COMINCO LTD.

EXPLORATION WESTERN DISTRICT

NTS: 82-F/9W

# GEOPHYSICAL REPORT

OF

SEISMIC DEPTH OF OVERBURDEN SURVEY ON THE

CLAIR CLAIMS

FORT STEELE MINING DIVISION, B.C.

Latitude: 49°~~42~~37'N
Longitude: 116°~~12~~16'W

Work Performed by: S.J. Visser, K.N. Hendry
Claim Owner and Operator: Cominco Ltd.

SEPTEMBER 1983



K.N. HENDRY

## TABLE OF CONTENTS



## ATTACHMENTS



## LIST OF PLATES

COMINCO LTD.

EXPLORATION WESTERN DISTRICT

NTS: 82-F/9 GEOPHYSICAL REPORT OF

# SEISMIC DEPTH OF OVERBURDEN SURVEY ON THE CLAIR CLAIMS

## FORT STEELE MINING DIVISION, B.C.

## LIST OF CLAIMS

The claims listed below are covered or partly covered by the grid.

| Name | Number of Units | Record Number | Assessment Work Due |
|---|---|---|---|
| Clair 4 | 18 | 557 | Sept. 25, 1983 |

## INTRODUCTION

This report pertains to the geophysical survey carried out on the Clair 4 claims which are located west of Kimberley on the St. Mary Lake Road. The claims are underlain by Proterozoic clastic sediments of the Middle and Lower Aldridge Formation. The survey took place on August 15 and 16, 1983 and the work was accomplished by Cominco personnel.

The object of the survey was to determine the depth of overburden near the west end of St. Mary Lake to prepare for a drilling program. This information would influence drilling logistics and hole location.

## INSTRUMENTATION AND SURVEY PROCEDURE

The seismic method was chosen to survey this location as it provides relatively simple logistics and accurate results.

The instrument used was a Nimbus ES-1200 12 channel seismograph. It features digital storage and playback of records and variable record times. Records were typically made using record times of 200 and 500 milliseconds resulting in timing lines at 2 millisecond and 5 millisecond intervals respectively. Thus picking first arrivals for a 200 millisecond record can be done to 0.5 millisecond.

Two cables were available for connecting the geophones to the instrument: a 12 takeout cable with 6 meter (20 foot) spacing and a 13 takeout cable with 30 meter spacing. The shorter cable facilitates shallow profiles carried out for surface velocity determination.

Explosives were used exclusively as the seismic source consisting typically of a seismic cap (zero delay) 150 gram primer and for the longer shots several primers and a 1" x 12" cartridge of explosive. The detonator is also made by Nimbus and the shot instant is applied to the seismograph by a direct cable link.

Typical survey procedure was to lay out the long cable with 20 or 30 meter geophone spacing (depending upon the room available) shoot at both ends of the array to obtain a reversed profile and also shoot an offset shot to find a deeper refractor or provide an overlap. Several shorter arrays were included to determine the depth of overburden and bedrock velocity near a drill hole (79-1) and shallow velocities in the valley (profile 3).

Overall error in depth estimation including chaining and instrumentation errors would be about 10%.

## DATA PRESENTATION

The first arrival times are plotted for each of the 5 profiles at various scales consistant with the geophone spacing. The vertical axis is time in milliseconds, the horizontal axis is distance. The time required to produce a first break at the corresponding shot geophone distance is determined and plotted. The line joining these points has a slope equivalent to the apparent velocity of the layer in question within the subsurface.

Included with each travel time graph is a listing of velocities and intercept times. An interpretative sketch provides a diagrammatic section of the earth under the profile.

## DISCUSSION OF DATA

A drill hole was available where suitably shallow overburden depths were known. A reversed profile with 5 meter geophone spacings was shot near DH79-1 (Plate 3). The depth of overburden determined near the collar agreed well with that measured during drilling. The calculated results, taking into account the sloping surface, are depth near drill hole-4.1 meters, depth 60 meters away along the road is 5.2 meters, and bedrock velocity corrected for the slope is 4120 meters per second. This is a typical velocity for a hard, moderately competent metamorphic rock. (Quartzitic sandstone).

Two reversed profiles were shot in the flat river valley area approximately perpendicular to St. Mary River a short distance west of St. Mary Lake (Plates 2,4,5).

Plate 4 is the travel time plot of profile 1 which lies at the south end of the cut line. A 20 meter geophone interval was chosen as the cut line was not straight and insufficient room was available for the full array (30 meter spacing).

Bedrock velocities were not observed in this area. The highest material velocity obtained was 2250 meters per second which is characteristic of fairly well consolidated sand or a loose, broken rock. It is more likely a sand as the alternative does not exist in this area. Vertical cliffs are observed along the St. Mary River formed from a semiconsolidated sandstone deposit (hoodoo's) which probably would be the same type of material alluded to above. Other strata observed on this profile are: depth to water table 8-9 meters, depth to consolidated sands 46-55 meters.

As bedrock arrivals were not detected, an assumed bedrock layer was constructed on the travel time graph at the last arrival obtained using a velocity of 4000 meters per second. The depth calculated using this method was 80 meters. This supposition is based on the assumption that the very next arrival would be from bedrock and thus 80 meters represents the shallowest possible depth at which it would be found.

Profile 2 (Plate 5) presents a similar picture except that larger geophone to shot distances were employed and thus greater bedrock depths are indicated.

Similar velocity and depth-to-top information was obtained for the consolidated sand deposit.

The shallowest possible bedrock depth calculation suggests a depth of more than 150 meters and probably more than 300 meters. (south off-end shot).

Profile 3 (Plate 6) is a short profile to investigate the true velocity of the upper overburden. A shallow layer velocity of less than 300 meters per second represents dry soil overlying a water saturated overburden. The depth to the water table is less than 2.5 meters.

Plate 7 is the travel time plot of profile 4 which is located along a road below and to the west of DH79-1. This profile was surveyed in an attempt to obtain bedrock velocity in an area uphill from the south end of profile 1. As the cut line did not go this far, an east-west profile was shot along the edge of the (crooked) road.

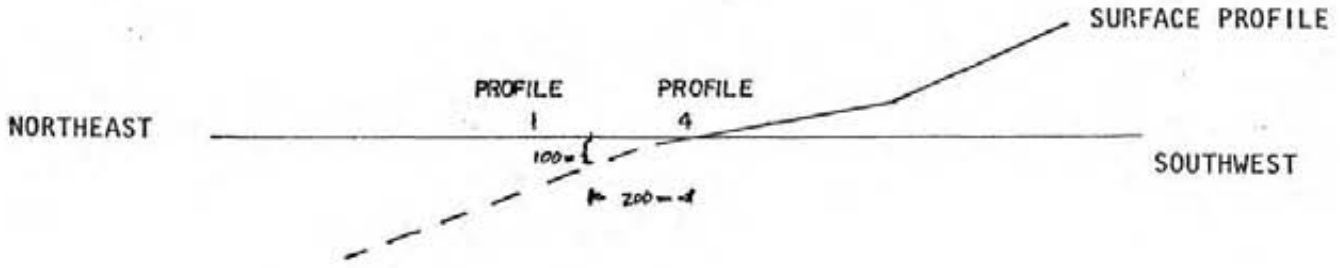
A shallow overburden layer was observed to overlie a bedrock refractor found at a depth of 12 meters. The velocity of the bedrock material is 3625 meters per second comparable to the value obtained at DH79-1 (4100 m/s).

An extremely fast layer was found at a depth of 55-60 meters and this unit may be an intrusive sill. The velocity obtained ( 7400 m/s) is unusually high and is partially due to slightly short intergeophone distances at some stations.

## CONCLUSIONS

A seismic depth-of-overburden survey carried out in the St. Mary River valley did not reach bedrock. The area chosen for the survey is the approximate middle of the valley opposite a secondary river entering from the south.

A profile surveyed slightly up the valley side did not reach bedrock at a fairly shallow depth. A simple projection of the steep slopes observed in the area from profile 4 to profile 1 area suggests than an overburden depth of more than 100 meters is not unreasonable at profile 1.




The projections of minimum depth to bedrock are more than 300 meters near the middle of the valley.

Report by:

K.N. Hendry
Senior Geophysicist
Cominco Ltd.
Eastern District

Approved by:

John M. Hamilton
Chief Geologist, Kimberley
Cominco Ltd.

Approved for
Release by:

G. HARDEN, Manager
Exploration
Western District

KNH/ml

Copies to:

Mining Recorder (2 copies)
Western District
Kootenay Exploration

"EXHIBIT A"

STATEMENT OF GEOPHYSICAL EXPENDITURES

CLAIR CLAIMS, 1982

1) STAFF TIME

| | | | |
|---|---|---|---|
| P. Klewchuk, Geologist | 1 day @ $210/day | $ 210.00 | |
| M. Miller, Assistant | 1 day @ $ 81/day | 81.00 | |
| S.J. Visser, Geophysicist | 2 days @ 182.50/day | 365.00 | |
| K.N. Hendry, Sr. Geophysicist | 4 days @ $245/day | 980.00 | $ 1,636.00 |

2) OPERATING DAY CHARGE

| | |
|---|---|
| 2 days @ $250/day (report and drafting) | 500.00 |

3) EQUIPMENT RENTAL

| | | |
|---|---|---|
| a) Nimbus ES1200 6 days (2 survey, 4 shipping) @ $40. | $240.00 | |
| b) Seismic Cable 30 m takeouts 6 days @ $10 | 60.00 | 300.00 |

4) EXPENSE ACCOUNTS

| | | |
|---|---|---|
| K. Hendry - Travel (Toronto-Cranbrook-Toronto) | $765.00 | |
| - Room and Board 4 days @ $50. | 200.00 | 965.00 |

5) MISCELLANEOUS

| | | |
|---|---|---|
| Truck Rental - 4 days @ $40.) | $ 160.00 | |
| Truck Fuel | 45.00 | |
| Explosives | 120.00 | |
| Crowbar and Shovel | 80.00 | |
| Equipment Freight | 345.00 | |
| Communications | 45.00 | 795.00 |
| TOTAL | | $ 4,196.00 |

IN THE MATTER OF THE B.C. MINERAL ACT
AND IN THE MATTER OF A GEOPHYSICAL PROGRAMME
CARRIED OUT ON THE CLAIR CLAIMS
LOCATED 15 KM WEST OF KIMBERLEY, B.C.
IN THE FORT STEELE MINING DIVISION OF THE
PROVINCE OF BRITISH COLUMBIA, MORE PARTICULARLY
N.T.S. : 82-F/9

# S T A T E M E N T

I, K.N. Hendry, of the City of Toronto, in the Province of Ontario, make oath and say:-

1. THAT I am employed as a Senior geophysicist by Cominco Ltd., and as such have a personal knowledge of the facts to which I hereinafter depose;

2. THAT annexed hereto and marked as "Exhibit A", to this statement is a true copy of expenditures incurred on the geophysical survey on the CLAIR mineral claims;

3. THAT the said expenditures were incurred during August 15 and 16, 1983, for the purpose of mineral exploration of the above-named claims.

K.N. HENDRY
Senior Geophysicist, Cominco Ltd.

SEPTEMBER 1983

# CERTIFICATION

I, K.N. Hendry of #303-330 Avenue Road, in the City of Toronto, in the Province of Ontario, do hereby certify that:-

1. I graduated from Carleton University in 1967 with a BSc in Geology.

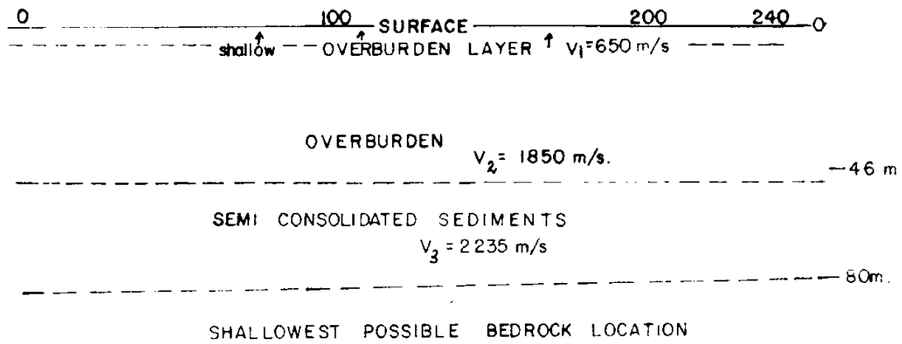
2. I have worked in the mineral exploration business since 1960, and been involved with geophysics since 1967 on a full time basis.

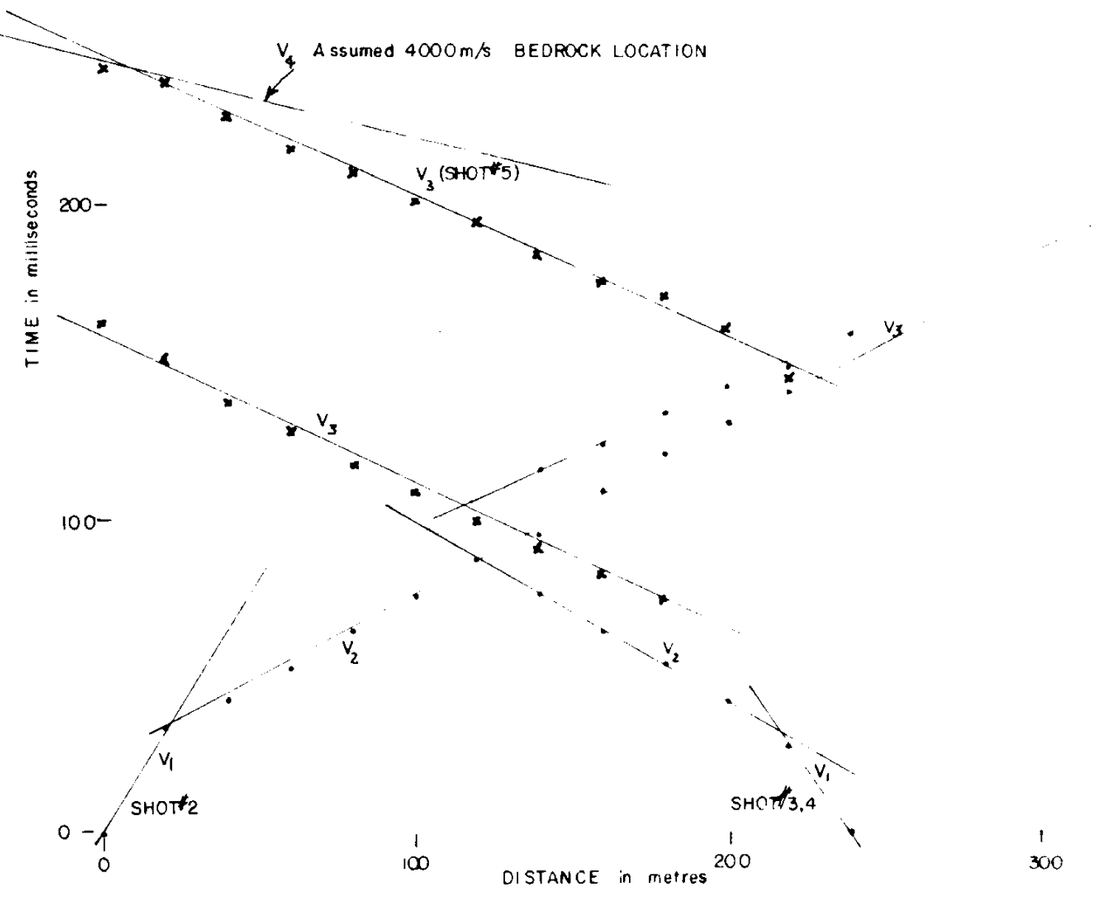
3. I have been employed with Cominco Ltd. since 1978 as geophysicist and senior geophysicist.

K.N. Hendry, BSc
Senior Geophysicist, Cominco Ltd.

SEPTEMBER 1983

INTERPRETATIVE SKETCH

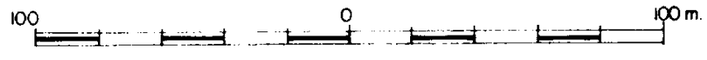



INTERPRETATION

| SOUTH END | NORTH END |
|---|---|
| $V_1$ = 600 m/s | $V_1$ = 710 m/s |
| $V_2$ = 1890 m/s | $V_2$ = 1800 m/s |
| $V_3$ = 2250 m/s | $V_3$ = 2220 m/s |
| $t_i 1$ = .023 seconds | $t_i 1$ = .018 seconds |
| $t_i 2$ = .053 " | $t_i 2$ = .047 " |
| | $t_i 3$ = .136 " |

SCALE






Cominco

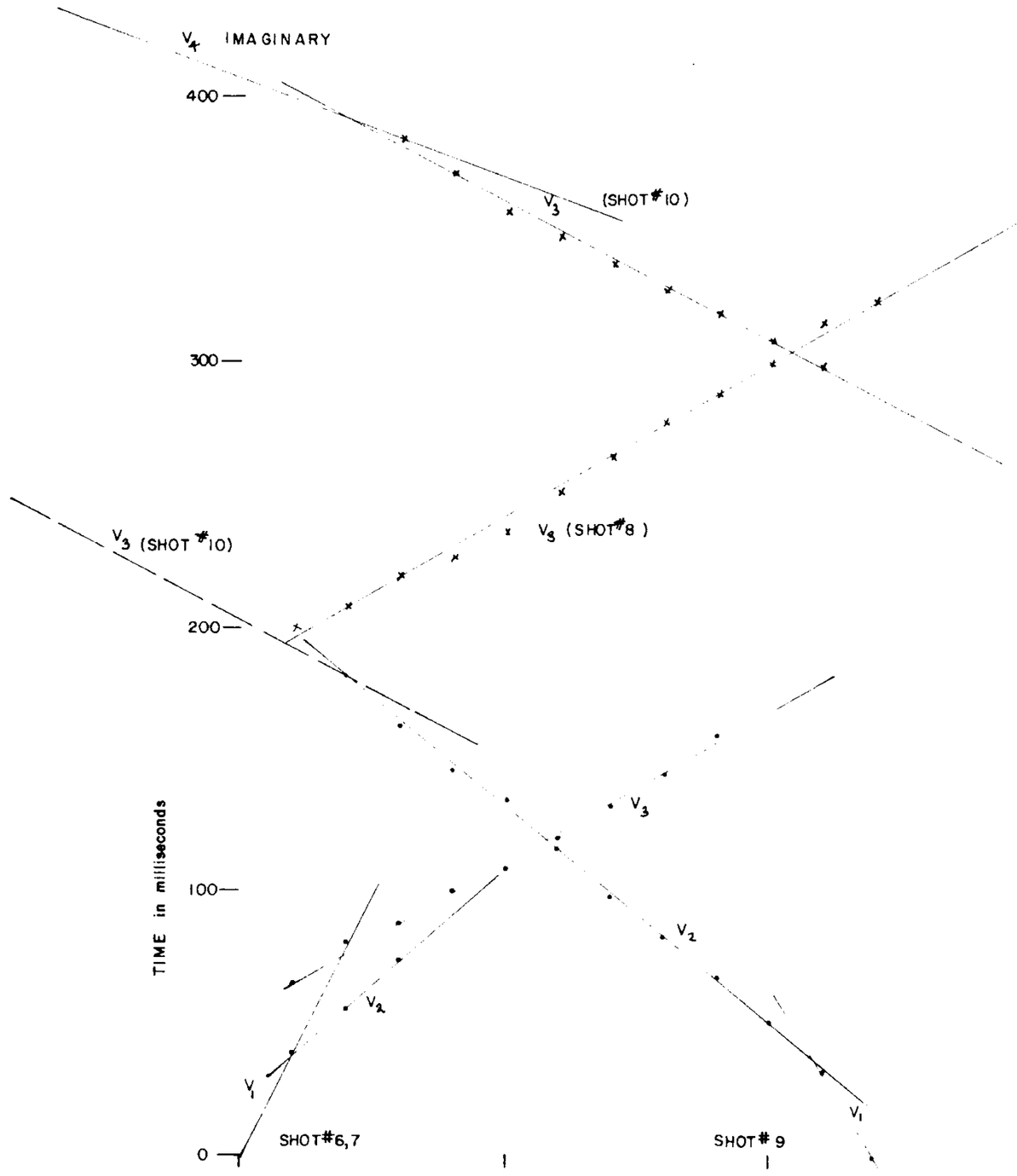
| Drawn by: K.N. Hendry | | Traced by: A.M. King | |
|---|---|---|---|
| Revised by | Date | Revised by | Date |
| | | | |

# CLAIR PROPERTY

## SEISMIC DEPTH OF OVERBURDEN STUDY
## PROFILE I U.T.EM. LINE 27W

Scale: 1:2000 | Date: AUG., 1983. | Plate: 4

210 0620




SOUTH END

$V_1$ = 750m/s

$V_2$ = 1700 m/s

$V_3$ = 2650 m/s

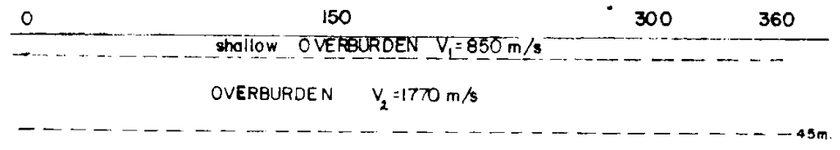
$t_i 1$ = ·02 seconds

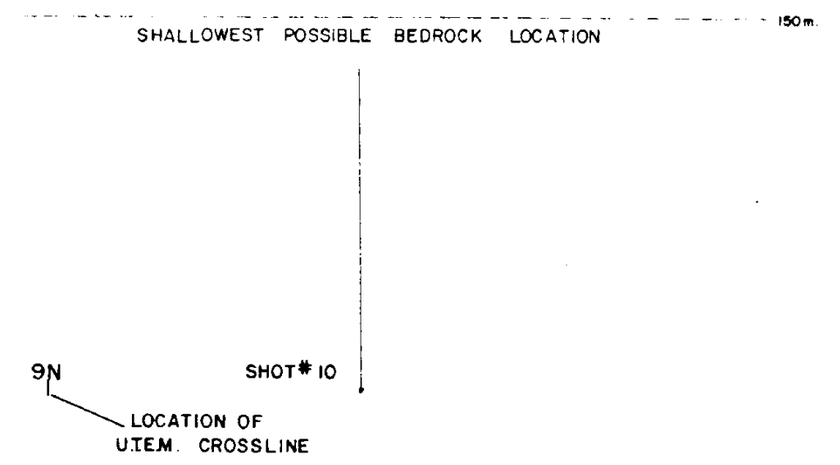
$t_i 2$ = ·053 "

$t_i 3$ = ·142 "



## INTERPRETATIVE SKETCH




$V_1$ = 900 m/s

$V_2$ = 1850 m/s

$V_3$ = 2900 m/s

$t_i 1$ = ·019 seconds

$t_i 2$ = ·080 "

$t_i 3$ = ·236 "

$V_4$ = 4000 m/s (imaginary)

SCALE

150 0 150 m.

K.N. Hendry

Cominco

| Drawn by: K.N. Hendry | | Traced by: A.M. King | |
|---|---|---|---|
| Revised by | Date | Revised by | Date |
| | | | |

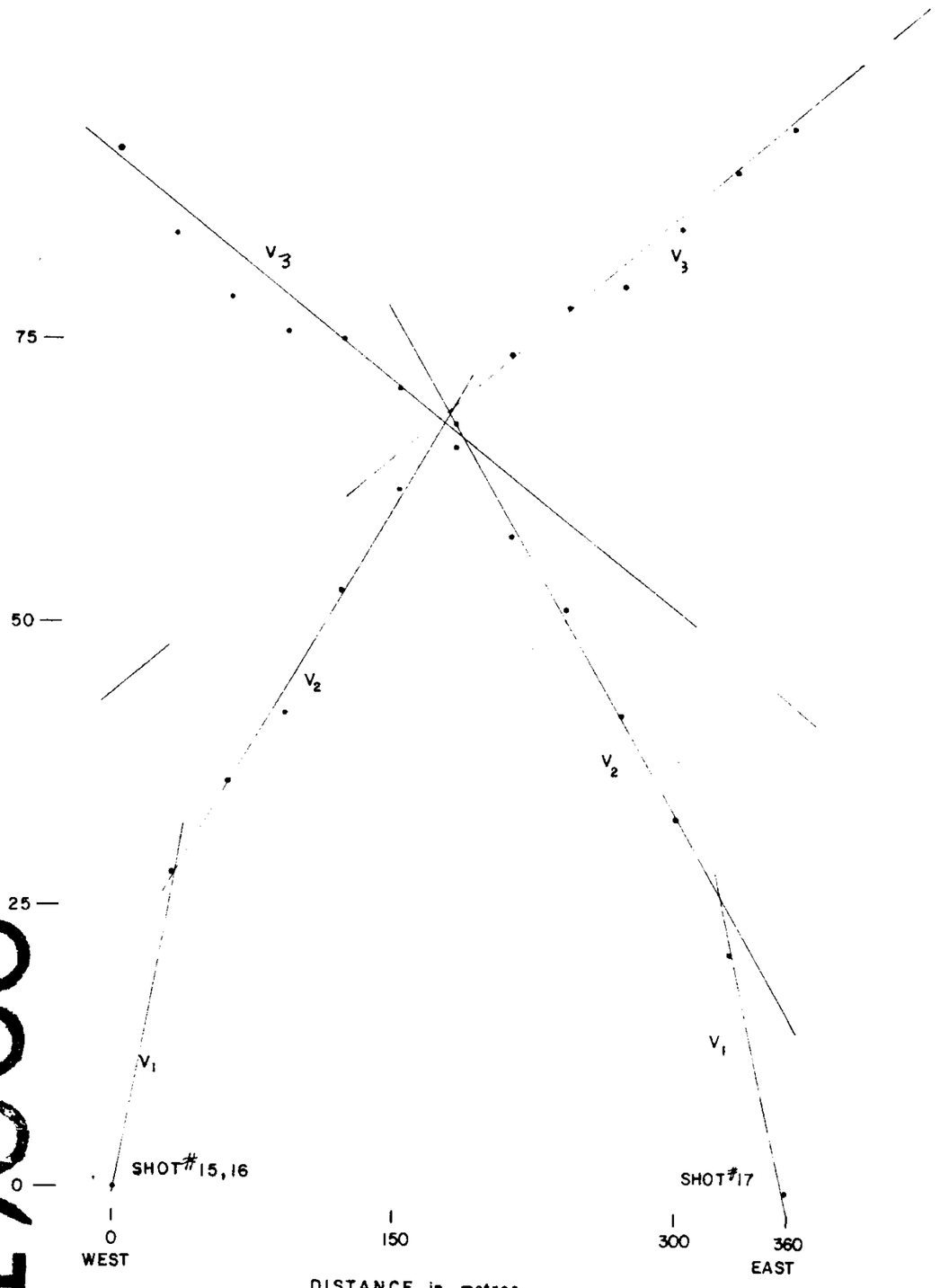
# CLAIR PROPERTY

## SEISMIC DEPTH OF OVERBURDEN STUDY

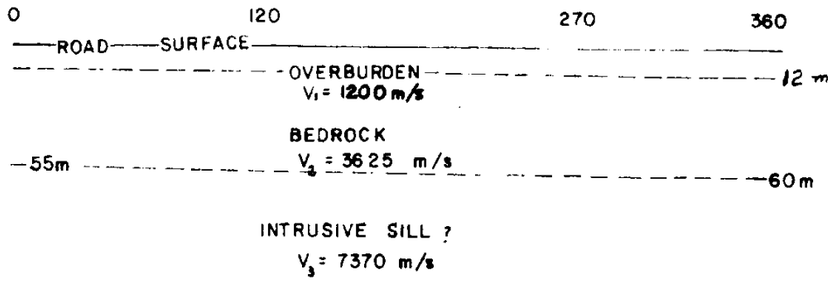
## PROFILE 2 U.T.E.M. LINE - 27 W

Scale: 1:3000 | Date: AUG., 1983. | Plate: 5

210.0620




INTERPRETATIVE SKETCH




INTERPRETATION

| EAST END | WEST END |
|---|---|
| $V_1$ = 1100 m/s | $V_1$ = 1350 m/s |
| $V_2$ = 3400 m/s | $V_2$ = 3550 m/s |
| $V_3$ = 7150 m/s | $V_3$ = 7600 m/s |
| $t_i1$ = .019 seconds | $t_i1$ = .015 seconds |
| $t_i2$ = .044 " | $t_i2$ = .043 " |

NOTE: high bedrock velocity due to short geophone spacing

SCALE
150 0 150 m.

K.N. Hendry

Cominco

| Drawn by: K. N. Hendry | | Traced by: A.M. King | |
|---|---|---|---|
| Revised by | Date | Revised by | Date |
| | | | |

# CLAIR PROPERTY

## SEISMIC DEPTH OF OVERBURDEN STUDY
## PROFILE 4 MEACHEN LAKE ROAD

Scale: 1:3000 | Date: AUG., 1983 | Plate: 7

210-0620