | | | |
| | 60 | | J: N24W, | | | | | | | |

**SAMPLE TYPES:**

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

**TYPE OF TESTS:**

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

# GEOTECHNICAL BORING LOG LB-7

**Date** 3-29-01 **Sheet** 3 **of** 4

**Project** Mountaingate, Tract 53072 **Project No.** 03-0381-001

**Drilling Co.** Tri-Valley Drilling **Type of Rig** Bucket-Auger

**Hole Diameter** 24" **Drive Weight** 1-28=5952 lbs, 28-55=3921 lbs, 55-84=2531 lbs, 84-114=1407 lbs **Drop** 12"

**Elevation Top of Hole** 1512' **Location** Refer to Geotechnical Map

| Elevation Feet | Depth Feet | Graphic Log (N S) | Attitudes | Sample No. | Blows Per Foot | Dry Density pcf | Moisture Content, % | Soil Class. (U.S.C.S.) | DESCRIPTION (Logged By ARH/GIM; Sampled By ARH) | Type of Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| | 60 | | 76NE | R-12 | 70/3" | | | | | |
| | | | J: N16W, 81NE | | | | | | | |
| 1450 | | | $F_o$: N63E, 16NW | | | | | | @62' abundant calcium carbonate lined joints; formation very fractured | |
| | | | J: N25E, 72SE | | | | | | | |
| | 65 | | | R-13 | 71/3" | 122.6 | 4.9 | | @65' increasing moisture content along fractures | |
| | | | J: N18W, 52NE | | | | | | | |
| 1445 | | | $F_o$: N44E, 17NW | | | | | | @67' seepage | |
| | 70 | | | R-14 | 46/9" | 124.5 | 4.7 | | | |
| | | | $F_o$: N75E,32NW | | | | | | | |
| 1440 | | | J: N28W,, 90 | | | | | | very fissile zone; very platey fractured, slight seepage, minor caving on northwest side of hole | |
| | | | J: N22E, 81SE | | | | | | | |
| | 75 | | | R-15 | 71/4" | | | | | |
| | | | $F_o$: N64E, 22NW | | | | | | | |
| 1435 | | | CLAY: N38E, 18NW | | | | | | @ 76.5' 1/8" thick grey CLAY, very moist, plastic, slightly firm, discontinous around hole | |
| | | | J: N87E, 66SE | | | | | | slightly weathered PHYLLITE: orange-brown with grey zones, moist to wet along joints, mostly massive with poor parting along foliation, with some fissile and fractured zones | |
| | 80 | | J: N14W, 90 | R-16 | 65/6" | 133.1 | 6.2 | | | |
| | | | J: N14E, 51SE | | | | | | | |
| 1430 | | | J: N44W, 21NE | | | | | | | |
| | | | | | | | | | standing water @ 83' due to seepage accumulation | |
| | 85 | | | R-17 | 37/6" | 118.1 | 12.6 | | | |
| 1425 | | | | | | | | | | |
| | 90 | | | | | | | | | |

**SAMPLE TYPES:**

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

**TYPE OF TESTS:**

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

# GEOTECHNICAL BORING LOG LB-7

**Date** 3-29-01 **Sheet** 4 of 4

**Project** Mountaingate, Tract 53072 **Project No.** 03-0381-001

**Drilling Co.** Tri-Valley Drilling **Type of Rig** Bucket-Auger

**Hole Diameter** 24" **Drive Weight** 0-28=5952 lbs, 28-55=3921 lbs, 55-84=2531 lbs, 84-114=1407 lbs **Drop** 12"

**Elevation Top of Hole** 1512' **Location** Refer to Geotechnical Map

| Elevation Feet | Depth Feet | Graphic Log (N / S) | Attitudes | Sample No. | Blows Per Foot | Dry Density pcf | Moisture Content, % | Soil Class. (U.S.C.S.) | DESCRIPTION | Type of Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| | 90 | | | R-18 | 40/6" | 117.1 | 7.7 | | Logged By ARH/GIM<br>Sampled By ARH | |
| 1420 | | | | | | | | | | |
| | 95 | | | R-19 | 56/8" | 117.4 | 8.8 | | | |
| 1415 | | | | | | | | | | |
| | 100 | | | R-20 | 63/3" | | | | Total depth drilled = 100 ft<br>Total depth sampled = 100 ft 3 inches<br>Total depth down-hole logged = 76 ft<br>Ground water not encountered<br>Seepage encountered at 67 ft and 72 ft<br>Boring backfilled with cuttings | |
| 1410 | | | | | | | | | | |
| | 105 | | | | | | | | | |
| 1405 | | | | | | | | | | |
| | 110 | | | | | | | | | |
| 1400 | | | | | | | | | | |
| | 115 | | | | | | | | | |
| 1395 | | | | | | | | | | |
| | 120 | | | | | | | | | |

SAMPLE TYPES:
- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- C CORE SAMPLE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
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- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

# GEOTECHNICAL BORING LOG LB-8

Date 4-4-01 | Sheet 1 of 4

Project Mountaingate, Tract 53072 | Project No. 03-0381-001

Drilling Co. Tri-Valley Drilling | Type of Rig Bucket-Auger

Hole Diameter 24" | Drive Weight 0-28=5952 lbs, 28-55=3921 lbs, 55-84=2531 lbs, 84-114=1407 lbs | Drop 12"

Elevation Top of Hole 1580' | Location Refer to Geotechnical Map

| Elevation Feet | Depth Feet | Graphic Log (N S) | Attitudes | Sample No. | Blows Per Foot | Dry Density pcf | Moisture Content, % | Soil Class. (U.S.C.S.) | DESCRIPTION (Logged By ARH/GIM; Sampled By ARH) | Type of Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| 1580 | 0 | | | | | | | | **TOPSOIL/COLLUVIUM/very weathered MODELO FORMATION(Tm):** SILTY CLAY: medium brown, moist, firm, slightly plastic, some zones with remnant bedding observed, scatterd rootlets, bottom contact gradational | |
| 1575 | 5 | | | R-1<br>B-1 | push/12" | 74.2 | 51.5 | | **MODELO FORMATION (Tm):** generally interbedded SILTY SANDSTONE, with occasional SILTSTONE and CLAYSTONE interbeds<br>CLAYEY SILTSTONE/SILTY CLAYSTONE: medium orange-brown, damp to slightly moist, very firm; finely bedded to massive with some hard cemented zones, bottom contact sharp and planar to curviplanar | MD, DS |
| 1570 | 10 | | J: N48W, 80SW<br>B: N64E, 12SE<br>B: N66W, 12 NE | R-2 | push 1/3" | 91.5 | 30.3 | | SILTY SANDSTONE: very fine-grained, light buff brown to cream with light orange-brown stained zones, damp, hard, massively bedded, easily friable, but cohesive, trace granular sand<br>13.7'-15.0': lense of calcium carbonate cemented SILTSTONE/ micrite, massive, very hard, discontinuous around hole | |
| 1565 | 15 | | | R-3<br>B-2 | 6 | 107.6 | 7.6 | | | |
| 1560 | 20 | | J: N24E, 12NW | R-4 | 6 | 109.2 | 7.9 | | | |
| 1555 | 25 | | J: N15E, 66NW | R-5 | 6 | 109.7 | 7.9 | | 25'-28': iron staining along near-vertical, closed joints | |
| 1550 | 30 | | | | | | | | | |

SAMPLE TYPES:
S SPLIT SPOON
R RING SAMPLE
B BULK SAMPLE
T TUBE SAMPLE
G GRAB SAMPLE
C CORE SAMPLE

TYPE OF TESTS:
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RV R-VALUE

# GEOTECHNICAL BORING LOG LB-8

Date 4-4-01 Sheet 2 of 4

Project Mountaingate, Tract 53072 Project No. 03-0381-001

Drilling Co. Tri-Valley Drilling Type of Rig Bucket-Auger

Hole Diameter 24" Drive Weight 0-28=5952 lbs, 28-55=3921 lbs, 55-84=2531 lbs, 84-114=1407 lbs Drop 12"

Elevation Top of Hole 1580' Location Refer to Geotechnical Map

Logged By ARH/GIM

Sampled By ARH

| Elevation Feet | Depth Feet | Graphic Log (N S) | Attitudes | Sample No. | Blows Per Foot | Dry Density pcf | Moisture Content, % | Soil Class. (U.S.C.S.) | DESCRIPTION | Type of Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| 1550 | 30 | | | R-6 | 44 | 119.6 | 7.2 | | 32.7'-34.0': iron staining along near-vertical, closed joints | |
| 1545 | 35 | | | R-7 | 42/9" | 121.8 | 7.1 | | | DS |
| | | | AB: N60W, 8SW | | | | | | SILTY CLAYSTONE: dark brown, damp, very firm, moderately plastic, finely bedded, approximately 2.5" thick underlain by a 1"-thick ash (?) bed: CLAY: white, damp, slightly plastic, soft, appears similar to caliche | |
| 1540 | 40 | | J: N44W, 86NE J: N25W, 78NE | R-8 | 4 | 101.2 | 13.1 | | 38.3'-41.8': caving along fracture; 1.5' maximum width along southeast side of boring SILTY SANDSTONE: fine- to medium-grained, medium orange-brown, damp to slightly moist, very hard, well to very well cemented and indurated, limey silt cemeted, some open and silt infilled fractures with mineralization along open faces; open from1/4" to 8" | |
| 1535 | 45 | | | R-9 | | | | | | |
| 1530 | 50 | | | R-10 | | | | | | |
| 1525 | 55 | | | R-11 | | | | | @ 55' abundant open and silt infilled fractures, open up to 8" | |
| | | | J: N42E, 82SE J: N41E, 79SE | | | | | | | |
| 1520 | 60 | | | | | | | | | |

SAMPLE TYPES:

S SPLIT SPOON
R RING SAMPLE
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TYPE OF TESTS:

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# GEOTECHNICAL BORING LOG LB-8

**Date** 4-4-01 **Sheet** 3 **of** 4

**Project** Mountaingate, Tract 53072 **Project No.** 03-0381-001

**Drilling Co.** Tri-Valley Drilling **Type of Rig** Bucket-Auger

**Hole Diameter** 24" **Drive Weight** 1-28=5952 lbs, 28-55=3921 lbs, 55-84=2531 lbs, 84-114=1407 lbs **Drop** 12"

**Elevation Top of Hole** 1580' **Location** Refer to Geotechnical Map

| Elevation Feet | Depth Feet | Graphic Log (N S) | Attitudes | Sample No. | Blows Per Foot | Dry Density pcf | Moisture Content, % | Soil Class. (U.S.C.S.) | DESCRIPTION (Logged By ARH/GIM; Sampled By ARH) | Type of Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| 1520 | 60 | | | R-12<br>B-3 | | | | | @61' air entering hole from .5" wide open fracture | |
| | | | J: N14E, 81NW | | | | | | | |
| 1515 | 65 | | J: N30E, 80NW | R-13 | | | | | | |
| | | | J: N48E, 78NW | | | | | | unconformity: sharp irregular erosional contact | |
| | | | | | | | | | **SANTA MONICA SLATE (Jsm):** generally PHYLLITE and weathered PHYLLITE: dark grey and orange-brown, slightly moist, hard to very hard, moderately well indurated, moderately fisslie with good parting along primary foliation, weakly foliated to massive in zones, abundant closed steeply-dipping joints | |
| 1510 | 70 | | J: N79E, 81NW<br>$F_o$: N13E, 38NW<br>$F_o$:N48W, 22SW | R-14 | | | | | | |
| 1505 | 75 | | J: N67W, 67SW | R-15 | 73/9" | 139.5 | 2.5 | | SLATE/PHYLLITE: dark grey, dry, very hard, jointed, moderate sheen along foliation | |
| 1500 | 80 | | J: N90E, 71S<br>J: N23W,53NE<br>$F_o$: N31E, 29NW | R-16 | 83/8" | 119.7 | 5.0 | | platey, fissile zone | |
| 1495 | 85 | | F/J: N9W, 40NE<br>F: N29W, 24SW<br>J: N76W, 73SW | R-17 | 65/6" | 120.4 | 5.3 | | SLATE/PHYLLITE: dark grey and brown stained, slightly moist, very hard, abundant steeply dipping joints and joint sets, calcium carbonate lined fractures, massive appearance | |
| 1490 | 90 | | J: N66W, | | | | | | | |

**SAMPLE TYPES:**

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
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- C CORE SAMPLE

**TYPE OF TESTS:**

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
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- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

# GEOTECHNICAL BORING LOG LB-8

Date 4-4-01 | Sheet 4 of 4

Project Mountaingate, Tract 53072 | Project No. 03-0381-001

Drilling Co. Tri-Valley Drilling | Type of Rig Bucket-Auger

Hole Diameter 24" | Drive Weight 0-28=5952 lbs, 28-55=3921 lbs, 55-84=2531 lbs, 84-114=1407 lbs | Drop 12"

Elevation Top of Hole 1580' | Location Refer to Geotechnical Map

| Elevation Feet | Depth Feet | Graphic Log (N S) | Attitudes | Sample No. | Blows Per Foot | Dry Density pcf | Moisture Content, % | Soil Class. (U.S.C.S.) | DESCRIPTION (Logged By ARH/GIM; Sampled By ARH) | Type of Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| 1490 | 90 | | 58SW | R-18 | 80/4" | | | | @ 89.5': 4"-thick zone of dark green-grey CLAY with angular PHYLLITE clasts, polished surfaces observed, clay bed is irregular and discontinuous around hole, down-dip lineation on polished surfaces | |
| | | | J: N65E, 32NW | | | | | | | |
| | | | J: N78W, 74SW | | | | | | | |
| 1485 | 95 | | | R-19 | 58/6" | 116.4 | 3.4 | | | |
| 1480 | 100 | | | R-20 | 50\3" | 102.9 | 3.4 | | | |
| 1475 | 105 | | | | | | | | **Total depth drilled = 100 ft**<br>**Total depth sampled = 100 ft 3 inches**<br>**Total depth down-hole logged = 95 ft**<br>**Ground water and seepage not encountered**<br>**Boring backfilled with cuttings** | |
| 1470 | 110 | | | | | | | | | |
| 1465 | 115 | | | | | | | | | |
| 1460 | 120 | | | | | | | | | |

SAMPLE TYPES:
- S SPLIT SPOON
- R RING SAMPLE
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TYPE OF TESTS:
- DS DIRECT SHEAR
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LEIGHTON AND ASSOCIATES, INC.

# GEOTECHNICAL BORING LOG LB-9

**Date** 7-1-02 **Sheet** 1 **of** 2

**Project** Mountaingate, Tract 53072 **Project No.** 03-0381-002

**Drilling Co.** Tri-Valley Drilling **Type of Rig** Bucket-Auger

**Hole Diameter** 24" **Drive Weight** (0'-28'=5952, 28'-55'=3921, 55'-84'=2531, 84'-114'=1407) lbs **Drop** 12"

**Elevation Top of Hole** 1425' **Location** See Geotechnical Map

| Elevation Feet | Depth Feet | Graphic Log (N / S) | Attitudes | Sample No. | Blows Per Foot | Dry Density pcf | Moisture Content, % | Soil Class. (U.S.C.S.) | DESCRIPTION (Logged By JBW/JGS; Sampled By JBW) | Type of Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| 1425 | 0 | | | | | | | | **LANDSLIDE DEBRIS (Qls-2):** SILTSTONE, brown to yellowish brown, slightly moist, soft to moderately hard, massive, fractured. | |
| 1420 | 5 | | @7' B: N33E,30NW<br>@8.5' C: N10E,35NW | | | | | | @ 8.5' sharp contact undulatory around the boring; | |
| 1415 | 10 | | | R-1<br>B-1 | 3 | | | | SANDSTONE, light yellow-brown, moist, soft, slightly friable, massive, slightly fractured, manganese oxide staining and roots along fractures. | |
| 1410 | 15 | | @13' J: N70W,75NE | | | | | | @ 14' - 18' COLLUVIAL ZONE, sandstone derived, cobbles and boulders in a silty sand matrix; boulders are up to 3' in diameter, angular.<br>@ 18' sharp contact, continuous around the boring, | |
| 1405 | 20 | | @18': S: N40E,25NW | R-2<br>B-2 | 7 | | | | SLATE, dark brown to gray, slightly moist, highly fractured, weathered, iron oxide and white clayey secondary mineral (sericite) along fractures. | |
| 1400 | 25 | | @25.1': S: N5E,30NW<br>@25.2': S: N-S,35W<br>@26': BRS: N15E,25NW<br>@29': J: | G-1 | | | | | @ 26': Basal Rupture Surface; 1/2" thick layer of clay with rock fragments, moist, firm to stiff<br>**BEDROCK:SANTA MONICA SLATE (JSM):** SLATE: medium gray, slightly moist, moderately fractured, hard, massive to slightly foliated; fractures are lined with iron oxide staining and secondary mineral sericite. | |
| 1395 | 30 | | | | | | | | | |

**SAMPLE TYPES:**

S SPLIT SPOON
R RING SAMPLE
B BULK SAMPLE
T TUBE SAMPLE
G GRAB SAMPLE
SH SHELBY TUBE

**TYPE OF TESTS:**

DS DIRECT SHEAR
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RV R-VALUE

# GEOTECHNICAL BORING LOG LB-9

**Date** 7-1-02 **Sheet** 2 **of** 2

**Project** Mountaingate, Tract 53072 **Project No.** 03-0381-002

**Drilling Co.** Tri-Valley Drilling **Type of Rig** Bucket-Auger

**Hole Diameter** 24" **Drive Weight** (0'-28'=5952, 28'-55'=3921, 55'-84'=2531, 84'-114'=1407) lbs **Drop** 12"

**Elevation Top of Hole** 1425' **Location** See Geotechnical Map

| Elevation Feet | Depth Feet | Graphic Log (N S) | Attitudes | Sample No. | Blows Per Foot | Dry Density pcf | Moisture Content, % | Soil Class. (U.S.C.S.) | DESCRIPTION | Type of Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Logged By JBW/JGS<br>Sampled By JBW | |
| 1395 | 30 | | N40E,52SE | R-3 | 16 for 4" | | | | SLATE: medium gray, slightly moist, moderately fractured, hard, massive to slightly foliated; fractures are lined with iron oxide staining and secondary mineral sericite. | |
| | | | @32": $F_o$: N52E,38NW | | | | | | | |
| 1390 | 35 | | @35': J: N35E,85SE<br>@36': $F_o$: N30E,40NW | | | | | | | |
| 1385 | 40 | | @39.5': $F_r$: N55E,38SE | R-4<br>B-3 | 53 for 9" | | | | @ 39.5': Fault 1/8" to 1/4" thick; below fault the slate is slightly less fractured and massive. | |
| | | | @43': J: N70E,50SE | | | | | | | |
| 1380 | 45 | | | | | | | | | |
| | | | @47.5': $F_r$: N70E,40NW<br>@49' J: N25E,75SE | | | | | | | |
| 1375 | 50 | | | R-5 | 28 for 9" | | | | | |
| 1370 | 55 | | | | | | | | **Total Depth drilled = 54'.**<br>**Sampled to 50'.**<br>**Boring downhole logged to 53'.**<br>**Groundwater not encountered.**<br>**Boring backfilled with cuttings.** | |
| 1365 | 60 | | | | | | | | | |

**SAMPLE TYPES:**

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- SH SHELBY TUBE

**TYPE OF TESTS:**

- DS DIRECT SHEAR
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**LEIGHTON AND ASSOCIATES, INC.**

# GEOTECHNICAL BORING LOG LB-10

**Date** 7-2-02 **Sheet** 1 **of** 2

**Project** Mountaingate, Tract 53072 **Project No.** 03-0381-002

**Drilling Co.** Tri-Valley Drilling **Type of Rig** Bucket-Auger

**Hole Diameter** 24" **Drive Weight** (0'-28'=5952, 28'-55'=3921, 55'-84'=2531, 84'-114'=1407) lbs **Drop** 12"

**Elevation Top of Hole** 1485' **Location** See Geotechnical Map

| Elevation Feet | Depth Feet | Graphic Log (N S) | Attitudes | Sample No. | Blows Per Foot | Dry Density pcf | Moisture Content, % | Soil Class. (U.S.C.S.) | DESCRIPTION | Type of Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| 1485 | 0 | | | | | | | | **Logged By** JBW/JGS **Sampled By** JBW | |
| | | | | | | | | | **LANDSLIDE DEBRIS (Qls-3):** SILTY SAND (COLLUVIUM): light brown to medium brown, dry, loose. | |
| 1480 | 5 | | | | | | | | | |
| | | | | | | | | | SLATE, grayish brown to medium gray, dry to slightly moist, soft to medium hard, highly fractured (open fractures up to 1"), fractures have iron oxide staining along surfaces, roots and rootlets were observed along fractures. | |
| 1475 | 10 | | | R-1 | 3 | | | | @10' boring opens up to approximately 4' in diameter due to highly fractured (slate crumbles upon light touch with hammer). | |
| | | | @13' J: N70W,75NE | | | | | | @13' prominent fracture set. | |
| 1470 | 15 | | | | | | | | | |
| | | | | | | | | | @ 21' shear zone: 1' thick, slate: dark gray, slightly moist, highly fractured, highly ground up; shear plane at base = 1/8" thick clay. | |
| 1465 | 20 | | | R-2 | 4 | | | | @22' Basal Rupture Surface, 1/8" thick clay, moist, firm to stiff; the slate in the lower 12-inches of the slide debris (above the rupture surface) is dark gray, slightly moist, highly fractured, and highly broken up. | |
| | | | @22' BRS: N20W,30SW | | | | | | **BEDROCK:SANTA MONICA SLATE (JSM):** SLATE, medium gray, slightly moist, hard, massive, moderately fractured. | |
| 1460 | 25 | | @25' F: N35E,32NW @26' S: N60E,40SE @28' S: N20E,15NW | | | | | | @ 26' shear zone, highly fractured and broken up slate, medium gray, slightly moist. | |
| | | | | | | | | | @ 28' shear zone, 3" to 6" thick of broken up slate, fractured, with white clayey secondary mineral (sericite) along fractures; sheared zone is irregular around boring. | |
| | | | @29.5' J: E-W,70S | | | | | | @ 29.5' fracture filled with white clayey alteration mineral (sericite) and soil. | |
| 1455 | 30 | | | | | | | | | |

**SAMPLE TYPES:**

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- SH SHELBY TUBE

**TYPE OF TESTS:**

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- CU TRIAXIAL SHEAR
- EI EXPANSION INDEX
- RV R-VALUE

# GEOTECHNICAL BORING LOG LB-10

**Date** 7-2-02 **Sheet** 2 **of** 2

**Project** Mountaingate, Tract 53072 **Project No.** 03-0381-002

**Drilling Co.** Tri-Valley Drilling **Type of Rig** Bucket-Auger

**Hole Diameter** 24" **Drive Weight** (0'-28'=5952, 28'-55'=3921, 55'-84'=2531, 84'-114'=1407) lbs **Drop** 12"

**Elevation Top of Hole** 1485' **Location** See Geotechnical Map

| Elevation Feet | Depth Feet | Graphic Log (N S) | Attitudes | Sample No. | Blows Per Foot | Dry Density pcf | Moisture Content, % | Soil Class. (U.S.C.S.) | DESCRIPTION | Type of Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | **Logged By** JBW/JGS<br>**Sampled By** JBW | |
| 1455 | 30 | | | R-3 | 18 | | | | SLATE, medium gray, slightly moist, hard, massive, moderately fractured. | |
| 1450 | 35 | | @34.5 Fg: N35W,30SW | | | | | | @ 34.5' SLATE, medium gray, slightly moist, moderately hard, moderately to highly fractured, with white clayey alteration mineral (sericite) and iron oxide staining along fractures. | |
| 1445 | 40 | | | R-4 | 24 | | | | | |
| | | | | | | | | | **Total depth drilled = 40'.**<br>**Sampled to 40'.**<br>**Boring downhole logged to 40'.**<br>**Groundwater not encountered.**<br>**Boring backfilled with cuttings.** | |
| 1440 | 45 | | | | | | | | | |
| 1435 | 50 | | | | | | | | | |
| 1430 | 55 | | | | | | | | | |
| 1425 | 60 | | | | | | | | | |

**SAMPLE TYPES:**

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- SH SHELBY TUBE

**TYPE OF TESTS:**

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- CU TRIAXIAL SHEAR
- EI EXPANSION INDEX
- RV R-VALUE

# GEOTECHNICAL BORING LOG LB-11

**Date** 7-7-02 **Sheet** 1 **of** 3

**Project** Mountaingate, Tract 53072 **Project No.** 03-0381-002

**Drilling Co.** Tri-Valley Drilling **Type of Rig** Bucket-Auger

**Hole Diameter** 24" **Drive Weight** (0'-28'=5952, 28'-55'=3921, 55'-84'=2531, 84'-114'=1407) lbs **Drop** 12"

**Elevation Top of Hole** 1490' **Location** See Geotechnical Map

| Elevation Feet | Depth Feet | Graphic Log (N / S) | Attitudes | Sample No. | Blows Per Foot | Dry Density pcf | Moisture Content, % | Soil Class. (U.S.C.S.) | DESCRIPTION | Type of Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| 1490 | 0 | | | | | | | | **Logged By** JBW/JGS<br>**Sampled By** JBW | |
| | | | | | | | | | **LANDSLIDE DEBRIS (Qls-3):**<br>SLATE, medium gray, slightly moist to dry, highly fractured, open fractures to 1/8", some fractures closed with white clay mineral (sericite), iron oxide staining and roots to 2", moderately weathered. | |
| 1485 | 5 | | | | | | | | | |
| 1480 | 10 | | @10' J: N-S,60E<br>@11' $F_o$: N25E,40NW | R-1 | 3 | | | | @10' prominent joint set.<br>@11' open fractures 1/8" to 1/4", lined with white clay mineral (sericite) and iron oxide. | |
| 1475 | 15 | | @15' $F_o$: N27E,35NW<br>@16.5' S: N45E,37NW<br>@17' J: N30E,70SE<br>@18.5' S: N55E,10SE | | | | | | @16.5 shear along foliation; broken up SLATE, roots to 3" thick, same material above and below shear.<br>@17' raveling zone.<br>@18' shear 1" to 2" thick, truncates fault at 17', roots along shear . | |
| 1470 | 20 | | @21' J: N30E,75SE | R-2 | 2 | | | | @18' - 46' heavy caving and metal casing was installed for downhole logging. | |
| 1465 | 25 | | | | | | | | | |
| 1460 | 30 | | | | | | | | | |

**SAMPLE TYPES:**

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- SH SHELBY TUBE

**TYPE OF TESTS:**

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- CU TRIAXIAL SHEAR
- EI EXPANSION INDEX
- RV R-VALUE

**LEIGHTON AND ASSOCIATES, INC.**

# GEOTECHNICAL BORING LOG LB-11

**Date** 7-7-02 **Sheet** 2 **of** 3

**Project** Mountaingate, Tract 53072 **Project No.** 03-0381-002

**Drilling Co.** Tri-Valley Drilling **Type of Rig** Bucket-Auger

**Hole Diameter** 24" **Drive Weight** (0'-28'=5952, 28'-55'=3921, 55'-84'=2531, 84'-114'=1407) lbs **Drop** 12"

**Elevation Top of Hole** 1490' **Location** See Geotechnical Map

**Logged By** JBW/JGS

**Sampled By** JBW

| Elevation Feet | Depth Feet | Graphic Log (N S) | Attitudes | Sample No. | Blows Per Foot | Dry Density pcf | Moisture Content, % | Soil Class. (U.S.C.S.) | DESCRIPTION | Type of Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| 1460 | 30 | | | R-3 | 11 | | | | @18' - 46' heavy caving and metal casing was installed for downhole logging. | |
| 1455 | 35 | | | | | | | | | |
| 1450 | 40 | | | R-4 | 6 | | | | | |
| 1445 | 45 | | | | | | | | @46' GRAVELLY SILTY CLAY, medium gray, slightly moist, highly fractured, weathered, abundant white clay mineral (sericite) and iron oxide staining. | |
| 1440 | 50 | | | R-5 | 6 | | | | | |
| 1435 | 55 | | @55.5' S: N40W,20NE | | | | | | @55' shear, 3" thick, SANDY CLAYEY SILT, light to medium olive gray, moist, soft to stiff; SLATE below is slightly more intact; basal layer is 1/4" thick medium gray to olive gray CLAY with an undulatory contact. | |
| 1430 | 60 | | @59' $F_O$: N52W,28SW | | | | | | @59' slight foliation with white clay mineral (sericite); moisture increases with depth. | |

**SAMPLE TYPES:**

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- SH SHELBY TUBE

**TYPE OF TESTS:**

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- CU TRIAXIAL SHEAR
- EI EXPANSION INDEX
- RV R-VALUE

# GEOTECHNICAL BORING LOG LB-11

**Date** 7-7-02 **Sheet** 3 **of** 3

**Project** Mountaingate, Tract 53072 **Project No.** 03-0381-002

**Drilling Co.** Tri-Valley Drilling **Type of Rig** Bucket-Auger

**Hole Diameter** 24" **Drive Weight** (0'-28'=5952, 28'-55'=3921, 55'-84'=2531, 84'-114'=1407) lbs **Drop** 12"

**Elevation Top of Hole** 1490' **Location** See Geotechnical Map

**Logged By** JBW/JGS

**Sampled By** JBW

| Elevation Feet | Depth Feet | Graphic Log (N S) | Attitudes | Sample No. | Blows Per Foot | Dry Density pcf | Moisture Content, % | Soil Class. (U.S.C.S.) | DESCRIPTION | Type of Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| 1430 | 60 | | | R-6 | 29 for 5" | | | | @60' SLATE, medium gray, slightly moist to moist, fractured, slightly more competent than above. | |
| 1425 | 65 | | @64' S: N32E,30NW N15E,28NW N15E,33NW @67.5' S: N30W,10SW N30W,8SW | | | | | | @64' shear, 4" thick, highly fractured SLATE, white clay mineral (sericite); with a 1/4" thick basal layer of gray clay, soft moist, sharp contact.<br>@67.8' Basal Rupture Surface: 2" to 3" thick, GRAVELLY SANDY SILT with minor CLAY, medium gray, seepage, white clay mineral (sericite) and altered quartzite; with a clay base; slightly undulatory. | |
| 1420 | 70 | | @67.8' BRS: N5W,28SW @69.5' S: N70E,30NW | R-7 | 30 for 5" | | | | **BEDROCK:SANTA MONICA SLATE (Jsm):** SLATE, medium gray, lightly foliated, hard, iron oxide staining, white clay mineral (sericite), slightly to moderately fractured, fractures are closed.<br>@69.5' shear, 1" to 2" thick, highly pulverized SLATE, seepage stops at 69.5'. | |
| 1415 | 75 | | @72' S: N20E,45NW N-S,47W N25E,48NW @74.5' J: N70W,70SW @77' $F_o$: N20E,32NW | | | | | | @72' shearing along foliation, 8" to 12" thick, SLATE is moderately fractured, sheared, not as pulverized as zones above, quartzite, white clay mineral (sericite) and iron oxide along shear, no water, minor clay along shear.<br>@74.5' SLATE, medium gray, moderately fractured, hard, massive; with localized iron oxide zones. | |
| 1410 | 80 | | @79.5' S: N50W,38SW N70W,35SW N40W,30SW | R-8 | 15 for 2" | | | | | |
| 1405 | 85 | | | | | | | | **Total depth drilled = 84'.**<br>**Sampled to 81.5'.**<br>**Boring downhole logged to 84'.**<br>**Minor seepage at 67.5'.**<br>**Groundwater not encountered.**<br>**Boring backfilled with cuttings.**<br>**Caving zone between 18' and 46'; casing was installed in boring between 18' and 46'.** | |
| 1400 | 90 | | | | | | | | | |

**SAMPLE TYPES:**

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- SH SHELBY TUBE

**TYPE OF TESTS:**

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- CU TRIAXIAL SHEAR
- EI EXPANSION INDEX
- RV R-VALUE

**LEIGHTON AND ASSOCIATES, INC.**

# GEOTECHNICAL BORING LOG LB-12

**Date** 7-15-02 **Sheet** 1 **of** 3

**Project** Mountaingate, Tract 53072 **Project No.** 03-0381-002

**Drilling Co.** Tri-Valley Drilling **Type of Rig** Bucket-Auger

**Hole Diameter** 24" **Drive Weight** (0'-28'=5952, 28'-55'=3921, 55'-84'=2531, 84'-114'=1407) lbs **Drop** 12"

**Elevation Top of Hole** 1465' **Location** See Geotechnical Map

| Elevation Feet | Depth Feet | Graphic Log (N S) | Attitudes | Sample No. | Blows Per Foot | Dry Density pcf | Moisture Content, % | Soil Class. (U.S.C.S.) | DESCRIPTION (Logged By JBW/JGS; Sampled By JBW) | Type of Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| 1465 | 0 | | | | | | | | **LANDSLIDE DEBRIS (Qls-6):** SANDSTONE and SILTSTONE, in silty sand matrix, dry to slightly moist, highly fractured; massive appearance | |
| 1460 | 5 | | | | | | | | | |
| 1455 | 10 | | @11' C: N55W,40NE<br>@12' F: N80W,85NE | R-1<br>B-1 | 3 | | | | @11' sharp contact with the SLATE below; contact consists of a 2" thick SANDY SILT, dark gray, slightly moist, loose to moderately dense.<br>@12' fault, cut off by contact at 11'; hanging wall is SLATE and SANDSTONE with roots; footwall is SLATE.<br>@13.5' SLATE, medium gray, slightly moist, highly fractured. | |
| 1450 | 15 | | @17' F: N60W,70NE | | | | | | @17' fault exits boring; fault gauge is SILTY CLAY, soft, dark gray, 1" thick.<br>@17' SLATE, medium gray, moderately to highly fractured, open fractures to 1/4", with increased moisture along fractures, roots, localized clay. | |
| 1445 | 20 | | @20' J: N45E,68NW | R-2 | 4 | | | | | |
| 1440 | 25 | | | | | | | | | |
| 1435 | 30 | | | G-1 | | | | | | |

**SAMPLE TYPES:**

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- SH SHELBY TUBE

**TYPE OF TESTS:**

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
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- CU TRIAXIAL SHEAR
- EI EXPANSION INDEX
- RV R-VALUE

# GEOTECHNICAL BORING LOG LB-12

**Date** 7-15-02 **Sheet** 2 of 3

**Project** Mountaingate, Tract 53072 **Project No.** 03-0381-002

**Drilling Co.** Tri-Valley Drilling **Type of Rig** Bucket-Auger

**Hole Diameter** 24" **Drive Weight** (0'-28'=5952, 28'-55'=3921, 55'-84'=2531, 84'-114'=1407) lbs **Drop** 12"

**Elevation Top of Hole** 1465' **Location** See Geotechnical Map

**Logged By** JBW/JGS

**Sampled By** JBW

| Elevation Feet | Depth Feet | Graphic Log (N S) | Attitudes | Sample No. | Blows Per Foot | Dry Density pcf | Moisture Content, % | Soil Class. (U.S.C.S.) | DESCRIPTION | Type of Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| 1435 | 30 | | @30' S: N80W,25NE | R-3 | 8 | | | | @30' localized shearing, SILTY SAND and CLAY, white to yellow; basal layer is 1/4" to1" thick CLAY, medium gray moist, soft, irregular around boring. | |
| | | | @31.5' J: N25E,65SE<br>F: N55E,62NE<br>@32' F: E-W,85N | | | | | | @31.5' SLATE, olive gray, moist, moderately hard, fractured, massive, slightly more competent than above.<br>@31.5' sedimentary block displaced by faulting, 6" long 3"wide; faulting causes pinching out of light colored material. | |
| 1430 | 35 | | @33.5' S: N30E,37NW<br>@35' J: N25E,90<br>@37' $F_o$: N30E,33SE | | | | | | @33' base of sedimentary unit very irregular around boring due to faulting, SLATE, moderately to tightly fractured, clay 1/4" to 1/2" thick, soft, highly plastic, moist light to olive gray, clay only along fractures, cut off by fault.<br>@33.5' shear, CLAY, olive gray, moist to wet.<br>@35' near vertical jointing, highly plastic clay in joints.<br>@35.8' shear, silt infill, light gray to light brown.<br>@37' SLATE, medium gray, moist, highly fractured, slightly more blocky, iron oxide staining, CLAY film along fractured surfaces. | |
| 1425 | 40 | | | R-4 | 12 | | | | | |
| | | | @43.5' J: N15E,55NW | G-2 | | | | | @44' Basal Rupture Surface: well developed CLAY, olive gray, moist, soft, plastic, 1/4" to 1/2" thick; above slide plane is a zone of highly broken SLATE. | |
| 1420 | 45 | | @44' BRS: N30W,25SW<br>N35W,23SW<br>N21W,29SW<br>@45' $F_o$: N-S,32W<br>@48' J: N15W,70SW<br>C: N80E,25NW | B-2 | | | | | **BEDROCK;SANTA MONICA SLATE (Jsm):**<br>SLATE, medium gray, slightly moist, weathered, slightly foliated, white clay mineral (sericite) in fractures.<br>@45.5' shear, 1/8" thick, dark gray SILT.<br>@46' SLATE, massive to slightly foliated, blocky, hard to very hard, slightly fractured, altered quartzite veins to 2" thick, with iron oxide staining.<br>@48' quartzite vein, 3" thick, irregular around hole; fractures are clay filled with iron oxide staining; SLATE is unoxidized and oxidized in fractures. | |
| 1415 | 50 | | | R-5 | 27 | | | | | |
| | | | @51' S: N33E,35NW | | | | | | @51' shear, 1/32" to 1/8" thick, dark gray silt. | |
| | | | @52.5' C: N20W,38NE | B-3 | | | | | @52.5' quartzite vein 3" thick. | |
| 1410 | 55 | | @55' J: N13E,63NE<br>S: N50E,30NW<br>@57' J: N5W,80SW<br>@58' $F_o$: N70E,30NW | | | | | | @55' shear, 1/8"to 1/4" thick, SILT, matrix, with iron oxide staining, dark gray, moist.<br>@58' increased oxidation in SLATE. | |
| 1405 | 60 | | | | | | | | | |

**SAMPLE TYPES:**

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- SH SHELBY TUBE

**TYPE OF TESTS:**

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- CU TRIAXIAL SHEAR
- EI EXPANSION INDEX
- RV R-VALUE

# GEOTECHNICAL BORING LOG LB-12

**Date** 7-15-02 **Sheet** 3 of 3

**Project** Mountaingate, Tract 53072 **Project No.** 03-0381-002

**Drilling Co.** Tri-Valley Drilling **Type of Rig** Bucket-Auger

**Hole Diameter** 24" **Drive Weight** (0'-28'=5952, 28'-55'=3921, 55'-84'=2531, 84'-114'=1407) lbs **Drop** 12"

**Elevation Top of Hole** 1465' **Location** See Geotechnical Map

| Elevation Feet | Depth Feet | Graphic Log (N S) | Attitudes | Sample No. | Blows Per Foot | Dry Density pcf | Moisture Content, % | Soil Class. (U.S.C.S.) | DESCRIPTION | Type of Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| 1405 | 60 | | @60' J: N80E,70SE<br>S: N75E,47SE<br>@62' S: N32E,57NW<br>S: N45E,58SE | R-6 | 24 | | | | Logged By JBW/JGS<br>Sampled By JBW<br>@60' shear ($S_1$) enters boring; slate is moderately fractured.<br>@62' shear exists on the south side of boring.<br>@63' SLATE, medium gray, increased moisture, moderately fractured, blocky, iron oxide staining along fractures. | |
| 1400 | 65 | | @65.5' $F_o$: N55E,35NW<br>@66' S: N40E,32NW | G-3 | | | | | @66' shear, 1/4" thick, no clay, slickenlines; below shear is SLATE, medium gray, slightly to moderately fractured to massive, increased foliation, increased quartzite veins up to 1/4" thick. | |
| 1395 | 70 | | @69' $F_o$: N80W,40NE | R-7 | 16 for 3" | | | | | |
| | | | @72' J: N70E,75SE | | | | | | @72' SLATE, medium gray, slightly to moderately fractured, no iron oxide staining, unweathered. | |
| 1390 | 75 | | | B-4 | | | | | | |
| 1385 | 80 | | | R-8 | 28 for 2" | | | | | |
| 1380 | 85 | | | | | | | | **Total depth drilled = 83'.**<br>**Sampled to 81.5'.**<br>**Boring downhole logged to 83'.**<br>**Groundwater not encountered.**<br>**Boring backfilled with cuttings.** | |
| 1375 | 90 | | | | | | | | | |

SAMPLE TYPES:

- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
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- G GRAB SAMPLE
- SH SHELBY TUBE

TYPE OF TESTS:

- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
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- CU TRIAXIAL SHEAR
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**LEIGHTON AND ASSOCIATES, INC.**

# GEOTECHNICAL BORING LOG LB-13

**Date** 7-8-02 **Sheet** 1 **of** 2

**Project** Mountaingate, Tract 53072 **Project No.** 03-0381-002

**Drilling Co.** Tri-Valley Drilling **Type of Rig** Bucket-Auger

**Hole Diameter** 24" **Drive Weight** (0'-28'=5952, 28'-55'=3921, 55'-84'=2531, 84'-114'=1407) lbs **Drop** 12"

**Elevation Top of Hole** 1395' **Location** See Geotechnical Map

| Elevation Feet | Depth Feet | Graphic Log (N S) | Attitudes | Sample No. | Blows Per Foot | Dry Density pcf | Moisture Content, % | Soil Class. (U.S.C.S.) | DESCRIPTION | Type of Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | **Logged By** JBW/JGS<br>**Sampled By** JBW | |
| 1395 | 0 | | | | | | | | **SLUMP? (Os?)/LANDSLIDE DEBRIS? (Ols-?):**<br>SLATE: medium brown to medium gray, slightly moist, moderately hard, iron oxide staining along fractured surfaces. | |
| 1390 | 5 | | @6' J: N30W,60SW<br>@7' S: N5E,40NW | | | | | | @7': creep zone: slate, dark gray, highly fractured to pulverized, roots, 2" - 3" thick. | |
| 1385 | 10 | | @10.5' J: E-W,60S | R-1 | 18 for 5" | | | | @10': SLATE: medium gray, slightly moist, moderately foliated, blocky, more competent.<br>@13': shearing and rootlets along foliation.<br>@14': quartzite along foliation, shearing on north side of boring. | |
| | | | @13' S: N70W,35SW | | | | | | @15.5': gradational transition to more massive and resistant slate, less weathered, with no surface rupture planes. | |
| 1380 | 15 | | @15' S: N85W,37SW<br>@15' $F_O$: N85W,15SW<br>@17' $F_O$: N75E,17SE | B-1 | N/A | | | | **BEDROCK:SANTA MONICA SLATE (Jsm):**<br>SLATE: medium to dark gray, slightly moist, hard to very hard, moderately fractured. | |
| | | | @18.5 J: N40E,80NW<br>@19' $F_T$: N20W,70NE<br>@19' $F_T$: E-W,68N<br>@21' $F_T$ N10E,55NW | R-2 | | | | | @18.5': SLATE, medium gray slightly moist, blocky, hard, moderately fractured.<br>@19' SLATE: medium gray, slightly moist, highly fractured, fault surface observed, irregular, not continuous around boring, fault gouge 1/4" to 1/2" thick with oxidation.<br>@21' fault entering boring. | |
| 1370 | 25 | | @24.8 $F_O$: N45E,40NW | | | | | | @24' shear zone along foliation, fracturing, very tight; a fault enters the boring on the northeast side.<br>@24.8': fault exits northwest side of boring.<br>@25.5'-28': fault, tight enters on southeast side and exits on northwest. | |
| | | | @27' $F_O$: E-W,20N<br>@28' $F_T$: N40E,65NW<br>@28' $F_T$: | | | | | | @27': foliation structure observed, not continuous, cut by fault on west side.<br>@27.1': quartzite vein cut by fault.<br>@28': SLATE: medium gray, slightly moist, slightly to moderately fractured , hard, slightly weathered; with localized quartzite veins. | |
| 1365 | 30 | | | | | | | | | |

**SAMPLE TYPES:**

S SPLIT SPOON
R RING SAMPLE
B BULK SAMPLE
T TUBE SAMPLE
G GRAB SAMPLE
SH SHELBY TUBE

**TYPE OF TESTS:**

DS DIRECT SHEAR
MD MAXIMUM DENSITY
CN CONSOLIDATION
CR CORROSION
SA SIEVE ANALYSIS
CU TRIAXIAL SHEAR
EI EXPANSION INDEX
RV R-VALUE

# GEOTECHNICAL BORING LOG LB-13

**Date** 7-8-02 **Sheet** 2 **of** 2

**Project** Mountaingate, Tract 53072 **Project No.** 03-0381-002

**Drilling Co.** Tri-Valley Drilling **Type of Rig** Bucket-Auger

**Hole Diameter** 24" **Drive Weight** (0'-28'=5952, 28'-55'=3921, 55'-84'=2531, 84'-114'=1407) lbs **Drop** 12"

**Elevation Top of Hole** 1395' **Location** See Geotechnical Map

| Elevation Feet | Depth Feet | Graphic Log (N S) | Attitudes | Sample No. | Blows Per Foot | Dry Density pcf | Moisture Content, % | Soil Class. (U.S.C.S.) | DESCRIPTION | Type of Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| 1365 | 30 | | N80E,60SE @29.1' Quartzite Vein: N35E,35SE | R-3 | 25/6" | | | | Logged By JBW/JGS<br>Sampled By JBW<br>SLATE: medium to dark gray, slightly moist, hard to very hard, moderately fractured; with localized quartzite veins. | |
| 1360 | 35 | | | | | | | | | |
| 1355 | 40 | | | | | | | | **Total depth drilled = 36'.**<br>**Sampled to 31'.**<br>**Boring downhole logged to 36'.**<br>**Groundwater not encountered.**<br>**Boring backfilled with cuttings.** | |
| 1350 | 45 | | | | | | | | | |
| 1345 | 50 | | | | | | | | | |
| 1340 | 55 | | | | | | | | | |
| 1335 | 60 | | | | | | | | | |

SAMPLE TYPES:
- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE
- G GRAB SAMPLE
- SH SHELBY TUBE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
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- SA SIEVE ANALYSIS
- CU TRIAXIAL SHEAR
- EI EXPANSION INDEX
- RV R-VALUE



# GEOTECHNICAL BORING LOG LB-14

**Date** 7-17-02 **Sheet** 1 **of** 3

**Project** Mountaingate, Tract 53072 **Project No.** 03-0381-002

**Drilling Co.** Tri-Valley Drilling **Type of Rig** Bucket-Auger

**Hole Diameter** 24" **Drive Weight** (0'-28'=5952, 28'-55'=3921, 55'-84'=2531, 84'-114'=1407) lbs **Drop** 12"

**Elevation Top of Hole** 1380' **Location** See Geotechnical Map

| Elevation Feet | Depth Feet | Graphic Log (N S) | Attitudes | Sample No. | Blows Per Foot | Dry Density pcf | Moisture Content, % | Soil Class. (U.S.C.S.) | DESCRIPTION | Type of Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| 1380 | 0 | | | | | | | | **Logged By** JBW/JGS<br>**Sampled By** JBW<br>**LANDSLIDE DEBRIS (Qls-8):**<br>@0'-5': CASING (Plastic) | |
| 1375 | 5 | | @5.5' S: N50E,19SE | | | | | | SLATE: medium gray to brownish gray, slightly moist, loose, highly broken, highly weathered, iron oxide staining on fractured surfaces, rootlets, locally pulverized and lacks structure.<br>@5.5' shear zone, 1/2" thick. | |
| 1370 | 10 | | @11' J: N70W,73S | R-1 | 12 | | | | @11' prominent joint set.<br>SLATE, medium gray, slightly moist, moderately to highly fractured, blocky appearance, iron oxide staining on fractured surfaces, rootlets. | |
| 1365 | 15 | | @14' S: N24E,27S<br>@17' S: N29W,25NE<br>N37W,20NE<br>@17.5' F: N60W,58SW | | | | | | @14' shear zone, medium gray, slightly moist, pulverized SLATE, highly fractured, 2" thick.<br>@17' shear zone, SILTY SAND texture, yellow brown, gray brown and light gray, slightly moist, 1.5' thick.<br>@17.5' fault cuts shear zone from above; below the fault the SLATE is medium gray, slightly moist, moderately fractured, iron oxide staining on fractured surfaces. | |
| 1360 | 20 | | | R-2 | 10 | | | | @20.5' shear zone. | |
| 1355 | 25 | | @26' J: N75W,50SW | | | | | | @26' SLATE, medium gray, slightly moist, moderately to highly fractured, blocky fracturing, open fractures to 1" wide and 2' deep, iron oxide staining and clay films on fractured surfaces.<br>below 26' increase of clay content in fractures. | |
| 1350 | 30 | | | | | | | | | |

**SAMPLE TYPES:**

S SPLIT SPOON
R RING SAMPLE
B BULK SAMPLE
T TUBE SAMPLE
G GRAB SAMPLE
SH SHELBY TUBE

**TYPE OF TESTS:**

DS DIRECT SHEAR
MD MAXIMUM DENSITY
CN CONSOLIDATION
CR CORROSION
SA SIEVE ANALYSIS
CU TRIAXIAL SHEAR
EI EXPANSION INDEX
RV R-VALUE

LEIGHTON AND ASSOCIATES, INC.

# GEOTECHNICAL BORING LOG LB-14

**Date** 7-17-02 **Sheet** 2 **of** 3

**Project** Mountaingate, Tract 53072 **Project No.** 03-0381-002

**Drilling Co.** Tri-Valley Drilling **Type of Rig** Bucket-Auger

**Hole Diameter** 24" **Drive Weight** (0'-28'=5952, 28'-55'=3921, 55'-84'=2531, 84'-114'=1407) lbs **Drop** 12"

**Elevation Top of Hole** 1380' **Location** See Geotechnical Map

| Elevation Feet | Depth Feet | Graphic Log (N S) | Attitudes | Sample No. | Blows Per Foot | Dry Density pcf | Moisture Content, % | Soil Class. (U.S.C.S.) | DESCRIPTION (Logged By JBW/JGS; Sampled By JBW) | Type of Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| 1350 | 30 | | | R-3 | 10 | | | | SLATE, medium gray, slightly moist to moist, moderately hard, highly fractured, with localized pulverized zones. | |
| 1345 | 35 | | @35.5' $F_6$: N79E,29SE | | | | | | @35.5' SLATE becomes slightly foliated. | |
| 1340 | 40 | | @40' S: N20E,22SE | R-4 | 5 | | | | @40' shear, SILTY CLAY, olive gray, moist, firm to stiff, 1" thick. | |
| | | | @43.5' S: E-W,32S | | | | | | @43.5' shear zone, 2' thick, clay lined, slickenlines at base, localized water seepage; SLATE below the shear zone is medium gray to medium brown, blocky with open fractures, iron oxide staining and clay seams on fractured surfaces. | |
| 1335 | 45 | | @45' S: N75E,25SE $F_6$: N75E,34SE | | | | | | @45' shear zone, 3" thick, SILTY SAND texture, medium gray, moist, with a 1/4" clay seam at base. @45.8' shear, CLAYEY SILT, medium gray to olive gray, moist, plastic, 1/4" thick. | |
| 1330 | 50 | | | R-5 | 10 | | | | @50' SLATE is medium gray, slightly moist, moderately fractured, blocky appearance, slight water seepage on open fractures (1/2" open); iron oxide staining and clay film on fractured surfaces. | |
| | | | @52.2' S: N70W,35SW E-W,38SW N70W,32SW @53.5' $F_6$: N45W,15NE | | | | | | @52.2' CLAY, 1/4" to 1/2" thick, medium gray to olive gray, wet, plastic, well developed around boring. @53.5' localized foliation; SLATE below is broken up and chaotic, moderately hard; with localized shearing along foliation. | |
| 1325 | 55 | | @55' S: N70E,22NW | | | | | | @55' shearing along foliation with polished surfaces; localized altered quartzite veins. | |
| | | | @57' $F_6$: N85E,27NW S: N58W,60SW @58' J: | | | | | | @58' a well developed shear 1/8" to 1/4" thick clay, continuous around the boring. | |
| 1320 | 60 | | | | | | | | | |

**SAMPLE TYPES:**

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**TYPE OF TESTS:**

DS DIRECT SHEAR
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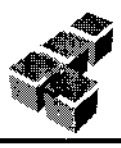

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