GEOLOGIC RECONNAISSANCE

SAFARI HIGHLANDS RANCH
SAN DIEGO COUNTY, CALIFORNIA

GEOCON
INCORPORATED

GEOTECHNICAL
ENVIRONMENTAL
MATERIALS

PREPARED FOR

CONCORDIA HOMES
SOLANA BEACH, CALIFORNIA

JUNE 27, 2014
PROJECT NO. G1689-32-01

GEOCON
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GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS

Project No. G1689-32-01
June 27, 2014

Concordia Homes
380 Stevens Avenue, Suite 307
Solana Beach, California 92075

Attention: Mr. Jeb Hall

Subject: GEOLOGIC RECONNAISSANCE
SAFARI HIGHLANDS RANCH
SAN DIEGO COUNTY, CALIFORNIA

Dear Mr. Hall:

In accordance with your authorization of our Proposal No. LG-14123, dated April 4, 2014, we have performed a geologic reconnaissance of the Safari Highlands Ranch property in Escondido, California. The accompanying report describes the site soil and geologic conditions, discusses the anticipated geotechnical considerations for site development and provides preliminary recommendations to assist in future geotechnical studies.

Should you have questions regarding this report, or if we may be of further service, please contact the undersigned at your convenience.

Very truly yours,

GEOCON INCORPORATED

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GEOLOGIC RECONNAISSANCE

1. PURPOSE AND SCOPE

This report presents the results of a geologic reconnaissance for the Safari Highlands Ranch property located north of Highway 78 and east of Escondido in San Diego County, California (see Vicinity Map, Figure 1). The purpose of this study was to perform a reconnaissance of the soil and geologic conditions within the property boundaries and identify any known geologic hazards that may adversely impact the project as planned. This correspondence also discusses items that will require evaluation during future geotechnical studies.

The primary geotechnical considerations for this project will be the presence of hard rock, rock fall potential and potential compression (including liquefaction) where embankments are planned over saturated and unconsolidated alluvial sediments within the deeper/wider valleys. Additional studies, including subsurface exploration, should be performed prior to construction to further characterize the geologic and geotechnical conditions.

The scope of our study included a review of readily available published geologic literature pertinent to the site (see List of References), performing a field reconnaissance consisting of geologic mapping in accessible locations and mapping hard rock outcrops, conducting a geophysical exploration program consisting of 30 seismic traverses across the site to evaluate rock rippability, reviewing stereoscopic aerial photographs of the property and reviewing a cut-fill exhibit and untitled preliminary development plan prepared by Hunsaker and Associates.

This correspondence includes logs of limited subsurface investigation performed previously by Geocon Incorporated and others, consisting of 21 rotary percussion (air track) borings (16 by Geocon and 5 by others) to evaluate rippability. Additionally, Geocon Incorporated excavated 10 trenches at various locations across the site to determine the thickness of surficial soil. Appendix A presents the results of the recent seismic traverses. Appendix B presents the air track boring logs and the trench logs performed by Geocon Incorporated in 2001. Appendix C presents the air-track boring logs by Ninyo and Moore (N&M) in 2000.

The exhibit used as a base map to depict the soil and geologic conditions consists of a reproducible copy of a compilation of digital information provided by Hunsaker & Associates (Geologic Map, Figure 2). The plan depicts the overall site and development boundaries, existing topography and mapped geologic contacts, based on published information and our reconnaissance. The rippability exhibit, Figure 3, presents a GoogleEarth Image with site topography, proposed cut areas, and mapped rock shelf areas. The locations of the seismic traverses, air track borings and trenches are presented on both Figures 2 and 3. The conclusions and recommendations presented herein are based on an analysis of the data reviewed as part of this study and our experience with similar soil and geologic conditions.

2. SITE AND PROJECT DESCRIPTION

The irregularly shaped property consists of approximately 1,150 acres of mostly undeveloped land. The site is situated north of State Route 78, immediately east of the City of Escondido in northern San Diego County, California. It is understood that the property is proposed for annexation into the City of Escondido. The San Diego Zoo Safari Park is located to the south. To the north and west are occasional single family residences on hilly terrain. Rancho San Pasqual development is located directly west of the site in Escondido, California. Site drainage is accomplished by two primary tributaries that flow in a southwesterly direction.

Topographically, the site consists of rugged, steeply sloping, hillside terrain with occasional, somewhat level valleys. A relatively flat alluvial area is located within the southern portion of the property with steeper hillside terrain to the north. The larger alluvial drainage transects the southern third of the property. Elevations across the overall property vary from approximately 400 feet above Mean Sea Level (MSL) in the southwest corner to a high of almost 1,800 feet above Mean Sea Level (MSL) in the northeast quadrant of the site.

Current plans propose construction of 550 residential lots of various sizes in 5 neighborhoods. A fire station and water quality basin is proposed in the southernmost portion of the property. Earthwork is expected to consist of approximately 7 million cubic yards of grading with maximum cuts and fills on the order of 90 feet. The project will be accessed by a central roadway extending from existing Vistamonte Avenue in Escondido.

Cut slopes are proposed at a maximum inclination of 2:1 (horizontal:vertical) with a maximum height of approximately 90 feet. Fill slopes are proposed at maximum inclinations of 2:1 (horizontal:vertical) with maximum heights on the order of 100 feet.

The above locations and descriptions are based on a site reconnaissance and review of the referenced untitled preliminary development plan. If development plans differ significantly from those described herein, Geocon Incorporated should be contacted for review and possible revisions to this report.

3. SOIL AND GEOLOGIC CONDITIONS

Based on a review of published geologic maps, previous geotechnical reports and observations during the site reconnaissance and field exploration, the geologic conditions exposed on the property consist of crystalline igneous rocks of the Southern California Batholith (granodiorite and tonalite), metamorphic rocks, alluvium and topsoil/colluvium. Although some of these units may not be encountered during grading, we have described them herein to characterize the general geologic conditions. The surficial soils and geologic formations are discussed below. The estimated extent of these units is shown on the Geologic Map, Figure 2.

3.1 Topsoil/Colluvium (Unmapped)

Topsoil consisting of loose, silty to clayey sand with occasional gravel typically covers most of the geologic formations at an average thickness of 1 to 3 feet. Topsoil and colluvium should be expected to be thicker on the flanks of drainages and in the lower elevations of the property. The topsoil and colluvium are generally dry, porous in nature and considered compressible and unsuitable for support of structural fill and the proposed improvements. These deposits will require remedial grading during project development.

3.2 Alluvium (Qal)

Alluvial soils were mapped during the field reconnaissance and are most prevalent in the major drainages. These deposits may contain large amounts of cobble and boulders, especially in the larger drainages, and be surrounded by a matrix of fine-grained sand, silt and clay. During the time of this reconnaissance and the previous Geocon study in 2001, no groundwater was observed at the surface within the drainages; however, it is likely that perched groundwater exists within the larger drainages, especially during the winter/rainy season. This is supported by the observation of surface water in the alluvial drainages in 1998 (see N&M report dated July 12, 2000) and by Geocon Incorporated in 1993 (report dated June 25, 1993). Due to the potential for liquefaction and/or consolidation of the alluvium, future studies should be performed to address these issues.

3.3 Granitic Rock (Klw)

Cretaceous-age granitic rock consisting of the Lake Wohlford granodiorite is present within the northern half of the property and underlies the surficial and alluvial units at depth. This rock is anticipated to have a variable weathering pattern ranging from completely weathered decomposed granite to outcrops of fresh, extremely strong, hard rock that will require blasting to excavate. Portions of the granite that are deeply weathered contain *corestones* and *floater* boulders that will require special handling and/or secondary breaking in order to be properly placed in fill areas. In other areas, the granite consists of solid *knobs*, *ribs*, and *ledges* that are non-rippable. The results of this study indicate that the granodiorite within the northern portion of the property varies in rippable thickness from 0 to 15 feet below the ground surface. The air track borings in this area (Geocon AT-3, -4, -5, -6, -9, -10, and -11 and N&M AT-1, -2, and -3), indicate rippable thicknesses of between 1 and 13 feet at the boring locations. Future studies should augment this preliminary information with additional seismic refraction surveys, air-track borings and bulldozer pits.

The granitic units generally exhibit adequate bearing and slope stability characteristics. Cut slopes excavated at an inclination of 2:1 (horizontal:vertical) within granitic rock should be grossly stable to the proposed heights if free of adversely oriented structural features (e.g. faults, joints, fractures). The soils derived from excavations within the decomposed granitic rock are anticipated to consist of low-expansive, silty, medium- to coarse-grained sands and should provide suitable foundation support in a properly compacted condition. In addition, it should be anticipated that excavations within the granitic rock will generate boulders and oversize materials (rocks greater than 12 inches in length) that will require special handling and possible exportation from the site.

3.4 Igneous and Metamorphic Rock, Undifferentiated (Ki/Km)

Granitic (igneous) rock and metamorphic rock were observed at multiple locations throughout the southern portion of the property and have been undifferentiated for the purpose of this report. The Cretaceous-age granitic formations identified include the Lake Wohlford Granodiorite (Klw), and Japatul Valley Tonalite (Kjv), both containing leucocratic dikes. Additionally, Cretaceous-age metamorphosed volcanic rock (Kmw, Western metavolcanic rocks) and metamorphosed silica granite was observed at isolated locations within the southern half of the property. Localized zones of contact metamorphism were noted within the rock as well.

The metamorphic rock was generally less weathered than the granite and decomposes to a more clayey soil. Portions of the rock are extremely strong and will require blasting to excavate. The results of the seismic refraction study indicate that the rock within the southern portion of the property varies in rippable thickness from 5 to 25 feet below the ground surface. The air track borings in this area (Geocon AT-1, -2, -7, -8, -12 to -16 and N&M AT-4 and -5), indicate rippable thicknesses of between 1 and 45 feet at the boring locations. As with the granitic rock in the north, future studies should augment the information herein.

The undifferentiated granitic rock and metamorphic rocks generally exhibit adequate bearing and slope stability characteristics. Cut slopes excavated at an inclination of 2:1 (horizontal:vertical) should be grossly stable to the proposed heights if free of adversely oriented structural features (e.g. faults, joints, fractures). The soils derived from excavations within the more weathered portions of the metamorphic rock are anticipated to consist of moderately expansive, clayey, medium- to coarse-grained sands and angular gravels and should provide suitable foundation support in a properly compacted condition. In addition, it should be anticipated that excavations will generate boulders and oversize materials (rocks greater than 12 inches in length) that will require special handling and possible exportation from the site.

4. ROCK RIPPABILITY

To aid in evaluating the rippability characteristics of the rock in proposed cut areas, a subsurface exploration program consisting of 30 seismic traverses was performed. The 30 seismic traverses were conducted by Southwest Geophysics Incorporated and their report is presented in Appendix A. Additionally, 21 air track borings were advanced during previous studies. Drill penetration rates were used to evaluate rock rippability and to estimate the depth at which difficult excavation will occur. It should be noted that rock rippability is a function of natural weathering processes that can vary vertically and horizontally over short distances depending on jointing, fracturing, and/or mineralogic discontinuities within the bedrock.

For the seismic traverses, the higher velocity materials are more difficult to excavate (rip). Once velocities exceed approximately 5,000 feet per second, the material may be considered non-rippable and blasting will likely be required. An empirical weighted average of the thickness of rippable rock for each seismic line based on a 5,000-foot-per-second is presented on the Geologic Map, Figure 2, and the Rippability Exhibit, Figure 3.

For the air track borings, a frequently used guideline to compare rock rippability to drill penetration rate is that a penetration rate of approximately 0 to 20 seconds per foot (spf) generally indicates rippable material, 20 to 30 spf indicates marginally to non-rippable material, and greater than 30 spf indicates non-rippable rock. These general guidelines are typically based on drill rates using a rotary percussion drill rig similar to an Ingersoll Rand ECM 360 with a 3½-inch drill bit. Prospective contractors should evaluate their own rippability threshold based on the anticipated excavation equipment and production requirements.

Rock shelves were identified that will likely require blasting from the ground surface. These areas have been mapped on Figures 2 and 3. The identification of these areas was based on observation of the apparent rock hardness and embedment into the surrounding ground/terrain.

The rippability terms used in the following discussion are approximately correlated to a D-9L or D-9N Caterpillar tractor equipped with a single shank hydraulic ripper. Results of the field investigation and the previous studies indicate non-rippable hardrock will likely be encountered at depths as shallow as 0 to 5 feet below the ground surface in some areas, and as deep as 25 feet in other areas. Two notable air track borings (Geocon AT-2 and -13, both located in the southern half of the site) indicated deeper rippable material on the order of 35 to 45 feet. Planned cuts for the project may be as great as 90 feet deep.

The variation in rippable conditions can be attributed to differential weathering of non-rippable ledges overlying less dense marginally rippable zones. Weathering can be greatly affected by joint and fracture patterns. Blasting will be necessary to efficiently excavate the rock in most areas of the project.

The depth to non-rippable rock shown for each traverse on Figures 2 and 3 should be interpreted as being an empirical weighted average across each line. This interpretation was performed to assist in a bulking evaluation for earthwork grading factors. Prospective grading contractors shall evaluate the seismic and air track data to evaluate rippability thresholds based on their experience and equipment.

Overexcavation of hard rock during mass grading in areas of building pads and utility corridors is recommended to facilitate future trenching for foundations and utilities. Based on past experience, rippable to marginally rippable zones will contain oversize boulders and "floaters" which will require special handling and placement procedures within fill areas.

5. GROUNDWATER

No groundwater was encountered at the site during the most recent reconnaissance or in the investigation in 2001. Groundwater was observed in previous studies within the major drainages, as well as some seepage at two locations within the granitic rock, and will be an important consideration where embankments are proposed across the drainages with respect to settlement and liquefaction potential. Groundwater depths will likely vary seasonally and should be evaluated during future studies. Wet alluvial removals may be encountered during grading operations, leading to difficult excavation, top loading, and compaction challenges. Additionally, due to joint patterns within the various bedrock units, seeps and springs may occur during the rainy season in other areas.

It is not uncommon for groundwater or seepage conditions to develop where none previously existed. Groundwater elevations are dependent on seasonal precipitation, irrigation, and land use, among other factors, and vary as a result. Proper surface drainage will be important to future performance of the project. Additionally, it should be anticipated that, where infilling of canyons or drainages is planned, the installation of subdrains to relieve the potential buildup of hydrostatic pressure will be required.

6. GEOLOGIC HAZARDS

6.1 Faulting and Seismicity

A review of the referenced geologic materials and our knowledge of the general area indicate that the site is not underlain by active or potentially active faults. An active fault is defined by the California Geological Survey (CGS) as a fault showing evidence for activity within the last 11,000 years. The site is not located within a State of California Earthquake Fault Zone. An inactive fault that trends northwest-southeast was mapped to the northwest of the site (see *Geologic Map of the Valley*

Center 7.5' Quadrangle, 1999 and *Geologic Map of the Oceanside 30' x 60' Quadrangle*, 2005) that suggests an extension to the southeast, roughly trending through the site; however, no fault has been mapped at the site and no evidence for a fault was observed during the recent field study or previous studies.

According to the computer program *EZ-FRISK* (Version 7.62), seven known active faults are located within a search radius of 50 miles from the property. We used acceleration attenuation relationships developed by Boore-Atkinson (2008) NGA USGS2008, Campbell-Bozorgnia (2008) NGA USGS, and Chiou-Youngs (2008) NGA in our analysis. The nearest known active fault is the Elsinore Fault, located approximately 13 miles northeast of the site and is the dominant source of potential ground motion. Table 6.1.1 lists the estimated maximum earthquake magnitude and peak ground acceleration for the most dominant faults in relationship to the site location calculated for Site Class C as defined by Table 1613A.5.3 of the 2013 California Building Code (CBC).

TABLE 6.1.1
DETERMINISTIC SEISMIC SITE PARAMETERS

Fault Name	Distance from Site (miles)	Maximum Earthquake Magnitude (Mw)	Peak Ground Acceleration		
			Boore-Atkinson 2008 (g)	Campbell-Bozorgnia 2008 (g)	Chiou-Youngs 2008 (g)
Elsinore	13	7.85	0.23	0.18	0.24
Newport-Inglewood	21	7.5	0.16	0.12	0.14
Rose Canyon	21	6.9	0.12	0.10	0.09
Earthquake Valley	24	6.8	0.11	0.08	0.07
San Jacinto	35	7.88	0.13	0.09	0.11
Coronado Bank	36	7.4	0.10	0.07	0.08
Palos Verdes Connected	36	7.7	0.06	0.06	0.05

We used the computer program *EZ-FRISK* to perform a probabilistic seismic hazard analysis. The computer program *EZ-FRISK* operates under the assumption that the occurrence rate of earthquakes on each mappable Quaternary fault is proportional to the faults slip rate. The program accounts for fault rupture length as a function of earthquake magnitude, and site acceleration estimates are made using the earthquake magnitude and distance from the site to the rupture zone. The program also accounts for uncertainty in each of following: (1) earthquake magnitude, (2) rupture length for a given magnitude, (3) location of the rupture zone, (4) maximum possible magnitude of a given earthquake, and (5) acceleration at the site from a given earthquake along each fault. By calculating the expected accelerations from considered earthquake sources, the program calculates the total average annual expected number of occurrences of site acceleration greater than a specified value. We utilized acceleration-attenuation relationships suggested by Boore-Atkinson (2008) NGA USGS, Campbell-Bozorgnia (2008) NGA USGS, and Chiou-Youngs (2007) NGA USGS 2008 in the analysis. Table 6.1.2 presents the site-specific probabilistic seismic hazard parameters including acceleration-attenuation relationships and the probability of exceedence.

TABLE 6.1.2
PROBABILISTIC SEISMIC HAZARD PARAMETERS

Probability of Exceedence	Peak Ground Acceleration		
	Boore-Atkinson, 2007 (g)	Campbell-Bozorgnia, 2008 (g)	Chiou-Youngs, 2008 (g)
2% in a 50 Year Period	0.42	0.41	0.48
5% in a 50 Year Period	0.31	0.30	0.34
10% in a 50 Year Period	0.24	0.23	0.25

The California Geologic Survey (CGS) has a program that calculates the ground motion for a 10 percent of probability of exceedence in 50 years based on an average of several attenuation relationships. Table 6.1.3 presents the calculated results from the *Probabilistic Seismic Hazards Mapping Ground Motion Page* from the CGS website.

TABLE 6.1.3
PROBABILISTIC SITE PARAMETERS FOR SELECTED FAULTS
CALIFORNIA GEOLOGIC SURVEY

Calculated Acceleration (g) Firm Rock	Calculated Acceleration (g) Soft Rock	Calculated Acceleration (g) Alluvium
0.29	0.31	0.34

While listing peak accelerations is useful for comparison of potential effects of fault activity in a region, other considerations are important in seismic design, including the frequency and duration of motion and the soil conditions underlying the site. Seismic design of the structures should be evaluated in accordance with the California Building Code (CBC) or other applicable code.

6.2 Liquefaction

Liquefaction typically occurs when a site is located in a zone with seismic activity, onsite soil is cohesionless, groundwater is encountered within 50 feet of the surface, and soil relative densities are less than about 70 percent. If all four previous criteria are met, a seismic event could result in a rapid pore-water pressure increase from the earthquake-generated ground accelerations. Such a condition could exist within the deeper alluvial deposits. The potential for liquefaction can be mitigated if recompaction of the loose sediments can be accomplished, combined with a subdrain system. Where the loose sediments cannot be recompacted alternative means to mitigate liquefaction may be necessary. This will require evaluation during future subsurface studies.

6.3 Landslides

No landslides were encountered during our site reconnaissance, and none are known to exist on the property or at a location that would impact the proposed development.

6.4 Rock Fall Potential

A detailed rock fall potential study was beyond the scope of this reconnaissance. Rock fall potential should be evaluated during future studies based on the current grading plan.

7. EARTHWORK GRADING FACTORS

Estimates of embankment shrink or swell (bulk/shrink) factors are presented in "Geotechnical Considerations," following. A discussion of these factors, and the level of accuracy associated with these estimates, is warranted. Bulk/shrink factors are based on comparing existing soil or rock conditions with expected final fill conditions. Numerous uncertainties are inherent with the analysis and its potential effect on site development costs should be considered when preparing budgets. Variations in natural soil density, as well as in compacted fill, render shrinkage value estimates very approximate.

For the existing conditions the density (and moisture content) can vary by 10 to 20 percent. The geometry of differing soil deposits can vary significantly over relatively short distances. The depth and variability of fracturing and weathering patterns within rock materials can vary abruptly over short distances, as well.

For fill areas, the degree of compaction that is achieved by the grading contractor may be significantly greater than the minimum required. As an example, the contractor can compact fills to any relative compaction of 90 percent or higher of the laboratory maximum dry density. Thus, the contractor has at least a 10 percent range of control over the fill volume. Overexcavation of formational materials underlying alluvium, particularly within narrow, steep-walled canyons, though not required, often occurs to facilitate the grading contractor's operation. Additionally, the grading contractor can overshoot during blasting of non-rippable rock, which increases bulking volume as well as generating an increased volume of oversized rock. The blasting pattern and explosive quantity used can measurably affect the volume of oversized rock generated. The grading contractor can also undercut/overexcavate areas for "convenience yardage."

Estimated ranges for percentage of shrinkage or bulking are presented in the following section. For use in earthwork balancing, the midpoint (average) of these ranges is typically used in determining shrinkage and bulking amounts, and in balancing cut and fill volumes on the site. However, in addition to the use of the average shrinkage/bulking for balancing purposes, it is recommended that the upper and lower bounds of the earthwork factor ranges be used to “bracket” the range of estimated earthwork shrinkage and bulking. By using the upper and lower bounds, an estimate of the maximum deviation of earthwork quantities may be established. The resulting maximum deviation is for inherent errors relating to the variability in earthwork factors and does not include an allowance for variables that occur during construction such as site grading errors, or the other factors discussed above. In this regard, it is suggested that maximum and minimum values also be assigned to other quantity estimates to permit a “worst case” and “best case” evaluation of balance site development costs.

8. GEOTECHNICAL CONSIDERATIONS

8.1 Compressible Topsoil/Colluvium and Alluvium

Potentially compressible topsoil, colluvium and alluvium are present and will require remedial grading or ground improvement techniques where structural improvements are planned. The settlement potential of these deposits and the magnitude of geotechnical mitigation required should be the focus of future studies.

8.2 Shallow Groundwater

Shallow groundwater within the alluvial deposits may limit the extent of remedial grading for proposed embankments crossing these areas using conventional techniques. De-watering and/or embankment surcharge methods may be necessary to induce compression related settlement prior to construction of structural improvements. Construction schedules can be impacted by surcharge techniques since construction of brittle improvements cannot commence until primary consolidation has occurred.

8.3 Liquefaction Potential

The saturated alluvial deposits underlying the site may be prone to liquefaction during an earthquake. In the event that future studies identify liquefiable layers, mitigation consisting of remedial grading and/or geotechnical ground improvement techniques may be necessary.

8.4 Shallow Hardrock

The presence of shallow hardrock in areas of planned excavation will necessitate blasting techniques to accomplish the grading. Future studies should augment the existing rippability information using exploration techniques such as additional seismic refraction surveys, rotary air percussion (air track) drilling, and bulldozer pits.

8.5 Rock Fall Potential

The risk for rock fall hazards along the perimeter of the development should be considered during future studies.

8.6 Slope Stability

The proposed excavations in the formational materials should be stable if free of adversely oriented structural features such as faults, fractures or joints. It is recommended that all cut slope excavations be observed during grading by an engineering geologist to check that soil and geologic conditions do not differ significantly from those anticipated. Fill slopes constructed from properly compacted soils should possess acceptable stability if inclined at 2:1 or flatter.

8.7 Estimated Bulk/Shrink Values

Estimated ranges for percentage of shrinkage or bulking are presented in the table below. As previously discussed, for earthwork balancing, the average of these ranges is typically used in determining shrinkage and bulking amounts, and, in balancing cut and fill on the site. However, "bracketing" these quantities with the high and low estimates should be performed as well as maximum and minimum quantity estimates for other grading factors to evaluate a "worst case" and "best case" scenario of earthwork balance site development costs.

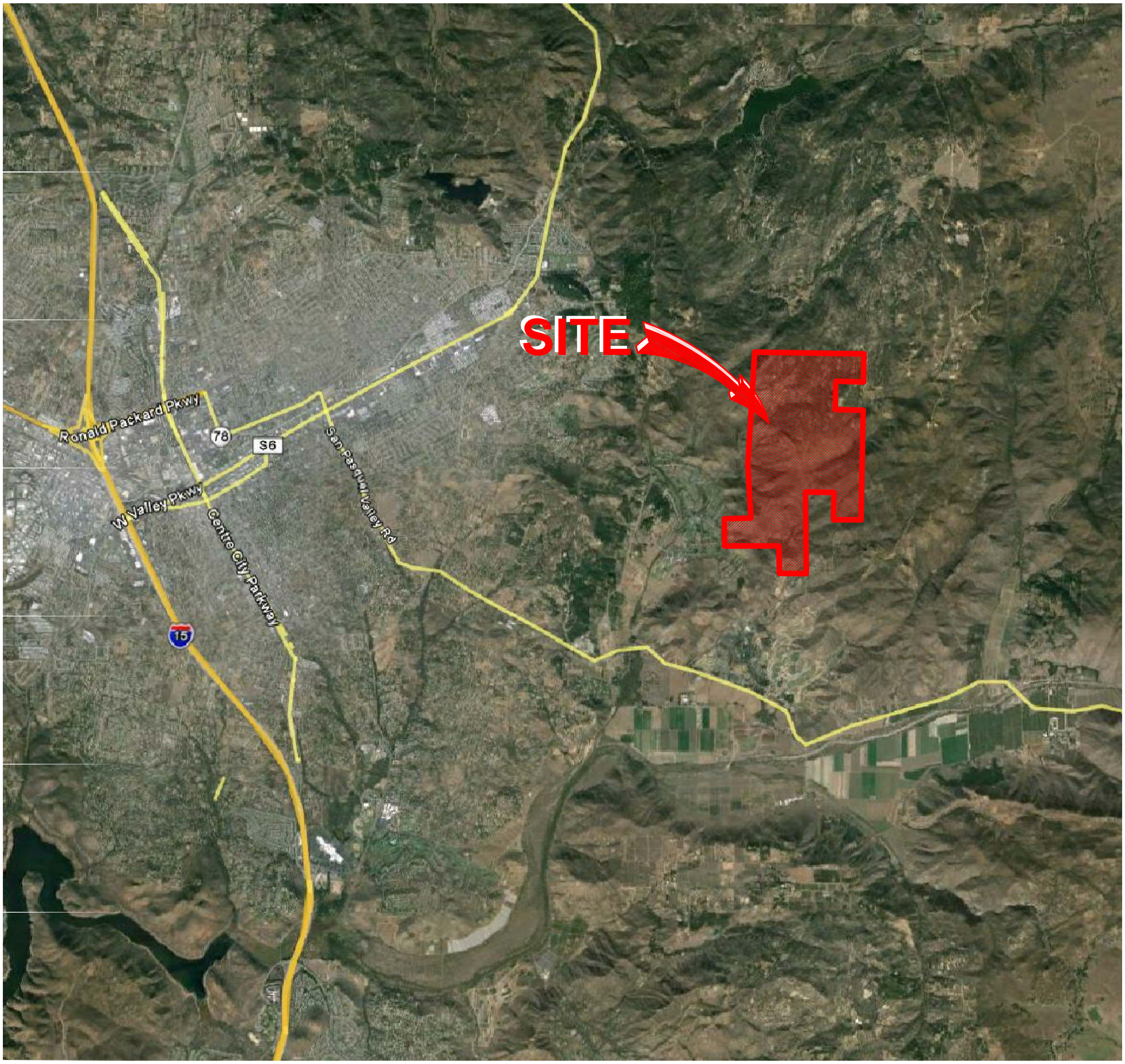
Soil Unit	Shrink-Swell Factors
Topsoil, Colluvium, Alluvium and Undocumented Fill Soils	10 to 15 Percent Shrinkage
Metamorphic/Granitic Rock - Rippable	15 to 20 percent Bulk
Metamorphic/Granitic Rock - Blasted	20 to 25 Percent Bulk

LIMITATIONS AND UNIFORMITY OF CONDITIONS

1. The recommendations of this report pertain only to the site investigated and are based upon the assumption that the soil conditions do not deviate from those disclosed in the investigation. If any variations or undesirable conditions are encountered during construction, or if the proposed construction will differ from that anticipated herein, Geocon Incorporated should be notified so that supplemental recommendations can be given. The evaluation or identification of the potential presence of hazardous or corrosive materials was not part of the scope of services provided by Geocon Incorporated.

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

3. The findings of this report are valid as of the present date. However, changes in the conditions of a property can occur with the passage of time, whether they be due to natural processes or the works of man on this or adjacent properties. In addition, changes in applicable or appropriate standards may occur, whether they result from legislation or the broadening of knowledge. Accordingly, the findings of this report may be invalidated wholly or partially by changes outside our control. Therefore, this report is subject to review and should not be relied upon after a period of three years.



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NO SCALE

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VICINITY MAP

SAFARI HIGHLANDS RANCH
SAN DIEGO COUNTY, CALIFORNIA

ME / RA		DSK/GTYPD	DATE 06 - 27 - 2014	PROJECT NO. G1689 - 32 - 01	FIG. 1

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GEOLOGIC MAP

SAFARI HIGHLANDS RANCH
SAN DIEGO COUNTY, CALIFORNIA

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SCALE 1" = 200'	DATE 06 - 27 - 2014	
PROJECT NO. G1689 - 32 - 01		FIGURE 2
SHEET 1 OF 1		

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RIPPABILITY EXHIBIT

SAFARI HIGHLANDS RANCH
SAN DIEGO COUNTY, CALIFORNIA

GEOCON INCORPORATED GEOTECHNICAL CONSULTANTS 6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974 PHONE 858 558-6900 - FAX 858 558-6159	SCALE 1" = 200'	DATE 06 - 27 - 2014	FIGURE 3
	PROJECT NO. G1689 - 32 - 01		
	SHEET 1 OF 1		

Plotted:06/26/2014 9:27AM | By:RUBEN AGUILAR | File Location:Y:\PROJECTS\G1689-32-01 SAFARI HIGHLANDS\SHEETS\G1689-32-01 RippabilityExhibit.dwg

APPENDIX A

APPENDIX A

FIELD INVESTIGATION

Our field investigation was performed in May 2014 and consisted of a site reconnaissance and field mapping, and performing 30 seismic refraction surveys. The results of these surveys are presented in the Seismic Refraction Survey Report by Southwest Geophysics Incorporated, which is presented in Appendix A. An empirical weighted average thickness of rippable rock for each seismic line is presented on Figures 2 and 3. These values are provided to assist in a bulking evaluation for earthwork grading factors. Contractors shall evaluate the seismic data considering their own rippability thresholds based on interpretation and the type of equipment that will be used to excavate the rock.

SEISMIC REFRACTION SURVEY
SAFARI HIGHLANDS RANCH
ESCONDIDO, CALIFORNIA

PREPARED FOR:

Geocon, Inc.
6960 Flanders Drive
San Diego, CA 92121

PREPARED BY:

Southwest Geophysics, Inc.
8057 Raytheon Road, Suite 9
San Diego, CA 92111

June 18, 2014
Project No. 114200

SOUTHWEST GEOPHYSICS, INC.
YOUR SUBSURFACE SOLUTION

June 18, 2014
Project No. 114200

Mr. David B. Evans, C.E.G.
Geocon, Inc.
6960 Flanders Drive
San Diego, CA 92121

Subject: Seismic Refraction Survey
Safari Highlands Ranch
Escondido, California

Dear Mr. Evans:

In accordance with your authorization, we have performed a seismic refraction survey pertaining to the subject project located in the San Pasqual area of Escondido, California. Specifically, our survey consisted of performing 30 seismic refraction traverses at the project site. The purpose of our study was to develop subsurface velocity profiles of the areas surveyed, and to assess the apparent rippability of the subsurface materials. This data report presents our survey methodology, equipment used, analysis, and results.

We appreciate the opportunity to be of service on this project. Should you have any questions related to this report, please contact the undersigned at your convenience.

Sincerely,
SOUTHWEST GEOPHYSICS, INC.

Aaron T. Puente
Senior Staff Geologist/Geophysicist

Hans van de Vrugt, C.E.G., P.Gp.
Principal Geologist/Geophysicist

REGISTERED GEOPHYSICIST
Hans van de Vrugt
No 1012
Exp. 2/29/16
STATE OF CALIFORNIA

ATP/HV/hv

Distribution: (1) Addressee (electronic)

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1. INTRODUCTION

In accordance with your authorization, we have performed a seismic refraction survey pertaining to the subject project located in the San Pasqual area of Escondido, California (Figures 1a and 1b). Specifically, our survey consisted of performing 30 seismic refraction traverses at the project site. The purpose of our study was to develop subsurface velocity profiles of the areas surveyed, and to assess the apparent rippability of the subsurface materials. This data report presents our survey methodology, equipment used, analysis, and results.

2. SCOPE OF SERVICES

Our scope of services included:

- Performance of 30 seismic refraction lines (SL-1 through SL-30) at the project site.
- Compilation and analysis of the data collected.
- Preparation of this data report presenting our results and conclusions.

3. SITE AND PROJECT DESCRIPTION

The project site is generally located to the north of Rockwood Road and the San Diego Zoo Safari Park in the San Pasqual area of Escondido (see Figures 1a and 1b). The site consists of relatively steep mountain ridges with their associated drainages and valleys. Several unmaintained dirt roads cross portions of the site. Numerous granitic and metavolcanic outcrops are present on site, as well as remnant boulders. Vegetation in the area consists of scattered to dense scrub brush, scattered trees, and annual grass. Figures 2a through 2f, and 3a through 3e depict the site conditions in the area of the seismic traverses.

Based on our discussions with you it is our understanding that the project involves the construction of single family residences and that site preparation will include cut and fill grading. Cuts up to 90 feet may be performed.

4. SURVEY METHODOLOGY

A seismic P-wave (compression wave) refraction survey was conducted at the site to evaluate the rippability characteristics of the subsurface materials and to develop subsurface velocity profiles of the areas surveyed. The seismic refraction method uses first-arrival times of refracted seismic waves to estimate the thicknesses and seismic velocities of subsurface layers. Seismic P-waves generated at the surface, using a hammer and plate, are refracted at boundaries separating materials of contrasting velocities. These refracted seismic waves are then detected by a series of vertical component geophones and recorded with a 24-channel Geometrics Geode seismograph. The travel times of the seismic P-waves are used in conjunction with the shot-to-geophone distances to obtain thickness and velocity information on the subsurface materials.

Thirty seismic lines (SL-1 through SL-30) were conducted in the study area. The general locations and lengths of the lines were selected by your office. Shot points (signal generation locations) were conducted along the lines at the ends, midpoint, and intermediate points between the ends and the midpoint.

The refraction method requires that subsurface velocities increase with depth. A layer having a velocity lower than that of the layer above will not generally be detectable by the seismic refraction method and, therefore, could lead to errors in the depth calculations of subsequent layers. In addition, lateral variations in velocity, such as those caused by core stones or intrusions can also result in the misinterpretation of the subsurface conditions.

The rippability values presented in Table 1 are based on our experience with similar materials and assume that a Caterpillar D-9 dozer ripping with a single shank is used. We emphasize that the cutoffs in this classification scheme are approximate and that rock characteristics, such as fracture spacing and orientation, play a significant role in determining rock rippability. These characteristics may also vary with location and depth. For trenching operations**,** the rippability values should be scaled downward. For example, velocities as low as 3,500 feet/second may indicate difficult ripping during trenching operations. In addition, the presence of boulders, which can be troublesome in a narrow trench, should be anticipated.

Table 1 – Rippability Classification	
Seismic P-wave Velocity	**Rippability**
0 to 2,000 feet/second	Easy
2,000 to 4,000 feet/second	Moderate
4,000 to 5,500 feet/second	Difficult, Possible Blasting
5,500 to 7,000 feet/second	Very Difficult, Probable Blasting
Greater than 7,000 feet/second	Blasting Generally Required

It should be noted that the rippability cutoffs presented in Table 1 are slightly more conservative than those published in the Caterpillar Performance Handbook (Caterpillar, 2011). Accordingly, the above classification scheme should be used with discretion, and contractors should not be relieved of making their own independent evaluation of the rippability of the on-site materials prior to submitting their bids.

5. ANALYSIS

As previously indicated, 30 seismic traverses were conducted as part of our study. The collected data were processed using SIPwin (Rimrock Geophysics, 2003), a seismic interpretation program, and analyzed using SeisOpt Pro (Optim, 2008) which uses first arrival picks and elevation data to produce subsurface velocity models. SeisOpt Pro uses a nonlinear optimization technique called adaptive simulated annealing. The resulting velocity model provides a tomography image of the estimated geologic conditions. Both vertical and lateral velocity information is contained in the tomography model. Changes in layer velocity are revealed as gradients rather than discrete contacts, which typically are more representative of actual conditions.

6. RESULTS, CONCLUSIONS AND RECOMMENDATIONS

Figures 4a through 4dd provide the velocity models calculated from SeisOpt Pro. Distinct vertical and lateral velocity variations are evident in the models. These inhomogeneities are likely related to the presence of remnant boulders, intrusions and differential weathering of the bedrock materials. It is also evident in the tomography models that the depth to bedrock is highly variable across the site.

Based on the refraction results, variability in the excavatability (including depth of rippability) of the subsurface materials should be expected across the project area. Furthermore, blasting may be required depending on the excavation depth, location, equipment used, and desired rate of production. In addition, oversized materials should be expected. A contractor with excavation experience in similar difficult conditions should be consulted for expert advice on excavation methodology, equipment and production rate.

7. LIMITATIONS

The field evaluation and geophysical analyses presented in this report have been conducted in general accordance with current practice and the standard of care exercised by consultants performing similar tasks in the project area. No warranty, express or implied, is made regarding the conclusions, recommendations, and opinions presented in this report. There is no evaluation detailed enough to reveal every subsurface condition. Variations may exist and conditions not observed or described in this report may be present. Uncertainties relative to subsurface conditions can be reduced through additional subsurface exploration. Additional subsurface surveying will be performed upon request.

This document is intended to be used only in its entirety. No portion of the document, by itself, is designed to completely represent any aspect of the project described herein. Southwest Geophysics, Inc. should be contacted if the reader requires additional information or has questions regarding the content, interpretations presented, or completeness of this document. This report is intended exclusively for use by the client. Any use or reuse of the findings, conclusions, and/or recommendations of this report by parties other than the client is undertaken at said parties' sole risk.

8. SELECTED REFERENCES

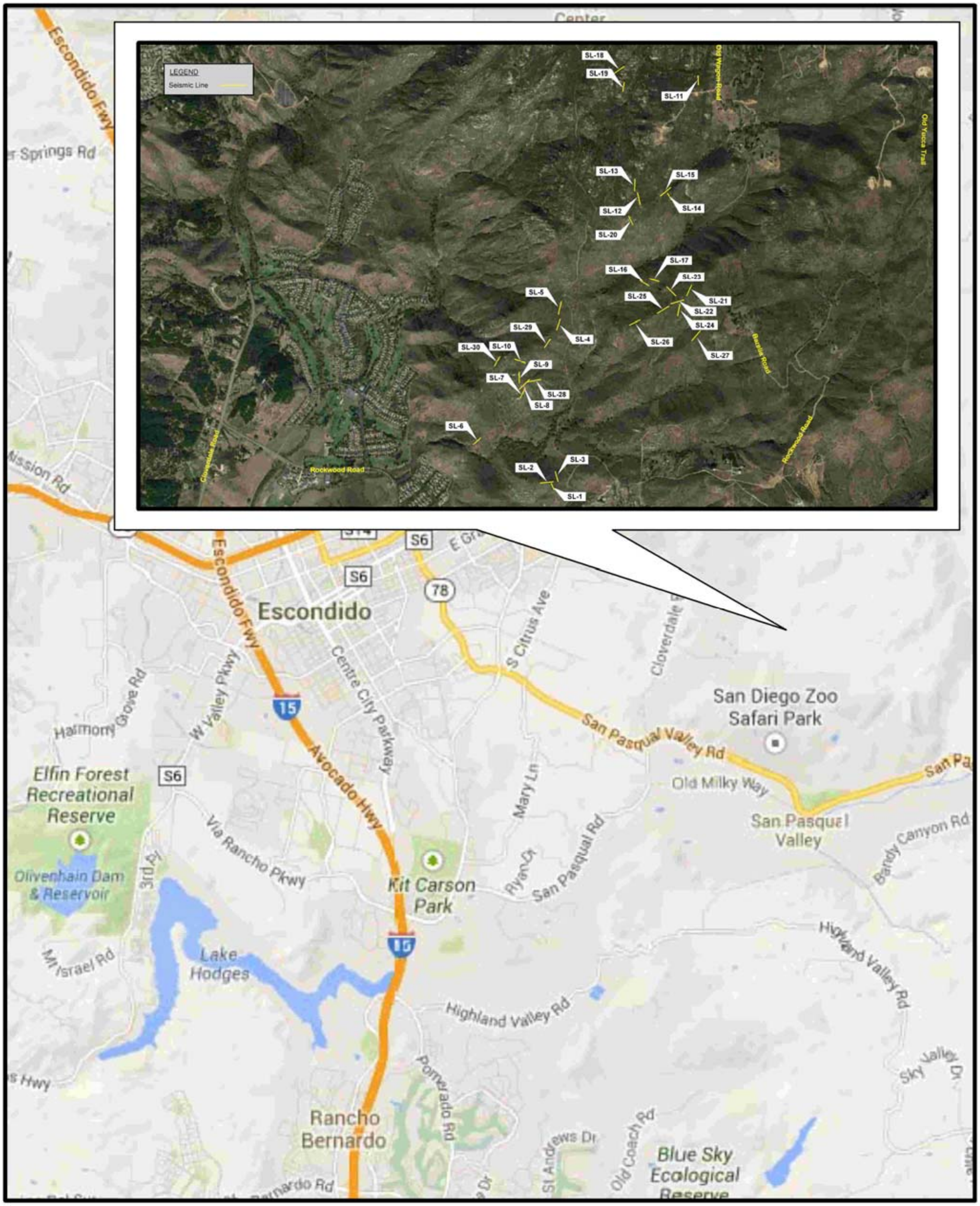
Caterpillar, Inc., 2011, Caterpillar Performance Handbook, Edition 41, Caterpillar, Inc., Peoria, Illinois.

Mooney, H.M., 1976, Handbook of Engineering Geophysics, dated February.

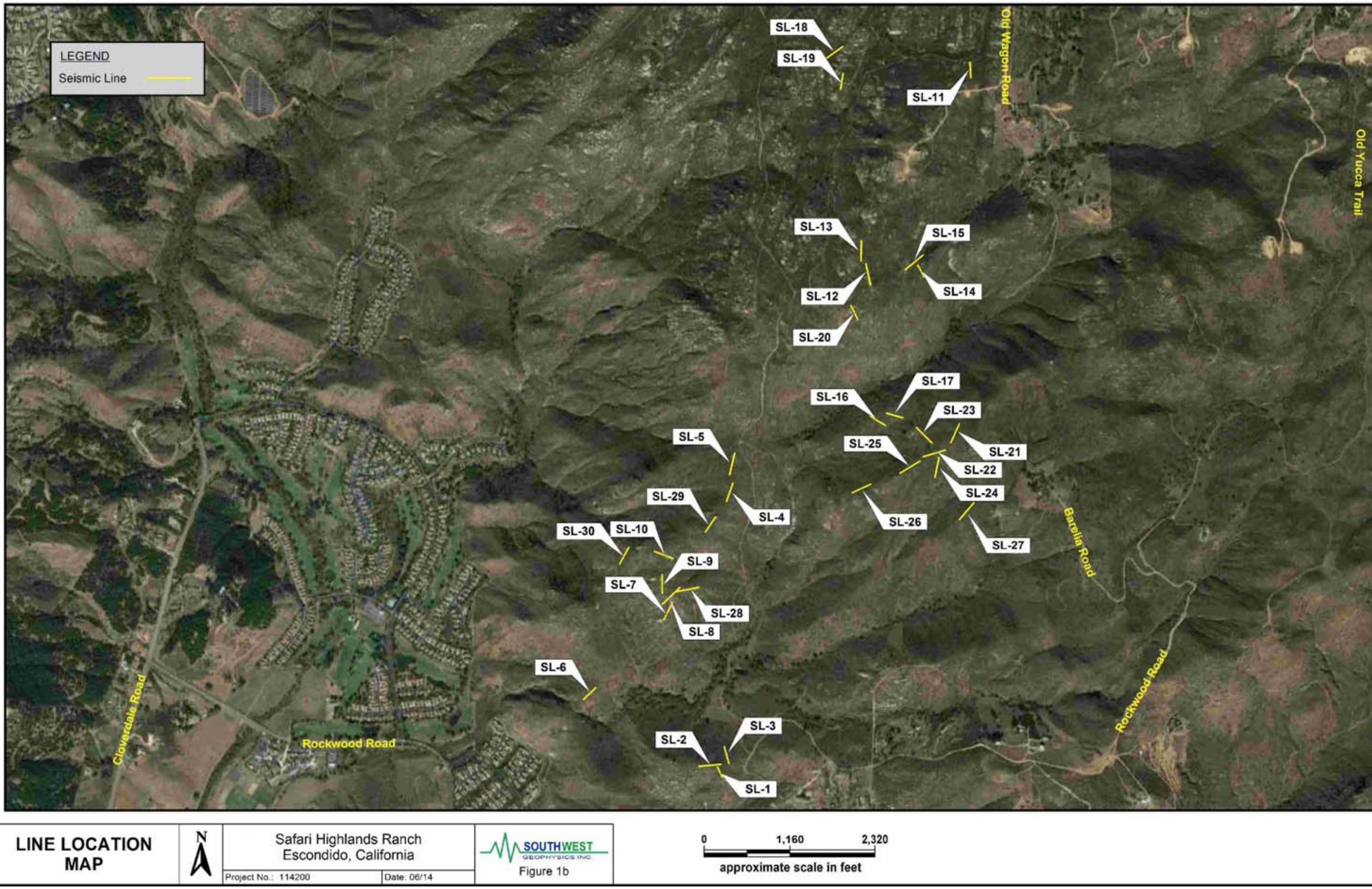
Optim, Inc., 2008, SeisOpt Pro, V-5.0.

Rimrock Geophysics, 2003, Seismic Refraction Interpretation Program (SIPwin), V-2.76.

Telford, W.M., Geldart, L.P., Sheriff, R.E., and Keys, D.A., 1976, Applied Geophysics, Cambridge University Press.



SITE LOCATION MAP	N	Safari Highlands Ranch Escondido, California		SOUTHWEST GEOPHYSICS INC. Figure 1a
		Project No.: 114200	Date: 06/14	



LINE LOCATION MAP

Safari Highlands Ranch
Escondido, California

Project No.: 114200 | Date: 06/14

SOUTHWEST GEOPHYSICS INC.

Figure 1b

0 120 240
approximate scale in feet

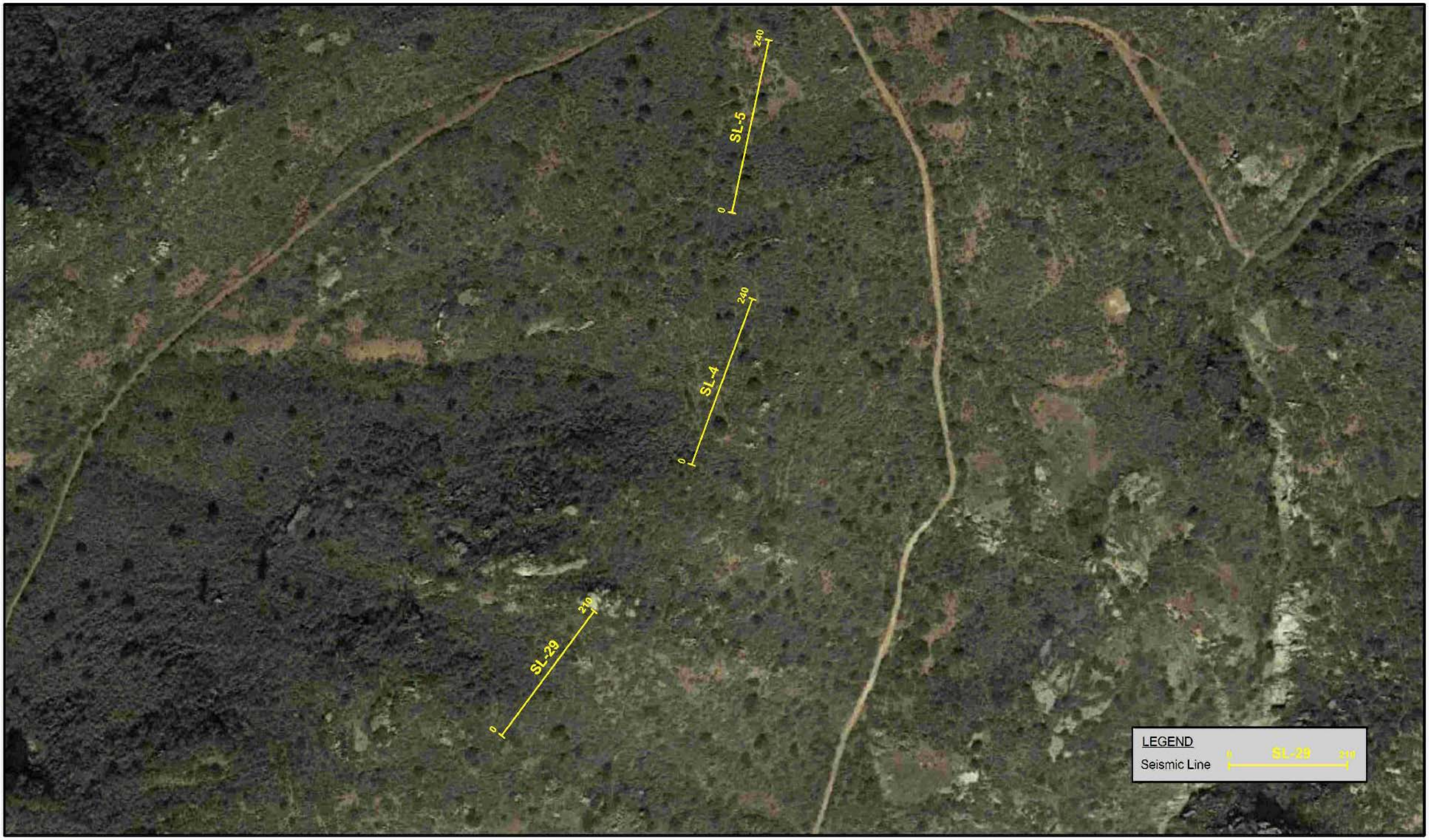
LINE LOCATION MAP
(SL-1, SL-2, SL-3 and SL-6)

N

Safari Highlands Ranch
Escondido, California

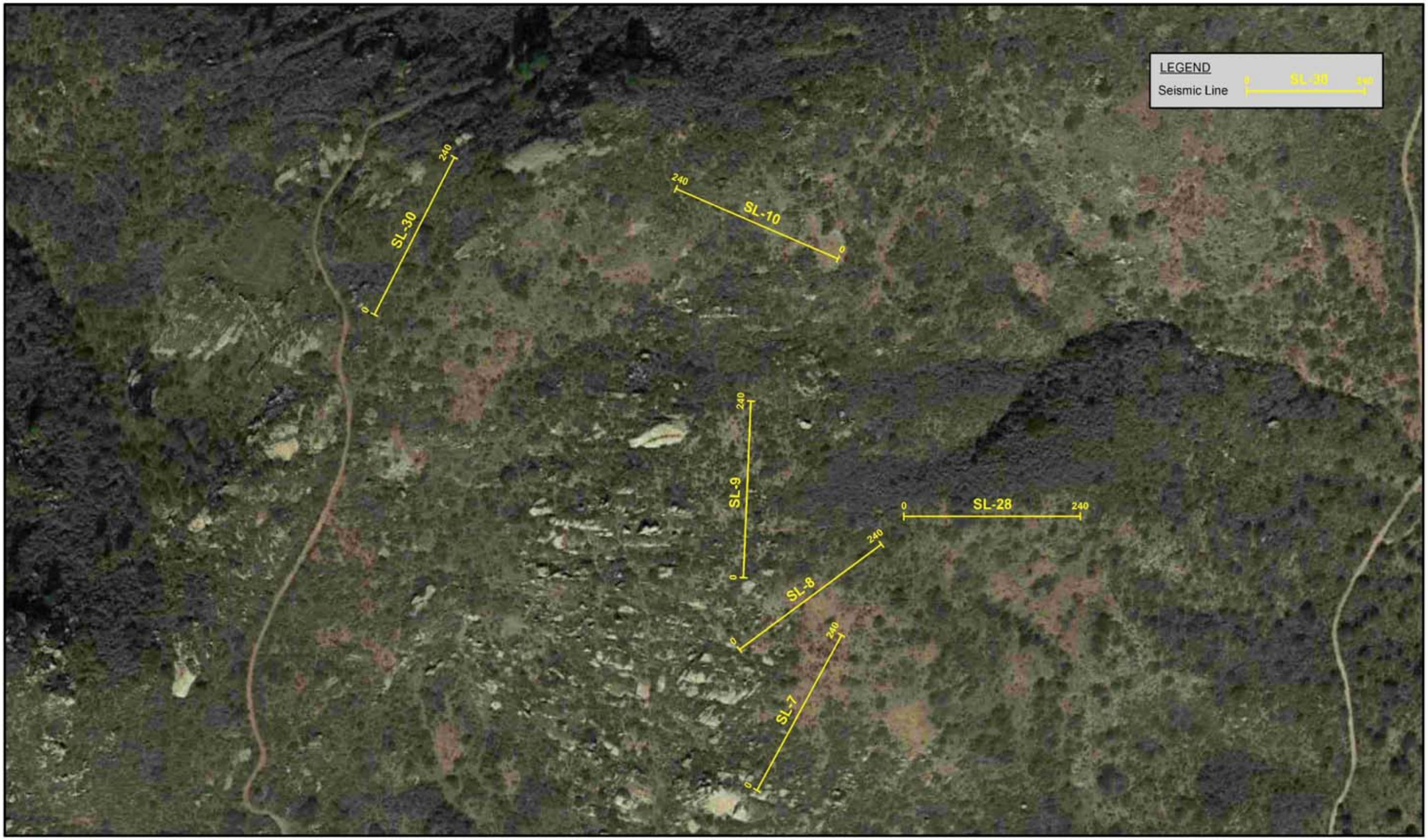
Project No.: 114200 | Date: 06/14

SOUTHWEST GEOPHYSICS INC.
Figure 2a



0 120 240
approximate scale in feet

LINE LOCATION MAP (SL-4, SL-5 and SL-29)	N	Safari Highlands Ranch Escondido, California Project No.: 114200 Date: 06/14	SOUTHWEST GEOPHYSICS INC. Figure 2b



LINE LOCATION MAP (SL-7 through SL-10, SL-28 and SL-30)	N	Safari Highlands Ranch Escondido, California Project No.: 114200 Date: 06/14	SOUTHWEST GEOPHYSICS INC. Figure 2c

LINE LOCATION MAP
(SL-11, SL-18 and SL-19)

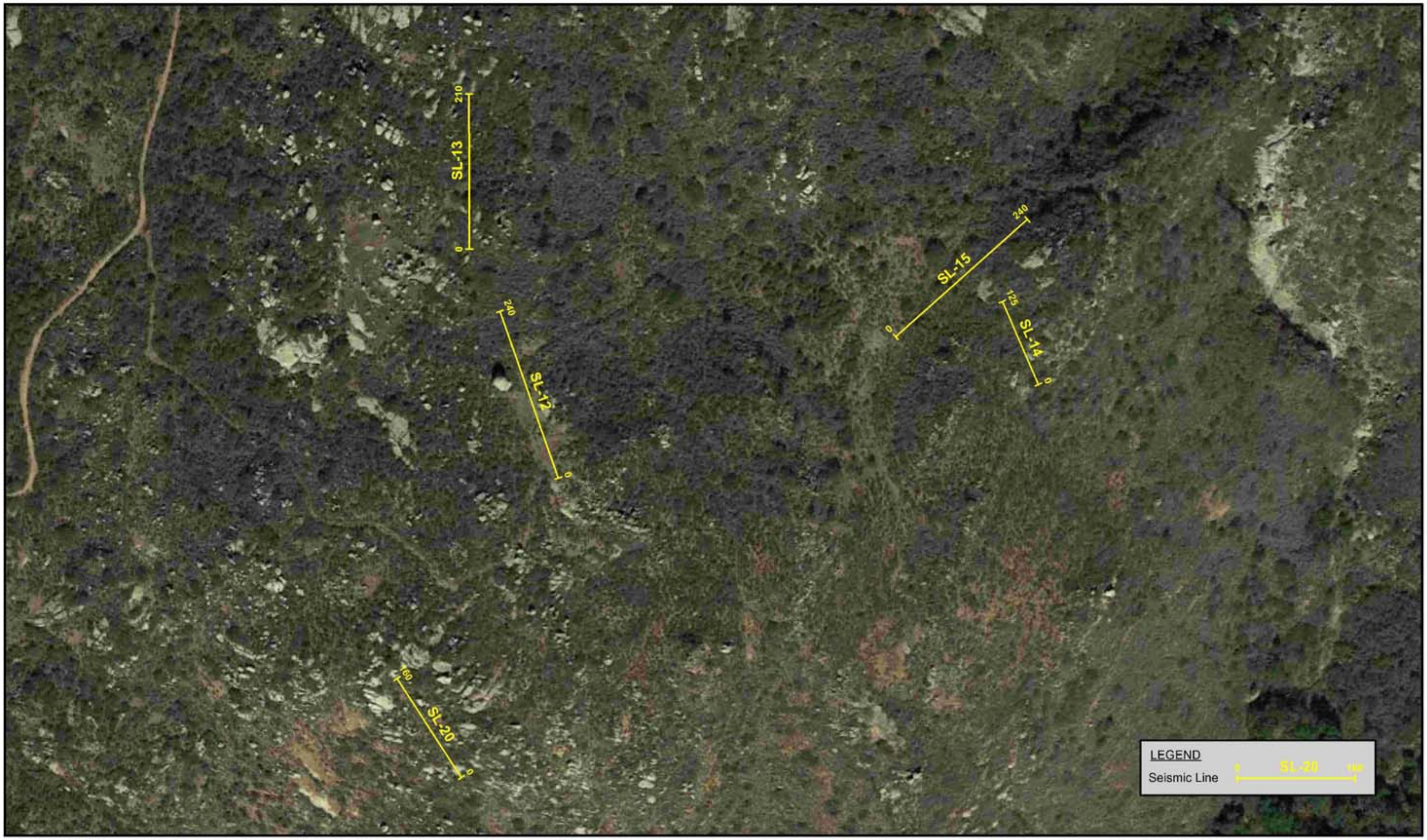
N

Safari Highlands Ranch
Escondido, California

Project No.: 114200 | Date: 06/14

SOUTHWEST GEOPHYSICS INC.
Figure 2d

0 120 240
approximate scale in feet



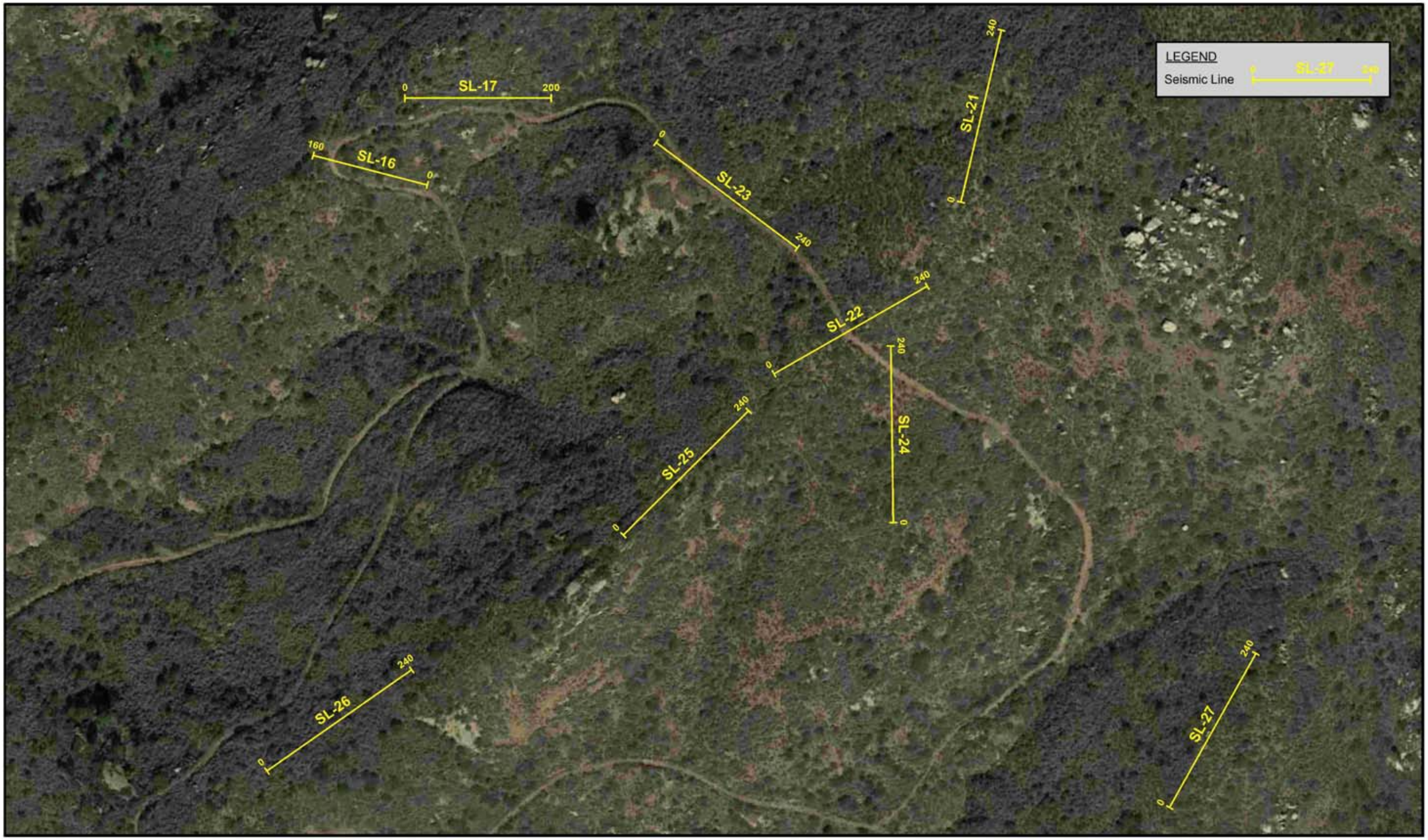
LINE LOCATION MAP
(SL-12 through SL-15, SL-20)

N

Safari Highlands Ranch
Escondido, California

Project No.: 114200 | Date: 06/14

SOUTHWEST GEOPHYSICS INC.
Figure 2e



LINE LOCATION MAP
(SL-16, SL-17, SL-21 through SL-27)

N

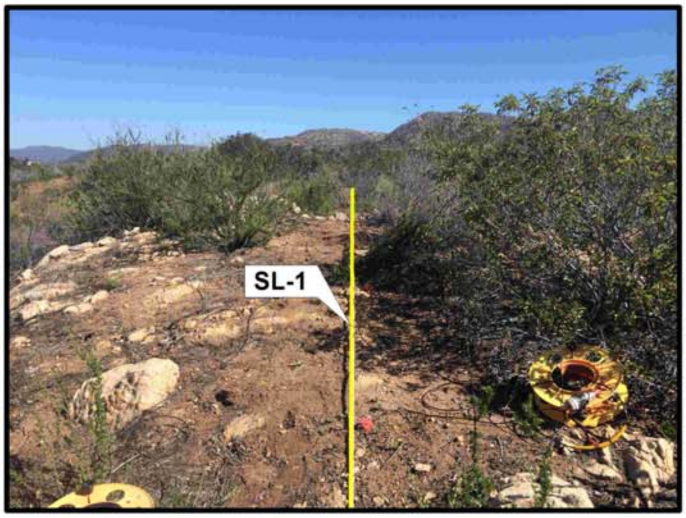
Safari Highlands Ranch
Escondido, California

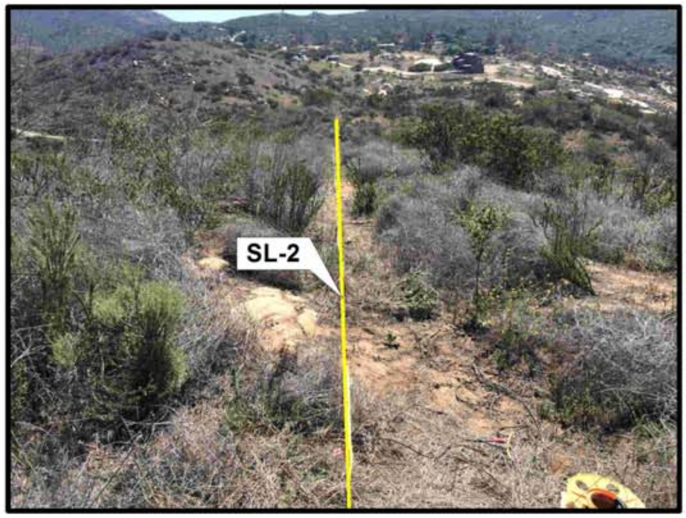
Project No.: 114200 | Date: 06/14

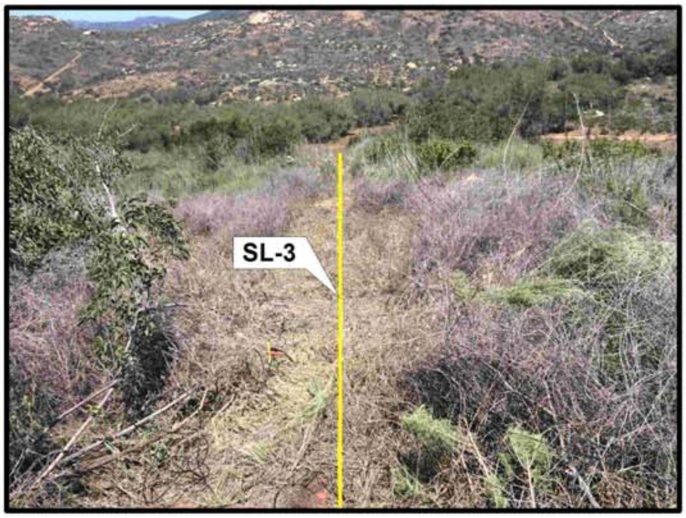
SOUTHWEST GEOPHYSICS INC.

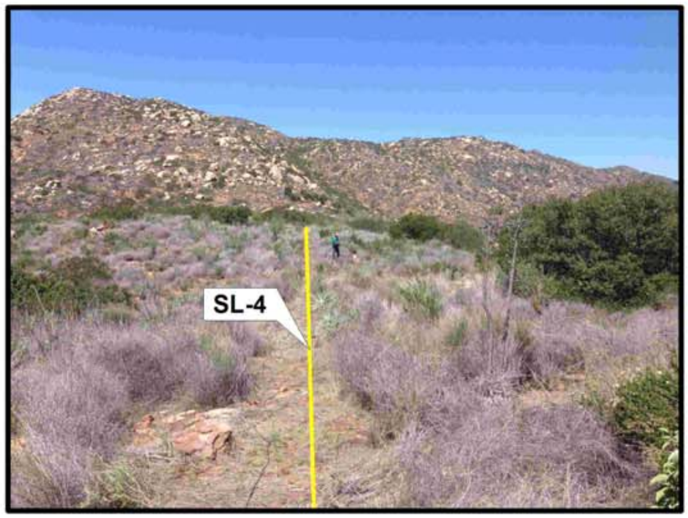
Figure 2f

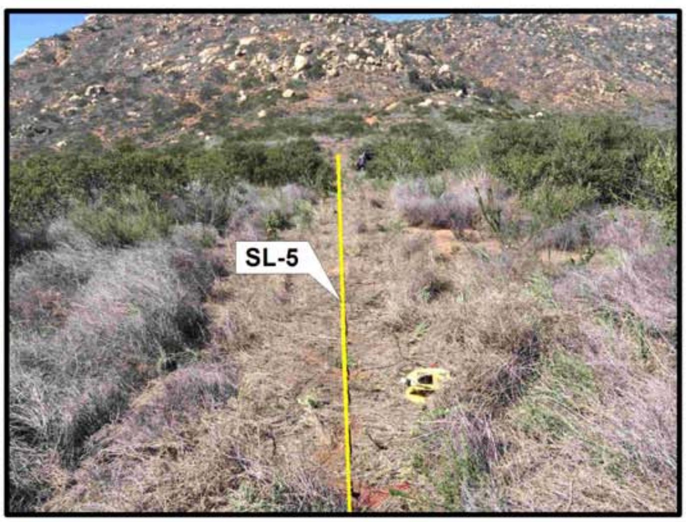
0 120 240
approximate scale in feet



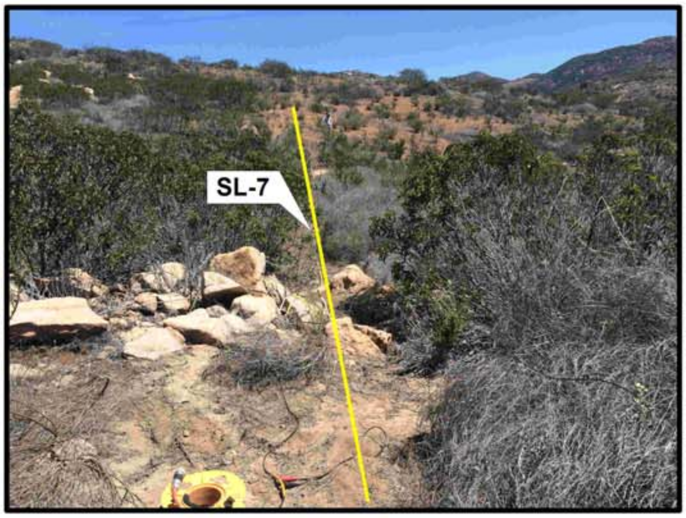


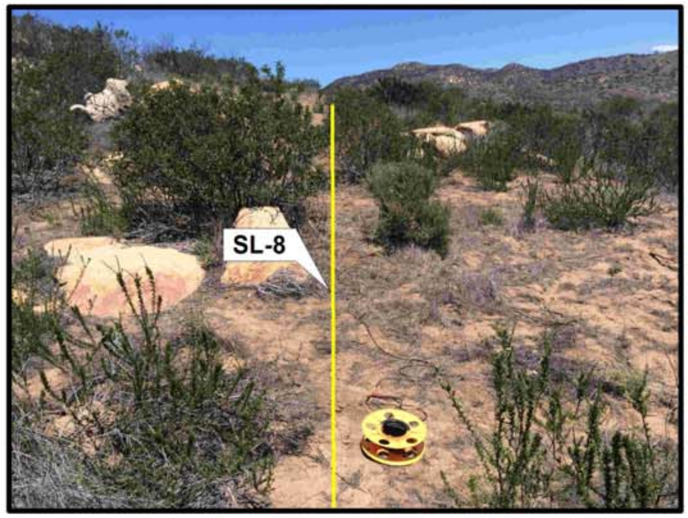


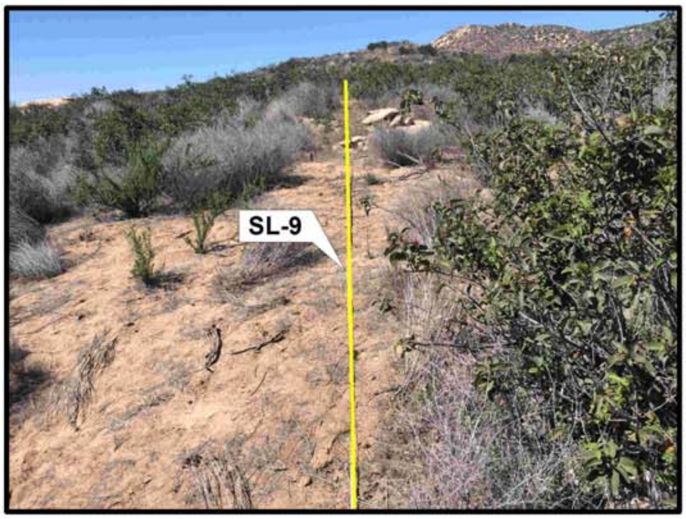


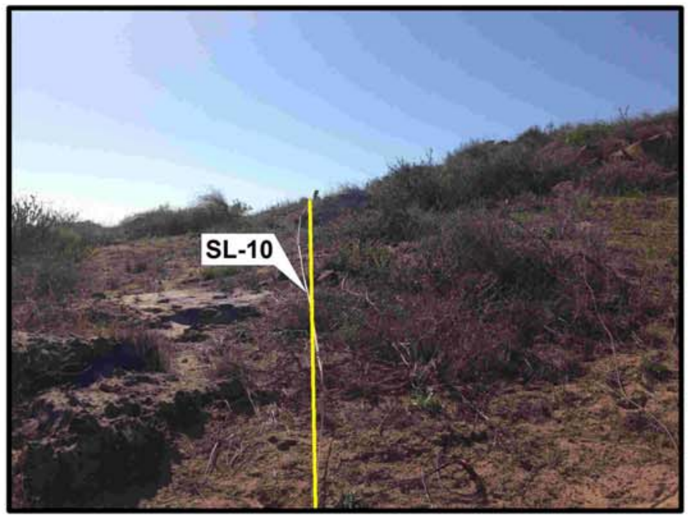


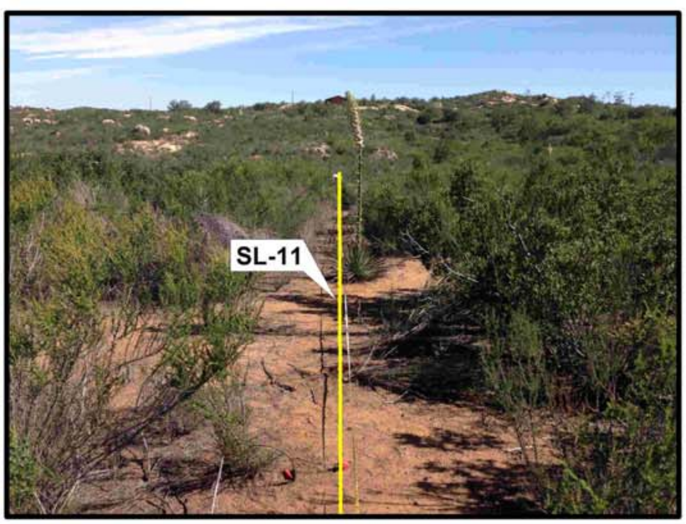
SITE PHOTOGRAPHS **(SL-1 through SL-6)**	Safari Highlands Ranch Escondido, California Project No.: 114200 Date: 06/14	SOUTHWEST GEOPHYSICS INC. Figure 3a

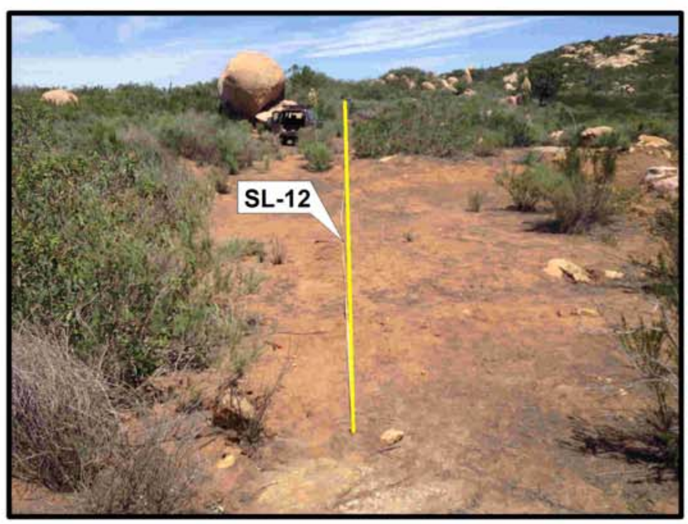




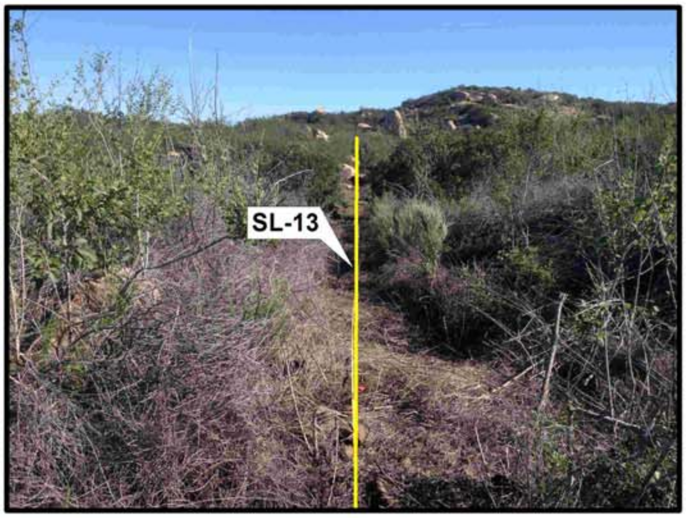


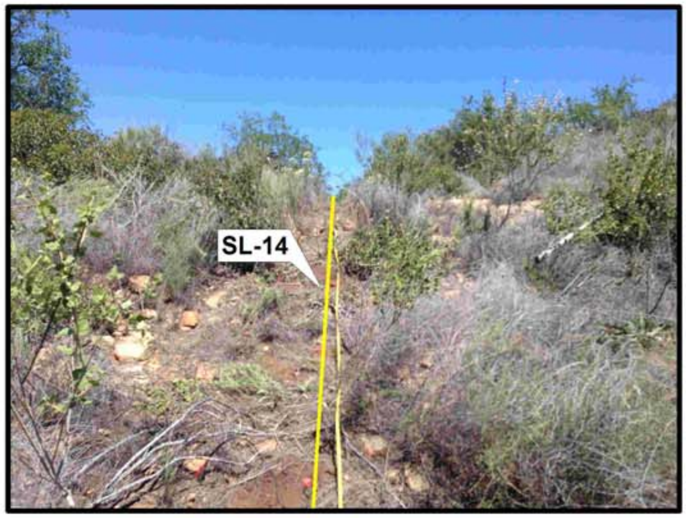


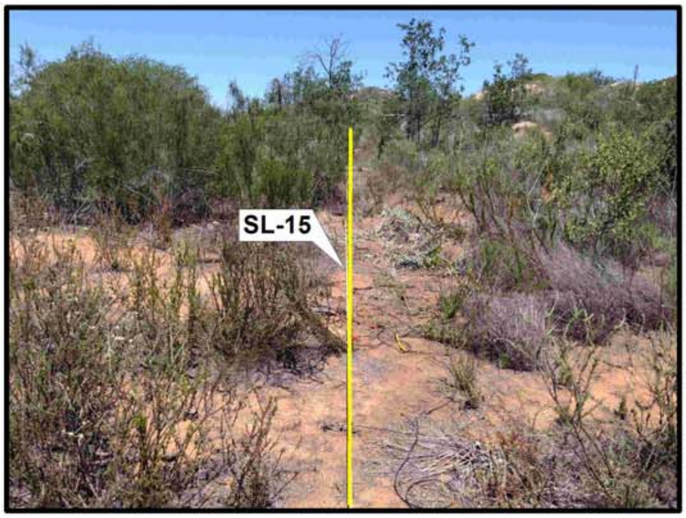


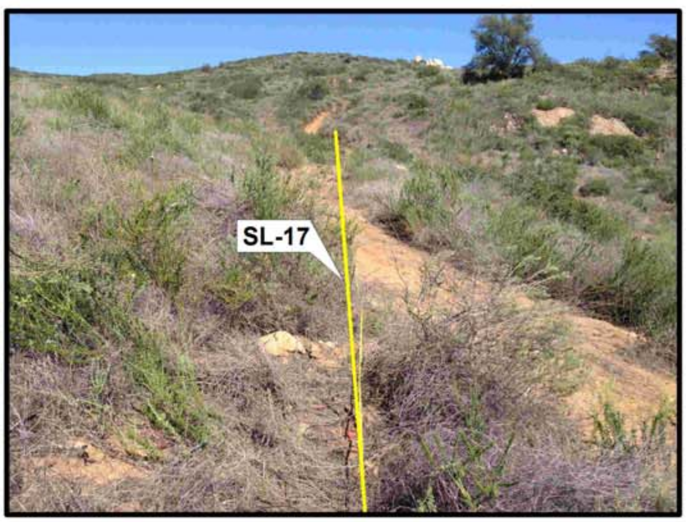


SITE PHOTOGRAPHS **(SL-7 through SL-12)**	Safari Highlands Ranch Escondido, California Project No.: 114200 Date: 06/14	SOUTHWEST GEOPHYSICS INC. Figure 3b









SITE PHOTOGRAPHS
(SL-13 through SL-18)

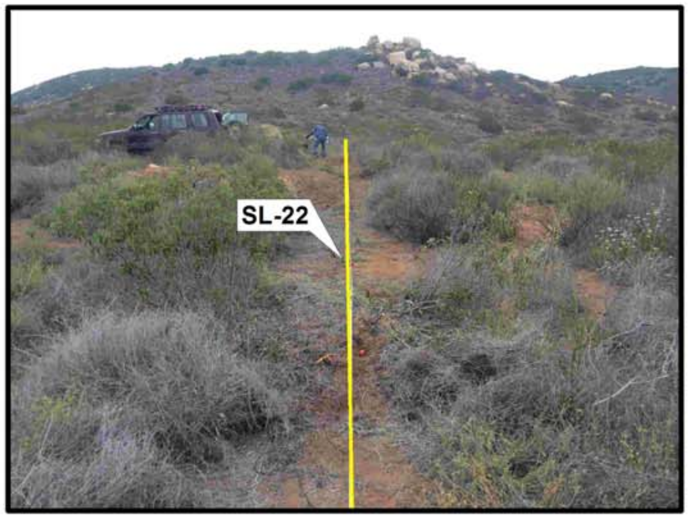
Safari Highlands Ranch
Escondido, California

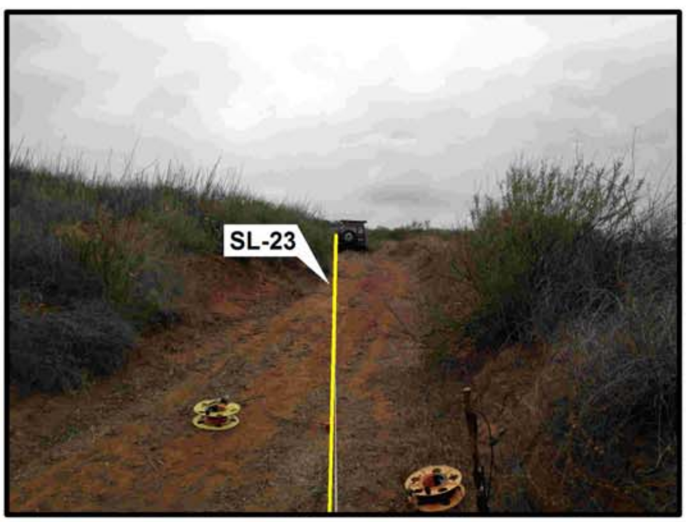
Project No.: 114200

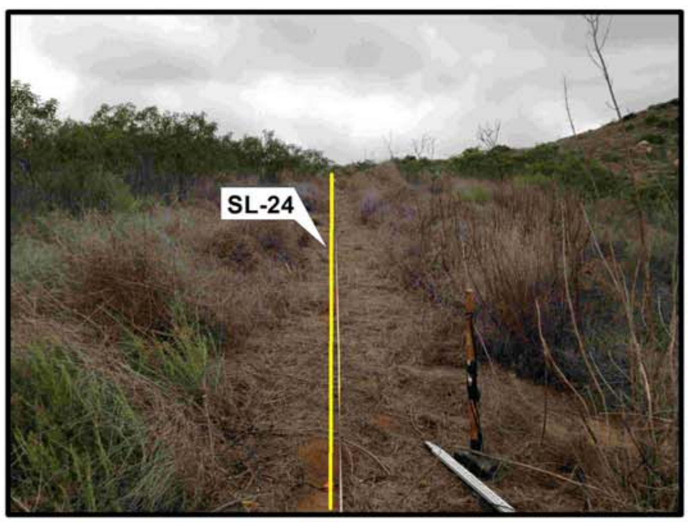
Date: 06/14

SOUTHWEST GEOPHYSICS INC.

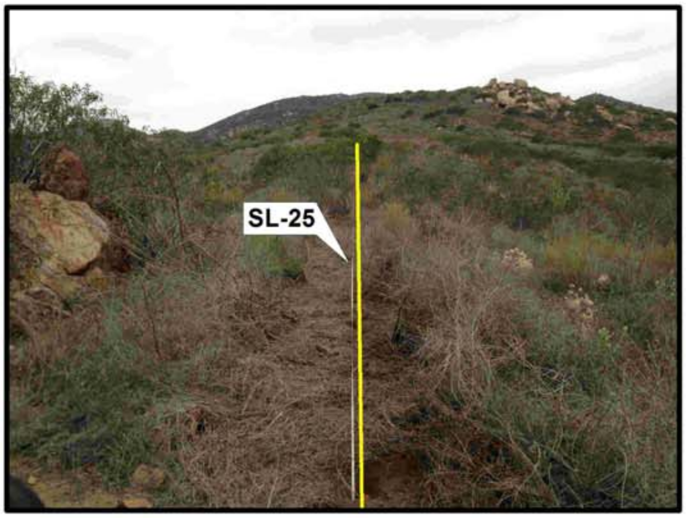
Figure 3c

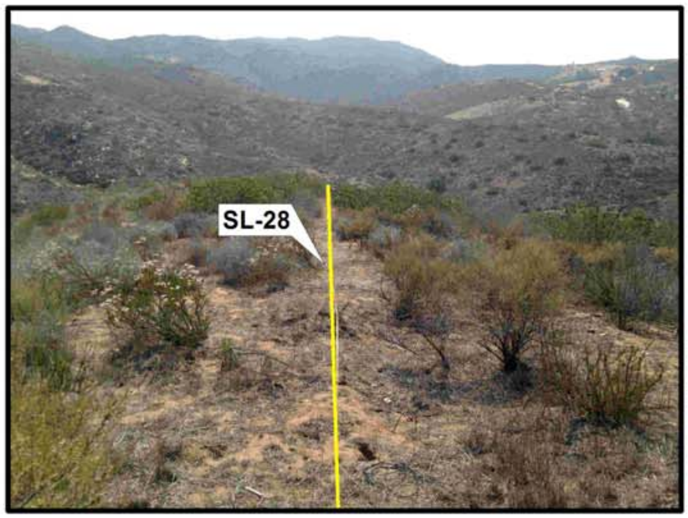


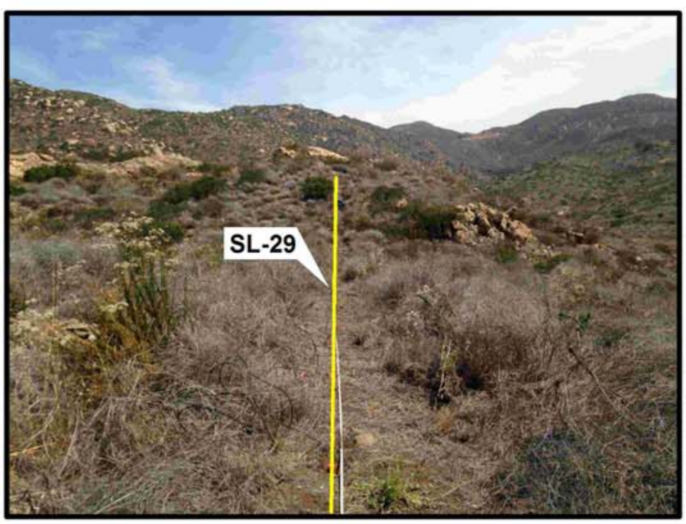


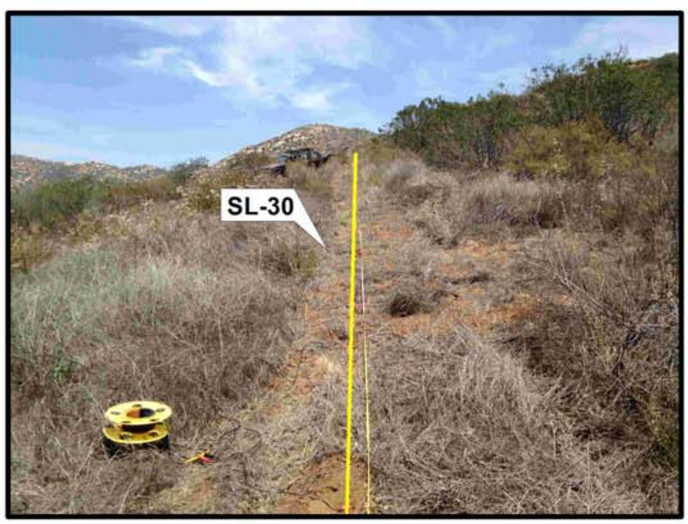


SITE PHOTOGRAPHS **(SL-19 through SL-24)**	Safari Highlands Ranch Escondido, California	SOUTHWEST GEOPHYSICS INC.
	Project No.: 114200 / Date: 06/14	Figure 3d



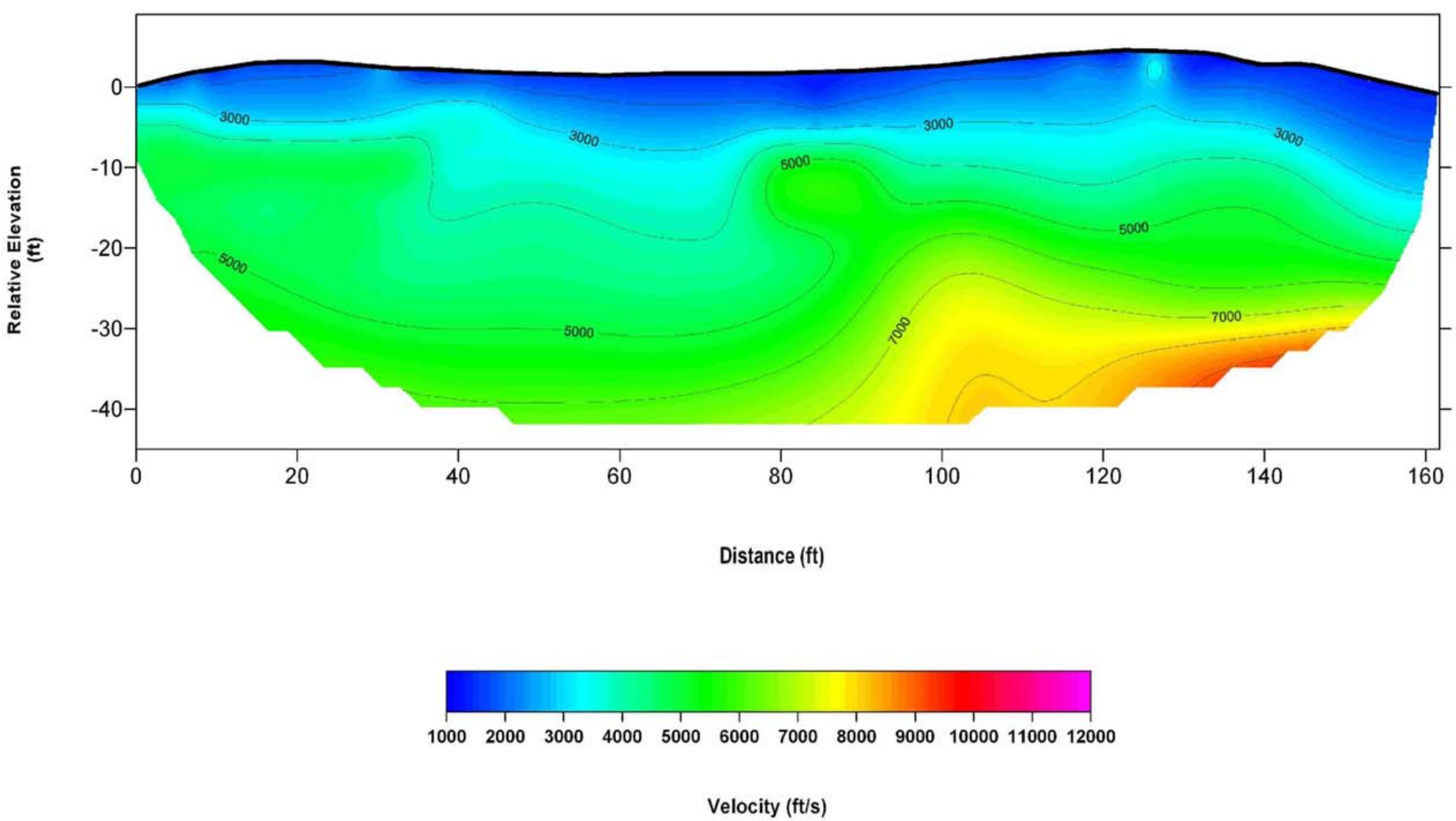






SITE PHOTOGRAPHS **(SL-25 through SL-30)**	Safari Highlands Ranch Escondido, California Project No.: 114200 — Date: 06/14	SOUTHWEST GEOPHYSICS INC. Figure 3e

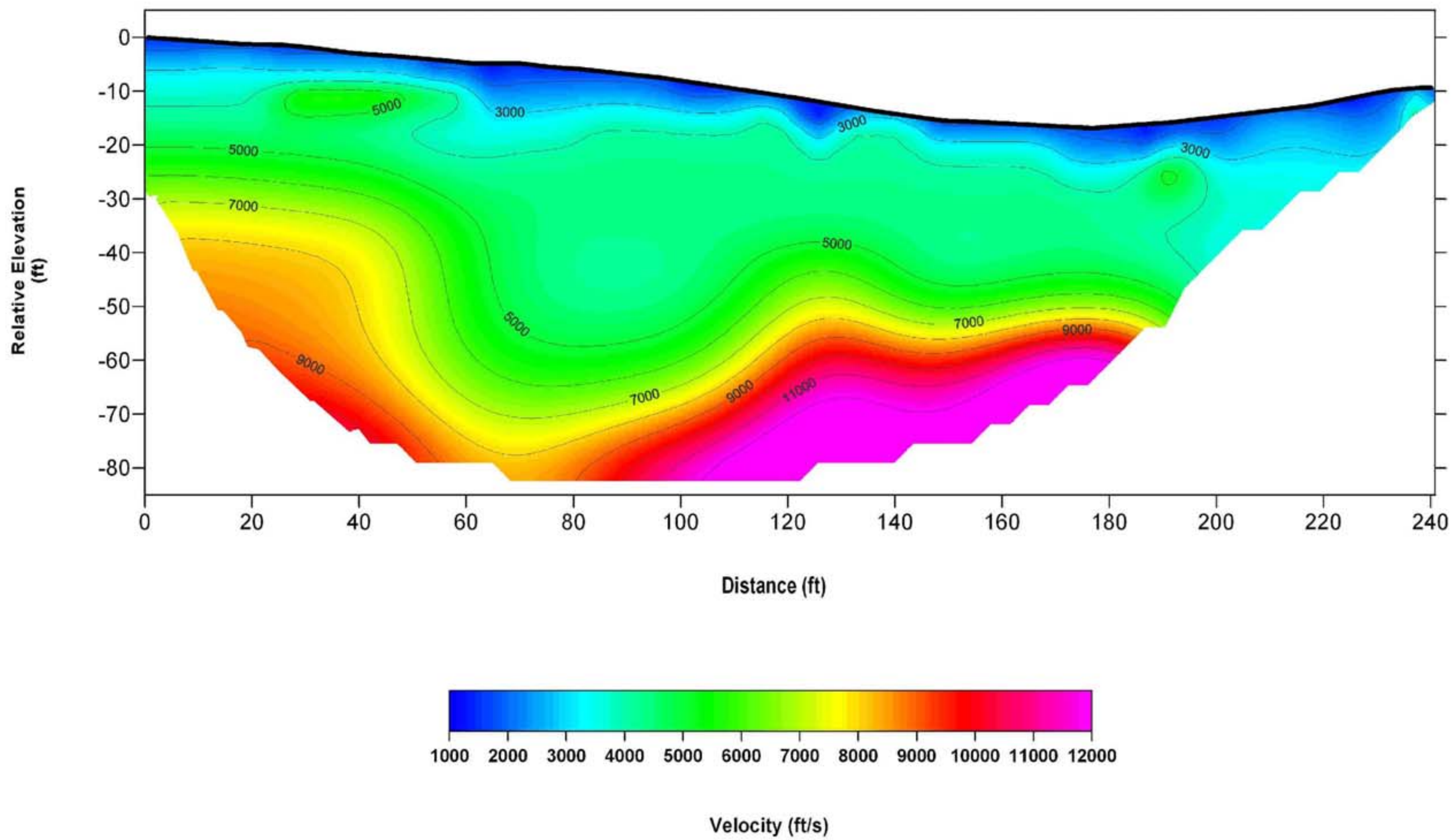
TOMOGRAPHY MODEL



SEISMIC PROFILE SL-1	Safari Highlands Ranch Escondido, California Project No.: 114200 / Date: 06/14	SOUTHWEST GEOPHYSICS INC. Figure 4a

Note: Contour Interval = 1,000 feet per second

TOMOGRAPHY MODEL



SEISMIC PROFILE SL-2	Safari Highlands Ranch Escondido, California Project No.: 114200 — Date: 06/14	SOUTHWEST GEOPHYSICS INC. Figure 4b	**Note: Contour Interval = 1,000 feet per second**

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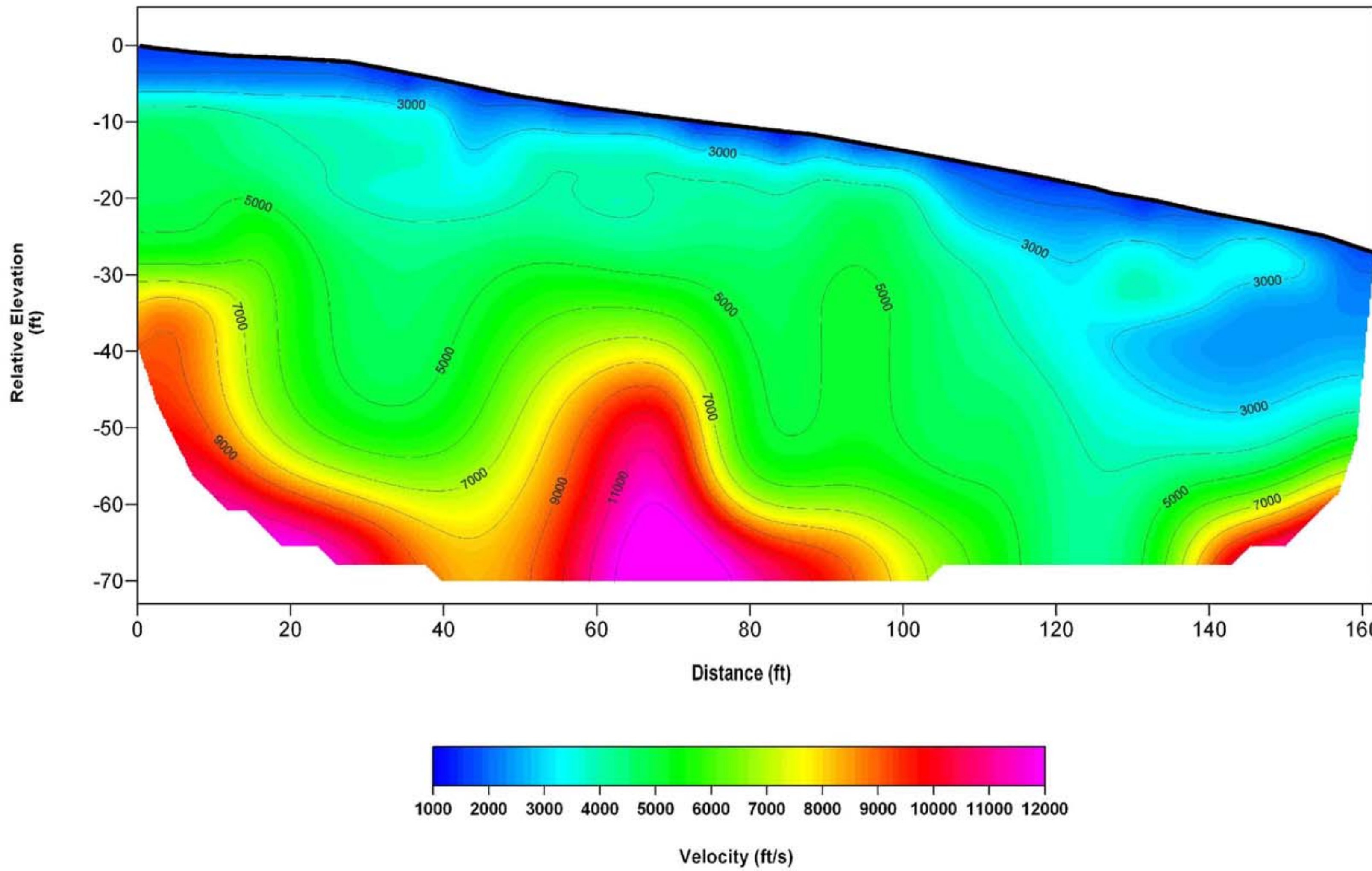
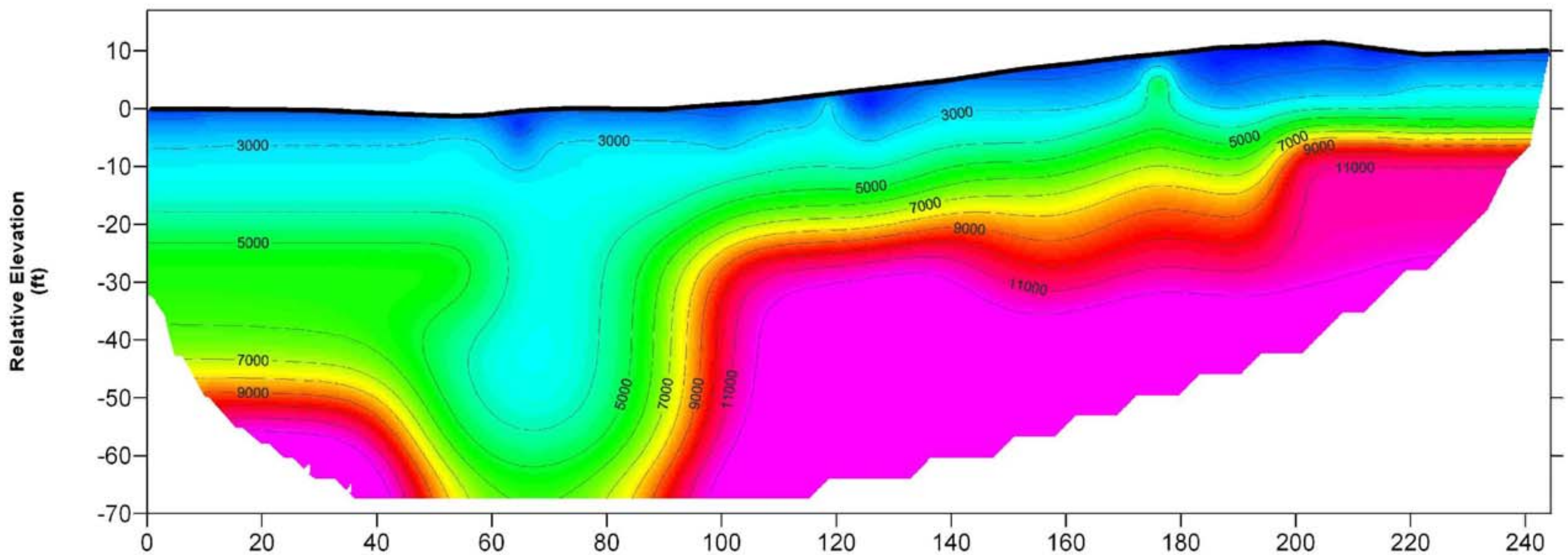
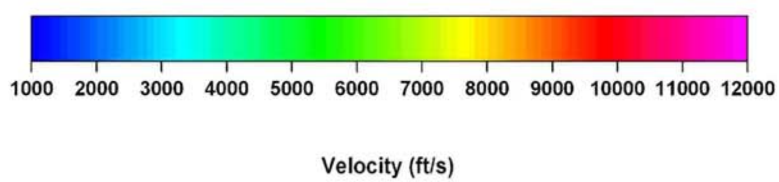


SEISMIC PROFILE SL-3	Safari Highlands Ranch Escondido, California Project No.: 114200 Date: 06/14	SOUTHWEST GEOPHYSICS INC. Figure 4c	**Note: Contour Interval = 1,000 feet per second**

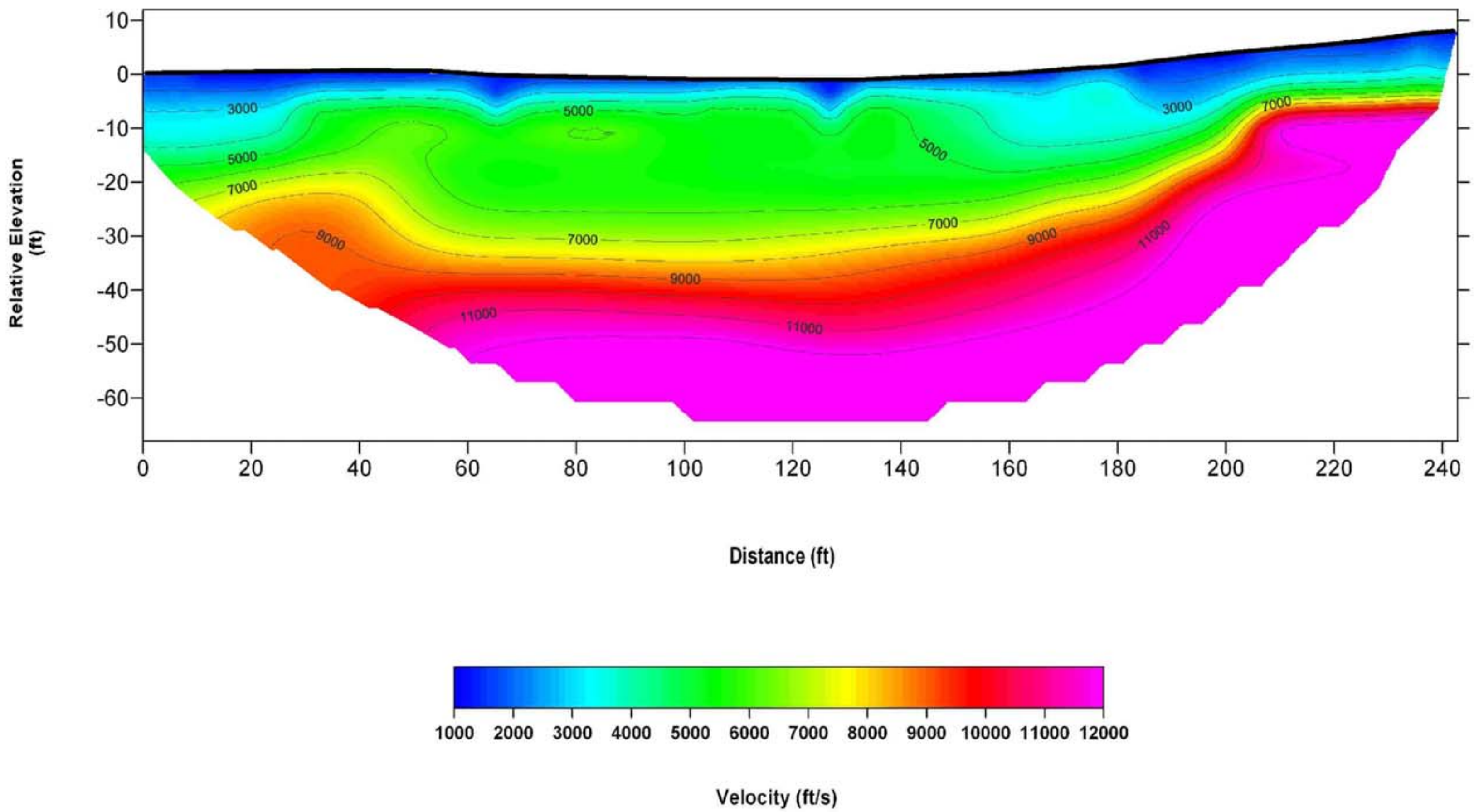
TOMOGRAPHY MODEL





SEISMIC PROFILE SL-4	Safari Highlands Ranch Escondido, California Project No.: 114200 / Date: 06/14	SOUTHWEST GEOPHYSICS INC. Figure 4d	**Note: Contour Interval = 1,000 feet per second**

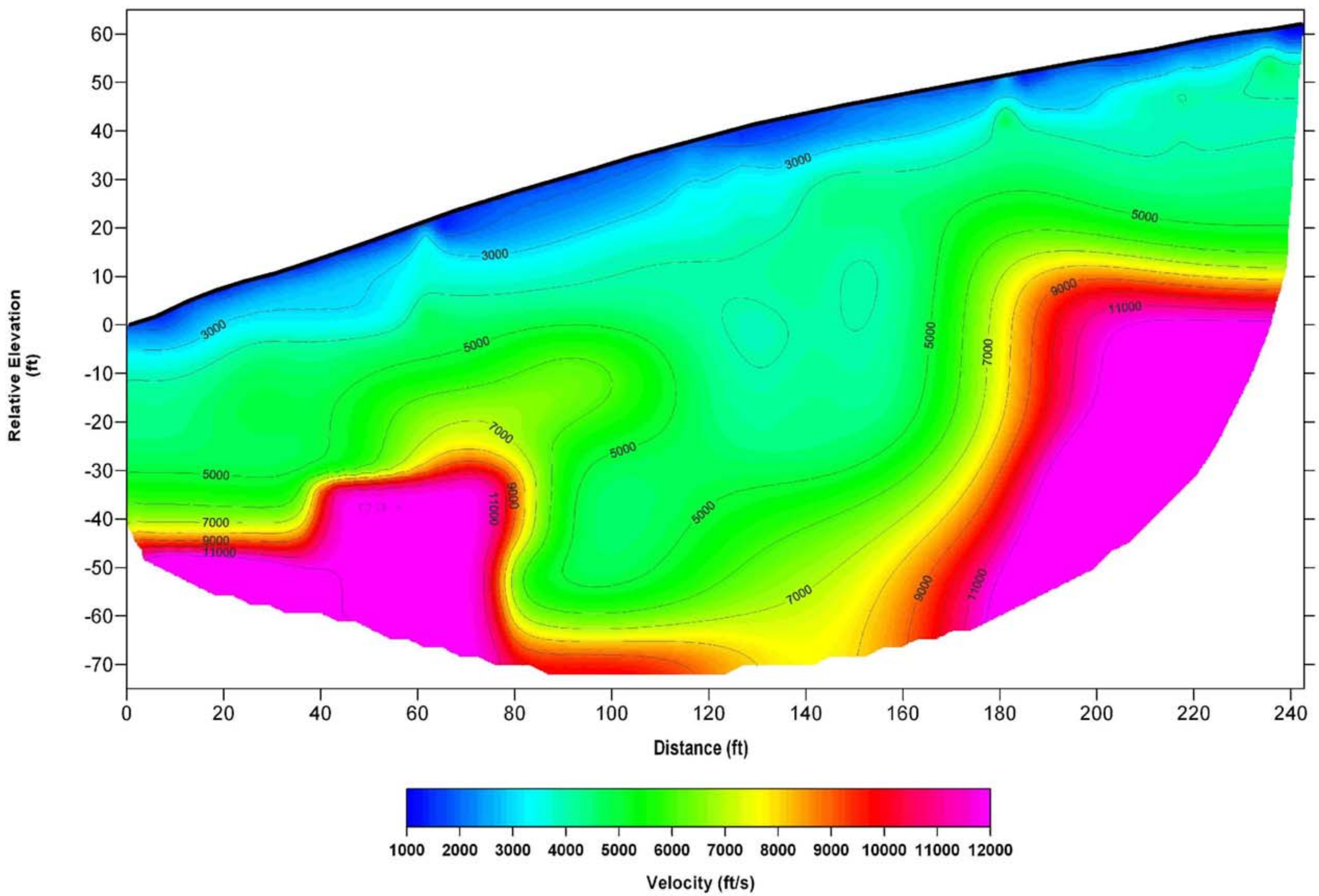
TOMOGRAPHY MODEL



SEISMIC PROFILE SL-5	Safari Highlands Ranch Escondido, California Project No.: 114200 Date: 06/14	SOUTHWEST GEOPHYSICS INC. Figure 4e

Note: Contour Interval = 1,000 feet per second

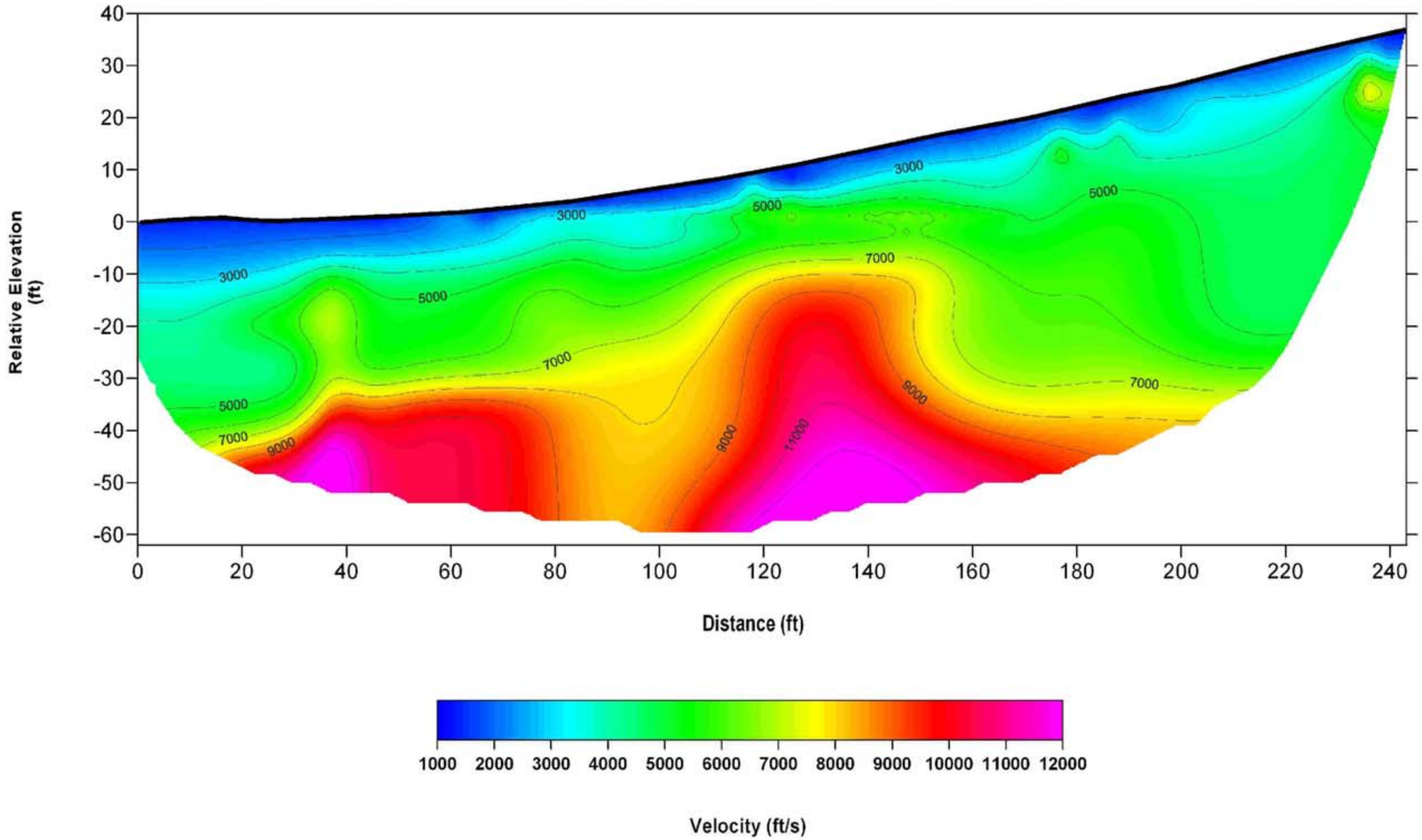
TOMOGRAPHY MODEL



SEISMIC PROFILE SL-6	Safari Highlands Ranch Escondido, California Project No.: 114200 Date: 06/14	SOUTHWEST GEOPHYSICS INC. Figure 4f

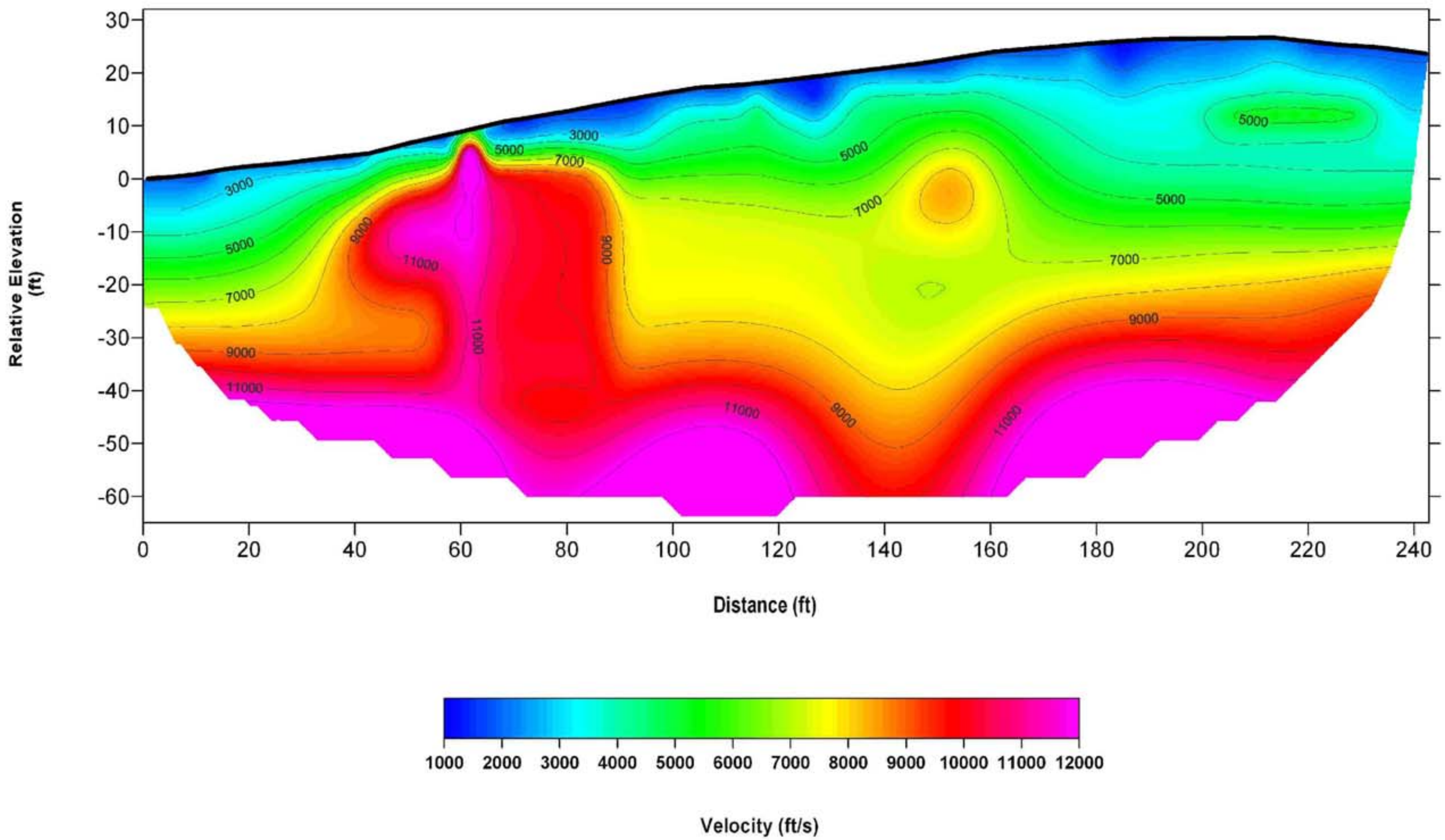
Note: Contour Interval = 1,000 feet per second

TOMOGRAPHY MODEL



SEISMIC PROFILE SL-7	Safari Highlands Ranch Escondido, California Project No.: 114200 — Date: 06/14	SOUTHWEST GEOPHYSICS INC. Figure 4g	**Note: Contour Interval = 1,000 feet per second**

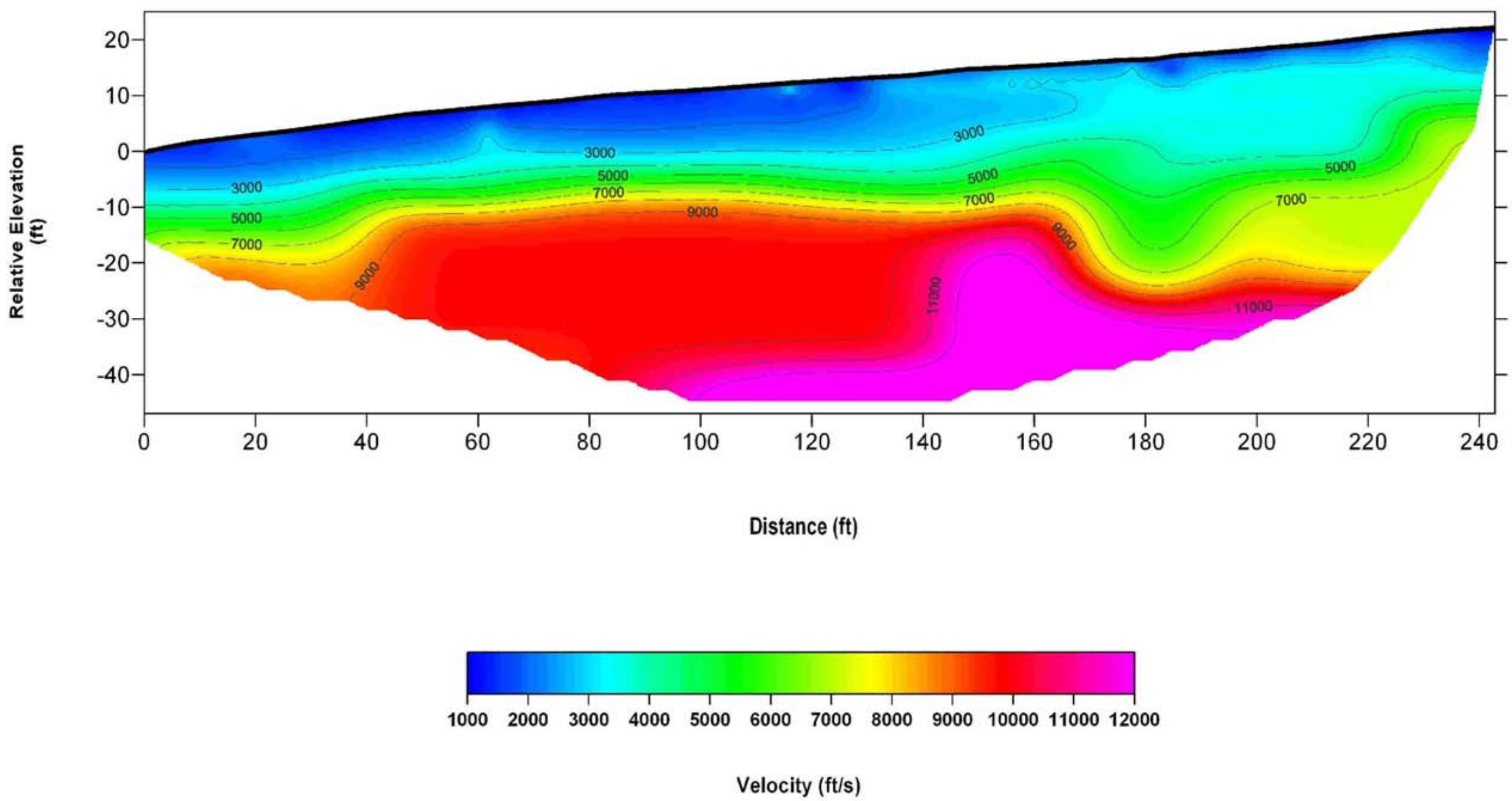
TOMOGRAPHY MODEL



SEISMIC PROFILE SL-8	Safari Highlands Ranch Escondido, California	SOUTHWEST GEOPHYSICS INC. Figure 4h
	Project No.: 114200 / Date: 06/14	

Note: Contour Interval = 1,000 feet per second

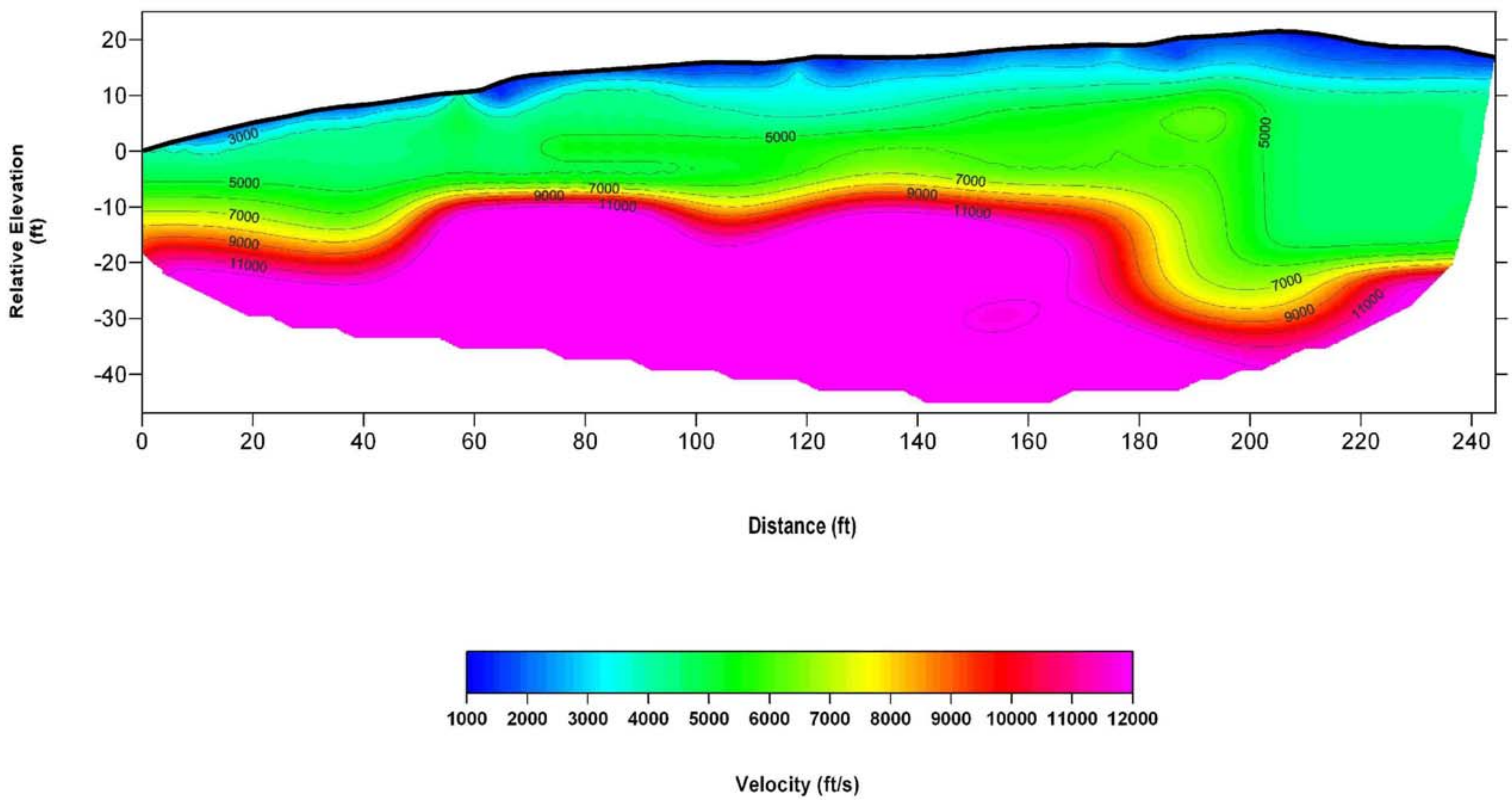
TOMOGRAPHY MODEL



SEISMIC PROFILE SL-9	Safari Highlands Ranch Escondido, California Project No.: 114200 · Date: 06/14	SOUTHWEST GEOPHYSICS INC. Figure 4i

Note: Contour Interval = 1,000 feet per second

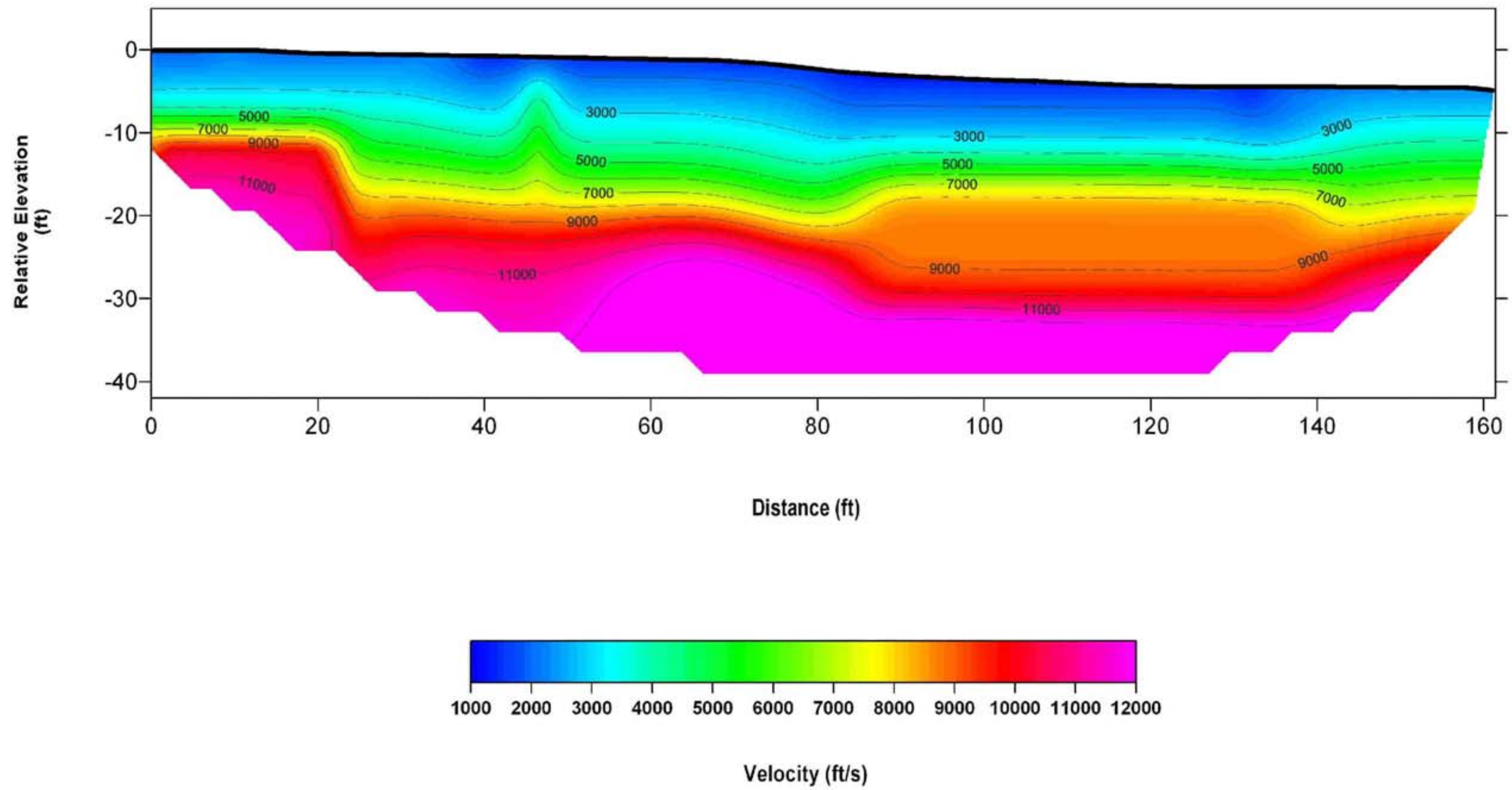
TOMOGRAPHY MODEL



SEISMIC PROFILE SL-10	Safari Highlands Ranch Escondido, California Project No.: 114200 Date: 06/14	SOUTHWEST GEOPHYSICS INC. Figure 4j

Note: Contour Interval = 1,000 feet per second

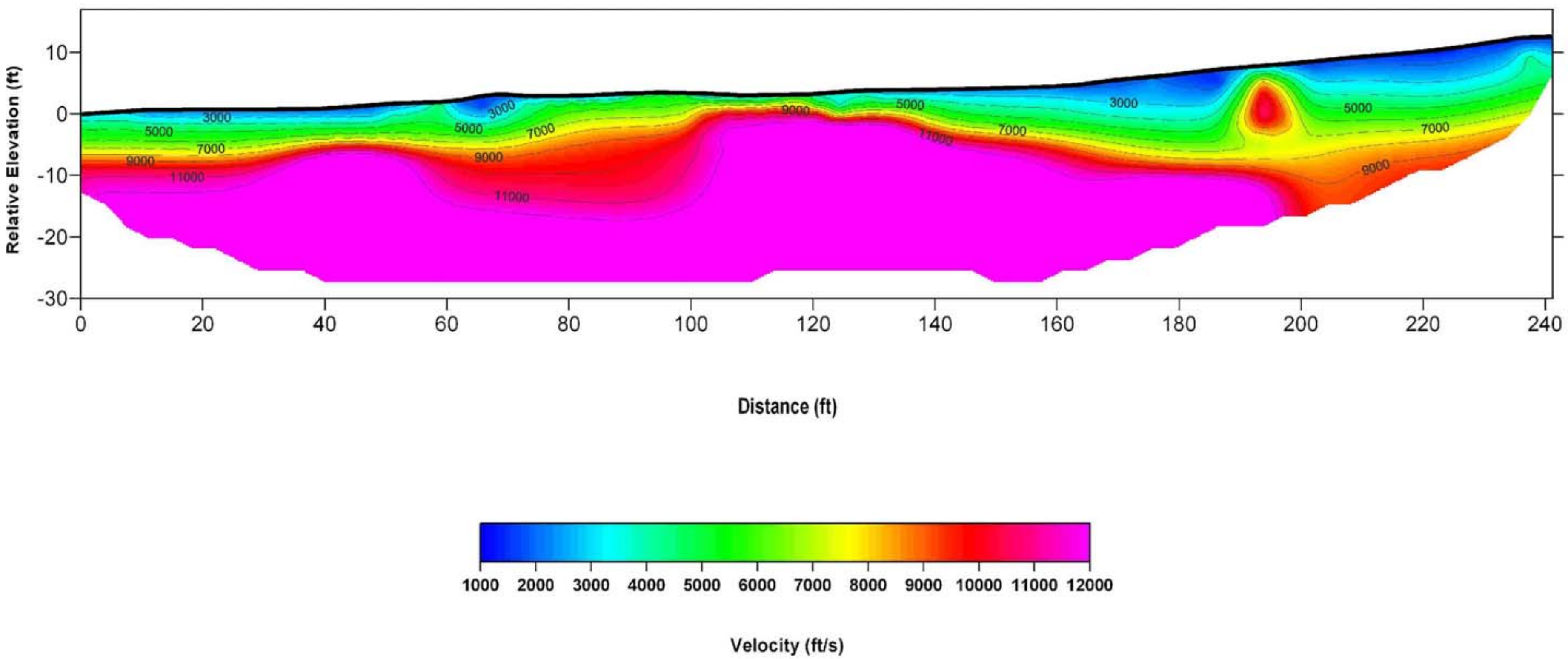
TOMOGRAPHY MODEL



SEISMIC PROFILE SL-11	Safari Highlands Ranch Escondido, California Project No.: 114200 Date: 06/14	SOUTHWEST GEOPHYSICS INC. Figure 4k

Note: Contour Interval = 1,000 feet per second

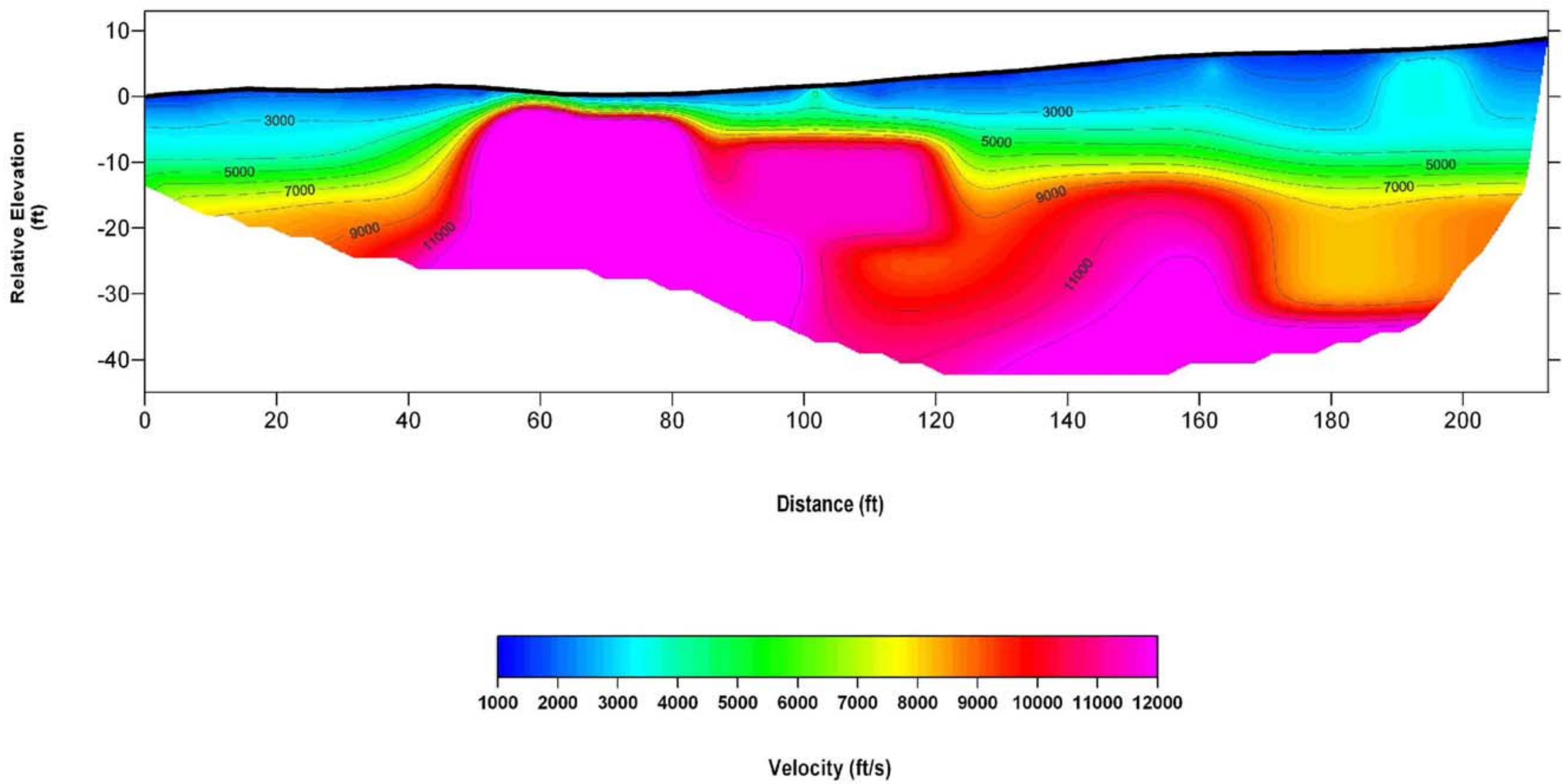
TOMOGRAPHY MODEL



SEISMIC PROFILE SL-12	Safari Highlands Ranch Escondido, California Project No.: 114200 / Date: 06/14	SOUTHWEST GEOPHYSICS INC. Figure 4l

Note: Contour Interval = 1,000 feet per second

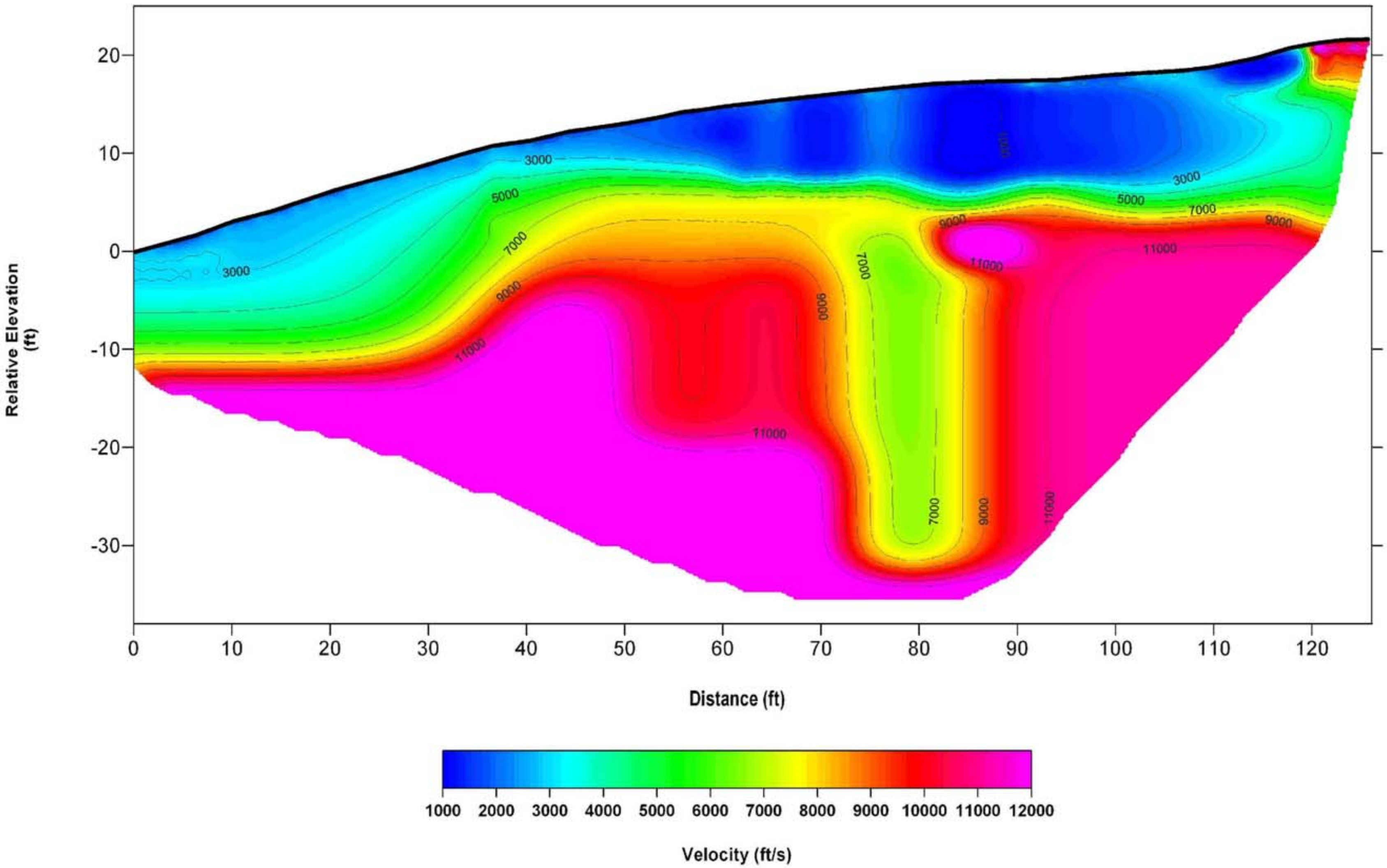
TOMOGRAPHY MODEL



SEISMIC PROFILE SL-13	Safari Highlands Ranch Escondido, California Project No.: 114200 — Date: 06/14	SOUTHWEST GEOPHYSICS INC. Figure 4m

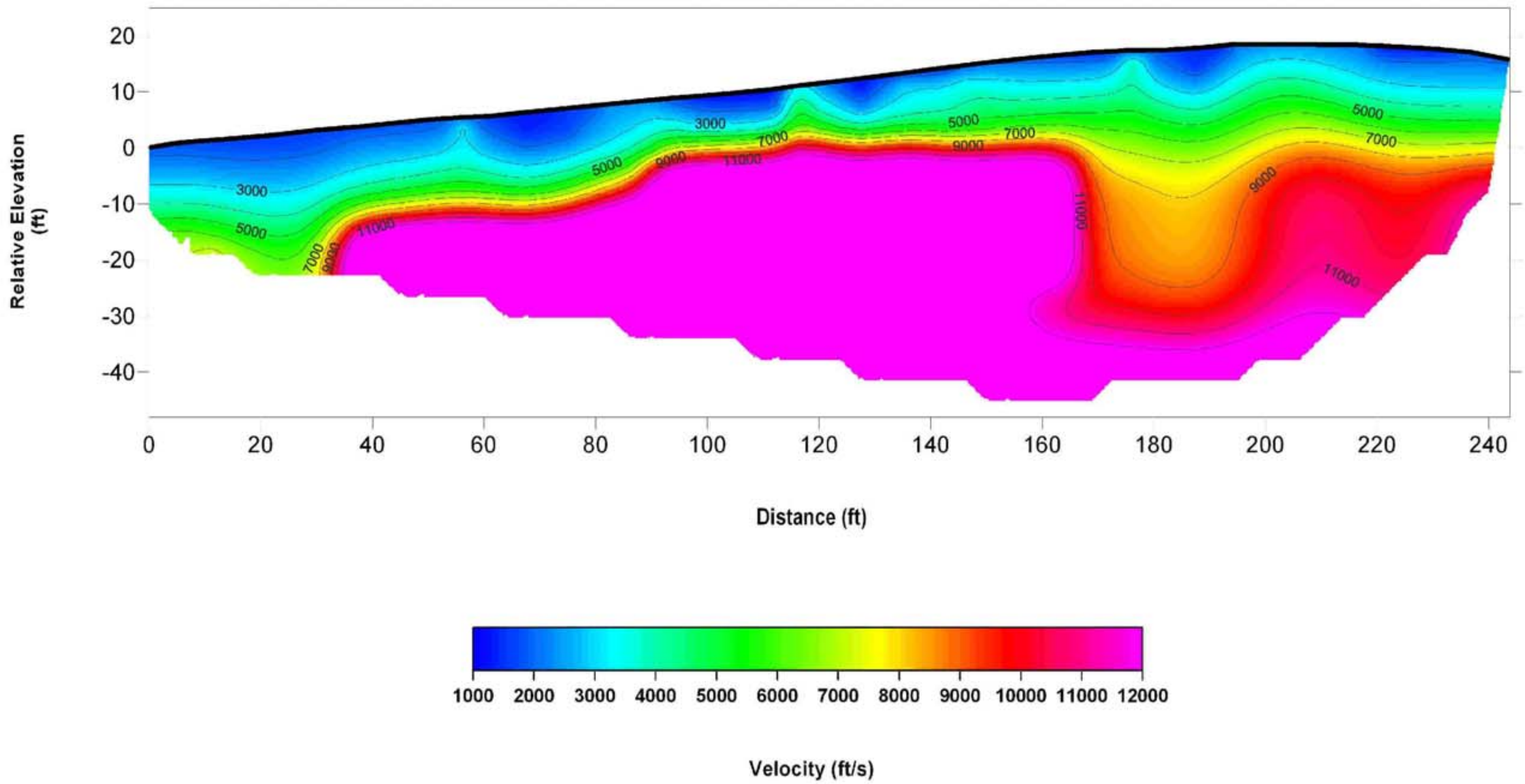
Note: Contour Interval = 1,000 feet per second

TOMOGRAPHY MODEL



SEISMIC PROFILE SL-14	Safari Highlands Ranch Escondido, California Project No.: 114200 Date: 06/14	SOUTHWEST GEOPHYSICS INC. Figure 4n	**Note: Contour Interval = 1,000 feet per second**

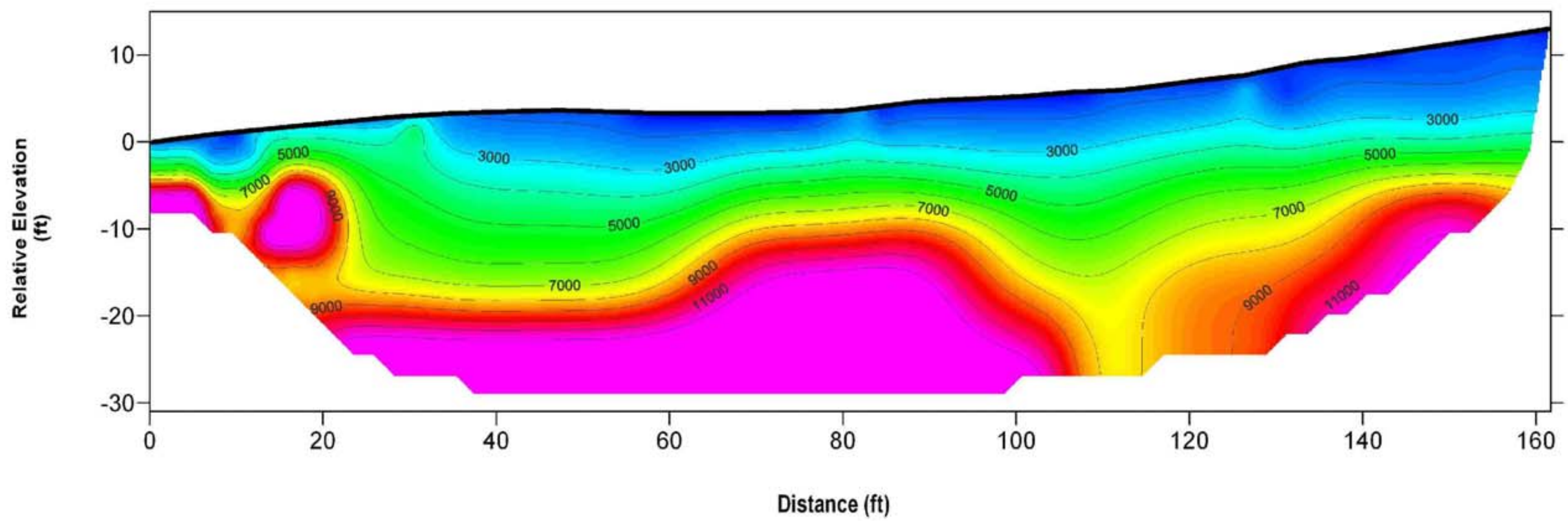
TOMOGRAPHY MODEL

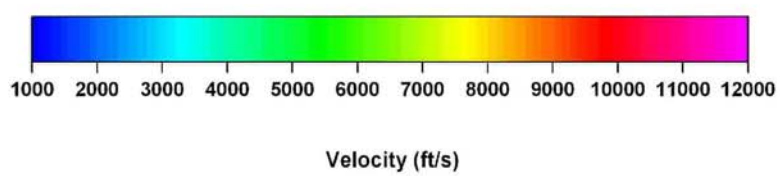


SEISMIC PROFILE SL-15	Safari Highlands Ranch Escondido, California Project No.: 114200 / Date: 06/14	SOUTHWEST GEOPHYSICS INC. Figure 4o

Note: Contour Interval = 1,000 feet per second

TOMOGRAPHY MODEL

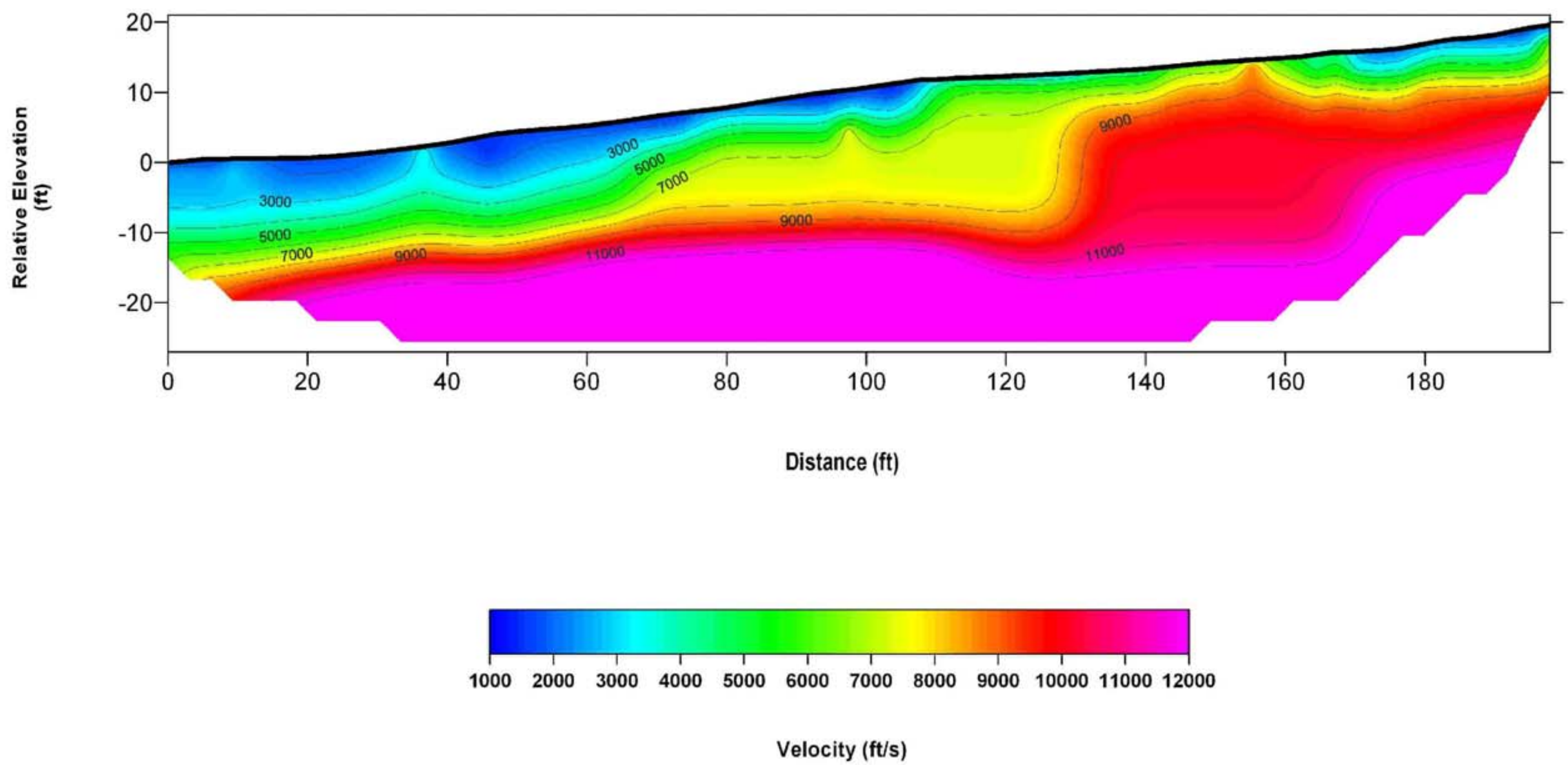




SEISMIC PROFILE **SL-16**	Safari Highlands Ranch Escondido, California Project No.: 114200 — Date: 06/14	SOUTHWEST GEOPHYSICS INC. Figure 4p

Note: Contour Interval = 1,000 feet per second

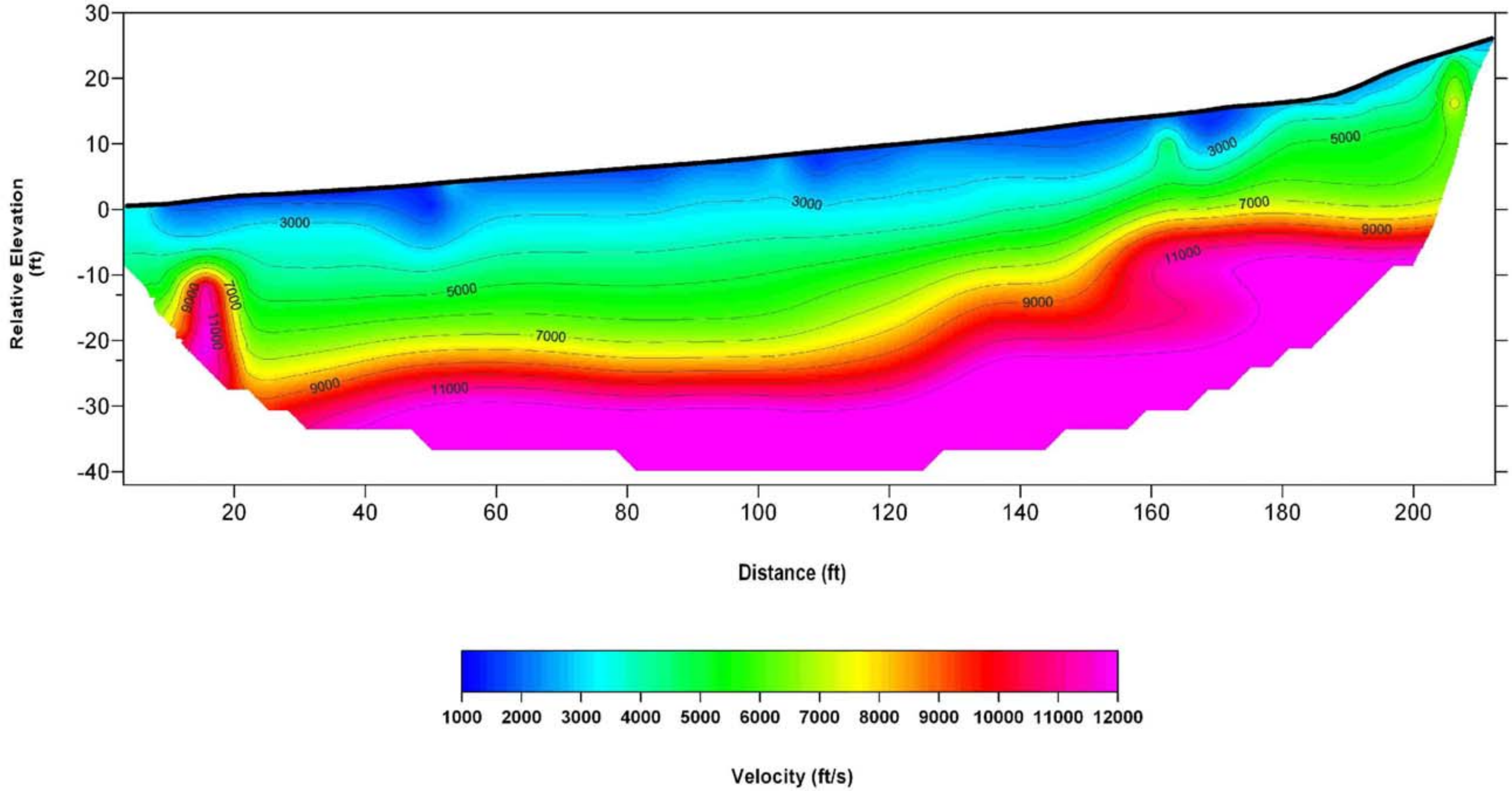
TOMOGRAPHY MODEL



SEISMIC PROFILE SL-17	Safari Highlands Ranch Escondido, California Project No.: 114200 Date: 06/14	SOUTHWEST GEOPHYSICS INC. Figure 4q

Note: Contour Interval = 1,000 feet per second

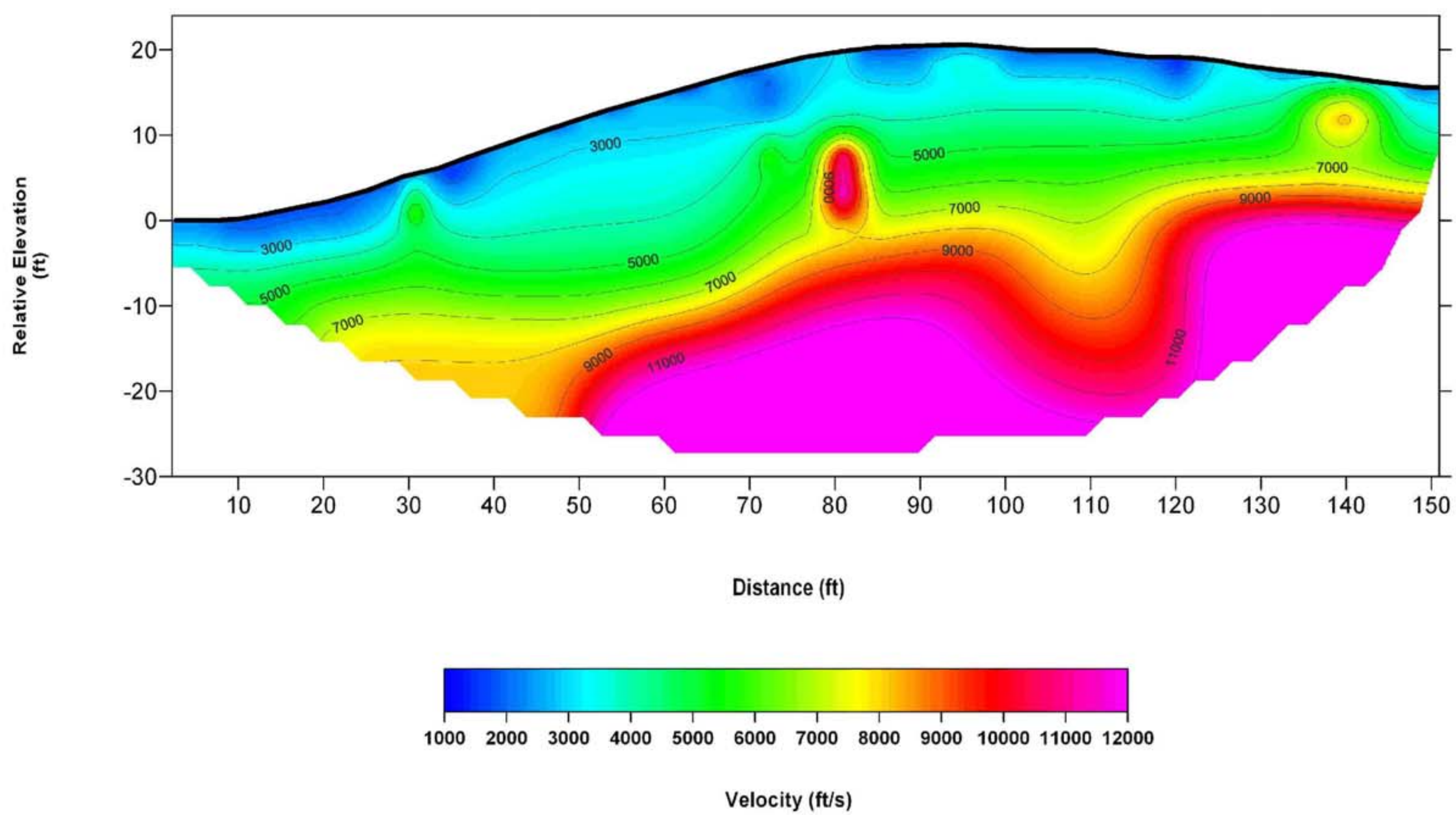
TOMOGRAPHY MODEL



SEISMIC PROFILE SL-18	Safari Highlands Ranch Escondido, California Project No.: 114200 — Date: 06/14	SOUTHWEST GEOPHYSICS INC. Figure 4r

Note: Contour Interval = 1,000 feet per second

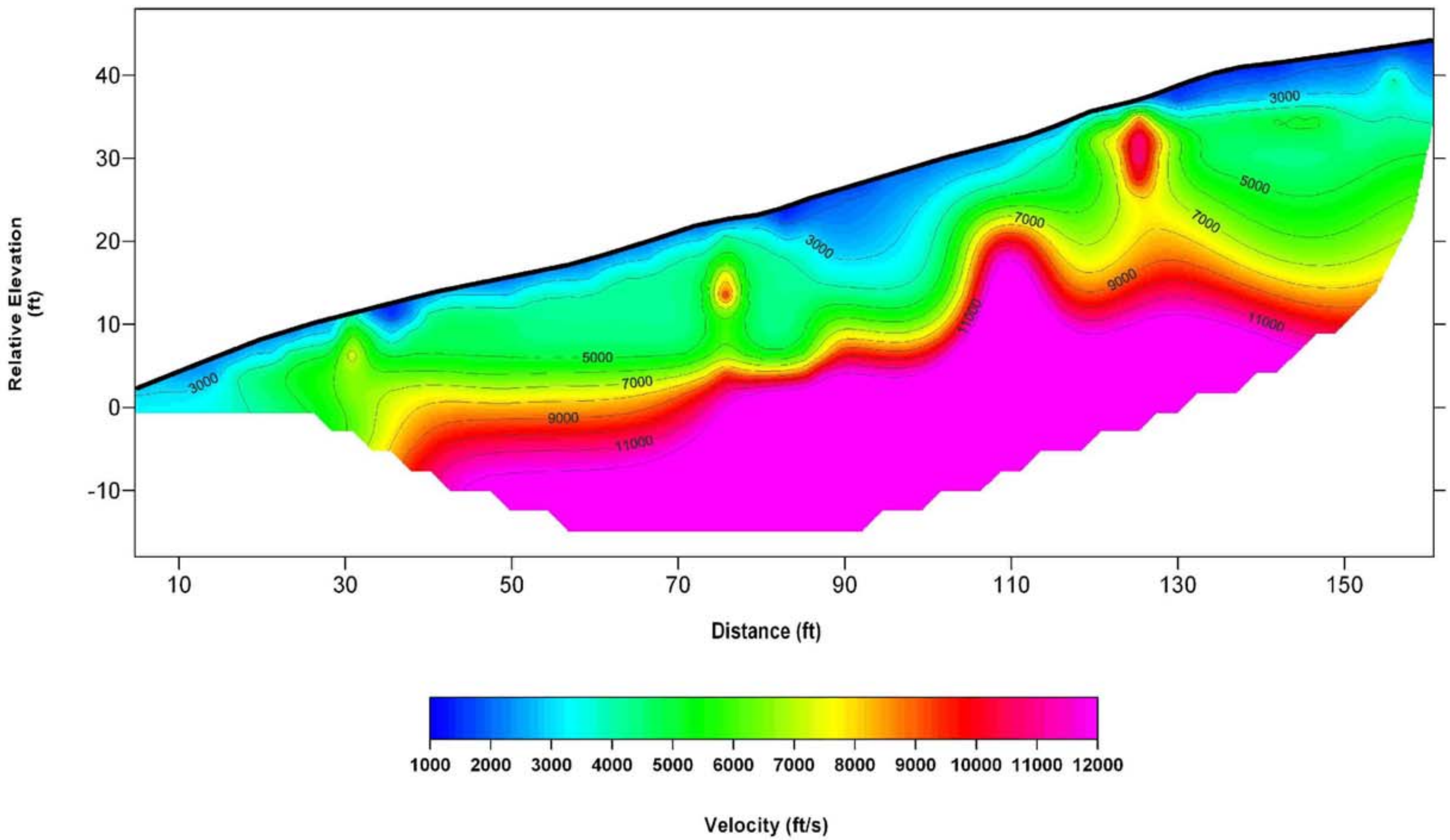
TOMOGRAPHY MODEL



SEISMIC PROFILE SL-19	Safari Highlands Ranch Escondido, California Project No.: 114200 · Date: 06/14	SOUTHWEST GEOPHYSICS INC. Figure 4s

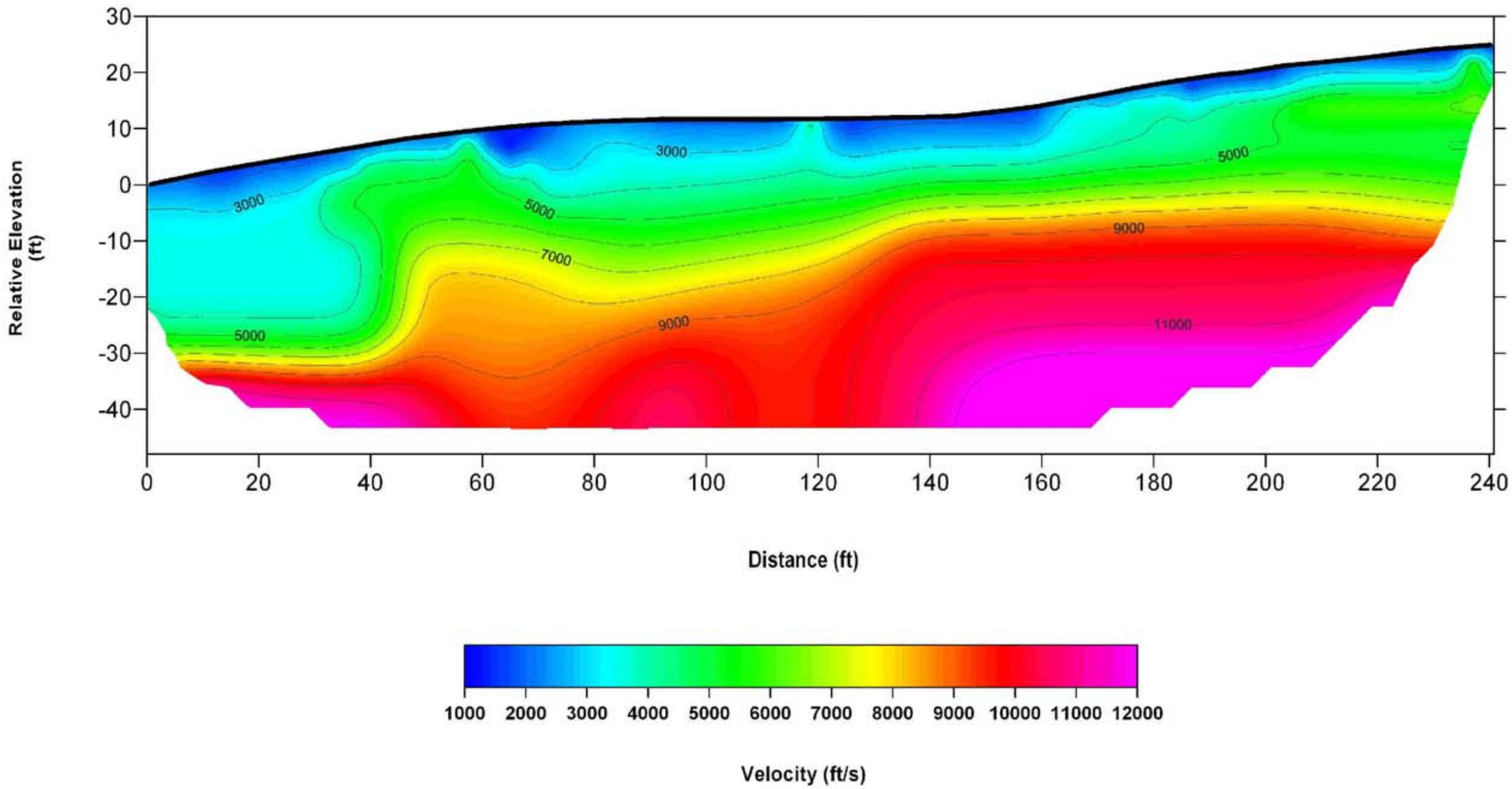
Note: Contour Interval = 1,000 feet per second

TOMOGRAPHY MODEL



SEISMIC PROFILE SL-20	Safari Highlands Ranch Escondido, California Project No.: 114200 — Date: 06/14	SOUTHWEST GEOPHYSICS INC. Figure 4t	**Note: Contour Interval = 1,000 feet per second**

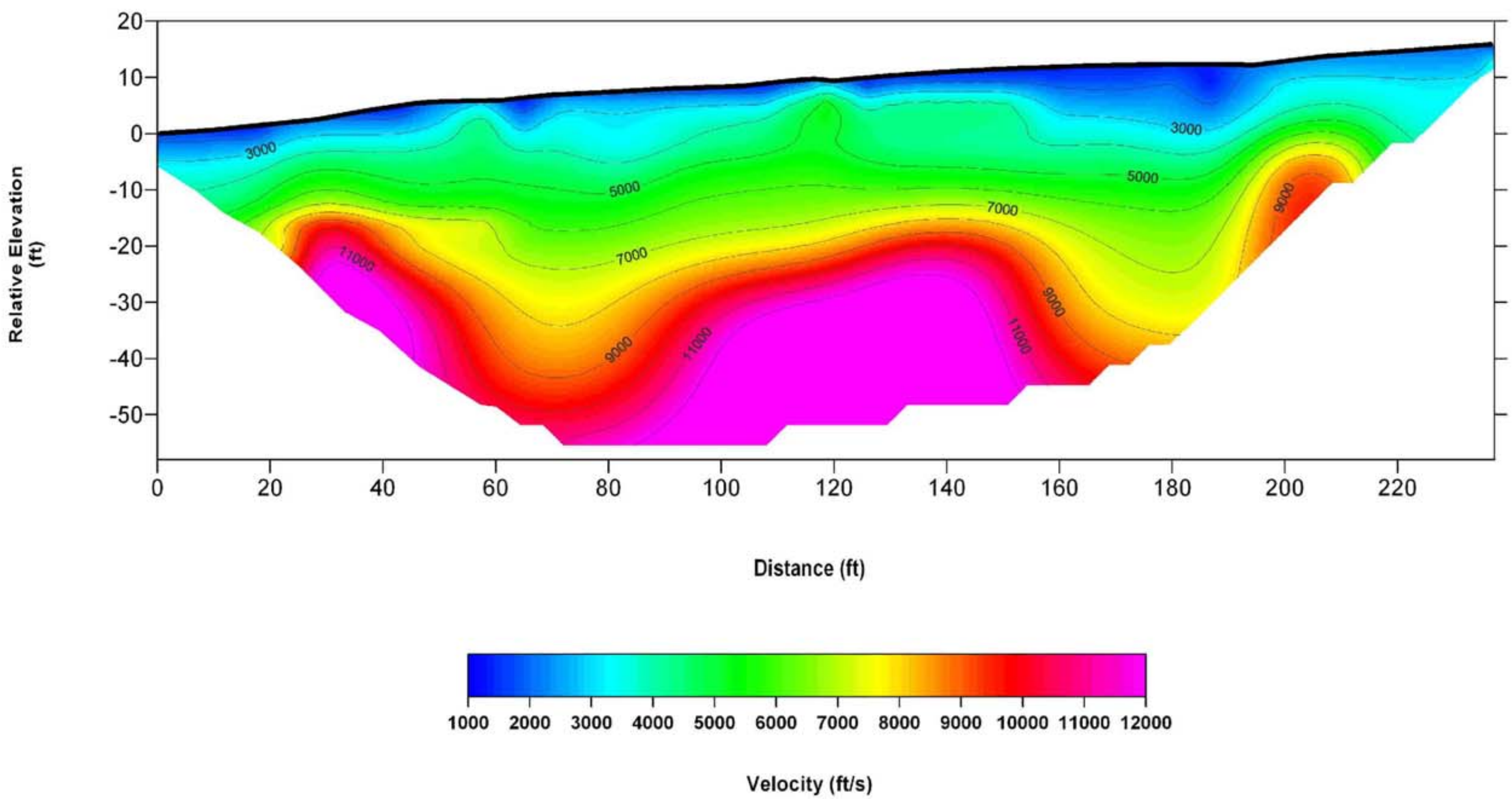
TOMOGRAPHY MODEL



SEISMIC PROFILE SL-21	Safari Highlands Ranch Escondido, California Project No.: 114200 · Date: 06/14	SOUTHWEST GEOPHYSICS INC. Figure 4u

Note: Contour Interval = 1,000 feet per second

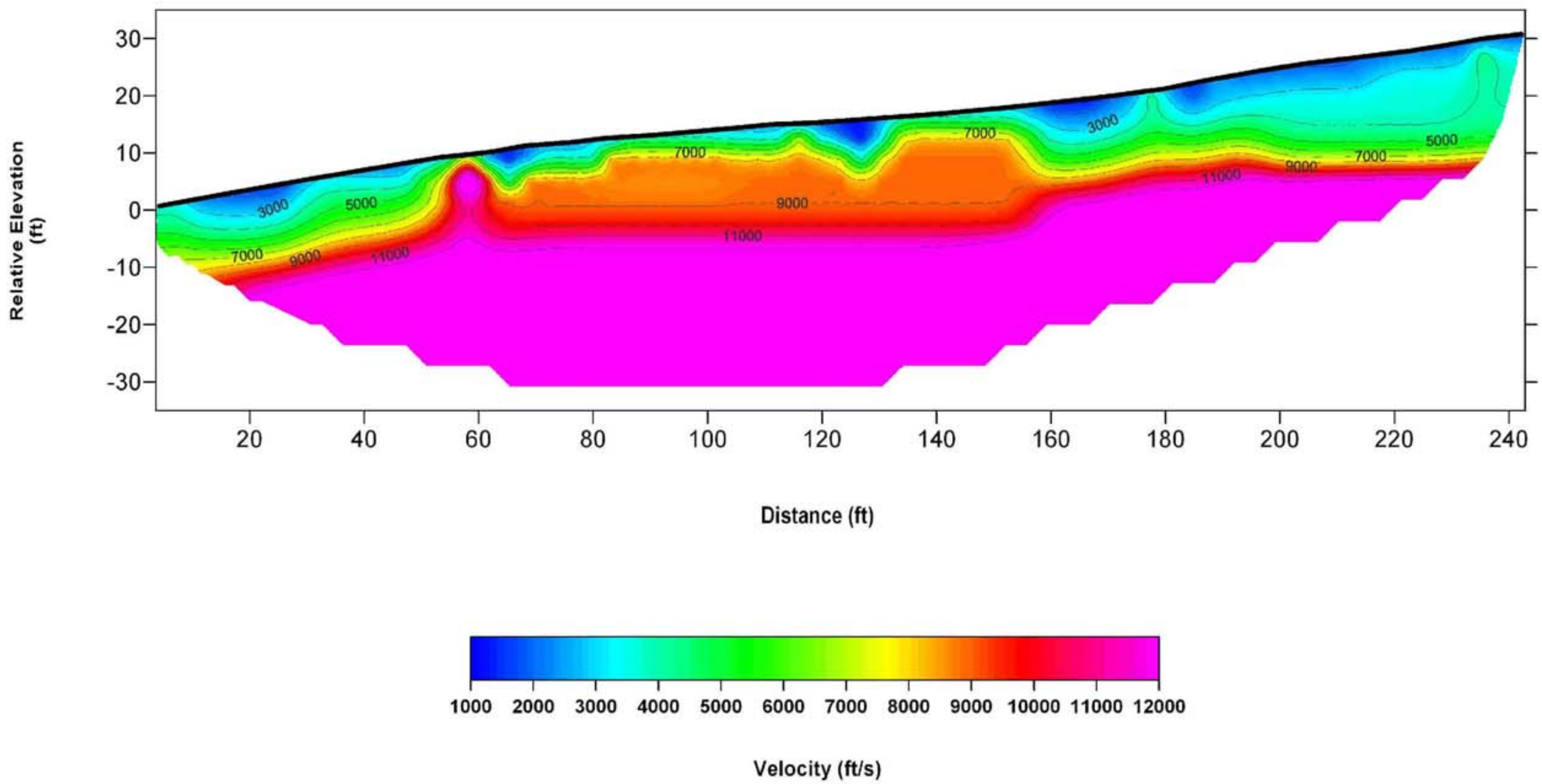
TOMOGRAPHY MODEL



SEISMIC PROFILE SL-22	Safari Highlands Ranch Escondido, California Project No.: 114200 / Date: 06/14	SOUTHWEST GEOPHYSICS INC. Figure 4v

Note: Contour Interval = 1,000 feet per second

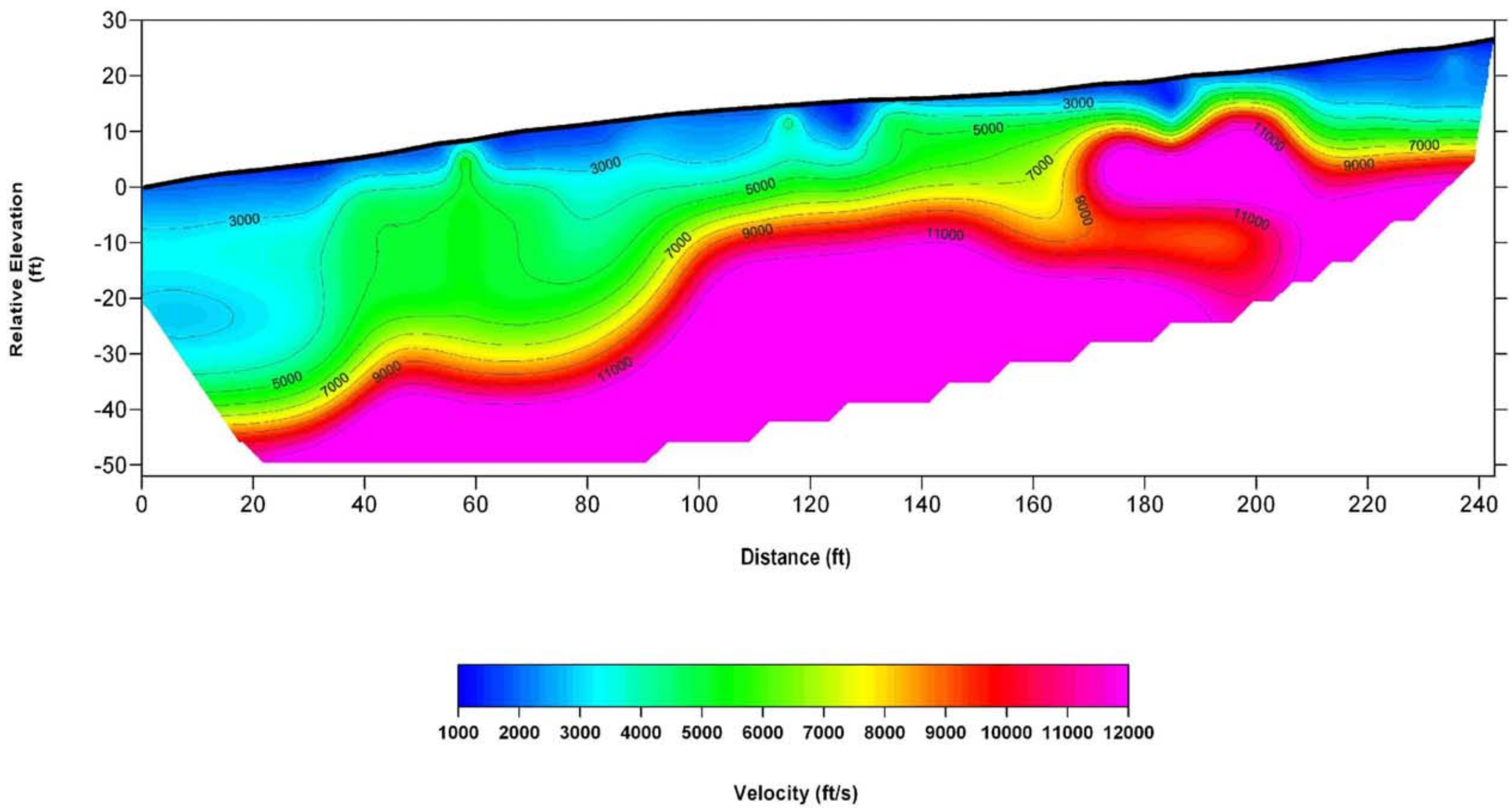
TOMOGRAPHY MODEL



SEISMIC PROFILE SL-23	Safari Highlands Ranch Escondido, California Project No.: 114200 / Date: 06/14	SOUTHWEST GEOPHYSICS INC. Figure 4w

Note: Contour Interval = 1,000 feet per second

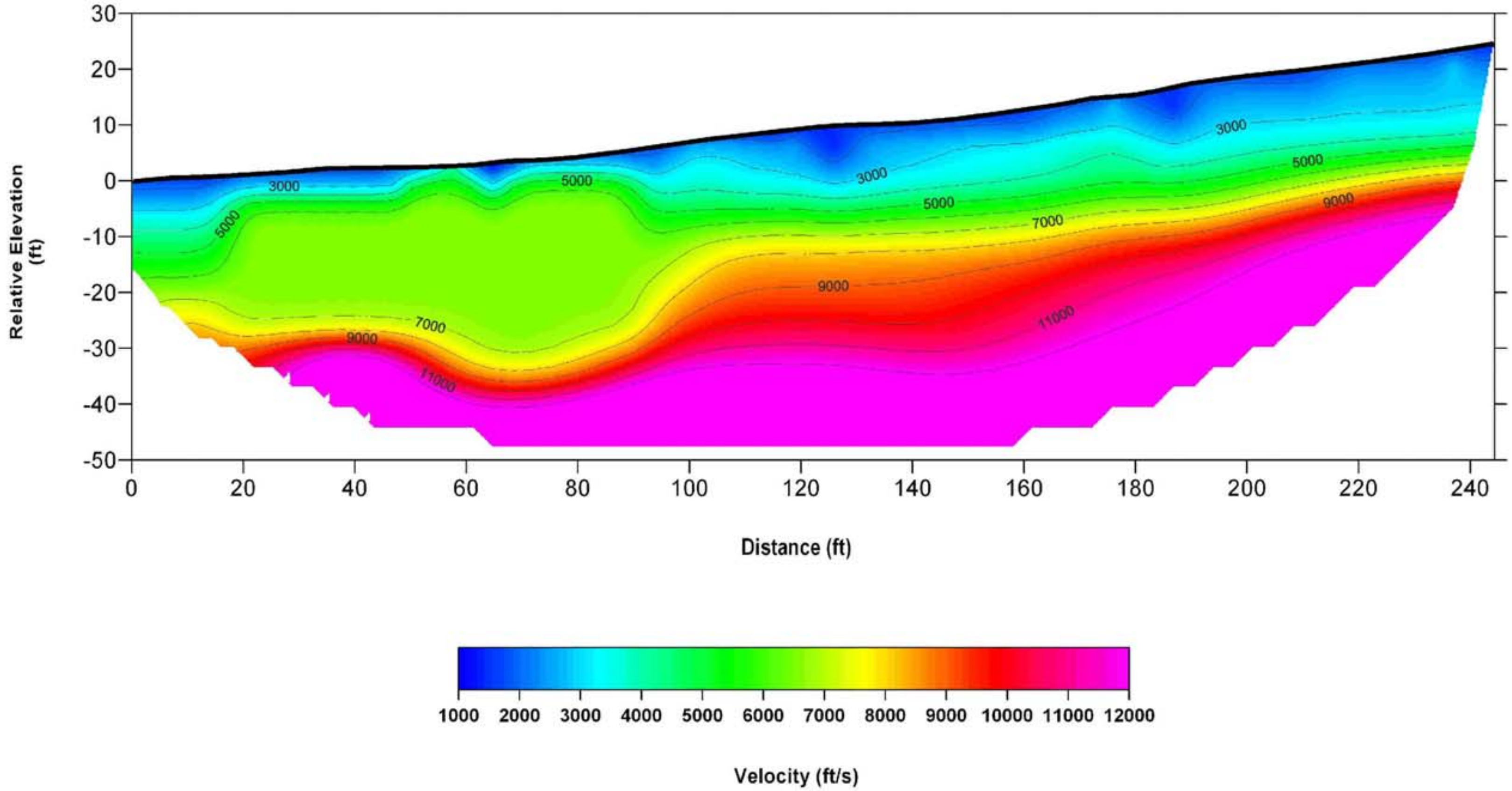
TOMOGRAPHY MODEL



SEISMIC PROFILE SL-24	Safari Highlands Ranch Escondido, California Project No.: 114200 — Date: 06/14	SOUTHWEST GEOPHYSICS INC. Figure 4x

Note: Contour Interval = 1,000 feet per second

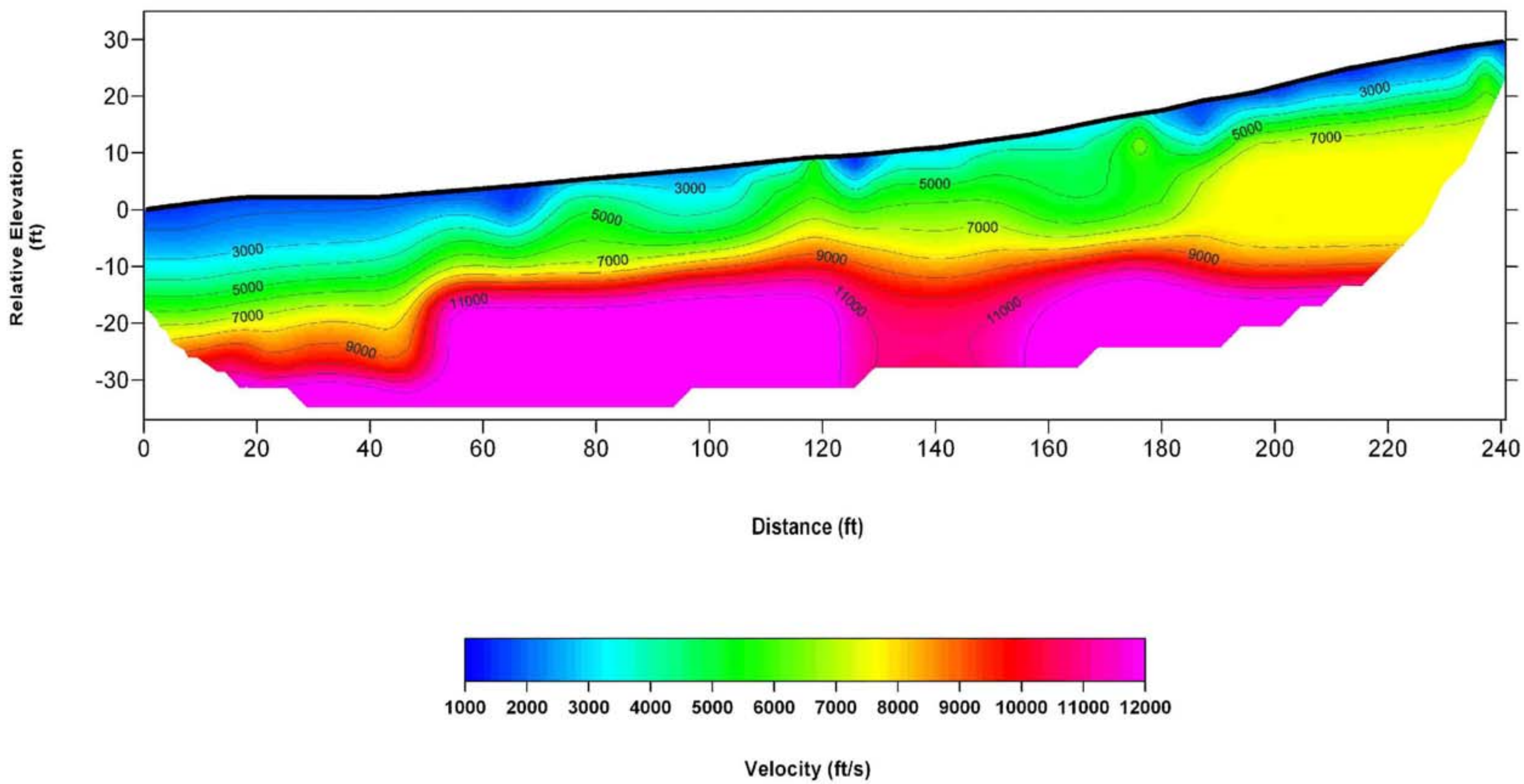
TOMOGRAPHY MODEL



SEISMIC PROFILE SL-25	Safari Highlands Ranch Escondido, California Project No.: 114200 Date: 06/14	SOUTHWEST GEOPHYSICS INC. Figure 4y

Note: Contour Interval = 1,000 feet per second

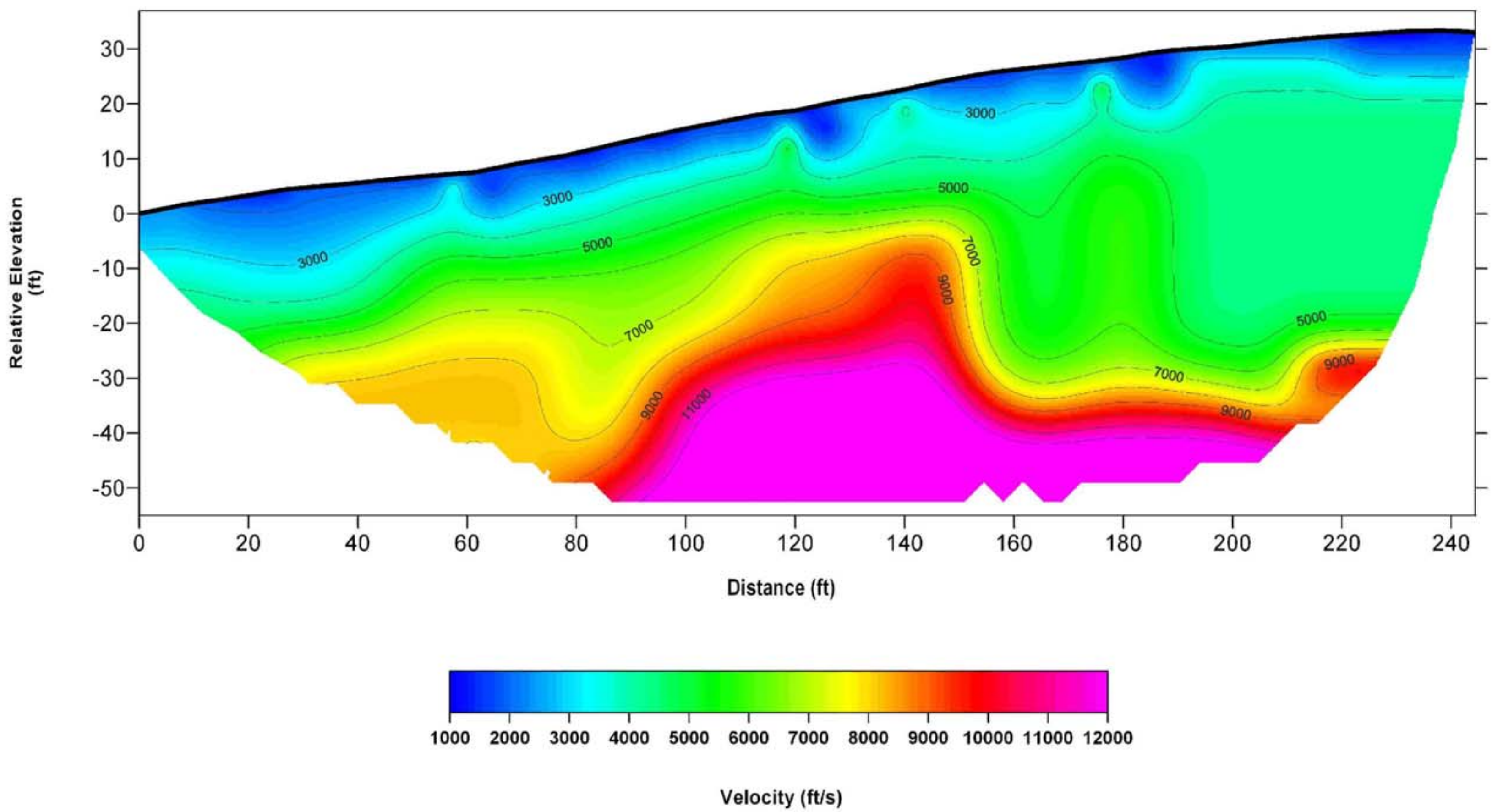
TOMOGRAPHY MODEL



SEISMIC PROFILE SL-26	Safari Highlands Ranch Escondido, California Project No.: 114200 — Date: 06/14	SOUTHWEST GEOPHYSICS INC. Figure 4z

Note: Contour Interval = 1,000 feet per second

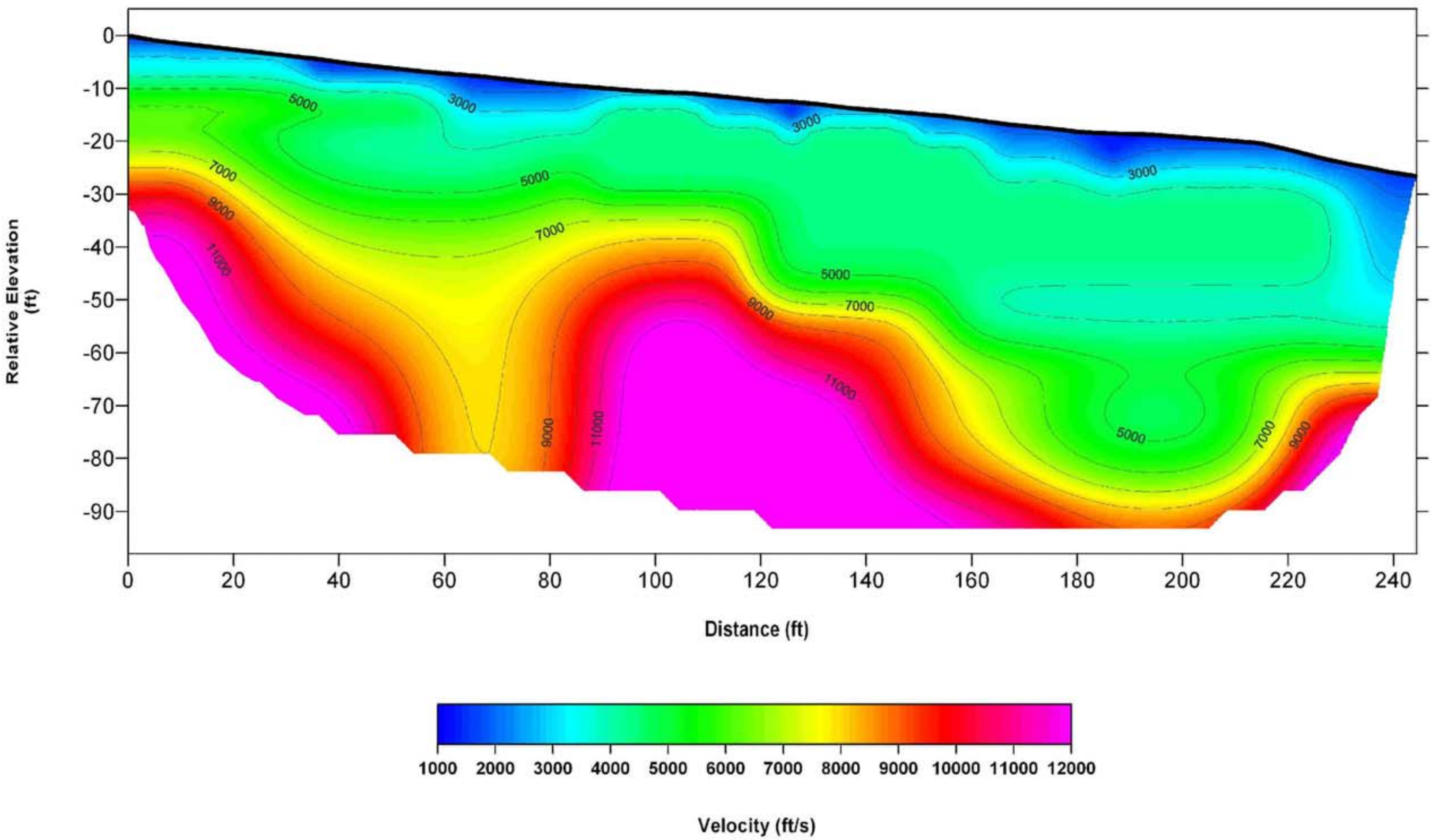
TOMOGRAPHY MODEL



SEISMIC PROFILE SL-27	Safari Highlands Ranch Escondido, California		SOUTHWEST GEOPHYSICS INC. Figure 4aa
	Project No.: 114200	Date: 06/14	

Note: Contour Interval = 1,000 feet per second

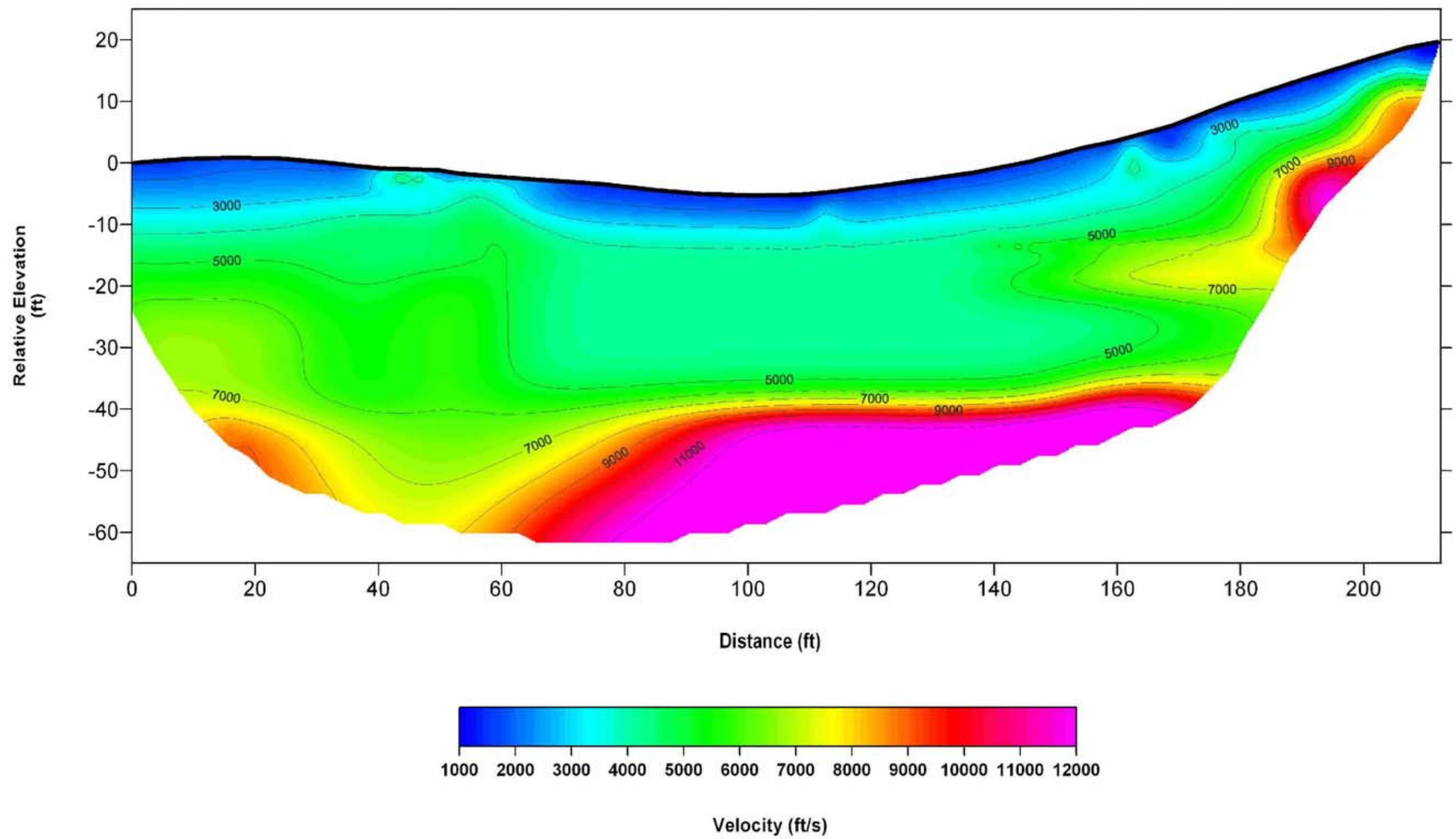
TOMOGRAPHY MODEL



SEISMIC PROFILE SL-28	Safari Highlands Ranch Escondido, California Project No.: 114200 / Date: 06/14	SOUTHWEST GEOPHYSICS INC. Figure 4bb

Note: Contour Interval = 1,000 feet per second

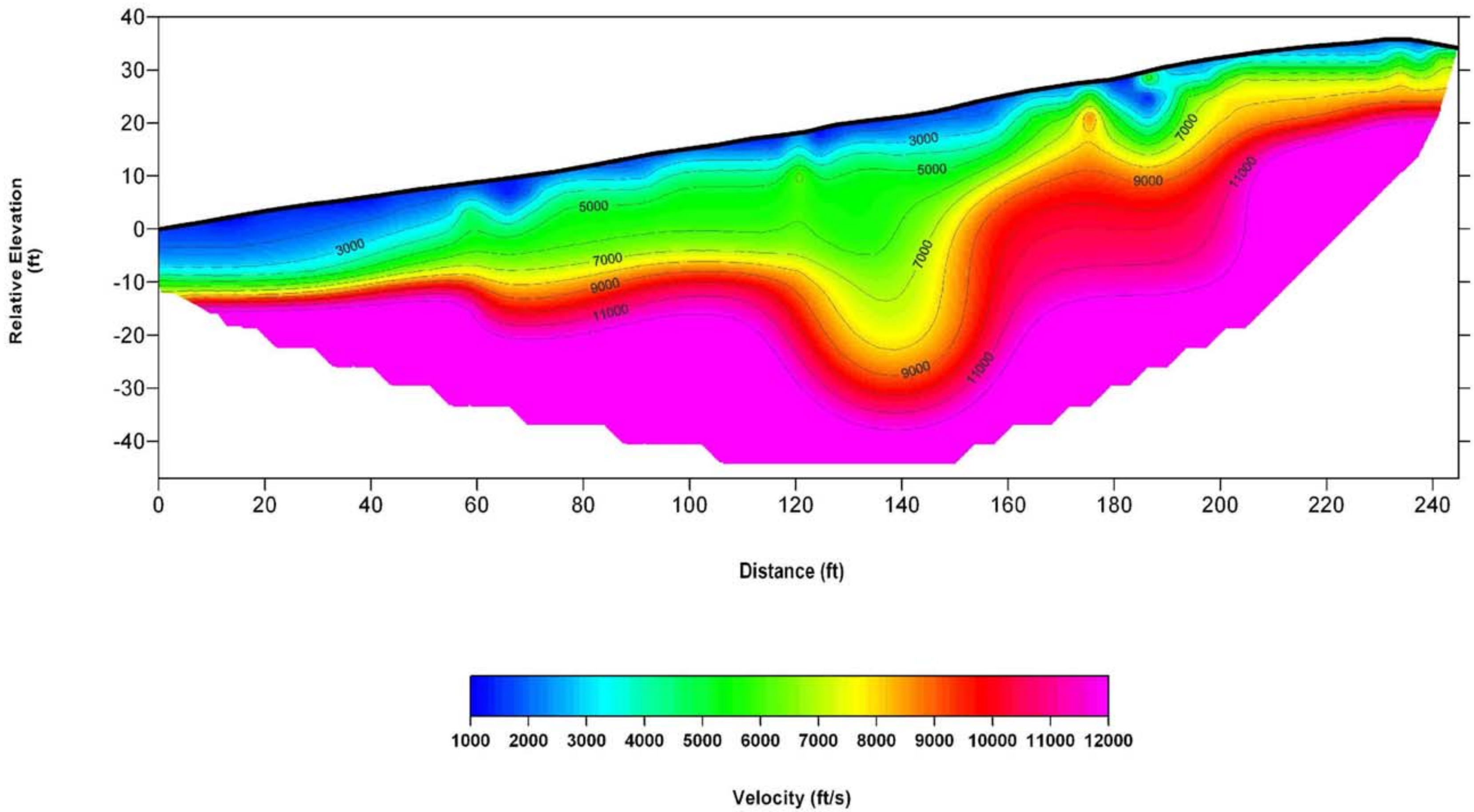
TOMOGRAPHY MODEL



SEISMIC PROFILE SL-29	Safari Highlands Ranch Escondido, California Project No.: 114200 / Date: 06/14	SOUTHWEST GEOPHYSICS INC. Figure 4cc

Note: Contour Interval = 1,000 feet per second

TOMOGRAPHY MODEL



SEISMIC PROFILE SL-30	Safari Highlands Ranch Escondido, California Project No.: 114200 — Date: 06/14	SOUTHWEST GEOPHYSICS INC. Figure 4dd	**Note: Contour Interval = 1,000 feet per second**

APPENDIX B

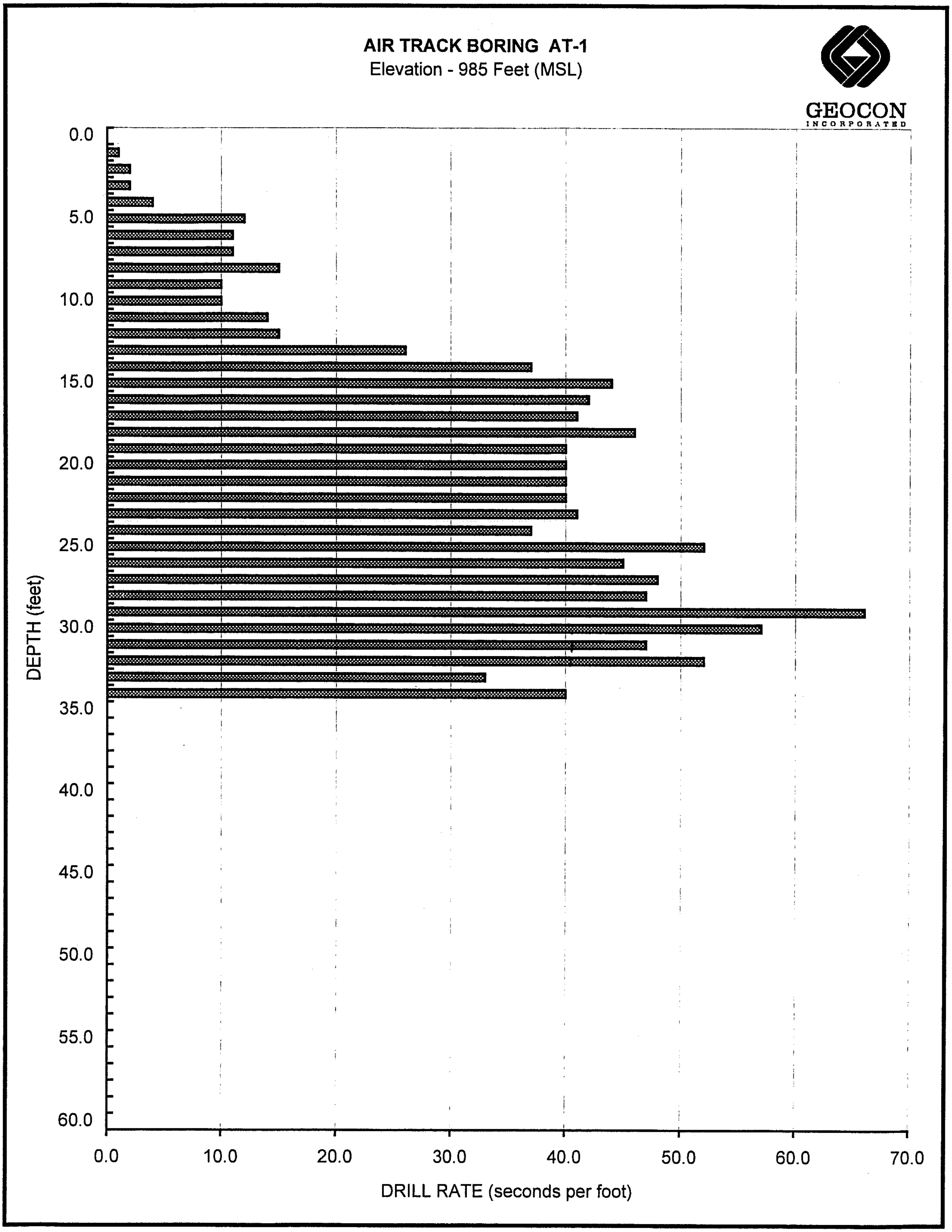
APPENDIX B

PREVIOUS FIELD WORK BY GEOCON INCORPORATED

Sixteen hydraulic rotary percussion (air-track) borings were advanced using an Ingersol Rand 490 drill with a 4-inch bit to depths up to 58 feet during a preliminary study by Geocon Incorporated in 2001 to evaluate rock rippability and thickness of surficial deposits. The penetration rates were recorded every foot in seconds using a stop watch as the drill bit was advanced. The air-track boring logs are presented herein. The information presented in Appendix B was originally provided in the referenced report dated December 17, 2001.

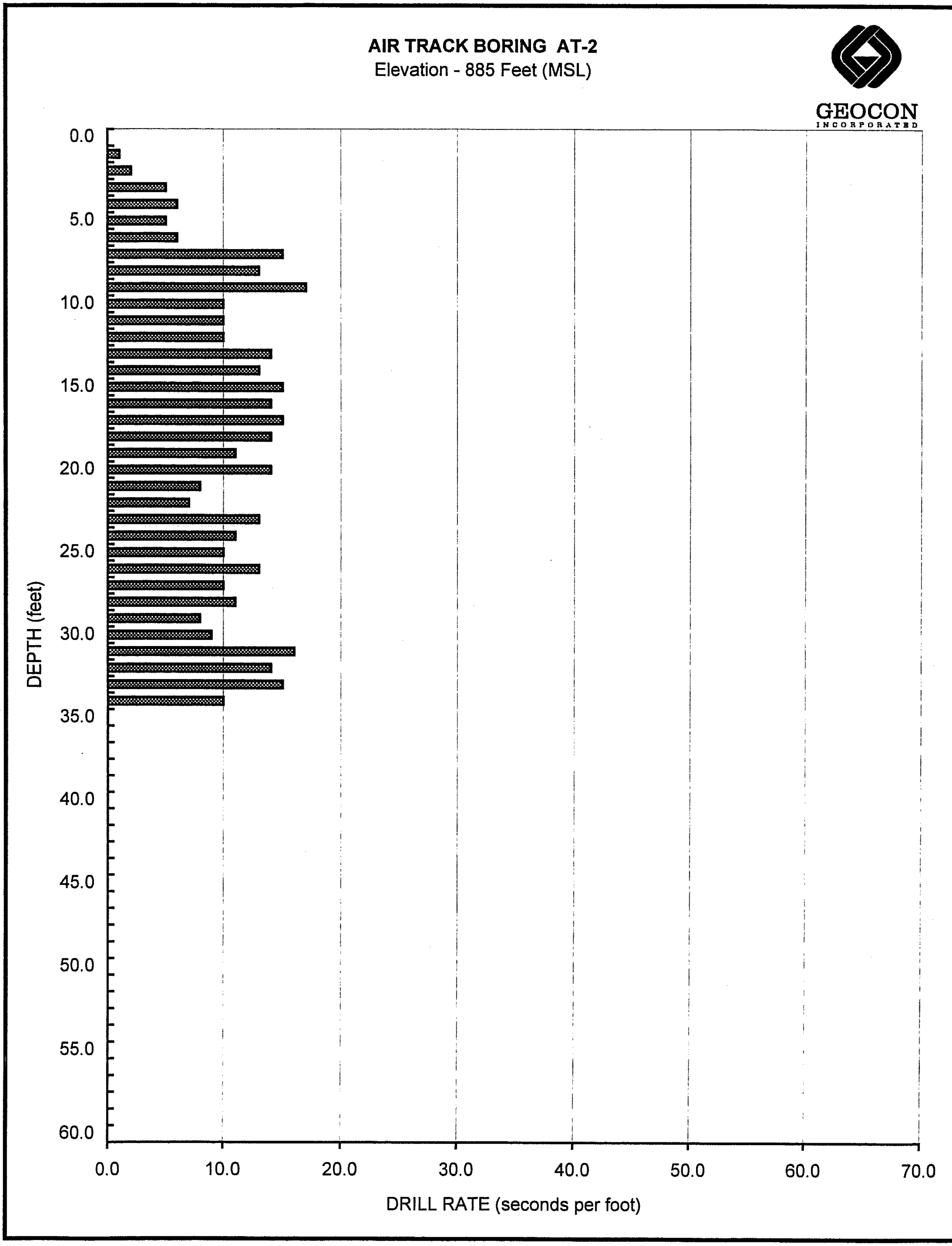
That same study also included excavating 10 backhoe trenches at the approximate locations shown on Figures 2 and 3. The trenches were excavated using a John Deere 450 track-mounted backhoe with a 2-foot-wide bucket to depths ranging from 3 feet to 12 feet below existing grade. Soil encountered in the trenches was visually examined, classified and logged in general conformance with the ASTM Practice for Description and Identification of Soils (Visual-Manual Procedure D2844). Logs of the exploratory trenches are presented following the air track boring logs. The logs depict the various soil types encountered.

VALLEY VIEW


AIR TRACK BORING AT-1
Elevation - 985 Feet (MSL)
GEOCON
INCORPORATED
DEPTH (feet)
0.0
5.0
10.0
15.0
20.0
25.0
30.0
35.0
40.0
45.0
50.0
55.0
60.0
0.0
10.0
20.0
30.0
40.0
50.0
60.0
70.0
DRILL RATE (seconds per foot)

PROJECT NO. 20084-12-01

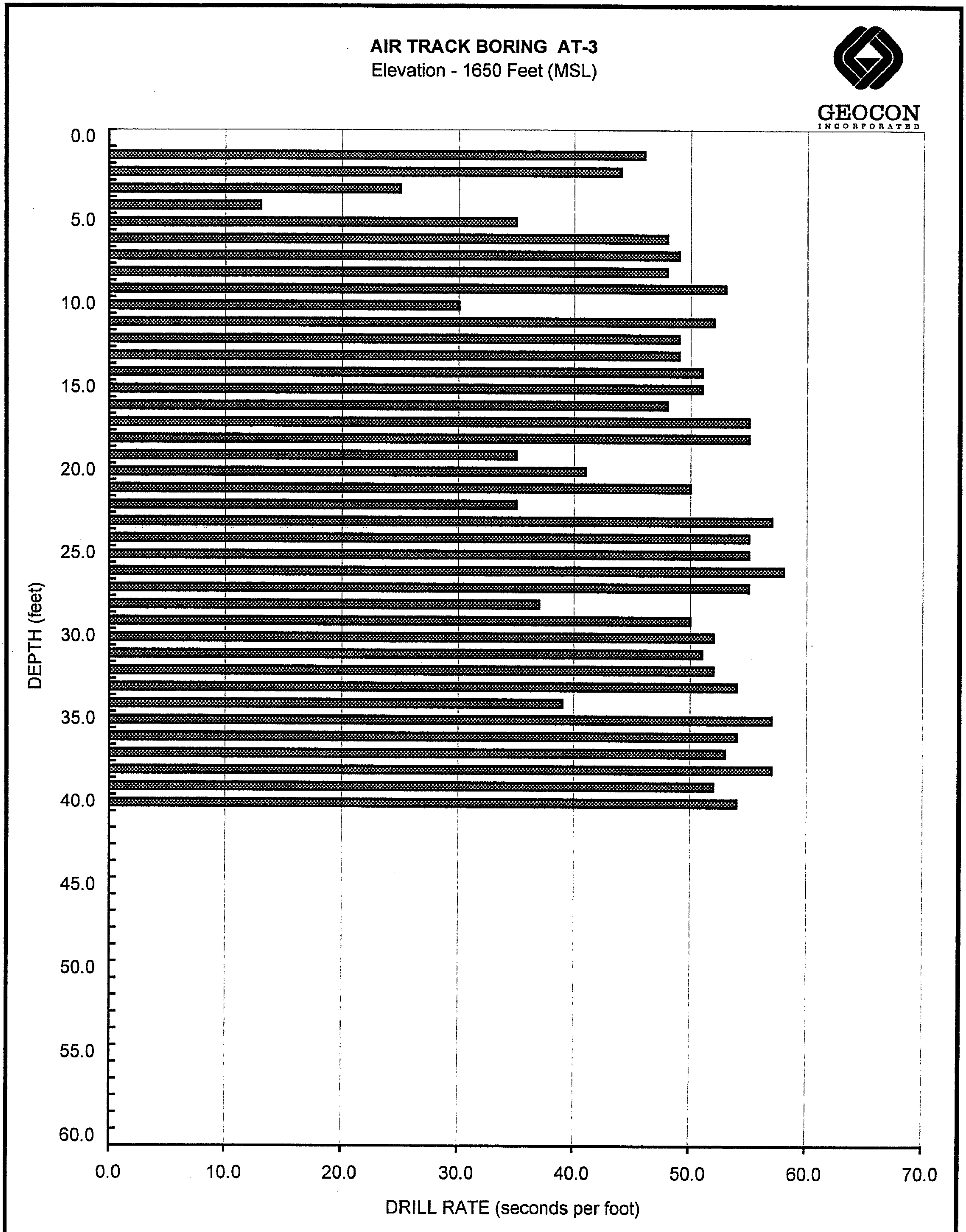
VALLEY VIEW



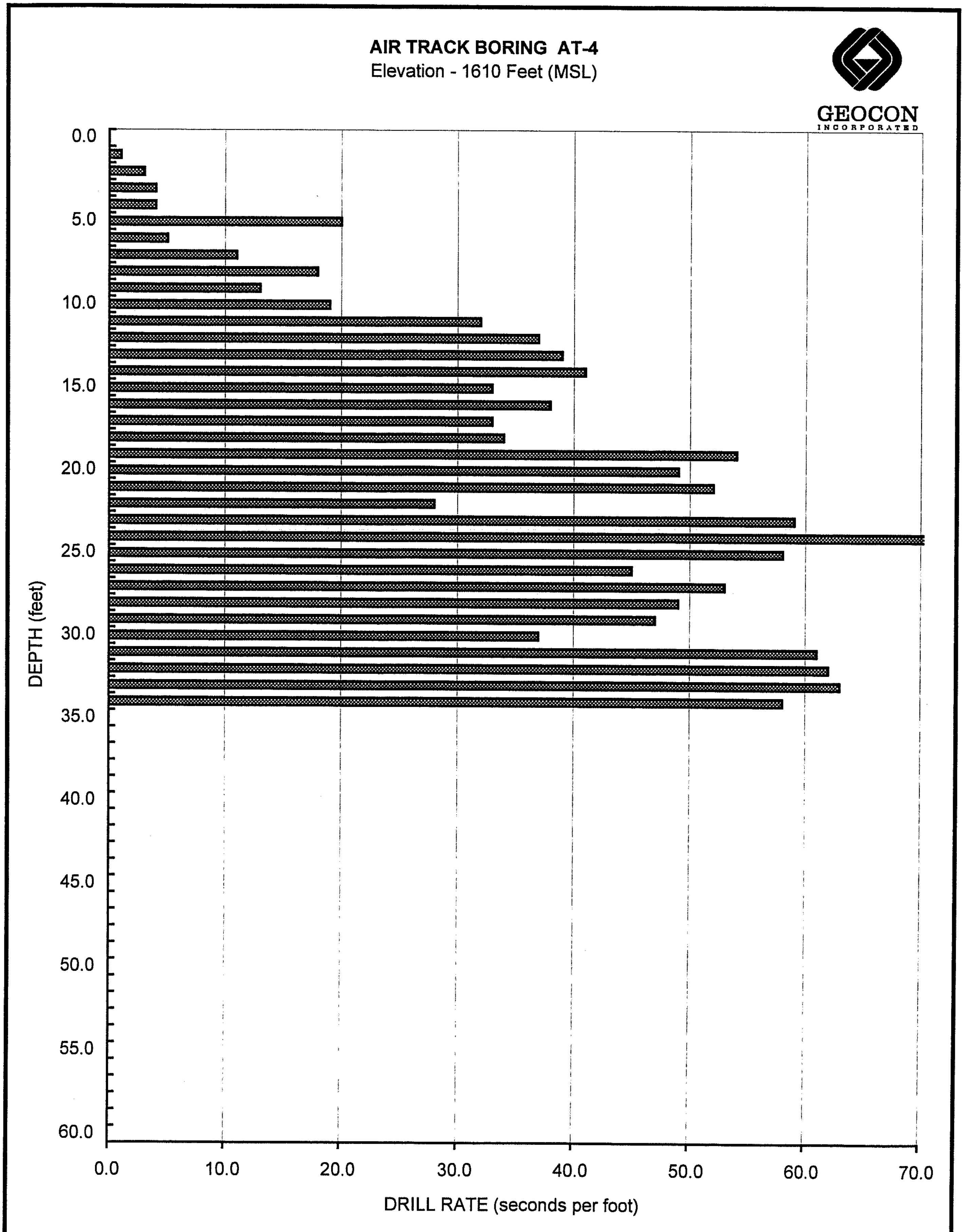
AT002.xls

FIGURE A-2

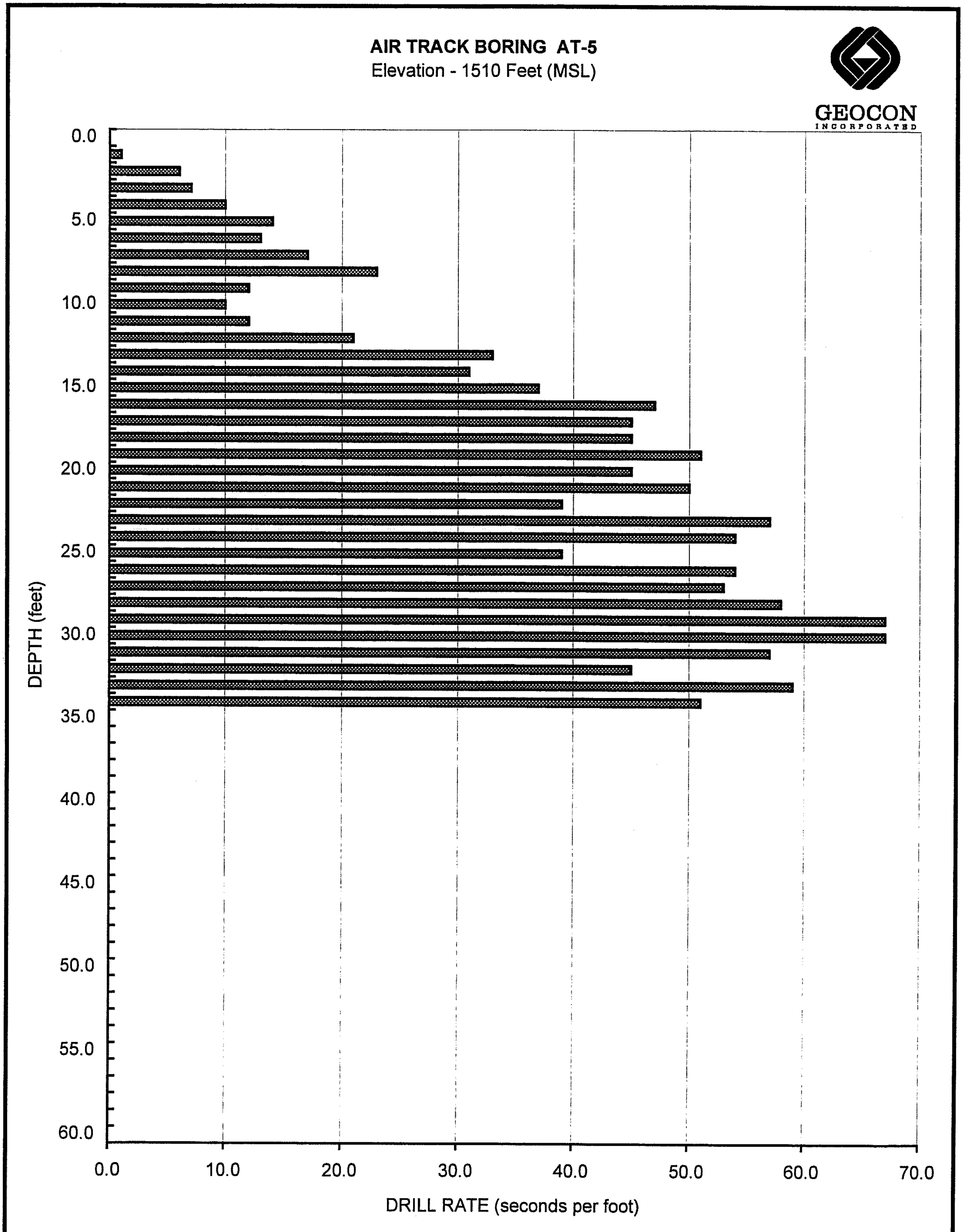
VALLEY VIEW


AIR TRACK BORING AT-3
Elevation - 1650 Feet (MSL)
GEOCON
INCORPORATED
DEPTH (feet)
0.0
5.0
10.0
15.0
20.0
25.0
30.0
35.0
40.0
45.0
50.0
55.0
60.0
0.0
10.0
20.0
30.0
40.0
50.0
60.0
70.0
DRILL RATE (seconds per foot)

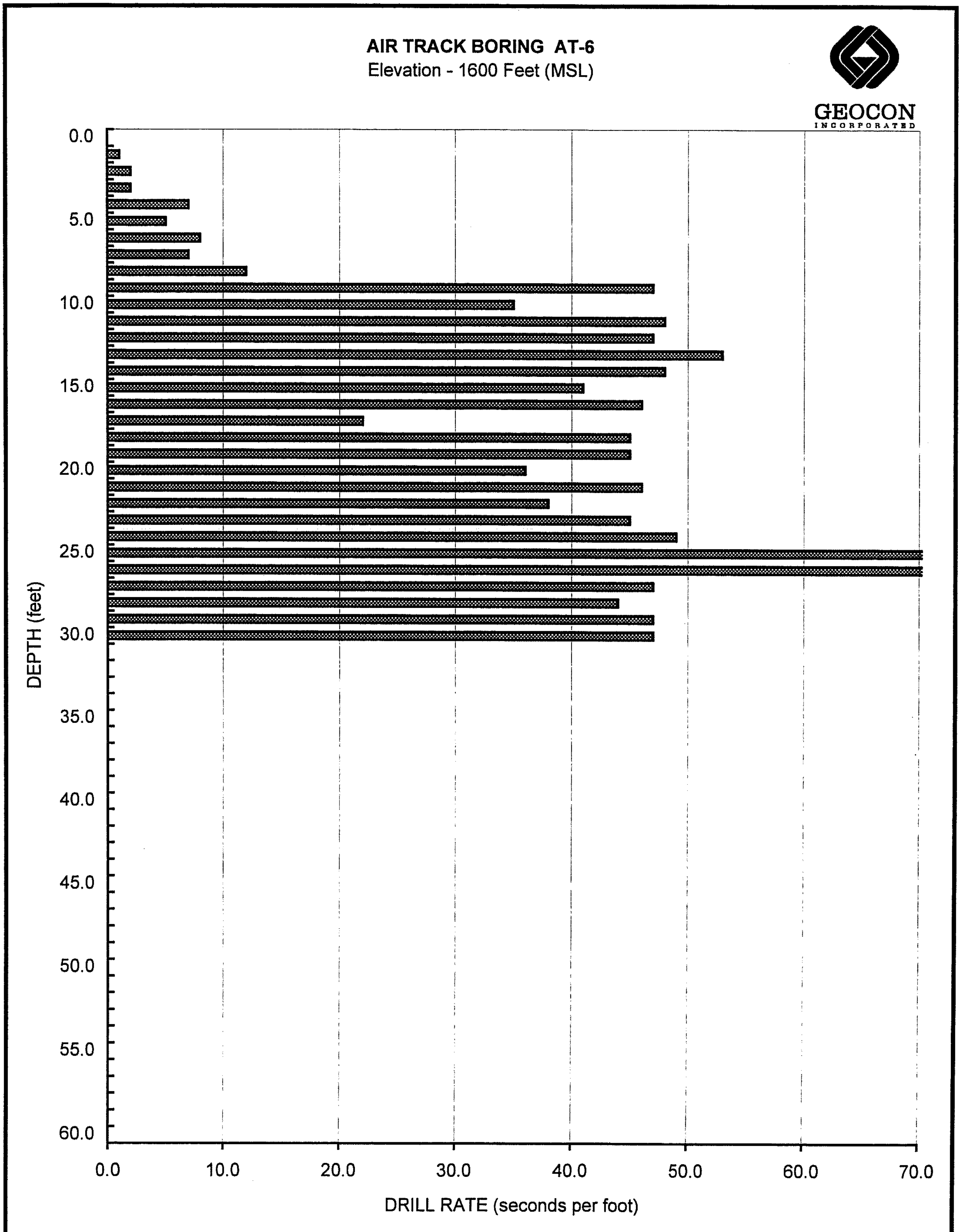
VALLEY VIEW


AIR TRACK BORING AT-4
Elevation - 1610 Feet (MSL)
GEOCON
INCORPORATED
DEPTH (feet)
0.0
5.0
10.0
15.0
20.0
25.0
30.0
35.0
40.0
45.0
50.0
55.0
60.0
0.0
10.0
20.0
30.0
40.0
50.0
60.0
70.0
DRILL RATE (seconds per foot)

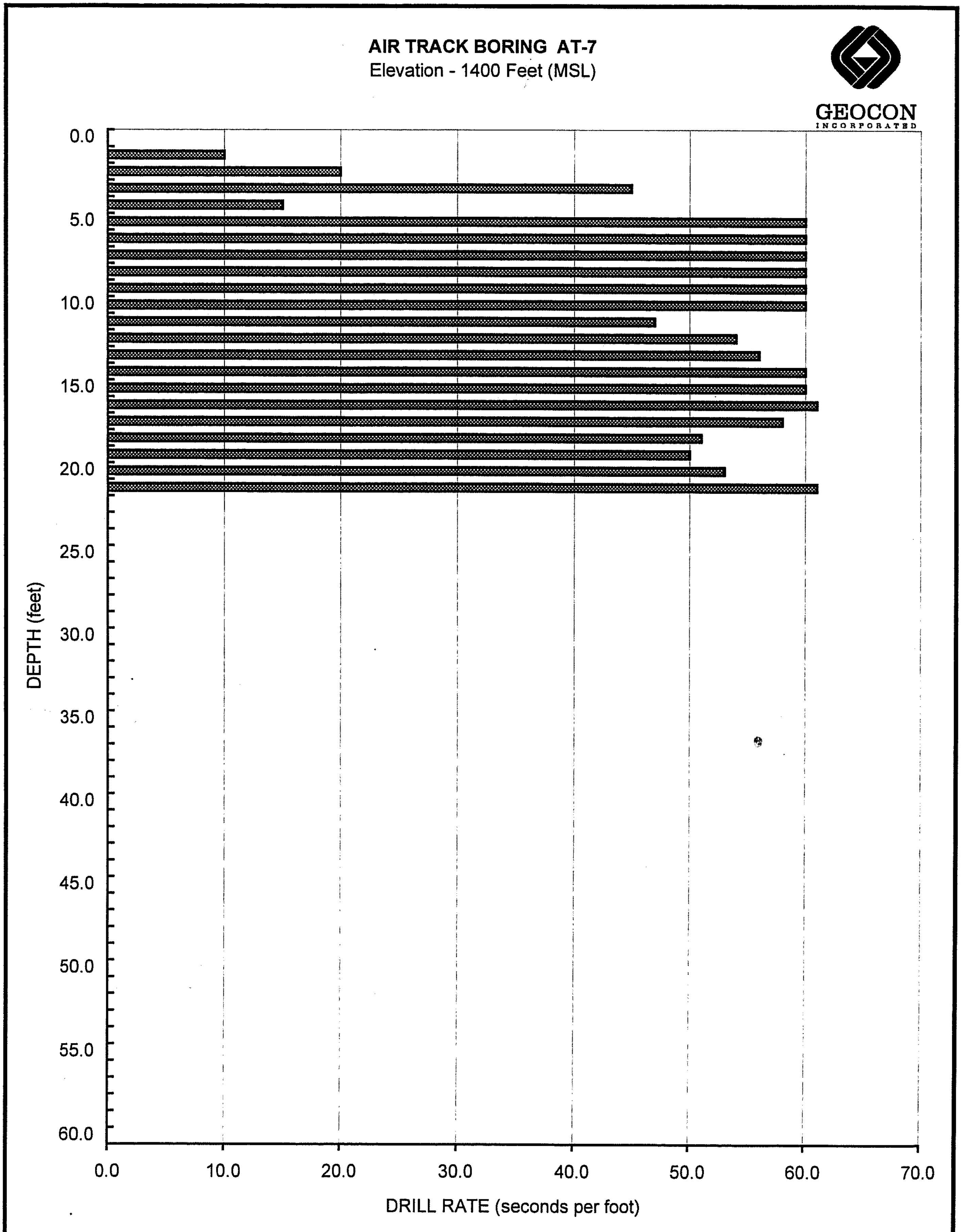
VALLEY VIEW


AIR TRACK BORING AT-5
Elevation - 1510 Feet (MSL)
GEOCON
INCORPORATED
DEPTH (feet)
0.0
5.0
10.0
15.0
20.0
25.0
30.0
35.0
40.0
45.0
50.0
55.0
60.0
0.0
10.0
20.0
30.0
40.0
50.0
60.0
70.0
DRILL RATE (seconds per foot)

VALLEY VIEW


AIR TRACK BORING AT-6
Elevation - 1600 Feet (MSL)
GEOCON
INCORPORATED
DEPTH (feet)
0.0
5.0
10.0
15.0
20.0
25.0
30.0
35.0
40.0
45.0
50.0
55.0
60.0
0.0
10.0
20.0
30.0
40.0
50.0
60.0
70.0
DRILL RATE (seconds per foot)

VALLEY VIEW


AIR TRACK BORING AT-7
Elevation - 1400 Feet (MSL)
GEOCON
INCORPORATED
DEPTH (feet)
0.0
5.0
10.0
15.0
20.0
25.0
30.0
35.0
40.0
45.0
50.0
55.0
60.0
0.0
10.0
20.0
30.0
40.0
50.0
60.0
70.0
DRILL RATE (seconds per foot)

VALLEY VIEW

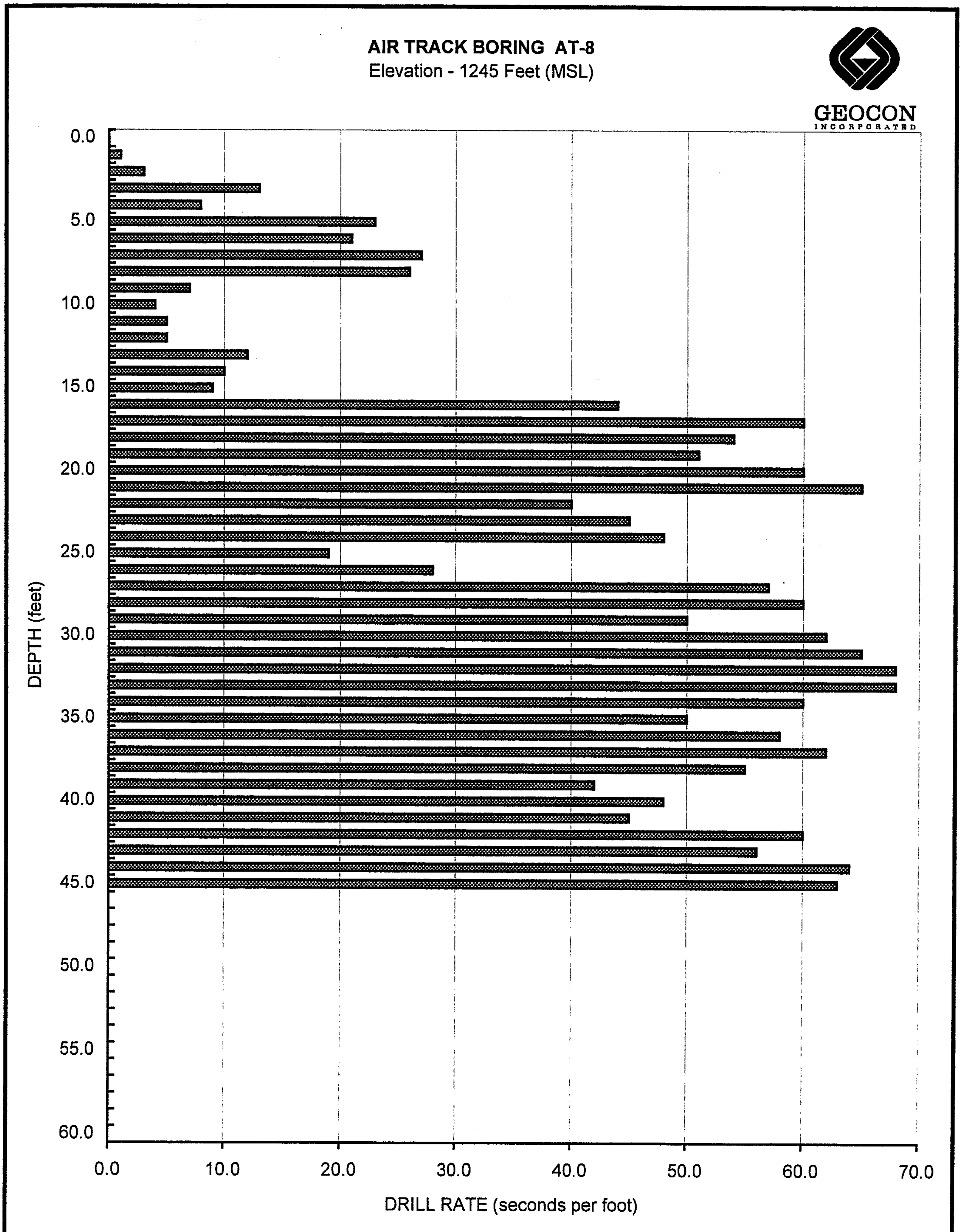
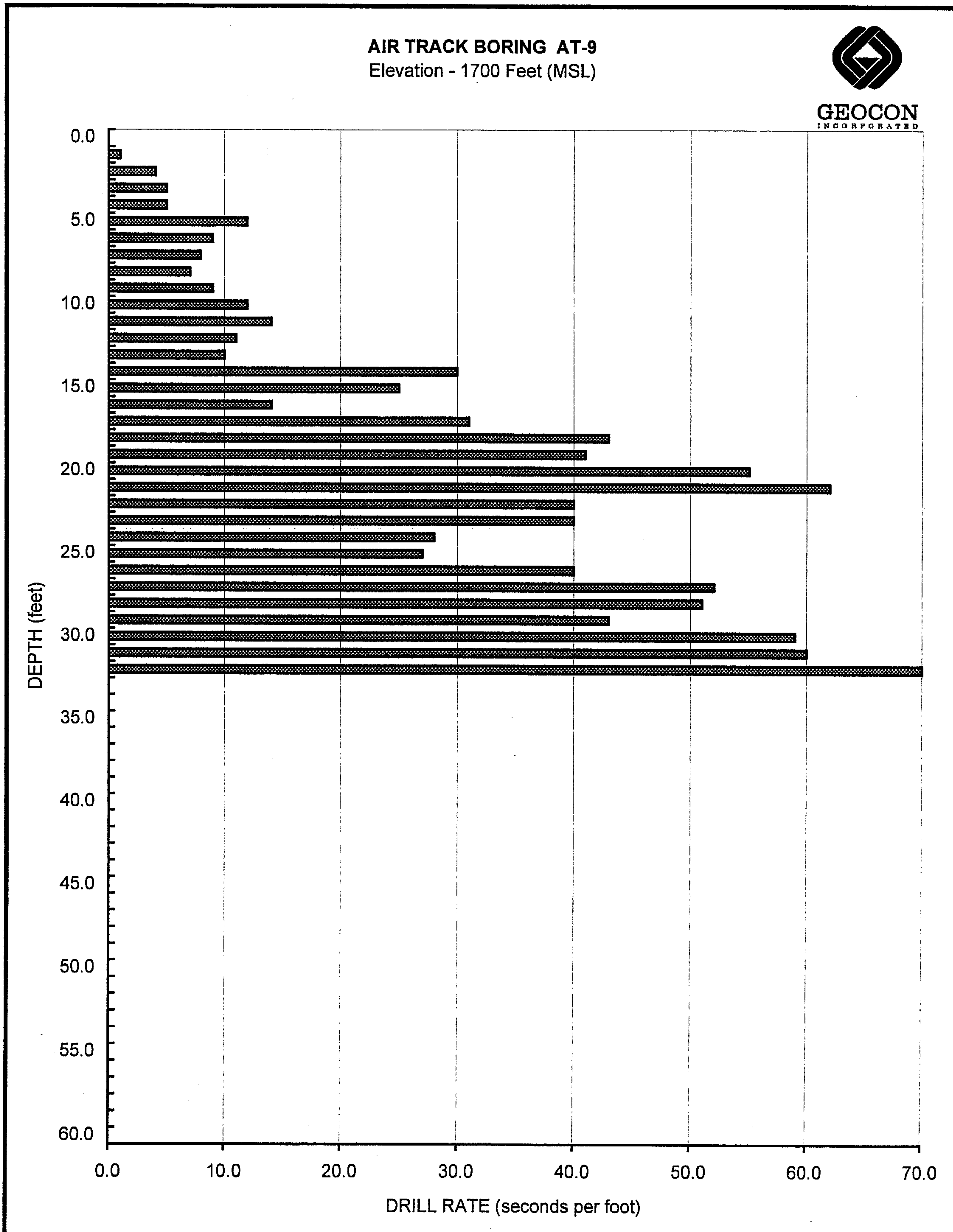
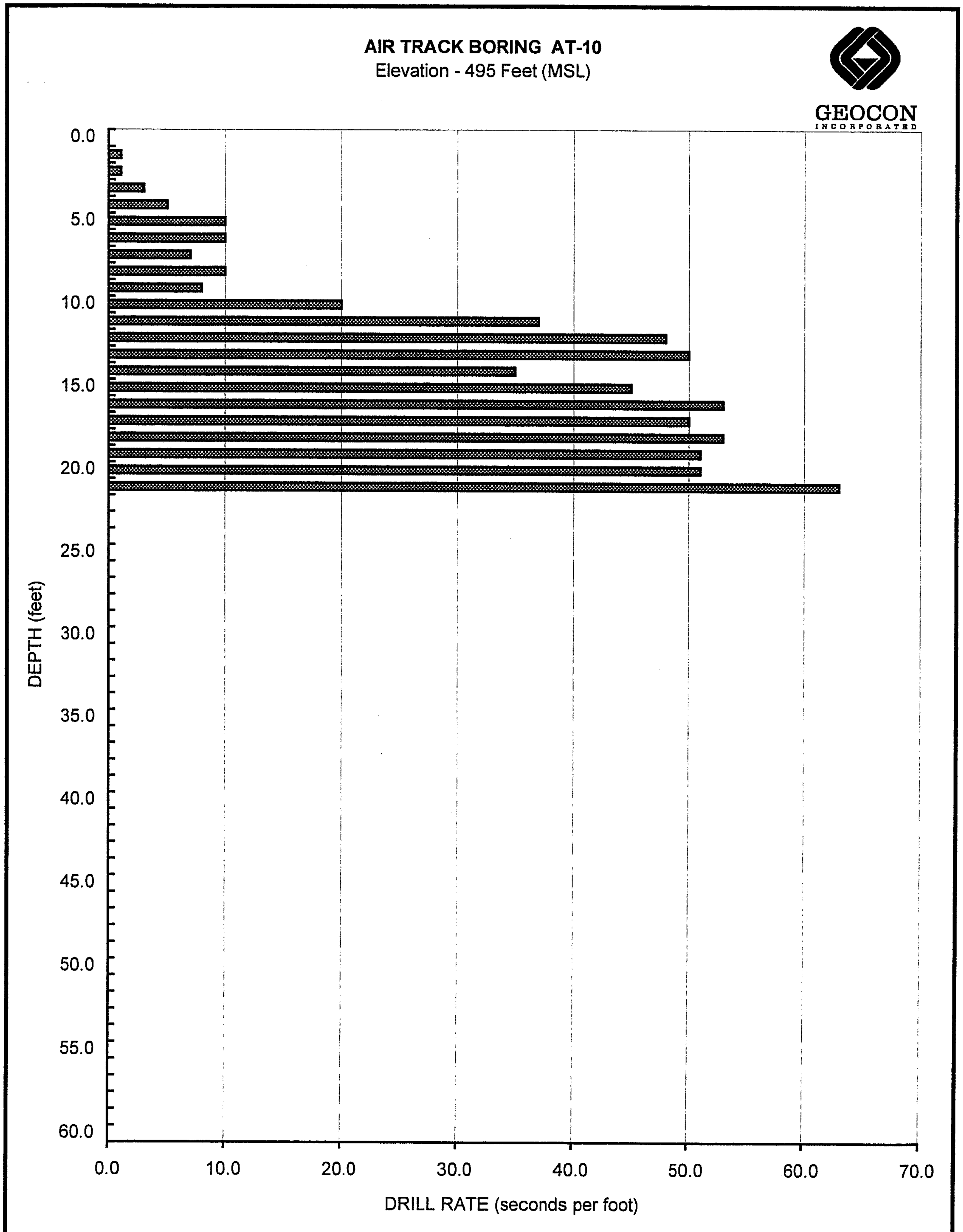


FIGURE A-8

VALLEY VIEW


AIR TRACK BORING AT-9
Elevation - 1700 Feet (MSL)
GEOCON
INCORPORATED
DEPTH (feet)
0.0
5.0
10.0
15.0
20.0
25.0
30.0
35.0
40.0
45.0
50.0
55.0
60.0
0.0
10.0
20.0
30.0
40.0
50.0
60.0
70.0
DRILL RATE (seconds per foot)

VALLEY VIEW


AIR TRACK BORING AT-10
Elevation - 495 Feet (MSL)
GEOCON
INCORPORATED
DEPTH (feet)
0.0
5.0
10.0
15.0
20.0
25.0
30.0
35.0
40.0
45.0
50.0
55.0
60.0
0.0
10.0
20.0
30.0
40.0
50.0
60.0
70.0
DRILL RATE (seconds per foot)

PROJECT NO. 20084-12-01

VALLEY VIEW

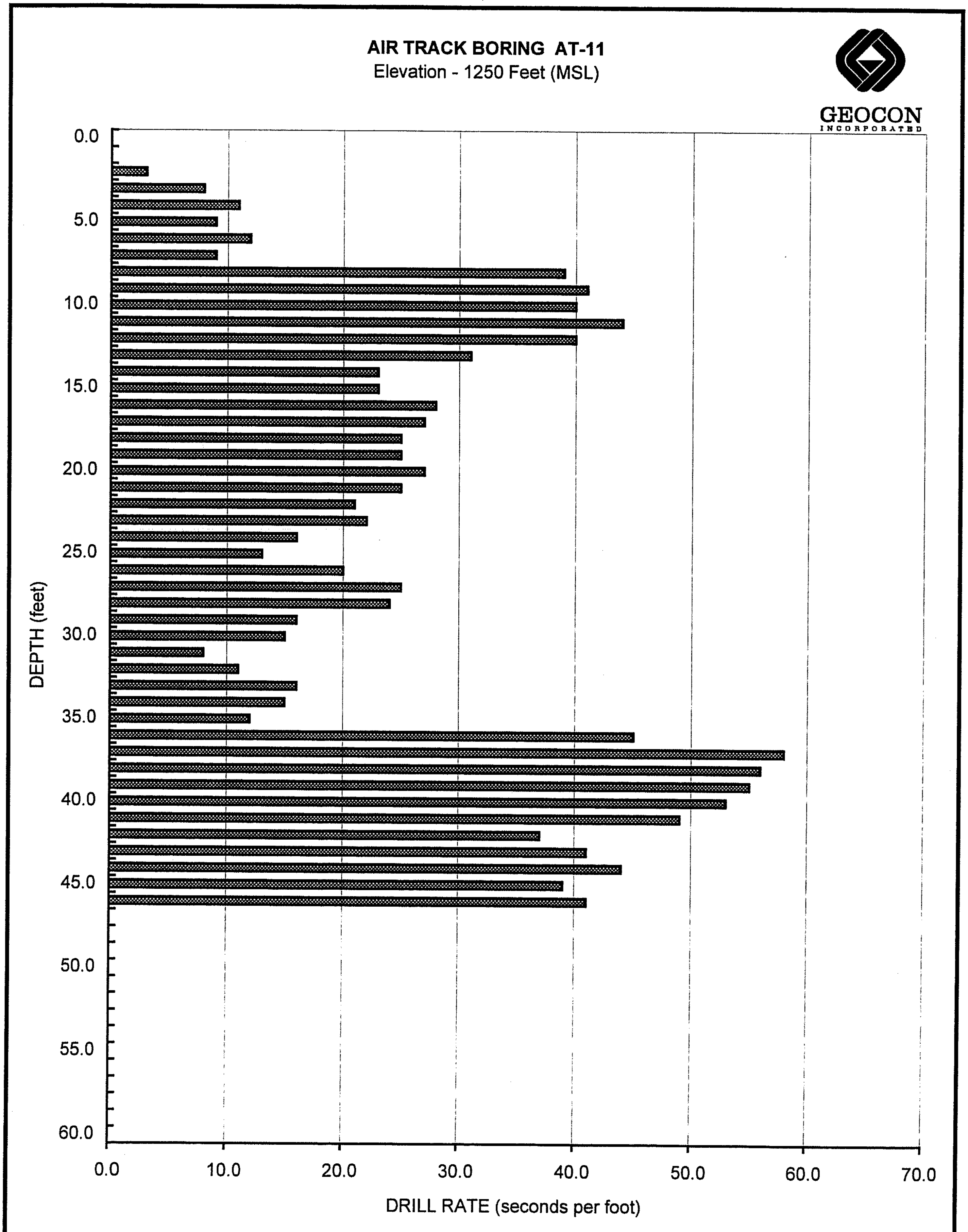


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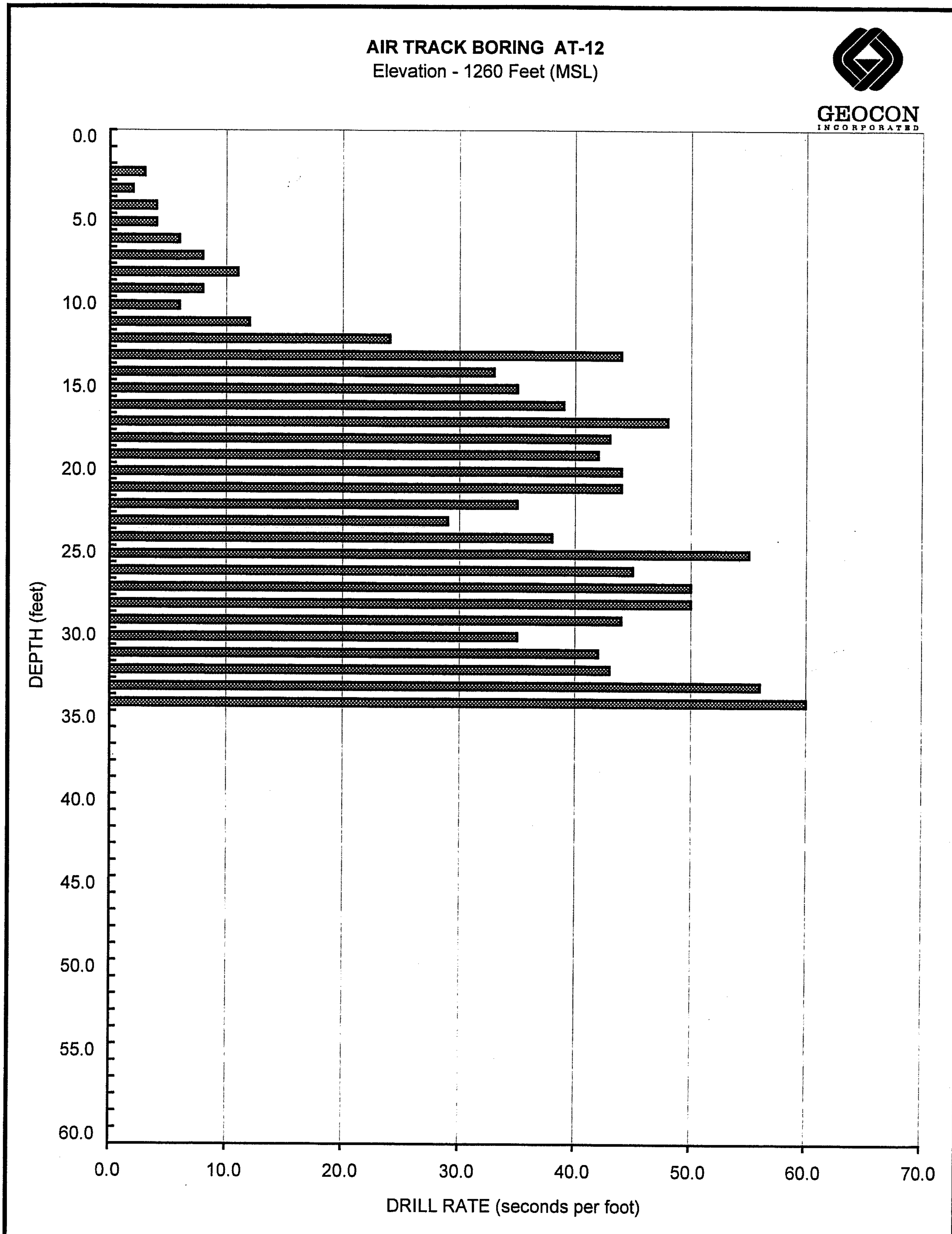
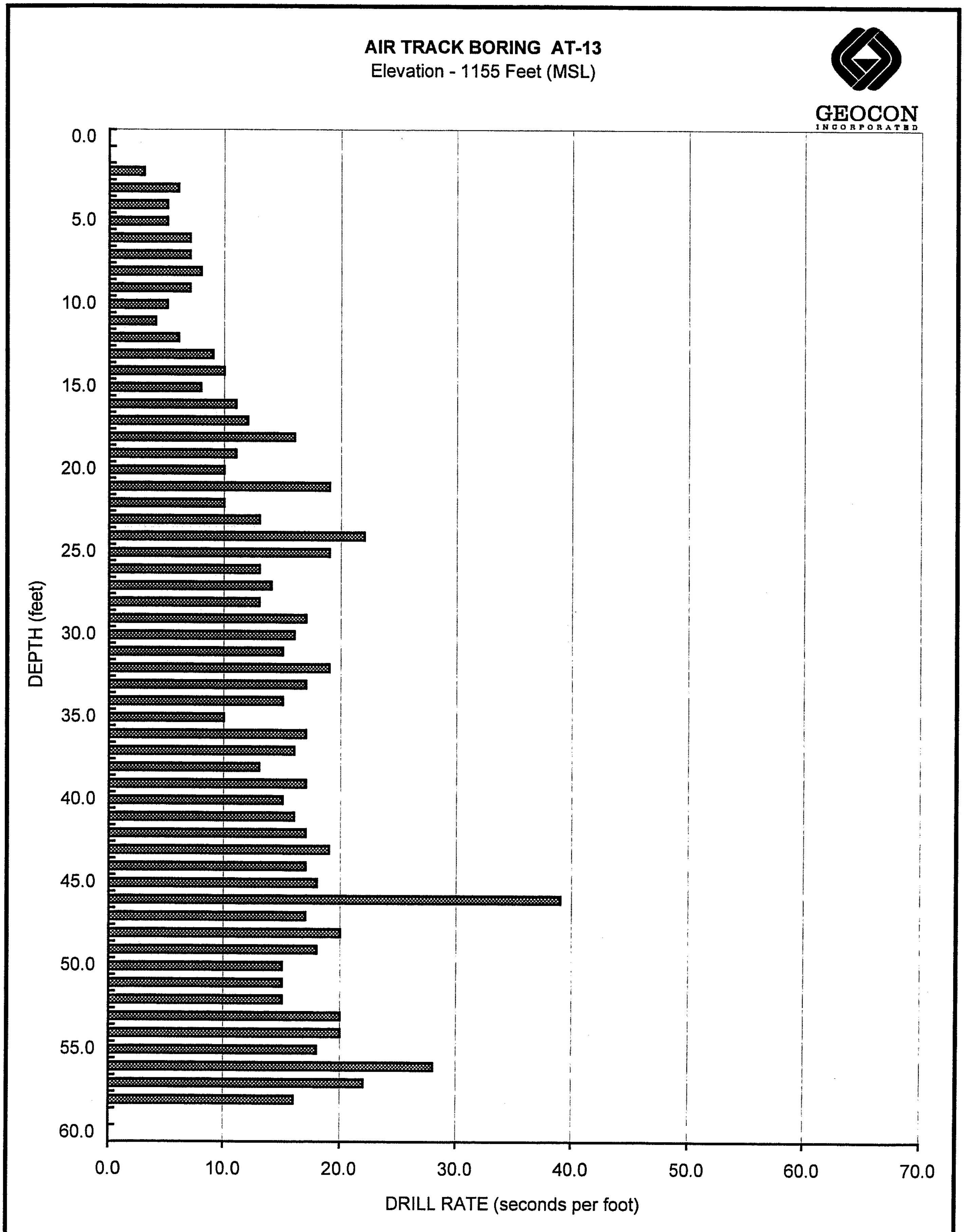
FIGURE A-11

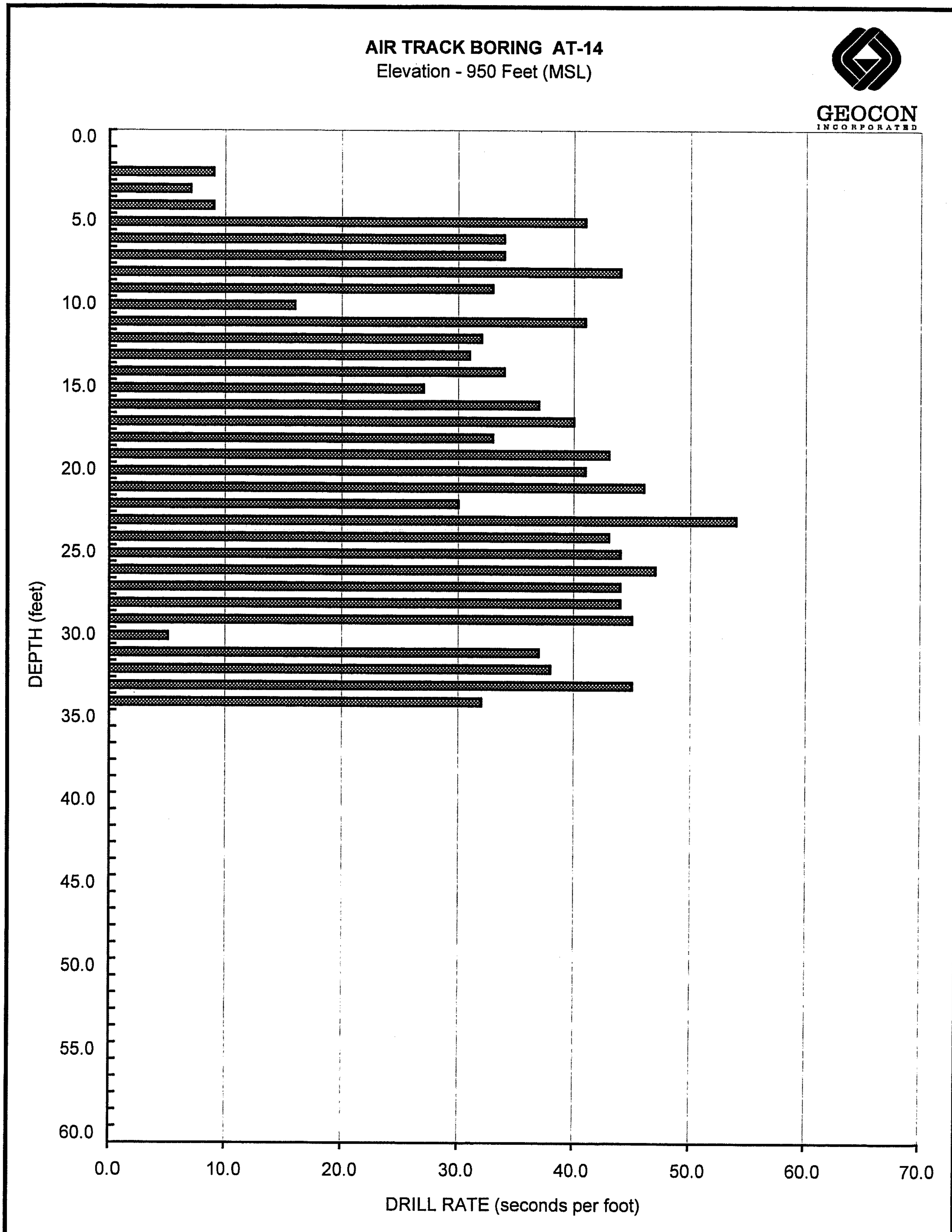
VALLEY VIEW


AIR TRACK BORING AT-12
Elevation - 1260 Feet (MSL)
GEOCON INCORPORATED
DEPTH (feet)
0.0
5.0
10.0
15.0
20.0
25.0
30.0
35.0
40.0
45.0
50.0
55.0
60.0
0.0
10.0
20.0
30.0
40.0
50.0
60.0
70.0
DRILL RATE (seconds per foot)

VALLEY VIEW


AIR TRACK BORING AT-13
Elevation - 1155 Feet (MSL)
GEOCON
INCORPORATED
DEPTH (feet)
0.0
5.0
10.0
15.0
20.0
25.0
30.0
35.0
40.0
45.0
50.0
55.0
60.0
0.0
10.0
20.0
30.0
40.0
50.0
60.0
70.0
DRILL RATE (seconds per foot)

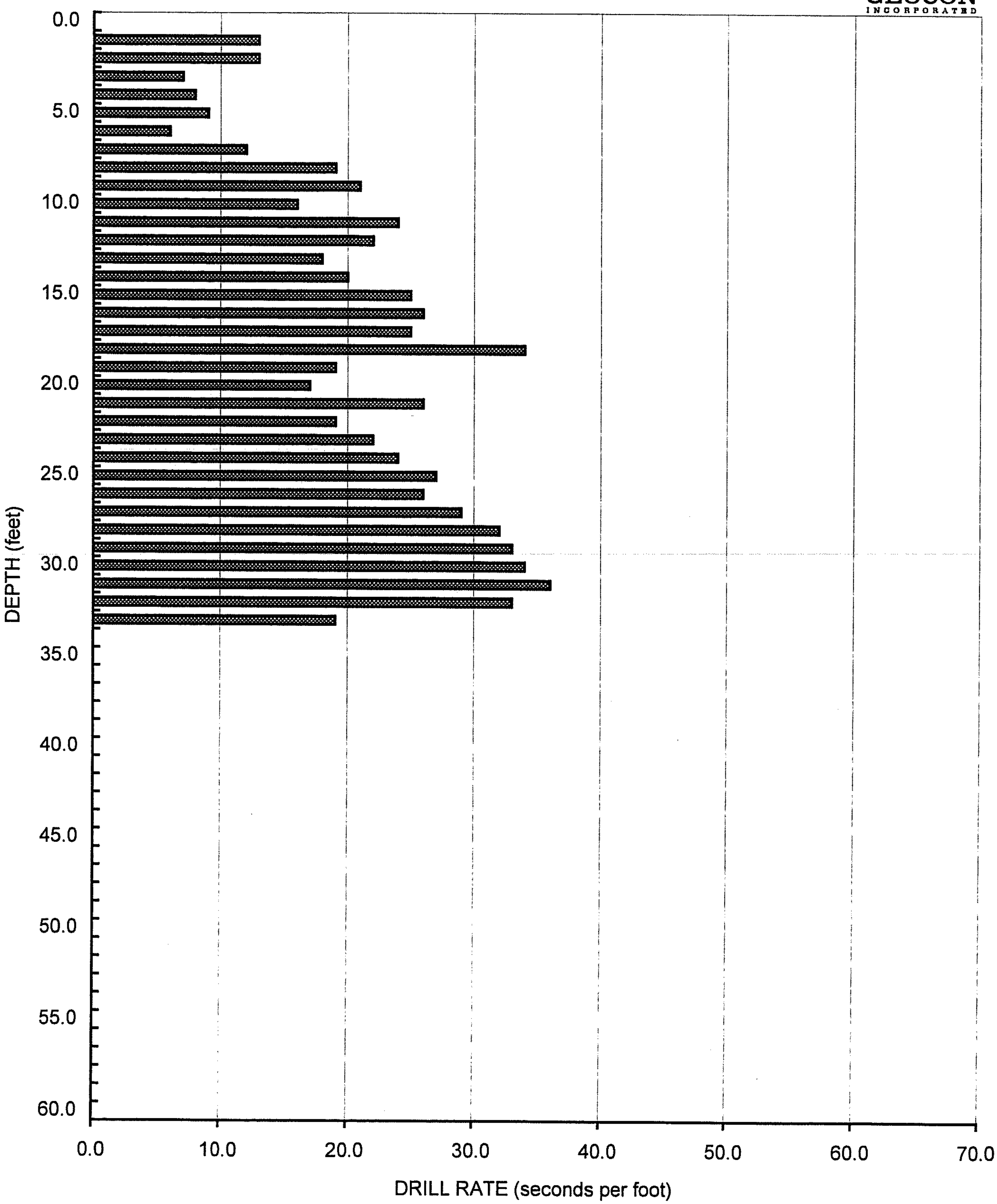
VALLEY VIEW


AIR TRACK BORING AT-14
Elevation - 950 Feet (MSL)
GEOCON
INCORPORATED
DEPTH (feet)
0.0
5.0
10.0
15.0
20.0
25.0
30.0
35.0
40.0
45.0
50.0
55.0
60.0
0.0
10.0
20.0
30.0
40.0
50.0
60.0
70.0
DRILL RATE (seconds per foot)

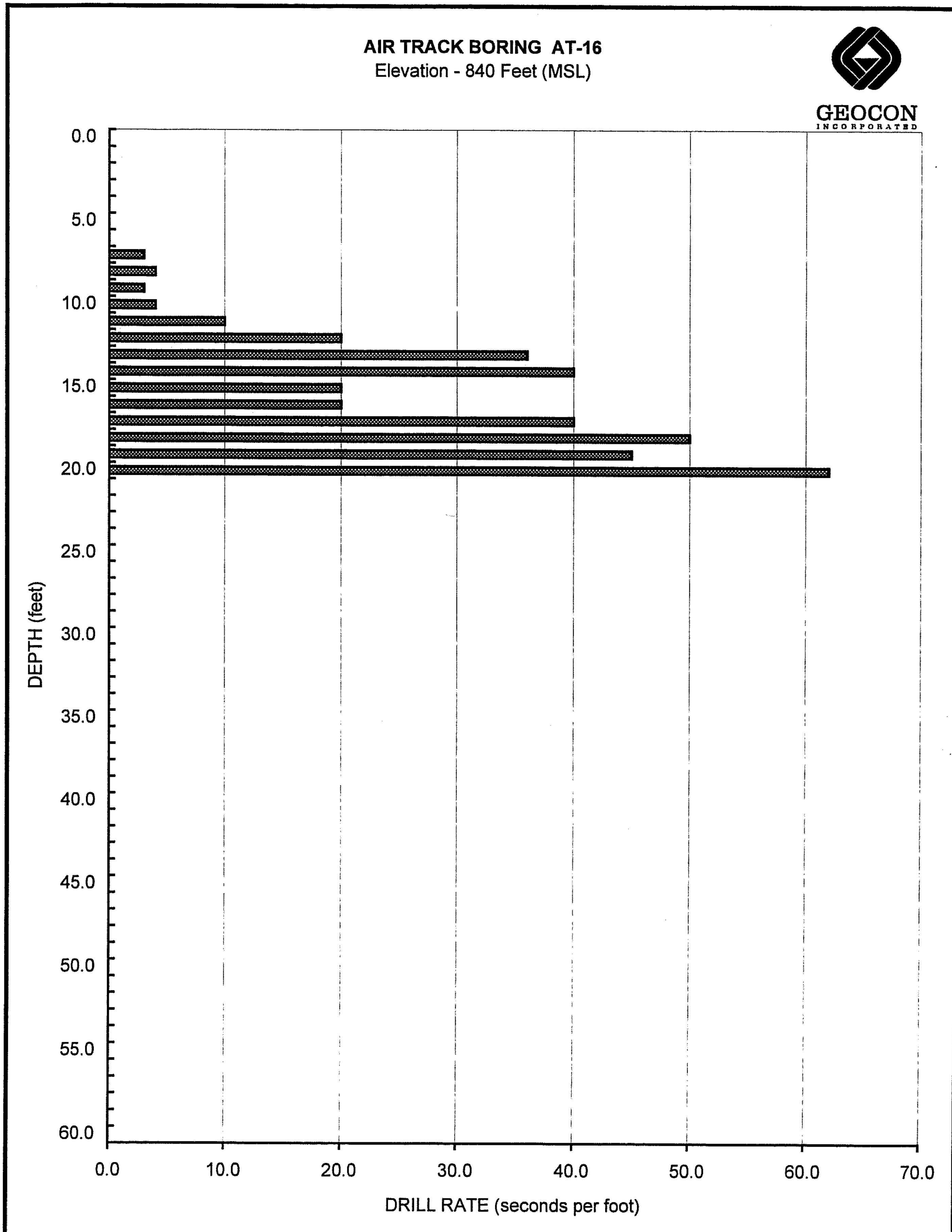
VALLEY VIEW

AIR TRACK BORING AT-15
Elevation - 940 Feet (MSL)

GEOCON INCORPORATED



VALLEY VIEW


AIR TRACK BORING AT-16
Elevation - 840 Feet (MSL)
GEOCON INCORPORATED
DEPTH (feet)
0.0
5.0
10.0
15.0
20.0
25.0
30.0
35.0
40.0
45.0
50.0
55.0
60.0
0.0
10.0
20.0
30.0
40.0
50.0
60.0
70.0
DRILL RATE (seconds per foot)

PROJECT NO. 20084-12-02

TRENCH T 1

ELEV. (MSL.) 1608 DATE COMPLETED 9/13/01

EQUIPMENT JD 450 W/24" BUCKET

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**TOPSOIL** Loose, dry, brown, fine to medium Silty SAND			
2	T1-1				**GRANITIC ROCK** Highly weathered, weak, light tannish yellow GRANITE -Becomes slightly weathered, moderately strong at 3 feet -Digging is difficult			
4								
6								
8					TRENCH REFUSAL AT 8 FEET			

Figure A-1, Log of Trench T 1

VVIEW

SAMPLE SYMBOLS
- ☐ ... SAMPLING UNSUCCESSFUL
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◧ ... STANDARD PENETRATION TEST
- ◪ ... CHUNK SAMPLE
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 20084-12-02

TRENCH T 2

ELEV. (MSL.) 1538 DATE COMPLETED 9/13/01

EQUIPMENT JD 450 W/24" BUCKET

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0 – 2				SM	**TOPSOIL** Loose, dry, dark brown, Silty, fine to medium SAND			
4 – 8	T2-1				**GRANITIC ROCK** Highly weathered, weak, light tannish orange, residual GRANITIC ROCK -Becomes very weathered, light tan at 6 feet -Becomes moderately weathered, moderately strong at 8 feet			
					TRENCH REFUSAL AT 9 FEET			

Figure A-2, Log of Trench T 2

VVIEW

SAMPLE SYMBOLS	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	⊠ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 20084-12-02

TRENCH T 3

ELEV. (MSL.) 1610 DATE COMPLETED 9/13/01

EQUIPMENT JD 450 W/24" BUCKET

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**TOPSOIL** Loose, dry, brown, Silty, fine to medium SAND			
2					**GRANITIC ROCK** Highly weathered, weak, light orangish brown, residual GRANITE			
4					-Becomes moderately weathered, moderately strong, highly fractured, light orangish tan, granodiorite at 3 feet			
6					TRENCH REFUSAL AT 6 FEET			

Figure A-3, Log of Trench T 3

VVIEW

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◧ ... STANDARD PENETRATION TEST
- ◪ ... CHUNK SAMPLE
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 20084-12-02

TRENCH T 4

ELEV. (MSL.) **1626** DATE COMPLETED **9/13/01**

EQUIPMENT **JD 450 W/24" BUCKET**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0 – 3	T4-1			SM	**TOPSOIL** Loose, dry, brown to light brown, Silty, fine to coarse SAND			
3 – 6					**GRANITIC ROCK** Highly weathered, weak, light orangish brown, residual GRANITE -Becomes weathered, strong, coarse grained, highly fractured granitic rock at 5 feet			
6					TRENCH REFUSAL AT 6 FEET			

Figure A-4, Log of Trench T 4

VVIEW

SAMPLE SYMBOLS
- ☐ ... SAMPLING UNSUCCESSFUL
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◧ ... STANDARD PENETRATION TEST
- ◩ ... CHUNK SAMPLE
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 20084-12-02

TRENCH T 5

ELEV. (MSL.) 1624 DATE COMPLETED 9/13/01

EQUIPMENT JD 450 W/24" BUCKET

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0 – 2 –				SM	**TOPSOIL** Loose, dry, light tan brown, Silty, fine to coarse SAND large pinholes present			
– 4 – 6					**GRANITIC ROCK** Moderately weathered, moderately strong, light orangish brown, slightly decomposed GRANITE excavates to fine to coarse grained decomposed granite with some clay component -Becomes weathered, strong granitic rock at 5 feet			
					TRENCH REFUSAL AT 6 FEET			

Figure A-5, Log of Trench T 5

VVIEW

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	⊠ ... DISTURBED OR BAG SAMPLE	◩ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 20084-12-02

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 6 ELEV. (MSL.) 1622 DATE COMPLETED 9/13/01 EQUIPMENT JD 450 W/24" BUCKET	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0 2		+ + +			**GRANITIC ROCK** Weathered, strong, light orangish brown, GRANITE ,excavates to a fine to coarse decomposed granite, very hard digging			
					TRENCH REFUSAL AT 3 FEET			

Figure A-6, Log of Trench T 6

VVIEW

SAMPLE SYMBOLS			
	□ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	⊠ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 20084-12-02

TRENCH T 7

ELEV. (MSL.) 1660 DATE COMPLETED 9/13/01

EQUIPMENT JD 450 W/24" BUCKET

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**TOPSOIL** Loose, dry, brown, fine to coarse SAND			
2 4					**GRANITIC ROCK** Weathered, moderately strong, light yellowish orange brown, coarse grained GRANITIC ROCK, excavates to coarse sand			
					TRENCH REFUSAL AT 5 FEET			

Figure A-7, Log of Trench T 7

VVIEW

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ▩ ... DISTURBED OR BAG SAMPLE
- ◪ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 20084-12-02

TRENCH T 8

ELEV. (MSL.) 1496 DATE COMPLETED 9/13/01

EQUIPMENT JD 450 W/24" BUCKET

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SP	**TOPSOIL** Loose, dry, brown, fine to coarse SAND			
2					**GRANITIC ROCK** Moderately weathered, moderately strong, light orange brown, coarse grained GRANITE			
4					-Becomes weathered, strong granitic rock at 5 feet			
6					TRENCH REFUSAL AT 6 FEET			

Figure A-8, Log of Trench T 8

VVIEW

SAMPLE SYMBOLS
- ☐ ... SAMPLING UNSUCCESSFUL
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◧ ... STANDARD PENETRATION TEST
- ◪ ... CHUNK SAMPLE
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 20084-12-02

TRENCH T 9

ELEV. (MSL.) **848** DATE COMPLETED **9/13/01**

EQUIPMENT **JD 450 W/24" BUCKET**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0 – 2	T9-1			SM	**TOPSOIL** Loose, dry, brown, Silty, fine to medium SAND			
2 – 7	T9-2			SM	**ALLUVIUM** Loose, dry, light brown, Silty, fine to coarse SAND, many pinholes visible -Becomes medium dense, light tan, brown, few pinholes visible at 5 feet			
7 – 12					**GRANITIC ROCK** Weathered, weak, light orange brown, medium grained residual GRANITIC ROCK -Becomes strong, coarse grained granitic rock at 10 feet			
12					TRENCH REFUSAL AT 12 FEET			

Figure A-9, Log of Trench T 9

VVIEW

SAMPLE SYMBOLS
- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◪ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 20084-12-02

TRENCH T 10

ELEV. (MSL.) 902 DATE COMPLETED 9/13/01

EQUIPMENT JD 450 W/24" BUCKET

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0 – 2				SM	**TOPSOIL** Loose, dry, brown, Silty, fine to coarse SAND, many pinholes present			
2 – 7					**GRANITIC ROCK** Highly weathered, weak, light orange brown, residual GRANITIC ROCK -Becomes weathered, moderately strong coarse grained granitic rock at 5 feet			
					TRENCH REFUSAL AT 7 FEET			

Figure A-10, Log of Trench T 10

VVIEW

SAMPLE SYMBOLS
- ☐ ... SAMPLING UNSUCCESSFUL
- ▧ ... DISTURBED OR BAG SAMPLE
- ◧ ... STANDARD PENETRATION TEST
- ◪ ... CHUNK SAMPLE
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

APPENDIX C

APPENDIX C

PREVIOUS FIELD WORK BY OTHERS

Five hydraulic rotary percussion (air-track) borings were advanced to depths of approximately 30 feet during an investigation by Ninyo and Moore in June, 2000, to evaluate rock rippability. The information presented in Appendix B was originally provided in the referenced report dated July 12, 2000. The borings were advanced using a track-mounted, ECM-370 pneumatic drill rig, equipped with a 3.5 inch drill bit.

The approximate locations of the borings are shown on Figures 2 and 3 (map pocket). The penetration rates (recorded in seconds per foot) for each air track boring are presented in Table C-1.

TABLE C-1 — LOGGED DRILLING RATES

Depth (feet)	Drilling Rate (seconds per foot)				
	B-1	**B-2**	**B-3**	**B-4**	**B-5**
0-1	2	3	1	6	12
1-2	3	15	1	6	14
2-3	10	44	4	7	13
3-4	14	46	9	7	8
4-5	3	62	14	7	10
5-6	13	50	11	6	12
6-7	12	55	14	6	11
7-8	15	68	14	7	10
8-9	10	38	10	9	25
9-10	36	32	7	9	14
10-11	34	57	21	14	13
11-12	22	54	10	10	14
12-13	22	45	15	15	14
13-14	16	51	12	13	14
14-15	7	120	16	12	15
15-16	11	17	18	18	17
16-17	20	13	18	25	20
17-18	28	32	15	34	12
18-19	34	35	20	54	12
19-20	21	42	18	75	55
20-21	26	38	16	45	60
21-22	17	65	18	45	40
22-23	21	48	13	40	62
23-24	20	68	14	60	58
24-25	18	58	13	65	68
25-26	21	65	16	40	68
26-27	19	48	17	65	59
27-28	18	48	15	60	62
28-29	26	49	14	60	46
29-30	31	53	12	71	63

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