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**GEOPHYSICAL CHARACTERIZATION OF SUBSURFACE PHYSICAL PROPERTIES
CAITHNESS LLC – SODA MOUNTAIN SOLAR FACILITY
SOUTHWEST OF BAKER, SAN BERNARDINO COUNTY, CALIFORNIA**



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TERRA PHYSICS Project No.: 09-63
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GEOPHYSICAL SURVEY LIMITATIONS

Geophysical exploration is not an exact science, only an additional tool used to locate subsurface material boundaries and measure their physical properties. *TERRA PHYSICS* is not a guarantor of the services provided, but agrees to perform services in a professional and non-negligent manner and according to information and data available to us. Users of this report should recognize the extreme difficulty in locating undocumented, subsurface material boundaries due to factors such as changing stratigraphy and hydrology and the proximity of near-surface sources of vibrational and electrical noise.

Data and results presented in this report were compiled from existing geological data and the current surveys. Geophysical interpretation of subsurface conditions from the surface measurements is not unique. These results represent reasonable descriptions of the geological conditions and are presented for information only. The results should be verified by direct investigation methods. Complex subsurface geology may prevent reliable extrapolation of these results away from their original measurement locations.

TERRA PHYSICS reserves the right to review this report's results when additional information concerning this investigation is available in the future.

TABLE OF CONTENTS

Section No.	Page
1.0 INTRODUCTION.....	1
1.1 Work Scope.....	1
1.2 BLM Access Permit.....	3
1.3 Health & Safety Issues.....	3
1.4 Schedule.....	3
2.0 SUMMARY OF RESULTS – GROUND WATER/BEDROCK DEPTHS	5
3.0 SUMMARY OF RESULTS – SOUTHEAST AREA	7
4.0 SUMMARY OF RESULTS – NORTHWEST AREA	10
5.0 DESCRIPTION OF GEOPHYSICAL SURVEY PROCEDURES.....	13
5.1 Transient Electromagnetic (Electrical Resistivity) Sounding	13
5.2 Seismic Refraction (Compressional Wave Velocity) Profiling	15
5.3 Seismic Downhole (Compressional And Shear Wave Velocities) Sounding.....	18
5.4 Seismic Surface Wave (Shear Wave Velocity) Sounding.....	20
5.5 Direct Current Electrical Resistivity Sounding	21
6.0 REFERENCES.....	24

LIST OF TABLES

Table No.	
1	Geophysical Survey Locations At Soda Mountain SE And NW Areas
2	TEM Survey Results At Soda Mountain SE And NW Areas
3	SE Area Generalized Geophysical Model
4	Geophysical Survey Results At Soda Mountain SE Area
4A	Refraction Compressional Wave Velocity Correlations With Stratigraphy
4B	Downhole Compressional And Shear Wave Velocity Correlations With Stratigraphy
4C	Surface Wave Shear Wave Velocity Correlations With Stratigraphy
4D	Electrical Resistivity Correlations With Stratigraphy
5	Typical Ranges Of Poisson's Ratio For Soils
6	NW Area Generalized Geophysical Model
7	Geophysical Survey Results At Soda Mountain NW Area.....
7A	Refraction Compressional Wave Velocity Correlations With Stratigraphy
7B	Downhole Compressional And Shear Wave Velocity Correlations With Stratigraphy
7C	Surface Wave Shear Wave Velocity Correlations With Stratigraphy
7D	Electrical Resistivity Correlations With Stratigraphy

LIST OF FIGURES

Figure

<u>No.</u>		
1	Soda Mountain Project Site Map	(after references)
2	Geophysical Survey Location Map	

GROUND WATER/BEDROCK RESULTS

3A	TEM-02 Sounding At Boring DYB10-02 Data & Interpreted Geoelectric Model
3B	TEM-09 Sounding At Boring DYB10-09 Data & Interpreted Geoelectric Model
3C	TEM-11 Sounding At Boring DYB10-11 Data & Interpreted Geoelectric Model

SE AREA RESULTS

4A	Refraction Profile SR-06 At Boring DYB10-06 Interpreted Seismic Velocity Cross Section
4B	Refraction Profile SR-10 At Boring DYB10-10 Interpreted Seismic Velocity Cross Section
4C	Refraction Profile SR-11 At Boring DYB10-11 Interpreted Seismic Velocity Cross Section
4D	Refraction Profile SR-12 At Boring DYB10-12 Interpreted Seismic Velocity Cross Section
4E	Refraction Profile SR-13 At Boring DYB10-13 Interpreted Seismic Velocity Cross Section
4F	Refraction Profile SR-14 At Boring DYB10-14 Interpreted Seismic Velocity Cross Section
4G	Downhole Velocity DH-10 At Boring DYB10-10 Data And Interpreted Velocity Zones
4H	Downhole Velocity DH-12 At Boring DYB10-12 Data And Interpreted Velocity Zones
4I	Surface Wave SW-10 At Boring DYB10-10 Shear Wave Velocity Sounding Interpreted From Surface Wave Data
4J	Surface Wave SW-11 At Boring DYB10-11 Shear Wave Velocity Sounding Interpreted From Surface Wave Data
4K	Surface Wave SW-13 At Boring DYB10-13 Shear Wave Velocity Sounding Interpreted From Surface Wave Data
4L	Surface Wave SW-14 At Boring DYB10-14 Shear Wave Velocity Sounding Interpreted From Surface Wave Data
4M	Resistivity DC-12 At Boring DYB10-12 Soil Electrical Resistivity Data And Interpreted Geoelectric Model

NW AREA RESULTS

5A	Refraction Profile SR-02 At Boring DYB10-02 Interpreted Seismic Velocity Cross Section
5B	Refraction Profile SR-05 At Boring DYB10-05 Interpreted Seismic Velocity Cross Section
5C	Refraction Profile SR-07 At Boring DYB10-07 Interpreted Seismic Velocity Cross Section
5D	Refraction Profile SR-08 At Boring DYB10-08 Interpreted Seismic Velocity Cross Section
5E	Refraction Profile SR-09 At Boring DYB10-09 Interpreted Seismic Velocity Cross Section
5F	Downhole Velocity DH-02 At Boring DYB10-02 Data And Interpreted Velocity Zones
5G	Downhole Velocity DH-09 At Boring DYB10-09 Data And Interpreted Velocity Zones
5H	Surface Wave SW-03 At Boring DYB10-03 Shear Wave Velocity Sounding Interpreted From Surface Wave Data
5I	Surface Wave SW-08 At Boring DYB10-08 Shear Wave Velocity Sounding Interpreted From Surface Wave Data
5J	Resistivity DC-02 At Boring DYB10-02 Soil Electrical Resistivity Data And Interpreted Geoelectric Model

LIST OF FIGURES (Continued)

TECHNIQUE DESCRIPTIONS

- 6 Generalized Plan View Of Transient Electromagnetic Resistivity Sounding
- 7 Generalized Plan View Of Seismic Refraction Profile
- 8 Generalized Plan View Of Seismic Velocity Survey In A Boring
- 9 Generalized Plan View Of Surface Wave Sounding
- 10 Generalized Plan View Of DC Electrical Resistivity Sounding

1.0 INTRODUCTION

This report describes the geophysical survey conducted by *TERRA PHYSICS* at the proposed Caithness Soda Mountain Project, a solar facility on Interstate 15 between Rasor Road and Zzyzx Road (Figure 1). The site is about 9 miles southwest of Baker in San Bernardino County, California. The survey is in support of the on-going Wilson Geosciences Inc. study to characterize geological and geotechnical conditions at this site for RMT, Inc. representing Caithness Soda Mountain LLC. Report Section 1 describes the work scope, site issues, and schedule. Sections 2, 3, and 4 summarize the results. Sections 5 and 6 describe all survey procedures and list the cited references, respectively.

1.1 Work Scope

Objectives of the geophysical surveys were to measure physical properties of in-situ subsurface soils and develop stratigraphic correlations with nearby geotechnical soil borings in the Project Southeast and Northwest areas. These properties can then be extrapolated for similar soil units across the project site. Five geophysical techniques were deployed near borings as shown in Table 1 and Figure 2. Surveys were designed and conducted no significant impact on the environmentally sensitive project site.

- o Transient Electromagnetic (TEM) Electrical Resistivity Sounding
Method purpose is to measure vertical changes in soil electrical resistivities to depths of about 350 feet to determine low-resistivity saturated zones and possibly high-resistivity crystalline bedrock for RMT ground water modeling. TEM provides deeper penetration with a smaller array than the direct current method.
- o Seismic Refraction Compressional Wave Velocity Profiling
Method purpose is to measure compressional wave velocities to depths of about 60 feet to determine soil stiffness. Interpreted cross section will delineate lateral and vertical velocity changes across a 1500 feet line so that stratigraphy can be extrapolated away from the borings.
- o Seismic Downhole Compressional And Shear Wave Velocities Sounding
Method purposes are to measure vertical changes in compressional and horizontally polarized shear velocities in the 20 feet deep borings and develop stratigraphic correlations. Subsurface properties can be inferred along refraction profiles using these correlations.
- o Seismic Surface Wave – Shear Wave Velocity Sounding
Method purposes are to measure vertical changes in shear velocity to depths of about 80 feet and develop stratigraphic correlations. This method can penetrate deeper than the 20 feet borings. The International Building Code (IBC) Site Class can be calculated from the results.
- o Direct Current Electrical Resistivity Sounding
Method purpose is to measure vertical changes in soil resistivity to depths of about 50 feet for electrical grounding system design.

The various geophysical techniques were assigned the associated geotechnical boring number. The numbers for the borings and geophysical surveys have no relationship to the sequence in which the field surveys were conducted.

TABLE 1 – GEOPHYSICAL SURVEY LOCATIONS AT SODA MOUNTAIN SE AND NW AREAS

BORING	TEM ELECTRICAL RESISTIVITY SOUNDING	DOWNHOLE COMPRESSION & SHEAR WAVE VELOCITY	SURFACE WAVE SHEAR WAVE VELOCITY SOUNDING	DC ELECTRICAL RESISTIVITY SOUNDING	REFRACTION COMPRESSIONAL WAVE VELOCITY PROFILE	LATITUDE NAD83 (degrees)	LONGITUDE NAD83 (degrees)	ELEVATION (feet)
DYB10-01	---	---	---	---	---	N35.196722	W116.154611	1247
DYB10-02	TEM-02 CENTERED ON BORING	DH-02 IN BORING	---	DC-02 CENTERED ON BORING	SR-02 NW @ N35.2084347, W116.1623867 SE 59 ft NW OF STAKE @ N35.2057029, W116.1584051 BORING @ 769 ft ON PROFILE	N35.207083	W116.160444	1414
DYB10-03	---	---	SW-03 CENTERED ON BORING		---	N35.206972	W116.174833	1517
DYB10-04	---	---	---	---	---	N35.191167	W116.185333	1451
DYB10-05	---	NO ACCESS	---	---	SR-05 SW @ N35.1817710, W116.1750673 NE 15 ft NE OF STAKE @ N35.1849284, W116.1719790 BORING @ 744 ft ON PROFILE	N35.183417	W116.173694	1346
DYB10-06	---	---	---	---	SR-06 SW @ N35.1716903, W116.1688891 NE 30 ft SW OF STAKE @ N35.1756692, W116.1672909 BORING @ 7 ft SW OF PROFILE SW END	N35.171694	W116.144167	1378
DYB10-07	---	NO ACCESS	---	---	SR-07 SW @ N35.1697292, W116.1850747 NE 10 ft SW OF STAKE @ N35.1731221, W116.1822286 BORING @ 15 ft NE OF PROFILE NE END	N35.173139	W116.182306	1401
DYB10-08	---	---	SW-08 CENTERED ON BORING	---	SR-08 NW @ N35.1754385, W116.1913342 SE 22 ft SE OF STAKE @ N35.1720751, W116.1886205 BORING @ 666 ft NW OF PROFILE NW END	N35.177000	W116.192500	1512
DYB10-09	TEM-09 CENTERED 200 ft NW OF BORING	DH-09 IN BORING	---	---	SR-09 SW @ N35.1544799, W116.1980340 NE 24 ft NE OF STAKE @ N35.1578272, W116.1952934 BORING @ 10 ft SW OF PROFILE SW END	N35.154528	W116.198028	1519
DYB10-10	---	DH-10 IN BORING	SW-10 CENTERED ON BORING	---	SR-10 SW @ N35.1543077, W116.1760666 NE 34 ft SW OF STAKE @ N35.1582274, W116.1742383 BORING @ 1057 ft ON PROFILE	N35.157028	W116.174833	1350
DYB10-11	TEM-11 CENTERED 8 ft SW OF BORING	---	SW-11 CENTERED ON BORING	---	SR-11 SW @ N35.1467396, W116.1825056 NE 20 ft SW OF STAKE @ N35.1497520, W116.1790052 BORING @ 753 ft ON PROFILE	N35.148278	W116.180833	1358
DYB10-12	---	DH-12 IN BORING	---	DC-12 CENTERED ON BORING	SR-12 SW @ N35.1427055, W116.1872098 NE 81 ft SW OF STAKE @ N35.1457098, W116.1836873 BORING @ 14 ft SW OF PROFILE SW END	N35.142750	W116.187250	1384
DYB10-13	---	---	SW-13 CENTERED 46 ft NW OF BORING	---	SR-13 NW @ N35.1418951, W116.1716066 SE 5 ft NW OF STAKE @ N35.1390707, W116.1678623 BORING @ 25 ft SW OF PROFILE SE END	N35.139000	W116.167890	1267
DYB10-14	---	---	SW-14 CENTERED 90 ft NE OF REFRACTION SW END AT ORIGINAL BORING LOCATION	---	SR-14 SW @ N35.1380668, W116.1769029 NE 4 ft SW OF STAKE @ N35.1410905, W116.1734780 BORING @ 560 ft NNE OF PROFILE SW END	N35.139806	W116.176530	1332
DYB10-15	---	---	---	---	---	N35.148083	W116.203333	1522

NOTE: Geodetic coordinates and elevations of borings from Diaz Yourman & Associates boring logs (08/30/10-09/02/10) and refraction rebar stakes from Wilson Geosciences (02/26/10).

1.2 BLM Access Permit

All field work was conducted in strict adherence to BLM Land Use Permit (CACA-51640) issued to Caithness Soda Mountain, LLC on May 27, 2010. The original expiration of September 30, 2010 was extended on September 21, 2010 until November 30, 2010. The permit was clearly displayed in the vehicles during every field day. No vehicles were driven off road. Wheel barrows were used to manually transport equipment to remote measurement locations. No plants or animals were disturbed. All conditions of the BLM permits were followed. Field activities were completed by October 21, 2010.

1.3 Health & Safety Issues

All field work was conducted in strict adherence to the Wilson Geosciences Inc. and RMT, Inc. approved *TERRA PHYSICS* (2010) "Health And Safety Procedures Manual And Accident Prevention Plan For Geophysical Surveys". This plan is in accordance with Title 29 Code of Federal Regulations (29CFR 1910 and 29CFR 1926) and Titles 8 and 22 California Code Of Regulations (Chapters 3, 4, 7, and 30). The plan, hospital route map, and emergency contact list were stored in each vehicle.

The *TERRA PHYSICS* site safety officer has been HAZWOPER trained since 1987 with annual refresher courses. He conducted tailgate briefings before work began each day. Greatest risks of injury were heat exhaustion, dehydration, and slip/trip/fall. To minimize the chance of injury, all field personnel worked together as a group. Field work was conducted in OSHA modified Level D personnel protection. No special decontamination procedures or protection was needed for the equipment. Every crew member had a walkie talkie and cell phone to ensure reliable communication. No accidents or injuries occurred during this project.

1.4 Schedule

PRECONTRACT ACTIVITIES

08/13/09 Cost proposal submitted.

12/08/09 Technique descriptions and diagrams were developed for the BLM permit.

01/01/10 Health And Safety Plan submitted.

CONTRACT ACTIVITIES

02/18/10 Boring locations and refraction profiles were staked and locations measured with GPS.

08/03/10 Subcontract signed.

08/05/10 Field work started.

09/27/10 TEM results for ground water modeling delivered.

09/29/10 Start delivery of SE Area results.

10/21/10 Field work finished.

11/11/10 Finish delivery of SE Area results.

11/13/10 Start delivery of NW Area results.

11/21/10 Finish delivery of NW Area results.

11/28/10 Draft report submitted.

12/09/10 Draft report comments received.

12/10/10 Final report submitted.

2.0 SUMMARY OF RESULTS – GROUND WATER/BEDROCK DEPTHS

RMT proposes to site a ground water well within the project site in order to determine ground water conditions. Since there are no wells within the site, a geophysical electrical survey was designed to measure vertical changes in soil electrical resistivities to depths of about 350 feet. Saturated alluvium generally causes a significant resistivity decrease and bedrock is usually highly resistive. The TEM technique was used instead of the standard direct current electrical resistivity method because a smaller measurement array could achieve the desired depth. A smaller array averages less soil volume and therefore has better vertical resolution and can be deployed closer to electrical transmission wires and gas pipelines without degrading data quality.

TEM sounding locations are described in Figure 2 and Table 1. TEM-09 was moved 200 feet NW of the original location to avoid signal coupling into the gas pipeline SE of the access road. Geoelectric models interpreted from the data are shown in Table 2. Only generalized resistivity correlations with stratigraphy are possible because no geotechnical borings at the site extend below 100 feet.

80 – 360 Ohm meters	Dry, Coarse And Fine Grain Alluvium
4 – 15 Ohm meter	Saturated Alluvium
530 – 610 Ohm meters	Bedrock

TEM-11 did not detect the saturated alluvium but did detect bedrock. Possible saturation depth was estimated by calculating the maximum thickness of ground water (4-15 Ohm meters zone) that could be perched on the bedrock without being detected. A 50 feet thick saturated zone produces a recognizable change in the resistivity synthetic data calculated from the model and would have been identified as a distinct low resistivity zone. Therefore, the maximum ground water thickness that would not be detected is about 50 feet. At this sounding, ground water would be deeper than 386 feet (below elevation of 972 feet).

TEM-09 did not detect the bedrock possibly because it is deeper than the survey's penetration. Bedrock depth was estimated by adding a 530-610 Ohm meters zone positioned at about 1000 feet deep within the original model. Zone depth was systematically decreased until the recognizable change occurred in the synthetic data calculated from the new model. Bedrock would be at least 500 feet deep (below elevation of 1024 feet) to remain undetected.

In the NW Area, the interpreted ground water and bedrock elevations are similar between TEM-02 and TEM-09 indicating almost no dip gradient. Interpreted ground water dips about 2 degrees SE and bedrock about 1 degrees SE from TEM-09 towards TEM-11 near the basin center. All though no direct continuity of surfaces is known to exist, the Interpreted ground water dips about 1 degree SW and bedrock about 0.5 degree SW from TEM-02 towards TEM-11.

TABLE 2 - TEM SURVEY RESULTS AT SODA MOUNTAIN SE AND NW AREAS

SOUNDING	DEPTH RANGE ¹ (feet)	ELEVATION RANGE ² (feet)	ELECTRICAL RESISTIVITY ¹ (ohm meters)	STRATIGRAPHY INFERRED SOLELY FROM TEM RESULTS
TEM-02 AT BORING DYB10-02	0±00 to 67±14	1414±00 to 1347±14	330± 40	DRY, COARSE GRAIN, ALLUVIUM
	67±14 to 182±13	1347±14 to 1232±13	37± 10	MOIST, FINE GRAIN, ALLUVIUM
	182±13 to 332±26	1232±13 to 1082±26	4± 0.8	SATURATED ALLUVIUM
	BELOW 332±26	BELOW 1082±26	530±100	BEDROCK
TEM-09 AT BORING DYB10-09	0±00 to 143±36	1524±00 to 1381±36	360± 50	DRY, COARSE GRAIN, ALLUVIUM
	143±36 to 354±30	1381±36 to 1170±30	98± 20	DRY, COARSE & FINE GRAIN, ALLUVIUM
	BELOW 354±30	BELOW 1170±30	15± 03	SATURATED ALLUVIUM
	---	---	---	ESTIMATED BEDROCK IS AT LEAST 500 FEET DEEP (BELOW ELEVATION OF 1024 feet)
TEM-11 AT BORING DYB10-11	0±00 to 436±49	1358±00 to 922±49	80± 12	DRY, COARSE AND FINE GRAIN, ALLUVIUM
	BELOW 436±49	BELOW 922±49	610± 92	BEDROCK
				GROUND WATER WAS NOT DETECTED. IF IT IS PERCHED ON BEDROCK THEN THE ESTIMATED MAXIMUM UNDETECTABLE THICKNESS IS ABOUT 50 FEET. THEREFORE, GROUND WATER WOULD BE AT LEAST 386 FEET DEEP (BELOW ELEVATION OF 972 FEET).

NOTE: 1. Depth & resistivity uncertainty ranges estimated from "TEMIXXL" (Interpex, 2008) software equivalence analysis.

2. Elevations are based on TOPO! Software (Wilson Geosciences, 02/26/10) at the sounding centers.

3.0 SUMMARY OF RESULTS – SOUTHEAST AREA

Two seismic methods (downhole compressional and shear velocities sounding and surface wave shear wave velocity sounding) and the electrical resistivity sounding method measured physical properties at six borings that supplemented the geotechnical data obtained in the borings. Stratigraphic correlations were developed between compressional and shear velocities and electrical resistivity. Subsurface conditions could then be inferred along the seismic refraction compressional wave velocity profiles (each 1500 feet long) using these correlations.

Geophysical measurement locations are described in Figure 2 and Table 1. Figures 4A through 4F show the six refraction compressional wave velocity cross sections to depths of about 70 feet. Figures 4G and 4H show the compressional and shear velocities vertical profile in the two borings. Figures 4I through 4L show the shear wave velocity vertical profile to about 100 feet depth and the International Building Code, IBC (International Code Council, 2003) VS100 value and Site Class. Figure 4M shows the electrical resistivity vertical profile to about 40 feet. The generalized geophysical model shown in Table 3 was assembled from all the survey results shown in Table 4. The specific subsurface layer interval thickness (Column 1) are approximate considering all methods and would not necessary be characteristic of any individual location for any individual technique.

TABLE 3 – SE AREA GENERALIZED GEOPHYSICAL MODEL

SUBSURFACE LAYER	REFRACTION COMPRESSIONAL WAVE VELOCITY (feet/second)	COMPRESSIONAL WAVE VELOCITY (feet/second)	DOWNHOLE SOUNDING COMPRESSIONAL WAVE VELOCITY (feet/second)	SHEAR WAVE VELOCITY (feet/second)	POISSON'S RATIO	SURFACE WAVE SHEAR WAVE VELOCITY (feet/second)	ELECTRICAL RESISTIVITY (Ohm meters)
0 - 12 ft THICK	1220 - 1620 $\pm$ 12%	990 - 1030 $\pm$ 06%	500 - 550 $\pm$ 06%	720 - 1040 $\pm$ 13%	0.30 - 0.33	310 - 2200 $\pm$ 15%	
38 - 64 ft THICK	2790 - 3720 $\pm$ 10%	2780 - 3200 $\pm$ 10%	1260 - 1270 $\pm$ 14%	1100 - 1820 $\pm$ 08%	0.37 - 0.41	60 $\pm$ 15%	
43 - 75 ft DEEP	4100 - 4500 $\pm$ 10%	---	---	1650 - 3050 $\pm$ 08%	---	---	

IBC VS100 = 1546 – 1626 feet/second Site Class C (very dense soil)

Poisson's Ratio was calculated for the downhole velocity zones (Tables 4 and 7). The values generally agree with dense sand/silty sand shown in Table 5 (Federal Highway Administration, 2004).

**TABLE 5
TYPICAL RANGES OF POISSON'S RATIO FOR SOILS**

SOIL TYPE	RANGE OF POISSON'S RATIO
Loose Sand	0.20 – 0.40
Medium Dense Sand	0.25 – 0.40
Dense Sand	0.30 – 0.45
Silty Sand	0.20 – 0.40
Sand And Gravel	0.15 – 0.35

TABLE 4 – GEOPHYSICAL SURVEY RESULTS AT SODA MOUNTAIN SE AREA

TABLE 4A - REFRACTION COMPRESSIONAL WAVE VELOCITY CORRELATIONS WITH STRATIGRAPHY

PROFILE	DEPTH ¹ RANGE (feet)	ELEVATION ² RANGE (feet)	PROFILE DISTANCE (feet)	COMPRESSIONAL WAVE VELOCITY (feet/second)	STRATIGRAPHY ³
SR-06 AT BORING DYB10-06	0 – 11	1376-1365	0- 660 660-1230 1230-1495	1260 ± 10% 1590 ± 10% 1290 ± 12%	Dry, Unconsolidated (low blow counts 10), SILTY SAND (SM) WITH GRAVEL
	11 – 75	1365-1301	0- 585 585- 950 950-1495	2700 ± 07% 2430 ± 08% 2910 ± 07%	Dry, Partially Consolidated (blow counts 40->50), SILTY SAND (SM) WITH GRAVEL
	BELOW 75	BELOW 1301	0-1495	4100 ± 10%	Boring Did Not Extend Into This Zone - Probably Consolidated ALLUVIUM That Is Dry Because The Velocity Is Less Than The Speed Of Sound in Water (4900-5400 feet/second).
SR-10 AT BORING DYB10-10	0 – 2	1350-1348	0-1495	1320 ± 11%	Dry, Unconsolidated (low blow counts 8-20), SILTY SAND (SM) WITH GRAVEL
	2 – 43	1348-1307	0- 620 620-1170 1170-1495	2530 ± 08% 3280 ± 07% 2290 ± 10%	Dry, Partially Consolidated (blow counts >50), GRAVEL WITH SILT (GP-GM) and SILTY SAND (SM) WITH GRAVEL (blow counts >50).
	BELOW 43	BELOW 1307	0-1495	4200 ± 10%	Boring Did Not Extend Into This Zone - Probably Consolidated ALLUVIUM That Is Dry Because The Velocity Is Less Than The Speed Of Sound in Water (4900-5400 feet/second).
SR-11 AT BORING DYB10-11	0 – 7	1357-1350	0- 875 875-1230 1230-1495	1220 ± 12% 1410 ± 10% 1240 ± 12%	Dry, Unconsolidated (low blow counts 14-24), SILTY SAND (SM) WITH GRAVEL
	7 – 67	1350-1290	0- 560 560-1230 1230-1495	2910 ± 06% 2580 ± 06% 2700 ± 10%	Dry, Partially Consolidated (blow counts >50), SILTY SAND (SM) WITH GRAVEL AND COBBLES
	BELOW 67	BELOW 1290	0-1495	About 4500 ± 10%	Boring Did Not Extend Into This Zone. Velocity Is Approximated Because Few Data Points Were Reliably Recorded From The Boundary That Is Greater Than 60 feet Deep. Zone Is Probably Consolidated ALLUVIUM That Is Dry Because The Velocity Is Less Than The Speed Of Sound in Water (4900-5400 feet/second).
SR-12 AT BORING DYB10-12	0 – 12	1378-1366	0- 680 680- 910 910-1495	1380 ± 13% 1240 ± 15% 1320 ± 13%	Dry, Unconsolidated (low blow counts 8-14), SILTY SAND (SM) WITH COBBLES
	12 – 75	1366-1303	0- 680 680- 910 910-1495	2960 ± 10% 2640 ± 10% 3040 ± 10%	Dry, Partially Consolidated (blow counts 21-29), SILTY SAND (SM) WITH COBBLES
	BELOW 75	BELOW 1303	0-1495	About 4500 ± 10%	Boring Did Not Extend Into This Zone. Velocity Is Approximated Because Few Data Points Were Reliably Recorded From The Boundary That Is Greater Than 70 feet Deep. Zone Is Probably Consolidated ALLUVIUM That Is Dry Because The Velocity Is Less Than The Speed Of Sound in Water (4900-5400 feet/second).
SR-13 AT BORING DYB10-13	0 – 6	1282-1276	0-1495	1620 ± 12%	Dry, Unconsolidated (low blow counts 18), SILTY SAND (SM) WITH GRAVEL
	6 – 44	1276-1238	0-1495	3720 ± 08%	Dry, Partially Consolidated (blow counts 30-39), SILTY SAND (SM) WITH GRAVEL And SAND WITH SILT (SP-SM) AND GRAVEL (blow count >50).
	BELOW 44	BELOW 1238	0-1495	4500 ± 10%	Boring Did Not Extend Into This Zone - Probably Consolidated ALLUVIUM That Is Dry Because The Velocity Is Less Than The Speed Of Sound in Water (4900-5400 feet/second).
SR-14 AT BORING DYB10-14	0 – 5	1315-1310	0- 660 660-1495	1330 ± 12% 1590 ± 12%	Boring Is About 560 feet NE of the profile so only approximate correlations are possible. Zone Is Probably Dry, Unconsolidated, GRAVEL WITH SILT AND SAND (GP-GM) With blow counts 18-25.
	5 – 59	1310-1256	0- 625 625-1495	2340 ± 08% 3250 ± 08%	Zone Is Probably Dry, Partially Consolidated , SILTY SAND (SM) With Blow Counts 46->50.
	BELOW 59	BELOW 1256	0-1495	About 4500 ± 10%	Velocity Is Approximated Because Few Data Points Were Reliably Recorded From The Boundary That Is Greater Than 75 feet Deep. Zone Is Probably Consolidated ALLUVIUM That Is Dry Because The Velocity Is Less Than The Speed Of Sound in Water (4900-5400 feet/second).

NOTE: 1. Depths and elevations are shown at each profile center.
2. Elevations are based on TOPO! Software (Wilson Geosciences, 02/26/10) at the profile ends.
3. Stratigraphy from Diaz Yourman & Associates (08/30/10 – 09/02/10) boring logs.

TABLE 4B - DOWNHOLE COMPRESSIONAL AND SHEAR WAVE VELOCITY CORRELATIONS WITH STRATIGRAPHY

BORING	DEPTH RANGE (feet)	ELEVATION ¹ RANGE (feet)	DOWNHOLE WAVE VELOCITIES COMPRESSIONAL SHEAR (feet/second) (feet/second)		POISSON'S RATIO	REFRACTION COMPRESSION VELOCITY (feet/second)	STRATIGRAPHY ²
DH-10 IN BORING DYB10-10	0- 6	1350-1344	990 ±06%	500 ± 06%	0.33	1320 ± 11%	Dry, Unconsolidated (low blow counts 8-20), SILTY SAND (SM) With Gravel
	6-16	1344-1334	3200 ±08%	1270 ± 14%	0.41	3280 ± 07%	Dry, Partially Consolidated (blow counts >50), GRAVEL AND SILT (GP-GM) Boring Bottom is 18.5 feet.
DH-12 IN BORING DYB10-12	0- 6	1384-1378	1030 ±06%	550 ± 06%	0.30	1380 ± 13%	Dry, Unconsolidated (low blow counts 8-14), SILTY SAND (SM) With Cobbles
	6-17	1378-1367	2780 ±10%	1260 ± 08%	0.37	2960 ± 10%	Dry, Partially Consolidated (blow counts 21-29), SILTY SAND (SM) With Cobbles Boring Bottom is 20.5 feet.

NOTE: 1. Elevations are based on TOPO! Software (Wilson Geosciences, 02/26/10) at the refraction profile ends.
2. Stratigraphy from Diaz Yourman & Associates (08/30/10 – 09/02/10) boring logs.

TABLE 4 – GEOPHYSICAL SURVEY RESULTS AT SODA MOUNTAIN SE AREA (Continued)

TABLE 4C - SURFACE WAVE SHEAR WAVE VELOCITY CORRELATIONS WITH STRATIGRAPHY

SOUNDING	DEPTH RANGE (feet)	ELEVATION ¹ RANGE (feet)	SHEAR WAVE VELOCITY (feet/second)	DOWNHOLE SHEAR WAVE VELOCITY (feet/second)	STRATIGRAPHY ²
SW-10 AT BORING DYB10-10 IBC VS100 ³ 1546 ft/sec SITE CLASS C	0-10	1350-1340	740 ± 10%	500 ± 06%	Dry, Unconsolidated (low blow counts 8-20), SILTY SAND (SM) WITH GRAVEL
	10-25	1340-1325	1210 ± 08%	1270 ± 14%	Dry, Partially Consolidated (blow counts >50), GRAVEL AND SILT (GP-GM) . Boring Bottom is 18.5 feet.
	25-45	1325-1305	1280 ± 06%	None	Probably Dry, Partially Consolidated ALLUVIUM .
	45-70	1305-1280	2280 ± 06%	None	Probably Dry, Consolidated ALLUVIUM .
	BELOW 70	BELOW 1280	2470 ± 06%	None	Probably Dry, Consolidated ALLUVIUM
SW-11 AT BORING DYB10-11 IBC VS100 ³ 1618 ft/sec SITE CLASS C	0- 6	1358-1352	720 ± 13%	None	Dry, Unconsolidated (low blow counts 19-24), SILTY SAND (SM) WITH GRAVEL
	6-14	1352-1344	1000 ± 10%	None	Dry, Partially Consolidated (blow counts 14->50), SILTY SAND (SM) WITH GRAVEL . Boring Bottom is 19.5 feet.
	14-24	1344-1334	1100 ± 08%	None	Probably Dry, Partially Consolidated ALLUVIUM
	24-36	1334-1322	1510 ± 08%	None	Probably Dry, Partially Consolidated ALLUVIUM
	36-49	1322-1309	1820 ± 08%	None	Probably Dry, Consolidated ALLUVIUM
	49-64	1309-1294	2020 ± 08%	None	Probably Dry, Consolidated ALLUVIUM .
	64-81	1294-1277	2260 ± 08%	None	Probably Dry, Consolidated ALLUVIUM
	BELOW 81	BELOW 1277	3050 ± 08%	None	Probably Dry, Consolidated ALLUVIUM .
SW-13 AT BORING DYB10-13 IBC VS100 ³ 1615 ft/sec SITE CLASS C	0-10	1271-1261	820 ± 12%	None	Dry, Unconsolidated (low blow counts 18-30), SILTY SAND (SM) WITH GRAVEL
	10-25	1261-1246	1370 ± 08%	None	Dry, Partially Consolidated (blow counts 39), SILTY SAND (SM) WITH GRAVEL And SAND WITH SILT (SP-SM) With Blow Counts 30->50. Boring Bottom is 19.5 feet.
	25-45	1246-1226	1520 ± 07%	None	Probably Dry, Partially Consolidated ALLUVIUM
	45-70	1226-1201	1650 ± 06%	None	Probably Dry, Consolidated ALLUVIUM .
	BELOW 70	BELOW 1201	2870 ± 06%	None	Probably Dry, Consolidated ALLUVIUM .
SW-14 AT BORING DYB10-14 IBC VS100 ³ 1626 ft/sec SITE CLASS C	0- 7	1328-1321	930 ± 08%	None	No Nearby Boring. Probably Dry, Unconsolidated ALLUVIUM .
	7-17	1321-1311	1040 ± 08%	None	Probably Dry, Partially Consolidated ALLUVIUM .
	17-29	1311-1299	1130 ± 07%	None	Probably Dry, Partially Consolidated ALLUVIUM .
	29-43	1299-1285	1430 ± 07%	None	Probably Dry, Partially Consolidated ALLUVIUM
	43-60	1285-1268	1780 ± 07%	None	Probably Dry, Consolidated ALLUVIUM .
	60-79	1268-1249	2460 ± 07%	None	Probably Dry, Consolidated ALLUVIUM .
	BELOW 79	BELOW 1249	3050 ± 07%	None	Probably Dry, Consolidated ALLUVIUM .

NOTE: 1. Elevations are based on TOPO! Software (Wilson Geosciences, 02/26/10) at the sounding array center.
2. Stratigraphy from Diaz Yourman & Associates (08/30/10 – 09/02/10) boring logs.
3. International Building Code (IBC) average shear velocity (VS) for 100 feet of depth was calculated following the procedures described by International Code Council (2003). The surface wave survey did not penetrate to 100 feet. A conservative estimate of the VS100 was made by extending the deepest velocity zone down to 100 feet.

TABLE 4D - ELECTRICAL RESISTIVITY CORRELATIONS WITH STRATIGRAPHY

SOUNDING	DEPTH ¹ RANGE (feet)	ELEVATION ² RANGE (feet)	COMPOSITE ELECTRICAL RESISTIVITY ¹ (Ohm meters)	STRATIGRAPHY ³
DC-12 AT BORING DYB10-12	0- 3	1384-1381	2200 ± 15%	Dry, Unconsolidated, SILTY SAND (SM) WITH COBBLES AND GRAVEL
	3-10	1381-1374	310 ± 15%	Dry, Partially Consolidated (hard drilling), SILTY SAND (SM) WITH COBBLES
	10-40	1374-1344	60 ± 15%	Boring Extended 11 feet Into This Zone - Probably Partially Consolidated SILTY SAND (SM) WITH GRAVEL

NOTE: 1. Depths, elevations, and resistivities are from composite models of the NW-SE and NE-SW arrays at each location.
2. Elevations are based on TOPO! Software (Wilson Geosciences, 02/26/10) at the array centers.
3. Stratigraphy from Diaz Yourman & Associates (08/30/10 – 09/02/10) boring logs.

4.0 SUMMARY OF RESULTS – NORTHWEST AREA

Two seismic methods (downhole compressional and shear wave velocity soundings and surface wave shear wave velocity sounding) and the electrical resistivity sounding method measured physical properties at six borings that supplemented the geotechnical data obtained in the borings. Stratigraphic correlations were developed between compressional and shear velocities and electrical resistivity. Subsurface conditions could then be inferred along the seismic refraction compressional wave velocity profiles (each 1500 feet long) using these correlations.

Geophysical measurement locations are described in Figure 2 and Table 1. Figures 5A through 5E show the five refraction compressional wave velocity cross sections to depths of about 70 feet. Figures 5F and 5G show the compressional and shear wave velocities vertical profile in the two borings. (Surveys were planned for Borings DYB10-07 and DYB10-07 but severe flooding and erosion of the BLM approved road prevented access to the borings.) Figures 5H through 5I show the shear wave velocity vertical profile to about 100 feet depth and the International Building Code, IBC (International Code Council, 2003) VS100 value and Site Class. Figure 5J shows the electrical resistivity vertical profile to about 40 feet. The generalized geophysical model shown in Table 6 was assembled from all the survey results shown in Table 7. Poisson's Ratio calculated for the downhole velocity zones generally agree with dense sand/silty sand shown in Table 5 (Federal Highway Administration, 2004).

TABLE 6 – NW AREA GENERALIZED GEOPHYSICAL MODEL

SUBSURFACE LAYER	REFRACTION COMPRESSIONAL WAVE VELOCITY (feet/second)	COMPRESSIONAL WAVE VELOCITY (feet/second)	DOWNHOLE SOUNDING COMPRESSIONAL WAVE VELOCITY (feet/second)	POISSON'S RATIO	SURFACE WAVE SHEAR WAVE VELOCITY (feet/second)	ELECTRICAL RESISTIVITY (Ohm meters)
0 - 8 ft THICK	1240 - 1750 $\pm$ 12%	600 - 1170 $\pm$ 08%	200 - 440 $\pm$ 08%	0.38 - 0.44	660 - 690 $\pm$ 14%	310 - 1000 $\pm$ 15%
42 - 68 ft THICK	2170 - 3800 $\pm$ 10%	2180 - 2440 $\pm$ 10%	790 - 900 $\pm$ 18%	0.40 - 0.44	1000 - 1630 $\pm$ 11%	80 - 330 $\pm$ 15%
46 - 73 ft DEEP	3820 - 4600 $\pm$ 10%	----	----	----	1720 - 2150 $\pm$ 06%	----

IBC VS100 = 1460 – 1575 feet/second Site Class C (very dense soil)

TABLE 7 – GEOPHYSICAL SURVEY RESULTS AT SODA MOUNTAIN NW AREA

TABLE 7A - REFRACTION COMPRESSIONAL WAVE VELOCITY CORRELATIONS WITH STRATIGRAPHY

PROFILE	DEPTH ¹ RANGE (feet)	ELEVATION ² RANGE (feet)	PROFILE DISTANCE (feet)	COMPRESSIONAL WAVE VELOCITY (feet/second)	STRATIGRAPHY ³
SR-02 AT BORING DYB10-02	0 – 6	1414-1408	0- 740 740-1035 1035-1495	1400 ± 09% 1750 ± 10% 1300 ± 09%	Dry, Unconsolidated (low blow counts 14), GRAVEL WITH SILT AND SAND (GP-GM)
	6 – 69	1408-1345	0- 380 380-1495	3800 ± 06% 3480 ± 07%	Dry, Partially Consolidated (blow counts 22->50), GRAVEL WITH SILT AND SAND (GP-GM)
	BELOW 69	BELOW 1345	0-1495	4600 ± 10%	Boring Did Not Extend Into This Zone - Probably Consolidated ALLUVIUM That Is Dry Because The Velocity Is Less Than The Speed Of Sound in Water (4900-5400 feet/second).
SR-05 AT BORING DYB10-05	0 – 4	1346-1342	0-1495	1350 ± 10%	Dry, Unconsolidated (low blow counts 15), GRAVEL WITH SILT AND SAND (GP-GM)
	4 – 46	1342-1300	0- 275 275- 565 565-1495	2860 ± 08% 2540 ± 07% 2860 ± 08%	Dry, Partially Consolidated (blow counts 21-31), GRAVEL WITH SILT AND SAND (GP-GM)
	BELOW 46	BELOW 1300	0-1495	4300 ± 08%	Boring Did Not Extend Into This Zone - Probably Consolidated ALLUVIUM That Is Dry Because The Velocity Is Less Than The Speed Of Sound in Water (4900-5400 feet/second).
SR-07 AT BORING DYB10-07	0 – 5	1411-1406	0-1495	1240 ± 10%	Dry, Unconsolidated (low blow counts 7-20), GRAVEL WITH SILT AND SAND (GP-GM)
	5 – 73	1406-1338	0- 320 320- 570 570-1495	2800 ± 08% 2560 ± 10% 2800 ± 08%	Dry, Partially Consolidated (blow counts 30->50), GRAVEL WITH SILT AND SAND (GP-GM)
	BELOW 73	BELOW 1338	0- 320 320- 570 570- 860 860-1160 1160-1495	4600 ± 08% 3820 ± 10% 4600 ± 08% 3670 ± 10% 4600 ± 08%	Boring Did Not Extend Into This Zone - Probably Consolidated ALLUVIUM That Is Dry Because The Velocity Is Less Than The Speed Of Sound in Water (4900-5400 feet/second).
SR-08 AT BORING DYB10-08	0 – 14	1449-1435	0-1495	1370 ± 11%	Boring Is About 666 feet from the profile so only approximate correlations are possible. Dry, Unconsolidated (low blow counts 8-30), GRAVEL WITH SILT AND SAND (GP-GM)
	14 – 20	1435-1429	0- 440 440-1190 1190-1495	2750 ± 09% 2170 ± 10% 2870 ± 09%	Dry, Partially Consolidated (blow counts 31->50), GRAVEL WITH SILT AND SAND (GP-GM)
	BELOW 20	BELOW 1429	0-1495	3250 ± 07%	Boring Did Not Extend Into This Zone - Probably Consolidated ALLUVIUM That Is Dry Because The Velocity Is Less Than The Speed Of Sound in Water (4900-5400 feet/second).
SR-09 AT BORING DYB10-09	0 – 9	1509-1500	0- 300 300- 660 660- 930 930-1495	1670 ± 12% 1360 ± 12% 1250 ± 12% 1360 ± 12%	Dry, Unconsolidated (low blow counts 23), GRAVEL WITH SILT AND SAND (GP-GM)
	9 – 51	1500-1458	0- 830 830-1300 1300-1495	3210 ± 08% 3430 ± 08% 3090 ± 10%	Dry, Partially Consolidated (blow counts 31->50), GRAVEL WITH SILT AND SAND (GP-GM)
	BELOW 51	BELOW 1458	0-1495	4600 ± 10%	Boring Did Not Extend Into This Zone - Probably Consolidated ALLUVIUM That Is Dry Because The Velocity Is Less Than The Speed Of Sound in Water (4900-5400 feet/second).

NOTE: 1. Depths and elevations are shown at each profile center.
2. Elevations are based on TOPO! Software (Wilson Geosciences, 02/26/10) at the profile ends.
3. Stratigraphy from Diaz Yourman & Associates (08/30/10 – 09/02/10) boring logs.

TABLE 7B - DOWNHOLE COMPRESSIONAL AND SHEAR WAVE VELOCITIES CORRELATIONS WITH STRATIGRAPHY

BORING	DEPTH RANGE (feet)	ELEVATION ¹ RANGE (feet)	DOWNHOLE WAVE VELOCITIES COMPRESSIONAL (feet/second)	SHEAR (feet/second)	POISSON'S RATIO	REFRACTION COMPRESSION VELOCITY (feet/second)	STRATIGRAPHY ²
B-02 IN BORING DYB10-02	0- 3	1414-1411	740 ±06%	330 ± 06%	0.38	1750 ±10%	Dry, Unconsolidated (low blow counts 14), GRAVEL WITH SILT AND SAND (GP-GM).
	3- 7	1411-1407	1170 ±08%	440 ± 08%	0.42	1750 ±08%	Dry, Partially Consolidated (blow counts 22), GRAVEL WITH SILT AND SAND (GP-GM).
	7 -18	1407-1396	2440 ±09%	790 ± 10%	0.44	3840 ±07%	Dry, Partially Consolidated (blow counts >50) GRAVEL WITH SILT AND SAND (GP-GM). Boring Bottom is 21 feet.
B-09 IN BORING DYB10-09	0- 3	1519-1516	600 ±06%	200 ± 06%	0.44	1670 ±12%	Dry, Unconsolidated (low blow counts 23), GRAVEL WITH SILT AND SAND (GP-GM).
	3-16	1516-1503	2180 ±10%	900 ± 18%	0.40	3210 ±08%	Dry, Partially Consolidated (blow counts 18->50), GRAVEL WITH SILT AND SAND (GP-GM).

NOTE: 1. Elevations are based on TOPO! Software (Wilson Geosciences, 02/26/10) at the refraction profile ends.
2. Stratigraphy from Diaz Yourman & Associates (08/30/10 – 09/02/10) boring logs.

TABLE 7 – GEOPHYSICAL SURVEY RESULTS AT SODA MOUNTAIN NW AREA (Continued)

TABLE 7C - SURFACE WAVE SHEAR VELOCITY CORRELATIONS WITH STRATIGRAPHY

SOUNDING	DEPTH RANGE (feet)	ELEVATION ¹ RANGE (feet)	SHEAR WAVE VELOCITY (feet/second)	DOWNHOLE SHEAR WAVE VELOCITY (feet/second)	STRATIGRAPHY ²
SW-03 AT BORING DYB10-03 IBC VS100 ³ 1575 ft/sec SITE CLASS C	0- 6	1517-1511	690 ± 14%	None	Dry, Unconsolidated (low blow counts 13-20), GRAVEL WITH SILT AND SAND (GP-GM) .
	6-13	1511-1504	1000 ± 11%	None	Dry, Partially Consolidated (blow counts 38), GRAVEL WITH SILT AND SAND (GP-GM) and SILTY SAND (SM) WITH GRAVEL (blow counts 30->50).
	13-21	1504-1496	1380 ± 08%	None	Dry, Partially Consolidated SILTY SAND (SM) WITH GRAVEL (blow counts >50). Boring Bottom is 19.5 feet.
	21-31	1496-1486	1500 ± 07%	None	Probably Dry, Partially Consolidated ALLUVIUM .
	31-42	1486-1475	1630 ± 06%	None	Probably Dry, Consolidated ALLUVIUM .
	42-54	1475-1463	1780 ± 06%	None	Probably Dry, Consolidated ALLUVIUM .
	54-68	1463-1449	1960 ± 06%	None	Probably Dry, Consolidated ALLUVIUM
	BELOW 68	BELOW 1449	2130 ± 06%	None	Probably Dry, Consolidated ALLUVIUM
SW-11 AT BORING DYB10-11 IBC VS100 ³ 1460 ft/sec SITE CLASS C	0- 8	1512-1504	660 ± 15%	None	Dry, Unconsolidated (low blow counts 8-30), GRAVEL WITH SILT AND SAND (GP-GM) .
	8-20	1504-1492	1180 ± 09%	None	Dry, Partially Consolidated (blow counts 31->50), GRAVEL WITH SILT AND SAND (GP-GM) . Boring Bottom is 19.5 feet.
	20-35	1492-1477	1430 ± 07%	None	Probably Dry, Partially Consolidated ALLUVIUM
	35-53	1477-1459	1630 ± 06%	None	Probably Dry, Consolidated ALLUVIUM .
	53-75	1459-1437	1720 ± 06%	None	Probably Dry, Consolidated ALLUVIUM
	BELOW 75	BELOW 1437	2150 ± 06%	None	Probably Dry, Consolidated ALLUVIUM .

NOTE: 1. Elevations are based on TOPO! Software (Wilson Geosciences, 02/26/10) at the sounding array center.
2. Stratigraphy from Diaz Yourman & Associates (08/30/10 – 09/02/10) boring logs.
3. International Building Code (IBC) average shear velocity (VS) for 100 feet of depth was calculated following the procedures described by International Code Council (2003). The surface wave survey did not penetrate to 100 feet. A conservative estimate of the VS100 was made by extending the deepest velocity zone down to 100 feet.

TABLE 7D - ELECTRICAL RESISTIVITY CORRELATIONS WITH STRATIGRAPHY

SOUNDING	DEPTH ¹ RANGE (feet)	ELEVATION ² RANGE (feet)	COMPOSITE ELECTRICAL RESISTIVITY ¹ (Ohm meters)	STRATIGRAPHY ³
DC-02 AT BORING DYB10-02	0- 3	1414-1411	1000 ± 15%	Dry, Unconsolidated, GRAVEL WITH SILT AND SAND (GP-GM)
	3- 7	1411-1407	310 ± 15%	Dry, Unconsolidated, GRAVEL WITH SILT AND SAND (GP-GM)
	7-17	1407-1397	80 ± 15%	Dry, Partially Consolidated, GRAVEL WITH SILT AND SAND (GP-GM)
	17-About 40	1397 – About 1374	330 ± 15%	Boring Only Extended 4 feet Into This Zone - Probably Partially Consolidated GRAVEL WITH SILT AND SAND (GP-GM) .

NOTE: 1. Depths, elevations, and resistivities are from composite models of the NW-SE and NE-SW arrays at each location.
2. Elevations are based on TOPO! Software (Wilson Geosciences, 02/26/10) at the array centers.
3. Stratigraphy from Diaz Yourman & Associates (08/30/10 – 09/02/10) boring logs.

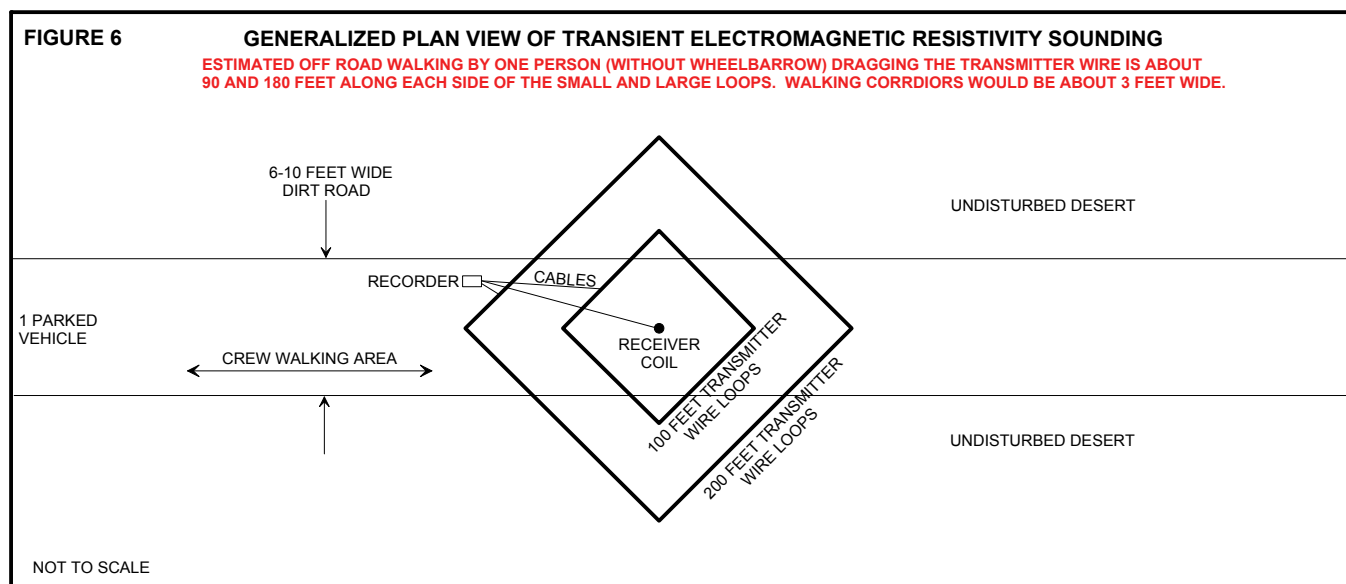
5.0 DESCRIPTION OF GEOPHYSICAL SURVEY PROCEDURES

All instruments were maintained according to the manufacturer's specifications and were functionally checked daily before data collection began. Equipment specifications, battery conditions, and problems were recorded in the daily activity log. (These logs were mailed weekly to Wilson Geosciences Inc.) This project was completed in accordance with RMT specifications, *TERRA PHYSICS* Standard Operating Procedures (2008) which are in accordance with the California Department of Health Services Standards (2008), U.S. Army Corps of Engineers Manual (2005), and appropriate ASTM guidelines.

Boring and refraction profile ends were staked using approximate geodetic coordinates (TOPO! Software) from Wilson Geosciences Inc. A Trimble (2001) model AG-114 GPS instrument was used to determine more precise locations. Real time differential corrections were provided by the OMNISTAR satellite. The geodetic coordinates (latitude and longitude) measured with the GPS were converted to California State Plane Zone 0405 (feet) using the NAD83 horizontal and NAVD88 vertical datum with the U.S. Army Corps Of Engineers (2007) program 'CORPSCON'. The final location data have an estimated uncertainty of ± 2 feet. Elevations of borings and profile ends were based on TOPO! Software maps (Wilson Geosciences, 02/26/10) and have an estimated uncertainty of ± 1 foot.

5.1 Transient Electromagnetic (Electrical Resistivity) Sounding

TEM soundings delineated vertical changes in soil electrical resistivity to depths of about 350 feet at three designated locations (near Borings DYB10-02, 09, and 11). Each sounding consists of two transmitter loops (shallow and deep penetration) measured one at a time. These loops were laid out within existing roads as shown in Figure 6. ASTM D6820-07 (2007) procedures were followed.



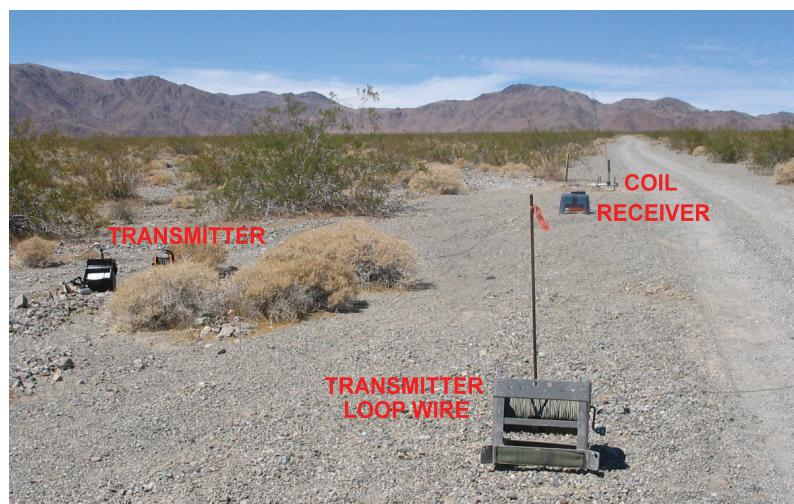
Equipment for collecting TEM data consists of a transmitter connected to a loop of wire and a receiver connected to a small coil (Geonics, 2005). A Geonics model EM-47 transmitter (Geonics Limited, 2005) that supplied electrical signals with repetition rates of 285, 75, and 30 Hz. This transmitter was connected to square loops of wire with side length of 100 and 200 feet. Loop corners were

established with a Pentax Total Station (2005). Estimated location uncertainty is ± 0.1 foot. Output current signal from the transmitter was read directly from the meter dial within $\pm 1\%$ uncertainty.

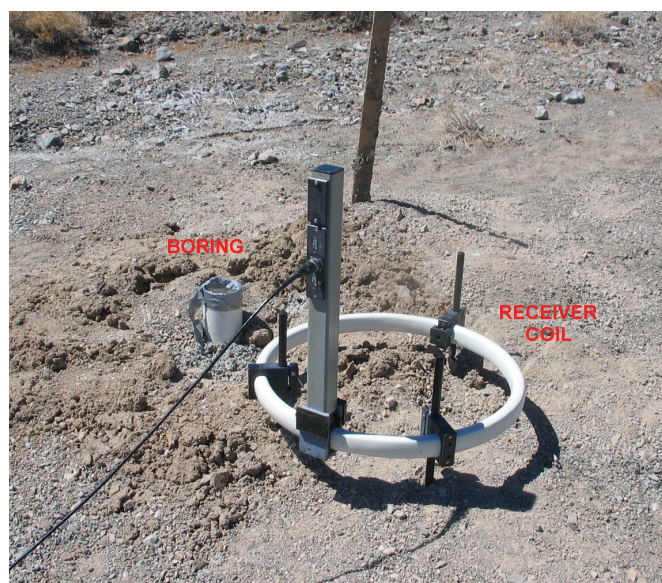
The data were recorded with a Geonics model 'PROTEM RX-D' digital receiver (Geonics Limited, 2005). The receiver was connected to a high frequency, vertical dipole coil. The receiver measured, stored, and displayed the decay data to within $\pm 1\%$ uncertainty. Total uncertainty of the TEM system is estimated at $\pm 2\%$. Data files are automatically stored on an internal hard drive and transferred to a disk for future processing.

Data collection/measurement procedures followed these steps. The transmitter was connected to the small loop, the 287 cycle repetition rate was selected, and the current flow and turn-on time were read from the transmitter. The receiver coil was positioned at the center of the transmitter loop. To measure the vertical resistivity section, the coil was laid on the ground and leveled so the dipole was vertical. The receiver was set to the transmitter repetition rate and the integration time was set long enough to record and stack at least 600 measurements to improve the signal-to-noise ratio. The stacked decay curve was observed on the receiver display and its quality checked. If the curve was not coherent and smoothly continuous downward, then the instruments were reset and the measurements were repeated. Three independent data sets were recorded for the first repetition rate to statistically determine measurement repeatability. This process was repeated for the other two repetition rates (75 and 30 cycles). Data quality was continuously monitored on the LCD screen during collection.

When the small loop measurements were finished, it was removed, and the large transmitter loop installed. The same measurement process was used for this loop.



TEM INSTRUMENTS



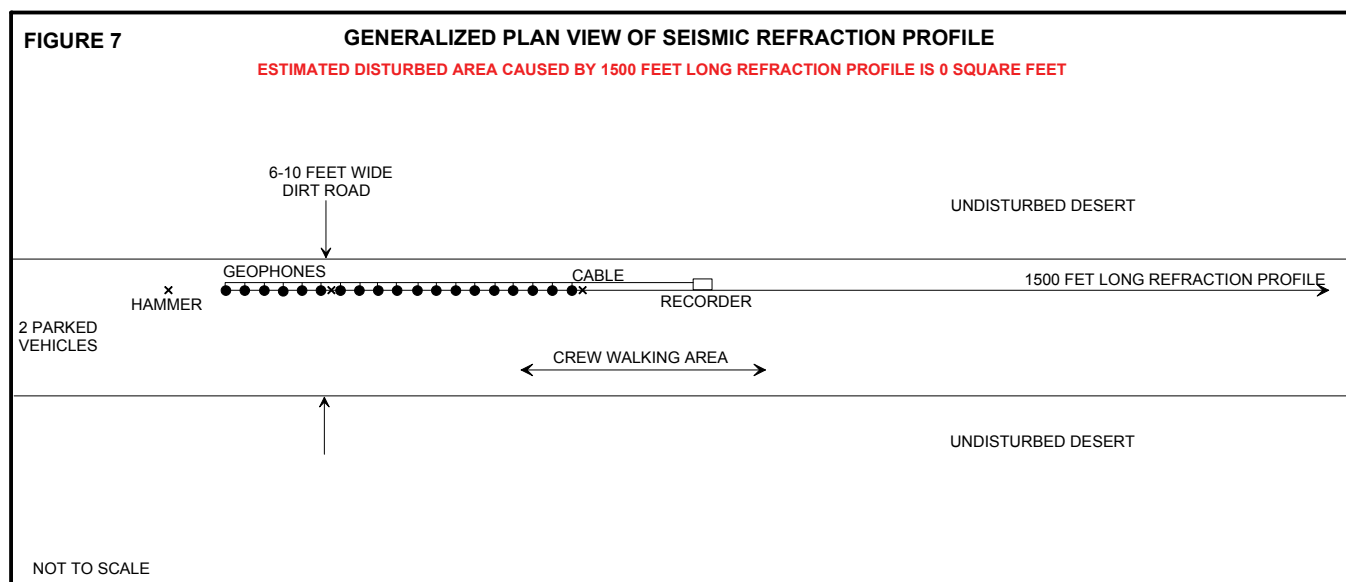
TEM RECEIVER COIL

Daily, the data were transferred to micro computer using the "PROTEM" software (Geonics Limited, 1993). The "TEMIXXL" software (Interpex, Limited, 2008) was used to edit each decay curve and average together all data sets for each loop size that were recorded with the same repetition rate and calculate the average apparent resistivity values.

Apparent resistivity data curves are shown on the left graphs in Figures 3A, 3B, and 3C. The 20 small squares are data points recorded at specific time gates along the decay curve. Data at longer measurement time represent deeper subsurface conditions. The data sets were input to "TEMIXXL" (Interpex, Limited, 2008) to obtain an estimate of depth penetration. The program calculates the apparent resistivity curve from the decay curves using the late-time approximation (Stoyer, 1990). A geoelectric model of resistivity layers with varying thicknesses is developed that yields a calculated, apparent resistivity curve matching the observed data curve within a specified tolerance (usually 10%). The model is interactively changed until the two curves match. Figures 3A, 3B, and 3C right graphs shows the final model parameters which show at least 332 feet of penetration was achieved. The solid red line in the figure represents the mathematically optimum geoelectric model. The dash blue lines represent equivalence models that produce similar data sets as the observed data. Layer resistivity and depth uncertainties can be estimated from the deviation between the optimum and equivalence models. Model parameters are listed in Table 2.

5.2 Seismic Refraction (Compressional Wave Velocity) Profiling

Refraction profiles delineated vertical and lateral changes in compressional velocities to depths of about 50 feet at six designated locations in the SE Area (near Borings DYB10-06, 10, 11, 12, 13, and 14). Each 1495 feet long profile consisted of five end-to-end spreads (each 299 feet long). Each spread consisted of 24 receiver (geophones) spaced 13 ± 0.1 feet apart. This geometry provided good lateral resolution. All spreads were laid out on the edge of existing roads in relatively undisturbed soil as shown in Figure 7, except for SR-13 and SR-14. There were no nearby roads so the instruments were placed in wheel barrows and manually pushed along the profile. ASTM D5777-08 (2008) procedures were followed.

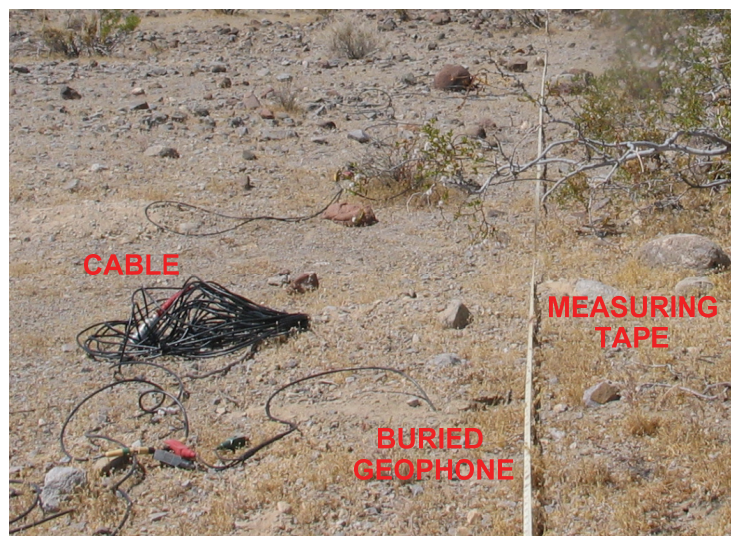


Equipment consists of a seismic wave energy source, geophones for sensing the refracted seismic waves, and a recording system. A 20-pound sledgehammer was used as the seismic source. Hammer impact points were located at every eighth geophone in each spread and about 70 feet off each spread end to increase penetration. Hammer was fitted with a timing circuit that sends an electrical signal to the recorder at the instant of wave generation (uncertainty ± 0.00001 seconds). Between 12 and 15 individual hammer blows at each source point were stacked together to improve signal-to-noise ratio and minimize background noise. Data were continuously monitored during collection to obtain the best quality possible.

Seismic waves were sensed by vertically oriented, Mark Products model L-28 land geophones (damped 28 Hz resonant frequency). The geophones were fitted with small metal spikes that were forcibly pushed into the ground and buried to improve coupling, reduce wind noise, and improve data quality. Geophone and source point locations have an estimated uncertainty of ± 0.1 feet along the measuring tapes stretched along the profile. Elevations of geophones and source points were measured with a Pentax, Incorporated (2005) model PTS-III₁₀ total station using standard surveying procedures.

The geophones' electrical signals were input to a Geometrics model R-48 (S/N 37951) seismograph running software version V4.6 (Geometrics, 2001). This system has one of the largest dynamic ranges of any engineering seismograph. The system is capable of filtering, processing, displaying, and recording 24 channels of data simultaneously. Data were recorded on the internal hard disk and then transferred to PC for later processing. Hard copy records were made during data collection to evaluate data quality and adjust measurement parameters when necessary. Records were labeled with project name and number, profile number, shot point number, source type, time, date, and operator's initials.

At the beginning of data collection, a functional calibration test was performed to check the systems timing line accuracy. An external 100 kHz pulse generator was connected to the geophone input terminal of the seismograph. A record was made of the 0.001 second period pulse. Pulse width compared within $\pm 1.2\%$ to the timing line spacing.



REFRACTION GEOPHONE AND CABLE



SEISMIC ENERGY SOURCE

The refraction interpretation process used the 'SEISIMAGER' software package (Geometrics, 2008). The first step in data reduction was to identify the first seismic wave arrival at each geophone. First arrivals represent compressional waves, the fastest traveling waves through geologic materials. Arrivals usually appeared as rather obvious upward excursions of the recording traces from their rest positions and were well defined at this site. Arrivals were digitally marked on the records and the time required for the wave traveling from the source point (start of the record) to each geophone was measured within ± 0.00025 seconds. Travel time repeatability between multiple records made at the same shot point was within ± 0.0006 seconds. All reciprocal times between source point pairs were within ± 0.0015 seconds (less than $\pm 3.7\%$ of the longest times) indicating reliable first arrival timing.

The measured travel times for each profile were plotted versus source point-to-geophone distances. Next, these data points were grouped into line segments (labeled on the graphs as numbers) representing subsurface velocity zones. Inverse slopes of these regression lines equal the zone's

apparent velocities. True velocities were calculated as the harmonic mean and with the Hobson/Overton method (Geometrics, 2008) from the individual apparent velocities. Velocity uncertainty was determined from measurement parameters uncertainties and ranged between $\pm 7\%$ and $\pm 14\%$.

Boundaries between the velocity zones were calculated using true velocities and travel time delays with ray tracing techniques (Geometrics, 2008). This calculation method assumes the material boundaries are dipping, slightly irregular, undulating layers that are a valid assumption for stratigraphy at this site. Interpreted subsurface velocity models (Figures 4A, B, C, D, E, and F for the SE Area and Figures 5A, B, C, D, and E for the NW Area) have no vertical exaggeration so true boundary dips are shown. The vertical axis is shown as elevation instead of depth so velocity sections can be directly compared. Elevation uncertainties were determined from velocity uncertainties and modeling scatter of the boundaries and ranged between $\pm 7\%$ and $\pm 14\%$. Interpreted zones are described in Tables 4 and 7.

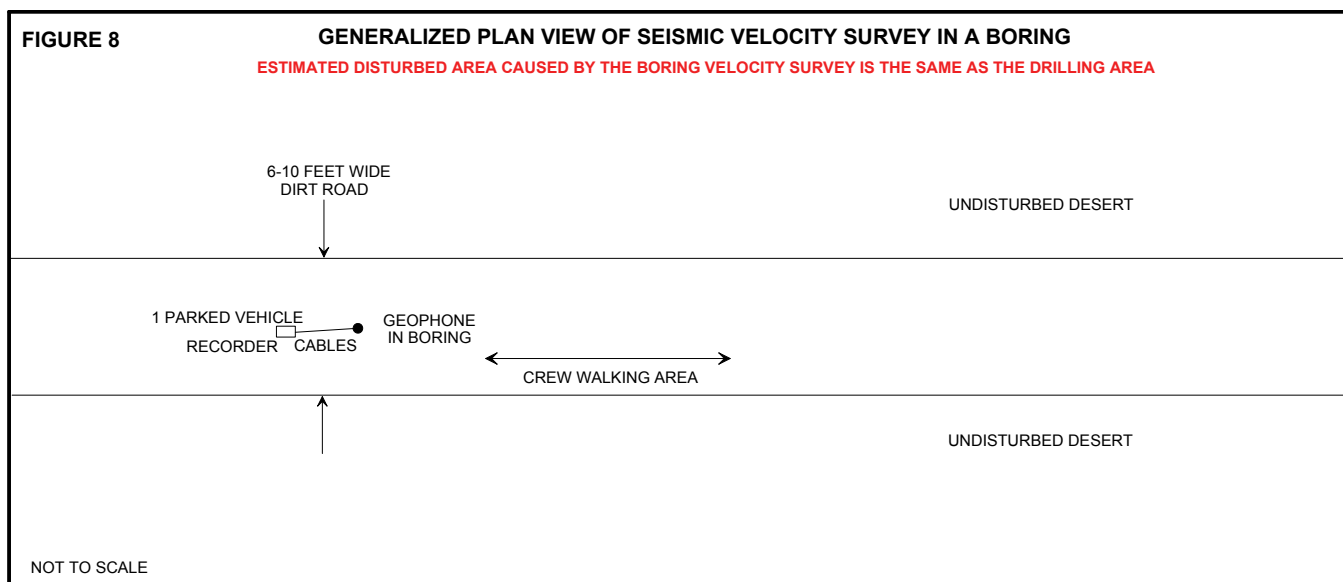
Profile SR-08 in the NW Area did not directly detect the deepest 4300-4600 feet/second velocity zone that the other four profiles did delineate. An exclusion depth for this layer was estimated for SR-08 by artificially adding it to the model at 120 feet deep. This zone was gradually raised until the synthetic travel time data began to mismatch with the observed data. At a depth of about 90 feet, this layer caused a significant change in the synthetic curve that probably would have been identified as another velocity zone. Therefore, if the 4300-4600 feet/second layer exists at SR-08, its surface would have to be at least 90 feet.

5.3 Seismic Downhole (Compressional And Shear Wave Velocities) Sounding

Seismic velocity survey in borings delineated vertical changes in compressional and horizontally polarized shear velocities in two designated borings in the SE Area (DYB10-10 and 12) and two borings in the NW Area (DYB10-03 and 08). Penetration was limited by the boring depths (between 14 and 21 feet). Surveys were planned for Borings DYB-05 and 07 in the NW Area but recent flooding prevented access to them. The borings were cased with 4 inch PVC and the annular space backfilled with bentonite to prevent air voids. Survey activities were within existing roads as shown in Figure 8. ASTM D7400 (2004) procedures were followed.

Equipment consists of the same seismic wave energy source and recording system described in Section 5.2. Seismic waves were sensed by a Mark Products sonde consisting of three mutually perpendicular geophones (damped 4.5 Hz resonance frequency). The sonde has a 2.4 feet long weight and side spring that locks it to the casing so seismic waves is reliably recorded.

The sonde was lowered into the casing until the weight bottom rested on the casing bottom. The deepest measurement is 2.4 feet (weight/spring length) above the casing bottom. The following procedures were performed at 2.5 feet intervals in the boring. Measurement depths of the geophones were relative to the ground surface at the boring (not the casing top) and have an estimated uncertainty of ± 0.1 foot.



GEOPHONE SONDE

Compressional waves were recorded with vertical hammer hits on a metal plate located 3.0 ± 0.1 feet from the casing center. (Offset distance provided a straight path for wave travel through relatively undisturbed soil.) The largest amplitude compressional waves were recorded by the vertically oriented geophone below depths of five feet because it is roughly parallel with the hammer hit direction. Shallower than ten feet, waves arrived on the vertically and horizontally oriented geophones at about the same time.

Horizontally polarized shear waves were initially generated with horizontal hits on the ends of a beam lying on the ground at the same distance of 3.0 ± 0.1 feet from the boring. The hammer person stood on the beam to provide solid coupling to the ground. A hammer hit on the beam's west end produces a horizontally polarized shear wave. A hit on the east end produces a shear wave with reversed polarity. Comparing data from both hits helped identify the reversed shear wave arrivals that occur

within the compressional wave decay trend. Generally, shear waves have large amplitudes and long time periods.

Data quality was continuously monitored during data collection to minimize the detrimental effects of the background vibrational noise (wind). Both wave arrivals were identified on the data records and their travel time from the seismic source measured with an estimated uncertainty of ± 0.0001 seconds. The slant travel paths from source to the geophones were calculated within ± 0.1 feet. The raw travel times along the slant path were converted to the equivalent times for a vertical travel path so a vertically incident profile can be presented. The data were plotted during acquisition to ensure reliable identification of the shear waves. The data are shown as small symbols (red for compressional and blue for shear wave arrivals) in Figures 4G and H for the SE Area and Figures 5F and G for the NW Area.

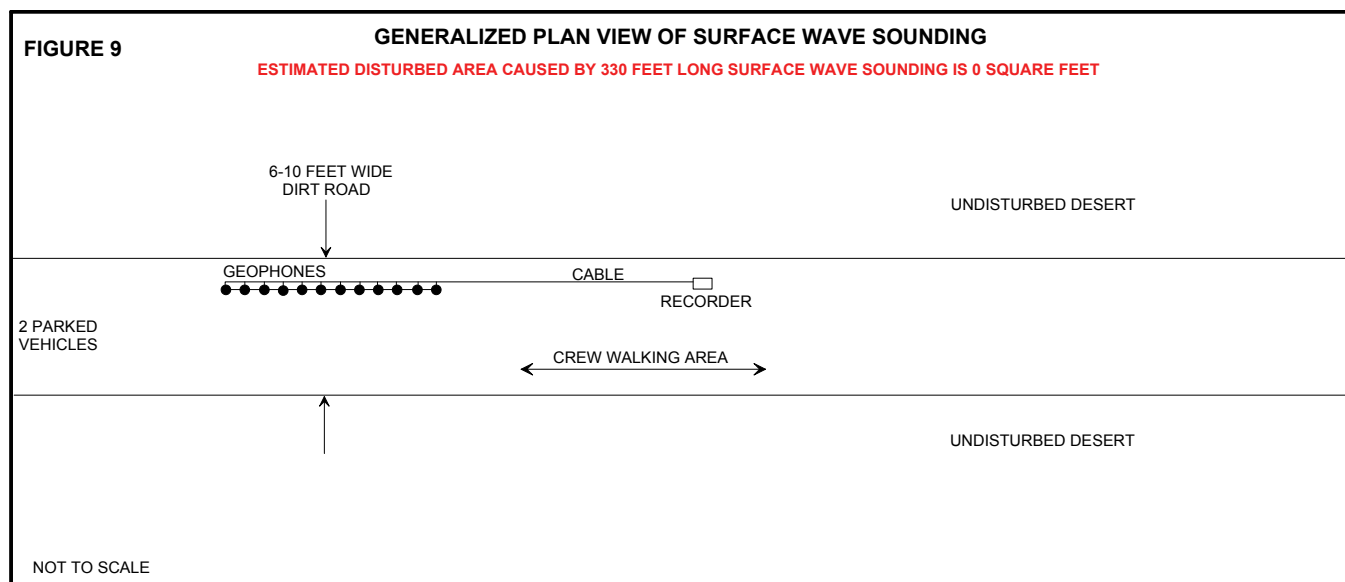
Regression lines fitted along these data points were interpreted to represent subsurface velocity zones. The inverse slopes of these lines (seismic velocities) were rounded to the nearest ten feet/second. The velocity uncertainty range was estimated by the regression line variance caused by data scatter. Stratigraphy descriptions and blow counts (Diaz Yourman & Associates, 2010) are shown in the right graphs of these figures and in Tables 4 and 7. At Borings DYB10-02, 09, 10, and 12, the compressional velocity vertical profiles were measured by downhole and refraction surveys. The slight compressional velocity variances were probably caused by the refraction method averaging across the 299 feet long geophone array instead of the small soil volume measured by the downhole method.

5.4 Seismic Surface Wave (Shear Wave Velocity) Sounding

Surface Wave soundings delineated vertical changes in shear velocities to depths of about 100 feet at four designated locations in the SE Area (Borings DYB10-10, 11, 13, and 14) and two locations in the NW Area (Borings DYB10-03 and 08). This method provided shear velocity vertical profiles at much greater depths than the downhole velocity surveys in shallow borings. Each sounding consisted of three collinear geophone arrays. Two active hammer source arrays consisted of 16 geophones spaced 2 ± 0.08 feet apart (shallow penetration) and spaced 10 ± 0.08 feet apart (medium penetration). One passive micro tremor source array used the medium array geometry. All spreads were laid out on the edge of existing roads in relatively undisturbed soil as shown in Figure 9. There are no ASTM procedures for Surface Wave soundings so the U.S. Army Corps Of Engineers (2005) procedures were used.

Equipment consists of the same seismic wave energy source and recording system described in Section 5.2. Seismic waves were sensed by Mark Products L4 geophones (damped 4.5 Hz resonance frequency). Lower frequency is needed for deeper penetration.

Active source data measurements consisted of constructing the shallow penetrating array and recording data from seismic energy source points located 2 and 10 feet off both sounding ends. Only one hammer hit is used per data record to prevent smearing high frequency signals by stacking multiple hits. This array responds primarily to short wavelength (high frequency) signals. Penetration is probably about 10 feet. Data is then recorded with the medium array and source points located 10 and 60 feet off both



sounding ends. Generally, 3-4 hammer hits are stacked to improve the signal-to-noise ratio. These lower frequency signals will not smear with stacking. The long array probably penetrates about 50 feet.

Passive source data uses the medium array to record very long wavelength micro tremors. No hammer source is used. Thirty five data records each measuring about 20 seconds of background vibrations are stacked. Penetration is about 100 feet.

The surface wave interpretation process used the 'SEISIMAGER' software package (Geometrics, 2008). The first step in data reduction is to edit the data and calculate a dispersion curve of seismic phase velocity versus frequency for each record. These curves are edited and combined to form a composite curve of both active and passive source data. Initial model of vertical shear velocity zones is constructed and a synthetic dispersion curve is calculated. This curve is compared to the observed data, adjustments are made to the initial shear velocity model and a new synthetic dispersion curve is calculated. This process continues until an acceptable dispersion curve match is achieved between the synthetic and observed curves (generally within $\pm 10\%$).

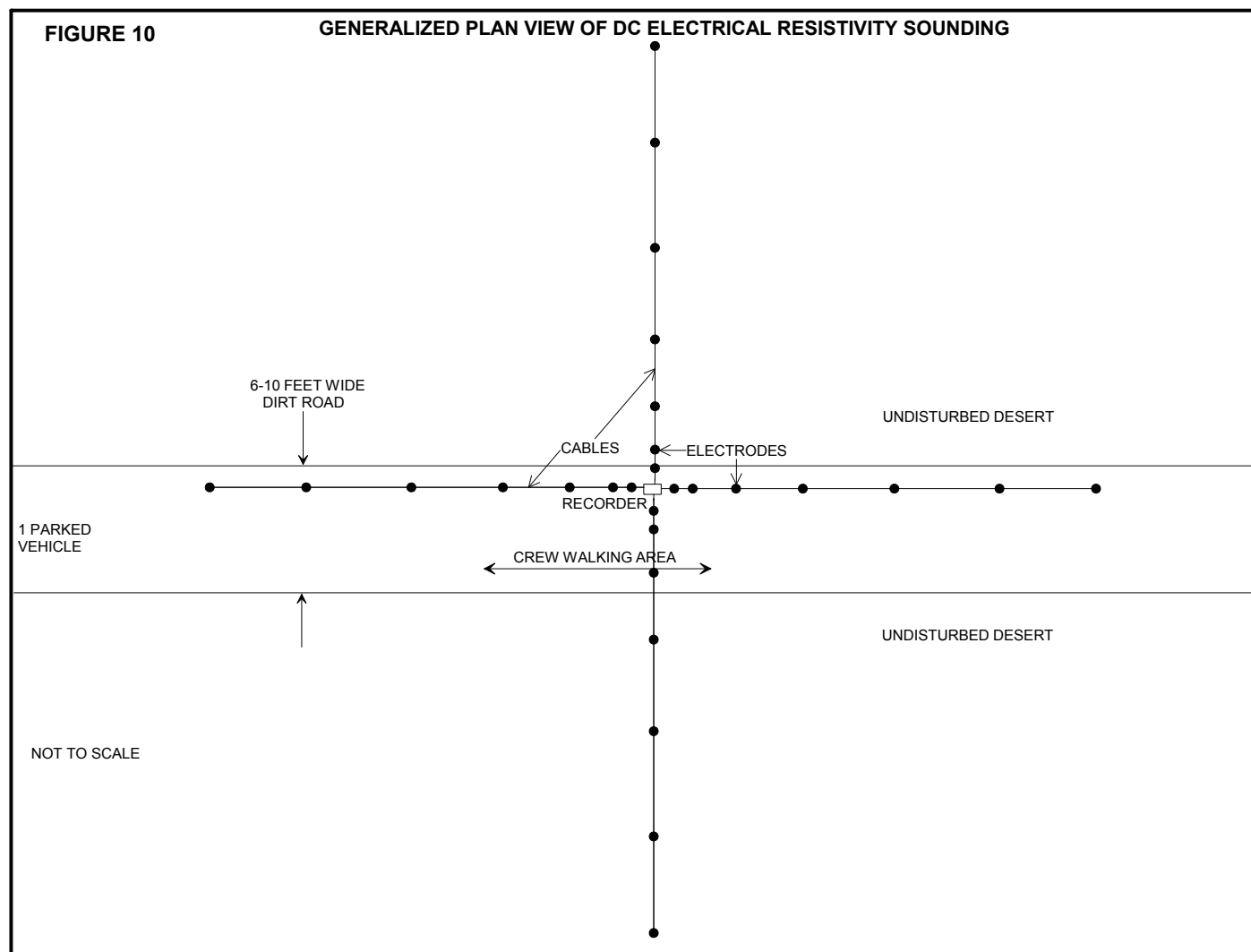
Interpreted shear velocity models are shown in Figures 4I, J, K, and L for the SE Area and Figures 5H and I for the NW Area. The vertical axis is shown as depths and elevations so velocity soundings can be directly compared. Velocity uncertainties are estimated from synthetic dispersion curve mismatch with the observed data and ranged between $\pm 6\%$ and $\pm 10\%$. Velocity models are described in Tables 4 and 7. At Boring DYB10-10, the shear velocity vertical profile was measured by surface wave and downhole surveys. The slight shear velocity variances were probably caused by the surface wave method averaging across the 150 feet long array instead of the small soil volume measured by the downhole method.

5.5 Direct Current Electrical Resistivity Sounding

Electric resistivity soundings delineated vertical changes in soil resistivities to depths of about 40 feet at Boring DYB10-12 in the SE Area and Boring DYB10-02 in the NW Area. At each location, two mutually perpendicular 180 feet long electrode arrays measured soil resistivity anisotropy. Five measurements at

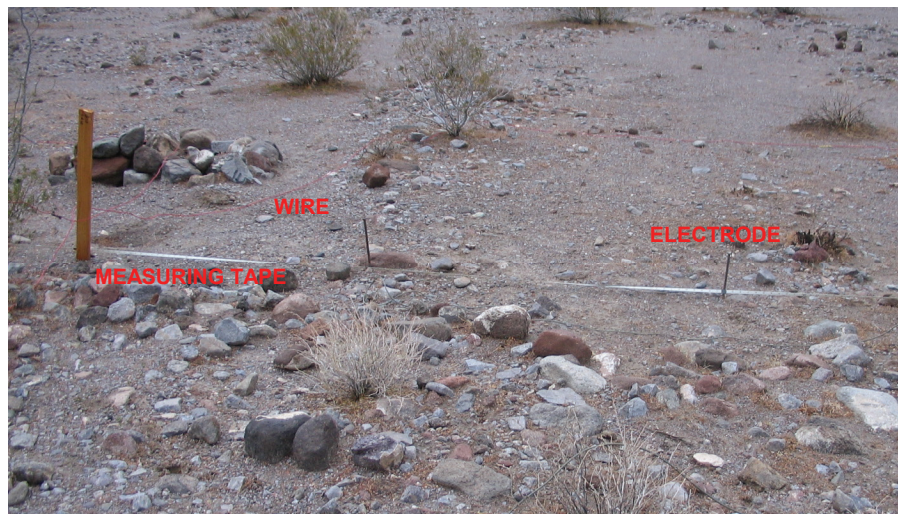
increasingly larger electrode spacings ($a = 5, 10, 20, 40$, and 60 feet) were made along each array according to ASTM G57 Wenner array procedures (Figure 10). All equipment was manually carried off road to minimize surface disturbance.

Equipment for collecting direct current resistivity data consists of a MINIRES meter (L&R Instruments, 2005) connected to four equally spaced metal electrodes inserted into the ground. The meter was functionally checked before and after each sounding using three calibration resistors. Resistance repeatability was within $\pm 0.05\%$. Total uncertainty of the meter is estimated at $\pm 1\%$. Estimated uncertainty of the electrode positions is ± 0.1 foot.



Measuring procedure followed the ASTM guidelines and IEEE Standard 81-1983 (The Institute of Electrical And Electronics Engineers, Inc. (1984). Electrodes were hammered into the ground only 0.25 feet, as required. The outer two current electrodes were connected to the meter's transmitter and the inner electrodes to the meter's voltage input. Connecting cables were cut to the exact lengths to avoid coiling, as required. Transmitter and receiver cables were separated by more than 10 feet at all times to prevent signal cross coupling. Three independent readings were made for each

electrode spacing to provide statistically reliable data. All four electrodes were then moved to the next spacing. instruments were reset and the measurements were repeated.



DC RESISTIVITY MEASUREMENT ARRAY



DC RESISTIVITY INSTRUMENT

Apparent resistance data and calculated resistivities are shown in the top graph and are plotted in the center graph of Figures 4M and 5J, as required by IEEE Standard 81-1983. Each data set was input to "IX1D" (Interpex, Limited, 2006) to obtain a geoelectric model of resistivity layers with varying thicknesses. Model iterations continue until the calculated synthetic apparent resistivity curve matching the observed data curve within a specified tolerance (usually 10%). The model is interactively changed until the two curves match. Models for the two arrays at each sounding were very similar and were combined into a final geoelectric model (lower table in the figures). Penetration of about 40 feet was achieved. Layer resistivity and thickness uncertainties were estimated from the mismatch between synthetic and observed data. Correlations between electrical resistivities and stratigraphy were developed and are described in Tables 4 and 7.

6.0 REFERENCES

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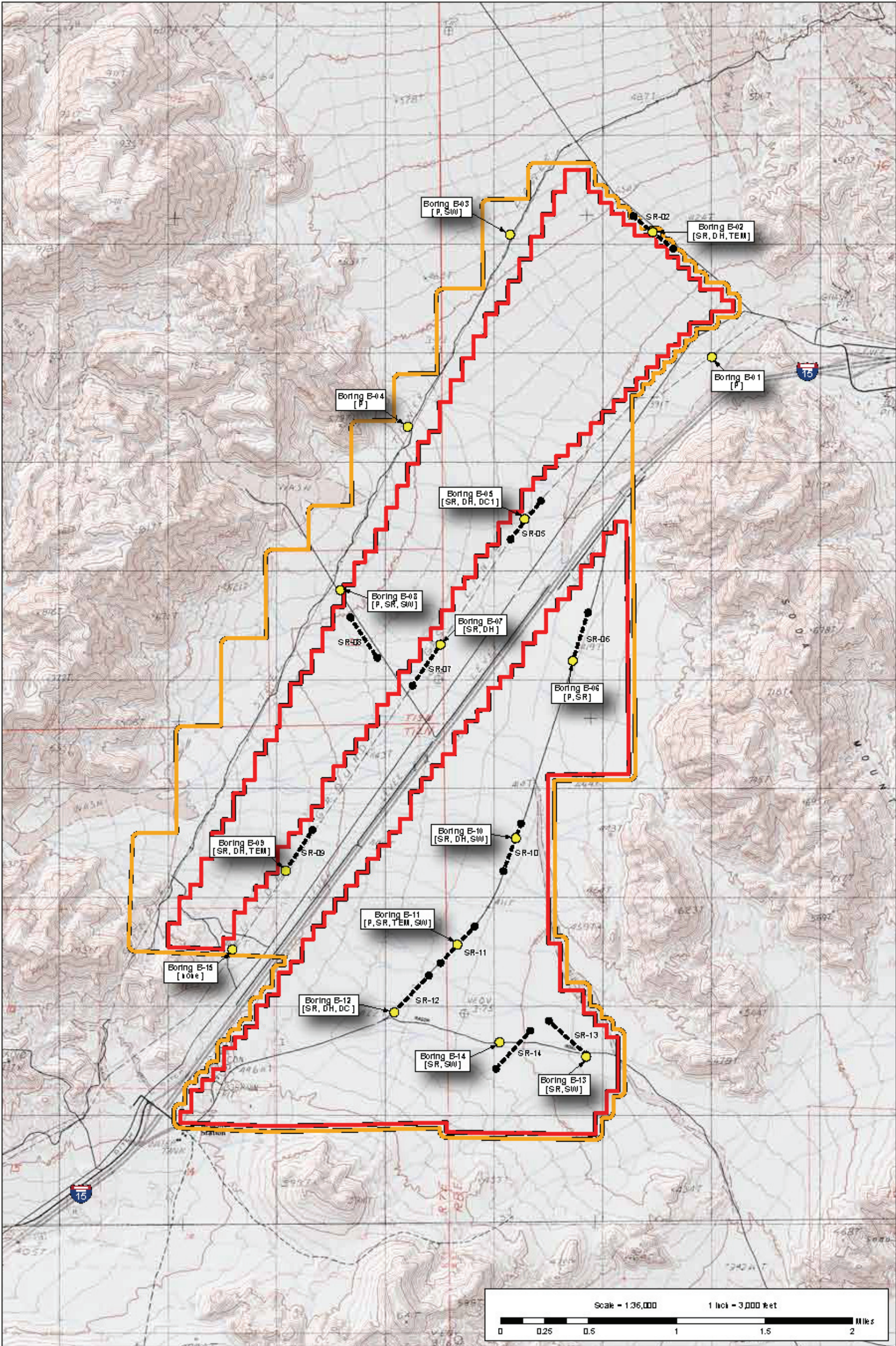
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FIGURE 1
SODA MOUNTAIN PROJECT SITE MAP
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Figure A: Project Area Field Investigation Locations



SOURCE: Wilson Geosciences 2010, BLM 2004, ESRI 2010, and RMT, Inc. 2010

LEGEND



- Interstate Highway
- Project Boundary
- Survey Boundary

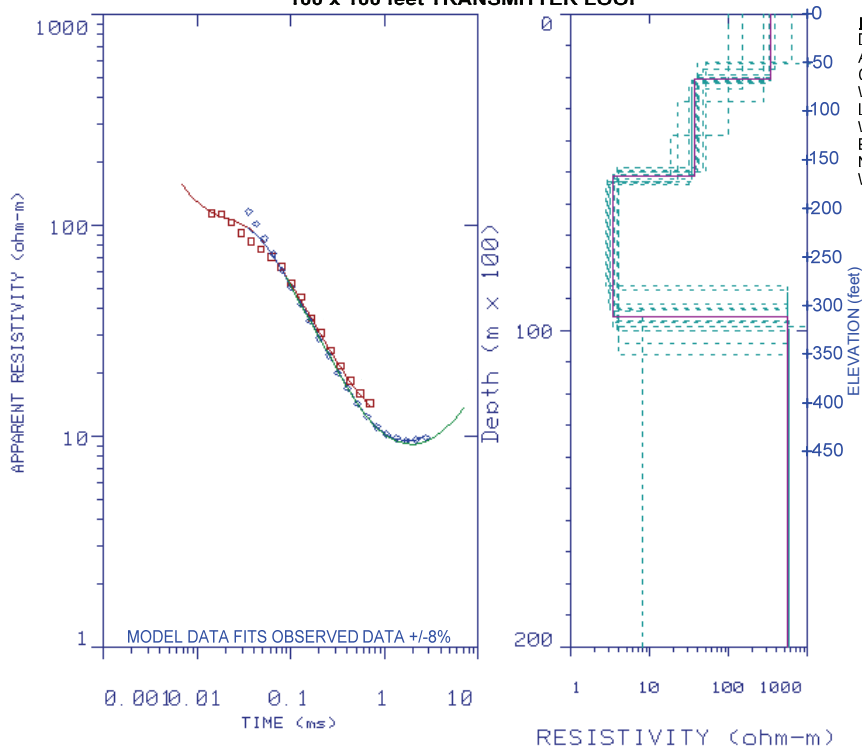
- Borehole
- Seismic Refraction Profile

- Geotechnical and Geophysical Task Explanation
- SR - Seismic Refraction Profile
 - P - Percolation Test
 - DH - Down Hole Seismic Profile
 - DC - Direct Current (DC) Resistivity Sounding
 - TEM - Transient Electromagnetic Resistivity Sounding
 - SW - Surface (Shear) Wave Sounding



FIGURE 2
GEOPHYSICAL SURVEY LOCATION MAP
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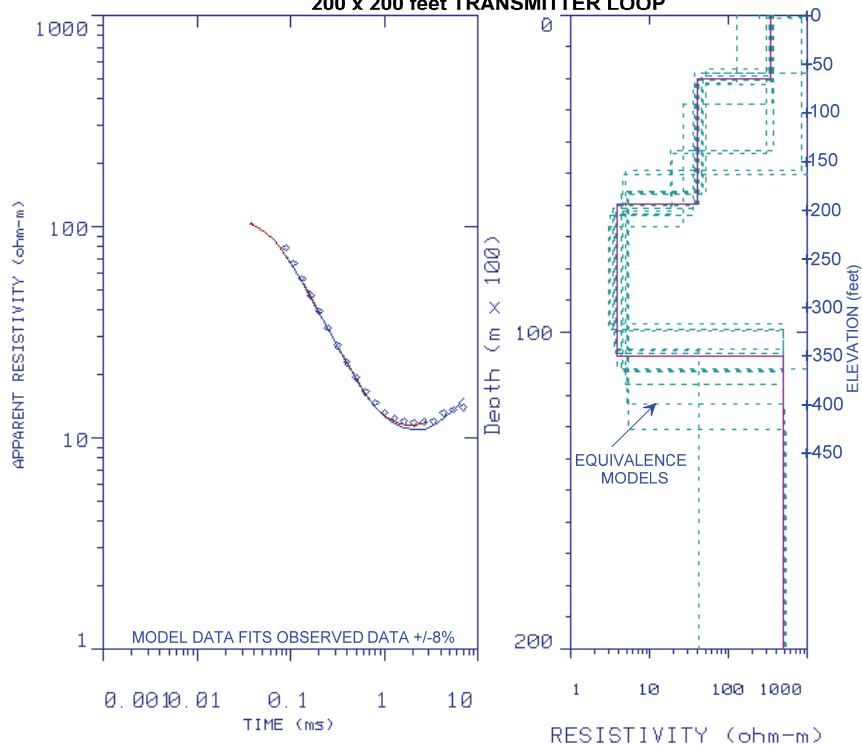
SHALLOW PENETRATION DATA 100 x 100 feet TRANSMITTER LOOP



EXPLANATION

DATA RECORDED WITH A GEONICS TEM-47 TRANSMITTER AND A DIGITAL PROTEM RECEIVER WITH A HIGH FREQUENCY COIL ON 9/15/10. TWO TRANSMITTER LOOPS WERE USED. HIGHER RESOLUTION, SHALLOW PENETRATING LOOP WAS 100 X 100 FEET. THE DEEPER PENETRATING LOOP WAS 200 X 200 FEET. BOTH LOOPS WERE CENTERED ON BORING DYB10-02 (N35.207083, W116.160444). THERE WERE NO NEARBY ELECTRIC LINES, PIPELINES, OR FENCES THAT WOULD DEGRADE DATA QUALITY.

DEEP PENETRATION DATA 200 x 200 feet TRANSMITTER LOOP

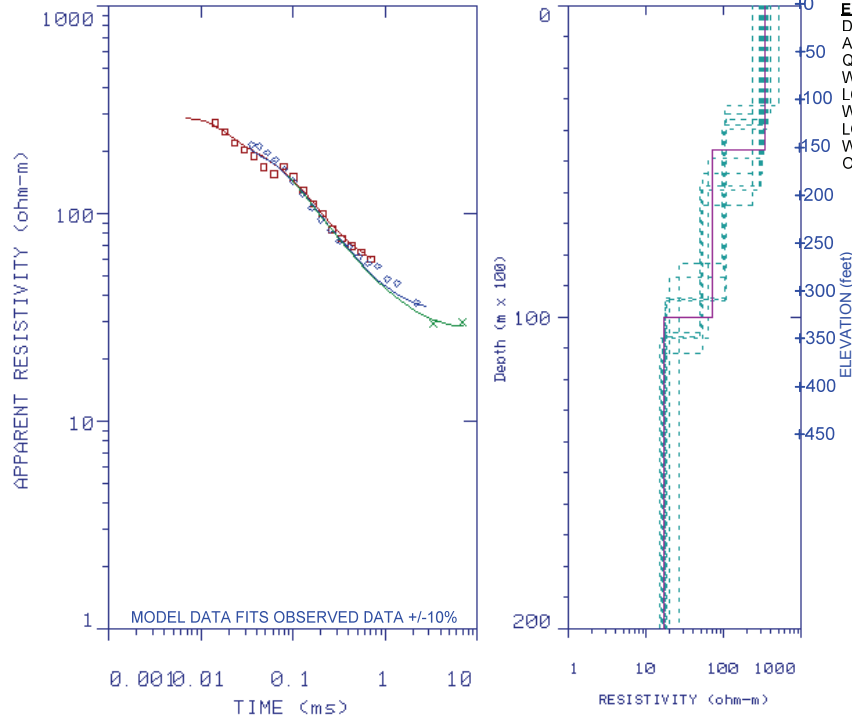


TEM-02 SOUNDING INTERPRETED GEOELECTRIC MODEL			
DEPTH RANGE (feet)	ELEVATION RANGE (feet)	RESISTIVITY (ohm meters)	STRATIGRAPHY INFERRED SOLELY FROM TEM RESULTS
0±00 to 67±14	1414±00 to 1347±14	330± 40	DRY, COARSE GRAIN, ALLUVIUM
67±14 to 182±13	1347±14 to 1232±13	37± 10	MOIST, FINE GRAIN, ALLUVIUM
182±13 to 332±26	1232±13 to 1082±26	4± 0.8	SATURATED ALLUVIUM
BELOW 332±26	BELOW 1082±26	530±100	BEDROCK

NOTE: Depth & resistivity uncertainty ranges estimated from "TEMIXL" (Interpex, 2008) equivalence analysis.

FIGURE 3A
TEM-02 SOUNDING AT BORING DYB10-02
DATA & INTERPRETED GEOELECTRIC MODEL
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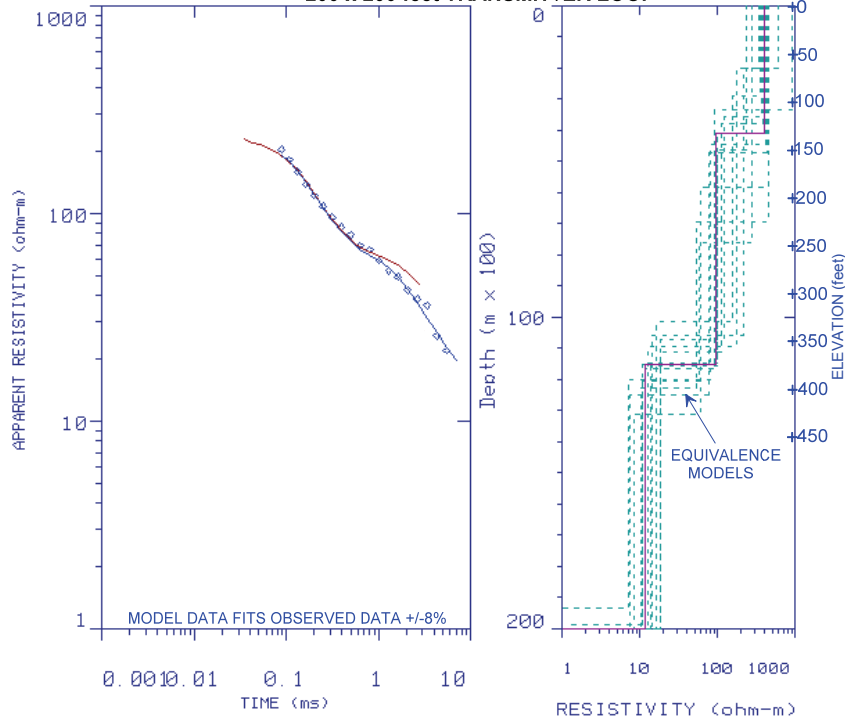
SHALLOW PENETRATION DATA 100 x 100 feet TRANSMITTER LOOP



EXPLANATION

DATA RECORDED WITH A GEONICS TEM-47 TRANSMITTER AND A DIGITAL PROTEM RECEIVER WITH A HIGH FREQUENCY COIL ON 9/16/10. TWO TRANSMITTER LOOPS WERE USED. HIGHER RESOLUTION, SHALLOW PENETRATING LOOP WAS 100 X 100 FEET. THE DEEPER PENETRATING LOOP WAS 200 X 200 FEET. BOTH LOOPS WERE CENTERED ON A LOCATION 200 FEET NW OF BORING DYB10-09 (N35.154528, W116.198028) TO AVOID DATA QUALITY ISSUES WITH THE OIL PIPELINE ABOUT 35 FEET SE OF THE BORING.

DEEP PENETRATION DATA 200 x 200 feet TRANSMITTER LOOP



TEM-09 SOUNDING INTERPRETED GEOELECTRICAL MODEL			
DEPTH RANGE (feet)	ELEVATION RANGE (feet)	RESISTIVITY (ohm meters)	STRATIGRAPHY INFERRED SOLELY FROM TEM RESULTS
0±00 to 143±36	1524±00 to 1381±36	360± 50	DRY, COARSE GRAIN, ALLUVIUM
143±36 to 354±30	1381±36 to 1170±30	98± 20	DRY, COARSE & FINE GRAIN, ALLUVIUM
BELOW 354±30	BELOW 1170±30	15± 03	SATURATED ALLUVIUM
---	---	---	ESTIMATED BEDROCK IS AT LEAST 500 feet DEEP (BELOW ELEVATION OF 1024 feet)

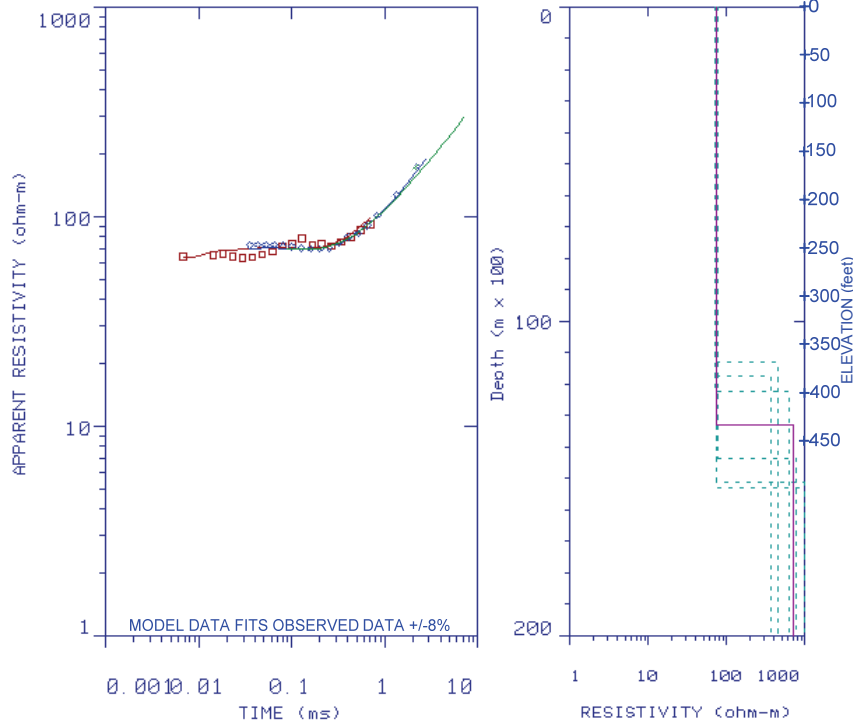
NOTE: Depth & resistivity uncertainty ranges estimated from "TEMIXXL" (Interpex, 2008) equivalence analysis.

FIGURE 3B
TEM-09 SOUNDING AT BORING DYB10-09
DATA & INTERPRETED GEOELECTRIC MODEL

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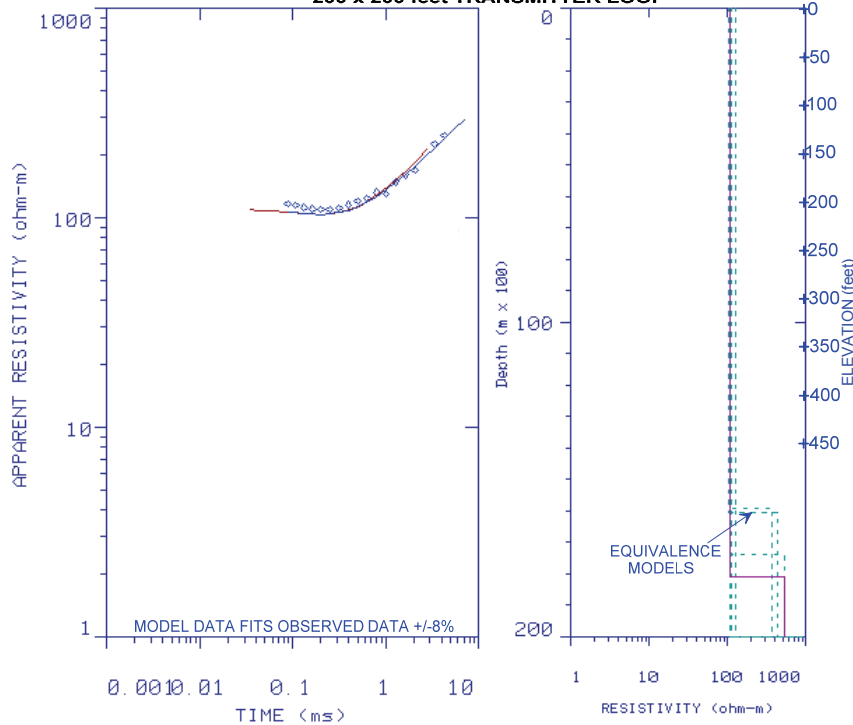
SHALLOW PENETRATION DATA 100 x 100 feet TRANSMITTER LOOP



EXPLANATION

DATA RECORDED WITH A GEONICS TEM-47 TRANSMITTER AND A DIGITAL PROTEM RECEIVER WITH A HIGH FREQUENCY COIL ON 9/15/10. TWO TRANSMITTER LOOPS WERE USED. HIGHER RESOLUTION, SHALLOW PENETRATING LOOP WAS 100 X 100 FEET. THE DEEPER PENETRATING LOOP WAS 200 X 200 FEET. BOTH LOOPS WERE CENTERED 8 FEET SW OF BORING DYB10-11 (N35.148278, W116.180833). THERE WERE NO NEARBY ELECTRIC LINES, PIPELINES, OR FENCES THAT WOULD DEGRADE DATA QUALITY.

DEEP PENETRATION DATA 200 x 200 feet TRANSMITTER LOOP



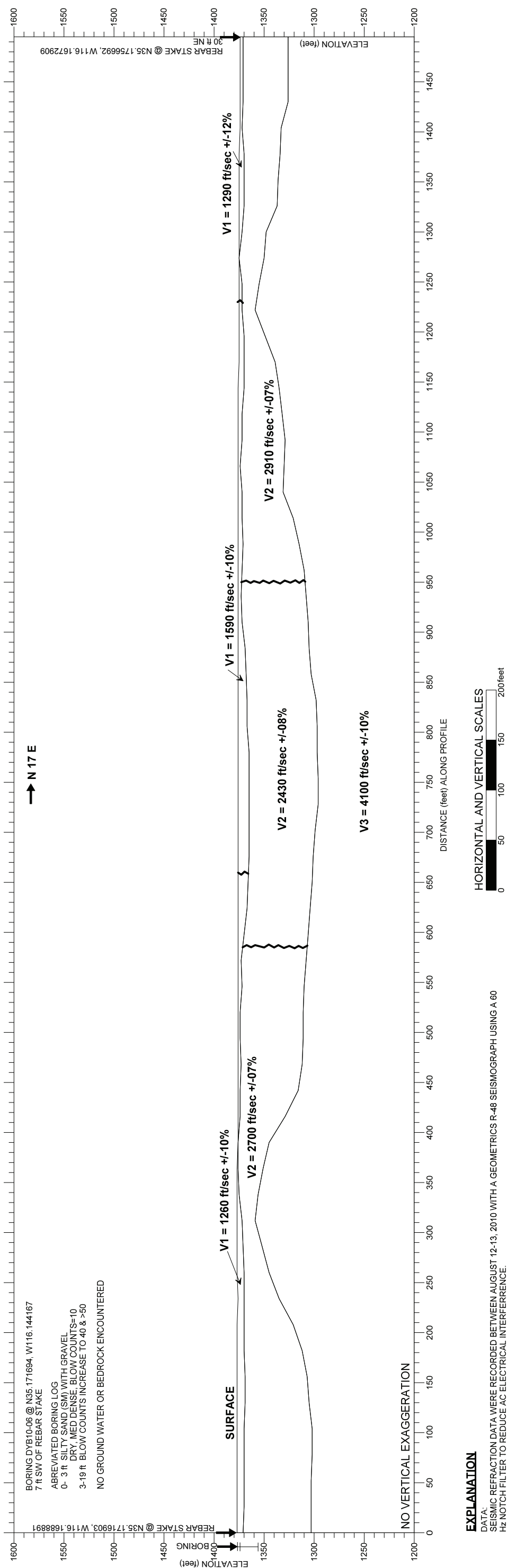
TEM-11 SOUNDING INTERPRETED GEOELECTRICAL MODEL			
DEPTH RANGE	ELEVATION RANGE	RESISTIVITY	STRATIGRAPHY INFERRED SOLELY
(feet)	(feet)	(ohm meters)	FROM TEM RESULTS
0±00 to 436±49	1358±00 to 922±49	80± 12	DRY, COARSE & FINE GRAIN, ALLUVIUM
BELOW 436±49	BELOW 922±49	610± 92	BEDROCK

IF GROUND WATER IS PERCHED ON BEDROCK, ESTIMATED MAXIMUM UNDETECTABLE THICKNESS IS 50 FEET, THEREFORE, GROUND WATER WOULD BE AT LEAST 386 FEET DEEP (BELOW ELEVATION OF 972 FEET).

NOTE: Depth & resistivity uncertainty ranges estimated from "TEMIXL" (Interpex, 2008) equivalence analysis.

FIGURE 3C
TEM-11 SOUNDING AT BORING DYB10-11
DATA & INTERPRETED GEOELECTRIC MODEL

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EXPLANATION

DATA:
SEISMIC REFRACTION DATA WERE RECORDED BETWEEN AUGUST 12-13, 2010 WITH A GEOMETRICS R-48 SEISMOGRAPH USING A 60 HZ NOTCH FILTER TO REDUCE AC ELECTRICAL INTERFERENCE.

THE 1406 FEET LONG PROFILE WAS LOCATED IN UNDISTURBED SOIL ABOUT 1-5 FEET SE OF THE DIRT ACCESS ROAD SE EDGE. THE PROFILE WAS DIVIDED INTO FIVE SPREADS EACH 289 FEET LONG. A SINGLE MARK PRODUCTS L-40 (40 Hz RESONANCE FREQUENCY) GEOPHONE WAS LOCATED AT 13 FEET INTERVALS ALONG THE PROFILE. SEISMIC WAVES WERE GENERATED AT EVERY EIGHTH GEOPHONE (91 FEET) ALONG EACH SPREAD AND ABOUT 70 FEET OFF EACH END OF EACH SPREAD. SEISMIC WAVE SIGNAL-TO-NOISE RATIO WAS INCREASED SIGNIFICANTLY BY DISCRETIONARILY STACKING 12-15 HAMMER HITS TOGETHER TO FORM EACH DATA RECORD THUS MINIMIZING BACK-GROUND NOISE VIBRATIONS.

NEARBY SURFICIAL FEATURES AND BORINGS ARE SHOWN ALONG THE PROFILE'S SURFACE

RESULTS: THREE DISTINCT VELOCITY ZONES WERE INTERPRETED FROM THE DATA USING GEOMETRICS (2002) SEISMAGER SOFTWARE. CORRELATIONS BETWEEN VELOCITY ZONES AND STRATIGRAPHY ARE BASED ON DIAZ YOURMAN & ASSOCIATES DESCRIPTIONS OF DYB10-06 BORING (PLATE A07, DATED 8/30/10).

SURFICIAL VELOCITY ZONE (1260-1290 FEET/SECOND $\pm 12\%$) PROBABLY REPRESENTS THE DRY, UNCONSOLIDATED, (LOW BLOW COUNTS 10) SILTY SAND (SM) WITH GRAVEL. BETWEEN DISTANCES OF 660-1230 FEET, THIS VELOCITY IS ABOUT 25% HIGHER (1590 FEET/SECOND $\pm 10\%$).

SECOND VELOCITY ZONE (2700-2910 FEET/SECOND $\pm 0.7\%$) PROBABLY REPRESENTS THE SAME DRY, BUT PARTIALLY CONSOLIDATED (BLOW COUNT INCREASE TO 40 & >50) SILTY SAND (SM) WITH GRAVEL.

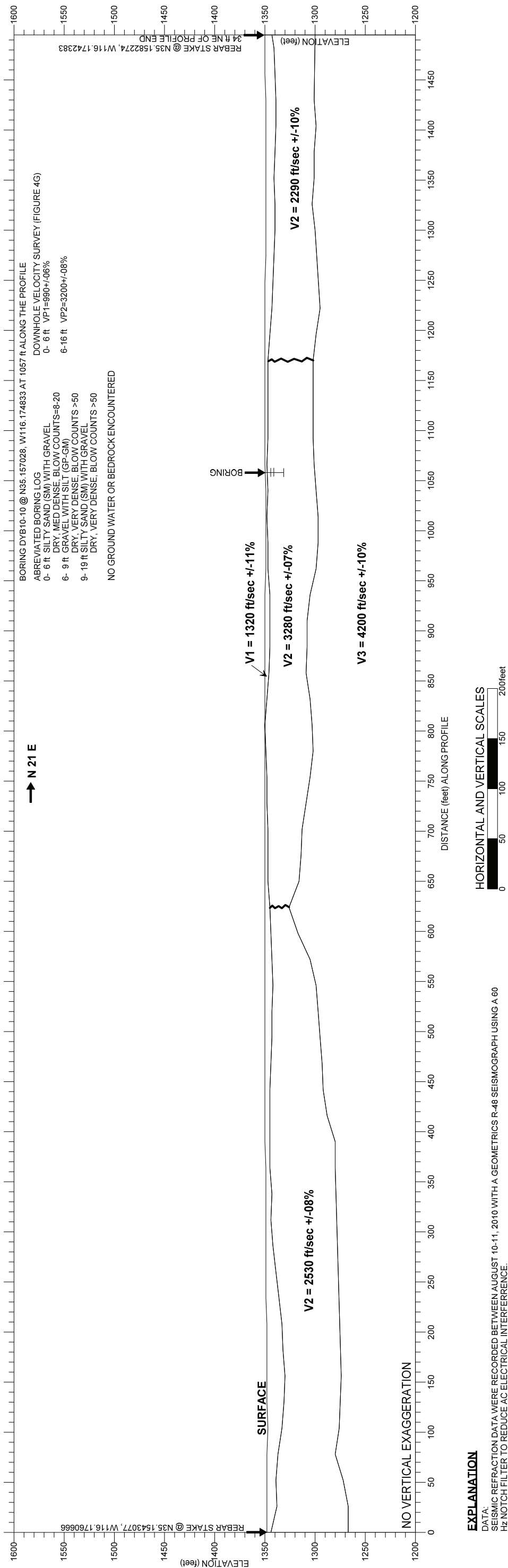
THIRD VELOCITY ZONE (4100 FEET/SECOND +/-10%) WAS SHALLOWER THAN AT THE OTHER NEARBY REFRACTION PROFILES AND THEREFORE COULD BE ACCURATELY MODELED. THE BORING DID NOT EXTEND INTO THIS ZONE. THE ZONE MAY REPRESENT CONSOLIDATED ALLUVIUM THAT IS DRY BECAUSE THE VELOCITY IS NOT WITHIN THE CHARACTERISTIC RANGE OF 4900-5400 FEET/SECOND (SPEED OF SOUND IN WATER).

PENETRATION IS ESTIMATED AT 70-75 FEET.

FIGURE 4A
REFRACTION PROFILE SR-06 AT BORING DYB10-06
INTERPRETED SEISMIC VELOCITY CROSS SECTION

CAITHNESS LLC - SODA MTN SOLAR PROJECT

TERRA PHYSICS



EXPLANATION

DATA:
SEISMIC REFRACTION DATA WERE RECORDED BETWEEN AUGUST 10-11, 2010 WITH A GEOMETRICS R-48 SEISMOGRAPH USING A 60 HZ NOTCH FILTER TO REDUCE AC ELECTRICAL INTERFERENCE.

THE 1498 FEET LONG PROFILE WAS LOCATED IN UNDISTURBED SOIL ABOUT 10-15 FEET SE OF THE DIRT ACCESS ROAD SE EDGE. THE PROFILE WAS DIVIDED INTO FIVE SPREADS EACH 289 FEET LONG. A SINGLE MARK PRODUCTS L-40 (40 HZ RESONANCE FREQUENCY) GEOPHONE WAS LOCATED AT 13 FEET INTERVALS ALONG THE PROFILE. SEISMIC WAVES WERE GENERATED AT EVERY EIGHTH GEOPHONE (91 FEET) ALONG EACH SPREAD AND ABOUT 70 FEET OFF EACH END OF EACH SPREAD. SEISMIC WAVE SIGNAL-TO-NOISE RATIO WAS INCREASED SIGNIFICANTLY BY DISCRETIONARILY STACKING 12-15 HAMMER HITS TOGETHER TO FORM EACH DATA RECORD THIS MINIMIZING BACK-GROUND NOISE VIBRATIONS.

NEARBY SURFICIAL FEATURES AND BORINGS ARE SHOWN ALONG THE PROFILE'S SURFACE. A DOWNHOLE VELOCITY (FIGURE 4G) AND A SURFACE WAVE SOUNDING (FIGURE 4I) WERE COMPLETED AT THE BORING

RESULTS:

THREE DISTINCT VELOCITY ZONES WERE INTERPRETED FROM THE DATA USING GEOMETRICS (2002) 'SEISMAGER' SOFTWARE. CORRELATIONS BETWEEN VELOCITY ZONES AND STRATIGRAPHY ARE BASED ON DIAZ YOURMAN & ASSOCIATES DESCRIPTIONS OF DY810-10 BORING (PLATE A11 DATED 8/30/10).

SURFICIAL VELOCITY ZONE (1320 FEET/SECOND +/-11%) PROBABLY REPRESENTS THE DRY, UNCONSOLIDATED, (LOW BLOW COUNTS 8-20) SILTY SAND (SM) WITH GRAVEL.

SECOND VELOCITY ZONE (2720-2790 FEET/SECOND +/-10%) PROBABLY REPRESENTS THE SAME DRY, PARTIALLY CONSOLIDATED (BLOW COUNT >50) GRAVEL WITH SILT (GP-GM). BETWEEN DISTANCES OF 620-1170 FEET, THIS VELOCITY IS ABOUT 19% HIGHER (3280 FEET/SECOND +/-07%).

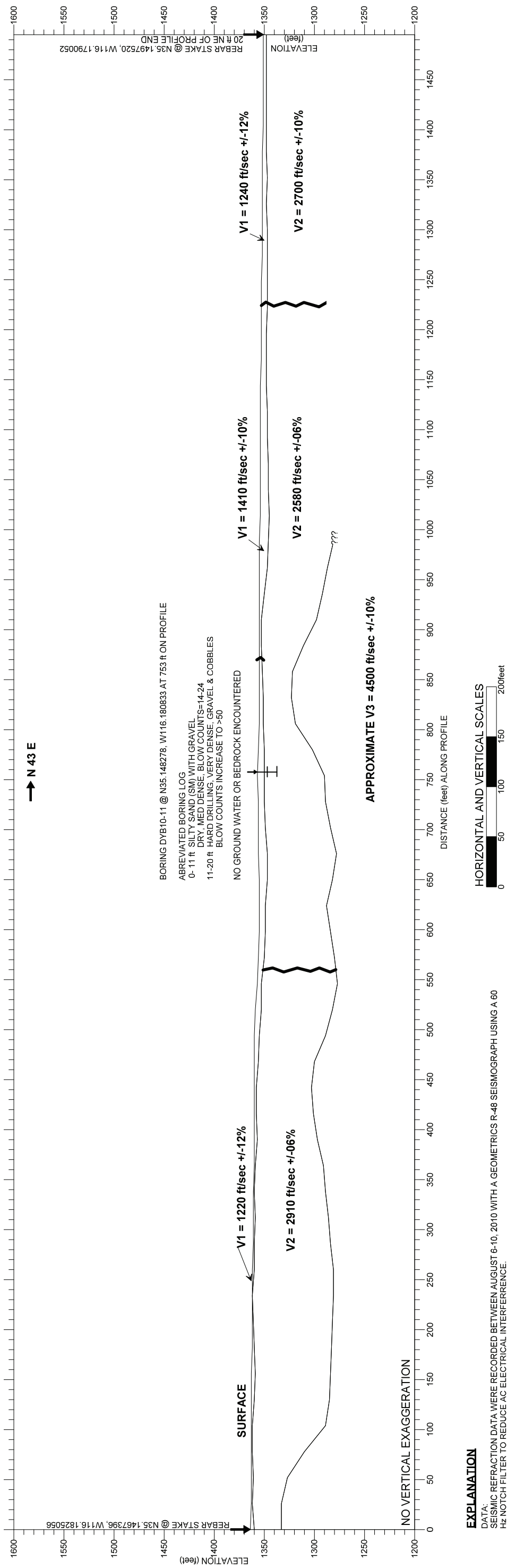
THIRD VELOCITY ZONE (4200 FEET/SECOND $\pm 10\%$) WAS SHALLOWER THAN AT THE OTHER NEARBY REFRACTION PROFILES AND THEREFORE COULD BE ACCURATELY MODELED. THE BORING DID NOT EXTEND INTO THIS ZONE. THE ZONE MAY REPRESENT CONSOLIDATED ALLUVIUM THAT IS DRY BECAUSE THE VELOCITY IS NOT WITHIN THE CHARACTERISTIC RANGE OF 4900-5400 FEET/SECOND (SPEED OF SOUND IN WATER).

PENETRATION IS ESTIMATED AT 70-75 FEET.

FIGURE 4B
REFRACTION PROFILE SR-10 AT BORING DYB10-10
INTERPRETED SEISMIC VELOCITY CROSS SECTION

CAITHNESS LLC - SODA MTN SOLAR PROJECT

TERRA PHYSICS



EXPLANATION

DATA:
SEISMIC REFRACTION DATA WERE RECORDED BETWEEN AUGUST 6-10, 2010 WITH A GEOMETRICS R-48 SEISMOGRAPH USING A 60 Hz NOTCH FILTER TO REDUCE AC ELECTRICAL INTERFERENCE.

THE 1496 FEET LONG PROFILE WAS LOCATED IN UNDISTURBED SOIL ABOUT 10-15 FEET SE OF THE DIRT ACCESS ROAD SE EDGE. THE PROFILE WAS DIVIDED INTO FIVE SPREADS EACH 299 FEET LONG. A SINGLE MARK PRODUCTS L-40 (40 HZ RESONANCE FREQUENCY) GEOPHONE WAS LOCATED AT 13 FEET INTERVALS ALONG THE PROFILE. SEISMIC WAVES WERE GENERATED AT EVERY EIGHTH GEOPHONE (91 FEET) ALONG EACH SPREAD AND ABOUT 70 FEET OFF EACH END OF EACH SPREAD. SEISMIC WAVE SIGNAL-TO-NOISE RATIO WAS INCREASED SIGNIFICANTLY BY DISCRETIONARILY STACKING 12-15 HAMMER HITS TOGETHER TO FORM EACH DATA RECORD THUS MINIMIZING BACKGROUND NOISE VIBRATIONS.

NEARBY SURFICIAL FEATURES AND BORINGS ARE SHOWN ALONG THE PROFILE'S SURFACE. A SURFACE WAVE SOUNDING (FIGURE 4J) AND A TEM SOUNDING (FIGURE 3A) WERE COMPLETED AT THE BORING.

RESULTS:

THREE DISTINCT VELOCITY ZONES WERE INTERPRETED FROM THE DATA USING GEOMETRICS (2002) 'SEISMIMAGER' SOFTWARE. CORRELATIONS BETWEEN VELOCITY ZONES AND STRATIGRAPHY ARE BASED ON DIAZ YORMAN & ASSOCIATES DESCRIPTIONS OF DY810-11 BORING (PLATE A12 DATED 8/30/10).

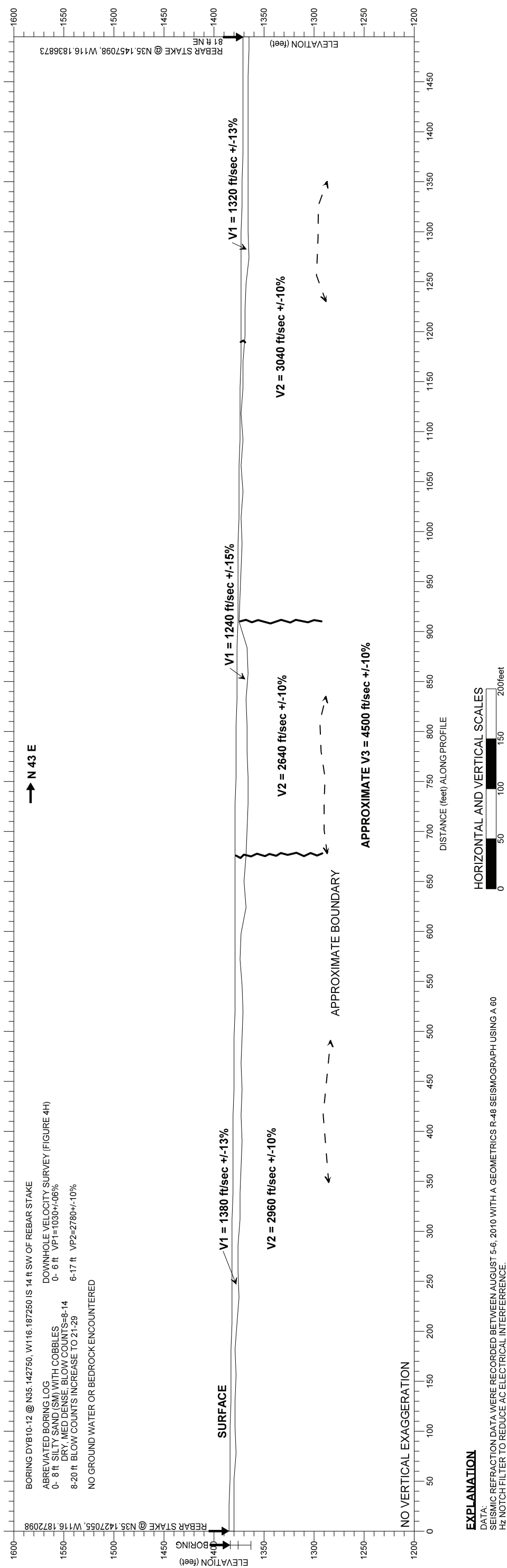
SURFICIAL VELOCITY ZONE (1220-1240 FEET/SECOND $\pm 12\%$) PROBABLY REPRESENTS THE DRY, UNCONSOLIDATED, (LOW BLOW COUNTS 14-24) SILTY SAND (SM) WITH GRAVEL. BETWEEN DISTANCES OF 875-1230 FEET, THIS VELOCITY IS ABOUT 15% HIGHER (1410 FEET/SECOND $\pm 10\%$).

SECOND VELOCITY ZONE (2700-2910 FEET/SECOND +/-10%) PROBABLY REPRESENTS THE SAME DRY, BUT PARTIALLY CONSOLIDATED (BLOW COUNT >50) SILTY SAND (SM) WITH COBBLES. BETWEEN DISTANCE OF 550-1230 FEET, THIS VELOCITY IS ABOUT 8% LOWER (2580 FEET/SECOND +/- 6%).

THIRD VELOCITY ZONE (4500 FEET/SECOND $\pm 10\%$) CAN ONLY BE APPROXIMATED BECAUSE FEW DATA POINTS WERE RELIABLY RECORDED FROM THE BOUNDARY THAT IS GREATER THAN 60-70 FEET DEEP. THE BORING DID NOT EXTEND INTO THIS ZONE. THE ZONE MAY REPRESENT CONSOLIDATED ALLUVIUM THAT IS DRY BECAUSE THE VELOCITY IS NOT WITHIN THE CHARACTERISTIC RANGE OF 4900-5400 FEET/SECOND (SPEED OF SOUND IN WATER).

PENETRATION IS ESTIMATED AT 60-70 FEET.

FIGURE 4C
REFRACTION PROFILE SR-11 AT BORING DYB10-11
INTERPRETED SEISMIC VELOCITY CROSS SECTION
CAITHNESS LLC - SODA MTN SOLAR PROJECT
TERRA PHYSICS



EXPLANATION

DATA: SEISMIC REFRACTION DATA WERE RECORDED BETWEEN AUGUST 5-6, 2010 WITH A GEOMETRICS R-48 SEISMOGRAPH USING A 60 HZ NOTCH FILTER TO REDUCE AC ELECTRICAL INTERFERENCE.

THE 1496 FEET LONG PROFILE WAS LOCATED IN UNDISTURBED SOIL ABOUT 10-15 FEET SE OF THE DIRT ACCESS ROAD SE EDGE. THE PROFILE WAS DIVIDED INTO FIVE SPREADS EACH 289 FEET LONG. A SINGLE MARK PRODUCTS L-40 (40 HZ RESONANCE FREQUENCY) GEOPHONE WAS LOCATED AT 13 FEET INTERVALS ALONG THE PROFILE. SEISMIC WAVES WERE GENERATED AT EVERY EIGHTH GEOPHONE (91 FEET) ALONG EACH SPREAD, AND ABOUT 70 FEET OFF EACH END OF EACH SPREAD. SEISMIC WAVE SIGNAL-TO-NOISE RATIO WAS INCREASED SIGNIFICANTLY BY DISCRETIONARILY STACKING 12-15 HAMMER HITS TOGETHER TO FORM EACH DATA RECORD. THIS MINIMIZED BACK-GROUND NOISE VIBRATIONS.

NEARBY SURFICIAL FEATURES AND BORINGS ARE SHOWN ALONG THE PROFILE'S SURFACE. A DOWNHOLE VELOCITY (FIGURE 4H) AND A DC RESISTIVITY SOUNDING (FIGURE 4M) WERE CONDUCTED AT THE BORING.

RESULTS:

THREE DISTINCT VELOCITY ZONES WERE INTERPRETED FROM THE DATA USING GEOMETRICS' (2002) 'SEISMIMAGER' SOFTWARE. CORRELATIONS BETWEEN VELOCITY ZONES AND STRATIGRAPHY ARE BASED ON DIAZ YOURMAN & ASSOCIATES DESCRIPTIONS OF YB'10-12 BORING (PLATE A13 DATED 8/30/10).

SURFICIAL VELOCITY ZONE (1320-1380 FEET/SECOND $\pm$ 13%) PROBABLY REPRESENTS THE DRY, UNCONSOLIDATED, (LOW BLOW COUNTS 8-4) SILTY SAND (SM) WITH COBBLES. BETWEEN DISTANCES OF 680-1190 FEET, THIS VELOCITY IS ABOUT 8% LOWER (1240 FEET/SECOND $\pm$ 15%).

SECOND VELOCITY ZONE (2960-3040 FEET/SECOND $\pm 10\%$) PROBABLY REPRESENTS THE SAME DRY, BUT PARTIALLY CONSOLIDATED (SLIGHT BLOW COUNT INCREASE TO 22-29) SILTY SAND (SM) WITH COBBLES, BETWEEN DISTANCES OF 680-910 FEET, THIS VELOCITY IS ABOUT 12% LOWER (2640 FEET/SECOND $\pm 10\%$).

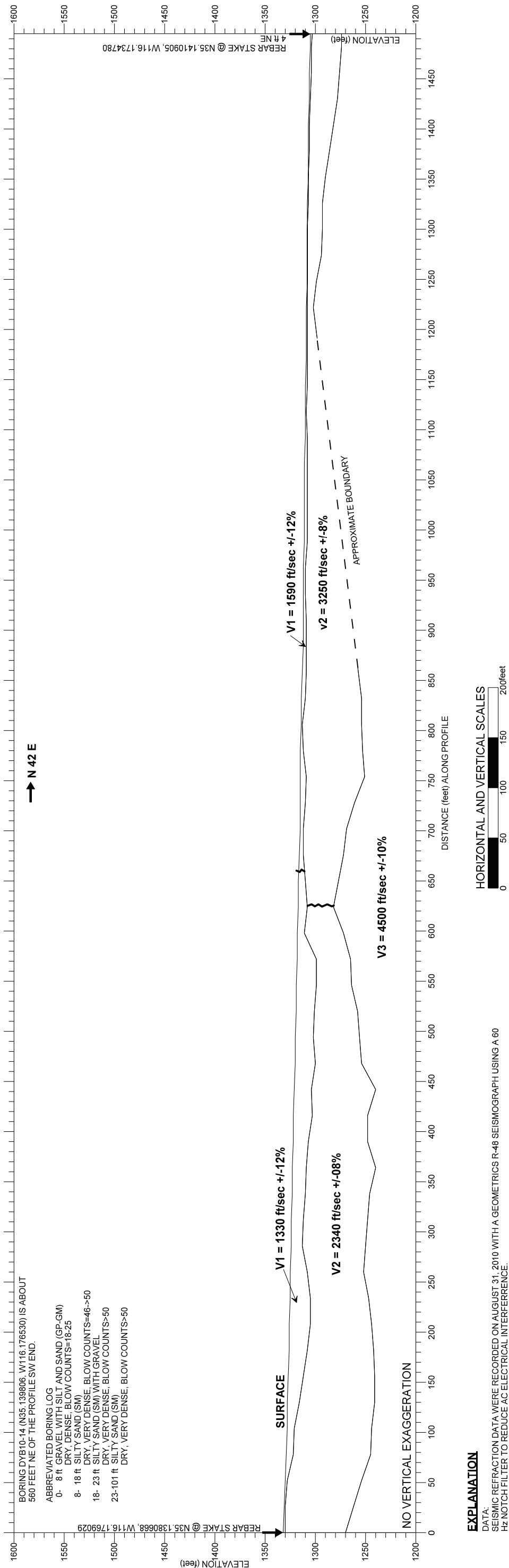
THIRD VELOCITY ZONE (4500 FEET/SECOND +10%) CAN ONLY BE APPROXIMATED BECAUSE FEW DATA POINTS WERE RELIABLY RECORDED FROM THE BOUNDARY THAT IS GREATER THAN 60 FEET DEEP. THE BORING DID NOT EXTEND INTO THIS ZONE. THE ZONE MAY REPRESENT CONSOLIDATED ALLUVIUM THAT IS DRY BECAUSE THE VELOCITY IS NOT WITHIN THE CHARACTERISTIC RANGE OF 4900-5400 FEET/SECOND (SPEED OF SOUND IN WATER).

PENETRATION IS ESTIMATED AT 70-75 FEET.

FIGURE 4D
REFRACTION PROFILE SR-12 AT BORING DYB10-12
INTERPRETED SEISMIC VELOCITY CROSS SECTION

CAITHNESS LLC - SODA MTN SOLAR PROJECT

TERRA PHYSICS



EXPLANATION

DATA: SEISMIC REFRACTION DATA WERE RECORDED ON AUGUST 31, 2010 WITH A GEOMETRICS R-48 SEISMOGRAPH USING A 60 Hz NOTCH FILTER TO REDUCE AC ELECTRICAL INTERFERENCE.

THE 1498 FEET LONG PROFILE WAS LOCATED IN UNDISTURBED SOIL (NO NEARBY ROAD). EQUIPMENT WAS MANUALLY CARRIED TO THE PROFILE. THE PROFILE WAS DIVIDED INTO FIVE SPREADS EACH 299 FEET LONG. A SINGLE MARK PRODUCTS L-40 (40 HZ RESONANCE FREQUENCY) GEOPHONE WAS LOCATED AT 13 FEET INTERVALS ALONG THE PROFILE. SEISMIC WAVES WERE GENERATED AT EVERY EIGHTH GEOPHONE (91 FEET) ALONG EACH SPREAD AND ABOUT 70 FEET OFF EACH END OF EACH SPREAD. SEISMIC WAVE SIGNAL-TO-NOISE RATIO WAS INCREASED SIGNIFICANTLY BY DISCRETIONARILY STACKING 12-15 HAMMER HITS TOGETHER TO FORM EACH DATA RECORD. THIS MINIMIZED BACKGROUND NOISE VIBRATIONS.

A SURFACE WAVE SOUNDING (FIGURE 4L) WAS COMPLETED AT THE PROFILE SW END

RESULTS:

THREE DISTINCT VELOCITY ZONES WERE INTERPRETED FROM THE DATA USING GEOMETRICS (2002). 'SEISMAGER' SOFTWARE. CORRELATIONS BETWEEN VELOCITY ZONES AND STRATIGRAPHY ARE BASED ON DIAZ YOUNMAN & ASSOCIATES DESCRIPTION OF DYB10-14 BORING (PLATE A15, DATED 9/01/10).

SURFICIAL VELOCITY ZONE (1330 FEET/SECOND $\pm$ 12%) PROBABLY REPRESENTS DRY, UNCONSOLIDATED, SILTY SAND (SM). BETWEEN DISTANCES OF 660-1495 FEET. THIS VELOCITY IS ABOUT 20% HIGHER (1590 FEET/SECOND $\pm$ 12%).

SECOND VELOCITY ZONE (2340 FEET/SECOND $\pm 0.08\%$) PROBABLY REPRESENTS THE SAME DRY, BUT PARTIALLY CONSOLIDATED SILTY SAND (SM). BETWEEN DISTANCES OF 625-1495 FEET, THIS VELOCITY IS ABOUT 30% HIGHER (3250 FEET/SECOND $\pm 0.08\%$).

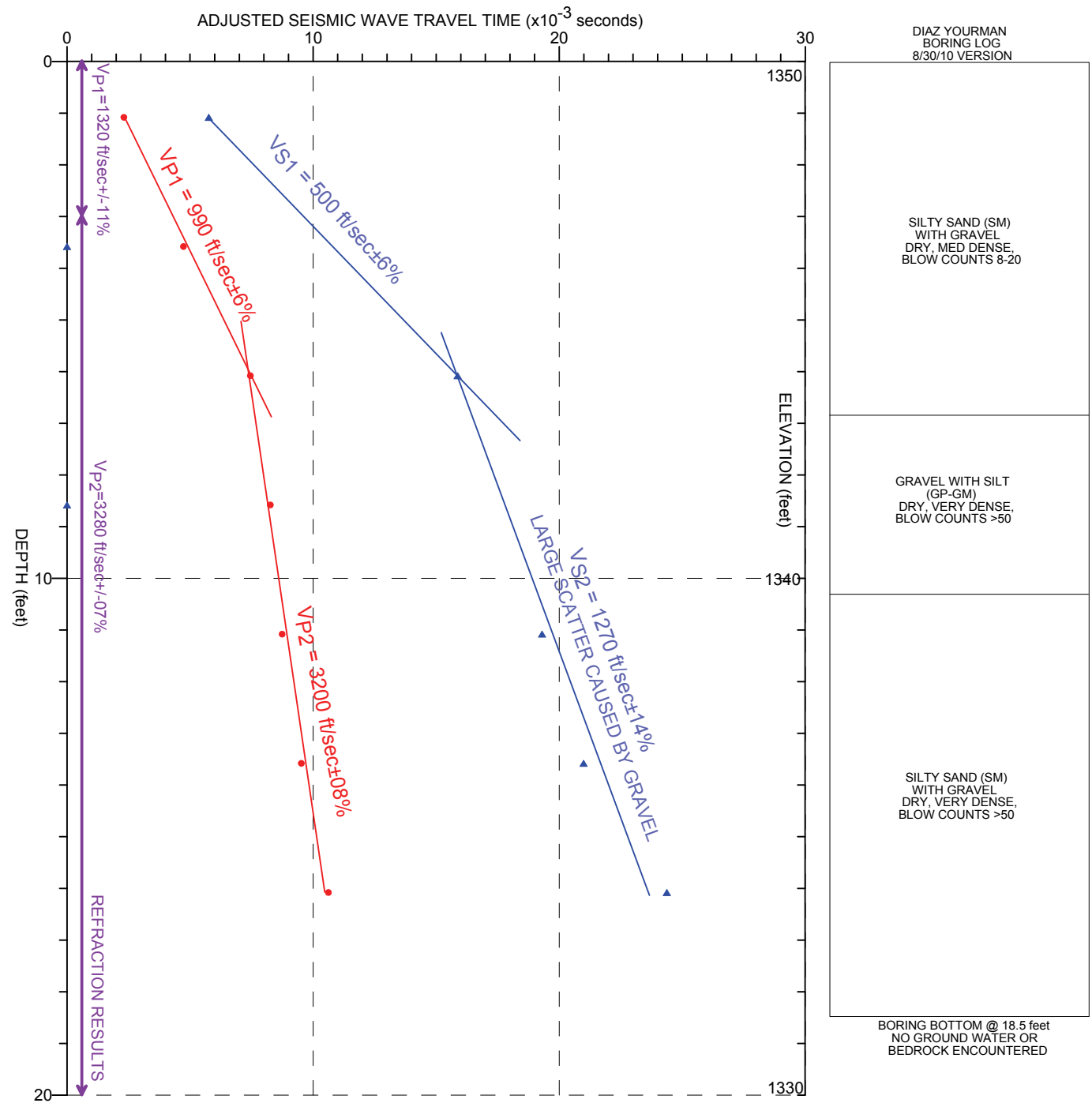
THIRD VELOCITY ZONE (4500 FEET/SECOND $\pm$ 10%) WAS SHALLOWER THAN AT THE OTHER NEARBY REFRACTION PROFILES AND THEREFORE COULD BE ACCURATELY MODELED. POOR DATA QUALITY CAUSED BY WIND NOISE PREVENTED A RELIABLE MODEL OF THIS BOUNDARY BETWEEN DISTANCES OF 835-1210 FEET. THE ZONE MAY REPRESENT CONSOLIDATED ALLUVIUM THAT IS DRY BECAUSE THE VELOCITY IS NOT WITHIN THE CHARACTERISTIC RANGE OF 4900-5400 FEET/SECOND (SPEED OF SOUND IN WATER).

PENETRATION IS ESTIMATED AT 75-80 FEET.

FIGURE 4F
REFRACTION PROFILE SR-14 FAR FROM BORING DYB10-14
INTERPRETED SEISMIC VELOCITY CROSS SECTION

CAITHNESS LLC - SODA MTN SOLAR PROJECT

TERRA PHYSICS



EXPLANATION

DATA:
DOWNHOLE VELOCITY SURVEY MEASURED CONDUCTED ON 10/20/10. COMPRESSIONAL (RED CIRCLES) AND HORIZONTALLY POLARIZED SHEAR (BLUE TRIANGLES) VELOCITIES WERE MEASURED AT 2.5 FEET INTERVALS STARTING AT THE MAXIMUM ACCESSIBLE DEPTH. A MARK PRODUCTS SONDE CONSISTING OF 3 MUTUALLY PERPENDICULAR GEOPHONES (4.5 HZ RESONANCE FREQUENCY) RECORDED THE SEISMIC WAVES THAT WERE GENERATED 3.0 FEET FROM THE BORING.

RESULTS:

ADJUSTED TIME AXIS WAS CALCULATED AS TRAVEL TIME MULTIPLIED BY THE RATIO OF THE MEASUREMENT DEPTH DIVIDED BY SLANT DISTANCE TRAVELED BY THE SEISMIC WAVES SO THE DATA WILL APPEAR AS A VERTICAL PROFILE.

THREE DISTINCT VELOCITY ZONES WERE INTERPRETED FROM THE DOWNHOLE SURVEY DATA. THE CORRESPONDING REFRACTION COMPRESSIONAL VELOCITY IS SHOWN IN PURPLE. CORRELATIONS BETWEEN VELOCITY ZONES AND STRATIGRAPHY ARE BASED ON DIAZ YOURMAN & ASSOCIATES DESCRIPTIONS OF DYB10-10 BORING (PLATE A-11 DATED 8/30/10).

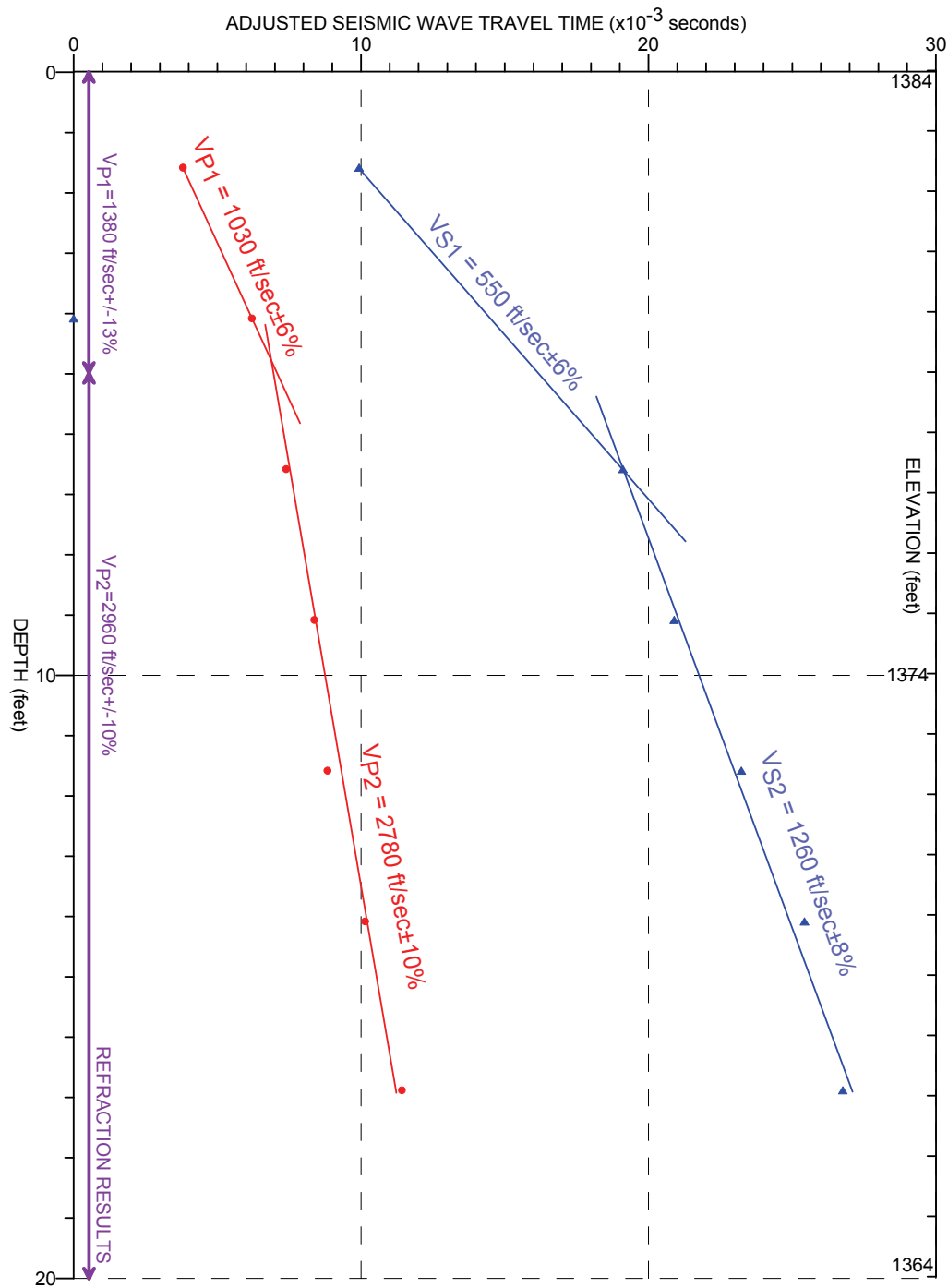
SURFICIAL VELOCITY ZONE (VP 990 FT/SEC AND VS 500 FT/SEC) PROBABLY REPRESENTS DRY, UNCONSOLIDATED (LOW BLOW COUNTS 8-20) SILTY SAND (SM) WITH GRAVEL...

SECOND VELOCITY ZONE (VP 3200 FT/SEC AND VS 1270 FT/SEC) PROBABLY REPRESENTS DRY, PARTIALLY CONSOLIDATED (BLOW COUNTS >50), GRAVEL WITH SILT (GP-GM) AND SILTY SAND (SM) WITH BLOW COUNTS >50.

FIGURE 4G
DOWNHOLE VELOCITY DH-10 AT BORING DYB10-10
DATA AND INTERPRETED VELOCITY ZONES

CAITHNESS LLC-SODA MTN SOLAR PROJECT

TERRA PHYSICS



DIAZ YOURMAN
BORING LOG
8/30/10 VERSION

SILTY SAND (SM)
WITH COBBLES
DRY, MED DENSE,
BLOW COUNTS 8-14

BLOW COUNT
INCREASE TO 21-29

BORING BOTTOM @ 20.5 feet
NO GROUND WATER OR
BEDROCK ENCOUNTERED

EXPLANATION

DATA:
DOWNHOLE VELOCITY SURVEY MEASURED CONDUCTED ON 10/20/10. COMPRESSIONAL (RED CIRCLES) AND HORIZONTALLY POLARIZED SHEAR (BLUE TRIANGLES) VELOCITIES WERE MEASURED AT 2.5 FEET INTERVALS STARTING AT THE MAXIMUM ACCESSIBLE DEPTH. A MARK PRODUCTS SONDE CONSISTING OF 3 MUTUALLY PERPENDICULAR GEOPHONES (4.5 HZ RESONANCE FREQUENCY) RECORDED THE SEISMIC WAVES THAT WERE GENERATED 3.0 FEET FROM THE BORING.

RESULTS:
ADJUSTED TIME AXIS WAS CALCULATED AS TRAVEL TIME MULTIPLIED BY THE RATIO OF THE MEASUREMENT DEPTH DIVIDED BY SLANT DISTANCE TRAVELED BY THE SEISMIC WAVES SO THE DATA WILL APPEAR AS A VERTICAL PROFILE.

THREE DISTINCT VELOCITY ZONES WERE INTERPRETED FROM THE DOWNHOLE SURVEY DATA. THE CORRESPONDING REFRACTION COMPRESSIONAL VELOCITY IS SHOWN IN PURPLE. CORRELATIONS BETWEEN VELOCITY ZONES AND STRATIGRAPHY ARE BASED ON DIAZ YOURMAN & ASSOCIATES DESCRIPTIONS OF DYB10-12 BORING (PLATE A-13 DATED 8/30/10).

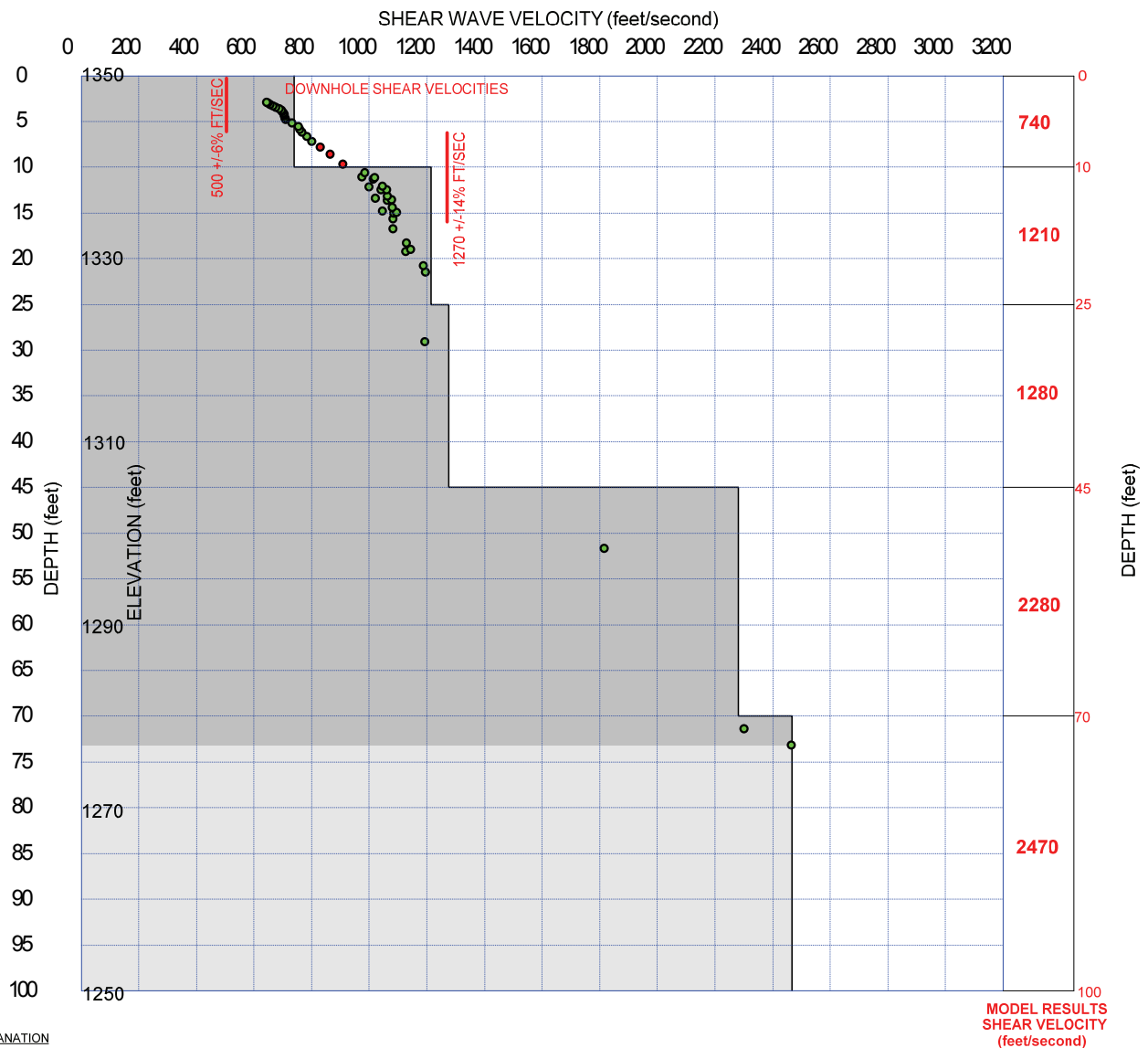
SURFICIAL VELOCITY ZONE (VP 1030 FT/SEC AND VS 550 FT/SEC) PROBABLY REPRESENTS DRY, UNCONSOLIDATED (LOW BLOW COUNTS 8-14) SILTY SAND (SM) WITH COBBLES..

SECOND VELOCITY ZONE (VP 2780 FT/SEC AND VS 1260 FT/SEC) PROBABLY REPRESENTS DRY, PARTIALLY CONSOLIDATED (BLOW COUNTS >21-29), SILTY SAND (SM).

FIGURE 4H
DOWNHOLE VELOCITY DH-12 AT BORING DYB10-12
DATA AND INTERPRETED VELOCITY ZONES

CAITHNESS LLC-SODA MTN SOLAR PROJECT

TERRA PHYSICS



EXPLANATION

DATA:

SURFACE WAVE DATA RECORDED WITH A SERIES OF THREE COCENTRIC GEOPHONE ARRAYS; TWO ACTIVE SOURCE (MASW) AND ONE PASSIVE (MICROTREMOR). THE ARRAYS WERE CENTERED ON BORING DYB10-10 STAKE (N35.157028, W116.174833) ON 10/13/10. ARRAYS WERE LOCATED IN RELATIVELY UNDISTURBED SOIL ABOUT 3-5 FEET SE OF THE DIRT ACCESS ROAD SE EDGE AND WERE ORIENTED NE. SHALLOW PENETRATING ARRAY CONSISTED OF 16 INLINE GEOPHONES (4.5 Hz RESONANCE FREQUENCY) SPACED 2 FEET APART. SEISMIC ENERGY SOURCE OFFSETS WERE 2 AND 10 FEET. EACH DATA RECORD HAD ONLY ONE HAMMER HIT SO HIGH FREQUENCY (SHALLOW) SIGNALS WERE NOT SMEARED BY STACKING. MEDIUM PENETRATING ARRAY CONSISTED OF 16 INLINE GEOPHONES SPACED 10 FEET APART. SEISMIC ENERGY SOURCE OFFSETS WERE 10 AND 60 FEET. SEISMIC WAVE SIGNAL-TO-NOISE RATIO WAS INCREASED SIGNIFICANTLY BY DISCRETIONARILY STACKING 3-4 HAMMER HITS TOGETHER TO FORM EACH DATA RECORD THUS MINIMIZING BACKGROUND NOISE VIBRATIONS. DEEP PENETRATING ARRAY HAD THE SAME GEOMETRY AS THE MEDIUM ARRAY AND RECORDED BACKGROUND NOISE FOR ABOUT 11 MINUTES. THE 35 INDIVIDUAL DATA RECORDS WERE COMBINED TO ENHANCE LOWER FREQUENCY SIGNALS.

RESULTS:

FIVE DISTINCT SHEAR WAVE VELOCITY ZONES WERE INTERPRETED FROM THE DATA USING GEOMETRICS (2009) 'SEISIMAGER' SOFTWARE. CORRELATIONS BETWEEN VELOCITY ZONES AND STRATIGRAPHY ARE BASED ON DIAZ YOURMAN & ASSOCIATES DESCRIPTIONS OF DYB10-10 BORING (PLATE A11 DATED 8/30/10). COINCIDENT DOWNHOLE VELOCITY SURVEY RESULTS ARE SHOWN IN RED AND APPEAR IN FIGURE 4G.

SURFICIAL SHEAR VELOCITY ZONE (740 FEET/SECOND +/-10%) PROBABLY REPRESENTS THE DRY, UNCONSOLIDATED (LOW BLOW COUNT 8-20), SILTY SAND (SM) WITH GRAVEL. CORRESPONDING DOWNHOLE SHEAR VELOCITY IS 500 FEET/SECOND +/-6%.

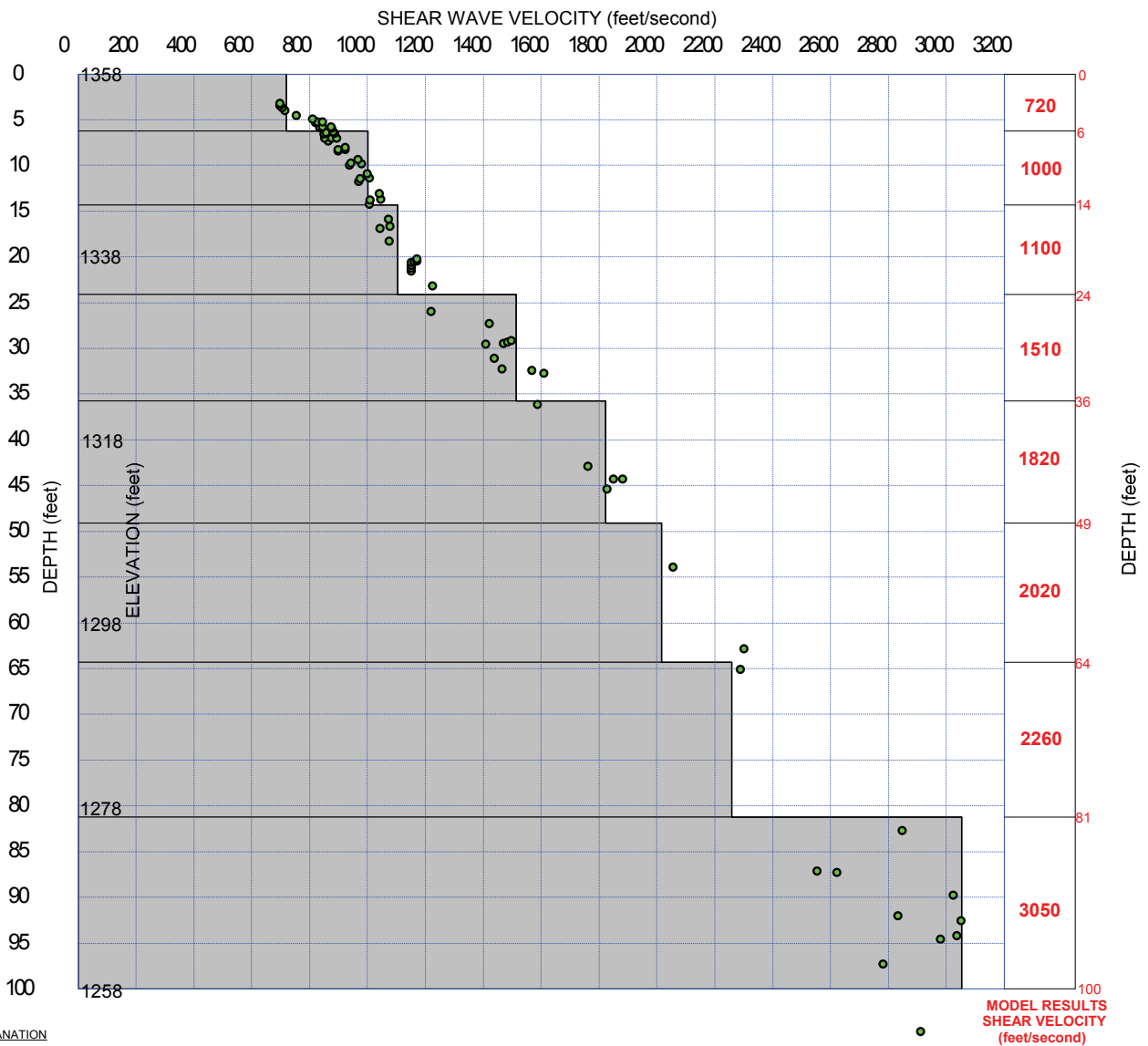
SECOND SHEAR VELOCITY ZONE (1210 FEET/SECOND +/-8%) PROBABLY REPRESENTS DRY, PARTIALLY CONSOLIDATED (BLOW COUNTS >60) GRAVEL WITH SILT (GP-GM). CORRESPONDING DOWNHOLE SHEAR VELOCITY IS 1270 FEET/SECOND +/-14%.

THIRD THROUGH FIFTH SHEAR VELOCITY ZONES WERE 1280 +/-6%, 2280 +/-6%, AND 2470 +/-6% FEET/SECOND. THE BORING DID NOT EXTEND INTO THESE ZONES. THEY MAY REPRESENT ALLUVIUM WITH CONSOLIDATION INCREASING WITH DEPTH.

THE IBC AVERAGE VS100 IS 1546 FEET/SECOND WHICH CORRESPONDS TO SITE CLASS C (VERY DENSE SOIL). SURVEY PENETRATION IS ESTIMATED AT 73 FEET. TO CALCULATE VS100, THE DEEPEST SHEAR VELOCITY WAS EXTENDED FROM 73 TO 100 FEET.

FIGURE 4I
SURFACE WAVE SW-10 AT BORING DYB10-10
SHEAR WAVE VELOCITY SOUNDING
INTERPRETED FROM SURFACE WAVE DATA

CAITHNESS LLC-SODA MTN SOLAR PROJECT
TERRA PHYSICS



EXPLANATION

DATA:

SURFACE WAVE DATA RECORDED WITH A SERIES OF THREE COCENTRIC GEOPHONE ARRAYS: TWO ACTIVE SOURCE (MASW) AND ONE PASSIVE (MICROTREMOR). THE ARRAYS WERE CENTERED ON BORING DYB10-11 STAKE (N35.148278, W116.180833) ON 10/13/10. ARRAYS WERE LOCATED IN RELATIVELY UNDISTURBED SOIL ABOUT 2-3 FEET SE OF THE DIRT ACCESS ROAD SE EDGE AND WERE ORIENTED NE. SHALLOW PENETRATING ARRAY CONSISTED OF 16 INLINE GEOPHONES (4.5 Hz RESONANCE FREQUENCY) SPACED 2 FEET APART. SEISMIC ENERGY SOURCE OFFSETS WERE 2 AND 10 FEET. EACH DATA RECORD HAD ONLY ONE HAMMER HIT SO HIGH FREQUENCY (SHALLOW) SIGNALS WERE NOT SMEARED BY STACKING. MEDIUM PENETRATING ARRAY CONSISTED OF 16 INLINE GEOPHONES SPACED 10 FEET APART. SEISMIC ENERGY SOURCE OFFSETS WERE 10 AND 60 FEET. SEISMIC WAVE SIGNAL-TO-NOISE RATIO WAS INCREASED SIGNIFICANTLY BY DISCRETIONARILY STACKING 3-4 HAMMER HITS TOGETHER TO FORM EACH DATA RECORD THUS MINIMIZING BACKGROUND NOISE VIBRATIONS. DEEP PENETRATING ARRAY HAD THE SAME GEOMETRY AS THE MEDIUM ARRAY AND RECORDED BACKGROUND NOISE FOR ABOUT 11 MINUTES. THE 35 INDIVIDUAL DATA RECORDS WERE COMBINED TO ENHANCE LOWER FREQUENCY SIGNALS.

RESULTS:

EIGHT DISTINCT SHEAR WAVE VELOCITY ZONES WERE INTERPRETED FROM THE DATA USING GEOMETRICS (2009) 'SEISIMAGER' SOFTWARE. CORRELATIONS BETWEEN VELOCITY ZONES AND STRATIGRAPHY ARE BASED ON DIAZ YOURMAN & ASSOCIATES DESCRIPTIONS OF DYB10-11 BORING (PLATE A12 DATED 8/30/10). NO DOWNHOLE VELOCITY SURVEY WAS CONDUCTED.

SURFICIAL SHEAR VELOCITY ZONE (720 FEET/SECOND +/-13%) PROBABLY REPRESENTS THE DRY, UNCONSOLIDATED (LOW BLOW COUNT 19-24), SILTY SAND (SM) WITH GRAVEL.

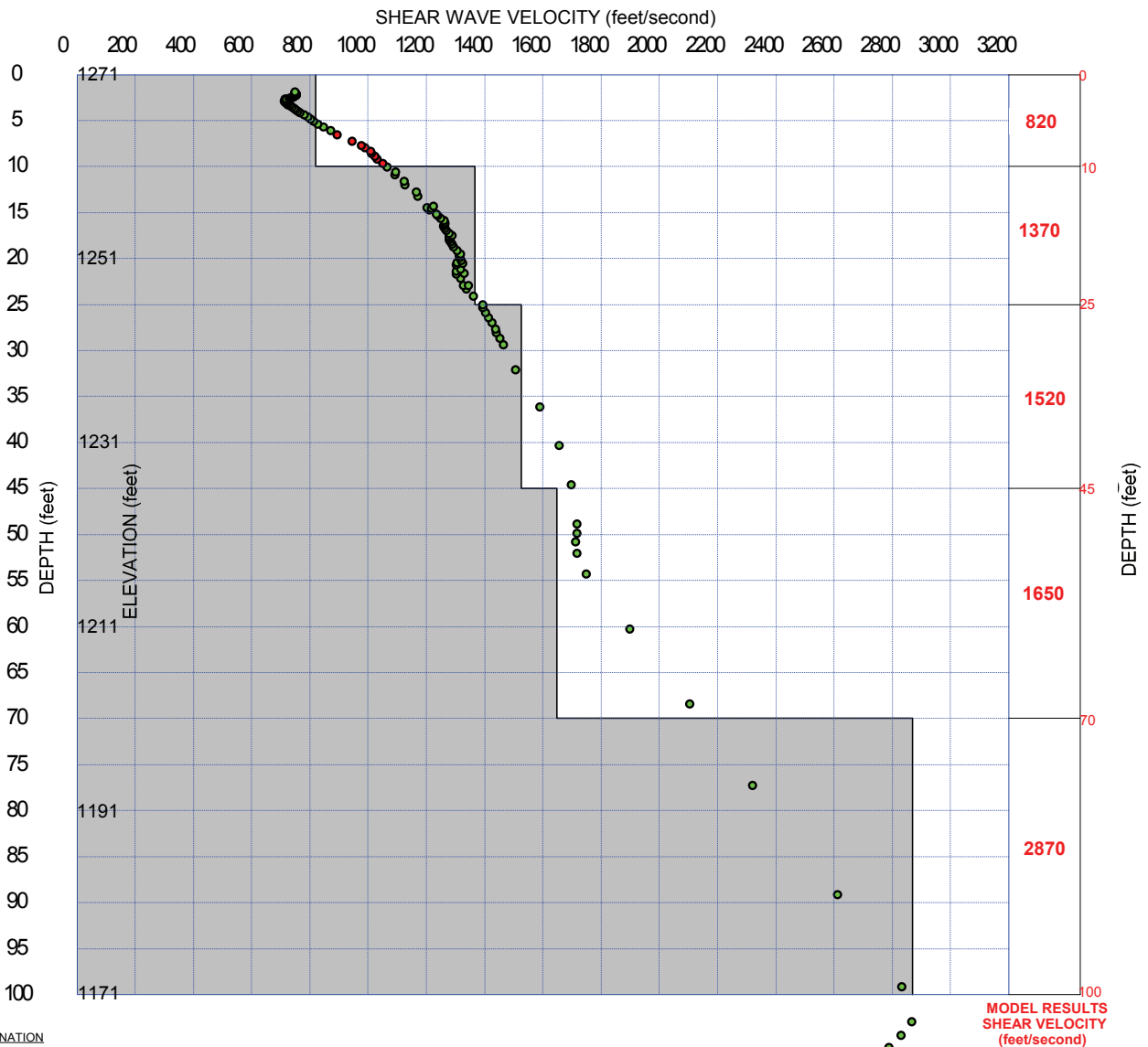
SECOND SHEAR VELOCITY ZONE (1000 FEET/SECOND +/-10%) PROBABLY REPRESENTS THE SAME DRY, PARTIALLY CONSOLIDATED (BLOW COUNTS 14->50) SILTY SAND (SM) WITH GRAVEL.

THIRD SHEAR VELOCITY ZONE (1100 FEET/SECOND +/-8%) PROBABLY REPRESENTS THE SAME DRY, PARTIALLY CONSOLIDATED (BLOW COUNTS >50) SILTY SAND (SM) WITH GRAVEL.

FOURTH THROUGH EIGHTH SHEAR VELOCITY ZONES WERE 1510+/-8%, 1820+/-7%, 2020+/-7%, 2260+/-7%, AND 3050+/-7% FEET/SECOND. THE BORING DID NOT EXTEND INTO THESE ZONES. THEY MAY REPRESENT ALLUVIUM WITH CONSOLIDATION INCREASING WITH DEPTH.

THE IBC AVERAGE VS100 IS 1618 FEET/SECOND WHICH CORRESPONDS TO SITE CLASS C (VERY DENSE SOIL). SURVEY PENETRATION IS ESTIMATED AT GREATER THAN 100 FEET.

FIGURE 4J
SURFACE WAVE SW-11 AT BORING DYB10-11
SHEAR WAVE VELOCITY SOUNDING
INTEPRETED FROM SURFACE WAVE DATA
CAITHNESS LLC-SODA MTN SOLAR PROJECT
TERRA PHYSICS



EXPLANATION

DATA:

SURFACE WAVE DATA RECORDED WITH A SERIES OF THREE COCENTRIC GEOPHONE ARRAYS: TWO ACTIVE SOURCE (MASW) AND ONE PASSIVE (MICROTREMOR). THE ARRAYS WERE CENTERED ABOUT 46 FEET NW OF BORING DYB10-13 STAKE ON 10/14/10. THE SHIFT KEPT A LARGE TOPOGRAPHY CHANGE SOUTH OF THE STAKE OUT OF THE ARRAYS. BORING DYB10-13 (N35.139000, W116.167890) WAS LOCATED ABOUT 25 FEET SW OF THE STAKE. ARRAYS WERE LOCATED IN RELATIVELY UNDISTURBED SOIL AND WERE ORIENTED NW. SHALLOW PENETRATING ARRAY CONSISTED OF 16 INLINE GEOPHONES (4.5 Hz RESONANCE FREQUENCY) SPACED 2 FEET APART. SEISMIC ENERGY SOURCE OFFSETS WERE 2 AND 10 FEET. EACH DATA RECORD HAD ONLY ONE HAMMER HIT SO HIGH FREQUENCY (SHALLOW) SIGNALS WERE NOT SMEARED BY STACKING. MEDIUM PENETRATING ARRAY CONSISTED OF 16 INLINE GEOPHONES SPACED 10 FEET APART. SEISMIC ENERGY SOURCE OFFSETS WERE 10 AND 60 FEET. SEISMIC WAVE SIGNAL-TO-NOISE RATIO WAS INCREASED SIGNIFICANTLY BY DISCRETIONARILY STACKING 3-4 HAMMER HITS TOGETHER TO FORM EACH DATA RECORD THUS MINIMIZING BACKGROUND NOISE VIBRATIONS. DEEP PENETRATING ARRAY HAD THE SAME GEOMETRY AS THE MEDIUM ARRAY AND RECORDED BACKGROUND NOISE FOR ABOUT 11 MINUTES. THE 35 INDIVIDUAL DATA RECORDS WERE COMBINED TO ENHANCE LOWER FREQUENCY SIGNALS.

RESULTS:

FIVE DISTINCT SHEAR WAVE VELOCITY ZONES WERE INTERPRETED FROM THE DATA USING GEOMETRICS (2009) 'SEISMIMAGER' SOFTWARE. CORRELATIONS BETWEEN VELOCITY ZONES AND STRATIGRAPHY ARE BASED ON DIAZ YOURMAN & ASSOCIATES DESCRIPTIONS OF DYB10-13 BORING (PLATE A14 DATED 8/30/10). NO DOWNHOLE VELOCITY SURVEY WAS CONDUCTED.

SURFICIAL SHEAR VELOCITY ZONE (820 FEET/SECOND +/-12%) PROBABLY REPRESENTS THE DRY, UNCONSOLIDATED (LOW BLOW COUNT 18-30), SILTY SAND (SM) WITH GRAVEL.

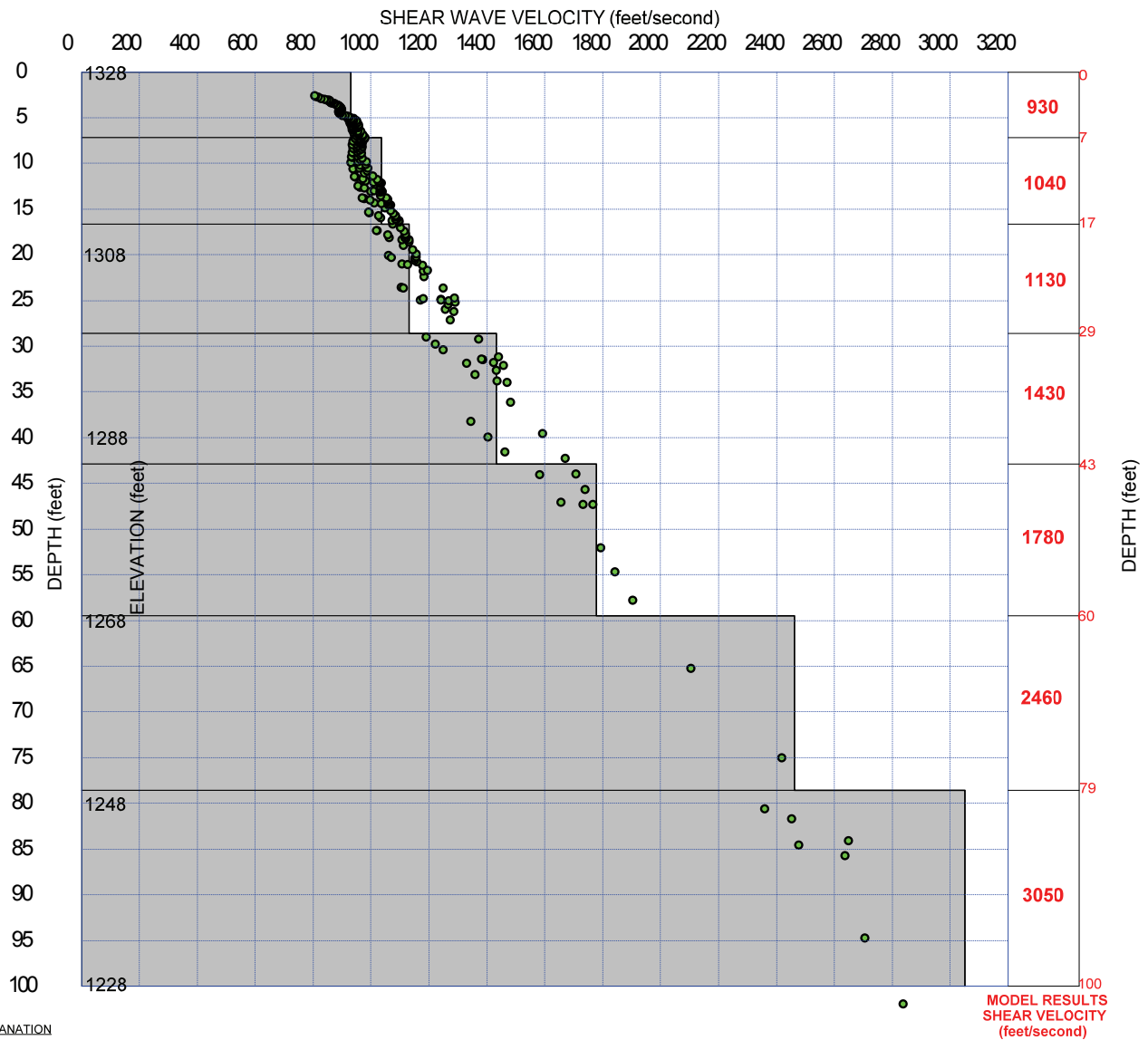
SECOND SHEAR VELOCITY ZONE (1370 FEET/SECOND +/-8%) PROBABLY REPRESENTS THE SAME DRY, PARTIALLY CONSOLIDATED (BLOW COUNTS 39) SILTY SAND (SM) WITH GRAVEL AND SAND WITH SILT (SP-SM) WITH BLOW COUNTS 30->50.

THIRD SHEAR VELOCITY ZONE (1520 FEET/SECOND +/-7%) PROBABLY REPRESENTS THE SAME DRY, PARTIALLY CONSOLIDATED SAND WITH SILT (SP-SM) WITH BLOW COUNTS 30->50.

FOURTH AND FIFTH SHEAR VELOCITY ZONES WERE 1650 AND 2870 FEET/SECOND +/-6%. THE BORING DID NOT EXTEND INTO THESE ZONES. THEY MAY REPRESENT ALLUVIUM WITH CONSOLIDATION INCREASING WITH DEPTH.

THE IBC AVERAGE VS100 IS 1615 FEET/SECOND WHICH CORRESPONDS TO SITE CLASS C (VERY DENSE SOIL). SURVEY PENETRATION IS ESTIMATED AT GREATER THAN 100 FEET.

FIGURE 4K
SURFACE WAVE SW-13 NEAR BORING DYB10-13
SHEAR WAVE VELOCITY SOUNDING
INTERPRETED FROM SURFACE WAVE DATA
CAITHNESS LLC-SODA MTN SOLAR PROJECT
TERRA PHYSICS



EXPLANATION

DATA:

SURFACE WAVE DATA RECORDED WITH A SERIES OF THREE COCENTRIC GEOPHONE ARRAYS; TWO ACTIVE SOURCE (MASW) AND ONE PASSIVE (MICROTREMOR). THE ARRAYS WERE CENTERED ABOUT 90 FEET NE OF REFRACTION PROFILE SR-13 SW STAKE ON 10/14/10. BORING DYB10-14 IS ABOUT 900 FEET WNW OF THIS STAKE. ARRAYS WERE LOCATED IN RELATIVELY UNDISTURBED SOIL BECAUSE THERE ARE NO NEARBY ROADS. ARRAYS ORIENTED NE. SHALLOW PENETRATING ARRAY CONSISTED OF 16 INLINE GEOPHONES (4.5 Hz RESONANCE FREQUENCY) SPACED 2 FEET APART. SEISMIC ENERGY SOURCE OFFSETS WERE 2 AND 10 FEET. EACH DATA RECORD HAD ONLY ONE HAMMER HIT SO HIGH FREQUENCY (SHALLOW) SIGNALS WERE NOT SMEARED BY STACKING. MEDIUM PENETRATING ARRAY CONSISTED OF 16 INLINE GEOPHONES SPACED 10 FEET APART. SEISMIC ENERGY SOURCE OFFSETS WERE 10 AND 60 FEET. SEISMIC WAVE SIGNAL-TO-NOISE RATIO WAS INCREASED SIGNIFICANTLY BY DISCRETIONARILY STACKING 3-4 HAMMER HITS TOGETHER TO FORM EACH DATA RECORD THUS MINIMIZING BACKGROUND NOISE VIBRATIONS. DEEP PENETRATING ARRAY HAD THE SAME GEOMETRY AS THE MEDIUM ARRAY AND RECORDED BACKGROUND NOISE FOR ABOUT 11 MINUTES. THE 35 INDIVIDUAL DATA RECORDS WERE COMBINED TO ENHANCE LOWER FREQUENCY SIGNALS.

RESULTS:

SEVEN DISTINCT SHEAR WAVE VELOCITY ZONES WERE INTERPRETED FROM THE DATA USING GEOMETRICS (2009) 'SEISMIMAGER' SOFTWARE. NO CORRELATIONS BETWEEN VELOCITY ZONES AND STRATIGRAPHY ARE POSSIBLE BECAUSE DIAZ YOURMAN & ASSOCIATES BORING DYB10-14 WAS TOO FAR FROM THE ARRAYS. NO DOWNHOLE VELOCITY SURVEY WAS CONDUCTED.

THE SEVEN SHEAR VELOCITY ZONES (930+/-12%, 1040+/-8%, 1130+/-8%, 1430+/-7%, 1780+/-7%, 2460+/-7%, AND 3050+/-7% FEET/SECOND) PROBABLY REPRESENT ALLUVIUM WITH CONSOLIDATION INCREASING WITH DEPTH.

THE IBC AVERAGE VS100 IS 1626 FEET/SECOND WHICH CORRESPONDS TO SITE CLASS C (VERY DENSE SOIL). SURVEY PENETRATION IS ESTIMATED AT GREATER THAN 100 FEET.

FIGURE 4L
SURFACE WAVE SW-14 FAR FROM BORING DYB10-14
SHEAR WAVE VELOCITY SOUNDING
INTERPRETED FROM SURFACE WAVE DATA
CAITHNESS LLC-SODA MTN SOLAR PROJECT
TERRA PHYSICS

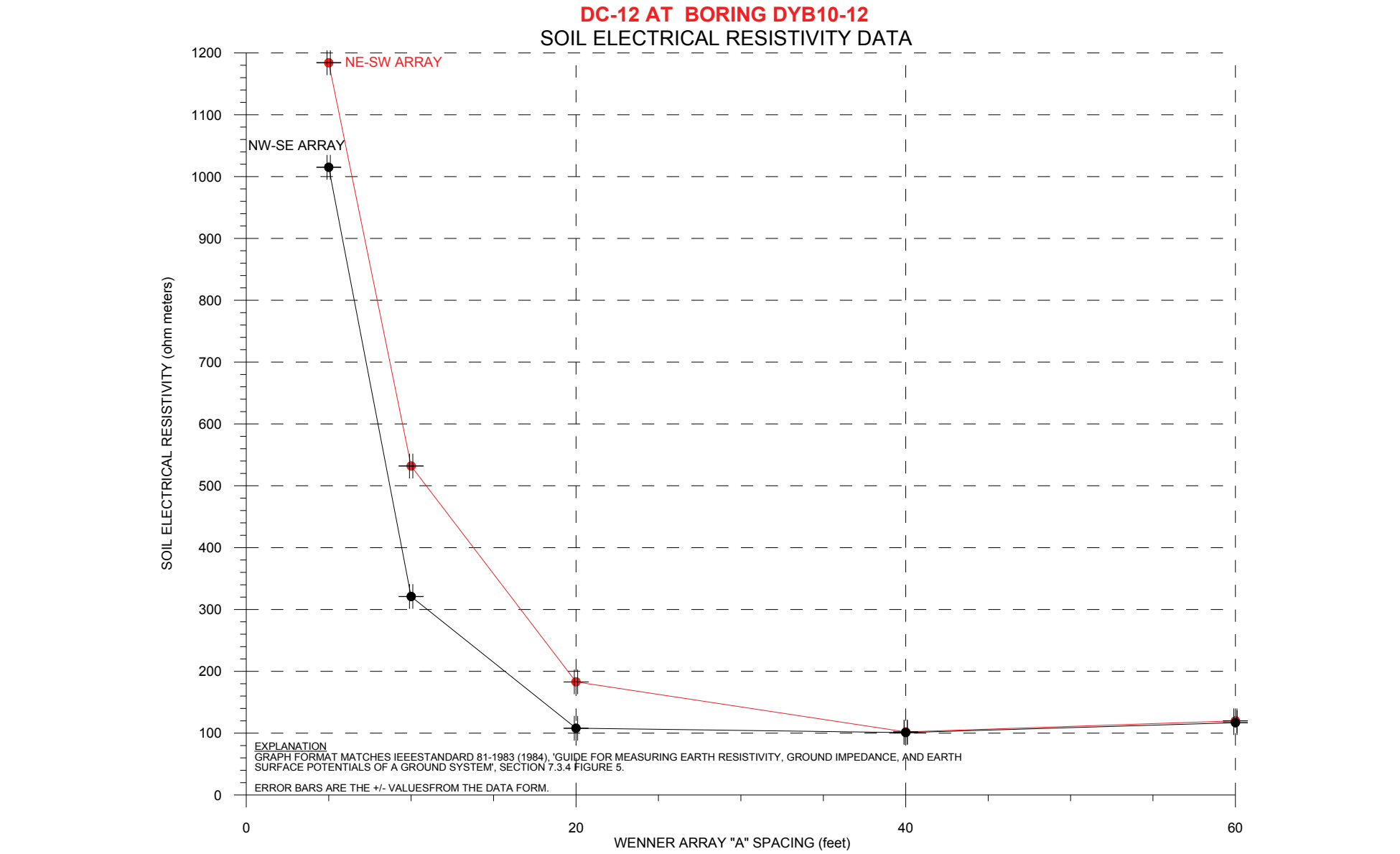
DC-12 AT BORING DYB10-12

SOIL ELECTRICAL RESISTIVITY TESTING FORM

STANDARD SOUNDING (SHALLOW PENETRATION) USING DIRECT CURRENT WENNER FOUR POINT ARRAY

PROJECT NAME: CAITHNESS LLC – SODA MOUNTAIN SOLAR POWER PROJECT TEST LOCATION ID: DC-12 (CENTERED ON B-12) NAD83 GEODETIC COORDINATES (degrees) AT ARRAY CENTER: N35.1427055, W116.1872098 ± 2 feet @ CENTER ELEVATION FROM ‘TOPO!’ SOFTWARE (WILSON GEOSIENCES, 2/26/10): 1384 feet ± 5 feet @ CENTER PREPARED FOR: WILSON GEOSIENCES				DATE: 10/20/10 TIME: 07:21 SIGNATURE OF TESTER: Kerry Hemmon		
MANUFACTURER/MODEL#: L & R INSTRUMENTS ULTRA “MINIRES”				TERRAIN DESCRIPTION: FLAT		
TRANSMITTER FREQUENCY: 5.0 HZ (S/N 201)				NEARBY UTILITY: NONE WITHIN 100 feet OF ANY ELECTRODE		
CALIBRATION DATE: 07/23/10				TRANS-REC WIRE SEPERATION: MORE THAN 10 feet		
FUNCTIONAL CALIBRATION: 10/21/10 CALIB RES = 19.06 ± 0.00025 ohms RELATIVE TO NBS REFERENCE OF 19.00 ± 0.01%				RESISTIVITY EQN: ASTM G57-06 & IEEE STD 81-1983 (PAGE 12) FOR ELECTRODE DEPTHS LESS THAN 0.1 “A” SPACING RESISTIVITY(ohm meter) = [2x3.1415]x[A(ft) x 0.3048]x[RESISTANCE(ohms)]		
SOIL TEMPERATURE: ABOUT 70 degrees F						
AIR TEMPERATURE: ABOUT 71 degrees F						
GROUND WATER TABLE: BELOW 300 feet				REMARKS: NONE		
PRECIPITATION/IRRIGATION: RAIN ABOUT 36 hours AGO						

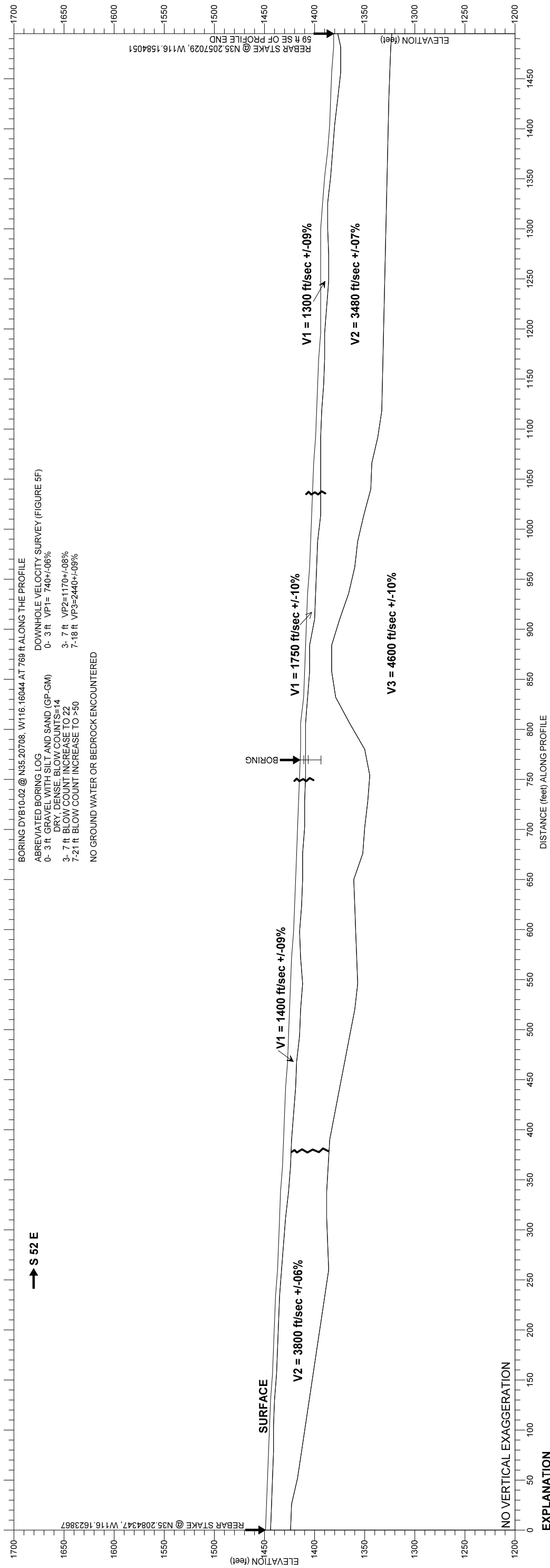
TEST LOCATION	READING #	“A” SPACING (feet)	ELECTRODE DEPTH (feet)	METER READING RESISTANCE (ohm)	METER MULTIPLIER	RESISTIVITY (ohm-meter)
	1	5.0 ± 0.1	0.25 ± 0.08	106.0 ± 0.00025	N/A	1015 ± 0.30
DC-12	2	10.0 ± 0.1	0.25 ± 0.08	16.78 ± 0.00025	N/A	321 ± 0.20
NW-SE ARRAY	3	20.0 ± 0.1	0.25 ± 0.08	2.808 ± 0.00025	N/A	108 ± 0.10
	4	40.0 ± 0.1	0.25 ± 0.08	1.313 ± 0.00025	N/A	101 ± 0.07
	5	60.0 ± 0.1	0.25 ± 0.08	1.018 ± 0.00025	N/A	117 ± 0.06
	1	5.0 ± 0.1	0.25 ± 0.08	123.7 ± 0.00025	N/A	1184 ± 0.30
DC-12	2	10.0 ± 0.1	0.25 ± 0.08	27.80 ± 0.00025	N/A	532 ± 0.20
NE-SW ARRAY	3	20.0 ± 0.1	0.25 ± 0.08	4.780 ± 0.00025	N/A	183 ± 0.10
	4	40.0 ± 0.1	0.25 ± 0.08	1.336 ± 0.00025	N/A	102 ± 0.07
	5	60.0 ± 0.1	0.25 ± 0.08	1.041 ± 0.00025	N/A	120 ± 0.06



CORRELATIONS OF GEOELECTRIC MODEL AND STRATIGRAPHY					
ARRAY	DEPTH ¹	ELEVATION ²	DEPTH/ELEVATION UNCERTAINTY		STRATIGRAPHY ³
	(feet)	(feet)	(%)	(feet)	
DC-12 AT BORING DYB10-12	0- 3	1384-1381	±15	± 1	Dry, Unconsolidated, SILTY SAND (SM) With Gravel
	3-10	1381-1374	±15	± 1	Dry, Partially Consolidated (hard drilling), SILTY SAND (SM) With Cobbles
	10- About 40	1374- About 1344	±15	± 6	Boring Extended 11 feet Into This Zone - Probably Partially Consolidated SILTY SAND (SM) With Fine Gravel

NOTE: 1. Depths, elevations, and resistivities are from composite models of the NW-SE and NE-SW arrays at each location.
2. Elevations are based on TOPO! Software (Wilson Geosciences, 02/26/10) at the array centers.
3. Stratigraphy from Diaz Yourman & Associates (08/31/10) boring logs.

FIGURE 4M
RESISTIVITY DC-12 AT BORING DYB10-12
SOIL ELECTRICAL RESISTIVITY DATA AND
INTERPRETED GEOELECTRIC MODEL
CAITHNESS LLC-SODA MTN SOLAR PROJECT
TERRA PHYSICS



SEISMIC REFRACTION DATA WERE RECORDED ON SEPTEMBER 1, 2010 WITH A GEOMETRICS R-48 SEISMOGRAPH USING A 60 HZ NOTCH FILTER TO REDUCE AC ELECTRICAL INTERFERENCE.

THE 1496 FEET LONG PROFILE WAS LOCATED IN UNDISTURBED SOIL ABOUT 3-5 FEET SW OF THE DIRT ACCESS ROAD SW EDGE. THE PROFILE WAS DIVIDED INTO FIVE SPREADS EACH 299 FEET LONG. A SINGLE MARK PRODUCTS L-40 (40 HZ RESONANCE FREQUENCY) GEOPHONE WAS LOCATED AT 13 FEET INTERVALS ALONG THE PROFILE. SEISMIC WAVES WERE GENERATED AT EVERY EIGHTH GEOPHONE (91 FEET) ALONG EACH SPREAD AND ABOUT 70 FEET OFF EACH END OF EACH SPREAD. SEISMIC WAVE SIGNAL-TO-NOISE RATIO WAS INCREASED SIGNIFICANTLY BY DISCRETIONARILY STACKING 12-15 HAMMER HITS TOGETHER TO FORM EACH DATA RECORD. THIS MINIMIZING BACK-GROUND NOISE VIBRATIONS.

NEARBY SURFICIAL FEATURES AND BORINGS ARE SHOWN ALONG THE PROFILE'S SURFACE. A DOWNHOLE VELOCITY (FIGURE 5F), A TEM SOUNDING (FIGURE 3B), AND A DC RESISTIVITY SOUNDING (FIGURE 5J) WERE CONDUCTED AT THE BORING.

RESULTS:

THREE DISTINCT VELOCITY ZONES WERE INTERPRETED FROM THE DATA USING GEOMETRICS (2002) 'SEISMIMAGER' SOFTWARE. CORRELATIONS BETWEEN VELOCITY ZONES AND STRATIGRAPHY ARE BASED ON DIAZ YOURMAN & ASSOCIATES DESCRIPTIONS OF DY810-02 BORING (PLATE A03 DATED 8/30/01).

SURFICIAL VELOCITY ZONE (1300 - 1400 FEET/SECOND $\pm 0.09\%$) PROBABLY REPRESENTS THE DRY, UNCONSOLIDATED, (LOW BLOW COUNT 14-22) GRAVEL WITH SILT AND SAND (GP-GM). BETWEEN DISTANCES OF 750-1035 FEET, THIS VELOCITY IS ABOUT 30% HIGHER (1750 FEET/SECOND $\pm 1.10\%$).

SECOND VELOCITY ZONE (3480 FEET/SECOND $\pm 10\%$) PROBABLY REPRESENTS THE SAME DRY, PARTIALLY CONSOLIDATED (BLOW COUNT >50) GRAVEL WITH SILT AND SAND (GP-GM). BETWEEN DISTANCES OF 0-380 FEET, THIS VELOCITY IS ABOUT 9% HIGHER (3800 FEET/SECOND $\pm 10\%$).

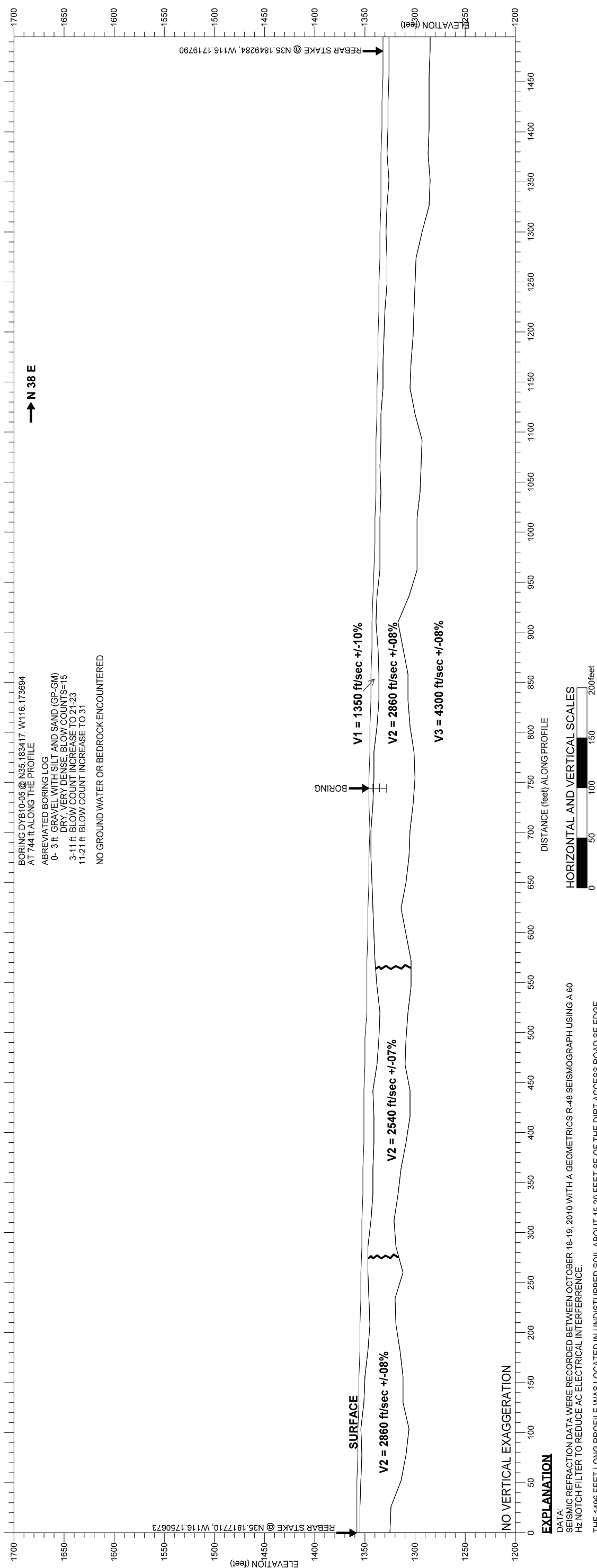
THIRD VELOCITY ZONE IS 4600 FEET/SECOND +/-10%. THE BORING DID NOT EXTEND INTO THIS ZONE. THE ZONE IS PROBABLY CONSOLIDATED ALLUVIUM THAT IS DRY BECAUSE THE VELOCITY IS NOT WITHIN THE CHARACTERISTIC RANGE OF 4900-5400 FEET/SECOND (SPEED OF SOUND IN WATER).

PENETRATION IS ESTIMATED AT 70-75 FEET.

FIGURE 5A
REFRACTION PROFILE SR-02 AT BORING DYB10-02
INTERPRETED SEISMIC VELOCITY CROSS SECTION

CAITHNESS LLC - SODA MTN SOLAR PROJECT

TERRA PHYSICS



EXPLANATION

DATA: SEISMIC REFRACTION DATA WERE RECORDED BETWEEN OCTOBER 18-19, 2010 WITH A GEOMETRICS R-48 SEISMOGRAPH USING A 60 HZ NOTCH FILTER TO REDUCE AC ELECTRICAL INTERFERENCE.

The 1496 FEET LONG PROFILE WAS LOCATED IN UNDISTURBED SOIL ABOUT 15-20 FEET SE OF THE DIRT ACCESS ROAD SE EDGE OF THE OIL PIPELINE. THE PROFILE WAS DIVIDED INTO FIVE SPREADS EACH 298 FEET LONG. A SINGLE MARK PRODUCT 13 L40 HZ RESONANCE FREQUENCY) GEOPHONE WAS LOCATED AT 13 FEET INTERVALS ALONG THE PROFILE. SEISMIC WAVES WERE GENERATED AT EVERY EIGHTH GEOPHONE (91 FEET) ALONG EACH SPREAD AND ABOUT 70 FEET OFF EACH END OF EACH SPREAD. SEISMIC WAVE SIGNAL-TO-NOISE RATIO WAS INCREASED SIGNIFICANTLY BY DISCRETIONARILY STACKING 12-15 HAMMER HITS TOGETHER TO FORM EACH DATA RECORD THUS MINIMIZING BACK-GROUND NOISE VIBRATIONS.

NEARBY SURFICIAL FEATURES AND BORINGS ARE SHOWN ALONG THE PROFILE'S SURFACE.

RESULTS:
THREE DISTINCT VELOCITY ZONES WERE INTERPRETED FROM THE DATA USING GEOMETRICS (2002) 'SEISIMAGER' SOFTWARE.
CORRELATIONS BETWEEN VELOCITY ZONES AND STRATIGRAPHY ARE BASED ON DIAZ YOURMAN & ASSOCIATES
DESCRIPTIONS OF DYB10-05 BORING (PLATE A06 DATED 9/02/10).

SURFICIAL VELOCITY ZONE (1350 FEET/SECOND $\pm$ 10%) PROBABLY REPRESENTS THE DRY, UNCONSOLIDATED, (LOW BLOW COUNT 15) GRAVEL WITH SILT AND SAND (GP-GM).

SECOND VELOCITY ZONE (2860 FEET/SECOND $\pm 0.08\%$) PROBABLY REPRESENTS THE SAME DRY, PARTIALLY CONSOLIDATED (BLOW COUNT 21-23) GRAVEL WITH SILT AND SAND (GP-GM) BETWEEN DISTANCES OF 275-365 FEET. THIS VELOCITY IS ABOUT 11% LOWER (2540 FEET/SECOND $\pm 0.07\%$).

THIRD VELOCITY ZONE IS 4300 FEET/SECOND (+/-08%). THE BORING DID NOT EXTEND INTO THIS ZONE. THE ZONE IS PROBABLY CONSOLIDATED ALLUVIUM THAT IS DRY BECAUSE THE VELOCITY IS NOT WITHIN THE CHARACTERISTIC RANGE OF 4900-5400 FEET/SECOND (SPEED OF SOUND IN WATER).

PENETRATION IS ESTIMATED AT 70-75 FEET.

FIGURE 5B
REFRACTION PROFILE SR-05 AT BORING DYB10-05
INTERPRETED SEISMIC VELOCITY CROSS SECTION
CAITHNESS LLC - SODA MTN SOLAR PROJECT
TERRA PHYSICS

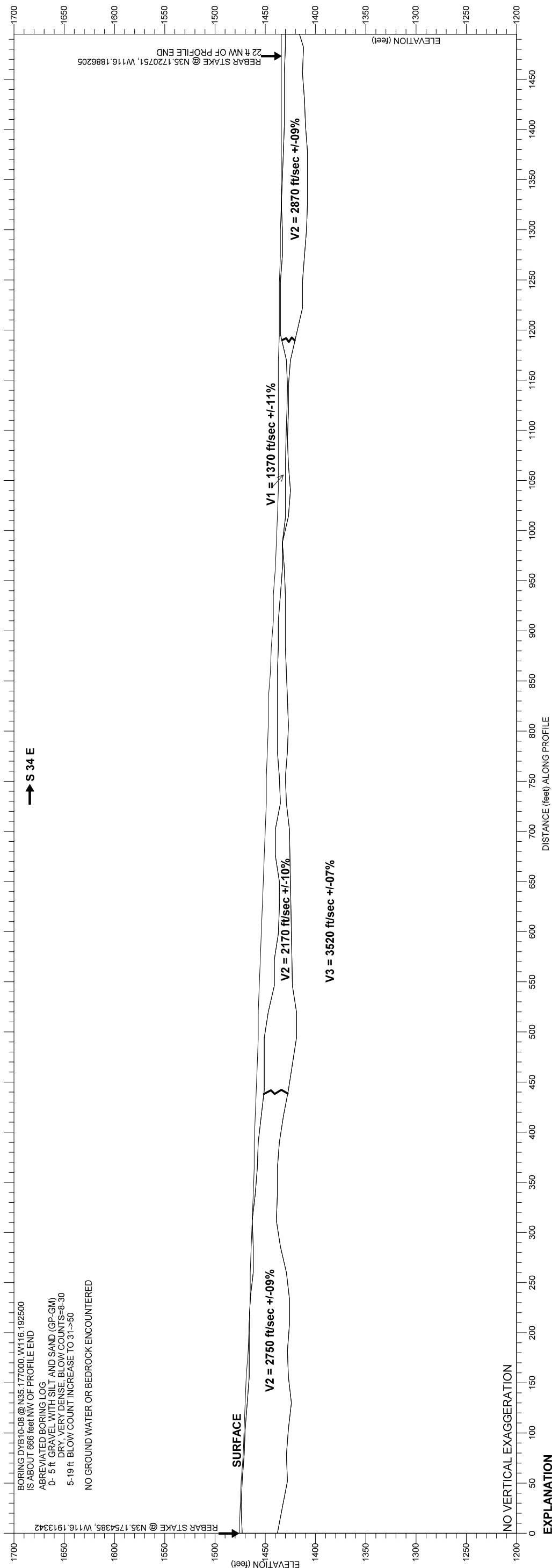
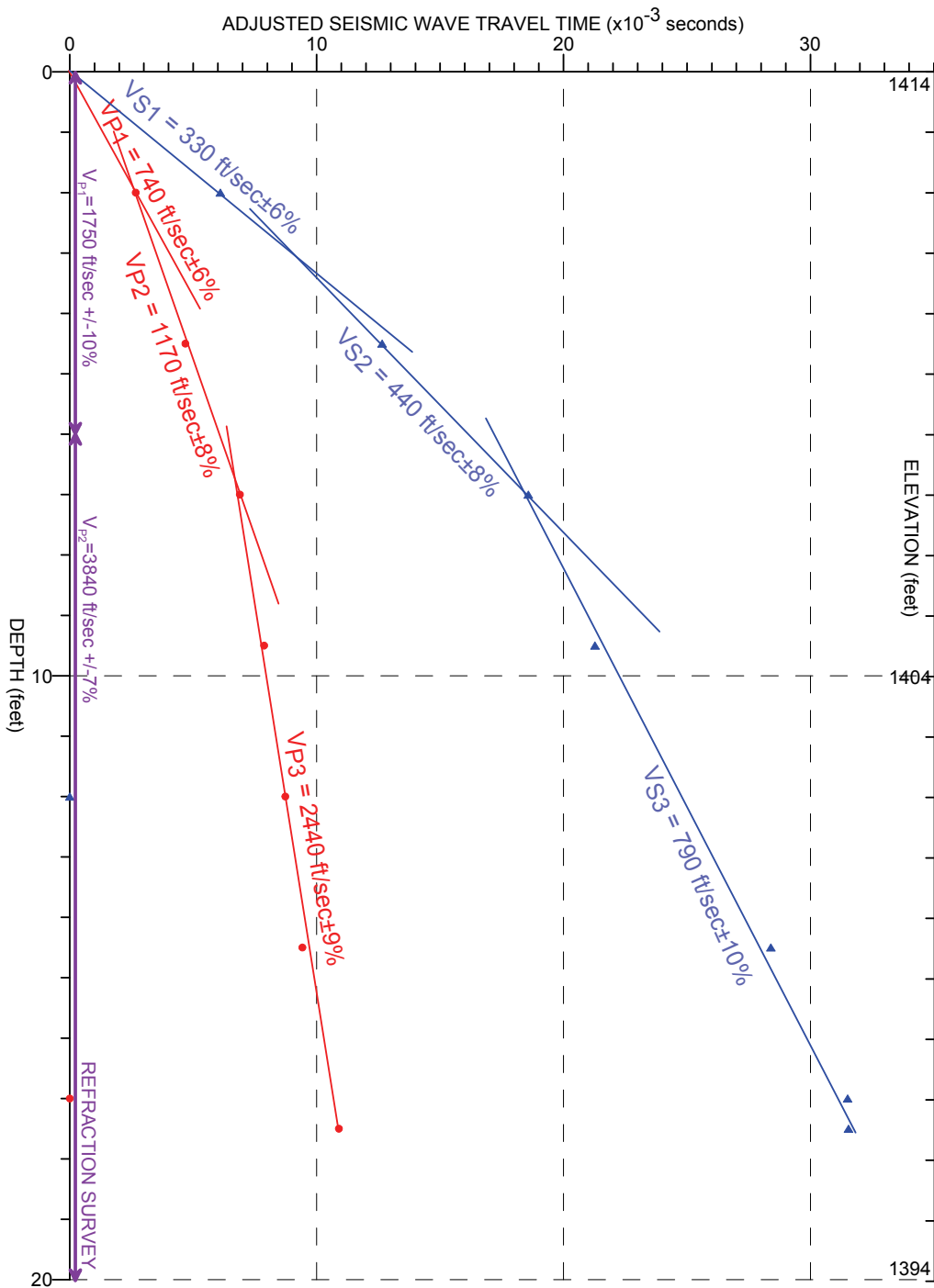


FIGURE 5D
REFRACTION PROFILE SR-08 FAR FROM BORING DYB10-08
INTERPRETED SEISMIC VELOCITY CROSS SECTION

CAITHNESS LLC - SODA MTN SOLAR PROJECT

TERRA PHYSICS



EXPLANATION

DATA:
DOWNHOLE VELOCITY SURVEY MEASURED CONDUCTED ON 10/21/10. COMPRESSIONAL (RED CIRCLES) AND HORIZONTALLY POLARIZED SHEAR (BLUE TRIANGLES) VELOCITIES WERE MEASURED AT 2.5 FEET INTERVALS STARTING AT THE MAXIMUM ACCESSIBLE DEPTH. A MARK PRODUCTS SONDE CONSISTING OF 3 MUTUALLY PERPENDICULAR GEOPHONES (4.5 HZ RESONANCE FREQUENCY) RECORDED THE SEISMIC WAVES THAT WERE GENERATED 3.0 FEET FROM THE BORING.

RESULTS:
ADJUSTED TIME AXIS WAS CALCULATED AS TRAVEL TIME MULTIPLIED BY THE RATIO OF THE MEASUREMENT DEPTH DIVIDED BY SLANT DISTANCE TRAVELED BY THE SEISMIC WAVES SO THE DATA WILL APPEAR AS A VERTICAL PROFILE.

THREE DISTINCT VELOCITY ZONES WERE INTERPRETED FROM THE DOWNHOLE SURVEY DATA. THE CORRESPONDING REFRACTION COMPRESSIONAL VELOCITY IS SHOWN IN PURPLE. CORRELATIONS BETWEEN VELOCITY ZONES AND STRATIGRAPHY ARE BASED ON DIAZ YOURMAN & ASSOCIATES DESCRIPTIONS OF DYB10-02 BORING (PLATE A-03 DATED 8/30/10).

SURFICIAL VELOCITY ZONE (VP 740 FT/SEC AND VS 330 FT/SEC) PROBABLY REPRESENTS DRY, UNCONSOLIDATED (LOW BLOW COUNTS 14) GRAVEL WITH SILT AND SAND (GP-GM).

SECOND VELOCITY ZONE (VP 1170 FT/SEC AND VS 440 FT/SEC) PROBABLY REPRESENTS THE SAME SOIL TYPE WITH SLIGHTLY HIGHER BLOW COUNTS (22).

THIRD VELOCITY ZONE (VP 2440 FT/SEC AND VS 790 FT/SEC) PROBABLY REPRESENTS DRY, PARTIALLY CONSOLIDATED (BLOW COUNTS >50), GRAVEL WITH SILT AND SAND (GP-GM).

DIAZ YOURMAN
BORING LOG
8/30/10 VERSION

GRAVEL WITH SILT
AND SAND (GP-GM)
DRY, DENSE,
BLOW COUNTS 14

BLOW COUNT
INCREASE TO 22

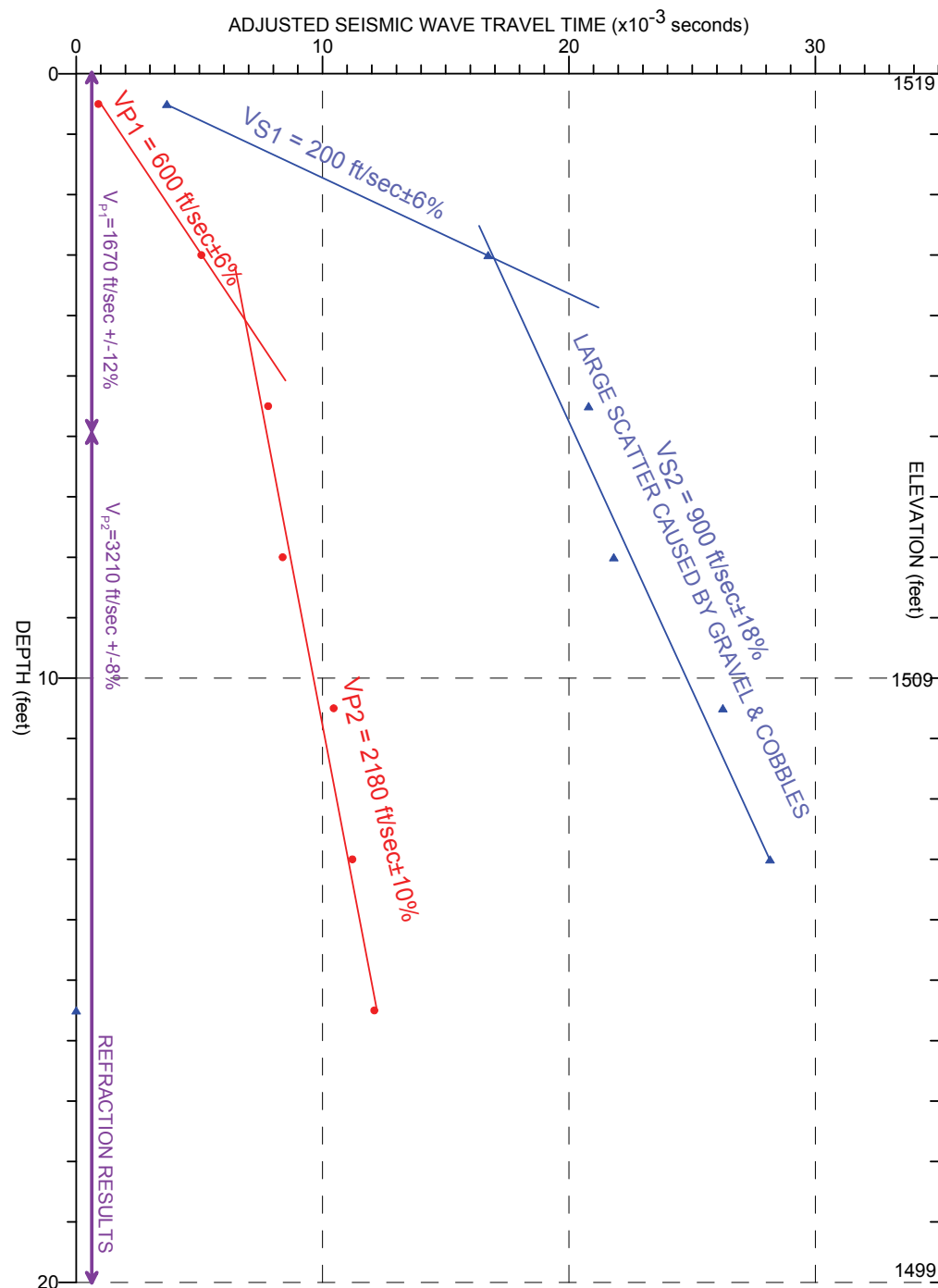
BLOW COUNT
INCREASE TO >50

BORING BOTTOM @ 21 feet
NO GROUND WATER OR
BEDROCK ENCOUNTERED

FIGURE 5F
DOWNHOLE VELOCITY DH-02 AT BORING DYB10-02
DATA AND INTERPRETED VELOCITY ZONES

CAITHNESS LLC-SODA MTN SOLAR PROJECT

TERRA PHYSICS



EXPLANATION

DATA:
DOWNHOLE VELOCITY SURVEY MEASURED CONDUCTED ON 10/21/10. COMPRESSIONAL (RED CIRCLES) AND HORIZONTALLY POLARIZED SHEAR (BLUE TRIANGLES) VELOCITIES WERE MEASURED AT 2.5 FEET INTERVALS STARTING AT THE MAXIMUM ACCESSIBLE DEPTH. A MARK PRODUCTS SONDE CONSISTING OF 3 MUTUALLY PERPENDICULAR GEOPHONES (4.5 HZ RESONANCE FREQUENCY) RECORDED THE SEISMIC WAVES THAT WERE GENERATED 3.0 FEET FROM THE BORING.

RESULTS:
ADJUSTED TIME AXIS WAS CALCULATED AS TRAVEL TIME MULTIPLIED BY THE RATIO OF THE MEASUREMENT DEPTH DIVIDED BY SLANT DISTANCE TRAVELED BY THE SEISMIC WAVES SO THE DATA WILL APPEAR AS A VERTICAL PROFILE.

THREE DISTINCT VELOCITY ZONES WERE INTERPRETED FROM THE DOWNHOLE SURVEY DATA. THE CORRESPONDING REFRACTION COMPRESSIONAL VELOCITY IS SHOWN IN PURPLE. CORRELATIONS BETWEEN VELOCITY ZONES AND STRATIGRAPHY ARE BASED ON DIAZ YOURMAN & ASSOCIATES DESCRIPTIONS OF DYB10-09 BORING (PLATE A-10 DATED 8/30/10).

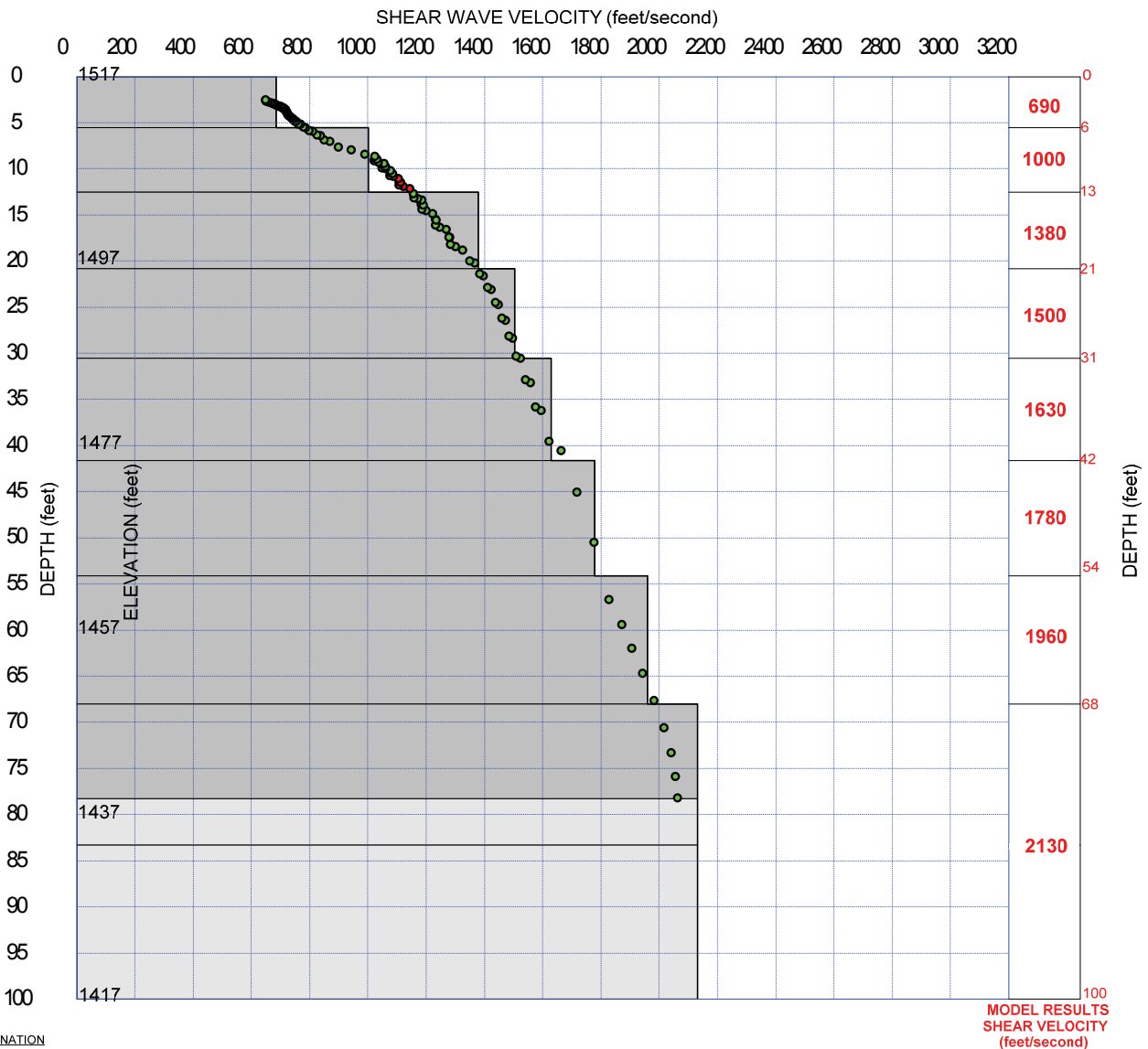
SURFICIAL VELOCITY ZONE (VP 600 FT/SEC AND VS 200 FT/SEC) PROBABLY REPRESENTS DRY, UNCONSOLIDATED (LOW BLOW COUNTS 23) GRAVEL WITH SILT AND SAND (GP-GM).

SECOND VELOCITY ZONE (VP 2180 FT/SEC AND VS 900 FT/SEC) PROBABLY REPRESENTS DRY, PARTIALLY CONSOLIDATED (BLOW COUNTS 18->50), GRAVEL WITH SILT AND SAND (GP-GM) AND COBBLES.

FIGURE 5G
DOWNHOLE VELOCITY DH-09 AT BORING DYB10-09
DATA AND INTERPRETED VELOCITY ZONES

CAITHNESS LLC-SODA MTN SOLAR PROJECT

TERRA PHYSICS



EXPLANATION

DATA:

SURFACE WAVE DATA RECORDED WITH A SERIES OF THREE COCENTRIC GEOPHONE ARRAYS: TWO ACTIVE SOURCE (MASW) AND ONE PASSIVE (MICROTREMOR). THE ARRAYS WERE CENTERED ON BORING DYB10-03 (N35.206972, W116.174833) ON 10/14/10. ARRAYS WERE LOCATED IN RELATIVELY UNDISTURBED SOIL ABOUT 3-5 FEET NW OF THE DIRT ACCESS ROAD NW EDGE AND WERE ORIENTED NW. SHALLOW PENETRATING ARRAY CONSISTED OF 16 INLINE GEOPHONES (4.5 Hz RESONANCE FREQUENCY) SPACED 2 FEET APART. SEISMIC ENERGY SOURCE OFFSETS WERE 2 AND 10 FEET. EACH DATA RECORD HAD ONLY ONE HAMMER HIT SO HIGH FREQUENCY (SHALLOW) SIGNALS WERE NOT SMEARED BY STACKING. MEDIUM PENETRATING ARRAY CONSISTED OF 16 INLINE GEOPHONES SPACED 10 FEET APART. SEISMIC ENERGY SOURCE OFFSETS WERE 10 AND 60 FEET. SEISMIC WAVE SIGNAL-TO-NOISE RATIO WAS INCREASED SIGNIFICANTLY BY DISCRETIONARILY STACKING 3-4 HAMMER HITS TOGETHER TO FORM EACH DATA RECORD THUS MINIMIZING BACKGROUND NOISE VIBRATIONS. DEEP PENETRATING ARRAY HAD THE SAME GEOMETRY AS THE MEDIUM ARRAY AND RECORDED BACKGROUND NOISE FOR ABOUT 11 MINUTES. THE 35 INDIVIDUAL DATA RECORDS WERE COMBINED TO ENHANCE LOWER FREQUENCY SIGNALS.

RESULTS:

EIGHT DISTINCT SHEAR WAVE VELOCITY ZONES WERE INTERPRETED FROM THE DATA USING GEOMETRICS (2009) 'SEISIMAGER' SOFTWARE. CORRELATIONS BETWEEN VELOCITY ZONES AND STRATIGRAPHY ARE BASED ON DIAZ YOURMAN & ASSOCIATES DESCRIPTIONS OF DYB10-03 BORING (PLATE A04 DATED 8/30/10). NO DOWNHOLE VELOCITY SURVEY WAS CONDUCTED.

SURFICIAL SHEAR VELOCITY ZONE (690 FEET/SECOND +/-14%) PROBABLY REPRESENTS THE DRY, UNCONSOLIDATED (LOW BLOW COUNT 13-20), GRAVEL WITH SILT AND SAND (GP-GM).

SECOND SHEAR VELOCITY ZONE (1000 FEET/SECOND +/-11%) PROBABLY REPRESENTS THE SAME DRY, PARTIALLY CONSOLIDATED (BLOW COUNTS 38) GRAVEL WITH SILT AND SAND (GP-GM) AND SILTY SAND (SM) WITH GRAVEL WITH BLOW COUNTS 30-50.

THIRD SHEAR VELOCITY ZONE (1380 FEET/SECOND +/-8%) PROBABLY REPRESENTS THE SAME DRY, PARTIALLY CONSOLIDATED SILTY SAND (SM) WITH GRAVEL WITH BLOW COUNTS >50.

FOURTH THROUGH EIGHT SHEAR VELOCITY ZONES WERE 1510 +/-7%, 1630 +/-6%, 1780 +/-6%, 1960 +/-6%, AND 2130 +/-6% FEET/SECOND. THE BORING DID NOT EXTEND INTO THESE ZONES. THEY MAY REPRESENT ALLUVIUM WITH CONSOLIDATION INCREASING WITH DEPTH.

THE IBC AVERAGE VS100 IS 1575 FEET/SECOND WHICH CORRESPONDS TO SITE CLASS C (VERY DENSE SOIL). SURVEY PENETRATION IS ESTIMATED AT 78 FEET. TO CALCULATE VS100, THE DEEPEST SHEAR VELOCITY WAS EXTENDED FROM 78 TO 100 FEET.

FIGURE 5H
SURFACE WAVE SW-03 AT BORING DYB10-03
SHEAR WAVE VELOCITY SOUNDING
INTERPRETED FROM SURFACE WAVE DATA

CAITHNESS LLC-SODA MTN SOLAR PROJECT
TERRA PHYSICS

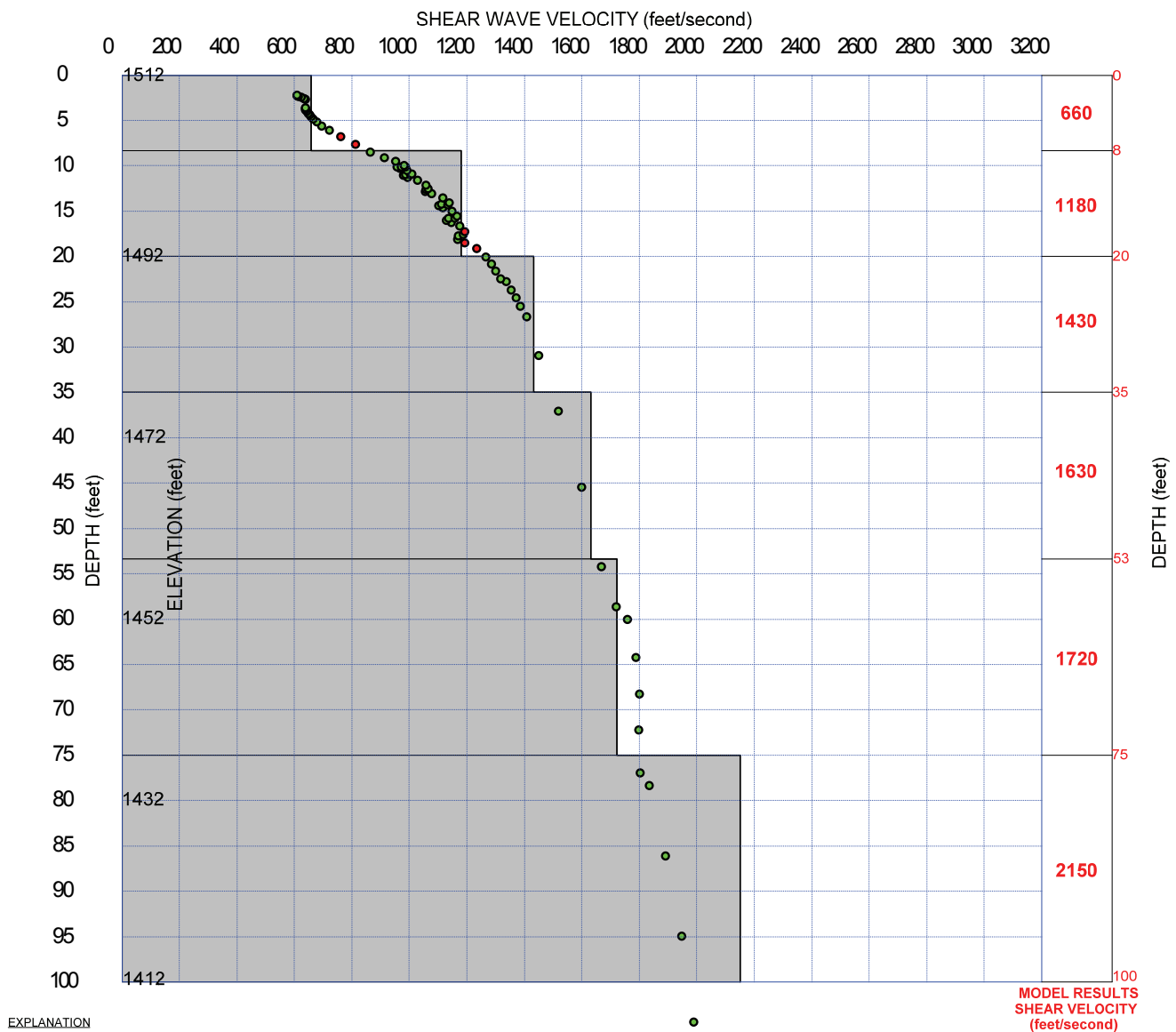


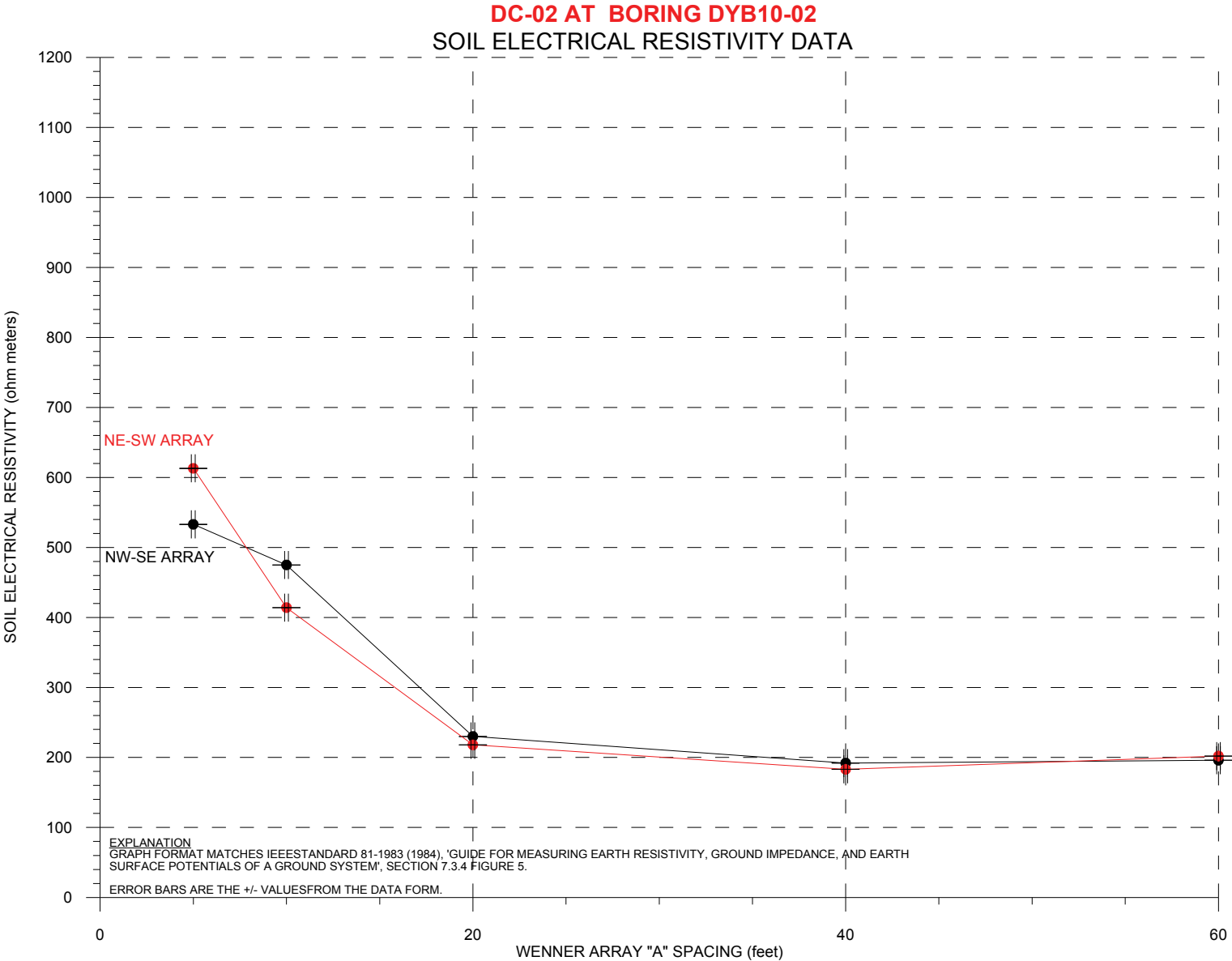
FIGURE 51
SURFACE WAVE SW-08 AT BORING DYB10-08
SHEAR WAVE VELOCITY SOUNDING
INTERPRETED FROM SURFACE WAVE DATA
CAITHNESS LLC-SODA MTN SOLAR PROJECT
TERRA PHYSICS

DC-02 AT BORING DYB10-02

SOIL ELECTRICAL RESISTIVITY TESTING FORM

STANDARD SOUNDING (SHALLOW PENETRATION) USING DIRECT CURRENT WENNER FOUR POINT ARRAY

PROJECT NAME: CAITHNESS LLC-SODA MOUNTAIN SOLAR POWER PROJECT TEST LOCATION ID: DC-02 (CENTERED ON B-02) NAD83 GEODETIC COORDINATES (degrees) AT ARRAY CENTER: N35.2070765, W116.1604443 ± 2 feet @ CENTER ELEVATION FROM ‘TOPO!’ SOFTWARE (WILSON GEOSIENCES, 2/26/10): 1414 feet ± 5 feet @ CENTER PREPARED FOR: WILSON GEOSIENCES				DATE: 10/21/10 TIME: 10:48 SIGNATURE OF TESTER: Kerry Hemmon		
MANUFACTURER/MODEL#: L & R INSTRUMENTS ULTRA “MINIRES”				TERRAIN DESCRIPTION: INCLINE PLANE – DOWN TO SE		
TRANSMITTER FREQUENCY: 5.0 HZ (S/N 201)				NEARBY UTILITY: NONE WITHIN 100 feet OF ANY ELECTRODE		
CALIBRATION DATE: 07/23/10				TRANS-REC WIRE SEPERATION: MORE THAN 10 feet		
FUNCTIONAL CALIBRATION: 10/21/10 CALIB RES = 19.06 ± 0.00025 ohms RELATIVE TO NBS REFERENCE OF 19.00 ± 0.01%				RESISTIVITY EQN: ASTM G57-06 & IEEE STD 81-1983 (PAGE 12) FOR ELECTRODE DEPTHS LESS THAN 0.1 “A” SPACING RESISTIVITY(ohm meter) = [2x3.1415]x[A(ft) x 0.3048]x[RESISTANCE(ohms)]		
SOIL TEMPERATURE: ABOUT 70 degrees F						
AIR TEMPERATURE: ABOUT 73 degrees F						
GROUND WATER TABLE: BELOW 300 feet				REMARKS: ORIGINALLY AT B-05 BUT EROSION FROM RECENT RAINS PREVENTED ACCESS		
PRECIPITATION/IRRIGATION: RAIN ABOUT 60 hours AGO						
TEST LOCATION	READING #	“A” SPACING (feet)	ELECTRODE DEPTH (feet)	METER READING RESISTANCE (ohm)	METER MULTIPLIER	RESISTIVITY (ohm-meter)
	1	5.0 ± 0.1	0.25 ± 0.08	55.70 ± 0.00025	N/A	533 ± 0.30
DC-02	2	10.0 ± 0.1	0.25 ± 0.08	24.80 ± 0.00025	N/A	475 ± 0.20
NW-SE ARRAY	3	20.0 ± 0.1	0.25 ± 0.08	6.012 ± 0.00025	N/A	230 ± 0.10
	4	40.0 ± 0.1	0.25 ± 0.08	2.502 ± 0.00025	N/A	192 ± 0.07
	5	60.0 ± 0.1	0.25 ± 0.08	1.705 ± 0.00025	N/A	196 ± 0.06
	1	5.0 ± 0.1	0.25 ± 0.08	64.00 ± 0.00025	N/A	613 ± 0.30
DC-02	2	10.0 ± 0.1	0.25 ± 0.08	21.60 ± 0.00025	N/A	414 ± 0.20
NE-SW ARRAY	3	20.0 ± 0.1	0.25 ± 0.08	5.686 ± 0.00025	N/A	218 ± 0.10
	4	40.0 ± 0.1	0.25 ± 0.08	2.388 ± 0.00025	N/A	183 ± 0.07
	5	60.0 ± 0.1	0.25 ± 0.08	1.761 ± 0.00025	N/A	202 ± 0.06



CORRELATIONS OF GEOELECTRIC MODEL AND STRATIGRAPHY						
ARRAY	DEPTH ¹	ELEVATION ²	DEPTH/ELEVATION UNCERTAINTY		COMPOSITE ELECTRICAL RESISTIVITY ¹ (ohm meters)	STRATIGRAPHY ³
	(feet)	(feet)	(%)	(feet)		
DC-02 AT BORING DYB10-02	0- 3	1414-1411	±15	± 1	1000 ± 15%	Dry, Unconsolidated, GRAVEL WITH SILT AND SAND (GP-GM)
	3- 7	1411-1407	±15	± 1	310 ± 15%	Dry, Unconsolidated, GRAVEL WITH SILT AND SAND (GP-GM)
	7-17	1407-1397	±15	± 3	80 ± 15%	Dry, Partially Consolidated (hard drilling), GRAVEL WITH SILT AND SAND (GP-GM)
	17-About 40	1397 - About 1374	±15	± 6	330 ± 15%	Boring Only Extended 4 feet Into This Zone - Probably Partially Consolidated GRAVEL WITH SILT AND SAND (GP-GM).

NOTE: 1. Depths, elevations, and resistivities are from composite models of the NW-SE and NE-SW arrays at each location.
2. Elevations are based on TOPO! Software (Wilson Geosciences, 02/26/10) at the array centers.
3. Stratigraphy from Diaz Yourman & Associates (08/31/10) boring logs.

FIGURE 5J
RESISTIVITY DC-02 AT BORING DYB10-02
SOIL ELECTRICAL RESISTIVITY DATA AND
INTERPRETED GEOELECTRIC MODEL
CAITHNESS LLC-SODA MTN SOLAR PROJECT
TERRA PHYSICS