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LIST OF ILLUSTRATIONS

SUMMARY

A seismic refraction survey was carried out over placer leases 7347, 8246, 9366 and 9483 located at Bralorne, B.C. along Cadwallader Creek in the Lillooet M.D., B.C. during the period August 10th to 20th, 1983. The object of the survey was to locate a burried creek channel carrying placer gold and to determine the velocities of and the depths to bedrock.

The leases are underlain by Upper Triassic sediments and volcanics, some of which is metamorphosed, as well as intrusions of granodiorite and ultramafics. The overburden is glacial till and fluvial sands and gravels.

The survey was carried out using a 12- and 24-channel seismic refraction system with 90- and 190-meter spreads, 5- and 10-meter geophone spacings, and employing explosives as the energy course. 28 spreads were done in total. The data were analyzed using an intercept-delay time technique.

CONCLUSIONS

1. The seismic refraction survey revealed the buried creek channel that was suspected to exist. It has a length of 1,100 m and is open at both the north end and the south end running through the entire survey area..

2. A second possible channel was detected on line 0N, 50N and 100N, striking northwesterly.

3. The bedrock velocities in the lower range are indicative of clastic sediments. Those in the upper range are indicative of volcanics and intrusives as well as possibly limestones and dolomites.

4. The overburden thickness (depth to bedrock) varies from as little as 2 m on the upper slopes to over 70 m within the buried creek channel.

RECOMMENDATIONS

Further seismic work should be done to better define the location of the channel and to extend its strike length.

That is in addition to seismic work to the north and to the south of the survey area it should consist of additional crosslines from 250 N to 750 N. In addition longer spreads, say 350 m, should be done to the north of 750 N in order to measure the greater depths in this area.

GEOPHYSICAL REPORT

ON A

SEISMIC REFRACTION SURVEY

ON

PLACER LEASES 7347, 8246, 9366 AND 9483

BRALORNE AREA

LILLOOET MINING DISTRICT

BRITISH COLUMBIA

INTRODUCTION AND GENERAL REMARKS

This report discusses the field procedure, compilation of data, and interpretation of results of a seismic refraction survey carried out over placer leases at and around Bralorne on Cadwallader Creek during the period August 10th to 20th, 1983.

The field work was carried out under the supervision of Andrew Rybaltowski, geophysicist, with two helpers. A total of 18 24-channel spreads and 10 12-channel spreads were completed to give a total profile length of 4,320 m.

The prime object was to locate an ancient buried creek channel known to exist in the area. There is strong reason to believe that this channel carries placer gold. A secondary object was to determine the thickness of overburden which would become important if placer mining was to take place.

The work was done at the request of Dr. F.B. Whiting, consulting geologist on behalf of Tracer Resources and as per the recommendations within his engineering report. Much of the preliminary information within this report has been taken from his report.

PROPERTY

The placer property consists of 4 placer leases staked within the Lillooet M.D., B.C. as shown on Sheet 2 and as described below:

Placer Lease	Expiry Date
7347	Nov. 16, 1983
8246	Dec. 31, 1983
9366	Dec. 31, 1983
9483	Dec. 31, 1983

Placer lease 8246 is not contiguous with the other three.

The above-noted expiry dates do not take into account the work discussed within this report that will be applied for assessment credits.

LOCATION AND ACCESS

The property is located at and around the Town of Bralorne and along Cadwallader Creek near its confluence with the Hurley River.

The geographical coordinates are 50° 47' N latitude and 122° 49' W longitude.

Bralorne can be reached by car from Vancouver via Lytton with a paved highway or a shorter route via Pemberton with gravel roads. The central part of the leases are reached by dirt road a few km out of Bralorne.

PHYSIOGRAPHY

The property is located on the east side of the physiographic unit known as the Pacific Ranges which is a division of the Coast Mountains. The terrain is generally quite rugged with slopes varying from steep to very steep. Mountains in the area reach elevations in excess of 2,800 m a.s.l.

The placer leases are located within the valley drained by Cadwallader Creek. The slopes are gentle to moderate with the elevation varying only from 1,030 to 1,130 m a.s.l. on P.L. 8246, and from 1,060 to 1,260 m a.s.l. on the other three leases. The three contiguous leases are centered on a northerly-striking "valley" that is up-slope and above Cadwallader Creek. It is along this valley that the suspected buried channel occurs, this being a former course of Cadwallader Creek.

HISTORY OF PREVIOUS WORK

Placer gold was first discovered in the area in 1858 and by 1886 in Cadwallader Creek. This led to the discovery of numerous lode gold deposits in the area, the two most well-known being the Bralorne Mine and the Pioneer Mine.

The only previous work done on the placer leases recently that the writer is aware of is some hammer seismic work carried out in 1982 by Dr. Whiting.

GEOLOGY

The bedrock underlying the leases consists mostly of sedimentary and volcanic rocks of Upper Triassic Age. They are as follows:

Hurley Formation: Thin-bedded argillite, phyllite, limestone, tuff, conglomerate, andesite, minor chert.

Pioneer Formation: Greenstone andesitic to basaltic flows and pyroclastics.

Bralorne Intrusions: Augite diorite, gabbro, greenstone intrusive and dioritized equivalents of Pioneer Formation.

Noel Formation: Thin-bedded argillite, chert, conglomerate and greenstone.

In close proximity to the property there are known intrusions of granodiorite and ultramafic rocks.

The overburden consists of fluvial sands and gravels and glacial till.

INSTRUMENTATION

Two 12-channel seismographs, Model 1210F, manufactured by Geometrics/Nimbus of Sunnyvale, California, were used on the project. The two were interfaced together to make up a 24-channel system. The 1210F features signal enhancement by stacking repeated signals in a digital memory. A CRT (cathode ray tube) continuously displays the signal stored in the memory on all channels. The stored signal can then be printed on a permanent

paper record by a built-in electric-writing oscillograph. The instrument also contains active signal filters on each amplifier.

Two 90-meter geophone cables were used, as well as 8 cycle/sec marsh geophones, manufactured by Mark Products of Houston, Texas.

The blasting was done with 1 encoder and 2 decoders. Series 200, manufactured by Input/Output of Houston, Texas. These were interfaced with Motorola portable FM radios.

FIELD PROCEDURE

The 'two-way, in-line shot' seismic refraction method was used for all traverses. The technique consisted of laying out 12 or 24 geophones in a straight line and recording arrival times from shots fired at either end of the spread. The arrival times from 3 additional shot points approximately every 1/4 of the spread length within the spread were also recorded. In the case of the 12-channel spreads, there was only one additional shot point fired within the center of the spread. This provided the overburden depth and velocity variations along the spread, and also gave additional information about the deeper layers. Finally for each spread, two off-end shots were fired at a distance of up to one-half the spread length from the nearest geophone. Since the off-end shots were a good distance from the nearest geophone, it was assumed that the first arrivals were in fact from the bedrock surface. This was felt necessary so that the refractions received from other shot points could be correlated and assigned the correct layer number.

There were 18 24-channel spreads done, each with a length of 190 m, and 10 12-channel spreads, each with a length of 90 m. The total length of the surveying was therefore 4,320 m.

The geophone separation was 10 m with it being reduced to 5 m near shot holes to obtain a more accurate overburden velocity.

The shots ranged in size from 0.1 to 1.0 kg, and were placed in holes 0.4 to 0.7 m deep.

There were some problems due to wind noise so that some shots had to be redone. However, the biggest problem by far was energy attenuation. That is, the energy would rapidly decrease to minimal by the time the shock wave reached the far geophones. As a result the amount of explosives was greatly increased so that there was twice as much needed as was estimated. Many shots had to be done and redone.

The energy attenuation problem was caused by a very dry surface layer as well as the depth to bedrock being much greater than was originally estimated.

COMPUTING METHOD

All seismic data was analyzed using an intercept-delay time technique. Implementation of this method requires reverse refraction profiles with bedrock refraction emanating from a common point for at least two detectors. This rock overlap is necessary in order to obtain a true refractor velocity and travel time in the overburden, independent of bedrock dip and/or surface irregularities. The off-end shot times are used to extrapolate the rock locations. With this information and related overburden veloc-

ities, it is possible to compute the depth to rock not only below each shot point, but also below each detector. However, the computed depths below shot points should be considered slightly more accurate than those below detectors.

The procedure is as follows:

1. Pick the first arrival times from the field records and draw time-distance graphs for each spread;

2. With the help of a plot of the difference in arrival times, determine which points are bedrock and which are overburden, and how many layers occur in the overburden;

3. Draw a delay line for each end shot and from this determine the delay time for each geophone;

4. Proportion the delay time for each geophone into the various times spent in the various layers. Multiply each layer time by the corresponding layer velocity, adjusting to Snell's Law to obtain the layer thickness. Adding the layer thicknesses together will give the total overburden depth.

Due to complex bedrock terrain some spreads were difficult to interpret. Therefore other interpretation methods were attempted and/or the above-described method was modified.

DISCUSSION OF RESULTS

The line locations are shown on the survey plan on Sheet 3, at a scale of 1:2,500 (1cm = 25 m). The interpreted results are shown in section form on Sheets 4 to 14, at a scale of 1:500 (1 cm = 5 m).

Three short 12-channel lines were done outside the area shown on the survey plan. The location of these lines is therefore shown on Sheet 2, the claim map, at a scale of 1:50,000.

As is shown on the profiles, the seismic refraction survey has delineated a buried creek channel that was probably a former course of Cadwallader Creek. The survey shows it to have a minimum length of 1100 m being open on both the north and south ends. The channel has been drawn on the survey plan (Sheet 3).

Depths to the bottom of the channel vary from about 20 m to over 70 m. On the profiles at the northern end of the survey area, the depths to the bottom of the channel could not be calculated since the depths are too great for the size of spread used.

On lines 0N, 100N and possibly 50N occurs a velocity slow zone that in the writer's experience is indicative of faults, shears or buried channels. A channel delineated as a slow zone has very steep sides so that the depth to the channel bottom cannot be measured.

On each profile, the writer has shown the seismic-interpreted depths on the crosslines. The agreement in almost all cases is quite good. Where there isn't good agreement, the cause is usually dipping bedrock (or undulating bedrock).

For the most part, the seismic results are interpreted as a 3-layer case.

On all profiles, the first layer is a loose, dry, surficial layer with a thickness of a few meters, and a velocity in the order of 300 to 500 m/s.

The second layer is overburden as well, usually with a velocity of 1400 to 2200 m/s. The top of this layer is quite likely the water table (water has a velocity of 1450 m/s). The higher the velocity, the more compact the material. Where the velocity of this material goes below 1400 m/s indicates the material is not water-saturated as well as being much less compact.

On the upper slopes of a number of the profiles, this second layer disppears.

The third layer has a velocity range of 3100 to 6000 m/s which indicates the material to be definitely bedrock. The lower velocities are more typical of clastic sedimentary bedrock, say, 3100 to 3800 m/s. Velocities of 4100 to 5200 m/s are likely volcanics, intrusives and/or metamorphics. Velocities in the range of 5400 to 6000 m/s are likely intrusives as well as possibly limestones or dolomites.

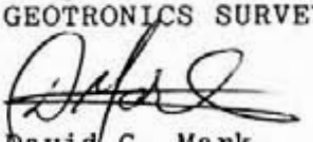
Lower velocities can also indicate fracturing or alteration within a rock-type that usually has a higher velocity.

VELOCITY CLASSIFICATION

A suggested classification of the velocities is as follows:

Velocity (meters/seconds)	Suggested Material
300 - 500	Overburden: surficial, loose, dry tills, sands & gravels
800 - 1300	Overburden: more compact, partially saturated tills, sands, & gravels
1400 - 1800	Overburden: water-saturated tills, sands & gravels
1800 - 2200	Overburden: very compact, water-saturated tills, sands & gravels
3100 - 3800	Bedrock: clastic sediments, possibly volcanics
4100 - 5200	Bedrock: volcanics, intrusives
5400 - 6000	Bedrock: intrusives, possibly limestones, dolomites

Respectfully submitted,
GEOTRONICS SURVEYS LTD.



David G. Mark,
Geophysicist

November 4, 1983

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Whiting, Dr. F.B., Geological Engineering Report on Bralorne Gold Placers, Whiting Mining Services International Ltd., July 26, 1982.

Cairnes, C.E., Geology and Mineral Deposits of Bridge River Mining Camp, B.C., Geol. Surv. of Can., Mem. 213, 1937.

Woodworth, G.J., Geology (Map), Pemberton (92J) Map-Area, Geol. Surv. of Can., O.F. 482, 1977.

GEOPHYSICIST'S CERTIFICATE

I, DAVID G. MARK, of the City of Vancouver, in the Province of British Columbia, do hereby certify:

That I am a Consulting Geophysicist of Geotronics Surveys Ltd., with offices at #403-750 West Pender Street, Vancouver, British Columbia.

I further certify that:

1. I am a graduate of the University of British Columbia (1968) and hold a B.Sc. degree in Geophysics.

2. I have been practising my profession for the past 15 years and have been active in the mining industry for the past 18 years.

3. I am an active member of the Society of Exploration Geophysicists and a member of the European Association of Exploration Geophysicists.

4. This report is compiled from data obtained from a seismic refraction survey carried out under the supervision of Andrew Rybaltowski, geophysicist, during the period August 10th to 20th, 1983.

5. I do not hold any interest in Tracer Resources Corp. nor in placer leases 7347, 8246, 9366 and 9483, nor do I expect to receive any interest as a result of writing this report.

David G. Mark
Geophysicist

November 4, 1983.

AFFIDAVIT OF EXPENSES

This is to certify that the seismic refraction survey carried out on Placer Leases 7347, 8246, 9366 and 9483 near Bralorne in the Lillooet M.D., B.C., from August 10th to 20th, 1983, was done to the value of the following:

Field:

3-man geophysics crew, 122 hours at $80/hour	$ 9,760.00
Room and board, 3 men at $150/day for 11 days	1,650.00
Instrument rental, 2 weeks at $1,800/week	3,600.00
Truck rental, 12 days at $70/day	840.00
Explosives and seismocaps	1,720.00
Survey supplies	100.00
	$17,670.00

Report:

Senior geophysicist, 10 hours at $40/hour	$ 400.00
Junior geophysicist, 177 hours at $30/hour	5,310.00
Geophysical technician, 42 hours at $20/hour	840.00
Drafting and printing	1,900.00
Report typing and compilation	150.00
	$ 8,600.00
	$26,270.00

Respectfully submitted,
GEOTRONICS SURVEYS LTD.

David G. Mark,
Geophysicist

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TRACER RESOURCES LTD.

PLACER LEASES

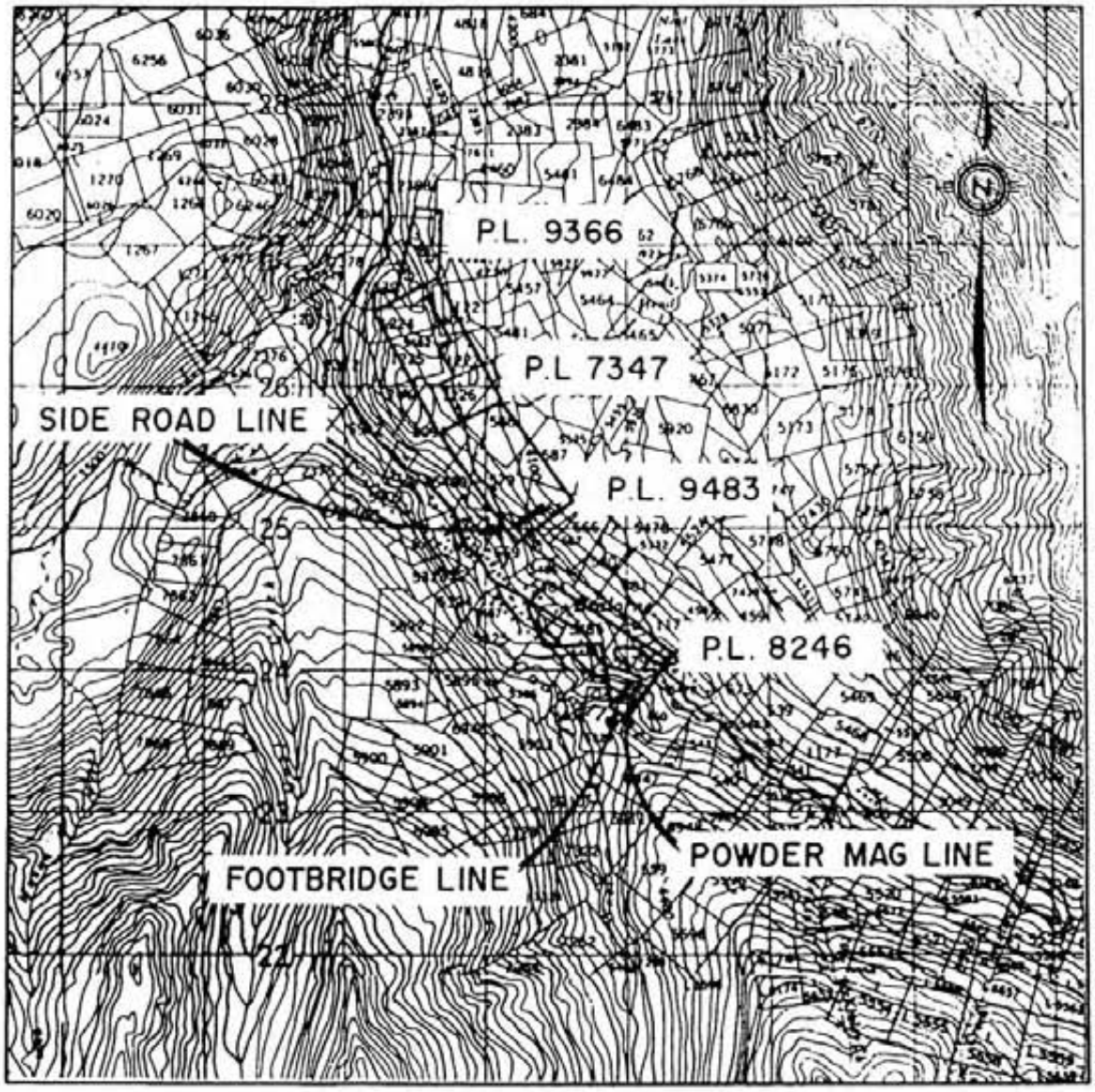
7347, 8246, 9366, 9483

BRALORNE AREA

LILLOOET MINING DIVISION, B.C.

LOCATION MAP

SCALE:	NTS.	DATE:	JOB No.	SHEET No.
1 : 500	92J/15W	OCT. 1983	83-36	1



NOTE: SEE OTHER SEISMIC LINE LOCATIONS ON SHEET NO 3.

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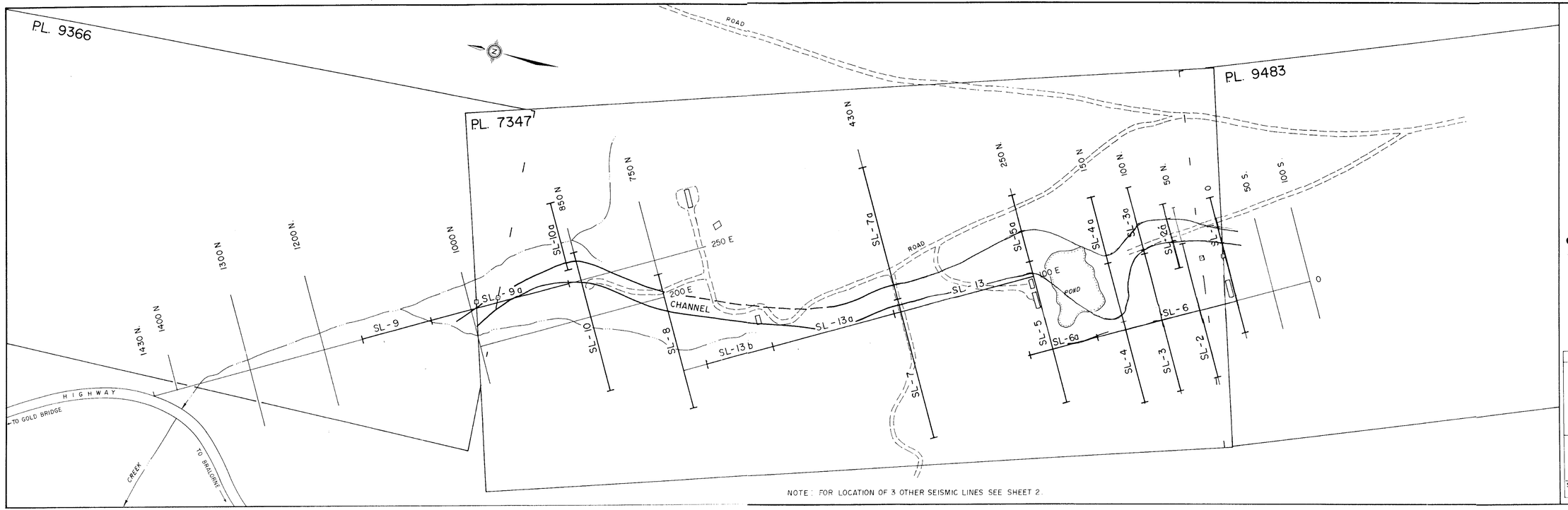
BRALORNE AREA
LILOOEET M.D., B.C.
PLACER LEASES
7347, 8246, 9366, 9483

CLAIM MAP

DATE:	SCALE	NTS.	JOB NO.:	SHEET NO
OCT., 1983	1:50,000	92J/15W	83-36	2



NOTE: FOR LOCATION OF 3 OTHER SEISMIC LINES SEE SHEET 2.

GEOLOGICAL BRANCH
ASSESSMENT REPORT

11,412

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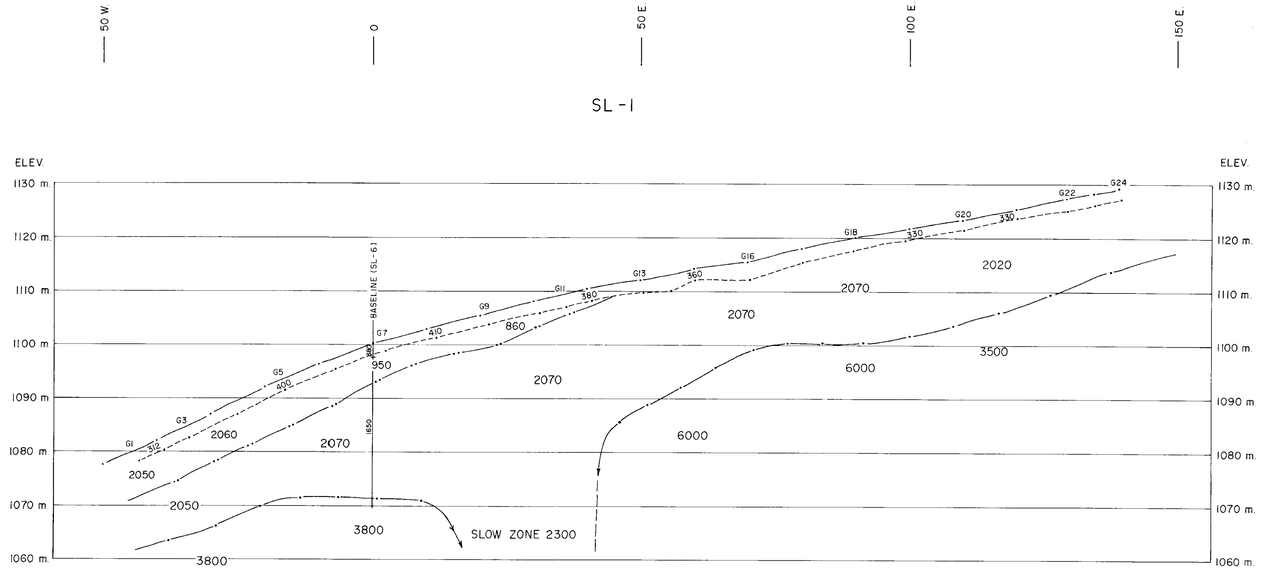
PLACER LEASES
7347, 8246, 9366, 9483
BRALORNE AREA
LILLOOET MINING DIVISION, B.C.

SEISMIC REFRACTION STUDY

PLAN

SCALE:	NTS.	DATE:	JOB No.	SHEET No.
1:2500	92J/15W.	OCT. 1983	83-36	3



LEGEND

Geophone location on ground surface

Bottom of weathered layer

Bottom of gravel or sand layer

Top of bedrock

2070 Average velocity in metres per second

GEOLOGICAL BRANCH
ASSESSMENT REPORT

11,412

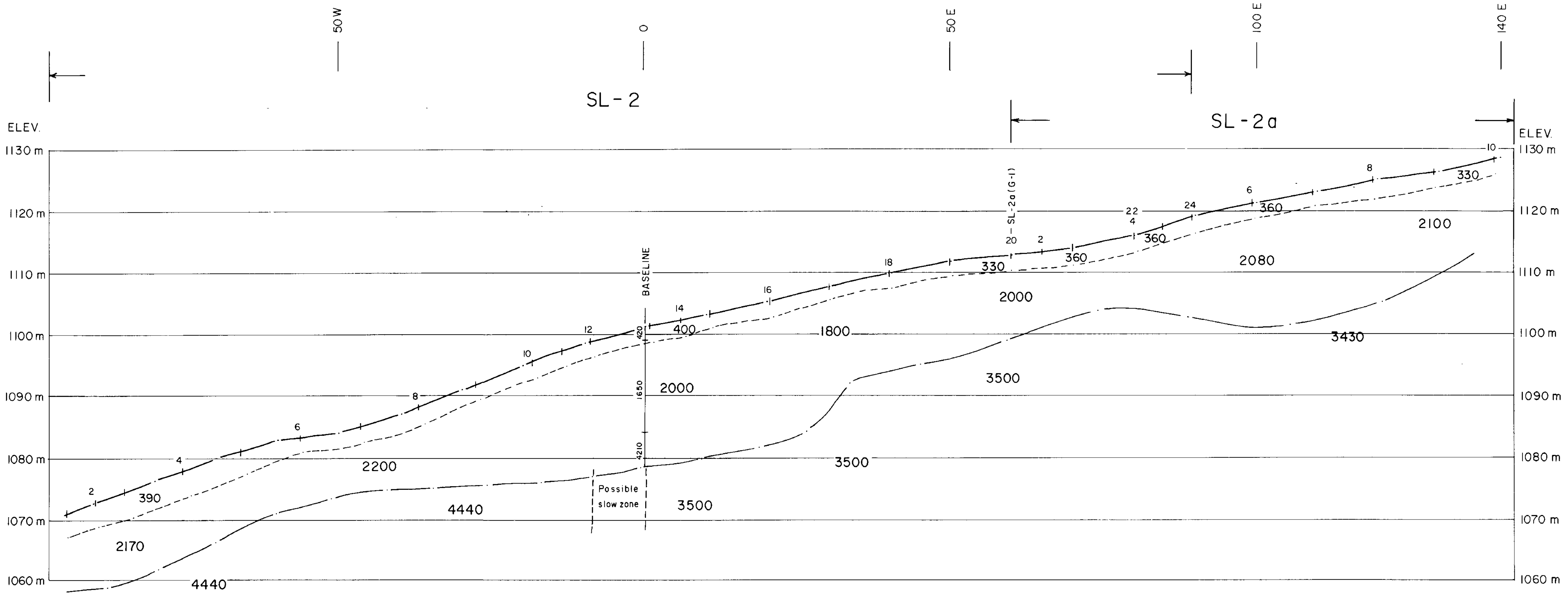
GEOTRONICS SURVEY LTD.

TRACER RESOURCES LTD
PLACER LEASES
7347, 8246, 9366, 9483
[illegible]

SEISMIC REFRACTION STUDY

PROFILE O N.

4



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ASSESSMENT REPORT

11,412

LEGEND

12 — Geophone location on ground surface

Bottom of weathered layer

Bottom of gravel or sand layer

Top of bedrock

2070 Average velocity in metres per second

SUGGESTED VELOCITY CLASSIFICATION

[illegible] Overburden [illegible]

[illegible] Overburden more compact [illegible] saturated [illegible] & gravels

400-1800 Overburden water saturated [illegible]

1800-2200 Overburden very compact, water saturated [illegible] sands & gravels

[illegible]-3800 Bedrock clastic sediment [illegible]

4100-5200 Bedrock volcanics, intrusives

[illegible]-6000 Bedrock intrusives, possibly limestones dolomites

SCALE IN METRES

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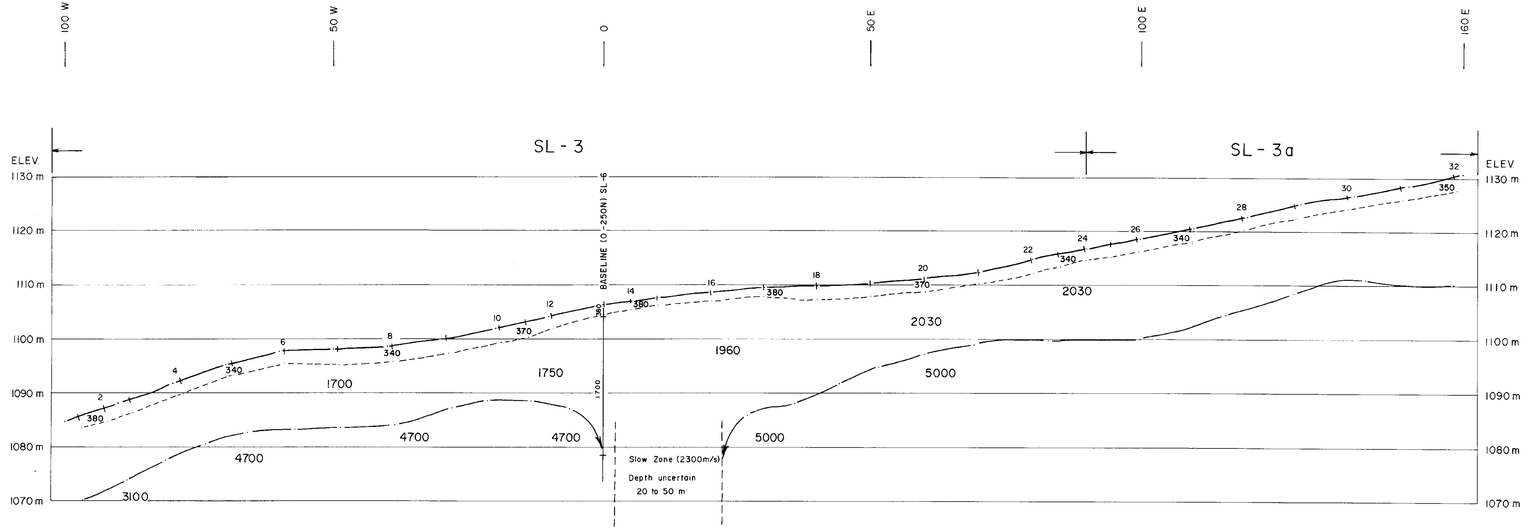
PLACER LEASES
7347, 8246, 9366, 9483
BRALORNE AREA

SEISMIC REFRACTION STUDY

PROFILE 50 N.

5



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LEGEND

2070 Average velocity in metres per second

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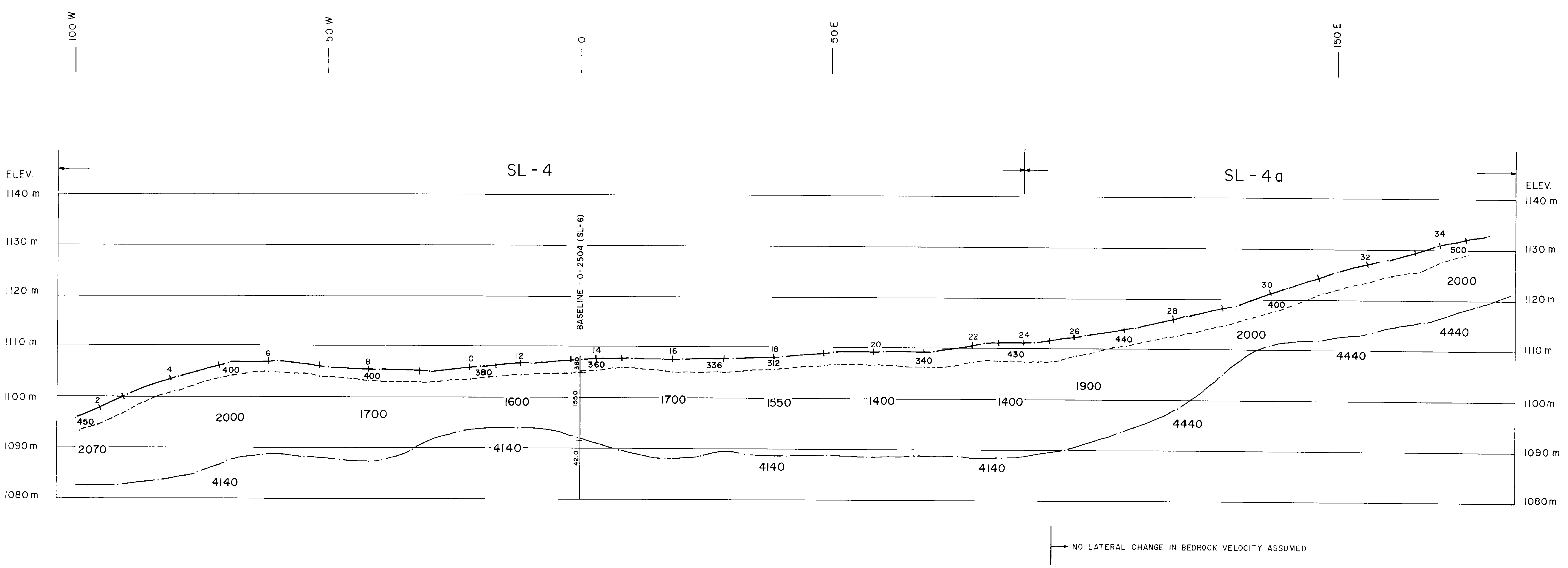
PLACER LEASES
7347, 8246, 9366, 9483
BRALORNE AREA

SEISMIC REFRACTION STUDY

PROFILE 100 N



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LEGEND

Bottom of weathered layer

Average velocity in metres per second

Bedrock volcanics, intrusives

SCALE IN METRES

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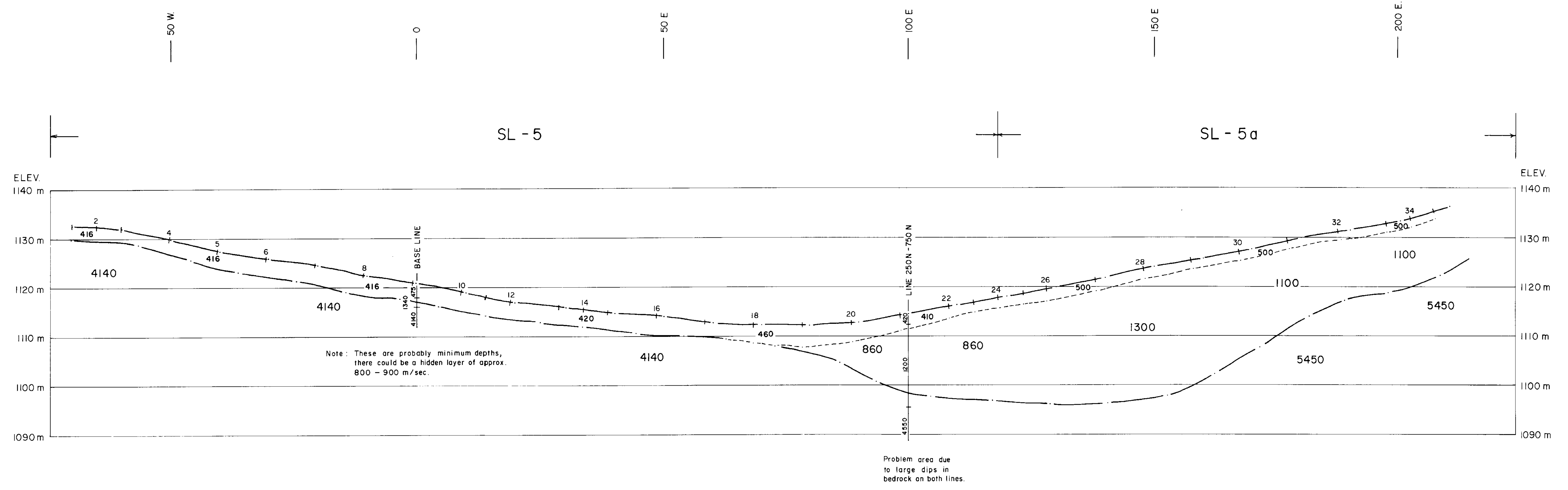
PLACER LEASES
7347, 8246, 9366, 9483
BRALORNE AREA
MINING DIVISION, BC

SEISMIC REFRACTION STUDY

PROFILE 150 N.

SCALE	INTS	DATE	JOB No	SHEET No
				7



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11,412

LEGEND

12 — Geophone location on ground surface

Bottom of weathered layer

Bottom of gravel or sand layer

Top of bedrock

2070 — Average velocity in metres per second

SUGGESTED VELOCITY CLASSIFICATION

300 – 500 Overburden surficial, loose dry [illegible]

800 – 1300 Overburden more compact [illegible] & gravels

1400 – 1800 Overburden water saturated [illegible]

1800 – 2200 Overburden very compact water saturated [illegible] sands & gravels

[illegible] Bedrock clastic sediments [illegible]

[illegible] Bedrock [illegible]

5400 – 6000 Bedrock [illegible]

SCALE IN METRES

GEOTRONICS SURVEYS LTD.

TRACER RESOURCES LTD.

PLACER LEASES

7347, 8246, 9366, 9483

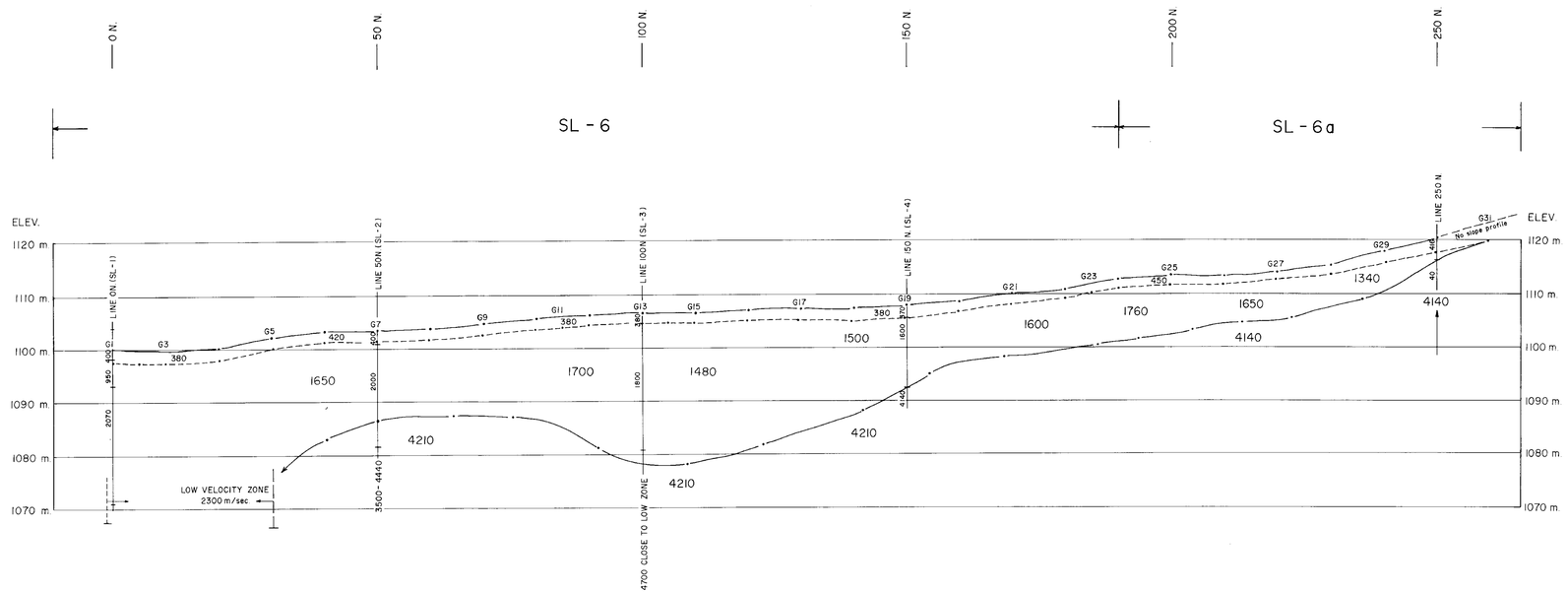
BRALORNE AREA

[illegible] MINING DIVISION, B.C.

SEISMIC REFRACTION STUDY

PROFILE 250 N.

8



GEOLOGICAL BRANCH
ASSESSMENT REPORT

11,412

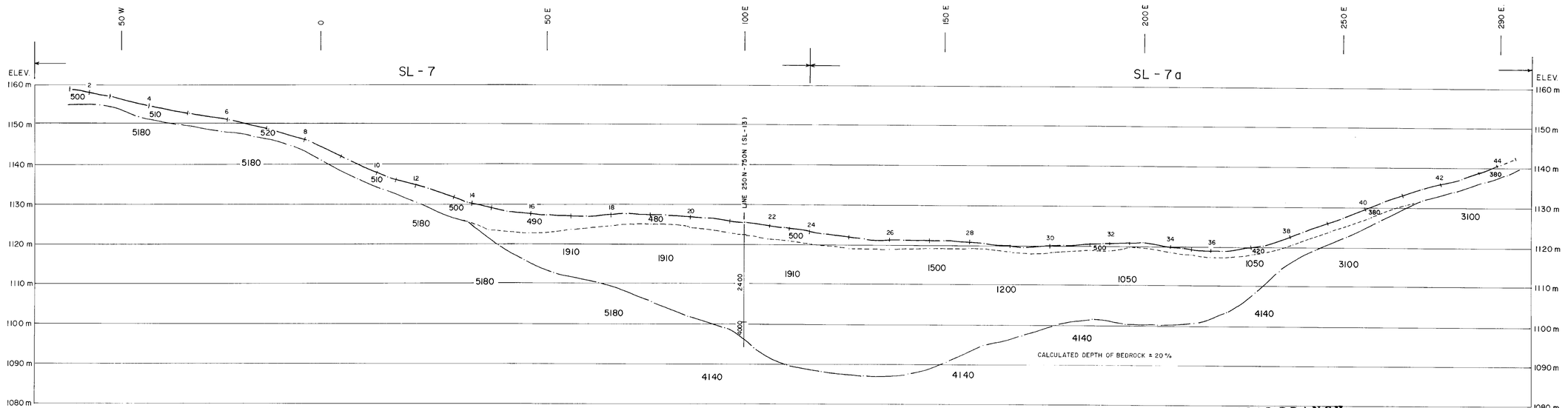
LEGEND

TRACER RESOURCES LTD.
PLACER LEASES
7347, 8246, 9366, 9483

SEISMIC REFRACTION STUDY

PROFILE 0 E.

9



LEGEND

Seismic cable

Bottom of weathered layer

Bottom of gravel or sand layer

Top of bedrock

2070 Average velocity in metres per second

SCALE: 1 METRE

GEOTRONICS SURVEYS LTD.

TRACER RESOURCES LTD

PLACER LEASES

7347, 8246, 9366, 9483

BRALORNE B.C.

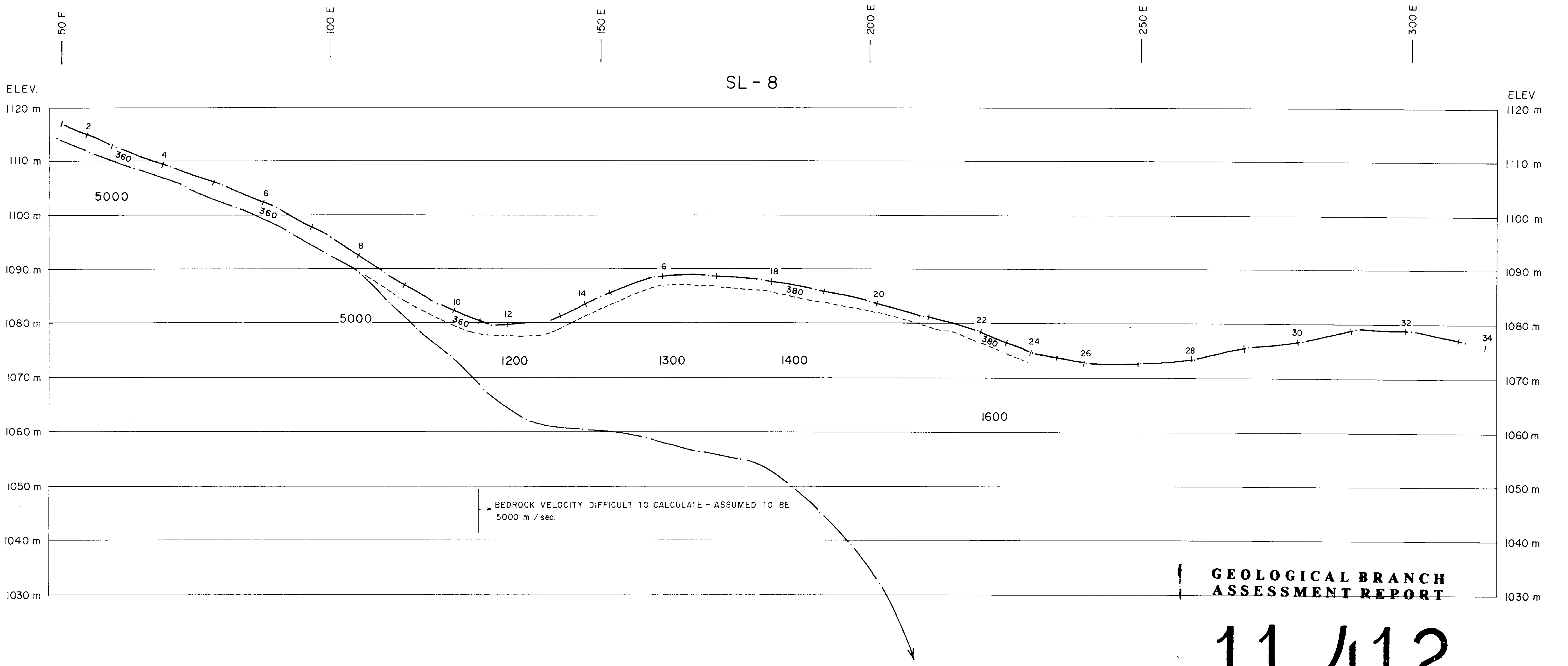
SEISMIC REFRACTION STUDY

PROFILE 430 N.

SCALE: 1" = 100'

GEOLOGICAL BRANCH
ASSESSMENT REPORT

11,412



LEGEND

12 — Geophone location on ground surface

Bottom of weathered layer

Bottom of gravel or sand layer

Top of bedrock

2070 Average velocity in metres per second

SUGGESTED VELOCITY CLASSIFICATION

300 - 500	Overburden surficial, loose, dry till, sands & gravels
800 - 1300	Overburden more compact, partially saturated till, sands & gravels
1400 - 1800	Overburden water saturated tills, sands & gravels
1800 - 2200	Overburden very compact, water saturated tills, sands & gravels
3100 - 3800	Bedrock clastic sediments, possibly volcanics
4100 - 5200	Bedrock volcanics, intrusives
5400 - 6000	Bedrock intrusives, possibly limestones, dolomites

SCALE IN METRES

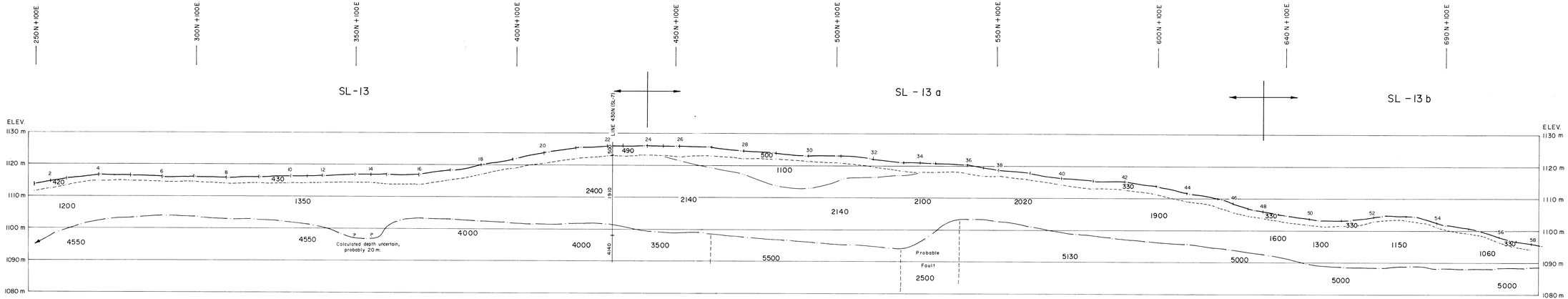
GEOTRONICS SURVEYS LTD

TRACER RESOURCES LTD
PLACER LEASES
7347, 8246, 9366, 9483

BRALORNE AREA

SEISMIC REFRACTION STUDY

PROFILE 750 N.



GEOLOGICAL BRANCH
ASSESSMENT REPORT

11,412

LEGEND

- Geophone location on ground surface
- Bottom of weathered layer
- Bottom of gravel or sand layer
- Top of bedrock

2070 Average velocity in metres per second.

SUGGESTED VELOCITY CLASSIFICATION

300 - 500	Overburden surficial, loose, dry till, sands & gravels
800 - 1300	Overburden more compact, partially saturated till, sands & gravels
1400 - 1800	Overburden water saturated tills, sands & gravels
1800 - 2200	Overburden very compact, water saturated tills, sands & gravels
3100 - 3800	Bedrock clastic sediments, possibly volcanics
4100 - 5200	Bedrock volcanics, intrusives
5400 - 6000	Bedrock intrusives, possibly limestones, dolomites

SCALE IN METRES

0 5 10 20 30 40

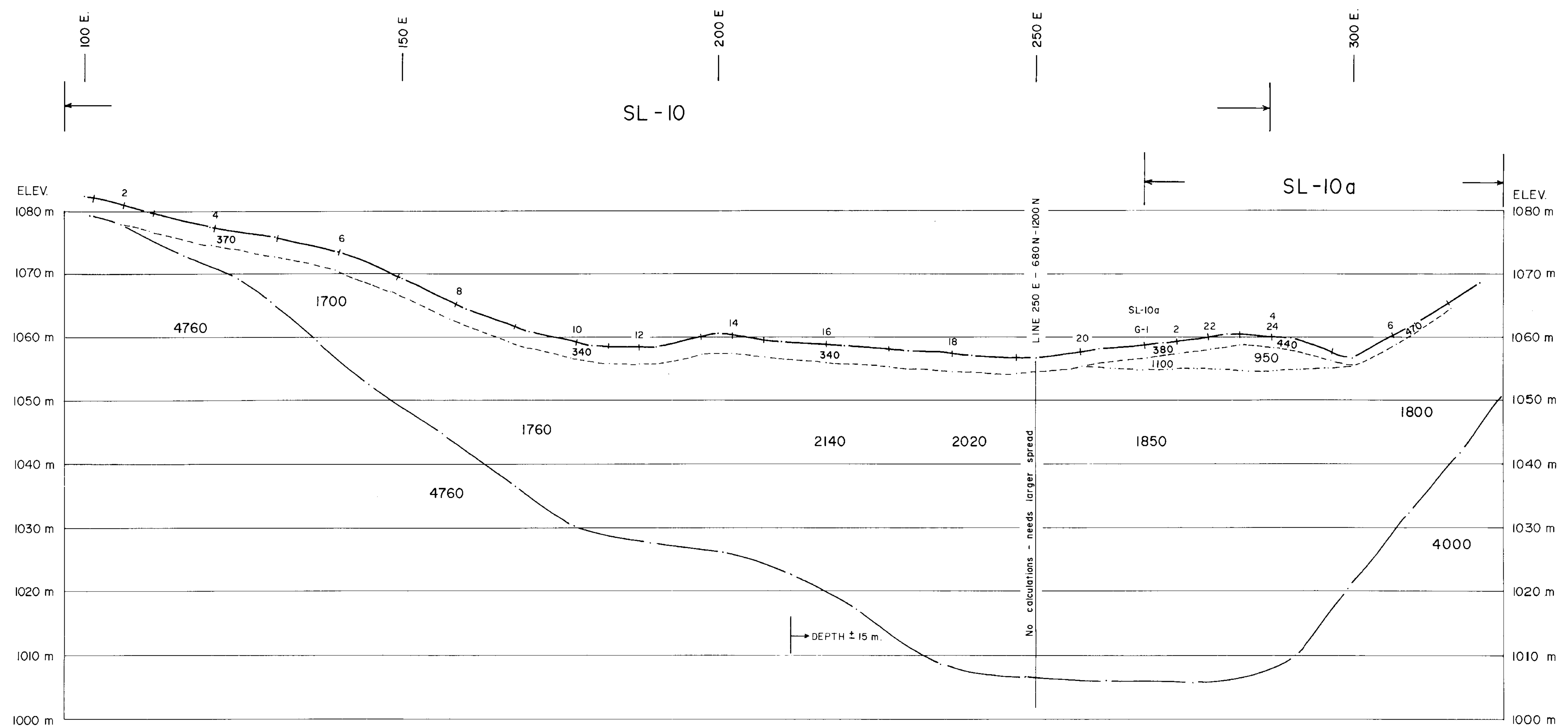
GEOTRONICS SURVEYS LTD.

TRACER RESOURCES LTD.
PLACER LEASES
7347, 8246, 9366, 9483
BRALORNE AREA
LILLOOET MINING DIVISION, BC

SEISMIC REFRACTION STUDY

PROFILE 100 E.

SCALE	INT'L	DATE	JOB No.	SHEET No.
1:500	922-15W	OCT. 1963	83-36	12



GEOLOGICAL BRANCH
ASSESSMENT REPORT
11,412

LEGEND

12 (geophone symbol)	Geophone location on ground surface
- - - - - - -	Bottom of weathered layer
—— ——	Bottom of gravel or sand layer
—— ——	Top of bedrock
2070	Average velocity in metres per second

SUGGESTED VELOCITY CLASSIFICATION

300 - 500	Overburden surficial loose dry tills, sands & gravels
800 - 1300	Overburden more compact partially saturated tills, sands, & gravels
1400 - 1800	Overburden water saturated tills, sands & gravels
1800 - 2200	Overburden very compact water saturated tills, sands & gravels
[illegible] - 3800	Bedrock clastic sediments [illegible]
4[illegible] - 5200	Bedrock volcanics, intrusives
540[illegible] - 6[illegible]	Bedrock intrusives [illegible] limestones dolomite

SCALE IN METRES

5 10 20 3[illegible] 4[illegible]

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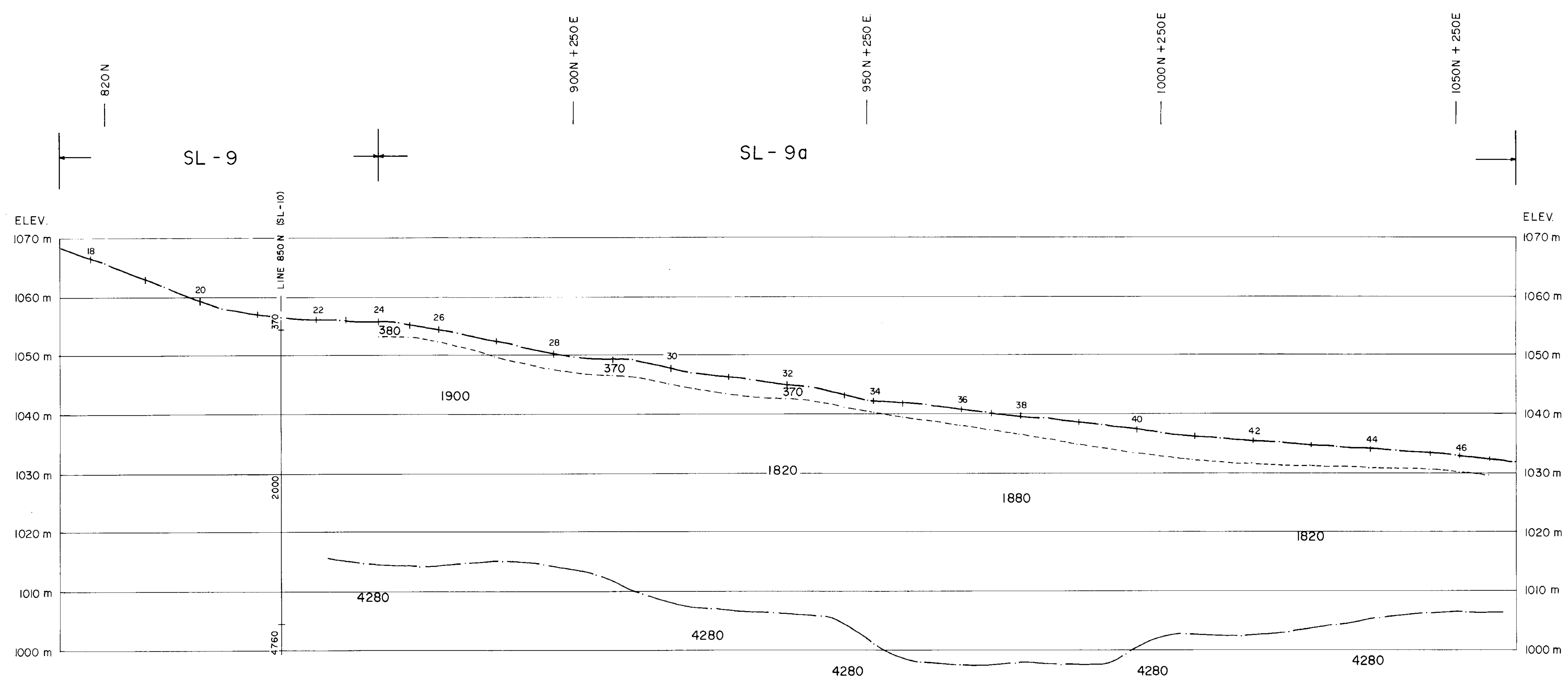
7347, 8246, 9366, 9483
BRALORNE AREA

[illegible] M.N. [illegible] B.C.

SEISMIC REFRACTION STUDY

PROFILE 850 N.

SCALE	INTER.	[illegible]	[illegible]	JOB No.	SHEET No.
[illegible]	[illegible]	F.W.	OCT. 1983	[illegible]	13



GEOLOGICAL BRANCH
ASSESSMENT REPORT

11,412

LEGEND

Geophone location on ground surface

Bottom of weathered layer

Bottom of gravel or sand layer

Top of bedrock

2070 Average velocity in metres per second

SUGGESTED VELOCITY CLASSIFICATION

300 - 500	Overburden surficial, loose, dry till, sands & gravels
800 - 1300	Overburden more compact, partially saturated till, sands & gravels
1400 - 1800	Overburden water saturated tills, sands & gravels
1800 - 2200	Overburden very compact, water saturated tills, sands & gravels
3100 - 3800	Bedrock clastic sediments possibly [illegible]
4100 - 5200	Bedrock volcanics, intrusives
5400 - 6000	Bedrock intrusives, possibly limestones, dolomites

SCALE IN METRES

0 5 10 20 30 40

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SEISMIC REFRACTION STUDY

PROFILE 250 E.

SCALE	NTS	DATE	JOB No	SHEET N
1 : 500	92 J 15 W	OCT 1983	83 - 39	14