A Geophysical Report
on
Magnetic & Induced Polarization Surveys
on
The TOP Claim Group
(59°, 131°,N.W.)

Claims Surveyed: 43,67,69-79,92,94,96,
107-109,111,112,125,127,129,200-
205,208-211,213,244-248,254-257,
299-303,309-316,323-325,327,336,
339-347,360-365,367,376,378-384,
391-396,403,404,501-508,511-513,
515-517,523

Survey Dates: July 14th - August 1st, 71

by

Peter E. Walcott, P.Eng.

A REPORT

ON

GROUND MAGNETIC

AND

INDUCED POLARIZATION SURVEYS

Smart River Area, B.C.

FOR

BOLIVAR MINING CORPORATION LIMITED

Vancouver, British Columbia

BY

PETER E. WALCOTT & ASSOCIATES LIMITED

Vancouver, British Columbia

JANUARY 1972

ERRATA

1. Maps W-136-3 to 14. Stations on Line 75 E should be shifted 100 feet south due to chainage error.

2. L 65 E a = 300' 11 + 50 N n = 1 M.F. should be 7 not 17

3. L 75 E a = 300' 104 N n = 4 M.F. should be 7 not 67

4. L 75 E a = 600' 119 N n = 1 $\rho_a/2\pi$ should be 1070 not 11

5. L 75 E a = 600' 116 N n = 2 $\rho_a/2\pi$ should be 100 not 43

6. L 85 E a = 300' 77 N n = 4 M.F. should be 75 not 8

7. L 85 E a = 600' 71 N n = 1 M.F. should be 45 not 5

8. L 85 E a = 600' 74 N n = 2 M.F. should be 51 not 5

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INTRODUCTION

Between July 14th and August 1st, 1971, Peter E. Walcott & Associates Limited carried out ground magnetic and induced polarization (I.P.) surveys over parts of a property, located in the Smart River area of northern British Columbia, optioned by Bolivar Mining Corporation Limited.

The surveys were a continuation of the ones undertaken in 1970, and were carried out over handcut (where necessary) line grids, the lines of which were turned off at right angles from a N 20° E base-line, and chained and picketed at 100 foot intervals. Survey work was also undertaken along three lines parallel to the baseline.

Readings of relative vertical intensity of the earth's field were taken every 100 feet along the lines using a fluxgate magnetometer, with additional readings at closer intervals in areas of steep magnetic gradients.

Measurements (first to fourth separation) of apparent resistivity and frequency effect (the I.P. response parameter) were made using the "dipole - dipole" method of surveying with a 300 foot dipole and fre-quencies of 0.3 and 5 c.p.s. Additional measurements were also made using a 600 foot dipole on Lines 65 E, 75 E, 85 E and 96 N respectively.

The I.P. data are presented in contour form on individual line profiles contained in this report as well as in contour form (1970 & 71) on plan maps of the grids, W-136-3 to 14, that accompany this report. The results of the magnetic survey (1970 & 71) are presented in contour form on Map W-136-15.

PROPERTY, LOCATION AND ACCESS

The property is located in the Atlin Mining Division of British Columbia, and consists of the following mineral claims:

TOP 50, 52, 65 - 81, 83, 85, 87, 89, 91 - 96, 107 - 112, 125, 127, 129, 200 - 408, 501 - 523

The claims are situated between elevations of 4000 and 5000 feet, largely above timberline, some 5 miles east of Swift Lake, British Columbia, and some 9 miles south of Mile 759, Alaska Highway, where the highway crosses the Smart River.

Access can be obtained either by means of a helicopter from the gravel pit at Mile 754 on the Alaska Highway, or by four wheel drive and/or tracked vehicle along an 11 mile cat road from the same gravel pit to the property.

PREVIOUS WORK

Previous work done on the claim group includes

(a) linecutting, soil sampling, trenching and geological mapping by Mastodon-Highland Bell Mines Ltd. in 1967 as documented in a report by J.B.P. Sawyer.

(b) Linecutting, soil sampling and geological mapping by Bolivar Mining Corporation in 1970.

(c) Magnetic and I.P. surveying by Peter E. Walcott & Associates Limited in 1970.

PURPOSE

The purpose of the survey was to

1. determine by the magnetic method the extent of magnetite-pyrite chalcopyrite bearing skarn type rocks, abundant outcroppings of which occur on the property, and

2. try and locate by the induced polarization method economic concentrations of copper and molybdenum mineralization, the presence of which has been noted in the skarns and adjacent metaquartzites.

GEOLOGY

The reader is referred to

a. G.S.C. Paper 44 - 25 by C.S. Lord.

b. G.S.C. Paper 68 - 55 by H. Gabrielse, "Geology of Jennings River Map Area".

c. Assessment report on 1967 work on TOP claims by J.B.P. Sawyer.

d. Geological report on 1970 work by staff of Cyprus Exploration Corp. Ltd., unpublished.

Briefly the area is underlain by Carboniferous metamorphic rocks, predominantly gneisses and schists with less abundant quartzites, limestones and dolomites, numerous outcroppings of which are readily visible.

The Simpson Batholith, a crude equidimensional pluton of Jurassic age, outcrops some 2 miles to the east.

Copper mineralization, associated with magnetite and pyrite, occurs in many types of skarn complex rocks on the property.

Numerous occurrences of graphite have been noted in the mica schists.

SURVEY SPECIFICATIONS

The induced polarization (I.P.) survey was carried out using a system manufactured by McPhar Geophysics Limited of Don Mills, Ontario. Measurements with this sytem are made in the frequency domain.

The system consists basically of three units, a receiver, a transmitter and a motor generator. - The transmitter, which obtains its power from the 2.5 kw 400 cycle generator driven by a gasoline engine, injects current into the ground at two electrodes C_1 and C_2 at two preselected frequencies, while the receiver, a very stable and sensitive potentiometer tuned to the frequency selected, makes measurements of observed voltages across the potential electrodes P_1 and P_2.

The data recorded in the field consists of careful measurements of the current (I) flowing through electrodes C_1 and C_2, the voltage (V) appearing between the potential electrodes P_1 and P_2 on the low frequency, and the "percentage apparent frequency effect" appearing between P_1 and P_2 (the receiver is designed to measure directly

$$\text{the \%age F.E.} = \frac{(P_a \text{ low} - P_a \text{ high}) \times 100)}{P_a \text{ high}}$$

The apparent resistivity (P_a) in ohm-feet is proportional to the ratio of the measured voltage and current, the proportionality factor depending on the geometry of the array used. In practise $\frac{P_a}{2\pi}$ is plotted.

A third parameter termed the "metal factor" is also calculated by dividing the apparent frequency effect by $\frac{P_a}{2\pi}$ and multiplying by 1000.

The survey was carried out using the "dipole - dipole" electrode array. This electrode configuration and the methods of presenting the results are illustrated in the appendix. Depth penetration with this array is increased or decreased by increasing or decreasing "a" and/or n.

In practise the equipment is set up at a particular station of the line to be surveyed; three transmitting dipoles are laid out to the rear, measurements are made for all possible combinations of transmitting and receiving dipoles, the latter consisting of two porous pots filled with an electrolyte copper sulphate solution "a" feet apart, up to the fourth separation, i.e. n = 4; the equipment is moved 3 "a" feet along the line to the next set-up.

SURVEY SPECIFICATIONS cont'd

The survey, a continuation of the one done in 1970, was carried out using a 300 foot dipole, with additional 600 foot dipole work on Lines 65 E, 75 E, 85 E and 96 N.

Difficulties were again encountered in injecting current into the ground on the talus slopes and over the outcrop regions even though two layered tinfoil electrodes at 2 to 3 feet depths were employed at each station (current range 0.01 to 1.00 amps on survey, maximum output of transmitter 5 amps).

The magnetic survey was carried out using a McPhar M-700 fluxgate magnetometer. This instrument measures variations in the vertical component of the earth's magnetic field to an accuracy of ± 10 gammas. Corrections for diurnal variations were made by tying-in to previously established base stations at intervals not exceeding two hours.

DISCUSSION OF RESULTS - 1970 and 1971 surveys.

The results should be studied in conjunction with the results from the geological and geochemical surveys as documented in reports by the staff of Bolivar Mining Corporation Limited.

It should be noted here that as Lines 65 E, 75 E and 85 E were not properly tied into the original grid the magnetic values obtained on these lines are plotted separately. However the I.P. values are plotted on the cross lines as the large separations and station intervals minimize the location errors.

The magnetic survey showed the property to be underlain by five magnetically different rock units, Units M_1 to M_5, as shown on Map W-136-15.

Unit M_1 is believed by the writer to correspond to the basaltic to dioritic basement.

Units M_2, M_3 and M_4 have the same magnetic characteristics but increasingly higher magnetic backgrounds. They are believed by the writer to be caused by different combinations, widths, degree of compression, etc. of the Carboniferous metamorphic rocks, i.e. the quartzites, schists, greenstones, limestones, etc. as listed on the geological section in the appendix.

These units, particularly Unit M_4, contain magnetite rich skarns as can be seen from the irregular magnetic patterns within the units. Most of the areas of skarn complexes correspond with those extrapolated from known outcroppings.

Unit M_5 is buried beneath a swamp and no outcrop exists for geological correlation. It exhibits the highest magnetic response and could be caused by a buried intrusive. However this would be in contrast to the general picture of the area where most of the intrusives appear as topographic highs.

Numerous faults are suggested from the magnetics on the northern and southern grids. In the latter case the line spacing was quite large (800 feet) and the contact between Units M_1 and M_2 appears quite disjointed, hence the faults. However it would probably be found that the contact would be smoothed out on the contoured results from a closer line spacing (200 or 400 feet) resulting in a decrease in the number of suggested faults.

DISCUSSION OF RESULTS cont'd

The I.P. survey showed the presence of a number of anomalous zones, as can be seen from the individual profiles and the contoured results of apparent frequency effect and metal factor, Maps W-136-7 to 14. (It should be noted here that while most of the survey was carried out using 300 foot dipoles Lines 100 N and 104 N were surveyed using 200 and 400 foot dipoles respectively so that best equivalent values were used to ensure continuity of the contour maps. These values are underlined on the contour maps).

These anomalous effects occur mostly in magnetic units M_2, M_3 and M_4, and are most probably attributable to sulphide mineralization and/or graphitic material.

Those located in the centre part of the grid are found in an area of known skarn complexes and mineralization, and correspond reasonably well with anomalous copper geochemical areas.

Those located in the western part of the grid are not associated with skarn complexes as can be seen from the magnetics. Unfortunately their geochemical association cannot be studied as no sampling was done on that portion.

No anomalous effects were observed in the interpreted basement rocks, while sporadic higher frequency effects were obtained over that part of unit M_5 surveyed.

Resistivity lows, i.e. conductivity highs, altough generally more related to rock porosity, etc. might indicate concentrations of sulphides and/or graphite in these cases.

Graphite, pyrite, pyrrhotite, chalcopyrite and magnetite, all of which can give rise to high I.P. effects, are known to occur in the Carboniferous metamorphic rocks on the property, so that good geological control is essential in trying to sort out the graphitic from the sulphide I.P. effects and assigning priorities to the I.P. anomalies.

A study of the geological section and the 300 and 600 foot dipole profiles on Line 65 E (the I.P. profiles are pseudosections so direct comparisons cannot be made) shows that over the mapped area the I.P. response is not limited to one rock type. However it can be seen that a strong frequency effect response is obtained at depth in the vicinity of the nose of the actinolite bearing rocks, and the response, although still high, drops off with depth where there are no suggested occurrences of the forementioned rocks.

DISCUSSION OF RESULTS cont'd

Two metal factor highs i.e. resistivity lows and frequency effect highs, occur on this line centred around 98 N and 122 N respectively.

The former shows good metal factor response on the 600 foot dipole work although the frequency effect drops off slightly with depth, and suggests a causative source dipping to the south (dip estimates from I.P. are normally not very reliable due to inhomogeneity, representation of volume sampling by a point, etc.)

The response on the latter drops off on the 600 foot dipole work suggesting a narrower causative source not extending to great depth.

Studies of the other profiles show that the former anomaly can be observed on Lines 92 N, 96 N and 75 E, and possibly on Line 100 N where ambiguity arises as its extension runs into another stronger feature to the west.

The latter anomaly can also be observed on Line 120 N particularly on the third and fourth separations at around 68 E but its expression is influenced by an anomaly centred around 61 E.

Although the geology indicates that structures trend across the grid two features are observed that are contrary to this pattern. These are (a) a strong frequency effect and metal factor high that occurs east of the baseline on Line 72 N and is not apparent on Lines 64 N and 80 N and (b) a zone of low response on the western end of Line 100 N that is not observed on the adjacent lines where high frequency effects are obtained.

The former feature is readily apparent on Line 85 E on both the 300 and the 600 foot dipole work. It appears to have a narrow causative source not extending to great depth as can be seen from the drop off in frequency effect with dipole width and separation.

The resistivity survey mostly reflected overburden thickness, and overburden and bedrock conductivity. However resistivity lows i.e. conductivity highs, were obtained in conjunction with high frequency effects in several areas where they are both thought to have the same causative source i.e. sulphide mineralization and/or graphitic material.

Several faults, known from the geology and/or interpreted from the magnetics, are evident on the contour plans of apparent resistivity.

Two occurrences where electrodes set up over and/or in very conductive material namely Lines 108 N, 54 or 57 E and Line 75 E, 110 N

DISCUSSION OF RESULTS cont'd

are evident from the "pant-leg" resistivity lows. As no corresponding frequency effect highs were obtained these lows are probably attributable to faults and/or water saturated shears.

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Between July 14th and August 1st, 1971, Peter E. Walcott & Associates Limited carried out magnetic and induced polarization surveys over parts of a property optioned by Bolivar Mining Corporation Limited.

The property, i.e. the TOP claims, is located near Swift Lake, British Columbia, some 9 miles south of the Smart River - Alaska Highway junction.

The magnetic survey showed the property to be underlain by five magnetically different rock types. Three of these were believed by the writer to correspond to different combinations of the Carboniferous metamorphic sequence, and the other two to basement rocks and a later intrusive.

Numerous faults were suggested by the magnetic pattern.

The I.P. survey showed the presence of a number of anomalous zones, some of which were in the region of assumed skarn complexes and generally coincided with copper geochemical anomalies.

Some anomalous zones, however, were obtained outside of these complexes, and had no geochemical expression, while others were obtained where no soil sampling had been carried out.

As a result the writer concludes (1) that the anomalous zones are most probably caused by sulphide mineralization and/or graphitic material, the presence of which are both observed on the property, and (2) that the most favourable locations for concentrations of the fore-mentioned causative sources are the combined frequency effect highs and resistivity lows.

He therefore recommends:

1. That in view of the complicated geological structure the geophysics and the geology be closely correlated and their associations (if any) studied (the geological picture is expected to change as a result of the 1971 field work).

2. That the causes of the best anomalies, obtained from geological, geochemical and geophysical correlation be investigated by diamond drilling.

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS cont'd

3. That, subject to geological guidelines, a 55° hole be collared at 94 N, 64 E and drilled N 70° E for 1500 feet to investigate the favourable anomaly described in the previous section.

Respectfully submitted,

PETER E. WALCOTT & ASSOCIATES LIMITED

Peter E. Walcott, P.Eng.
Geophysicist

Vancouver,
British Columbia

January 1972

APPENDIX

COST OF SURVEY

Peter E. Walcott & Associates Limited undertook the magnetometer survey on a linemileage basis, and the I.P. survey on a daily basis. Mobilization and draughting costs were extra so that the total cost of the services provided was $9,454.55.

PERSONNEL EMPLOYED ON SURVEY

Name	Occupation	Address	Date
Peter E. Walcott	Geophysicist	Peter E. Walcott & Assoc. 605 Rutland Court, Coquitlam, B.C.	Jul. 14 - Aug. 1st, Nov. 20th - 26th, Dec. 18th - 20th, 71 Jan. 6th - 20th,1972
V. Pashniak	Geophysical Operator	" "	Jul. 14th - Aug. 1st, 1971
K. Drobot	"	McPhar Geophysics Kamloops, B.C.	Jul. 14th - Aug. 1st, 1971
G. MacMillan	"	Peter E. Walcott & Assoc. 605 Rutland Court, Coquitlam, B.C.	Dec. 10th - 31st, 71 Jan. 10th - 20th, 72
J. Walcott	Typing	" "	Jan. 21st, 1972
P. Charlie	Helper	General Delivery Whitehorse, Y.T.	Jul. 14th - Aug. 1st, 1971
J. Charlie	"	" "	"
S. Scurvey	"	" "	"

CERTIFICATION

I, Peter E. Walcott, of the Municipality of Coquitlam, British Columbia, hereby certify that:

1. I am a Graduate of the University of Toronto in 1962 with a B.A.Sc. in Engineering Physics, Geophysics Option.

2. I have been practising my profession for the last nine years.

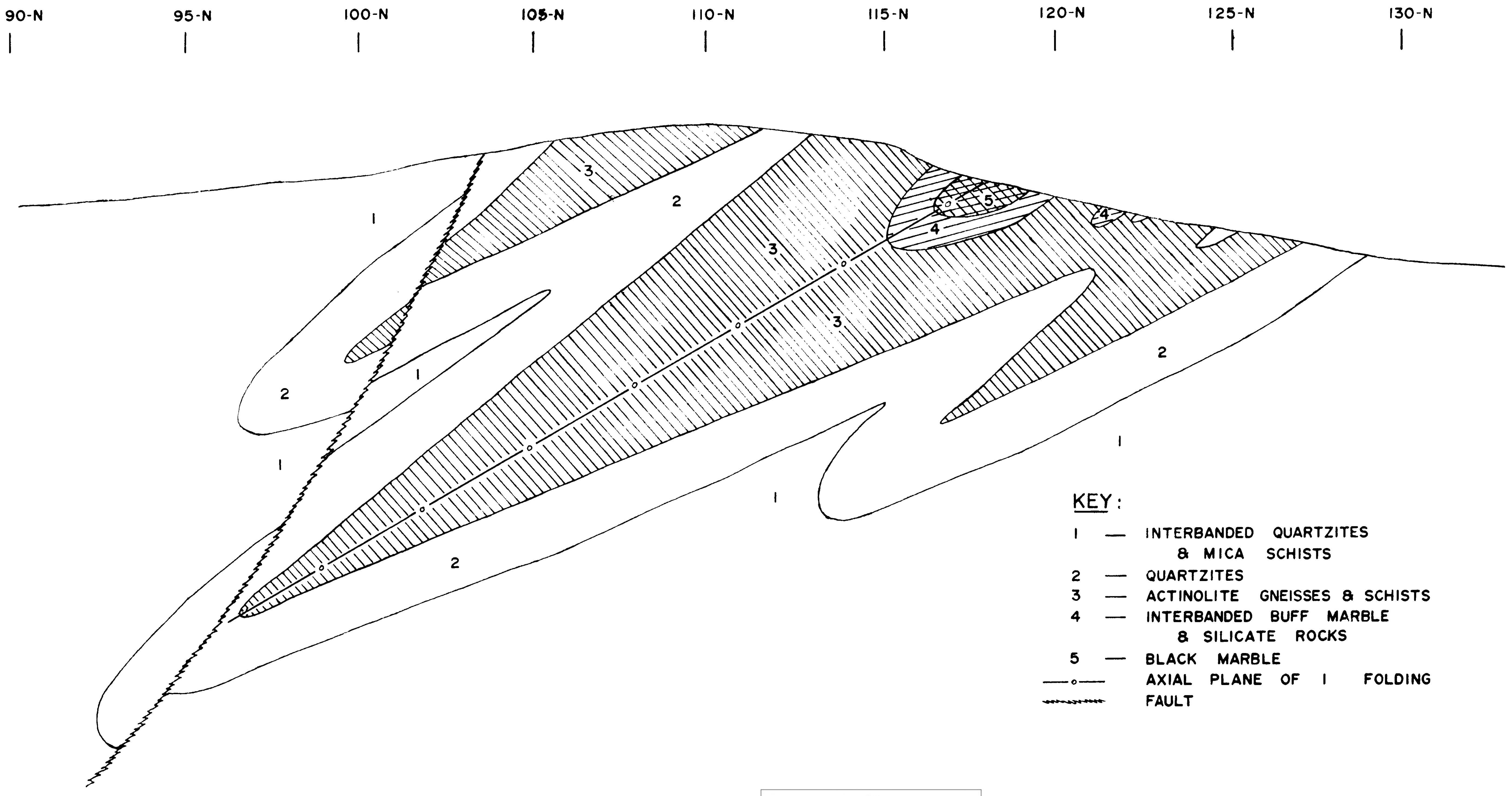
3. I am a member of the Association of Professional Engineers of British Columbia, Ontario and the Yukon Territory.

4. I hold no interests, direct or indirect, in the securities or properties of Bolivar Mining Corporation Limited nor do I expect to receive any.

Peter E. Walcott, P.Eng.

Vancouver,
British Columbia

January 1972



BOLIVAR MINING CORP. LTD.
SMART RIVER AREA

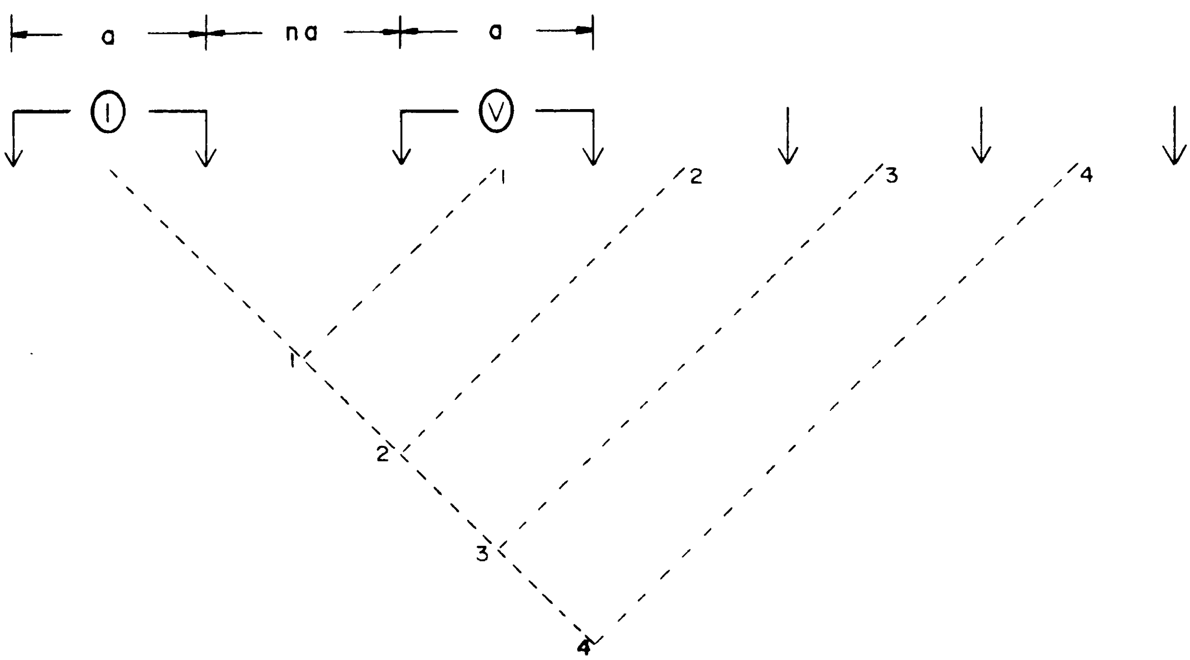
INFERRED GEOLOGICAL SECTION

LINE 65 + 00 -E

SCALE 1" = 300'

GEOLOGY BY P.F. LEWIS

DIPOLE — DIPOLE ARRAY

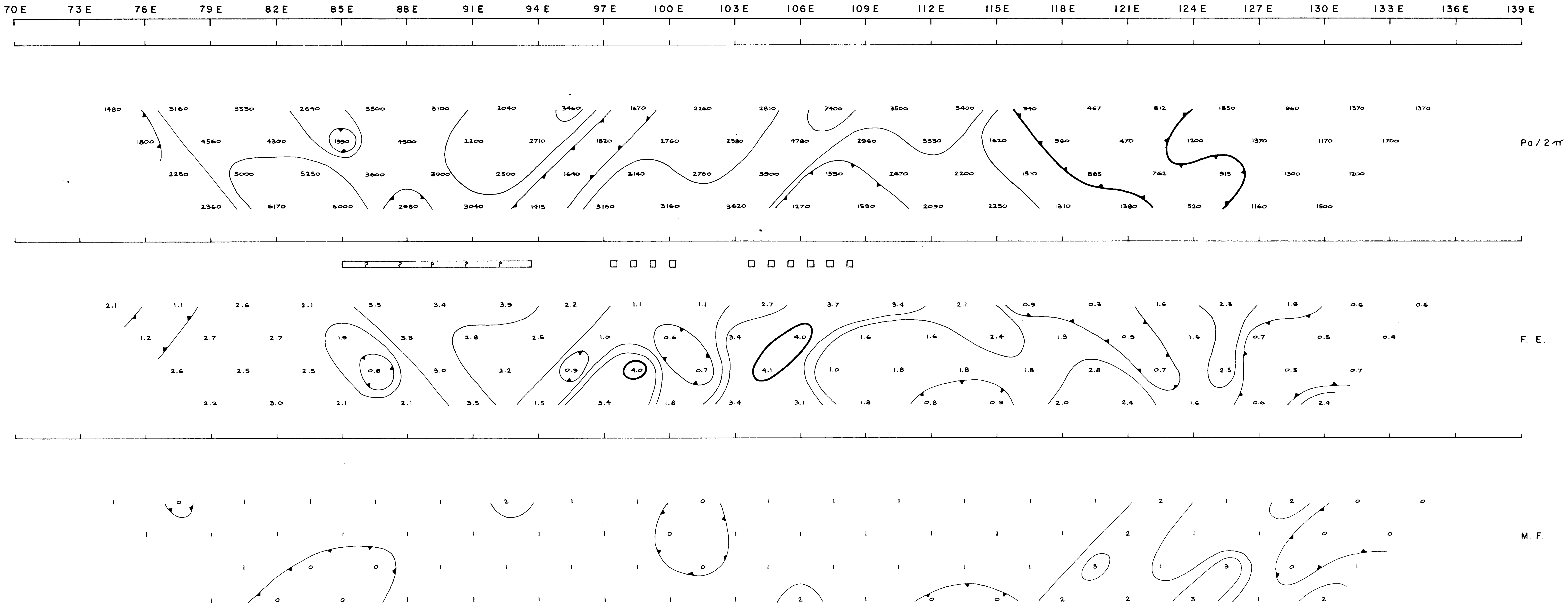


ANOMALOUS ZONE

PROBABLE ANOMALOUS ZONE

POSSIBLE ANOMALOUS ZONE

QUESTIONABLE ANOMALOUS ZONE



BOLIVAR MINING CORP. LTD.

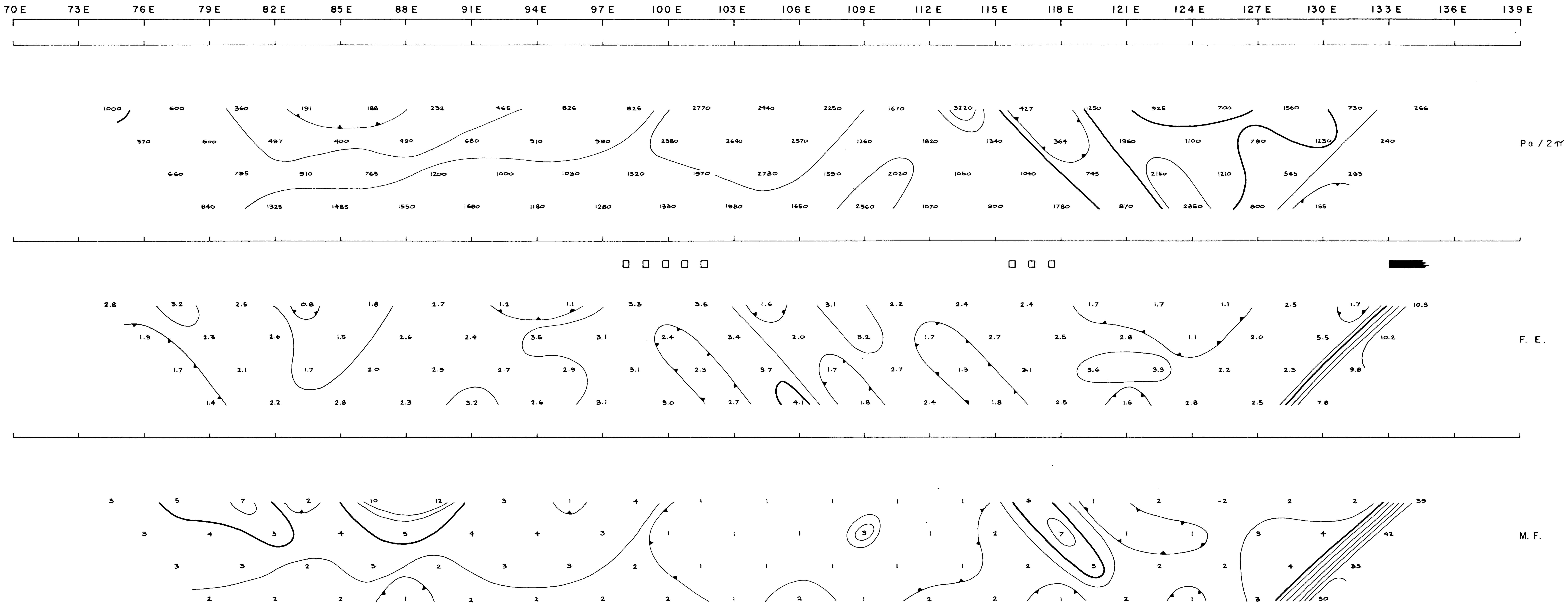
SMART RIVER AREA

LINE 28+00 S

SCALE : 1" = 300'

FR. - 5 & 0.3 C/SEC.

a = 300'



BOLIVAR MINING CORP. LTD.

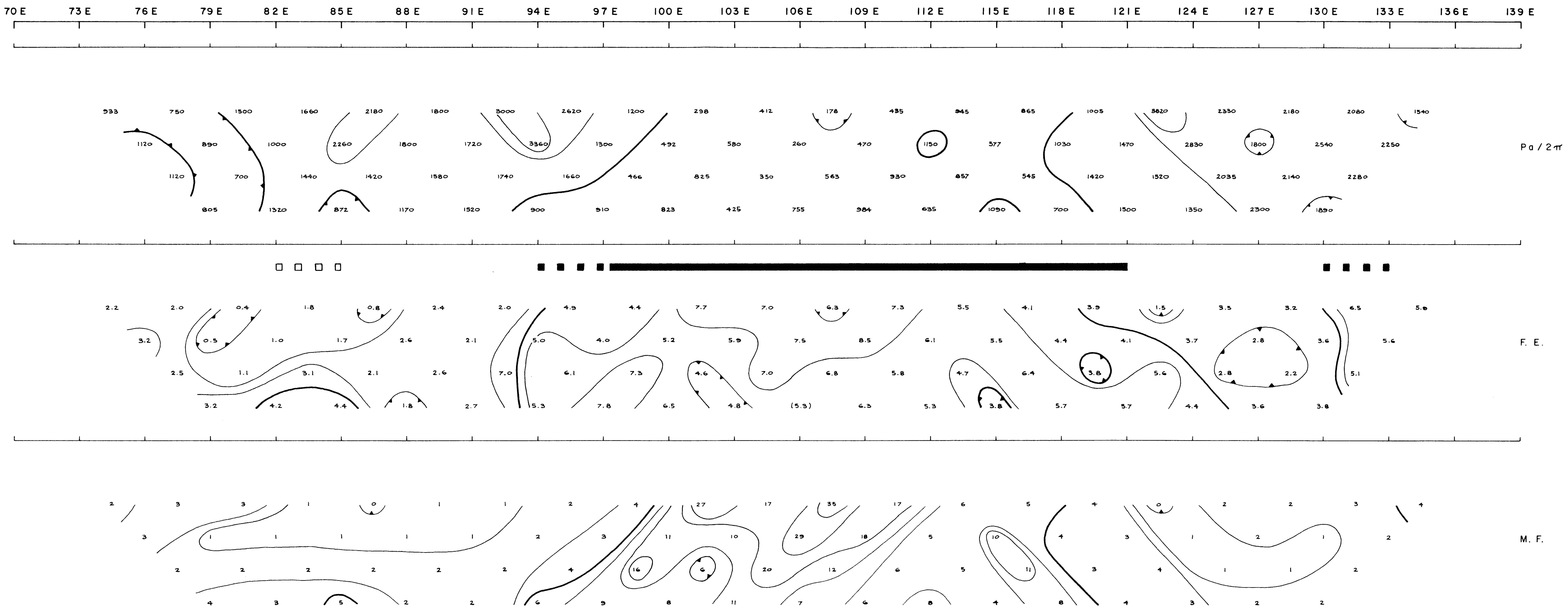
SMART RIVER AREA

LINE 12 + 00 S

SCALE : 1" = 300'

FR. - 5 & 0.3 C/SEC.

a = 300'



BOLIVAR MINING CORP. LTD.

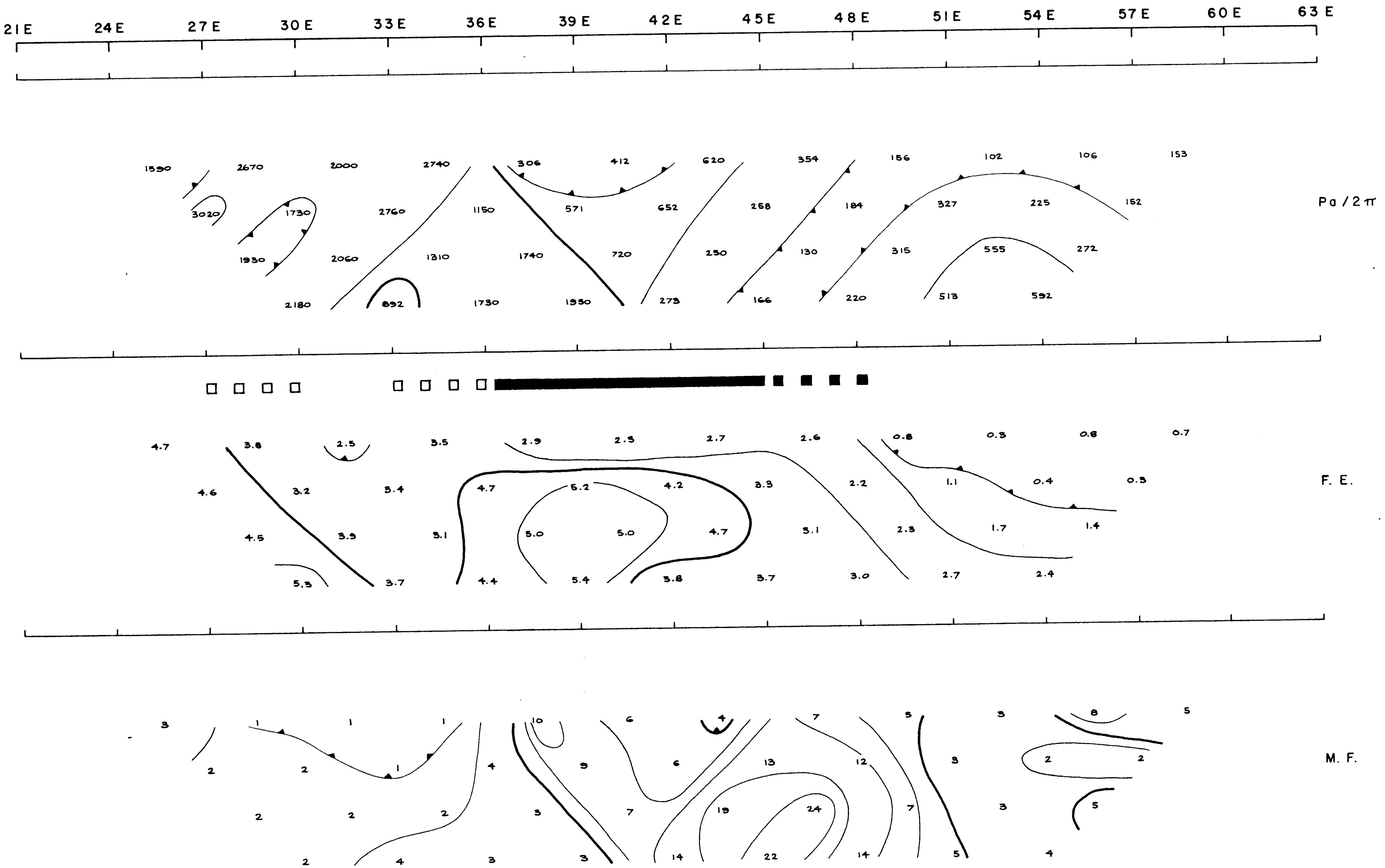
SMART RIVER AREA

LINE 4+00 N

SCALE : 1" = 300'

FR.- 5 & 0.3 C/SEC.

a = 300'



BOLIVAR MINING CORP. LTD.

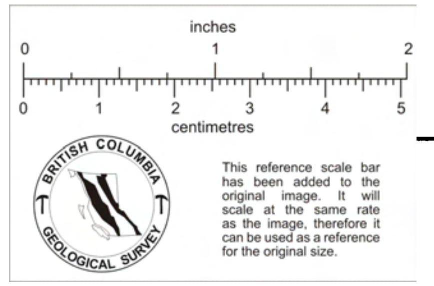
SMART RIVER AREA

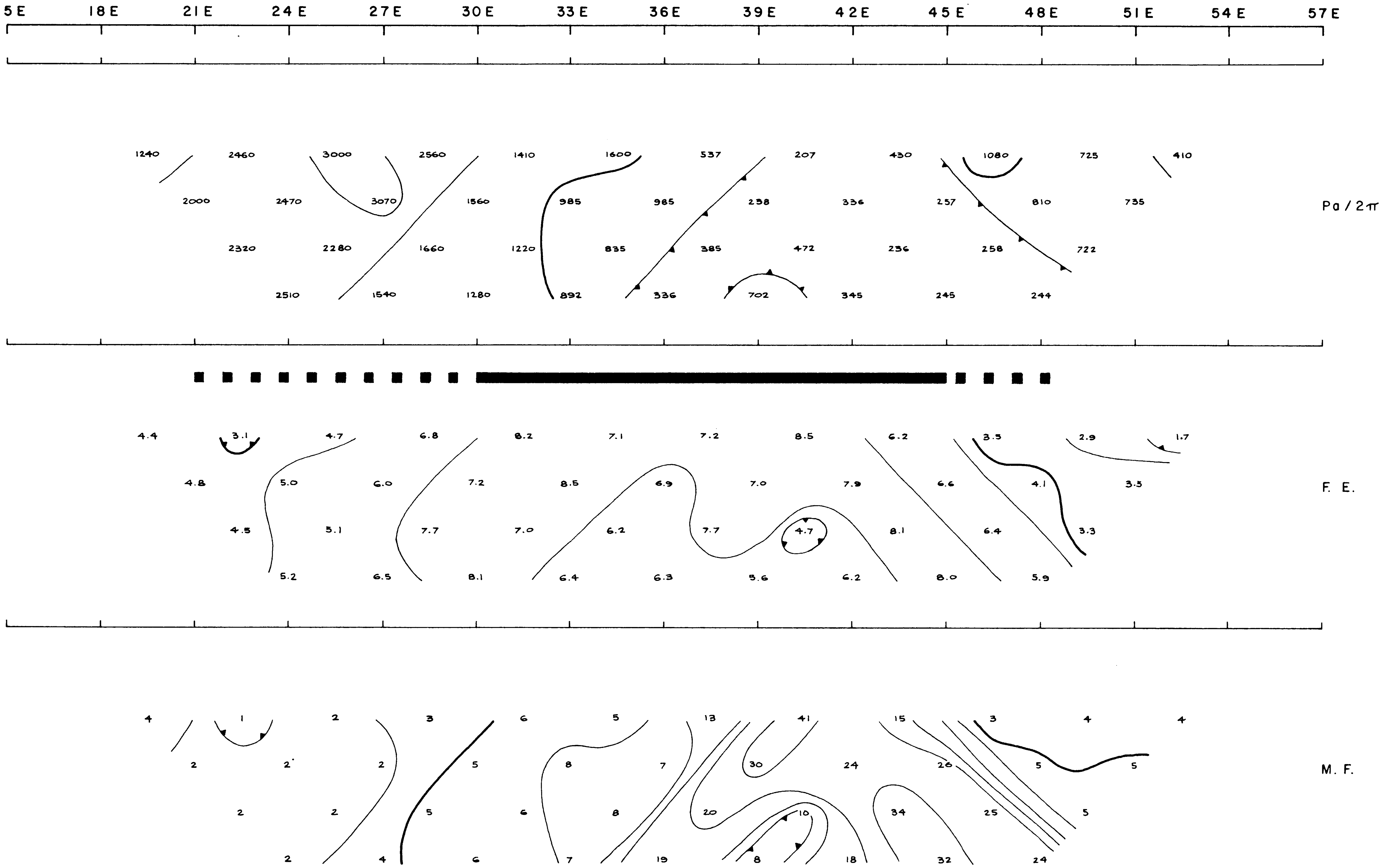
LINE 72+00 N

SCALE : 1" = 300'

FR.- 5 & 0.3 C/SEC.

a = 300'





BOLIVAR MINING CORP. LTD.

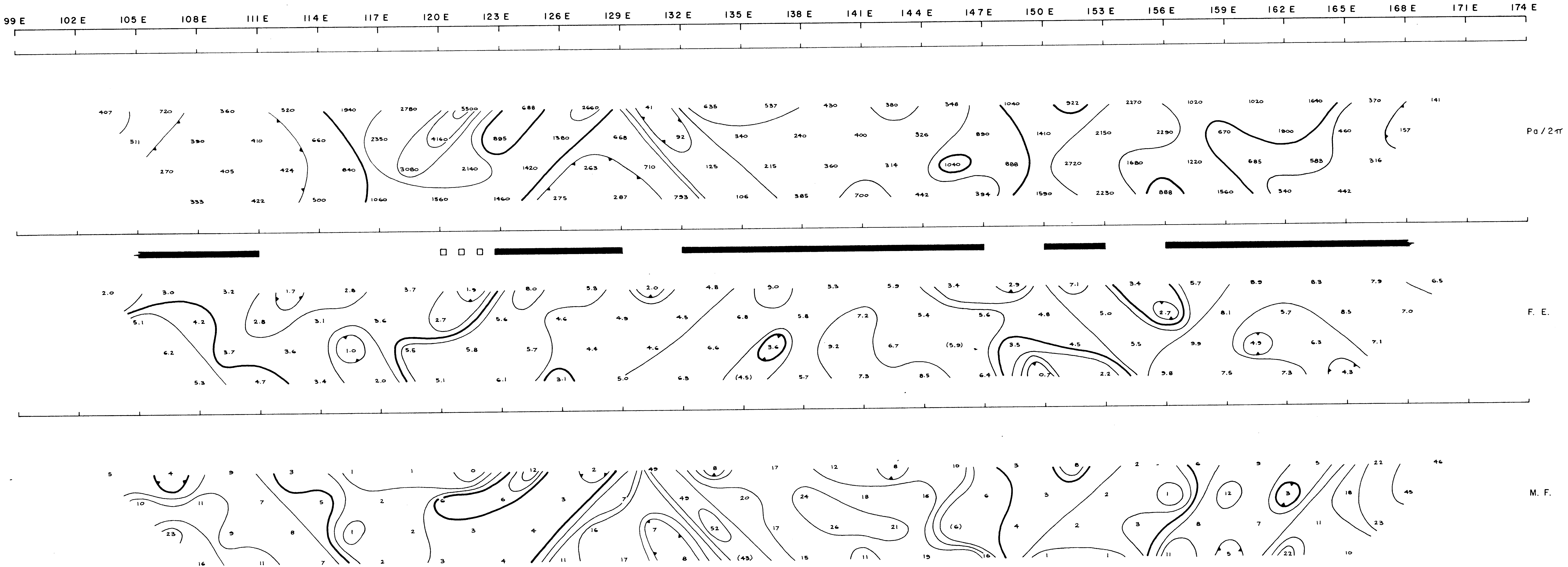
SMART RIVER AREA

LINE 80+00 N

SCALE: 1" = 300'

FR. - 5 & 0.3 C/SEC

a = 300'



BOLIVAR MINING CORP. LTD.

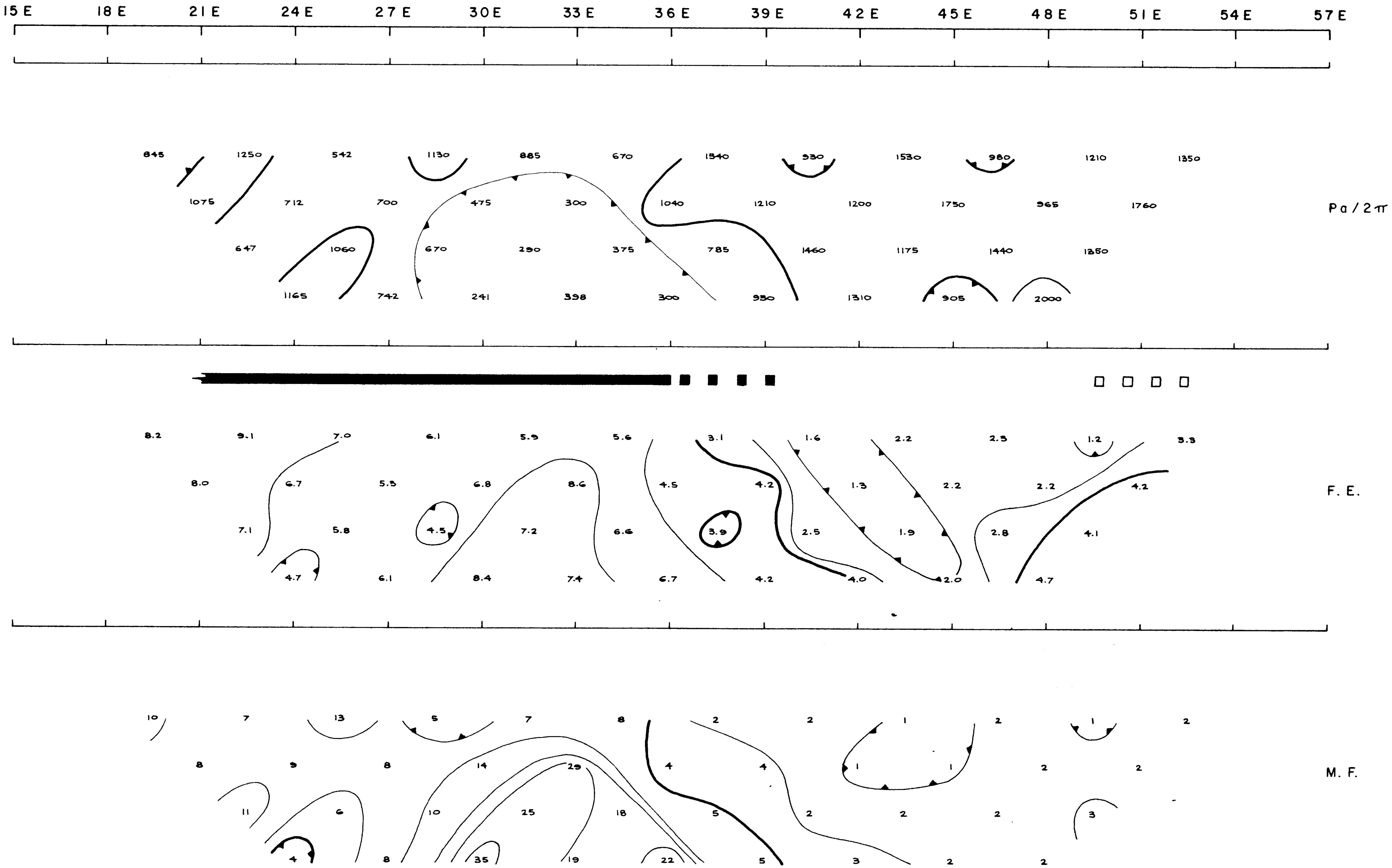
SMART RIVER AREA

LINE 80+00 N

SCALE : 1" = 300'

FR.- 5 & 0.3 C/SEC.

a = 300'



BOLIVAR MINING CORP. LTD.

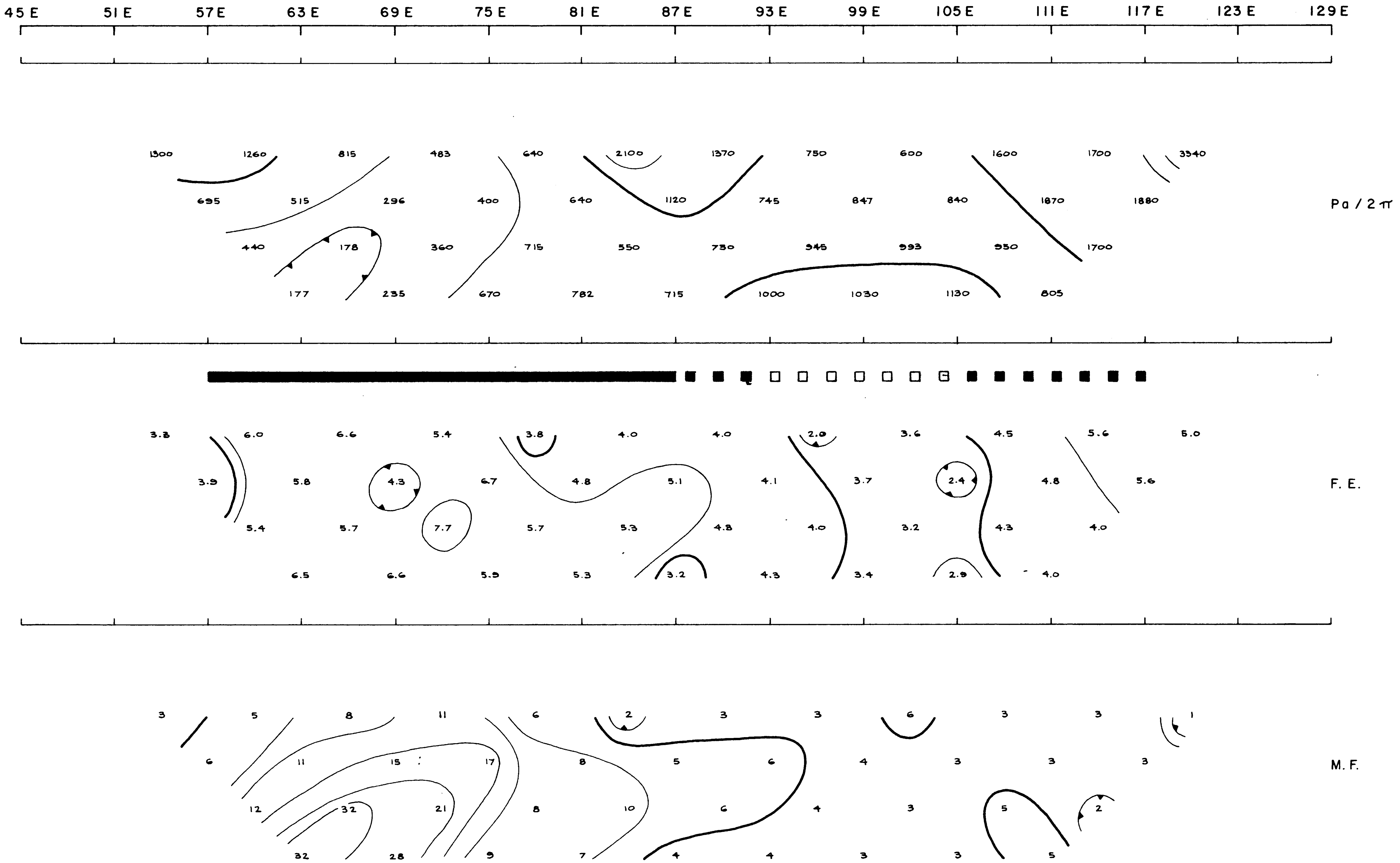
SMART RIVER AREA

LINE 92+00 N

SCALE : 1" = 300'

FR.- 5 & 0.3 C/SEC

a = 300'



BOLIVAR MINING CORP. LTD.

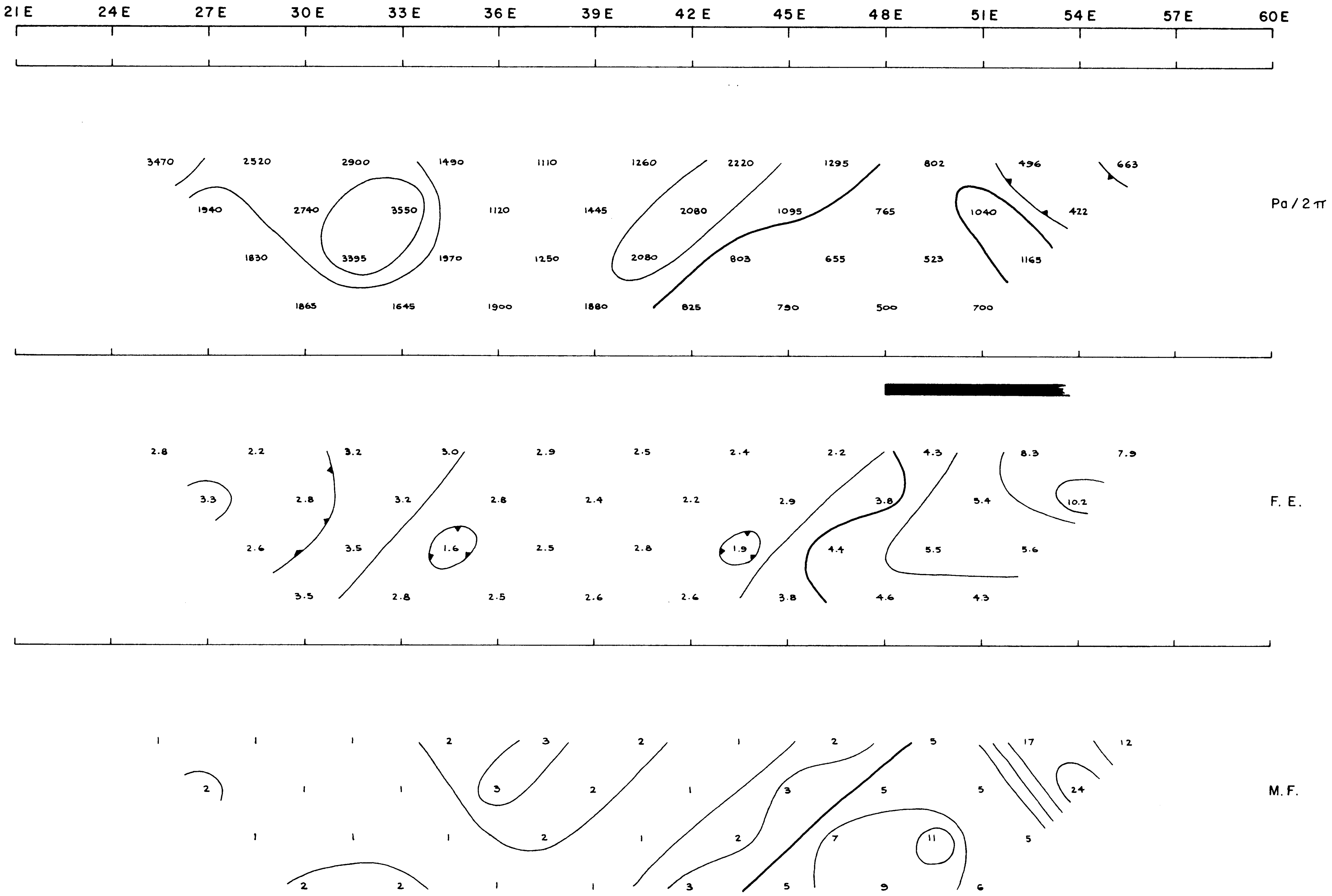
SMART RIVER AREA

LINE 96+00 N

SCALE : 1" = 600'

FR. - 5 & 0.3 C/SEC.

a = 600'



[redacted]

BOLIVAR MINING CORP. LTD.

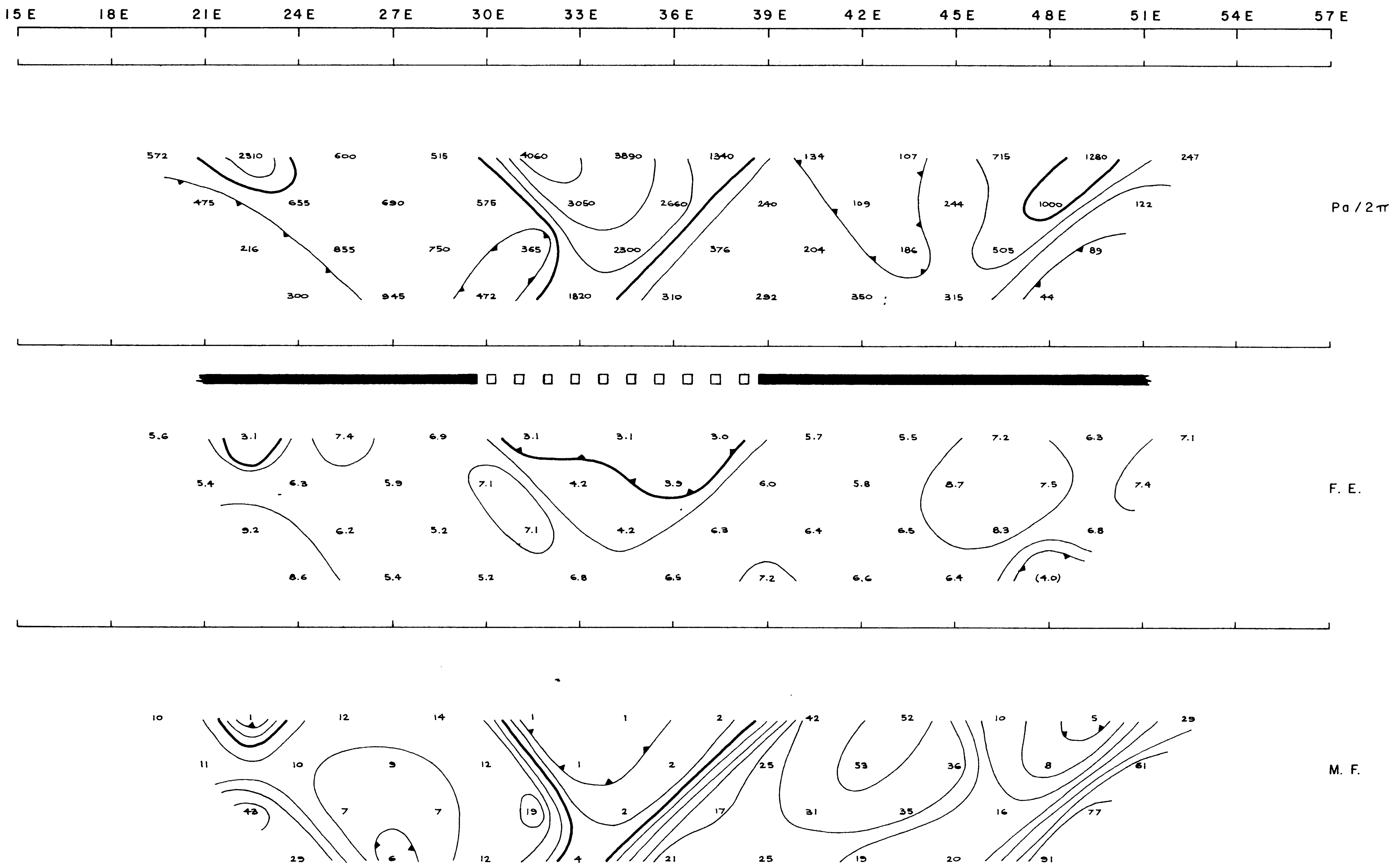
SMART RIVER AREA

LINE 100 + 00 N

SCALE : 1" = 300'

FR. - 5 & 0.3 C/SEC.

a = 300'



BOLIVAR MINING CORP. LTD

SMART RIVER AREA

LINE 108+00 N

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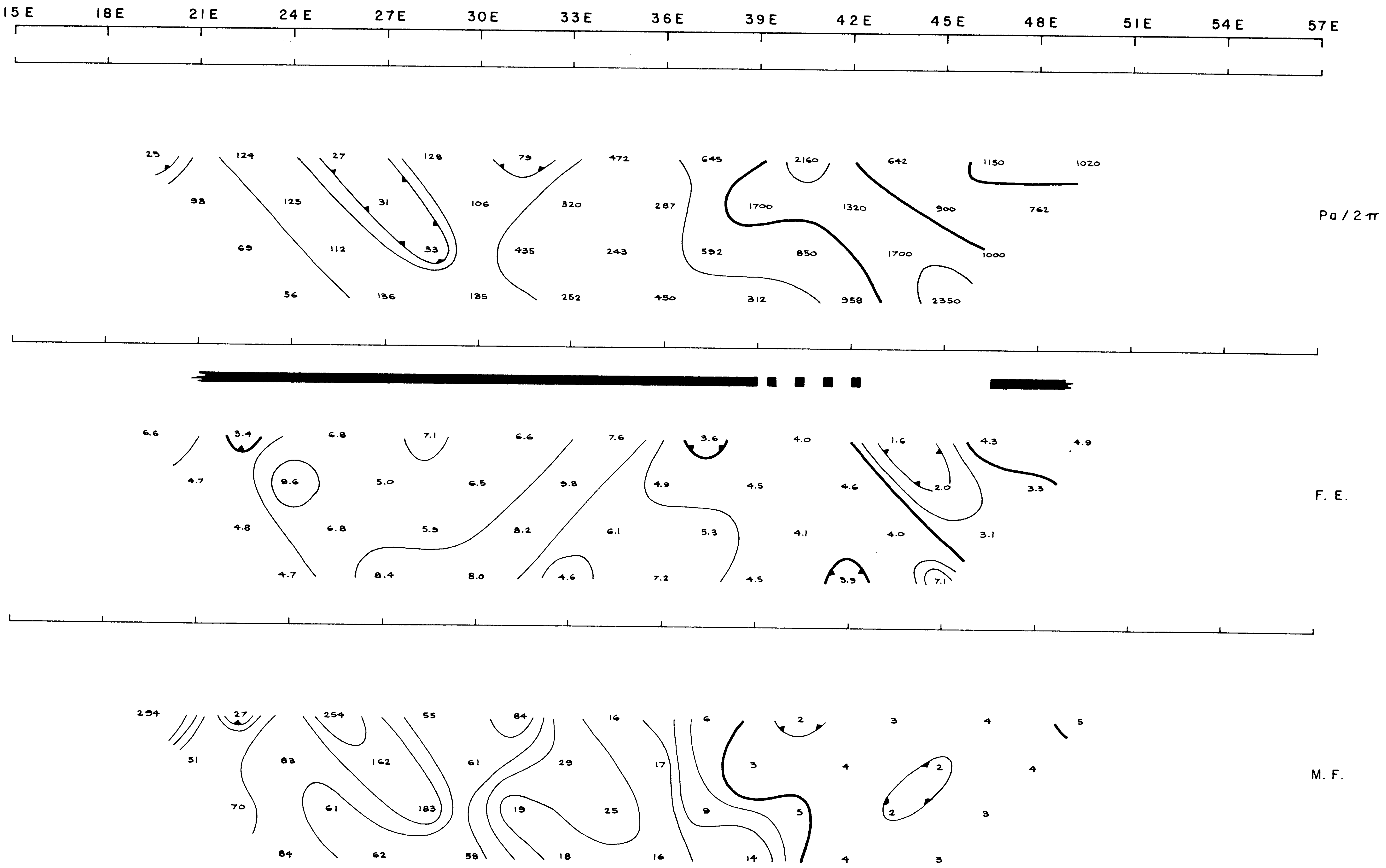


BOLIVAR MINING CORP. LTD.

SMART RIVER AREA

LINE 120+00 N

SCALE : 1" = 300'

FR. - 5 & 0.3 C/SEC.

a = 300'

BOLIVAR MINING CORP. LTD.

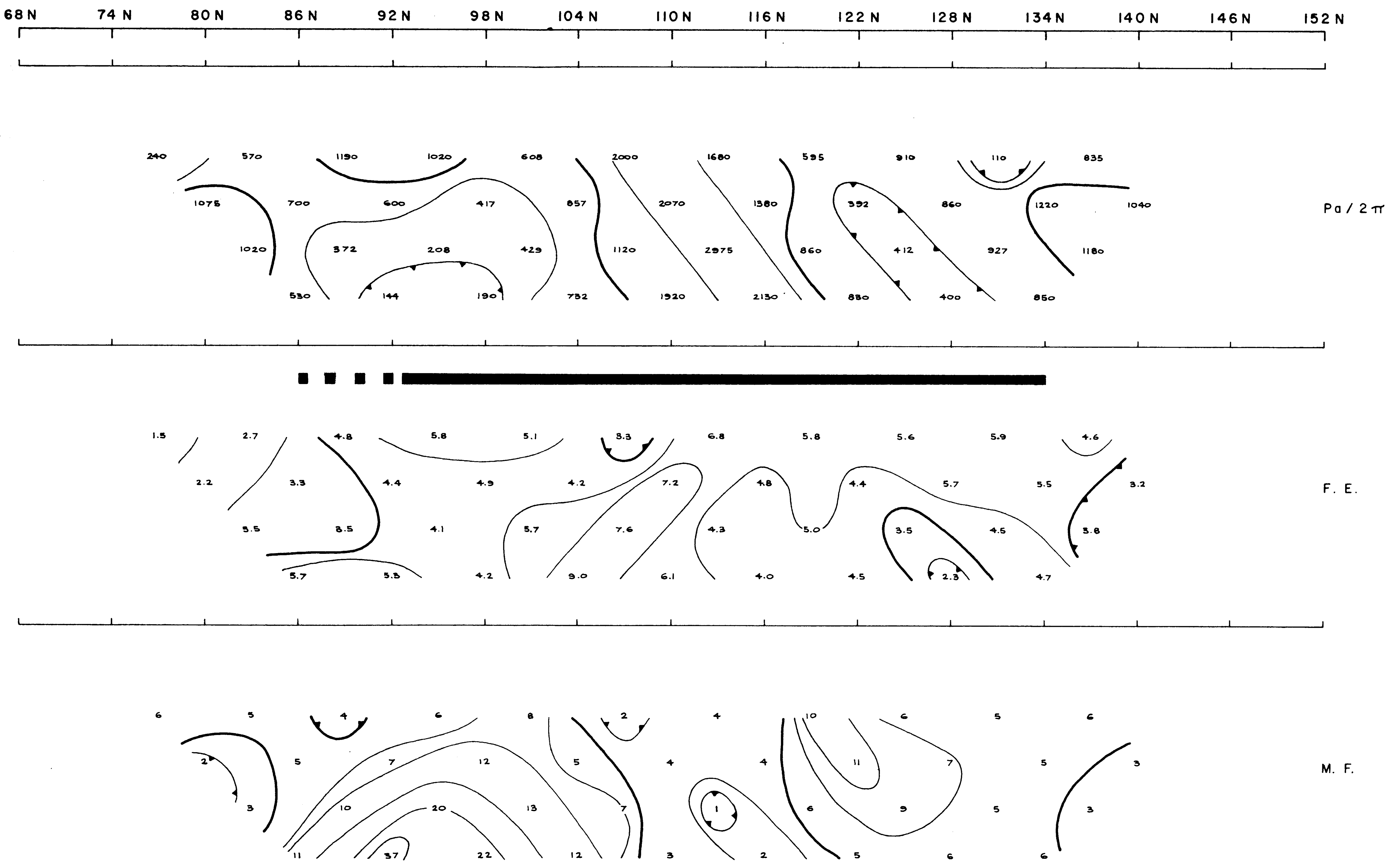
SMART RIVER AREA

LINE 65+00 E

SCALE 1" = 300'

FR.- 5 & 0.3 C/SEC.

a = 300'



BOLIVAR MINING CORP. LTD.

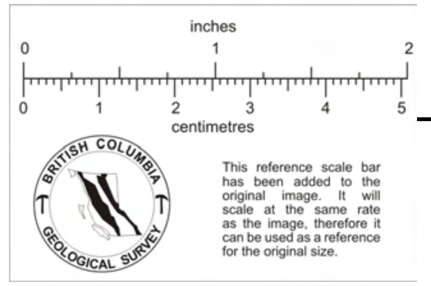
SMART RIVER AREA

LINE 65+00 E

SCALE : 1" = 600'

FR. - 5 & 0.3 C/SEC.

a = 600'



BOLIVAR MINING CORP. LTD.

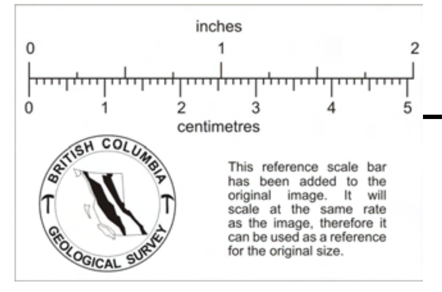
SMART RIVER AREA

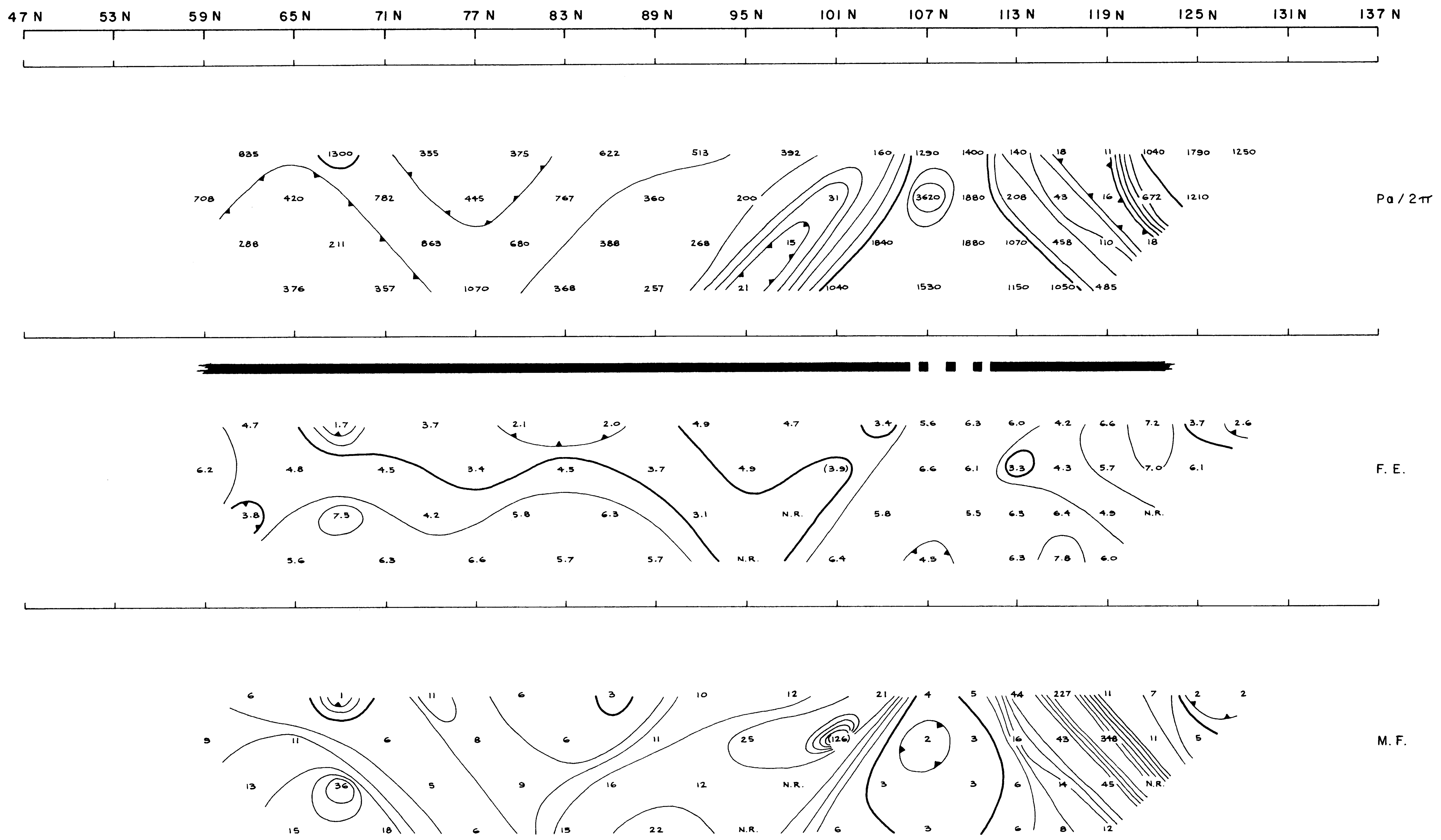
LINE 75+00 E

SCALE : 1" = 300'

FR.- 5 & 0.3 C/SEC.

a = 300'





BOLIVAR MINING CORP. LTD.

SMART RIVER AREA

LINE 75 + 00 E

SCALE : 1" = 600'

FR. - 5 & 0.3 C/SEC.

a = 600'

BOLIVAR MINING CORP. LTD.

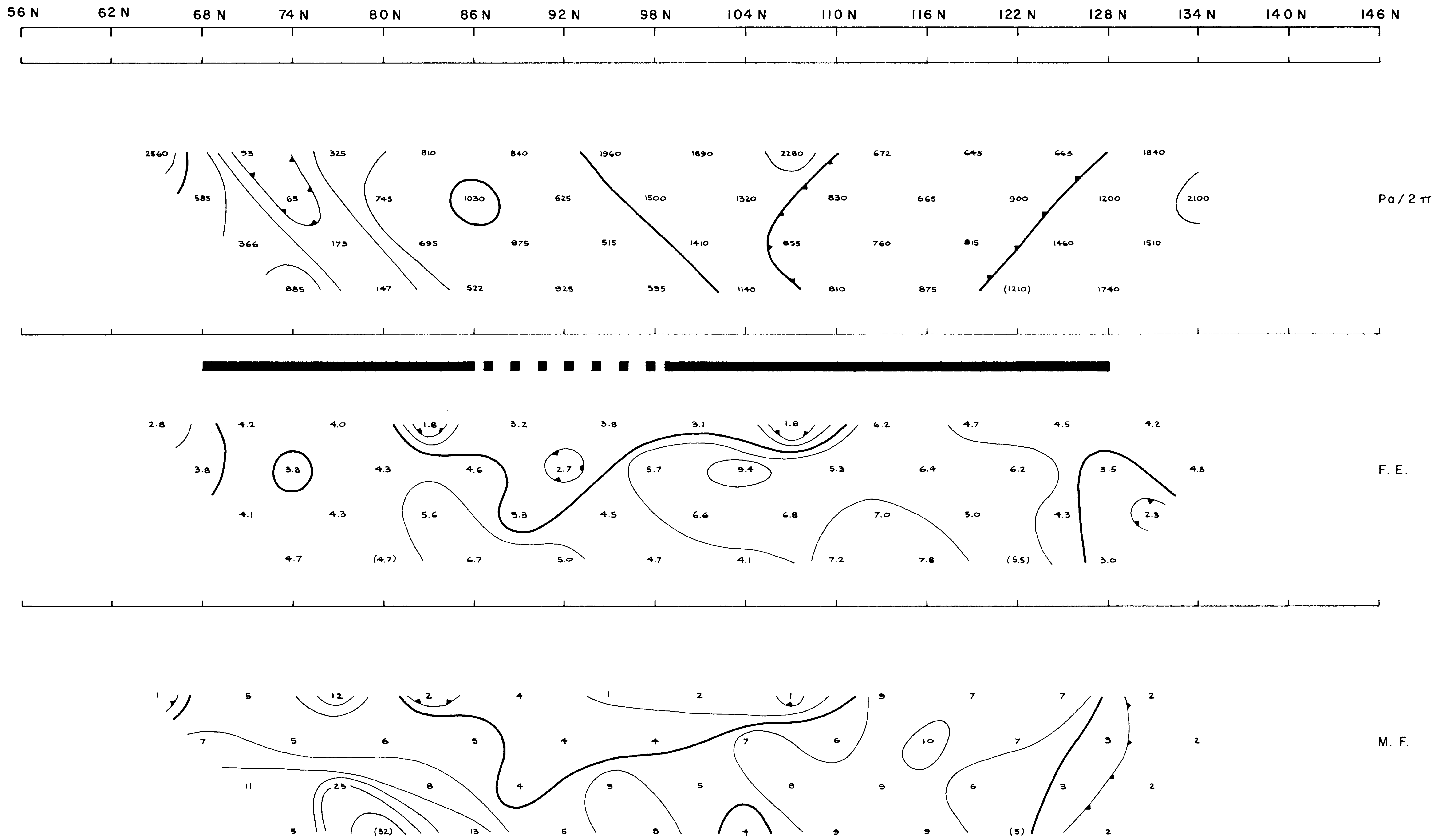
SMART RIVER AREA

LINE 85+00 E

SCALE : 1" = 300'

FR. - 5 & 0.3 C/SEC.

a = 300'



BOLIVAR MINING CORP. LTD.

SMART RIVER AREA

LINE 85 + 00 E

SCALE : 1" = 600'

FR. - 5 & 0.3 C/SEC.

a = 600'