μ Geophysics Corporation

March 7, 1976

Mr. Art Lange
Amax Exploration, Inc.
4704 Harlan Street
Denver, Colorado 80212

Subject: Shallow Refraction

Dear Sir:

The subject of this letter is to propose a program of shallow refraction at the Mt. Princeton prospect near Buena Vista, Colorado. The objective of the survey proposed is to map the velocity and depth of the alluvial cover in the upper Arkansas valley. Knowledge of the depth of the alluvium is important for control of other geophysical methods such as ground noise, electrical methods and large-scale refraction or reflection.

An estimated velocity and structural model for the upper Arkansas valley alluvial cover is shown in Figure 1. The layered section consists of a low-velocity top layer (alluvial velocity of about 0.8 km/sec) perhaps 0 to 100m thick overlaying higher velocity sediments on basement (velocity of about 2.5 km/sec).

The stated objective is to map the upper layer velocity and thickness. This can be done by a reverse-profile shallow-refraction techniques. The travel times produced by the above models are shown in Figure 2.

The extent of the proposed survey is approximately 16km of profile. The profiles include 6.5 km of line from below Mt. Princeton eastwards, two lines across Chalk Creek totaling 7.0 km and 2 km across Cottonwood Creek.

A second series of refraction data will be taken at points spaced regularly in the area of interest. These spot checks would be run near any wells to tie the refraction data to well data. The short interval data will include approximately 21 set ups. The lines and spot checks are shown in Plate I.

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It should be stressed at this point that a geophysicist in the field will make interpretations and will adjust the field procedure to insure the most effective data set.

The field equipment for this survey includes a refraction string with 12 geophones placed at 20 meters for a total maximum offset of 260 meters. The source is non-explosive, therefore no special permitting is required. The recorder is a 12 channel system with adjustable gain. The survey will also utilize an enhancement seismograph for difficult signal areas.

Costs for this effort are estimated to be:

I.	Field Work/Day	
	1 - Geophysicist	$150.00
	1 - Technician	75.00
	Truck	25.00
	TOTAL/DAY	$250.00
II.	Equipment/Month (minimum)	
	Seismographs	$600.00
III.	Office/Day	
	1 - Geophysicist	$100.00

Productivity is better than 1 km continuous profiling/day or 5 spot recordings/day. A day of office work per field day will be necessary to produce a final report. The full program outlined above will thus have a maximum upper-limit total cost of $7,600. Increases in productivity can be expected if the access to the area is good or if the geology is continuous enough that line segments can be skipped and shots eliminated.

If we can furnish you with clarification of the above proposal, please contact us.

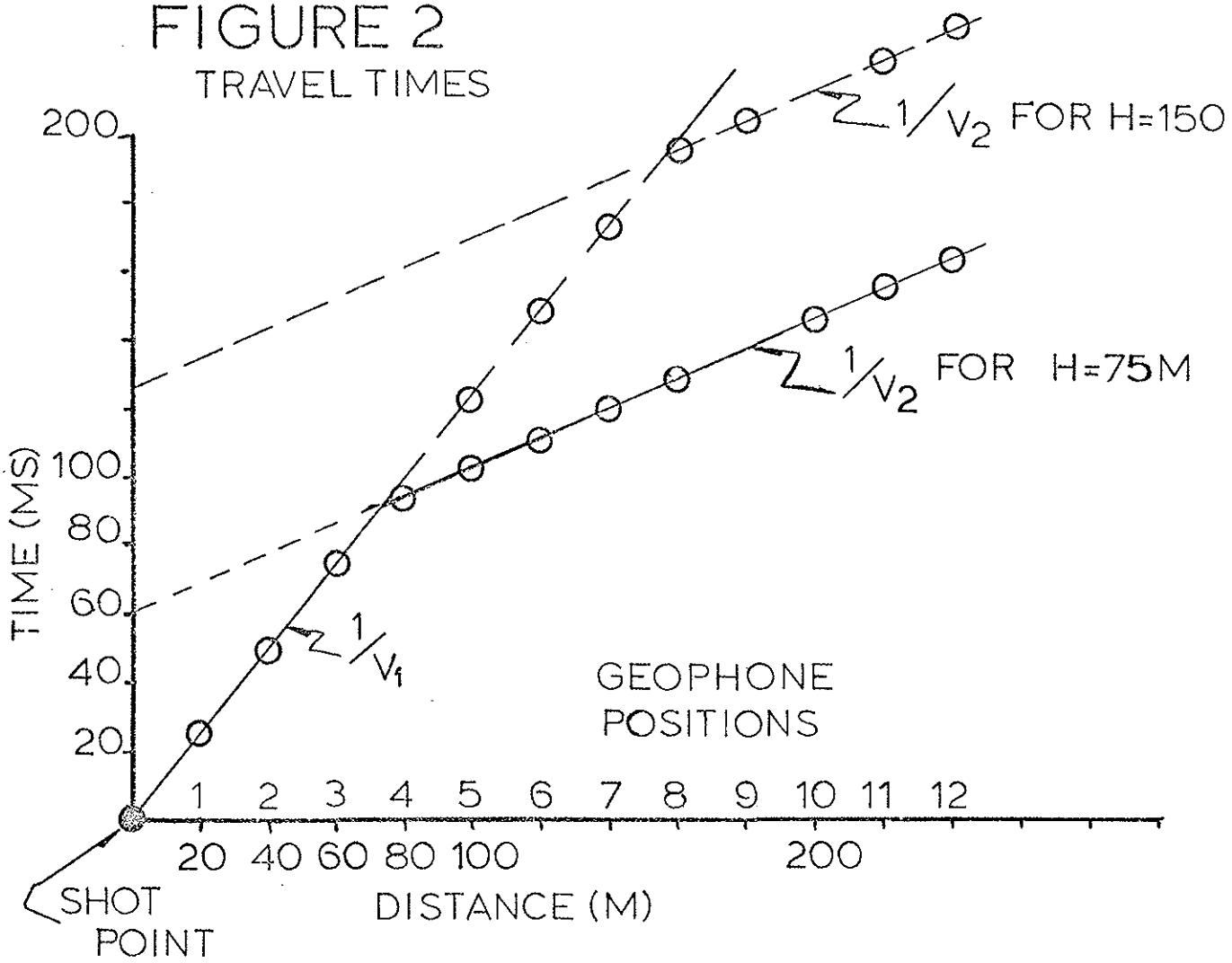
Very truly yours,

Paul Larry Brown

PLB/ph

FIGURE 2

TRAVEL TIMES



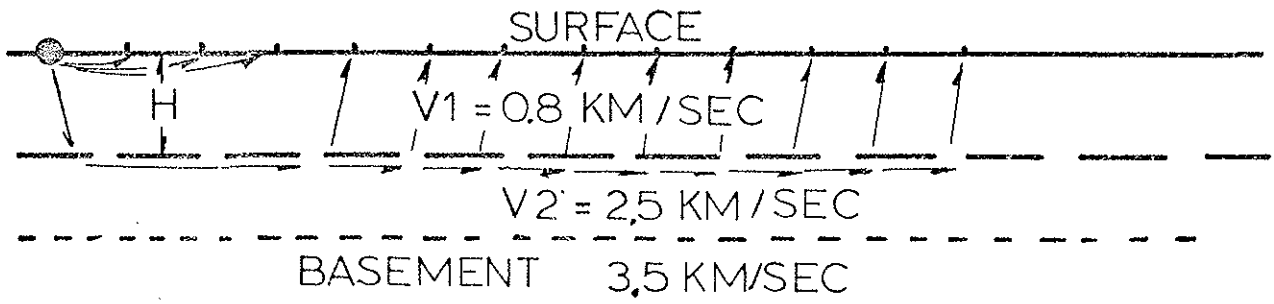


FIGURE 1

VELOCITY MODEL

CROSS SECTION

SHALLOW REFRACTION

PLATE 1

Mt. Princeton Prospect

Mapped, edited, and published by the Geological Survey

Control by USGS and USC&GS

Topography from aerial photographs by photogrammetric methods
Aerial photographs taken 1953. Field check 1956

Polyconic projection. 1927 North American datum
10,000-foot grid based on Colorado coordinate system, central zone
1000-meter Universal Transverse Mercator grid ticks, zone 13, shown in blue

Red tint indicates areas in which only landmark buildings are shown

Dashed land lines indicate approximate locations
Certain land lines are omitted in Ts. 50 and 51 N.-R. 7 E. and T. 15 S.-R. 79 W. because of insufficient data
Ts. 49, 50, and 51 N.-Rs. 6, 7, 8 and 9 E. are based on the New Mexico Principal Meridian
T. 15 S.-Rs. 77, 78 and 79 W. are based on the Sixth Principal Meridian

SCALE 62500

1 0 1 2 3 4 MILES

3000 0 3000 6000 90 12000 15000 18000 21000 FEET

1 .5 0 1 3 4 5 KILOMETERS

CONTOUR INTRVAL 80 FEET
DATUM IS MEAN SEA LEVEL

UTM GRID AND 1956 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

ROAD CLASSIFICATION
Medium duty — Light-duty —
Unimproved dirt .....
U.S. Route State Route

COLORADO
QUADRANGLE LOCATION

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U. S. GEOLOGICAL SURVEY, DENVER COLORADO 80225 OR WASHINGTON, D. C. 20242
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

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