**FOR CONTRACT NO.: 02-4C94U4**

# INFORMATION HANDOUT

## AGREEMENTS

UNITED STATES FOREST SERVICE TIMBER SALE AGREEMENT REQUIREMENT FOR STUMP TREATMENT

## MATERIALS INFORMATION

PRELIMINARY RECOMMENDATIONS FOR RIPPABILITY FOR MANZANITA CHUTE CURVE IMPROVEMENT

**ROUTE: 02-Sha-44-46.6/48.3**

# Memorandum

*Flex your power!*
*Be energy efficient!*

To: AL TRUJILLO
DISTRICT 2 SAFETY DESIGN BRANCH CHIEF

ATTN: JUSTIN BORDERS
SAFETY DESIGN PROJECT ENGINEER

Date: March 24, 2009

File: 02-SHA-44-PM46.9/48.3
Manzanita Chute
02-4C9401

From: **DEPARTMENT OF TRANSPORTATION**
**DIVISION OF ENGINEERING SERVICES**
**GEOTECHNICAL SERVICES – MS 5**

Subject: Preliminary Recommendations for Rippability for Manzanita Chute Curve Improvement

## 1. Introduction

Per your request of November 2, 2007 we are providing preliminary rippability recommendations for the proposed curve improvement at Manzanita Chute on State Route 44, located approximately sixteen miles east of Shingletown in Shasta County, California. Two different realignments were considered, and ultimately the northern alignment (Alternative A) was approved. This option will include several large road cuts in hard rock. The purpose of this report is to assess excavation characteristics and advise if blasting would be required for construction of the proposed road cuts.

## 2. Existing Facilities and Proposed Improvements

At the time of our field reconnaissance, this east-west trending segment of SR 44 consisted of two 12-foot wide, asphalt-paved lanes that link the City of Redding with Lassen Volcanic National Park (LVNP). Cross culverts for the adjacent Manzanita Creek were observed. No other utilities or structures were identified within the project limits.

According to District staff, there have been numerous accidents at this location. During the 5 year period from March 1, 2002 to February 28, 2007, there have been 25 accidents, including one fatality and fifteen injuries. These statistics represent a total accident rate 5.5 times higher than the statewide average. The purpose of this project is to reduce the number and severity of accidents by improving the lane and shoulder geometrics and increasing the clear recovery zone. The proposed design speed will be increased from the current 35 mph to 60 mph.

The proposed safety improvements include realignment of the corridor toward the north with an estimated 79,000 cubic yards of excavation. The new roadway will include 12-foot wide lanes with 4-foot wide shoulders. In addition, there will be snow storage and an increase in the clear recovery zone for vehicles that have left the traveled way. Lastly, the existing roadbed will be removed, contour graded and replanted before abandonment. All existing culverts will be removed.

**3. Pertinent Reports and Investigations**

Preparation for this report included a review of published data such as California Geologic Survey publications and previous reports, a field reconnaissance and geophysical (seismic refraction) surveys to estimate seismic velocity. No subsurface investigations, i.e., drilling, sample collection, or laboratory testing, were conducted for this report.

The following documents or websites were reviewed for the preparation of this report:

- "A General Location Guide for Ultramafic Rocks in California – Areas More Likely to Contain Naturally-Occurring Asbestos", Churchill, R.K., and Hill, R.L., CDMG Open File Report 2000-19, 2000.
- "Geologic Map of the Lassen Peak, Chaos Crags, and Upper Hat Creek Area, California". Christiansen, R. L., Clynne, M.A., and Muffler, L.J., published by USGS, 2002.
- "Geologic Map of the Western Flank of Brokeoff Volcano and Vicinity", Clynne, M.A., USGS Open File Report 84-224, 1984.
- National Resource Conservation Soil Survey, U.S. Department of Agriculture website, http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx
- Western Regional Climate Data Center website, www.wrcc.dri.edu, December 2007.

## 4. Physical Setting

### 4.1 Climate

The nearest weather station is located at Manzanita Lake (approximate elevation 6000'), one and a half miles east of the project within Lassen Volcanic National Park. The Western Regional Climate Center maintained monthly climate records for this location from 1/1/1949 through 12/31/2007. Average maximum and minimum air temperatures for Manzanita Lake are 57.4° F and 31.7° F, respectively. The park itself receives more precipitation than anywhere in the Cascades south of the Three Sisters due to not having a rain shadow from the Coast Ranges. The average annual precipitation at Manzanita Lake is 41.05 inches, with the heaviest rainfall occurring from November through March. The heaviest snowfall occurs between December and April, with an average annual snowfall of 189.5 inches. Within LVNP, snowbanks may persist year-round at the highest elevations.

### 4.2 Topography and Drainage

The existing SR 44 roadway within the project area roughly parallels the path of Manzanita Creek through a forested area. The new alignment will be constructed to the north, in rugged volcanic terrain covered with greenleaf manzanita and ceanothus shrubs, as well as fir, pine and cedar trees. The range in elevation begins at 5100' at the west end, rising to nearly 5500' at the easterly terminus. Surface drainage is generally west to southwesterly with some local variations. Manzanita Creek eventually drains westward into the Sacramento Valley.

### 4.3 Regional Geology and Seismicity

The project is located in southeastern Shasta County, within the Cascade Range geomorphic province. This region includes the southern section of a long chain of volcanoes, extending from British Columbia in Canada to Northern California, that define a subduction zone where the Juan de Fuca Plate plunges beneath the North American Plate. Researchers believe the Lassen area developed in several stages, beginning with volcanism at Brokeoff Mountain. More recent volcanic activity shifted to domes and flows of dacite and rhyodacite that erupted on its northern flank. Lassen Peak (elevation 10,457'), at the southern tip of the Cascades, is located east of the project site. It is a dormant volcano that had its last major eruption in 1915, with lesser activity extending into 1921.

October 1915 eruption of Mount Lassen - (Photograph by Chester Mullen)

The site is not located in an area known to contain naturally occurring asbestos and no rock containing serpentine was observed during the field review.

### 4.4 <u>Soils Survey</u>

The National Cooperative Soil Survey describes the soils within the project limits as belonging to the Inville-Yallani families (at the west end of the project) and the Sheld family (at the east end). The Inville-Yallani families consist of very gravelly, rhyolitic soils underlain by weathered bedrock within 5 feet of the surface. The Sheld family unit is described as 27 to 31 inches of gravelly to very gravelly sandy loam underlain by unweathered bedrock.

## 5. Field Investigation

### <u>Geophysical Survey</u>

Surface geophysical surveys were conducted in January 2009 to estimate rock excavation characteristics. Although snow cover in the project area restricted access somewhat, it did not otherwise interfere with the acquisition of data. Three refraction profiles were measured, with emphasis on the largest proposed cuts.

Measured seismic velocities generally indicate the material is moderately difficult to rip; however, very large, house-size boulders throughout the project limits may require size reduction. A more detailed discussion of these geophysical surveys is provided in the attached memorandum entitled, "Route 44 Roadway Realignment Project, PM 46.9/48.3".

## 6. Geotechnical Conditions

### 6.1 <u>Site Geology</u>

The Manzanita Chute curve improvement project is located in southeastern Shasta County, just west of Lassen Volcanic National Park. The area was covered by successive, thick, slow-cooling basaltic and andesitic flows from various vents and fissures. Some areas have a thin soil cover, however, excavation for the new road cuts are likely to intercept one or more of the following volcanic rock units: 1) Blocky cinder cone rubble and thick porphyritic rhyodacite flows with phenocrysts of plagioclase, biotite, and hornblende in a brown glassy groundmass from lower Manzanita Creek; 2) Porphyritic, dark gray mafic andesite with large phenocrysts of augite, plagioclase and hypersthene originating from Red Lake Mountain; and 3) Pumiceous pyroclastic flow

### 6.2 <u>Rippability</u>

Our Office investigation indicates that the Manzanita Chute realignment is underlain by a series of Cenozic volcanic flows from different sources. Although jointed and blocky, the particle size of these volcanic rocks may vary greatly and be difficult to excavate and/or transport due to size. This observation corroborates well with the interpretation of the seismic refraction profiles collected in the project area. The contractor should expect to use explosives or other methods such as hydraulic splitters, hoe-rams and chemical expanders to reduce particle size. In that regard, Caltrans has recently published Standard Special Provisions 19-705 for "Rock Excavation" and SSP 19-706 for "Rock Excavation (Controlled Blasting). Additional excavation technologies or methods may be utilized subject to the Engineer's approval.

Standard Special Provision S5-280, "Project Information" discloses to bidders and contractors a list of pertinent information available for their inspection prior to bid opening. The following is an excerpt from SSP S5-280 disclosing information originating from the Geotechnical Services. Items listed to be included in the Information Handout will be provided in Acrobat (.pdf) format to the addressee(s) of this report via electronic mail.

Data and information attached with the project plans are:
A. None

Data and Information included in the Information Handout provided to the bidders and Contractors are:

Data and Information available for inspection at the District Office:
**A. Preliminary Rippability Recommendations dated March 24, 2009**

Data and Information available for inspection at the Transportation Laboratory are:
A. None

The recommendations contained in this report are based on the specific project information provided to this office through March 23, 2009. If any conceptual changes are made during final design or in the field that could relate to or are related to geotechnical issues, the Office of Geotechnical Design North should review those changes to determine if these recommendations still apply. If you have any questions or comments, please call me at (916) 227-1069, or Doug Brittsan at (916) 227-1079.

MARCIA KIESSE, PG
Engineering Geologist
Office of Geotechnical Design North
Branch C

Attachments
C: Douglas Brittsan
RE Pending File
GDN File
GS File

State of California
DEPARTMENT OF TRANSPORTATION

Business, Transportation and Housing Agency

# Memorandum

*Flex your power!*
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**To:** **Douglas Brittan**
Senior M&R Engineer
Geotechnical Design North
Division of Engineering Services

**Date** March 19, 2009

**File:** 02-SHA-44-46.9/48.3
02-4C9403

**From:** **DEPARTMENT OF TRANSPORTATION**
DIVISION OF ENGINEERING SERVICES
GEOTECHNICAL SERVICES-MS#5

Attention: Marcia Kiesse

**Subject:** Route 44 Roadway Realignment Project, PM 46.9/48.3

## Introduction

This memo documents the results of a refraction seismic survey to assist in the design of roadway improvements for Highway 44 between PM 46.9 to 48.3. The seismic refraction survey was employed determine the rippability of the material proposed to be removed to accommodate the new alignment. Three refraction profiles were surveyed over two visits. Snow cover restricted access to some degree. The deepest cuts were prioritized. Figure 1 shows the approximate locations of the seismic lines.

Interpretation of the survey results used the Generalized Reciprocal Method of refraction Interpretation (GRM; Palmer,(1980). This method can accommodate variation in refractor velocity and depth along the seismic line, is relatively insensitive to refractor dip ( up to 20 degrees) and can accommodate hidden layer conditions (where supporting borehole data exist). Data interpretation used Viewseis, a commercially available computer program.

## Results and Discussion

Elevations in this report are estimated from USGS topographic maps. Surveyed elevations are not available as of the date of this report. Due to weather constraints at the time of the survey, seismic lines were positioned along project stationing where snow was minimal and foot access was possible. We chose station 27+50 and 78+00 since they had the deepest cuts. Measured velocities are listed in Table 1.

Line 3 was surveyed on February 2 after initial processing of lines 1 and 2 to use as a baseline. This site was chosen because it is approximately at existing road grade and it meets criteria for the GRM to model well. Specifically that location had a soil horizon over rock. The software program used assumes layers are continuous whereas our targeted sampling locations are basically outcrops of volcanic rock. Seismic data acquired to date are representative for the locations sampled, but are not adequate to evaluate rippability of the entire project site. Measured seismic velocities generally indicate the material is moderately difficult to rip however numerous very large (house-sized) boulders throughout the project site may require on site reduction or pre-blasting in order to reduce the material to reasonable size.

**TABLE 1**

| Line | Layer | Average Thickness (m) | Average Velocity (m/s) | Approx. Project Stationing | Line Length(m) | Inferred Material | Rippability |
|---|---|---|---|---|---|---|---|
| 1 | 1 | 3.5 | 400 | 22+00 | 50 | Colluvium | ER |
| 1 | 2 | N/A | 1200 | 22+00 | 50 | Weathered volcanics | MD |
| 2 | 1 | 0-3.0 | 400 | 27+00 | 100 | soil and rock | ER |
| 2 | 2 | 7* | 750 | 27+00 | 100 | Weathered volcanics | ER |
| 2 | 3 | N/A | 1200 | 27+00 | 100 | Weathered volcanics | MD |
| 3 | 1 | 6 | 300 | 78+00 | 60 | soil and rocks | NR |
| 3 | 2 | N/A | 1400 | 78+00 | 60 | Weathered volcanics | MD |

[1] ER = Easily Ripped, MD = Moderately Difficult, DR = Difficult Ripping, NR = Not Rippable,

## Geology

Rock within the proposed alignment consists of Quaternary volcanic flows overlain by recent thin soil. Outcrops of andesite predominate the landscape. We observed large boulders and outcrops of andesite within the proposed alignment. Vegetation consists of mature stands of timber and dense manzanita.

## Data Acquisition and Processing

Seismic refraction data were recorded using an EG&G Smartseis 24channel seismograph with 14 Hz geophones. The profiles varied in length but were all using 2.0 meter (6.56 feet) geophone spacing. The energy source employed was a hammer and striker plate. Refraction data from each shot were stored in the seismograph's memory. Both profile geometry and refraction data were backed-up to paper and floppy disk upon completion of the survey.

Profiles in this report are presented in terms of velocity units. A velocity unit is a three-dimensional unit which, due to its elastic properties and density, propagates seismic waves at a characteristic velocity or within a characteristic velocity range. Velocities denoted in this report and in the seismic refraction sections are expressed in meters per second. At least one velocity is present within a geological rock unit. In addition, each zone of weathering, or fracturing within that geological unit can constitute its own velocity unit. Conversely, when two rock units such as water saturated gravel and moderately weathered rock propagate seismic waves at the same velocity and are adjacent to each other, both units would be part of the same velocity unit. Lastly, discontinuous velocities might result from variation in the degree of alteration in the form of physical and chemical weathering and should be considered in the interpretation of the data.

Ripping ability is based on unpublished Caltrans data for a Caterpillar D9 series bulldozer with a single-tooth ripper. These values are as follows:

| **Velocity (m/s)** | **Rippability** |
|---|---|
| <1050 | Easily Ripped |
| 1050-1500 | Moderately Difficult |
| 1500-2000 | Difficult Ripping |
| >2000 | Not Rippable |

Different excavation equipment may experience different results. Penetrating efficacy of the ripping tooth is often more important in predicting ripping success than seismic velocity alone. Undetected blocks or lenses of high-velocity material may also be present within rippable zones, requiring blasting or other means of mechanical breakage for excavation.

Thank you for the opportunity to work on this project. If you have any questions or need additional assistance, please contact me at (916) 227-1307 or Mr. Bill Owen at (916) 227-0227.

Report by:

Dennison Leeds
Engineering Geologist
Geophysics and Geology Branch

Reviewed By:

William Owen, CEG 1735
Chief, Geophysics and Geology Branch

PROFESSIONAL GEOLOGIST
W.P. OWEN
No. 1735
Exp. 03/2010
CERTIFIED ENGINEERING GEOLOGIST
STATE OF CALIFORNIA

Project File.

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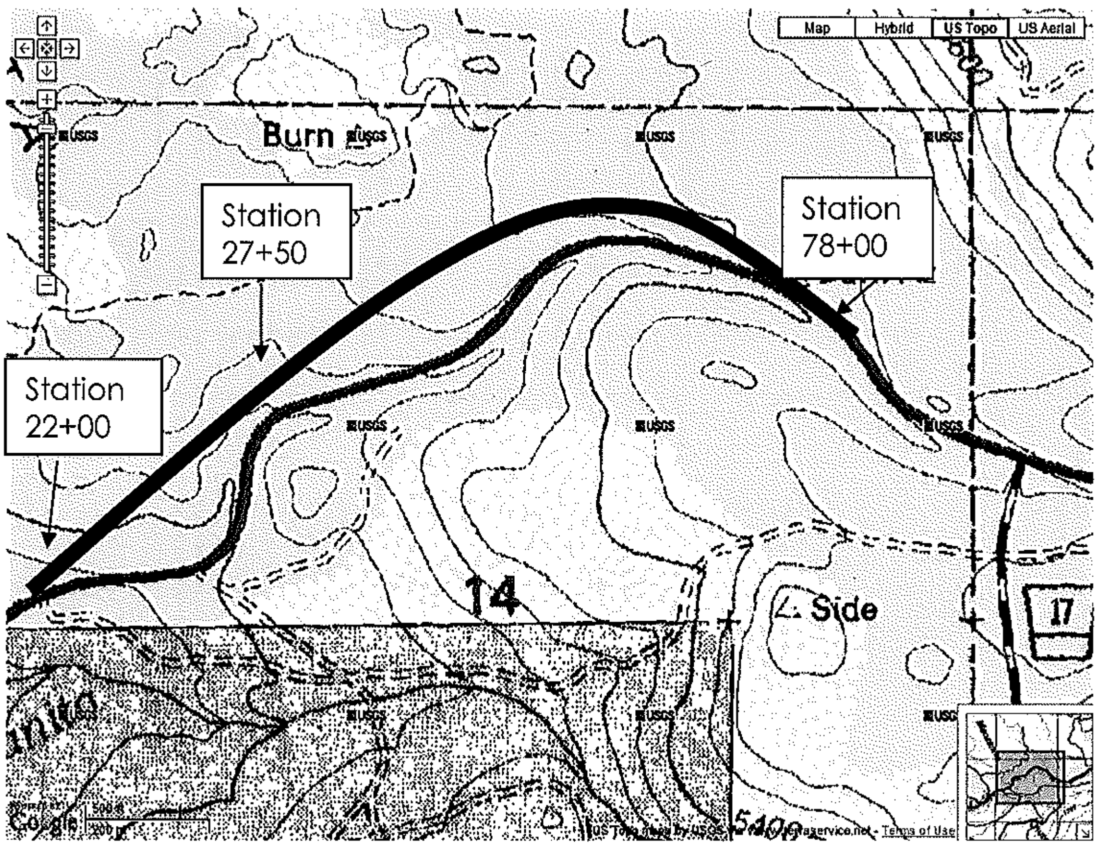


Figure 1. Sketch of the proposed re-alignment indicating approximate locations of the seismic lines

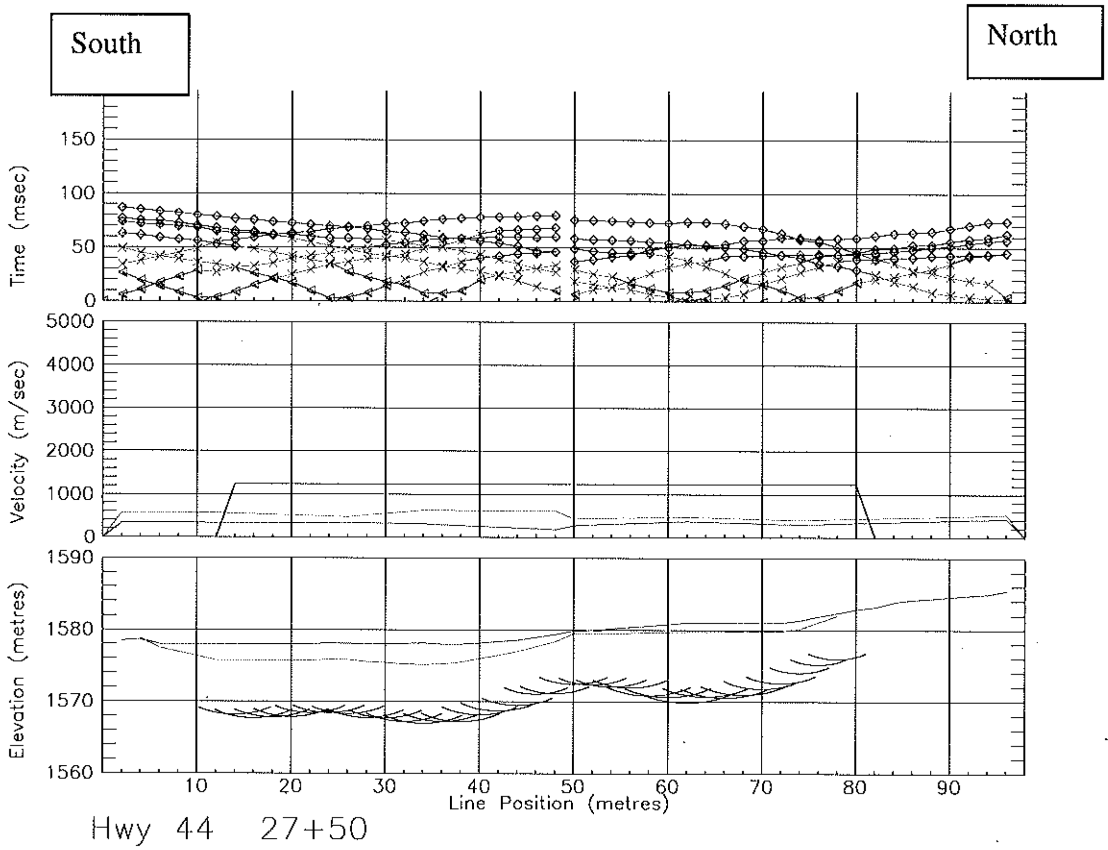


Figure 2. Travel-time curve, velocity model and depth section for seismic line @ 27+50. Cut here is expected to be 30 feet (9.14 meters). Model indicates material at that depth has a seismic velocity of 1200meters/ second

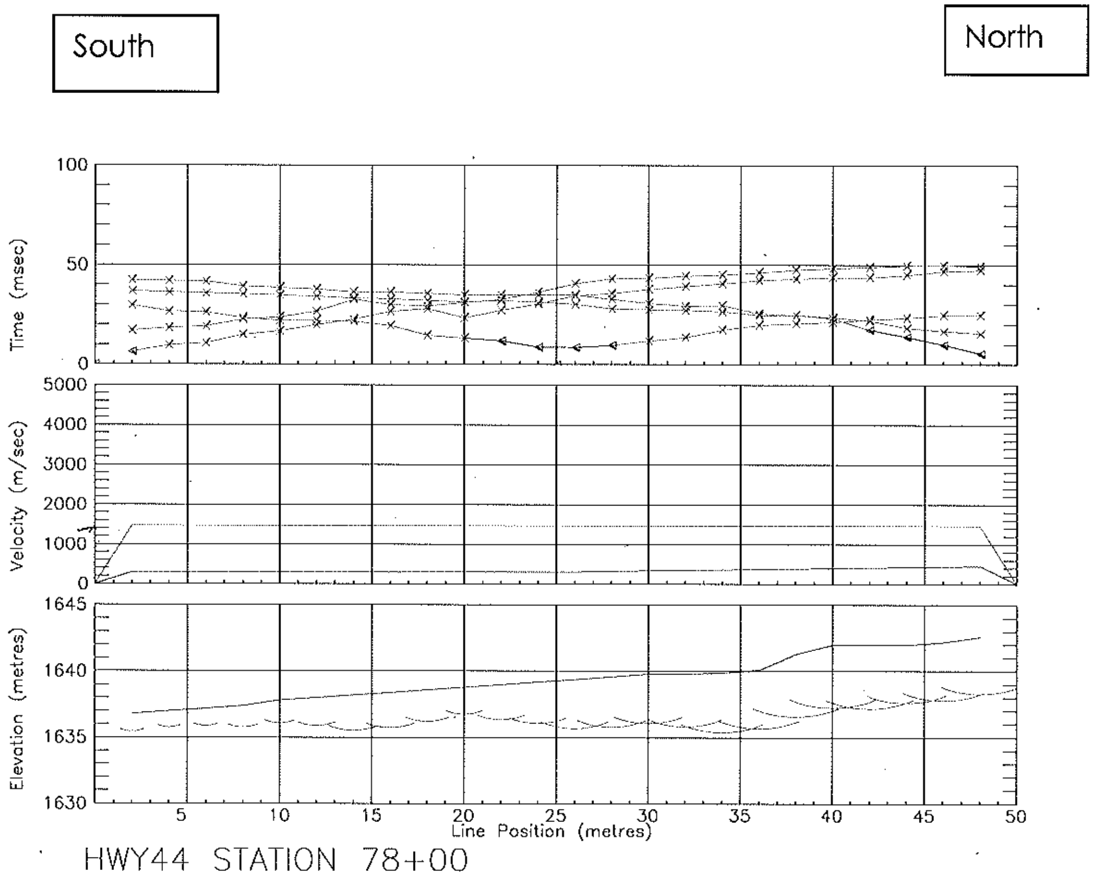


Figure 3. Travel time curve, velocity model and depth section for seismic line at 78+00 where cuts are expected to be 28 feet (8.53 meters). This model indicates material at that depth has a seismic velocity of 1420 meters per second.

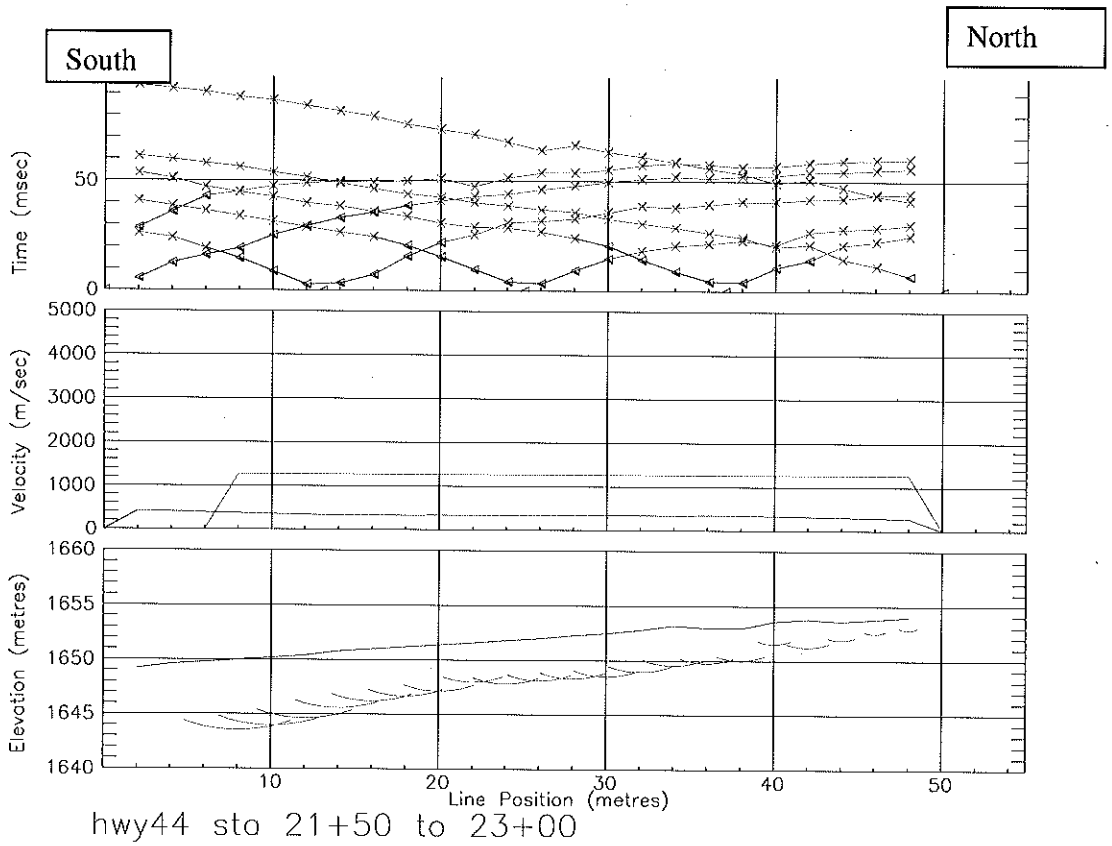


Figure 4 Travel-time curve, velocity model and depth section for seismic line @ station 22+00

Treatment of Stumps

Within areas shown on Sale Area Map, Purchaser shall treat stumps of all live CONIFER trees equal to or greater than 14inches stump diameter, (measured inside bark) unless otherwise agreed in writing. Treatment shall be with a borate compound registered by EPA in the State of California for prevention of annosus root disease.
Treatment shall consist of removal of sawdust and other loose debris from the cut surface of the stump and application of a thin layer of the borate compound uniformly over the entire cut surface, including exposed wood surfaces on the stump sides, at the rate specified on the product label. Any surface irregularities on the stump preventing application of a uniform layer of borate compound shall be cut level prior to treatment. Unless waived in writing, Purchaser shall also apply an approved colorant mixed with the borax to insure complete coverage. Treatment should be done as soon as possible but shall be completed no later than 4 hours after felling, otherwise stumps shall be re-cut and treated.

Purchaser shall not apply borate compound during heavy rain fall or when such precipiation rate is predicted within 4hours of application to cause borate compound to be flushed off the stump and become ineffective, in that case treatment shall be reapplied. Application shall be completed within 24 hours of the precipitation having ceased. Borate compound also shall not be applied to stumps located within 0feet of live streamcourses and meadows/wetlands shown on Sale Area Map and 0 feet of sensitive plant location boundaries as flagged on the ground.

Purchaser shall provide the borate compound and colorant and apply it in compliance with the State of California laws and regulations pertaining to pesticides and pest control operations. Borate compound storage shall be located such that any spillage will not contaminate water. All spills shall be promptly cleaned up and spilled material disposed of according to the product label. All spills occuring in water or over 25pounds shall be reported to Forest Service within 24 hours.

Purchaser shall submit at the end of each month a "Monthly Summary of Pesticide Use Reports" to the appropriate County Agricultural Commissioner with a copy to the District Ranger.