GEOPHYSICAL REPORT

ON A

SEISMIC REFRACTION SURVEY

ON THE

WOLVERINE PLACER GOLD PROPERTY

JACKFISH CREEK, MANSON CREEK AREA

OMINECA MINING DIVISION, BRITISH COLUMBIA

PROPERTY LOCATION	:	Centre is located 6.6 km N50°W of village of Manson Creek, British Columbia 55°42'N Latitude, 124° 35'W Longitude N.T.S. - 93N/10E
WRITTEN FOR	:	**WILLEM KLEINHOUT** P.O. Box 407, Station A Vancouver, British Columbia V6C 2N2
WRITTEN BY	:	David G. Mark, P.Geo., **GEOTRONICS SURVEYS LTD.** #405 - 535 Howe Street Vancouver, British Columbia V6C 2Z4
DATED	:	February 1997

GEOTRONICS

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SUMMARY

Seismic refraction surveying was carried out over the Wolverine Claims located about 6.6 km N50°W of the village of Manson Creek to the west of the upper reaches of Jackfish Creek in the Omineca Mining Division, British Columbia. The work was carried out at two different times, once in February, 1996, and the other in December, 1996. The object of the work was to locate buried creek or river channels, especially pre-glacial, that may carry placer gold.

The leases are underlain by Cache Creek sediments, probably argillites and slates, and possibly volcanics. The overburden is glacial till and boulder clay and localized fluvial sands and gravels. Within the placer channels of the area, the sands and gravels are overlain by the glacial material.

The surveying was carried out using a 24-channel seismic refraction system with 190-meter spreads using 5/10-meter geophone spacings and with 345-meter spreads using 15-meter geophone spacings, and employing explosives as the energy course. For the February work, three spreads were completed along one line resulting in a terrain survey length of 570 m and for the December work 2 spreads were completed along two lines, one spread per line, each perpendicular to the other for a terrain survey length of 535 meters. The data were analyzed using an intercept time delay method.

This work is a follow-up of seismic refraction work carried out by Geotronics during November 1988 and October 1993. This previous work also forms part of this report.

CONCLUSIONS

The seismic refraction survey revealed a number of Tertiary buried creek channels interpreted from bedrock depressions. Considering the numerous placer deposits occurring within buried channels in the area, these channels are prime exploration targets.

1. Two channels occur on line 20+00W, one on line 2+50W, and seven on line 5+00E.
2. One possible channel was located at the north end of Line 18+00E. However, to the north of this line, no channels were shown on lines SL-1 and SL-2, therefore, indicating that a channel probably occurs between lines 18+00E and SL-1 within the swamp area.
3. On lines 10+50W, no possible channels were indicated.
4. SL-BL indicates two possible channels along which the survey line appears to run sub-parallel to. These channel(s) would be ones already revealed on line 2+50W or possibly line 5+00E.
5. In addition, several slow zones within bedrock were located and may represent in-filled, steep-sided channels.

Because the lines are so far apart, it is difficult to extend any of the channels from one line to the next on the basis of the seismic work alone. Further work will be needed to rectify this.

RECOMMENDATIONS

Considering that it is likely that velocity inversion layers exist on all channels (high velocity boulder clay overlying low velocity gravels), it is recommended to test the channels with the seismic reflection method. Using the velocities from the seismic refraction work, more accurate depths to the bottom of the channels should be able to be obtained.

The possible channels should also be checked out, or verified by borehole drilling and/or test pitting by an excavator. The purpose would be to verify that the bedrock depressions are buried creek or river channels, and that they are mineralized with placer gold.

The seismic refraction work was of a reconnaissance nature (the lines are far apart). Since channels were located, further seismic refraction work is definitely recommended. The purpose would be to more accurately delineate the channels, as well as to determine the depths to their bottoms. The line spacing should be no more than 100 metres, and the method used should be such that a greater accuracy in depth calculations can be achieved.

The geophone spacing, for the most part, could be left at 5 and 10 metres, but some narrower channels should be delineated with a smaller geophone spacing.

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INTRODUCTION AND GENERAL REMARKS

This report discusses the results of seismic refraction surveying carried out along three lines within the Wolverine placer gold property, which occurs within Little Wolverine Pass, located 6.6 km N50°W (310°E) of the village of Manson Creek.

The seismic work was carried out for the purpose of locating buried Tertiary creek or river channels that were hoped to carry placer gold. The Manson Creek area is well known for numerous placer gold deposits occurring within buried channels. The Wolverine claims were located to encompass the possible channels that were delineated from air photos and Landsat imagery by Willem E. Kleinhout, geophysicist.

The seismic work was of a reconnaissance nature and, thus, the survey and interpretation methods were designed not so much to obtain bedrock depths, but channel locations.

The work was carried out from February 18 to 22, 1996 and from December 14 to 16, 1996 by a crew of five men headed by the writer.

The work was done at the request of Willem E. Kleinhout, who also located the crew onto the property as well as managed the project.

PROPERTY AND OWNERSHIP

The property consists of five contiguous placer leases grouped as the Wolverine placer gold property as shown on Map #2, and as described below:

Name	Placer Lease No.	Tag No.	Expiry Date
Wolverine 1	335593	P87940	May 8,1999
Wolverine 2	335594	P87941	May 8,1999
Wolverine 3	335595	P87942	May 8,1999
Wolverine 4	335596	P87943	May 8,1999
Wolverine 5	335597	P87944	May 8,1999
Wolverine 6	347757	P91902	?
Wolverine 7	347758	P91903	?
Wolverine 8	353198	P93558	?
Wolverine 9	353199	P93559	?

The expiry dates shown assume that the work discussed within this report will be accepted for assessment credits.

The property is owned by Willem E. Kleinhout of Vancouver, British Columbia.

LOCATION AND ACCESS

The property is located about 6.6 km N50°W of the village of Manson Creek to the west of the upper reaches of Jackfish Creek in the Omineca Mining Division, British Columbia.

The geographical coordinates are 55° 42' north latitude and 124° 35' west longitude.

Manson Creek can be reached by car along gravel roads from Mackenzie, over a distance of 160 km (100 miles), or from Fort St. James over a distance of 185 km (115 miles). The property is reached by traveling westerly from Manson Creek along the road to Germansen Landing for about 10 km. The eastern part of the property is reached by 5 km (3 miles) of gravel road, which runs northwesterly from Manson Creek.

PHYSIOGRAPHY

The property is located within the southern part of the physiographic unit known as the Swannell Ranges, which is a division of the Omineca Mountains. The terrain is generally moderate with slopes varying from gentle to steep. Mountains in the area reach elevations in excess of 1,600 m (5,250 feet) a.s.l., but valley floors are often about 1,000 m (3,280 feet).

The property is located within a west-northwesterly trending saddle-shaped valley. The eastern part of the property is drained by the northerly-flowing Jackfish Creek. The western part slopes down into the Germansen River valley. The terrain is quite gentle, with some steeper slopes on the northwestern part of the property. The elevation varies from about 950 to 1,100 metres above sea level.

HISTORY

Placer gold was first discovered on Silver Creek in 1868 and through the years since, the creeks and rivers in the general area have been worked off and on. Apparently, the government did not keep records until 1874. Since then, 15,103 ounces of gold were mined from the area immediately east of the property (lower Slate Creek, Manson Creek, and Lost Creek). This is most likely significantly lower than the 'real' figure, since it was quite common not to report all the gold, due to government taxation.

West of the property, mostly along the northwesterly-trending part of Germansen River and its tributaries, 24,138 ounces of gold were recorded as produced, mostly by two main operators: Germansen Mines Limited and Germansen Ventures Ltd.

Slate Creek, about 4 km to the south, was worked by various companies, including Cominco, who worked it from 1929 to 1943. Six channels can be seen within their workings.

Since the five placer leases have been staked, no previous work has been carried out on them. However, on the same ground but with the previous placer leases, Geotronics Surveys Ltd. carried out seismic work along lines 5+00E, 2+50W and 20+00W during November 1988 and along lines 10+50W and 18+00E during October, 1993. Those results form part of this report.

GEOLOGY

The G.S.C. geology map of the area shows the property to be underlain by mostly sediments, and possibly some volcanics of the Cache Creek group of Pennsylvanian and Permian age. The Cache Creek group occurs as a west- to northwest-trending band dipping nearly vertical that averages 13 km wide. The Cache Creek group in the area of the property consists mostly of argillites and slates, with minor beds of greenstone and schist. Also, several small bodies of serpentine have been seen to cut across the Cache Creek rocks.

The Manson fault zone crosses Slate Creek in a northwesterly direction and along this zone the slates and argillites have been hydrothermally altered to a buff-coloured aggregate of ankeritic carbonate, quartz and mariposite.

The overburden consists almost entirely of glacial till produced by easterly-flowing glaciers, as well as boulder clay. Fluvial gravels occur in the placer channels close to bedrock and underlie the till and boulder clay.

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 cables for the 190-meter spreads, and two 165-meter cables for the 345-meter spreads were used, as well as 8 cycle/sec marsh geophones, manufactured by Mark Products of Houston, Texas.

The blasting was done with one encoder and one decoder, 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 method was used for all seismic lines. The technique consists of laying out 24 geophones in a straight line and recording arrival times from shots fired at either end of the spread. Arrival times from three additional shot points each located every 1/4 of the spread length within the middle of the spread were also recorded. This provided the layer depths and velocity variations along the spread, and also gave additional information about the deeper layers. Finally, for each spread, two additional off-end shots were fired, each at a distance of up to one-half the spread length from the nearest geophone so that all first arrivals were from the basement bedrock (or basal layer). This was felt necessary so that the refractions received from the other shot points could be correlated and assigned the correct layer number.

The geophone spacing used for SL-BL and SL-2 was 5 metres at the two ends and the middle of the spread, and 10 metres for the rest of the spread. This resulted in a spread length of 190 metres. For SL-1, the geophone spacing used was 15 meters resulting in a spread length of 345 meters.

Three seismic lines were run, as shown on Maps #2 and 3, during the two survey times. SL-BL consisted of three overlapping spreads for a total horizontal and terrain length of 570 m. SL-1 consisted of one spread for a survey length of 345 meters and SL-2 consisted of one spread for a survey length of 190 meters. The terrain along each of the lines was surveyed in by hand-held clinometer. The geophone stations were marked by blaze orange flagging.

The shots ranged in size from 0.1 to 4.0 kg., and were placed in holes 0.4 m deep.

The following table describes all work, as follows:

	LINE	NO. SPREADS	HORIZ. LENGTH	SURVEY DATE
1	SL 5+00E	13	1,605 m	Nov 1988
2	SL 2+50W	4	665 m	Nov 1988
3	SL 20+00W	3	425 m	Nov 1988
4	SL 10+50W	2	314 m	Oct 1993
5	SL 18+00E	2	380 m	Oct 1993
6	SL BL	3	570 m	Feb 1996
7	SL-1	1	345 m	Dec 1996
8	SL-2	1	190 m	Dec 1996

COMPUTING METHOD

All seismic data were analyzed using an intercept-delay time technique. Implementation of this method requires reverse 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 refractions from either end back to their respective shot locations. With this information and related overburden velocities, it is possible to compute the depth to bedrock below each detector.

The seismic-interpreted profiles from the previous work were plotted at a scale of 1:1,000 on Map #4 (November, 1988) and on Map #5 (October, 1993). For the new lines, SL-BL was plotted on Map #6, and SL-1 and SL-2 were plotted on Map#7 also at a scale of 1:1,000. The location of the eight lines is shown on the claim map, Map #2, at a scale of 1:50,000, and on the Plan Map #3, at a scale of 1:10,000. The base for these maps was taken from the 1:50,000 topographic map (NTS 93N/10).

DISCUSSION OF RESULTS

A suggested classification of the velocities is as follows:

Layer #	Velocity	Suggested Material
1	240 - 540	Overburden: loose surficial glacial till, possibly sand, gravel.
2A	1000 - 1250	Overburden: probably gravels or till, partially compact, non-saturated.
2	1500 - 2000	Overburden: probably gravels or till, saturated, compact.
2	2000 - 2500 (2670?)	Overburden: boulder clay, glacial till, water-saturated, very compact, possibly semi-lithified.
3	2800 - 4400	Bedrock: Cache Creek sediments, possibly volcanics.
3	6,100	Bedrock: limestone

Horizontal changes in overburden velocity may be caused by a variable water content, type of material and/or compactness of the material. Therefore, arbitrary boundaries within the overburden should be treated as physical changes and not necessarily as geological boundaries.

Bedrock velocities can be much lower than is indicated within the table if the rock is highly fractured or highly altered. Also, it is not common to find overburden velocities above 2,500 meters/second. In other words, velocities above 2,500 meters/second are usually indicative of bedrock. However, the overburden may be semi-lithified resulting in a higher than usual velocity. Also, the accuracy of the velocity measurement is dependent on (1) the bedrock topography, especially around areas of sharp changes such as buried creek channels, and (2) the number of points defining the velocity. Therefore some of the bedrock velocities may be higher or lower than is shown.

The number of seismic velocity layers occurring on the project site is either two, with the second layer being bedrock, or three, with the third layer being bedrock. The first layer in both cases is loose, surficial overburden. The middle layer of the three layer case is a very compact, possibly water-saturated glacial till/boulder clay and occurs in most of the suggested buried creek channels.

As can be seen on the profiles of the eight lines (Maps #4, #5, #6, and #7), a number of bedrock depressions interpreted to be buried creek channels have been profiled. Not all the depressions are necessarily channels, but all must be checked by further work.

Because of the large line separation, it is difficult to connect the channels from one line to the other based on the seismic work alone. Again, further work will overcome this problem.

The depths that have been calculated to the bottom of the channels must not be treated as accurate. Firstly, as mentioned above, accuracy was not considered important at this stage of

the exploration project. Secondly, in these areas, it is more likely to encounter velocity inversions or hidden layers, either one of which will adversely affect the accuracy of the seismic-interpreted depths. The occurrence of velocity inversion layers is very likely since it is well known in the area that in the buried creek channels, high velocity boulder clays are underlain by lower velocity gravels. This will result in seismically-calculated depths within channels to be deeper than they actually are.

Line 18+00E shows the bedrock increasing its depth to the north. This could reflect a channel area that is open to the north. The depth averages about 20 m.

From 40+00 to 80+00 is a slow velocity zone within the bedrock. This may simply be due to a different rock-type (clastic sediments?), or a fracture or fault zone. However, it could also be due to a buried steep-sided channel in-filled with boulder clay overlying gravels.

The depths to bedrock along the line, other than the possible northern channel area, varies from 2.5 m to 5.5 m.

Lines SL-1 and SL-2 occur to the immediate north of line 18+00E and therefore could be considered the northern extension of that line. Both lines show a simple two-layer case and indicate bedrock to be just below the surface with the depths to bedrock varying from one to three meters and averaging about two meters.

There are no channels indicated on these two lines but taking these two lines along with line 18+00E suggest the probability that a channel occurs between line 18+00E and line SL-1 within the swamp area.

Line 5+00E, largely because it is the longest, has the most channels, or possible channels. Four occur south of the property, two occur within the property, and one occurs on the northern boundary. The channels are described in the following table, with the numbering going from south to north.

Channel	Horizontal Meter Location	Width (metres)	Depth to Bottom
1	14 - 40	26 m	10 m
2	96 - 154	58 m	12 - 18 m
3	183- 300	117 m	12 - 24 m
4	348 - 404	56 m	10 - 19 m
5	674 - 710	36 m	5 - 11 m
6	822 - 925	103 m	9 - 14 m
7	1144 - 1222	78 m	3 - 5 m

The depths to bedrock other than within the channels vary from surface (outcropping) to 8 m south of the bush road, and 1.5 to 4.5 m north of the bush road.

On **Line 2+50W**, only one channel was mapped, and it occurs south of the property, at 134 to 216 m. This results in a width of 82 m, and has a depth varying from 5 to 8.5 m.

Over the rest of the line, the overburden varies from about 1 m to 5 m.

Line 10+50W has not revealed any possible channels. However, from 4+50 to 20+50 there is a possible second overburden layer which would result in the bedrock within this area being at a greater depth. As a result, this could be a channel area.

A possible fault is shown to occur at about 27+50. It is possible this may represent a buried channel, though very narrow, but this is doubtful.

The seismic-calculated depths to bedrock along t his line vary from 2.1 m to 5.3 m.

On **Line 20+00W**, occurs one and possibly two channels, both on the property. It appear the channels may be separate, but it is possible they occur as one large channel. The southern channel occurs from 200 to 360 m, resulting in a width of 160 m, and has a depth varying from 18 to 24 m. The northern channel extends from 382 m to north of the survey line, therefore giving a minimum width of 44 m. It has a depth of up to 20 m.

The depth to bedrock apart from the channels varies from about 2 to 6 m .

Line SL-BL occurs at line 2+50W, as shown on the claim map and the survey plan, and has a direction that is approximately orthogonal to it. SL-BL shows a three-layer case with depths varying from 9 m below G-64 to 31 meters below G-23. However, this is in disagreement with line 2+50W which is a two-layer case with depths much shallower (about half). Possible explanations are as follow:

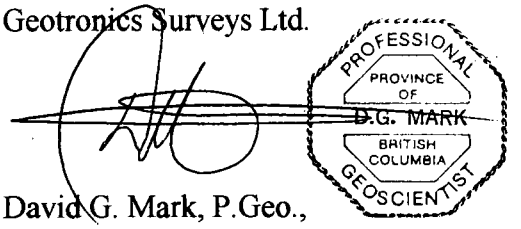
1. The bedrock depths on line 2+50W in this area are somewhat questionable since there is some evidence of a second overburden layer which would make it a three-layer case. This would result in the calculated seismic-depths of 2+50W being deeper.
2. The location of SL-BL may not be accurate. Possibly it is closer to line 5+00W which is a three layer case with bedrock depths that agree more with those of SL-BL. The writer was not able to check the location because of winter conditions.
3. The quality of the records of SL-BL were not as good as those of the other lines because of the frozen ground resulting in poor energy coupling. This means the interpretation may not be as accurate. However, the data clearly shows that SL-BL consists of a three-layer case and thus this possibility is not considered likely.

Two possible channel areas have been indicated on this line. The western boundary of one occurs at about G-26 and that of the other at about G-56. The eastern boundaries are not

well-defined, and thus are not shown, possibly because SL-BL runs sub-parallel and/or along the channel.

Throughout the property, a number of **slow zones** within the bedrock have been mapped by the seismic surveys. These can be faults and/or steep-sided buried channels. In many cases the width may be no more than 10 m. Not surprisingly, a number of these occur within channels.

Respectfully submitted,
Geotronics Surveys Ltd.



David G. Mark, P.Geo.,
Geophysicist

February 1997

GEOTRONICS

REFERENCES

Armstrong, J.E., Fort St. James Map Area - Cassiar and Coast Districts, British Columbia. Geological Survey of Canada, Memoir 252, 1965.

Mark, David G., Geophysical Report on a Seismic Refraction Survey on The Slate Creek Pass Placer Leases, Manson Creek Area, Omineca Mining Division, British Columbia, December 11, 1993.

Mark, David G., Geophysical Report on a Seismic Refraction Survey on The Slate Creek Placer Claim Group, Manson Creek Area, Omineca Mining Division, British Columbia, December 21, 1993.

Mark, David G., Geophysical Report on a Seismic Refraction Survey on The Jackfish Creek Placer Leases, Manson Creek Area, Omineca Mining Division, British Columbia, December 22, 1993.

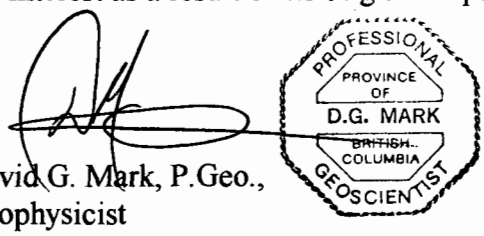
GEOPHYSICIST'S CERTIFICATE

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 #405 - 535 Howe Street, Vancouver, British Columbia.

I further certify that:

1. I am registered as a Professional Geoscientist with the Association of Professional Engineers and Geoscientists of the Province of British Columbia.
2. I am a graduate of the University of British Columbia (1968) and hold a B.Sc. degree in Geophysics.
3. I have been practicing my profession for the past 29 years, and have been active in the mining industry for the past 32 years.
4. This report is compiled and interpreted from data obtained from two seismic refraction surveys carried out under my field supervision during the periods of February 18 to 22, 1996, and December 14 to 16, 1996.
5. I do not hold any interest in the placer property discussed within this report, nor in any other properties Willem Kleinhout may have an interest in, nor do I expect to receive any interest as a result of writing this report.



David G. Mark, P.Geo.,
Geophysicist

February 1997

GEOTRONICS

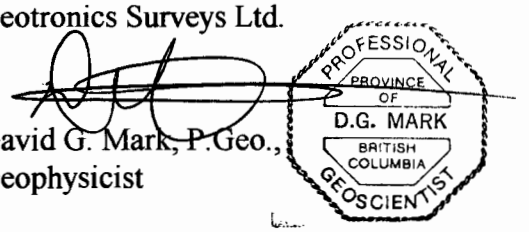
AFFIDAVIT OF EXPENSES

(February, 1996)

A seismic refraction survey along with line cutting was carried out over a portion of the Wolverine Placer Gold Property which occurs within Little Wolverine Pass, located 6.6 km N50°W (310°E) of the village of Manson Creek, from February 18 to 22, 1996, to the value of the following:

Mob-demob, at cost		
Wages	$1,225.00	
Truck rental and gas	800.00	
Room and board	375.00	$2,400.00
Field:		
5-man crew, 2 days @ $1,350/day	2,700.00	
Truck rental and gas, 2 days @ $120/day	240.00	
Explosives, 1 case @ $160/case	160.00	
Seismocaps, 26 @ $4.50/cap	617.00	
Room and Board, 2 days @ $150/day	300.00	3,517.00
Data Reduction & Report:		
Senior geophysicist, 15 hr. @ $50/hr.	750.00	
Drafting	350.00	
Geophysical technician, 30 hours @ $35/hour	1,050.00	
Printing, photocopying, compilation	200.00	2,350.00
GRAND TOTAL		**$8267.00**

Respectfully submitted,
Geotronics Surveys Ltd.



David G. Mark, P.Geo.,
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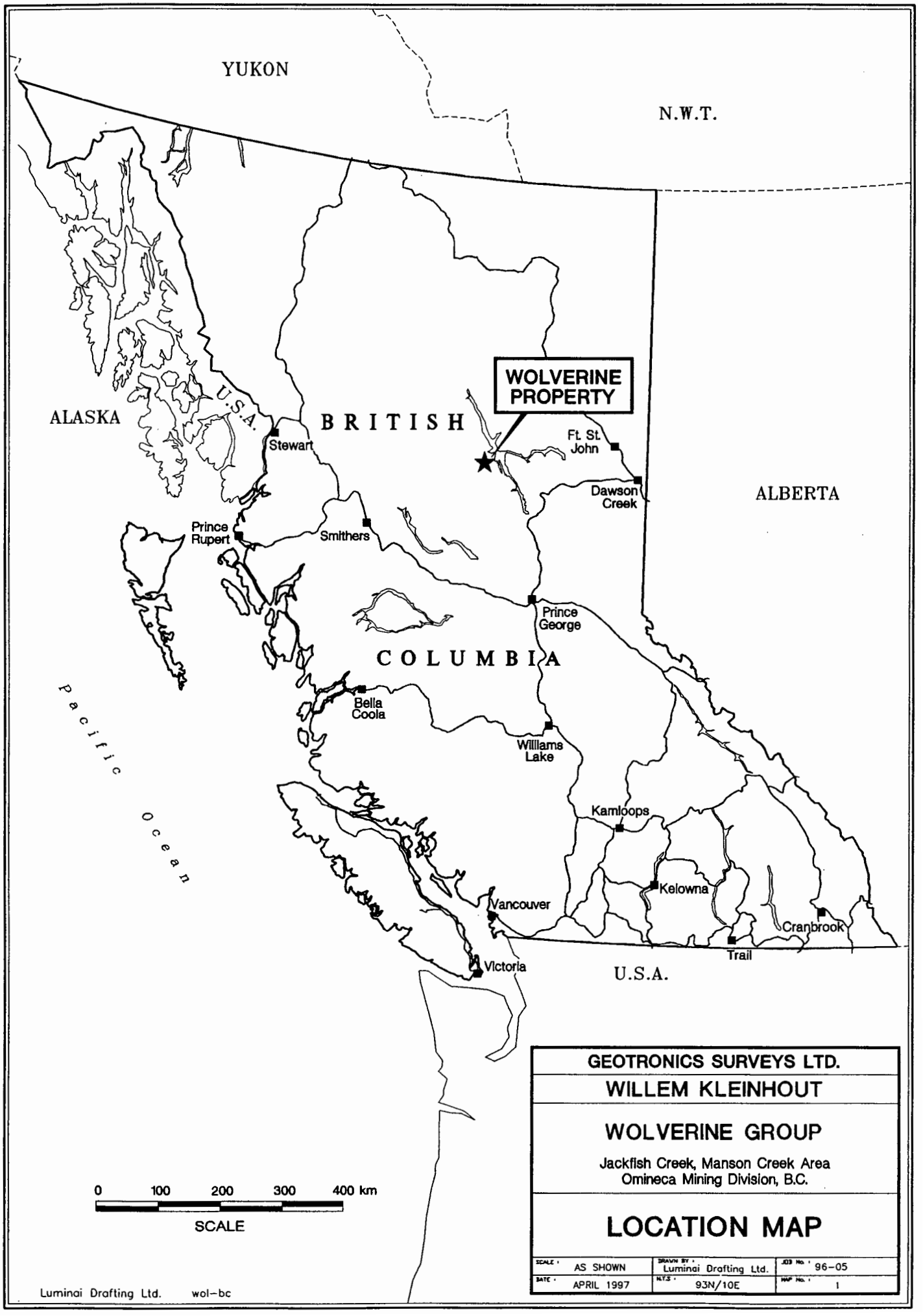


GEOTRONICS SURVEYS LTD.

WILLEM KLEINHOUT

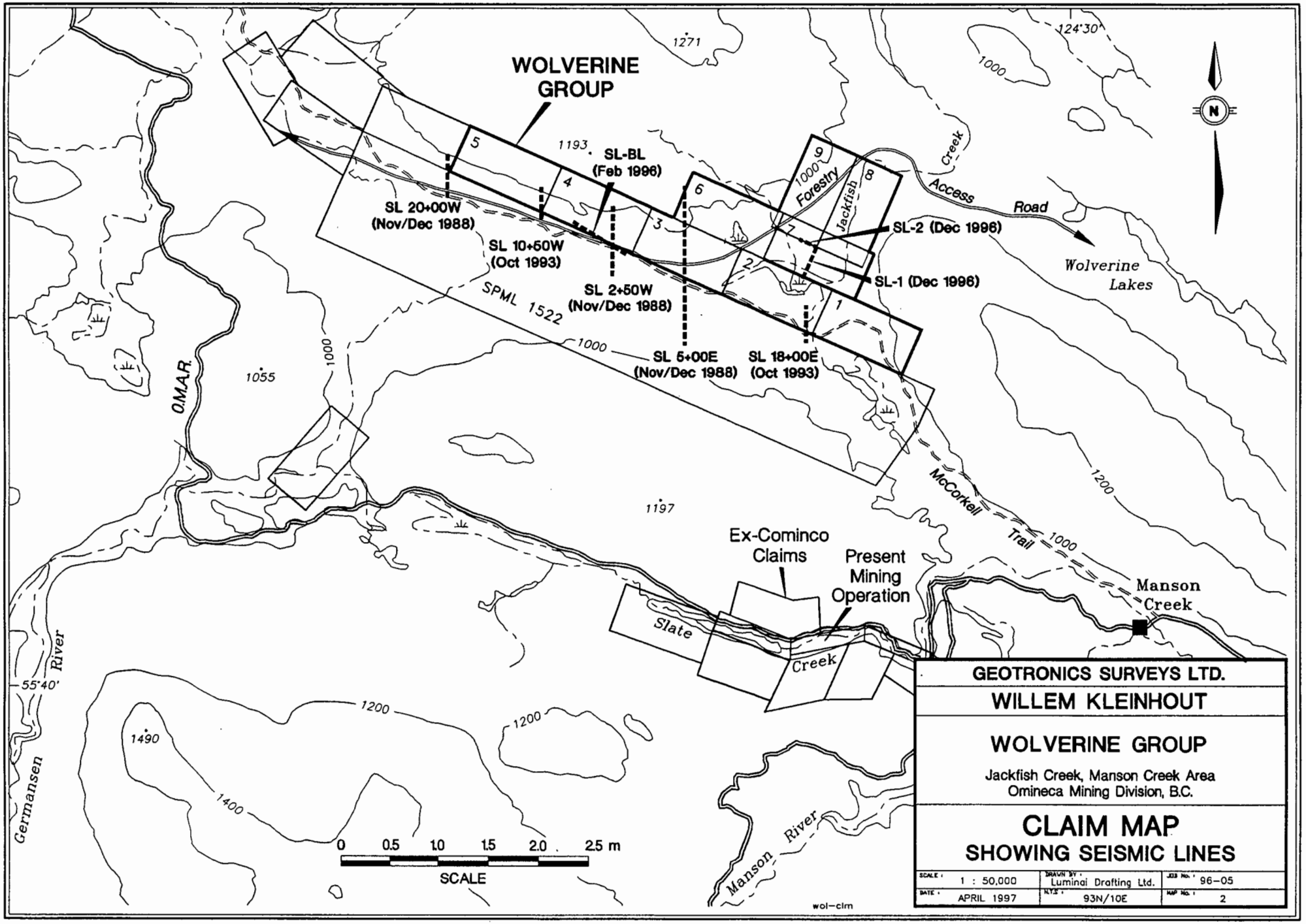
WOLVERINE GROUP

Jackfish Creek, Manson Creek Area
Omineca Mining Division, B.C.

LOCATION MAP

SCALE : AS SHOWN	DRAWN BY : Luminai Drafting Ltd.	JOB No. : 96-05
DATE : APRIL 1997	N.T.S. : 93N/10E	MAP No. : 1

Luminai Drafting Ltd. wol-bc



GEOTRONICS SURVEYS LTD.

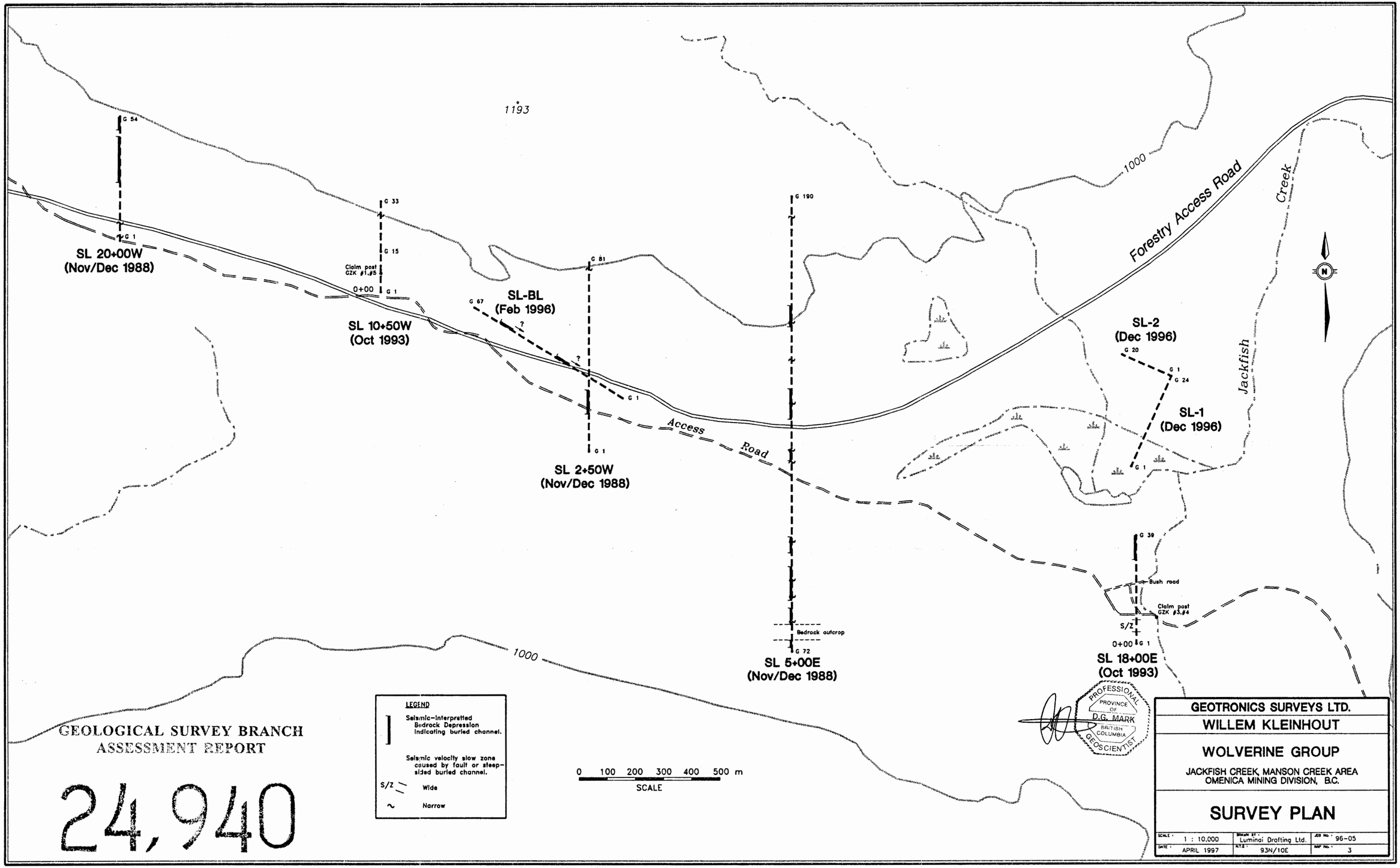
WILLEM KLEINHOUT

WOLVERINE GROUP

Jackfish Creek, Manson Creek Area
Omineca Mining Division, B.C.

CLAIM MAP
SHOWING SEISMIC LINES

SCALE : 1 : 50,000	DRAWN BY : Luminal Drafting Ltd.	JOB No. : 96-05
DATE : APRIL 1997	N.T.S. : 93N/10E	MAP No. : 2



GEOLOGICAL SURVEY BRANCH
ASSESSMENT REPORT

24,940

GEOTRONICS SURVEYS LTD.
WILLEM KLEINHOUT

WOLVERINE GROUP

JACKFISH CREEK, MANSON CREEK AREA
OMENICA MINING DIVISION, B.C.

SURVEY PLAN

SCALE : 1 : 10,000	Drawn By : Luminai Drafting Ltd.	Job No. : 96-05
DATE : APRIL 1997	N.T.S. : 93N/10E	Map No. : 3

LEGEND

G-1 G-2 — Ground surface showing Geophone Numbers

3400 — Average Seismic Velocity (metres per second)

Intermediate Seismic Horizon (within overburden)

Seismic-interpreted bedrock subsurface

S/Z — Slow zone within bedrock indicative of fault and/or buried steep-sided channel.

SUGGESTED VELOCITY CLASSIFICATION

340 - 540 metres/sec — OVERBURDEN: SURFICIAL, LOOSE, DRY TILL, SANDS & GRAVELS.

1000 metres/sec — OVERBURDEN: PARTIALLY COMPACT TILLS, SANDS & GRAVELS

1800 - 2500 metres/sec — OVERBURDEN: VERY COMPACT, WATER-SATURATED GLACIAL TILLS

2800 - 3500 metres/sec — BEDROCK: CACHE CREEK CLASTIC SEDIMENTS, POSSIBLY VOLCANICS

6100 metres/sec — BEDROCK: LIMESTONE

PROFESSIONAL GEOSCIENTIST — PROVINCE OF BRITISH COLUMBIA — D.G. MARK

SCALE IN METRES
0 10 20 30 40

GEOTRONICS SURVEYS LTD.

WILLEM KLEINHOUT

WOLVERINE GROUP

JACKFISH CREEK, MANSON CREEK AREA, OMINECA MINING DIVISION, B.C.

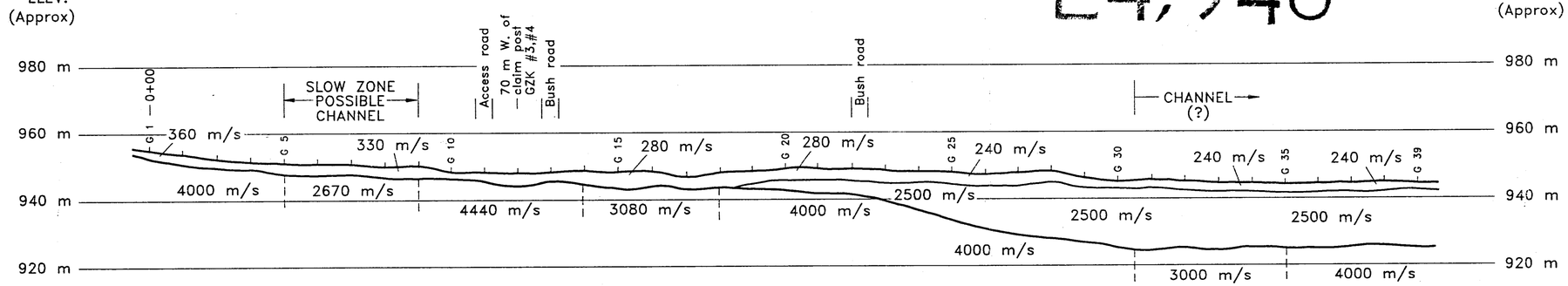
SEISMIC REFRACTION STUDY PROFILES

SCALE:	N.T.S.	DATE:	JOB No.	MAP No.
1:1000	93N/10E	FEB., 1989	89-39	4

SL 18+00E

LINE DIRECTION 0° →

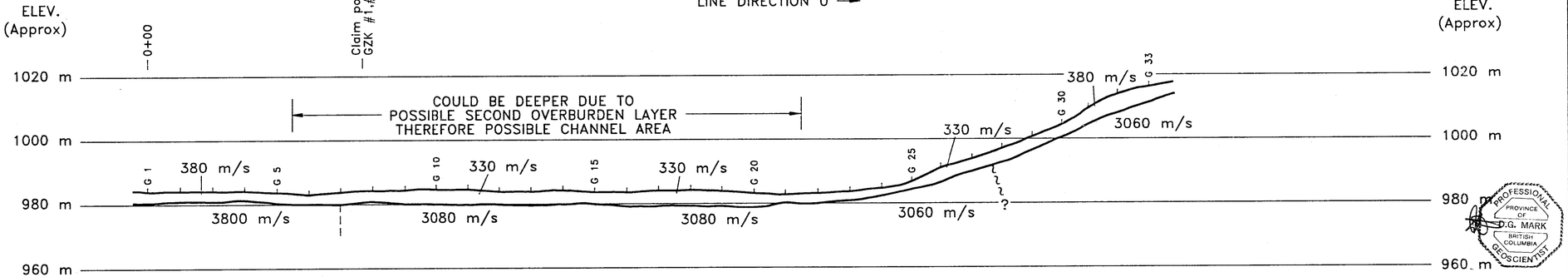
S — N



SL 10+50W

LINE DIRECTION 0° →

S — N



LEGEND

- G 15 — GROUND SURFACE SHOWING GEOPHONE NUMBERS
- 4000 m/s — AVERAGE SEISMIC VELOCITY (metres per second)
- INTERMEDIATE SEISMIC HORIZON (within overburden)
- SEISMIC–INTERPRETED BEDROCK (SUBSURFACE)
- PROBABLE LOCATION OF SEISMIC–INTERPRETED BEDROCK (SUBSURFACE)
- S/Z — SLOW ZONE WITHIN BEDROCK INDICATIVE OF FAULT OR STEEP–SIDED BURIED CHANNEL

SUGGESTED VELOCITY CLASSIFICATION

240–380 metres/sec – OVERBURDEN: SURFICIAL LOOSE, DRY TILL, SANDS AND GRAVELS

1800–2500 metres/sec – OVERBURDEN: VERY COMPACT, WATER–SATURATED BOULDER CLAYS AND TILLS; POSSIBLY SANDS AND GRAVELS

2670 metres/sec – OVERBURDEN(?): SAME AS ABOVE OR BEDROCK(?): SOFT CLASTIC SEDIMENTS OR ALTERED, FRACTURED SEDIMENTS

3000–3800 metres/sec – BEDROCK: SEDIMENTS, PROBABLY ARGILLITES AND SLATES; POSSIBLY SOME VOLCANICS

4000–5330 metres/sec – BEDROCK: VOLCANICS, POSSIBLY LIMESTONE

GEOTRONICS SURVEYS LTD.

WILLEM KLEINHOUT

WOLVERINE GROUP

Jackfish Creek, Manson Creek Area
Omineca Mining District, B.C.

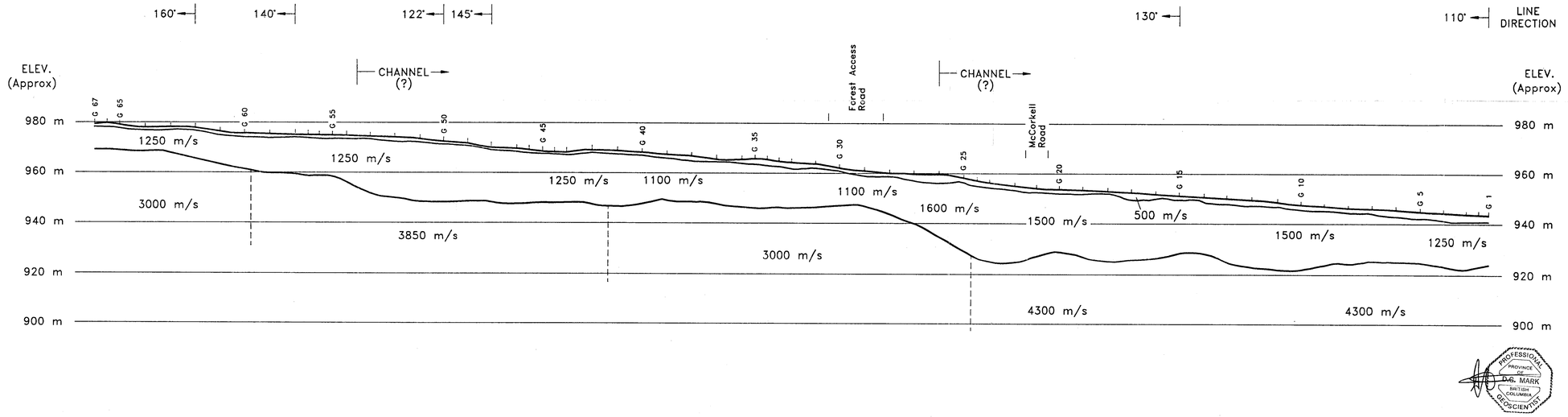
SEISMIC REFRACTION STUDY PROFILES SL 18+00E & 10+50W

SCALE : 1 : 1,000	DRAWN BY : Luminai Drafting Ltd.	JOB No. : 93–04
DATE : DEC. 1993	N.T.S : 93N/10E	MAP No. : 5

SL-BL

W

E



LEGEND

- G 15 — GROUND SURFACE SHOWING GEOPHONE NUMBERS
- 4000 m/s — AVERAGE SEISMIC VELOCITY (metres per second)
- INTERMEDIATE SEISMIC HORIZON (within overburden)
- SEISMIC-INTERPRETED BEDROCK (SUBSURFACE)
- PROBABLE LOCATION OF SEISMIC-INTERPRETED BEDROCK (SUBSURFACE)
- |S/Z| — SLOW ZONE WITHIN BEDROCK INDICATIVE OF FAULT OR STEEP-SIDED BURIED CHANNEL

SUGGESTED VELOCITY CLASSIFICATION

240-380 metres/sec – OVERBURDEN: SURFICIAL LOOSE, DRY TILL, SANDS AND GRAVELS

1000-1300 metres/sec – OVERBURDEN: PARTIALLY COMPACT TILLS, SANDS AND GRAVELS

1500-2500 metres/sec – OVERBURDEN: VERY COMPACT, WATER-SATURATED BOULDER CLAYS AND TILLS; POSSIBLY SANDS AND GRAVELS

2670 metres/sec – OVERBURDEN(?): SAME AS ABOVE OR BEDROCK(?): SOFT CLASTIC SEDIMENTS OR ALTERED, FRACTURED SEDIMENTS

3000-3800 metres/sec – BEDROCK: SEDIMENTS, PROBABLY ARGILLITES AND SLATES; POSSIBLY SOME VOLCANICS

4000-5330 metres/sec – BEDROCK: VOLCANICS, POSSIBLY LIMESTONE

GEOTRONICS SURVEYS LTD.
WILLEM KLEINHOUT

WOLVERINE GROUP

Jackfish Creek, Manson Creek Area
Omineca Mining Division, B.C.

SEISMIC REFRACTION STUDY PROFILE SL-BL

SCALE : 1 : 1,000	DRAWN BY : Luminal Drafting Ltd.	JOB No. : 96-05
DATE : APRIL 1997	N.T.S. : 93N/10E	MAP No. : 6

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
D.G. MARK
GEOSCIENTIST

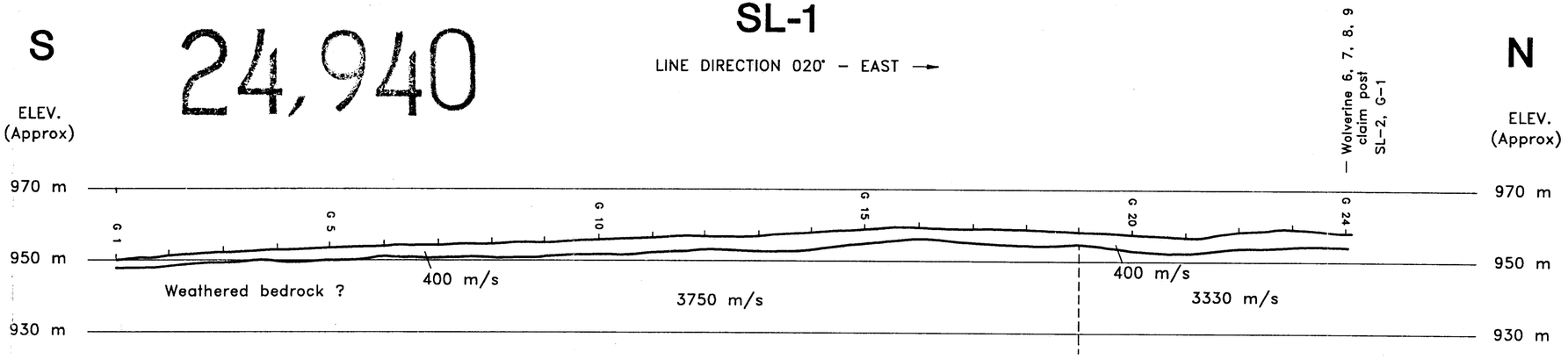
SL-1

LINE DIRECTION 020° – EAST →

S

N

ELEV. (Approx)



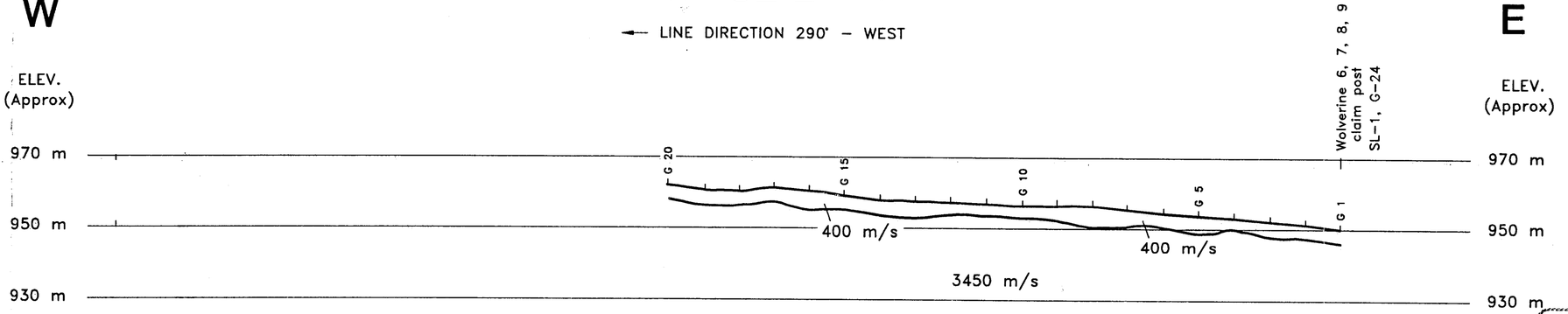
SL-2

← LINE DIRECTION 290° – WEST

W

E

ELEV. (Approx)



LEGEND

G 15 — GROUND SURFACE SHOWING GEOPHONE NUMBERS

4000 m/s — AVERAGE SEISMIC VELOCITY (metres per second)

INTERMEDIATE SEISMIC HORIZON (within overburden)

SEISMIC–INTERPRETED BEDROCK (SUBSURFACE)

PROBABLE LOCATION OF SEISMIC–INTERPRETED BEDROCK (SUBSURFACE)

|S/Z| — SLOW ZONE WITHIN BEDROCK INDICATIVE OF FAULT OR STEEP–SIDED BURIED CHANNEL

SUGGESTED VELOCITY CLASSIFICATION

240–380 metres/sec – OVERBURDEN: SURFICIAL LOOSE, DRY TILL, SANDS AND GRAVELS

1000–1300 metres/sec – OVERBURDEN: PARTIALLY COMPACT TILLS, SANDS AND GRAVELS

1500–2500 metres/sec – OVERBURDEN: VERY COMPACT, WATER–SATURATED BOULDER CLAYS AND TILLS; POSSIBLY SANDS AND GRAVELS

2670 metres/sec – OVERBURDEN(?): SAME AS ABOVE OR BEDROCK(?): SOFT CLASTIC SEDIMENTS OR ALTERED, FRACTURED SEDIMENTS

3000–3800 metres/sec – BEDROCK: SEDIMENTS, PROBABLY ARGILLITES AND SLATES; POSSIBLY SOME VOLCANICS

4000–5330 metres/sec – BEDROCK: VOLCANICS, POSSIBLY LIMESTONE

GEOTRONICS SURVEYS LTD.
WILLEM KLEINHOUT

WOLVERINE GROUP

Jackfish Creek, Manson Creek Area
Omineca Mining Division, B.C.

SEISMIC REFRACTION STUDY PROFILES SL-1 / SL-2

SCALE : 1 : 1,000	DRAWN BY : Luminai Drafting Ltd.	JOB No. : 96-05
DATE : APRIL 1997	N.T.S : 93N/10E	MAP No. : 7

PROFESSIONAL GEOSCIENTIST — PROVINCE OF BRITISH COLUMBIA — D.G. MARK