COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES GEOLOGY AND GEOPHYSICS

RECORDS:

1966/97

GEOCHEMICAL INVESTIGATIONS IN THE KALGOORLIE AREA, WESTERN AUSTRALIA. PROGRESS REPORT

---

by

N.W. Le Roux

5928/65

GEOCHEMICAL INVESTIGATIONS IN THE KALGOORLIE AREA, WESTERN AUSTRALIA. PROGRESS REPORT

by

N.W. Le Roux

Records: 1966/97

CONTENTS

	Page No.
SUMMARY	1
INTRODUCTION	1
SOIL, TOPOGRAPHY, VEGETATION AND CLIMATE	2
PREVIOUS WORK	2
GENERAL GEOLOGY	2
SAMPLING PROCEDURE	2
ANALYTICAL PROCEDURES AND RESULTS	2
DETAILS OF MINERALIZATION	4
ELEMENTS ASSOCIATED WITH ORE	6
DISCUSSION	6
CONCLUSIONS	7
RECOMMENDATIONS	8
ACKNOWLEDGEMENTS	8
REFERENCES	9

TABLES

I : Golden Horseshoe - Sample Details and Analytical Results.
II : Lake View Lode - Sample Details and Analytical Results.
III : Federal Lode - Sample Details and Analytical Results.
IV : Hamilton No. 3 West Branch - Sample Details and Analytical Results.
V : Hamilton Cross Lode - Sample Details and Analytical Results.
VI : Eastern Lode System - Sample Details and Analytical Results.
VII : Sleeping Beauty Lode - Sample Details and Analytical Results.
VIII: Slippery Gimlet Lode - Sample Details and Analytical Results.
IX : Gimlet South Lode - Sample Details and Analytical Results.
X : New Area - Sample Details and Analytical Results.
XI : Information Available for Samples.
XII : Average Values for Elements.

SECTIONS

1 : Golden Horseshoe
2 : Lake View Lode
3 : Federal No. 6
4 : Hamilton No. 3 West Lode
5 : Hamilton Cross Lode
6 : 4500'S
7 : Ora Banda Traverses

FIGURES

1	Golden Horseshoe 1400' level	V, Cu, As
2	Golden Horseshoe 1400' level	Co, Ni
3	Lake View Lode	V, Cu, Co, As, Ni
4	Federal Lode	V, Cu, Co
5	Federal Lode	Ni, As
6	Hamilton No. 3 West Lode	V, Cu, Co, As, Ni
7	Hamilton Cross Lode	V, Cu, Ni
8	Hamilton Cross Lode	Co, As
9	W.M.C. Section Map 4500'S Nos. 615-74	V, Cu, Co, Ni
10	W.M.C. Section Map 4500'S Nos. 615-74	As
11	W.M.C. Section Map 4500'S Nos. 137-196	Co, As, Ni
12	W.M.C. Section Map 4500'S Nos. 137-196	V, Cu
13	W.M.C. Section Map 4500'S Nos. 94-240	V, Co, Ni
14	W.M.C. Section Map 4500'S Nos. 94-240	Cu, As
15	W.M.C. Section Map 4500'S Nos. 622-312	V, Cu, As
16	W.M.C. Section Map 4500'S Nos. 622-312	Ni, Co
17	W.M.C. Section Map 4500'S Nos. 791-809	V, Co, Cu, As
18	W.M.C. Section Map 4500'S Nos. 791-809	Ni
19	Sleeping Beauty Lode ± 82 mesh	V, Ni, Co
20	Sleeping Beauty Lode ± 82 mesh	Cu, As
21	Slippery Gimlet	V, Ni, Cu, As, Co
22	Gimlet South	V, Ni, Cu, As, Co
23	New Area - Ora Banda	V, Cu, Ni, Co, As

GEOCHEMICAL INVESTIGATIONS IN THE KALGOORLIE AREA, WESTERN AUSTRALIA. PROGRESS REPORT

SUMMARY

This interim report sets down the results of work carried out to date on trace element studies in the Kalgoorlie area. Most of the samples analysed are from subsurface rocks. The analyses for arsenic, copper, cobalt, nickel and vanadium are presented in graphical and tabular form. Arsenic appears to be the only one of these five elements associated directly with the gold mineralisation. Some future approaches to the overall programme are discussed.

INTRODUCTION

The purpose of this record is to set down the results of preliminary geochemical studies of the trace elements associated with and surrounding gold-bearing lodes in the Kalgoorlie area Western Australia. Events leading to the initiation of this programme are outlined by Pontifex & Le Roux (1965).

The samples used for the work were submitted by Western Mining Corporation, Kalgoorlie, and were collected from the various mining companies in the area viz. Great Boulder, Gold Mines of Kalgoorlie and Lake View and Star. The mines of these companies are situated in the twin townships of Kalgoorlie and Boulder. Other samples submitted were obtained from Western Mining Corporation's leases near Ora Banda, 36 miles north-west of Kalgoorlie township. The locations of the various mining leases are given by Finucane, (1965).

SOIL, TOPOGRAPHY, VEGETATION AND CLIMATE

The area is flat-lying with red clay soil and few rock outcrops. The vegetation consists mainly of salt bush and light timber. [redacted] experiences an 8 inch - 10 inch rainfall and a mean annual temperature range of 40°F - 92°F.

PREVIOUS WORK

Trace element studies have been carried out in individual areas by Western Mining Corporation but results are unpublished.

GENERAL GEOLOGY

The most recent contributions to the geology of the Kalgoorlie Goldfield are Haycraft (1965), Woodall (1965), Finucane (1964, 1965) and Wells (1964).

SAMPLING PROCEDURE

With the exception of Ora Banda samples, which are representative of soil 6" - 12" below the surface, the samples were all taken from underground. Some are chip samples taken across lodes exposed in underground workings, others are derived from drill-core from underground drilling, and were collected by mine geologists and crushed prior to delivery to the Bureau of Mineral Resources. Duplicates of most of these samples are held by Western Mining Corporation. The Bureau has retained portions of all the samples submitted.

ANALYTICAL PROCEDURES AND RESULTS

The methods used were:-

a) Emission Spectrography b) Colorimetric

a Emission spectrography

The instrument used was a large Hilger Quartz Spectrograph operated under the supervision of A.D. Haldane. Briefly, the procedure adopted was as follows:- The soil samples were oven dried at about 105°C and ground by hand to pass through an eighty mesh sieve. After preheating the samples to 500°C, they were loaded into hollow electrodes and arced to completion. Most of the samples were diluted 1:1 with pure washed silica sand to help the arcing behaviour. The resulting spectra were photographed and the location and intensities of the lines compared against standard plates.

Details:-

Plate type N50
Arc length 6mm
Arc current 10 amps
Slit 8 micron by 2mm
Development 2½ minutes at 68°F
Developer hydroquinone/sodium carbonate
Range 3600-2480 angstrom
Electrodes L4206 + ⅛" C

b) Colorimetric

Arsenic was determined using a modified Gutzeit method. (Sandell 1959).

0.2g of crushed sample (-100 mesh) was fused with 2.0g of potassium hydroxide in a nickel crucible. The contents of the crucible were transferred to a 100ml conical flask with water and concentrated hydrochloric acid. 14 ml of the following solution were added:-

30 ml 10% $SnCl_2$)
125 ml conc. HCl) 500 ml with distilled water.
50 ml 15% KI)

After placing a mercuric chloride paper in the Gutzeit head, 3.0g of zinc (low in arsenic) was added and the head placed on the flask.

The stains on the paper due to the reaction of the liberated arsine were compared with standard colours.

Some checks were carried out using the Meteropoly Molybdenum Blue Method (Sandell, 1959).

It was originally intended that the Direct Reading Emission Spectrograph would be used to analyse the samples for about thirty trace elements. However, the instrument was not in operation when the results were required so the list of elements was amended and alternative methods had to be used.

The results are tabulated in Tables I to X and the relevant sectional maps are shown in Sections 1-7. The results have also been plotted on three cycle, semi-logarithmic paper and are shown in Figures 1-23.

DETAILS OF MINERALIZATION

A survey of the literature and studies of polished sections by I. Pontifex (B.M.R.) showed that the following minerals have been identified in Kalgoorlie ore.

Telluride minerals (in approximate order of abundance)

Calaverite $AuTe_2$

Coloradoite HgTe

Petzite Ag_3AuTe

Sylvanite $AuAgTe_4$

and in subordinate abundance:

Krennerite $AuTe_2$

Hessite Ag_2Te

Altaite PbTe

Melonite $NiTe_2$

Weissite Cu_2Te

Nagyagite $Au(Pb, Sb, Te)_8$

Tetradymite Bi_2Te_2S

Native tellurium Te

Tellurbismuth Bi_2Te_3

Associated metallic minerals

Native gold Au

Pyrite FeS_2

Arsenopyrite FeAsS

Fahl ore (argentiferous copper sulphide)

Bournonite $2Pb\ Cu_2S\ Sb_2S_3$

Enargite $Cu_2S\ 4CuS\ (AsSb)_2\ S_3$

Jamesonite $4PbS\ FeS\ 3Sb_2S_3$

Stibnite Sb_2S_3

Galena PbS

Sphalerite ZnS

Chalcopyrite $Cu_2S\ Fe_2S_3$

Tetrahedrite $5\ Cu_2S\ 2\ (CuFe)S\ 2Sb_2S_3$

Hematite Fe_2O_3

Scheelite $CaO\ WO_3$ (commonly with some Co)

Loellingite $(Fe, Co, Ni)\ As_2$

Magnetite Fe_3O_4

The following list of non-metallic minerals which are associated with the Kalgoorlie ore is geven by Lindgren (1906).

Fluorite	CaF_2
Rutile	TiO_2
Calcite	$CaCO_3$
Dolomite	$Ca(Mg, Fe)(CO_3)_2$
Siderite	$FeCO_3$
Ankerite	$Ca(Fe^{2+}, Mg, Mn)(CO_3)_2$
Sericite	hydrated K, Al, silicate
Chlorite	hydrated Fe, Mg, Al, silicate
Albite	Na, Al silicate
Tourmaline	Na, Fe, B, Al silicate
	Silica is also present

Simpson (1902) gives various chemical analyses of Kalgoorlie minerals

Calaverite $AuTe_2$

Ag	Cu	Se
0.5-4.8%	0.63%	1.13%

Goldschmidtite $Au\ Ag\ Te_2$

Ag	Cu	Se
9.76%	0.32%	0.2%

Petzite $(Au\ Ag)_2\ Te$

Hg	Cu	Se	Sb
2.26%	0.20%	1.45%	0.30%

Kalgoorlite $Au_2\ Ag_6\ Hg\ Te_6$

Hg
10.86%

Coolgardite $(Au\ Ag\ Hg)_2\ Te_3$

Hg	Cu	Sb
3.70%	0.88%	1.20%

Enargite $Cu_3\ AsS_4$

Au	Ag	Cu	Zn	As	Sb	Te
0.12%	0.22%	41.69%	2.68%	16.87%	4.30%	0.05%

Coloradoite $Hg_2\ Te_3$

Hg	Au	Ag	Te
50.40%	trace	0.12%	49.48%

ELEMENTS ASSOCIATED WITH THE ORE

From the lists above it appears that the following trace elements should be associated with the ore:- Au, Ag, Te, Pb, Cu, Sb, Hg, Ni, Zn, As, Bi, W, Co and B.

In addition it is suggested that vanadium is associated with the gold mineralisation. Simpson (1902) quotes roscoelite, a vanadium mica, as being a secondary mineral in the lodes. He gives the vanadium content as 27.11% V_2O_3. Maclaren (1908) also reports roscoelite.

No molybdenum mineral is reported in the literature nor has any been observed in the mine workings. However, an underground sample from the Hamilton No. 3 West Branch (Table IV) has a molybdenum value greater than 1000 p.p.m.

Results show that molybdenum, tungsten, silver, antimony, mercury and arsenic occur in greater concentrations in mill-feeds than in country rocks.

Tellurium has not been placed in this latter list although thirteen telluride minerals have been reported (see page 4). The analytical methods used to date have not been sensitive enough to show a difference between the tellurium content of mill feed and country rock.

The following elements therefore appear to be associated with the ore:- Au, Ag, Te, Fe, Pb, Cu, Sb, Hg, Ni, Zn, As, Bi, W, Co, B, V and Mo.

DISCUSSION

Of the five elements considered in detail in this investigation (arsenic, cobalt, copper, nickel and vanadium), arsenic appears to be the only one showing a direct relationship with the gold mineralization. Primary dispersion is erratic. Arsenic values range from virtually zero to several hundred parts per million and the fall-off from peak values to background values takes place over varying distances even in the same rock type. The background value for arsenic in unmineralized Golden Mile Dolerite is about 20 p.p.m. (Table XII). In the Lake View Lode (Fig. 3) where the peak value is about 500 ppm, the fall to 20 ppm takes place in 50 feet; the rock is Golden Mile Dolerite. In Hamilton No. 3 West Branch the rock is again Golden Mile Dolerite but the fall-off from 200 ppm to 20 ppm takes place over 10 feet. A preview of soil to bed-rock relationship for arsenic is given by the results obtained from the analysis of the Ora Banda samples (Tables VII-X, Figs. 19-23). These samples, representative of the soil 6" to 12" below the surface, have anomalous arsenic dispersions covering hundreds of feet. It would seem from this limited evidence that arsenic is a good indicator for gold mineralization. It must be noted that no results have been obtained for underground samples from Ora Banda or soil samples from Kalgoorlie.

Copper, vanadium, nickel and cobalt do not show significant concentrations near the gold lodes. For most of the samples studied, rock type (dolerite, basalt), grainsize (fine, medium etc.), degree of bleaching, shearing, mineral content, (ilmenite, leucoxene, epidote etc.) are known. All or some of these factors could contribute to the migration effects of the element being studied and must be considered. Choosing one element, two

traverses and some thirty known facts about the sample, it is a feasible exercise to seek some common factors as reasons for a high concentration of the element. When five elements, fourteen traverses and about thirty-five factors (Table XI) are all taken into consideration, not only are deductions from such a diversity of facts very difficult but the compilation of these facts so that they are quickly retrievable also presents a problem. One way to store the information to ensure that it is quickly retrievable is in a punch-card system. This would also make the correlation of the variable factors easier.

Reference has been made (page 6) to a molybdenum value of greater than 1000 ppm. Molybdenum does not appear to migrate very far from the lode. A sample nine inches across strike from the lode contains 70 ppm molybdenum, while at six feet the molybdenum value has fallen to less than 1 ppm. The only other molybdenum occurrence found is in the Eastern Lode System (Table VI). Sample number B.M.R. 011269, W.M.C. 129 has 5 ppm molybdenum. This sample is 200 feet from a major gold lode.

One aspect of the geology which has been suggested by Western Mining Corporation and confirmed by the chemical results is that the Golden Mile Dolerite is a differentiated sill. The Horseshoe traverse (Figs. 1 and 2) which spans the basalt-dolerite junction shows definite zones in the dolerite where vanadium and nickel in particular are concentrated or depleted. This is also evident in Figs. 11 and 12 and Fig. 13. The maximum value for vanadium occurs about 1100 feet from the basalt-dolerite boundary in both Figs. 12 and 1, Sections 6 and 1. This maximum value is followed in each case by a depletion in vanadium to 3 ppm within 200 feet of the maximum value. Similarly nickel has a maximum value of 150 ppm about 100 feet from the boundary in Figs. 2 and 13, Sections 1 and 6 and in Figs. 2 and 11, Section 1 and 6 decreases to zero at about 1400 feet from the dolerite-basalt boundary. This kind of fractionation is well documented in the literature Goldschmidt, 1954, McDougall, 1963, Rankama, 1950. The chemical evidence supports mineralogical evidence obtained by R. Woodall and G. Travis (pers. comm.) of Western Mining Corporation.

Table XII shows the average concentrations of the various elements in the different rock types, and the order of magnitude of these average values. The general order is:

$$V > Cu > Ni > Co > As$$

There is an exchange of position between nickel and arsenic in the Golden Mile Dolerite. These higher arsenic values are possibly due to more gold deposits in the dolerite than basalt.

CONCLUSIONS

GENERAL

Studies to date indicate that arsenic is the only element clearly associated with the gold mineralization.

Elemental variations support the mineralogical evidence obtained by Woodall and Travis of Western Mining Corporation for "zoning", in the Golden Mile Dolerite.

RECOMMENDATIONS

As one aspect of this work is to obtain information on element(s) which could be used for geochemical prospecting in a Kalgoorlie-type area it is suggested that the following elements be determined in both the primary zone and soil samples.

Au, Ag, Cu, Sb, Hg, As, W, B, V, Mo and Te.

Until analytical results have been obtained for such elements as Sb, Hg, W, B, and Te, it is difficult to draw conclusions as to what importance to place on any given elements in the list.

Thirteen telluride minerals from Kalgoorlie are shown (page 4) and it is obviously important to determine the distribution of tellurium. A method is being developed in the B.M.R. geological laboratory (Marshall, 1965) with which it is hoped a detection limit of 0.2 ppm in the solid will be obtained. Baxter (1964) reports a background in the Cripple Creek area, Colorado, of 0.5 ppm tellurium. An analysis of a sample taken over a mineralised area showed 12.5 ppm tellurium.

Mercury is another element where the detection limit of the analytical method needs to be low. According to Williston (1964) a detection limit of well under 1 ppm needs to be achieved. Instruments are in use, based on the principle of atomic absorption for which a sensitivity of 1 part per billion (1 in 10^9) is claimed. These instruments are not commercially available as yet.

Another problem to be kept in mind for future work is that of determining a suitable sub-surface depth for soil sampling. This will need to be below the surface contamination of old workings, slime dumps, old mills, windborne dust etc., which abound in the area.

A system of information storage, such as a simple punch-card system is needed because of the number of parameters involved in the interpretation of the results.

ACKNOWLEDGEMENTS

I should like to acknowledge the helpful discussions with members of the B.M.R. laboratory, especially I.R. Pontifex, also the staff of Western Mining Corporation, Great Boulder Mines Ltd., Gold Mines of Kalgoorlie and Lake View and Star.

REFERENCES

R.A. BAXTER & S.E. POET, 1964 - Geochemical prospecting, Mines Magazine, Sept. 1964, p.27.

K.J. FINUCANE, 1964 - Ore penetration into Calc Schist on the Kalgoorlie Goldfield - Proc. A.I.M.M. No. 211, p. 49.

K.J. FINUCANE, 1965 - Ore distribution and lode structures in the Kalgoorlie Goldfield - Geology of Australian Ore Deposits, 2nd Edition, p.80.

M. GOLDSCHMIDT, 1954 - Geochemistry, Clarendon Press.

J.A. HAYCRAFT, 1965 - Ore bodies in the Mt. Charlotte-Hannans North Area, Kalgoorlie. Proc. A.I.M.M. No. 213, p. 49.

N.W. Le ROUX, 1965 - Geochemical Investigations in the Kalgoorlie and Norseman Areas, Western Australia. Bur. Min. Res. Aust. Rec. 1966/96 unpubl.

W. LINDGREN, 1906 - Metasomatic processes in the Gold Deposits of Western Australia. Econ. Geol. Vol. 1, No. 534, pp. 530-544.

J.M. MACLAREN, 1908 - Gold, its geological occurrence and geographical distribution. London, Mining Journal, p. 404.

N.J. MARSHALL, 1965 - Multi-Element Solvent Extraction in Atomic Absorption Analysis - B.M.R. Record 1965/150 unpubl.

I. McDOUGALL & J.F. LOVERING, 1963 - Fractionation of Cr, Ni, Co and Cu in a Differentiated Dolerite - Granophyre Sequence at Red Hill, Tasmania - J. Geol. Soc. Aust. V.10, Part 2.

I.R. PONTIFEX & N.W. Le ROUX, 1965 - Visit to Kalgoorlie and Norseman Goldfields by N.W. Le Roux & I.R. Pontifex, July, 1965. Bur. Min. Resour. Aust. Rec. 1965/172 (unpubl.)

K. RANKAMA & G. SAHAMA, 1950 - Geochemistry, Univ. of Chicago Press.

E.B. SANDELL, 1959 - Colorimetric Determination of Traces of Metals, Third Edition.

E.S. SIMPSON, 1902 - Bull. Geol. Surv. W.A. No. 6.

A.A. WELLS, 1964 - Western Lode Structures and Southward Extensions on the Boulder Mining Belt - Proc. A.I.M.M. No. 211, p. 181.

S.H. WILLISTON, 1964 - The Mercury Halo Method of Exploration - Eng. and Min. J. V165 No. 5, p. 98.

R. WOODALL, 1965 - Structure of the Kalgoorlie Goldfield - Geology of Australian Ore deposits, 2nd Edition, p. 71.

TABLE I.

GOLDEN HORSESHOE

SAMPLE DETAILS AND ANALYTICAL RESULTS (P.P.M.)

W.M.C. No.	B.M.R. No.	Description	Ni	Co	Cu	V	As	Other elements
2533	011954	Bleached P.B.	20	30	40	100	13	
2532	011953	Chloritic → bleached P.B.	40	30	30	150	45	
2531	011952	" "	50	30	50	150	13	
2530	011951	" "	60	30	30	150	17	
2529	011950	" "	40	40	30	150	15	
2440	011949	Bleached P.B.	30	40	30	150	20	
2439	011948	"	30	30	40	150	15	
2438	011947	"	30	30	40	200	13	
2437	011946	"	40	30	40	200	15	
2436	011945	"	40	30	30	200	25	
2435	011944	Chloritic P.B.	50	40	50	200	17	
2434	011943	"	50	30	30	200	13	
2433	011942	"	40	30	30	150	50	
2396	011941	fg 1x (sparse) chl. G.M.D.	50	30	50	150	4	
2395	011940	mg 1x (sparse) G.M.D. more basic than usual	80	30	80	100	35	
2394	011939	" " "	150	40	50	100	10	
2393	011938	Chloritized amphibolite with sparse f-mg 1x	80	30	80	100	32	
2392	011937	" " " (G.M.D.	100	40	50	150	45	
2391	011936	fg and mg 1x (sparse) chl. G.M.D.	50	30	50	150	13	
2390	011935	m-cg 1x chl. G.M.D.	20	30	40	150	10	
2389	011934	mg chl.G.M.D. with sparse 1x aggregates	20	40	50	200	7	
2322	011933	" " "	30	40	50	200	20	
2321	011932	mg 1x chl. G.M.D.	15	30	50	200	17	
2320	011931	"	10	30	50	100	10	
2319	011930	"	12	20	30	60	17	
2318	011929	mg chl.G.M.D. with sparse 1x aggregates	15	20	80	150	45	
2317	011928	" "	15	30	80	200	13	
2316	011927	f-mg 1x chl. G.M.D.	15	40	80	200	30	
2315	011926	"	20	40	50	200	32	
2314	011925	"	10	40	100	200	17	
2313	011924	f-mg il →1x chl. G.M.D.	20	20	30	60	2.5	
2312	011923	mg il chl. G.M.D.	15	70	150	700	20	
2311	011922	mg il, epi, amp. G.M.D.	10	70	200	700	7	
2310	011921	" "	10	50	150	700	7	
2309	011920	f-mg il, -epi, chl. G.M.D.	5	50	100	700	11	
2308	011919	f-mg il chl. G.M.D.	a	50	2	700	2.5	
2307	011918	" "	a	70	30	500	7	
2305	011917	" "	a	100	100	400	25	
2304	011916	" "	a	80	40	200	32	
2302	011915	f-mg il chl.G.M.D.,with a crude variolitic	a	70	40	200	25	
2301	011914	" " texture	a	70	40	60	32	
2300	011913	" " "	a	50	40	5	30	
2578	011955	Bleached mg il → 1x G.M.D.	5-	15	2-	5-	9	
2579	011956	Weakly bleached mg il G.M.D.	5-	20	5	5-	15	
2580	011957	Bleached mg il G.M.D.	5-	25	15	5	30	
2581	011958	mg il chl. G.M.D.	5	20	5	30	22	
2582	011959	mg il→1x 'ophitic' chl. G.M.D.	10	30	50	300	27	
2583	011960	mg 1x 'ophitic' chl. G.M.D.	5	30	20	200	22	
2584	011961	Bleached mg 1x G.M.D.	5	30	10	150	30	
2585	011962	mg 1x 'ophitic' chl. G.M.D.	10	40	40	200	37	
2586	011963	" "	10	40	30	200	30	
2587	011964	Bleached mg 1x G.M.D.	10	30	30	200	17	
2588	011965	mg 1x 'ophitic' chl. G.M.D.	10	30	40	150m	30	
2589	011966	mg 1x chl. G.M.D.	10	30	20	200	37	
2590	011967	mg 1x 'ophitic' chl. G.M.D.	10	30	40	200	35	

ABBREVIATIONS USED IN SAMPLE DESCRIPTIONS

Abbreviation	Full Terminology
chl. G.M.D.	Chloritic Golden Mile Dolerite
wkly. blchd. G.M.D.	Weakly bleached Golden Mile Dolerite
S/B G.M.D.	Semi-bleached Golden Mile Dolerite
Blchd. G.M.D.	Bleached Golden Mile Dolerite
H/B G.M.D.	Highly bleached Golden Mile Dolerite
chl. P.B.	Chloritic Paringa Basalt
Blchd. P.B.	Bleached Paringa Basalt
il	ilmenitic
lx	Leucoxenitic
il → lx	Ilmenite altering to leucoxene
Epi	Epidotic
amph.	Amphibolitic

Average Grain size of Ilmenite or Leucoxene

fg	Fine grained (<0-25 mm)
f-mg	Fine-medium grained (0.25-1.0 mm)
mg	Medium grained (1.0-3.0 mm)
m-cg	Medium-coarse grained (3.0 -5.0 mm)

TABLE II.

LAKE VIEW LODE

SAMPLE DETAILS AND ANALYTICAL RESULTS (p.p.m.)

Lode: Lake View Lode. Sample No's. W.M.C. 17074 - 112. : B.M.R. 011873-911.

Location: Perseverance Shaft, No.10 Level.

Remarks: All samples were collected along the south wall of the crosscut, using the western boundary of the main lode channel as a Datum. The main lode channelas a Datum. The main lode channel extends from 0-8½ feet east of Datum, with other lode seams from 12½-13½ feet, east and 16-17 feet east. The lode material is highly bleached well mineralised (f.g. pyrite), sheared and siliceous G.M.D., with some quartz and quartz-carbonate veins.

Grade: In this area the average grade was 7 dwts over an average stoping width of 15 feet.

W.M.C.No.	B.M.R.No.	Location (feet)	Width (ins.)	Description	Ni	Co	Cu	V	As	Other elements
17074	011873	0-2E	24	Highly bleached weakly sheared and sericitic well mineralized (f.g.pyrite) m-cg 1x G.M.D. Some silica and quartz-carbonate veining.	10	25	30	400	400	Ag
17075	011874	2-4E	24	Do. to 17074, but more siliceous	7	25	50	400	200	Au Ag
17076	011875	4-6E	24	" "	5-	20	40	300	150	Ag
17077	011876	6-8E	24	" "	5-	20	40	300	300	Ag
17078	011877	8-10E	24	m-cg 1x G.M.D. Some fragments weakly bleached and weakly mineralized (f.g.pyrite) with some quartz-carbonate veining.	5-	20	40	200	200	Ag
17079	011878	10-12¼E	30	S/B -weakly bleached m-cg 1x 'ophitic' G.M.D.	5-	20	40	200	200	Ag
17080	011879	12½-13½E	12	H/B, moderately sheared well mineralized (f.g. pyrite) siliceous G.M.D.	5-	25	40	300	400	Ag
17081	011880	13½-16E	30	Weakly bleached - S/B m-cg 1x G.M.D. Some fragments weakly sheared (sericitic).	5-	25	50	200	150	Ag
17082	011881	16 -17E	12	H/B, moderately sheared (sericitic), siliceous well mineralized G.M.D.(f.g. pyrite)	5	25	50	400	150	Ag
17083	011882	17 -18E	12	S/B - weakly bleached m-cg 1x G.M.D. Some veining (pyritic) and weak shearing.	5-	20	40	200	167	
17084	011883	18 -20E	24	" "	5-	20	40	200	50	
17085	011884	20 -22E	24	" "	5-	20	70	200	333	
17086	011885	22 -24E	24	Weakly sheared m-cg 1x Chl.G.M.D. Some fragments bleached with a fair amount of f-mg. pyrite.	5	25	70	200	500	Ag
17087	011886	24 -26E	24	Weakly sheared and weakly bleavhed G.M.D. Some quartz-carbonate veining and minor fg pyrite.	5-	20	50	200	30	
17088	011887	26 -28E	24	Weakly sheared and weakly bleached G.M.D. Some quartz-carbonate veining and minor fg pyrite to 17087	5-	20	40	200	45	
17089	011888	28 -30E	2	do to 17087	5	20	40	200	40	
17090	011889	0 -2W	24	Weakly bleached -S/B weakly sheared m-cg 1x G.M.D. with some pyrite around minor quartz-carbonate veins.	5	20	35	200	200	
17091	011890	2 -4W	24	do. to 091, but no pyrite or veining	5-	20	35	200	50	
17092	011891	4 -6W	24	do.	10	50	50	300	60	
17093	011892	6 -8W	24	do.	10	30	50	300	50	
17094	011893	8-10W		Weakly sheared m-cg 1x chl.G.M.D.	10	30	70	200	40	
17095	011894	10-12W	24	m-cg 1x 'Ophitic' Chl. G.M.D.	7	30	60	300	40	
17096	011895	12-14W	24	Weakly sheared weakly bleached m-cg 1x G.M.D.	5	30	60	300	45	
17097	011896	14-16W	24	m-cg 1x 'Ophitic' Chl. G.M.D.	10	40	60	200	60	
17098	011897	16-18W	24	do	5	30	60	200	50	
17099	011898	18-20W	24	do	5	30	80	200	40	
17100	011899	20-22W	24	do	5	35	60	300	40	
17101	011900	22-24W	24	do	5	25	60	300	40	
17102	011901	24-26W	24	do	5	50	70	300	40	
17103	011902	26-28W	24	do	10	40	80	300	30	
17104	011903	28-30W	24	do	7	30	80	200	25	
17105	011904	30-32W	24	do	7	30	70	200	25	
17106	011905	32-36W	48	do	10	35	80	200	25	
17107	011906	36-40W	48	Weakly sheared semi-bleached m-cg 1x G.M.D. with some pyritic quartz veins and abundant fg magnetite.	5	20	60	200	25	
17108	011907	40-44W	48	do to 17107	5	20	50	200	20	
17109	011908	44-48W	48	Fragments of unbleached, semi-bleached and highly bleached (some pyrite) m-cg 1x G.M.D.	5	20	50	200	20	
17110	011909	48-52W		m-cg 1x ophitic Chl. G.M.D.	7	30	80	200	20	
17111	011910	52-56W		do	10	30	60	200	20	
17112	011911	56-60W		do	7	30	70	200	20	

For abbreviations used in sample descriptions refer to Table I.

TABLE III

FEDERAL LODE

SAMPLE DETAILS AND ANALYTICAL RESULTS (P.P.M.)

Lode: Federal Lode — Sample No's. W.M.C. 17113 - 17151. B.M.R. No's.011968-12006

Location: Block "45" No.6 Level

Remarks: A this section the lode consists of a series of mineralized seams up to 18" wide extending over the stope width of 12 feet. The eastern wall of the stope is bounded by a strong shear dipping 70°W, and this was used as the datum for sample locations. Those samples from 10' - 55'E and 12' - 47'W were taken from diamond drill holes XF14 and XF13, and those from 0' - 12'W from the stope backs, approximately 20' north and 20' above the drill holes. In this area the wall rock is bleached Paringa Basalt and the lode is confined to a zone of flow - top brecciation extending from o-12W and 0-6E.

Grade: Approximate grade of the area is 5 dwts/ton.

W.M.C.No.	B.M.R. No.	Location (feet)	Width (ins.)	Description	Ni	Co	Cu	V	As	Other elements
		XF14								
17113	011968	10 - 12E	24	Bleached Paringa Basalt (Blchd PB)	30	30	50	150	15	
17114	011969	12 - 14E	24	Blchd PB with minor carb veins	30	30	40	200	15	
17115	011970	14 - 16E	24	do.	50	30	50	150	15	
17116	011971	16-17- 17'10E	22	do	50	30	40	150	20	
				17'10" - 19'4" missing - narrow weakly mineralized seams, assayed trace.						
17117	011972	19'4"- 22E	32	Blchd PB, minor chl. and carb veins	30	30	40	150	20	
17118	011973	22 - 25E	36	do	30	30	40	150	15	
				25-25'9" missing - weakly minlsed.carb seam @ 25', assayed trace.						
117119	011974	25'9"- 28E	27	Blchhd PB, minor chl, and qtz-carb veins.	25	30	40	100	5	
117120	011975	28 - 31E	36	do	25	30	40	150	15	
117121	011976	31 - 34E	36	do	25	30	40	150	15	
117122	011977	34 - 37E	36	do	30	30	40	100	15	
117123	011978	37 - 40E	36	do	25	30	30	100	15	
117124	011979	40 - 45'4"	64	do	30	30	40	100	15	
				45'4" - 45'10" missing - strong but weakly minlsed seam @ 35'6", assayed trace						
17125	011980	45'10"-50E	50	Blchd PB, minor chl. and qtz-carb veins	30	30	40	100	10	
17126	011981	50' - 55E	60	do	30	30	40	100	10	
		XF13								
17127	011982	12 - 14W	24	do	20	30	30	100	15	
17128	011983	14 - 16W	24	do	20	30	40	100	15	
17129	011984	16 - 18W	24	do	20	30	30	150	15	
17130	011985	18 - 20W	24	do	25	30	40	150	15	
17131	011986	20 - 22W	24	do	20	20	30	130	15	
17132	011987	22 - 25W	36	Tuffaceous and brecciated blchd PB.	25	20	40	150	15	
17133	011988	25 - 28W	36	Blchd PB with appearance similar to white bleached porphyry.	15	20	30	150	10	
				28' - 28'10" missing - weakly mineralized flow tap breccia, assayed trace.						
17134	011989	28'10"- 32W	38	Blchd PB, minor qutz-carb.veins	15	20	25	100	30	
17135	011990	32'- 35W	36	do	12	20	30	100	5	
17136	011991	35' - 38W	36	do	20	20	30	100	15	
17137	011992	38' - 41W	36	do	20	20	40	100	25	
17138	011993	41' - 44W	36	do	20	20	40	100	15	
17139	011994	44 - 47W	36	do	20	30	20	150	10	
17140	011995	0 - 2W	24	Bleached PB., brecciated	25	30	30	100	10	
17141	011996	2 - 3'8"W	20	do	30	30	40	150	10	
17142	011997	3'8"- 4'W	4	Moderately minlsed (fg pyrite) and sheared (sericitic) blchd PB with qtz-carb veins (from mnlsed shear dipping 45°W)	20	30	30	150	40	
17143	011998	4 - 6W	24	Bleached and brecciated PB with several narrow mineralised seams (very minor shearing)	20	30	30	150	15	
17144	011999	6 - 8W	24	Blchd and brecciated PB, moderately minlsed. from 6½-7½W (no shearing)	20	30	40	200	30	Ag
17145	012000	8 - 9½W	18	Silicified, moderately mineralised weakly blchd PB, terminated at 9'6" by an oblique weak fault dipping 70°W (see plan).	30	30	50	200	40	Ag
7146	012001	9'6"-12'W	30	Chloritic blchd PB (flow top breccia.	30	30	30	150	15	
7147	012002	0 - 2E	24	Blchd and brecciated PB	30	20	40	100	20	
7148	012003	2 - 4E	24	do	30	30	40	100	15	
7149	012004	4 - 6E	24	do	30	30	30	150	15	
7150	012005	6 - 8E	24	Blchd PB.	30	30	30	100	15	
7151	012006	8 - 10E		"	20	30	30	100	5	

TABLE IV

HAMILTON No.3 WEST BRANCH

SAMPLE DETAILS AND ANALYTICAL RESULTS (P.P.M.)

Lode: Hamilton No.3 West Branch. Sample No's. W.M.C. 17001-029 and 17113. B.M.R. 011800-29 and 011912

Location: Hamilton Shaft, No.28 Level.

Remarks: At this section through the lode abundant free Au is visible in a 1" wide siliceous vein. The country rock for 9 inc. each side of this vein is bleached moderately sheared and moderately mineralized (f-mg pyrite) G.M.D. Moderate shearing with only minor bleaching extends for a further 2'3" each side of these bleached and mineralized zones. All samples were collected along the north wall of the crosscut using the siliceous vein as a Datum.

Grade: Face assays in the area 30 ft.north and 50 ft. south of the crosscur averaged 17.5 dwts over a width of 72 inches.

W.M.C.Nos.	B.M.R. Nos.	Location (feet)	Width (ins.)	Description	Ni	Co	Cu	V	As	Other elements
17001	011800	9" - 3½'W	33	Moderately sheared weakly bleached m-cg il "Ophitic" chl.Q.D.G.Minor quartz carb. veins.	7	40	70	300	20	
17002	011801	0 - 9'W	9	(Excluding 17003) H/B moderately sheared and mineralized (fg pyrite) m-cg lx G.M.D. A little tourmaline present on some of the sericitic shear planes.	10	40	100	300	200	Mo(70), Sn(10)
17003	011802	-	1"	f.g. grey silica with streaks of silica and fg. magnetite (?). Abundant free Au.	5	30	150	300	60	Mo (1000+) Sn(10) Ag, Au, Pb(10)
17113	011912	9 - 9"E	9"	(Excluding 17003). Do to 17002	5	30	50	300	250	Mo(25)
17004	011803	9" - 3'E	27"	m-cg il moderately sheared (sericitic) QLDG	5	30	40	300	30	Mo(5)
17005	011804	3 - 5E	24"	m-cg il lx G.M.D.weakly sheared with minor blebs of pyrite.	7	40	40	300	20	Sn(50)
17006	011805	5 - 7E	24"	m-cg/Chl. G.W.D. /lx.	7	40	15	300	25	Mo(10), Sn(20)
17007	011806	7 - 9E	24"	m-cg lx Chl.G.M.D. ('ophitic texture') Some fragments weakly bleached and sheared with small quartz-carbonate veins.	7	40	40	300	25	Sn(20)
17008	011807	9 - 11E	24"	m-cg. il 'ophitic' Chl. G.M.D.	5	30	50	200	20	Sn(10)
17009	011808	11 - 13E	24"	m-cg. il Chl. G.M.D.	5	40	40	300	30	Sn(20)
17010	011809	13 - 15E	24"	m-cg. il Chl. G.M.D.	5	30	40	300	30	Sn(10)
17011	011810	15 - 17E	24"	m-cg. il Chl. G.M.D.	5	30	40	300	25	
17012	011811	17 - 19E	24"	m-cg. lx Chl.G.M.D. weakly sheared and veined	7	40	70	300	30	
17013	011812	19 - 21E	24"	m-cg. lx Chl.G.M.D. Minor pyrite and veining	10	40	40	300	20	
17014	011813	21 - 23E	24"	m-cg. lx Chl. G.M.D. Minor pyrite and "	5-	30	40	200	20	
17015	011814	23 - 25E	24"	m-cg. lx Chl. G.M.D. Minor pyrite and "	5-	30	50	200	45	
17016	011815	25 - 27E	24"	m-cg. lx Chl. G.M.D. Minor pyrite and "	5-	20	70	300	45	
17017	011816	27 - 29E	24"	m-cg.lx Chl. Q.D.G. moderately sheared with a fair amount of any pyrite and qyz. veins.	5	40	300	150	45	
17018	011817	29 - 31E	24"	do. to 17017	5	50	500	150	45	
17019	011818	31 - 33E	24"	mg il Chl.G.M.D. moderately sheared	5	50	50	200	40	
17020	011819	33 - 37E	48"	mg il 'ophitic' Chl.G.M.D.	10	40	40	300	15	
17021	011820	37 - 41E	48"	mg lx 'Ophitic' Chl.G.M.D.	5	40	40	300	10	
17022	011821	41 - 45E	48"	do.	10	40	40	300	10	
17023	011822	45 - 49E	48"	S/B m-cg il 'Ophitic' G.M.D.	5	30	40	300	20	
17024	011823	49 - 53E		m-cg il 'ophitic' Chl.G.M.D. Some fragments weakly bleached and weakly sheared.	10	30	40	250	25	
17025	011824	53 - 57E	48"	S/B m-cg il G.M.D.	12	30	40	200	30	
17026	011825	57 - 61E	48"	Weakly bleached m-cg il 'Ophitic' G.M.D.	10	30	40	200	25	
17027	011826	61 - 65E	48"	do.	10	30	12	300	25	
17028	011827	65 - 69E	48"	do	5	20	2-	300	20	
17029	011828	69 - 73E	48"	do	5	20	30	200	20	

TABLE V

HAMILTON CROSS LODE

SAMPLE DETAILS AND ANALYTICAL RESULTS (P.P.M.)

Lode: Hamilton Cross Lode. Sample No's. W.M.C. 17030 - 073. B.M.R. 011829 - 72.

Location: Hamilton Shaft, No.24 Level.

Remarks: At this section the lode is weakly mineralized and consists of 6 inches of banded silica and carbonate, centred around a strong control shear. Moderately sheared and bleached G.M.D. with a fair amount of fg pyrite extends 15 inches west of the main control shear, but there is no bleaching or mineralization immediately east of the control shear. All samples were taken along the south wall of the crosscut, using the control shear as a Datum.

Grade: Over a strike distance of 170 feet (50 feet north and 120 feet south of the crosscut) face assays averaged 6.5 dwts over a width of 72 inches.

Sample No's. W.M.C. No.	B.M.R. No.	Location (feet)	Width (ins.)	Description	Ni	Co	Cu	V	As	Other elements
17030	011829	3"E - 3"W	6	Strongly sheared siliceous lode material with carbonate and weak fg pyrite mineralization.	10	20	70	150	100	Ag
17031	011830	3" -18"W	15	Bleached moderately sheared f-mg lx G.M.D. with a little tourmaline on sericitic shear planes.	20	25	50	700	500	Ag
17032	011831	18"- 4'W	30	f-mg lx weakly bleached G.M.D. Variolitic texture.	20	20	40	150	20	
17033	011832	4 - 6'W	24	f-mg lx S/B G.M.D. Poor variolitic texture.	20	25	50	150	20	
17034	011833	6 - 8'W	24	S/B f-mg lx G.M.D. with a crude variolitic texture	20	25	30	150	20	
17035	011834	8 - 10'W	24	do to 17034	20	20	40	200	20	
17036	011835	10 - 12'W	24	f-mg lx chl.G.M.D. weakly sheared	12	30	50	200	20	
17037	011836	12 - 14'W	24	f-mg lx chl.G.M.D.with a variolitic texture	15	20	30	200	25	
17038	011837	14 - 16'W	24	do to 17037	20	25	40	150	20	
17039	011838	16 - 18'W	24	do to 17037	20	25	50	200	25	
17040	011839	18 - 20'W	24	mg lx 'ophitic' chl. G.M.D.	20	30	10	200	20	
17041	011840	20 - 22'W	24	mg lx 'ophitic' chl. G.M.D. Some fragments sheared	20	30	10	150	30	
17042	011841	22 - 24'W	24	mg il chl.G.M.D. Some small quartz-carb. veins.	30	30	40	200	40	
17043	011842	24 - 26'W	24	mg il → lx chl. G.M.D., semi-bleached and weakly sheared.	15	30	7	200	30	
17044	011843	26 - 28'W	24	do.	20	30	50	200	30	
17045	011844	28 - 30W	24	do	30	30	50	350	25	
17046	011845	30 - 34'W	48	mg lx 'ophitic' chl. G.M.D.	30	30	100	200	30	Ag
17047	011846	34 - 38'W	48	S/B mg lx G.M.D.	30	40	70	300	200	Ag
17048	011847	38 - 42'W	48	S/B mg lx G.M.D.	25	40	100	200	35	Ag
17049	011848	-	4	4" well carbonatised shear, dipping 60°W. Some quartz and f-mg pyrite	10	20	10	150	25	Ag
17050	011849	42 - 46'W	44	(Excluding 17049) mg il lx weakly bleached and weakly sheared G.M.D.	30	30	50	200	60	Ag
17051	011850	46 - 50'W	48	S/B mg il→lx G.M.D.	15	30	30	300	40	
17052	011851	50 - 54'W	48	S/B mg→lx G.M.D. with small qtz.-carb.veins	20	30	40	300	40	
17053	011852	54 - 58'W	48	mg lx 'ophitic' chl. G.M.D.	15	35	40	300	10	
17054	011853	58 - 62'W	48	do	12	30	40	200	15	
17055	011854	62 - 72'W	120	do	15	30	40	200	20	
17056	011855	72 - 82'W	120	do	20	30	50	200	20	
17057	011856	3" - 2'E	21	Weakly sheared f-mg lx chl. G.M.D. with very minor fg pyrite. Poor variolitic texture.	40	40	30	300	40	
17058	011857	2' - 4'E	24	f-mg lx chl. G.M.D. with a variolitic texture	30	20	35	200	40	
17059	011858	4 - 6E	24	do	20	30	30	200	20	
17060	011859	6 - 8E	24	do	40	30	10	200	20	
17061	011860	8 - 10E	24	do, weakly bleached	30	30	15	200	20	
17062	011861	10 - 12E	24	f-mg lx chl.G.M.D. variolitic texture. Minor pyrite	30	40	60	200	15	
17063	011862	12 - 14E	24	do	30	35	50	200	15	
17064	011863	14 - 16E	24	mg lx 'ophitic' chl. G.M.D. Some fragments weakly sheared and veined (quartz-carbonate)	30	30	50	200	15	
17065	011864	16 - 18E	24	mg lx S/B G.M.D. moderately sheared	20	30	50	200	15	
17066	011865	18 - 20E	24	do	30	30	50	150	15	
17067	011866	20 - 22E	24	do	20	25	70	150	10	
17068	011867	22 - 24E	24	mg lx weakly bleached G.M.D.	30	30	50	150	25	
17069	011868	24 - 26E	24	do	30	30	60	200	10	
17070	011869	26 - 28E	24	do	30	30	50	200	10	
17071	011870	28 - 30E	24	do. weakly bleached and sheared	40	30	50	200	25	
17072	011871	30 - 34E	24	f-mg lx chl. G.M.D. variolitic texture	30	25	30	150	15	
17073	011872	34 - 38E	24	do	30	30	10	150	10	

TABLE VI

EASTERN LODE SYSTEM

SAMPLE DETAILS AND ANALYTICAL RESULTS (P.P.M.)

All samples are either - (a) Chloritic, Golden Mile Dolerite, or (b) Chloritic, Paringa Basalt.
The grain size and degree of bleaching varies. This is indicated in the tabulation.
The approximate mineral composition of the various rock types are as follows -

Golden Mile Dolerite:

Chloritic, unbleached - chlorite 30%. Altered plagioclase 30% (Mixture of albite, epidote, chlorite and sericite ± carbonite).
carbonate 25% (mainly ankerite ± calcite and siderite)
Quartz 10%. Ilmenite or leucoxene 5%.

Chloritic, bleached - As above, but with little or no chlorite and more sericite, carbonate ± more albite and quartz.

Paringa Basalt: Mineralogically very similar to the Golden Mile Dolerite. On average, probably contains less ilmenite and leucoxene.

Location: 4500S on Gold Mines of Kalgoorlie Ltd. co-ordinates. Military Grid Ref. 1190500yN (lat.30°47'S). 452000yE (long.121°30'E).

Sample No's. W.M.C. No.	B.M.R. No.	Location (feet)	Mesh	Description	Ni	Co	Cu	V	As	Other elements
64	011200	S.K. 15 level	-100	GMD (bl) cg.	5-	35	30	5	35	
74	201	S.K. 4 level	-200	" f-mg	25	30	50	200	50	
75	202	S.K. 4 level	-200	" mg.	25	30	40	200	35	
76	203	S.K. 4 level	-200	" bl. cg.	25	20	50	150	35	
94	204	Ent. 23 level	-200	" unbl. f-mg.	10	60	80	500	50	
125	205	S.K. 15 level	-200	" " f-mg.	5-	40	60	60	40	
126	206	"	-200	" " mg.	5-	20	40	5-	25	
127	207	"	-200	" bl. mg.	5-	30	15	5-	20	
128	208	"	-200	" (bl) mg.	5-	20	40	5-	30	
131	209	"	-200	" " m-cg.	10	40	50	300	30	
132	210	"	-200	" bl mg.	5	40	50	400	150	
133	211	"	-200	" unbl. m-cg.	5	40	70	400	25	
134	212	"	-200	" " m-cg.	a	20	10	5-	15	
135	213	"	-200	" " mg.	5-	20	2-	5-	15	
136	214	"	-200	" " m-cg.	5-	30	25	5	15	
137	215	"	-200	" " m-cg.	5-	20	2-	5-	20	
138	216	"	-200	" " m-cg.	5-	30	20	10	20	
193	217	"	-100	" unbl. f-mg.	5-	50	12	40	20	
194	218	"	-200	" " f-mg.	5-	60	100	60	50	
195	219	"	-100	" " f-mg.	5-	60	30	150	40	
196	220	"	-200	" (bl) f-mg.	5-	50	15	150	25	
197	221	"	-200	" unbl. f-mg.	5-	50	30	60	20	
240	222	Ent. 23 level	-100	P.B. bl. fg.	20	30	40	100	10	
241	223	"	-100	" " f-mg.	25	30	40	100	5	
242	224	"	-200	" " fg.	30	30	50	120	20	
243	225	"	-100	" unbl. fg.	40	30	60	150	25	
244	226	"	-100	GMD " fg.	80	35	30	150	10	Ag
245	227	"	-200	" " f-mg.	80	20	50	100	15	Ag
246	228	"	-200	" " f-mg.	80	50	80	150	50	Ag
247	229	"	-200	" " f-mg.	30	30	70	150	25	Ag
248	230	"	--100	" " f-mg.	5-	40	30	400	40	Ag
306	231	N.N.B.8 level	-200	P.B. bl. fg.	30	30	50	150	15	Ag
308	232	"	-100	" " fg.	40	25	40	150	40	
312	233	"	-200	" " fg.	50	30	40	200	10	
314	234	"	-100	" " fg.	40	30	50	200	10	
316	235	"	-100	" " fg.	40	30	50	150	10	
327	236	"	-100	" " fg.	40	30	40	60	10	
330	237	Ent.23 level	-200	" " fg.	30	20	35	200	25	
607	238	S.K.4 level	-100	GMD unbl. mg.	15	30	50	200	20	
608	239	"	-200	" (bl) mg	10	30	40	200	20	
609	240	"	-100	" " mg.	12	30	35	200	30	
610	241	"	-100	" " mg.	15	40	80	200	30	Ag
611	242	"	-200	" " cg.	12	20	50	200	20	Ag
612	243	"	-100	" " mg.	12	25	60	200	25	Ag
613	244	"	-100	" " mg.	15	30	40	200	25	
614	245	"	-100	" " mg.	12	30	35	200	40	
615	246	"	-100	" bl. mg.	12	30	40	200	20	
616	247	N.N.B. 8 level	-200	P.B. bl. fg.	30	30	40	100	15	
617	248	"	-200	GMD " fg.	80	40	40	150	25	
618	249	"	-200	" (bl) fg.	30	25	40	100	10	
619	250	"	-200	P.B. bl. fg.	30	20	2-	150	15	
620	251	"	-200	" " fg	60	50	40	200	75	
621	252	"	-200	" " fg.	50	40	60	200	35	
622	253	"	-200	" " fg.	30	30	2-	150	30	
624	254	S.K. 4 level	-200	GMD. (bl) mg.	15	40	30	200	25	
625	255	"	-100	" " mg.	20	40	100	200	50	
626	256	"	-200	" " m.-cg.	15	30	100	300	45	
628	257	"	-100	" " cg.	15	25	70	200	25	
629	258	"	-100	" " m.cg.	20	30	70	200	40	
630	259	"	-100	" " mg.	20	30	40	200	20	
791	260	D.D.H. SD2	-200	P.B. bl. fg.	30	30	30	150	5	
793	261	"	-100	" " fg.	25	20	40	150	5	
796	262	"	-200	" " fg.	30	30	30	100	5	
798	263	"	-200	" " fg.	30	30	40	150	5	
800	264	"	-100	" " fg.	30	30	50	150	5	
805	265	"	-200	" " fg.	50	30	50	150	5	
808	266	"	-100	" " fg.	40	30	50	150	5	
809	267	"	-200	" " fg.	40	30	15	150	5	
627	268	S.K.4 level	-200	GMD " mg.	12	20	15	100	20	
129	269	S.K. 15 level	-200	" unbl. f-mg.	5-	30	20	5-	10	Mo 5 ppm.
130	270	"	-200	" (bl.) mg.	5-	20	2	5-	15	

(Abbreviations used:
G.M.D. Golden Mile Dolerite
P.B. Paringa Basalt
bl. bleached
(bl) semi bleached
unbl. unbleached
fg. fine grained
f-mg. fine to medium grained
mg medium grained
m-cg medium to coarse grained
cg coarse grained)

TABLE VII.

SLEEPING BEAUTY LODE

SAMPLE DETAILS AND ANALYTICAL RESULTS (P.P.M.)

1. Samples are representative of soil 6" - 12" sub surface and have been collected at fifty-foot intervals along a traverse line over a known lode.
2. The host rock of the auriferous lode is a fine-grained porphyritic basalt with oligoclase, phenocrysts up to 1½ imches across lode material consists of altered porphyritic basalt with thin stringers of quartz, pyrite, pyrrhotite (rare) and calcite.
3. Maximum width of lode is ten feet.
4. Lode is at 150N.

Sample Numbers W.M.C. No.	B.M.R. No.	Mesh Fraction	Distance from Traverse Datum	Sample Description.	Ni	Co	Cu	V	As	Remarks
S.B. 1	011316	-82	00		40	15	50	100	25	
2	317	"	50N		40	15	40	100	25	
3	318	"	100N		50	20	40	100	50	
4	319	"	150N		50	20	40	100	200	
5	320	"	200N		80	20	50	150	200	
6	321	"	250N	All samples red-brown	70	20	50	100	200	
7	322	"	300N	loam with Fe pisolites	100	30	100	200	100	
8	323	"	350N		80	25	80	200	50	
9	324	"	400N	and lateritic fragments.	60	25	70	150	25	
10	325	"	450N		50	25	50	150	40	
11	326	"	500N		40	20	40	60	20	
12	327	"	550N		50	20	50	100	20	
S.B. 1	328	+ "	00		30	20	80	300	60	
2	329	"	50N		60	20	100	300	40	
3	330	"	100N		50	15	40	200	60	
4	331	"	150N		60	15	70	200	500	
5	332	"	200N		100	20	100	300	400	
6	333	"	250N		50	15	50	150	300	
7	334	"	300N		100	15	60	700	300	
8	335	"	350N		80	20	70	200	60	
9	336	"	400N		150	20	100	500	150	
10	337	"	450N		50	20	50	200	40	
11	338	"	500N		100	20	100	500	40	
12	011339	"	550N		30	15	70	250	60	

TABLE VIII

SLIPPERY GIMLET LODE

SAMPLE DETAILS AND ANALYTICAL RESULTS (P.P.M.)

1. Samples are representative of soil 6" - 12" sub surface and have been collected at 50 foot intervals along a traverse line over a known lode.
2. The host rock of the auriferous lode is a fine-grained porphyritic basalt with oligoclase phenocrysts up to 1½ inches across. Lode material consists of altered porphyritic basalt with thin stringers of quartz, pyrite, pyrrhotite (rare) and calcite.
3. Traces of arsenopyrite reported.
4. Lode position is at 00 (traverse datum)

369304	011340	-82	25N		300	30	70	100	20	
306	341	"	75N		300	30	50	100	25	
307	271	"	100N		400	30	40	60	25	
309	272	"	150N		200	30	30	50	10	
311	273	"	200N		150	20	30	40	15	
313	274	"	250N		200	30	40	100	40	
314	342	"	275N	All samples deep	300	30	40	100	20	
316	275	"	350N	red-brown loam	200	30	50	100	15	
317	276	"	400N	with Fe pisolites.	100	25	40	100	20	Pb 50 ppm.
318	277	"	450N		50	15	35	60	25	
319	278	"	500N		30	12	20	60	20	
330	279	"	25S		200	30	30	80	60	
332	280	"	75S		300	30	50	80	15	
333	343	"	100S		300	30	60	100	20	
334	281	"	125S		300	30	50	100	15	
335	282	"	150S		250	30	50	100	20	

TABLE IX.

GIMLET SOUTH LODE

SAMPLE DETAILS AND ANALYTICAL RESULTS (P.P.M.)

1. Samples are representative of soil 6" - 12" subsurface and have been collected at 50-foot intervals along a traverse line over a known lode.
2. The host rock of the auriferous lode is a fine-grained porphyritic basalt with oligoclase phenocrysts up to 1½ inches across. Lode material consists of altered porphyritic basalt with thin stringers of quartz, pyrite, pyrrhotite (rare) and calcite.
3. This lode is up to 80 feet wide in productive areas.
4. Lode position is approximately 1350S.

Sample Nos. W.M.C. No.	B.M.R. No.	Mesh Fraction	Distance from Traverse Datum.	Sample Description.	Ni	Co	Cu	V	As	Remarks.
1-101	011283	-82	950S		50	15	40	150	25	
1-102	284	"	1000S		50	15	40	60	25	
1-103	285	"	1050S		80	20	35	100	25	
1-104	286	"	1100S	All samples red	50	20	40	150	40	
1-105	287	"	1150S	loam with fe pisolites;	50	15	35	100	45	
1-106	288	"	1200S	often lateritic.	40	15	30	70	35	
1-107	289	"	1250S		30	15	30	80	30	
1-108	290	"	1300S		30	15	20	70	25	
1-109	291	"	1350S		30	15	20	80	80	
1-110	292	"	1400S		50	15	40	100	30	
1-111	293	"	1450S		50	20	30	100	25	
1-112	294	"	1500S		50	15	30	125	25	

(Fe = Fayle description)

TABLE X

NEW AREA

SAMPLE DETAILS AND ANALYTICAL RESULTS (P.P.M.)

1. Samples are representative of soil 6" - 12" sub-surface and have been collected at 50-foot intervals.
2. The area is well exposed but there appears to be no surface expression of gold mineralization.

1-211	011295	- 82	2000N		30	12	40	100	15
212	296	"	2050N		50	20	50	150	15
213	297	"	2100N		30	15	50	150	25
214	298	"	2150N		50	15	70	200	25
215	299	"	2200N	All samples	50	15	70	200	25
216	300	"	2250N	lateritic soils.	70	15	80	200	25
217	301	"	2300N		30	15	50	150	25
218	302	"	2350N		30	12	40	150	25
219	303	"	2400N		50	15	50	150	15
220	304	"	2450N		50	15	50	150	50
221	305	"	2500N		30	12	50	150	25
222	306	"	2550N		30	15	40	100	20
223	307	"	2600N		30	15	30	100	20
224	308	"	2650N		30	20	30	100	15
225	309	"	2700N		30	20	30	100	15
226	310	"	2750N		50	15	40	100	15
227	311	"	2800N		40	20	50	100	15
228	312	"	2850N		50	20	50	150	10
229	313	"	2900N		30	15	50	150	10
230	314	"	2950N		40	15	50	150	10
231	315	"	3000N		30	10	30	30	10

TABLE XI

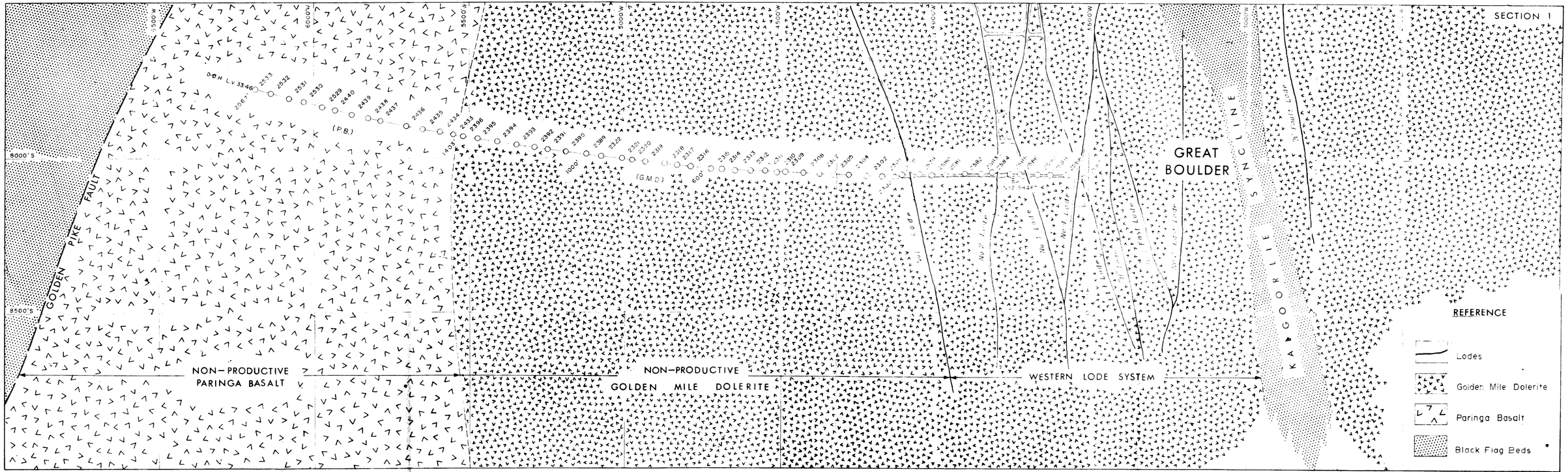
INFORMATION AVAILABLE FOR SAMPLES

Sample Numbers	Arsenic	Vanadium	Cobalt
Copper	Paringa Basalt	Golden Mile Dolerite	Oxidised Zone
Non-oxidised Zone	Fine-grained	Fine to medium grained	Medium grained
Medium to coarse-grained	Coarse-grained	Highly bleached	Bleached
Semi bleached	Unbleached	Sheared	Moderately sheared
Unsheared	Ophitic	Ilmenitic	Leucoxinitic
Sercitic	Pyritic	Epidotic	Amphibolitic
Carbonates	Free gold	Tourmaline	Silica
Nickel	Distance from gold		

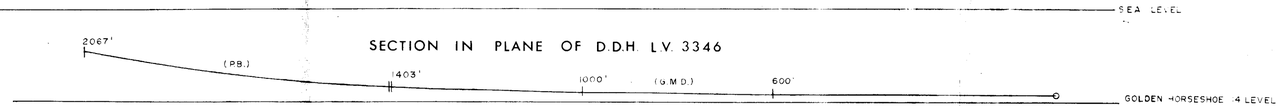
TABLE XII

AVERAGE VALUES FOR ELEMEBTS (P.P.M.)

ROCK TYPE.	W.M.C. No.	LOCATION	As	Ni	Co	Cu	V	ORDER OF MAGNITUDE
Paringa Basalt	791-809	E.Lode	5	34	29	38	144	V Cu Ni Co As
Paringa Basalt	312-622	E.Lode	24	40	31	37	155	V Ni Cu Co As
Paringa Basalt	243-240	E.Lode	17	29	28	45	134	V Cu Ni Co As
Paringa Basalt	2433-2533	Golden Horseshoe	21	40	32	36	165	V Ni Cu Co As
Paringa Basalt	17113-17151	Federal Lode	16	26	28	36	133	V Cu Co Ni As
		Mean	17	34	30	38	146	V Cu Ni Co As
Golden Mile Dolerite	94-244	E.Lode	31	47	39	57	242	V Cu Ni Co As
Golden Mile "	615-74	E.Lode	30	16	29	52	197	V Cu As Co Ni
Golden Mile "	137-196	E.Lode	31	5-	35	31	83	V Co Cu As Ni
Golden Mile "	2396-2578	Golden Horsehoe	19	25	44	65	251	V Cu Co Ni As
Golden Mile "	2579-2587	Golden Horsehoe Lode Area	28	8	30	25	153	V Co As Cu Ni
Golden Mile "	2396-2587	Golden Horsehoe Total Samples	19	20	40	53	223	V Cu Co Ni As
Golden Mile "	17001-17029	Hamilton No.3.West Branch	41	7	34	71	265	V Cu As Co Ni
Golden Mile "	17074-17112	Lake View	110	6	27	55	243	V As Cu Co Ni
Golden Mile "	17030-17073	Hamilton Cross	40	24	29	43	212	V Cu As Co Ni
Golden Mile "	617-618	E.Lode	17	55	32	40	125	V Ni Cu Co As
		Mean	37	21	34	49	199	V Cu As Co Ni
Soil	369304-369335	Slippery Gimlet	23	224	27	43	83	Ni V Cu Co As
Soil	1-101 to 1-112	Gimlet South	34	47	16	33	99	V Ni As Cu Co
Soil	S.B.1 to S.B.12	Sleeping Beauty	80	59	21	55	126	V As Ni Cu Co
Soil	1-211 to 1-231	New area	19	40	16	48	135	V Cu Ni As Co
		Mean	39	92	20	45	111	V Ni Cu As Co



SECTION IN PLANE OF D.D.H. L.V. 3346



GOLDEN HORSESHOE 1400' LEVEL
AND
D.D.H. L.V. 3346

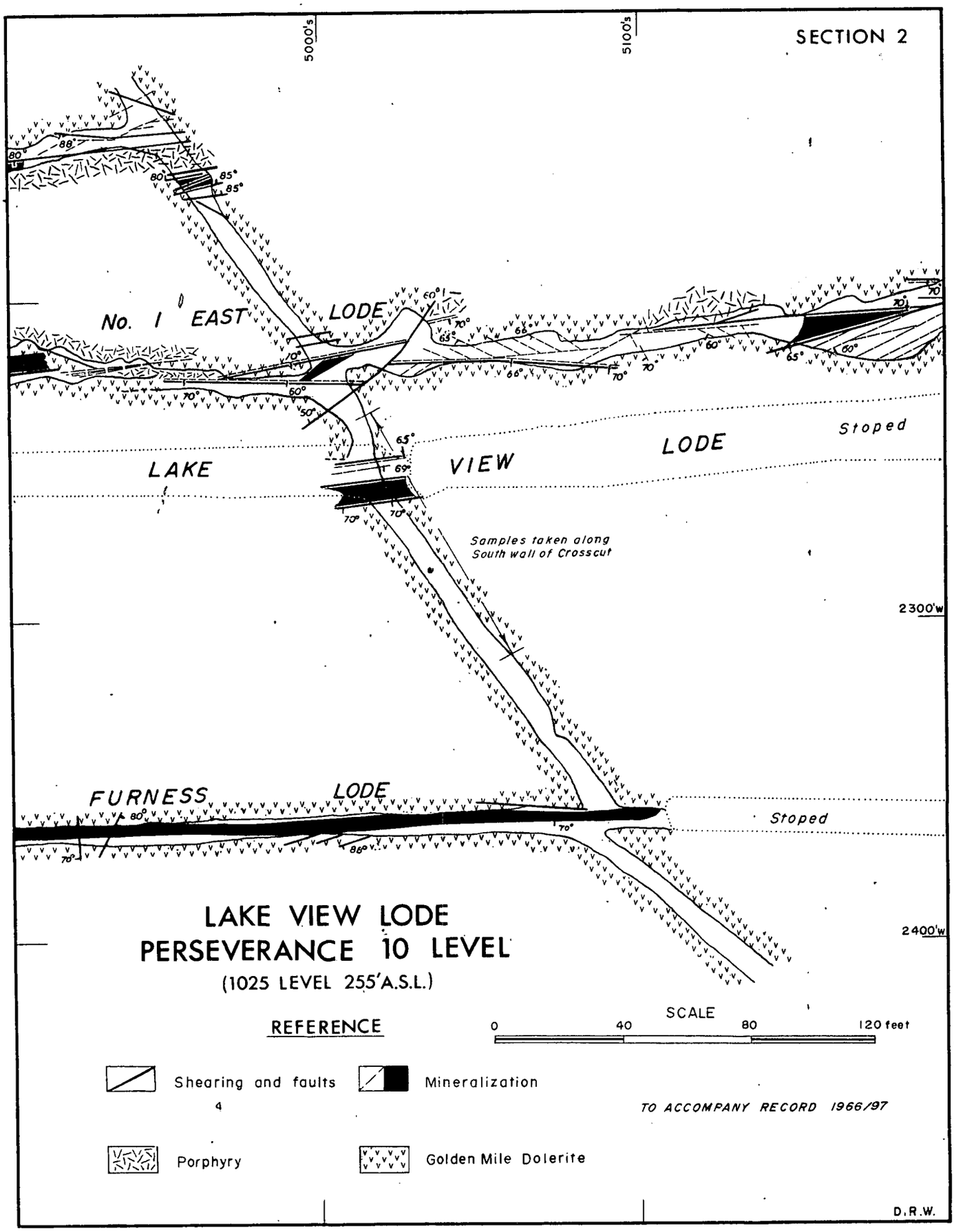
0 200 400 600 800 feet

H51/A9/2

All information supplied by the Western Mining Corporation Ltd.

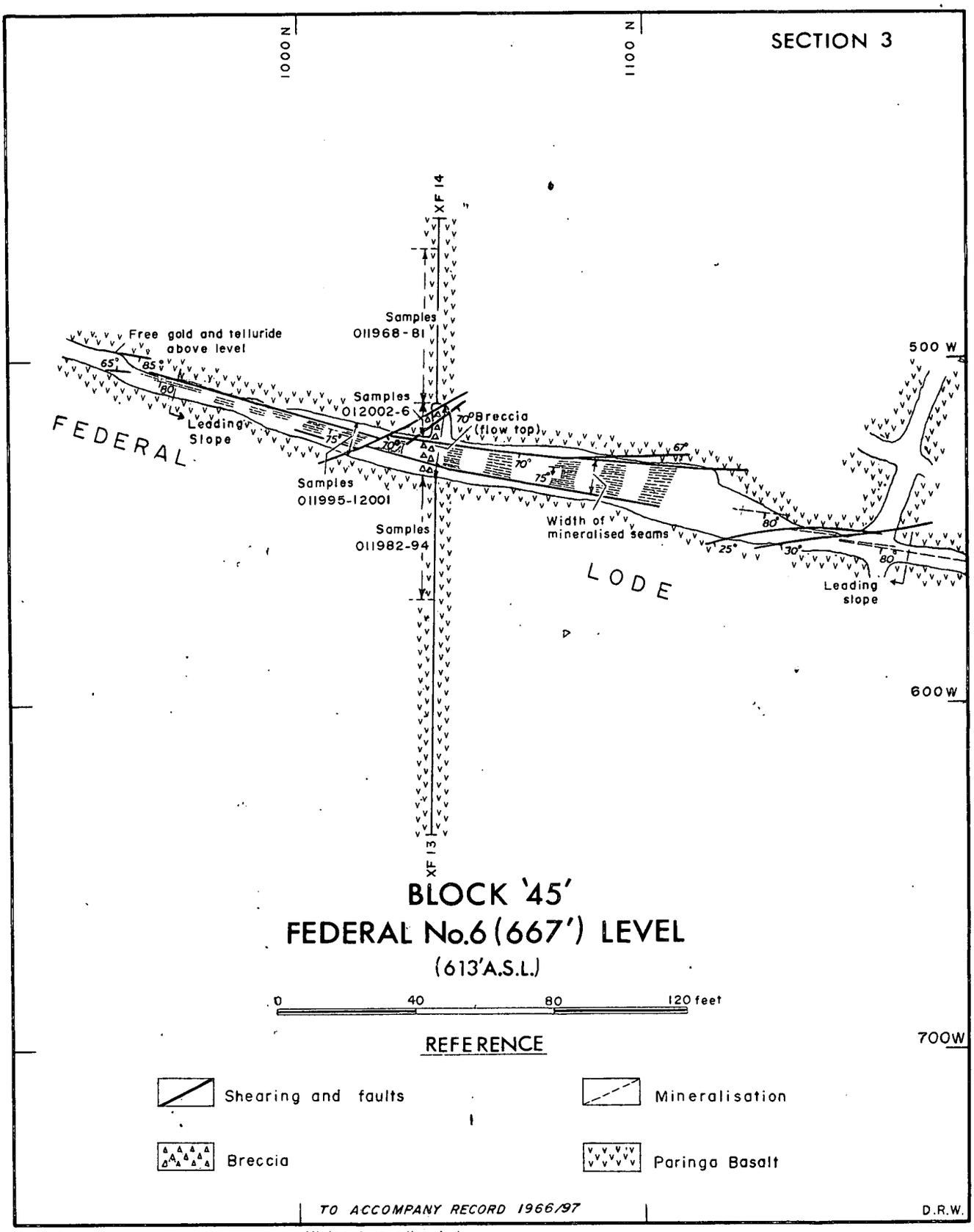
To accompany Record 1986/97

D.R.W.



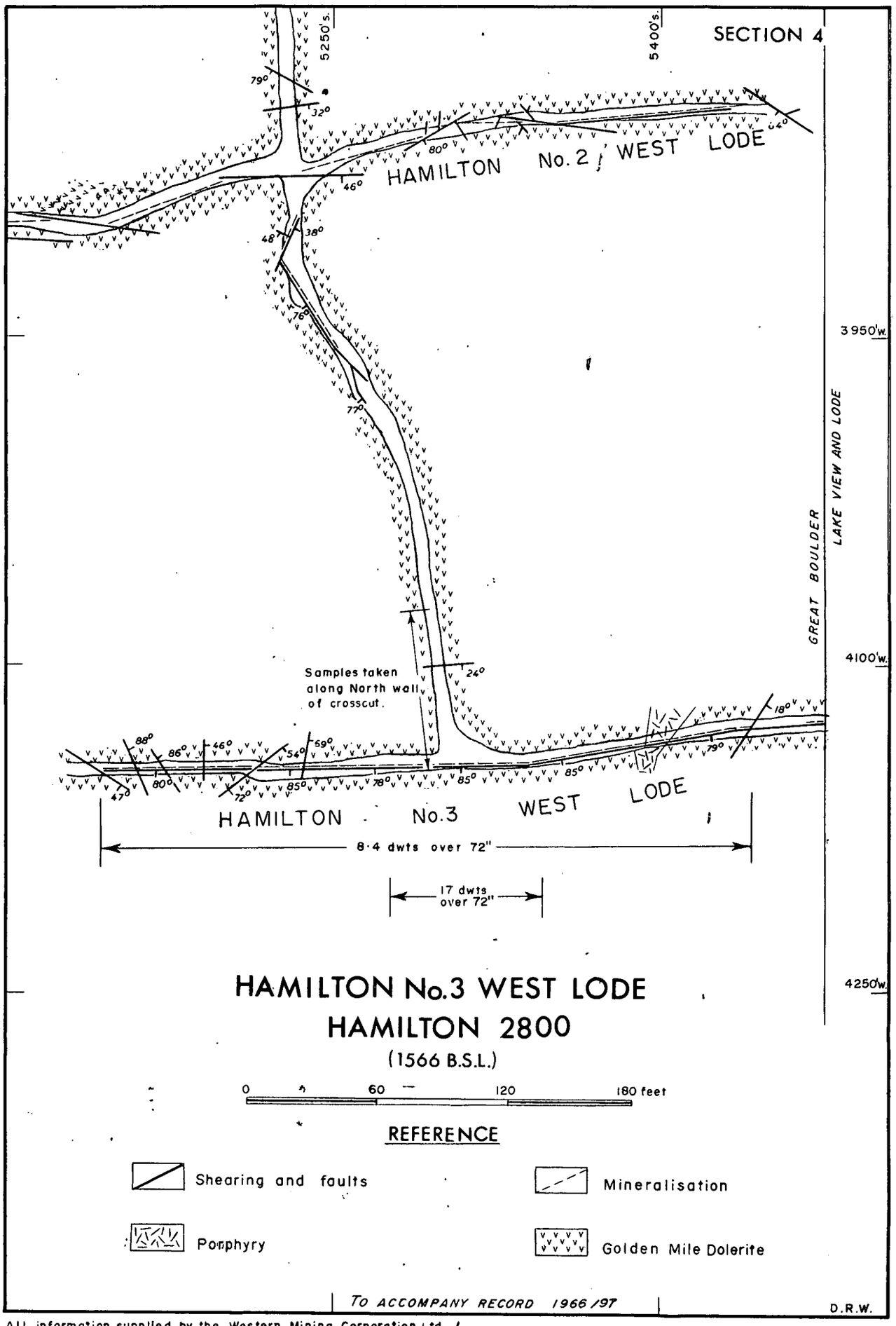
All information supplied by the Western Mining Corporation Ltd.

H51/A9/3



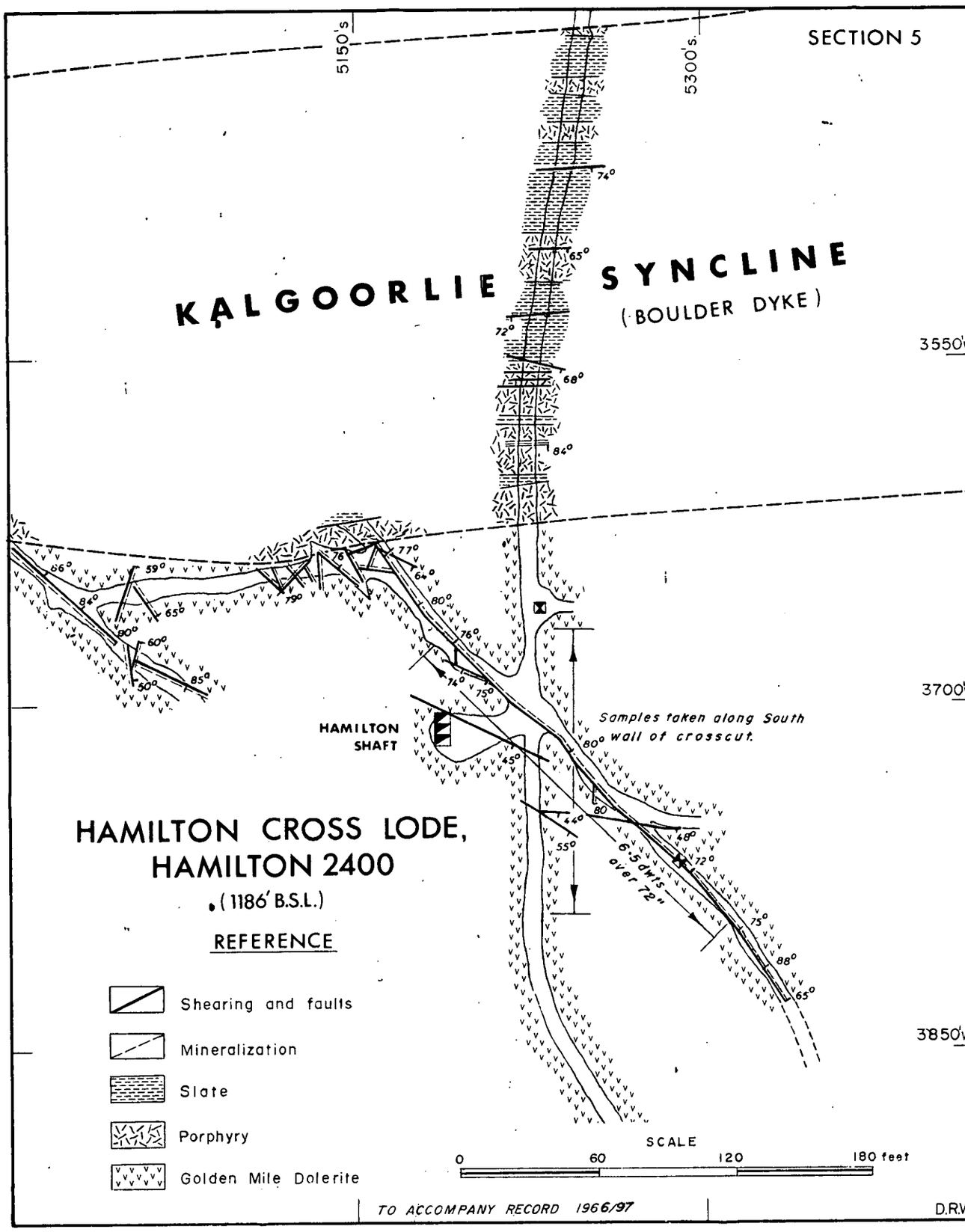
All information supplied by the Western Mining Corporation Ltd

H51/A9/4



All information supplied by the Western Mining Corporation Ltd.

H51/A9/5



All information supplied by Western Mining Corporation Ltd.

H51/A9/6

4000 W 3000 W 2000 W 1000 W 00

GOLD MINES OF KALGOORLIE | NORTH KALGURLI (1912) LTD | LAKE VIEW & STAR | NEW NORTH BOULDER

500'A.S.L.

500'B.S.L.

1500'B.S.L.

2500'B.S.L.

CROSS SECTION

SHOWING ROCK SPECIMEN LOCATIONS

4500'S

200 100 0 200 400

SCALE IN FEET

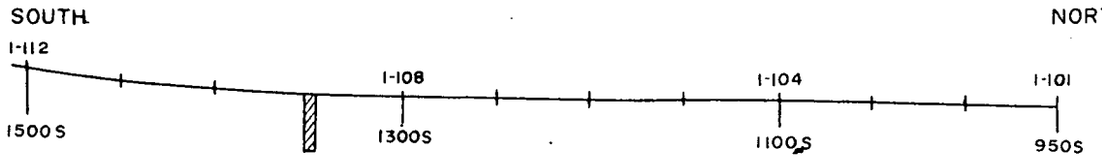
REFERENCE

- BLACK FLAG BEDS
- GOLDEN MILE DOLERITE
- PARINGA BASALT
- ALBITE PORPHYRY
- SAMPLE POINTS
- SAMPLES RECEIVED FOR GEOCHEMICAL STUDIES
- FAULTS
- GOLD BEARING LODES & VEINS

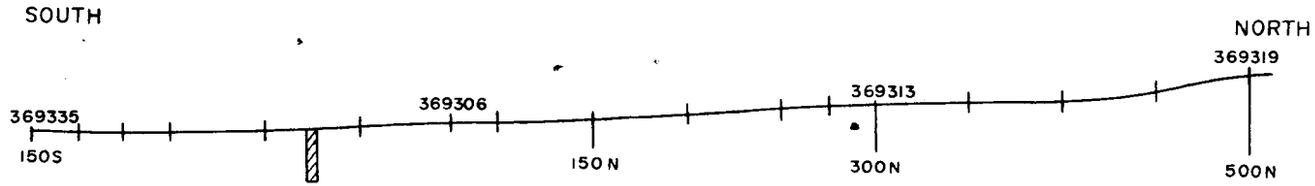
NOTE :— INFORMATION SUPPLIED BY WESTERN MINING CORPORATION LIMITED

H51/A9/8

TO ACCOMPANY RECORD 1966/97



GIMLET SOUTH TRAVERSE



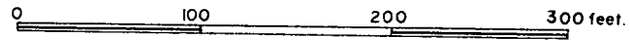
SLIPPERY GIMLET TRAVERSE

TOPOGRAPHICAL SECTIONS

SHOWING

ORA BANDA GEOCHEMICAL SAMPLE TRAVERSES

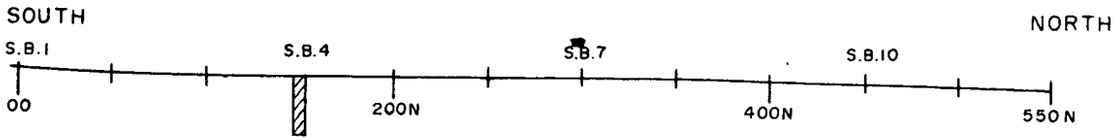
SCALE



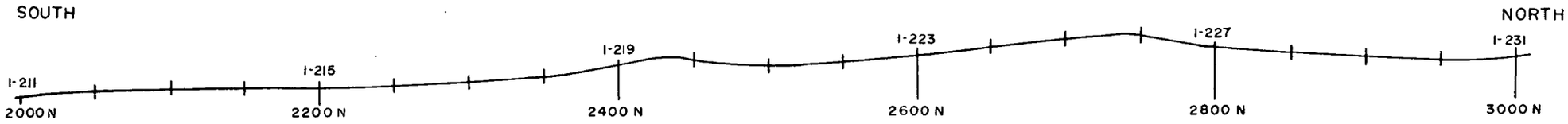
REFERENCE

LODE

INDICATES SAMPLE POSITION



SLEEPING BEAUTY TRAVERSE



UNNAMED ARSENIC ANOMALY - NEW AREA

All information supplied by the Western Mining Corporation Ltd.

TO ACCOMPANY RECORD 1966/97

H51/A9/7

D.R.W.

Fig. 1

GOLDEN HORSESHOE

1400' LEVEL

p.p.m.

1000
800
600
400
200
100
80
60
40
20
10
8
6
4
2
1

VANADIUM
COPPER
ARSENIC

2533 2532 2531 2530 2529 2440 2439 2438 2437 2436 2435 2434 2433 2396 2395 2394 2393 2392 2391 2390 2389. 2322 2321 2320 2319 2318 2317 2316 2315 2314 2313 2312 2311 2310 2309 2308 2307 2305 2304 2302 2301 2300 2578 2579 2580 2581 2582 2583 2584 2585 2586 2590 2589 2588 2587

BASALT

DOLERITE

WESTERN LODE SYSTEM

SAMPLE POINTS

SCALE 1" : 200'

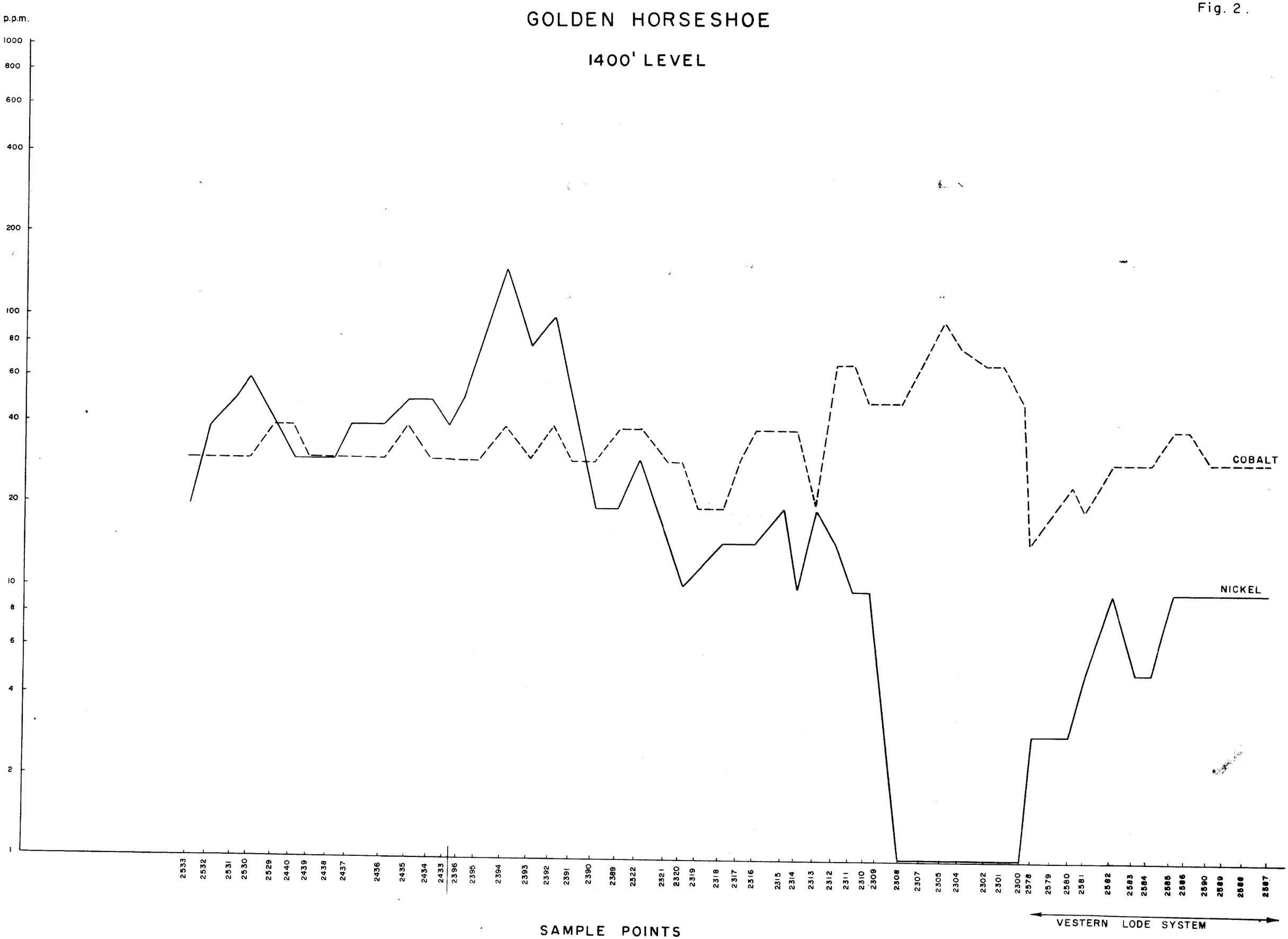
To accompany Record 1966/97

H51/A/1 JK

Fig. 2.

GOLDEN HORSESHOE

1400' LEVEL



SAMPLE POINTS

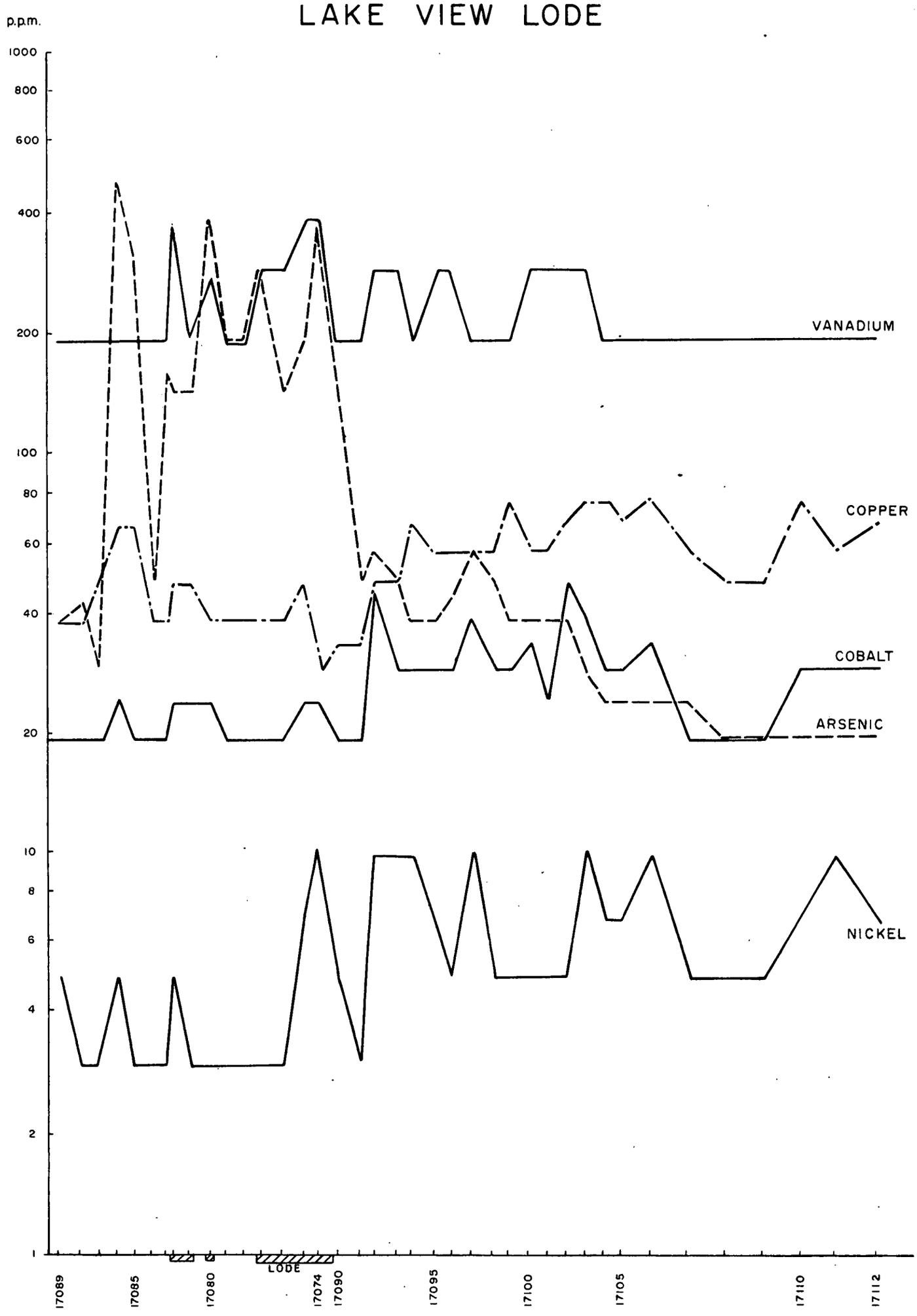
SCALE 1" : 200'

To accompany Record 1966/97

H51/A/2 JK

Fig. 3.

LAKE VIEW LODE



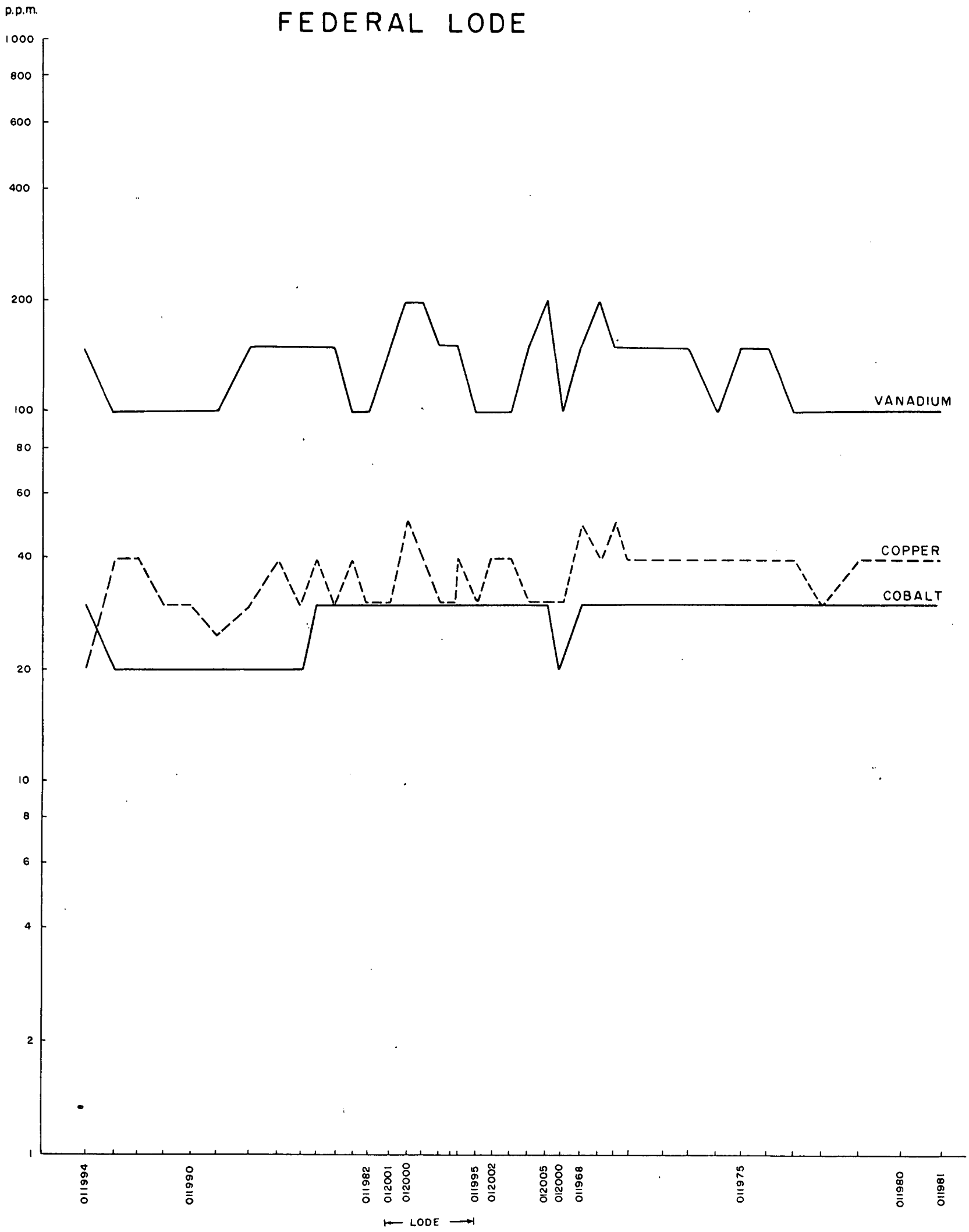
SCALE 1cm : 5'

To accompany Record 1966/97

H51/A/3

Fig. 4.

FEDERAL LODE



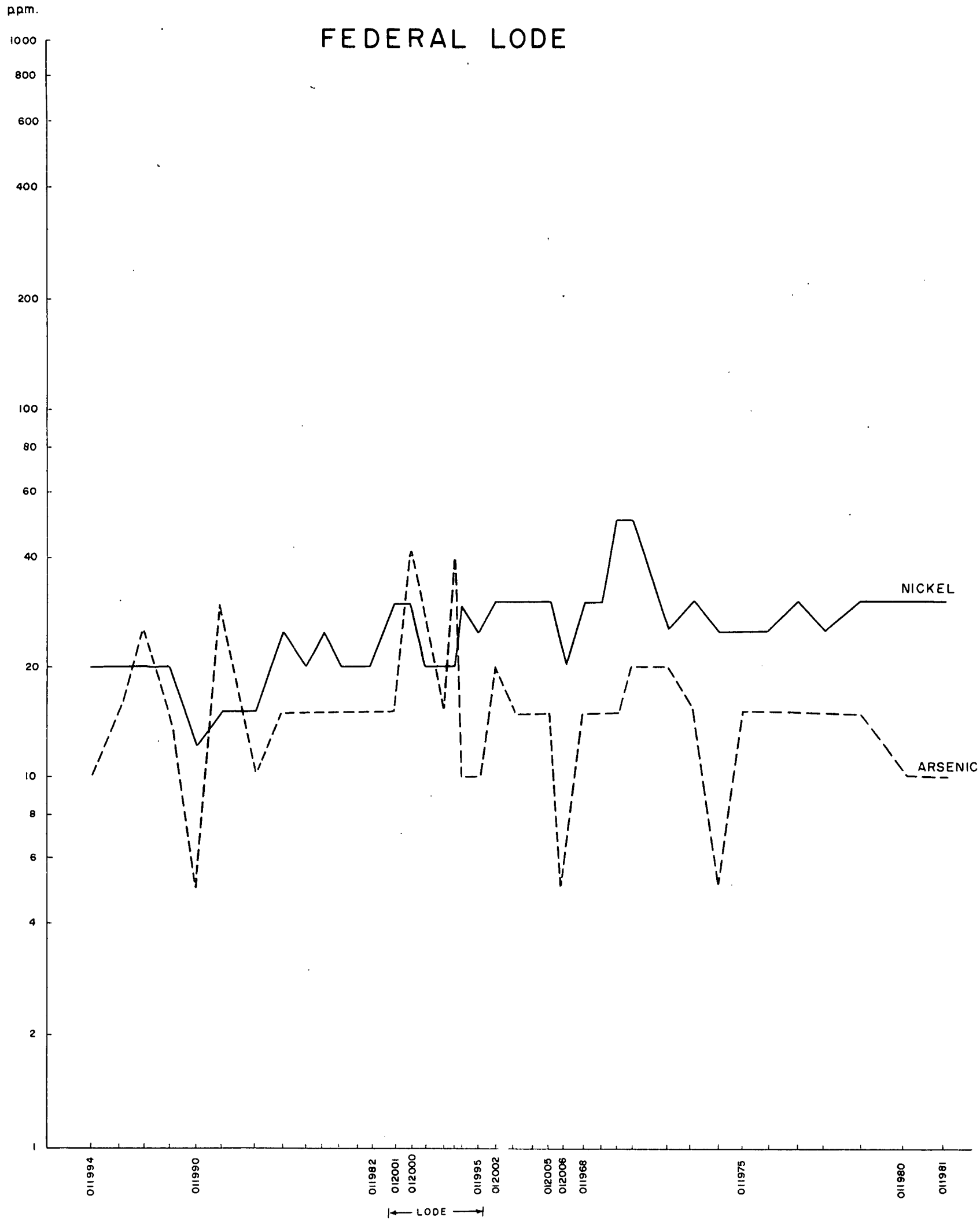
SCALE 1cm : 5'

To accompany Record 1966/97

H51/A/4 JK

Fig. 5.

FEDERAL LODE



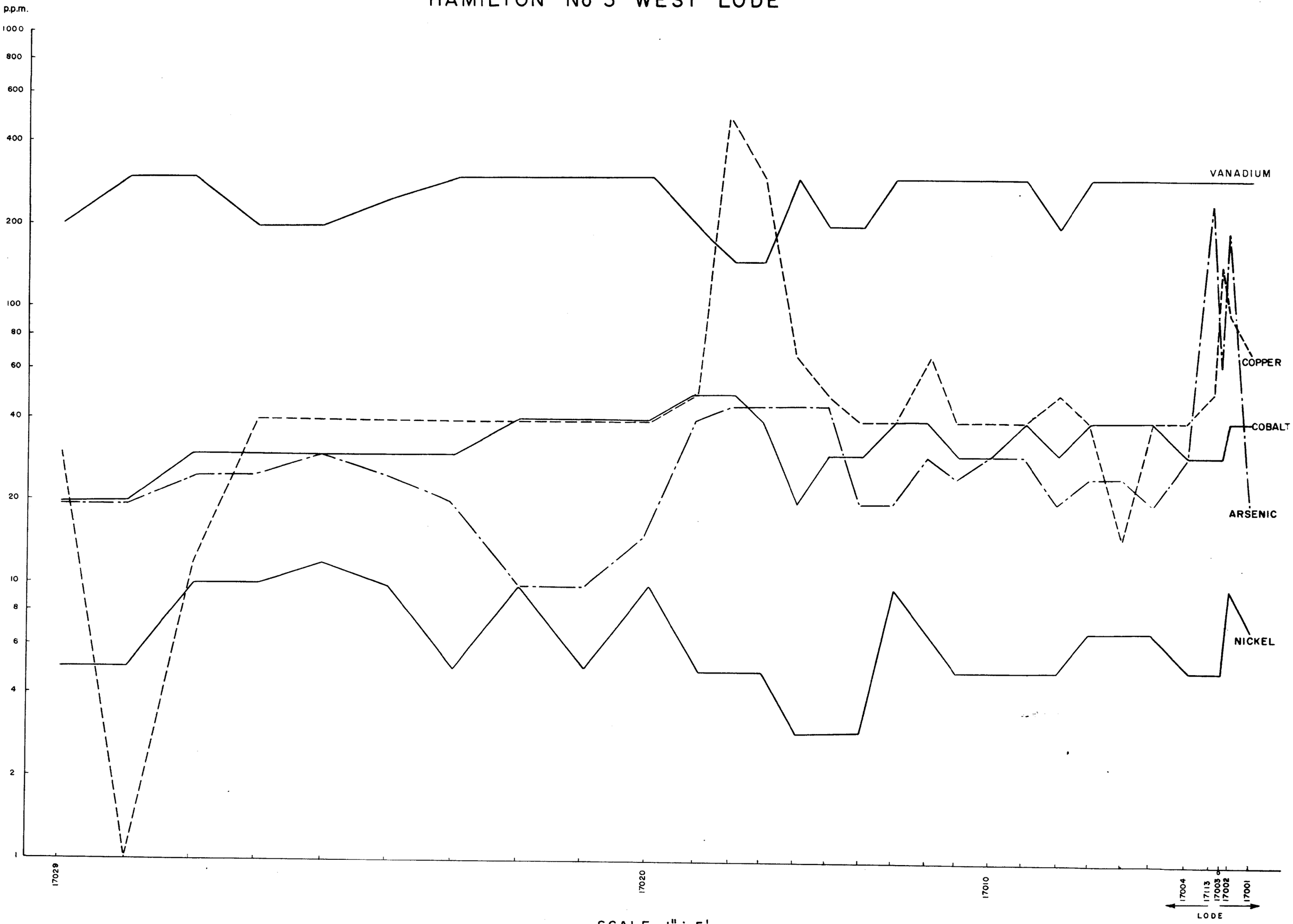
SCALE 1cm : 5'

To accompany Record 1966/97

H51/A/5 JK

Fig. 6.

HAMILTON No 3 WEST LODE



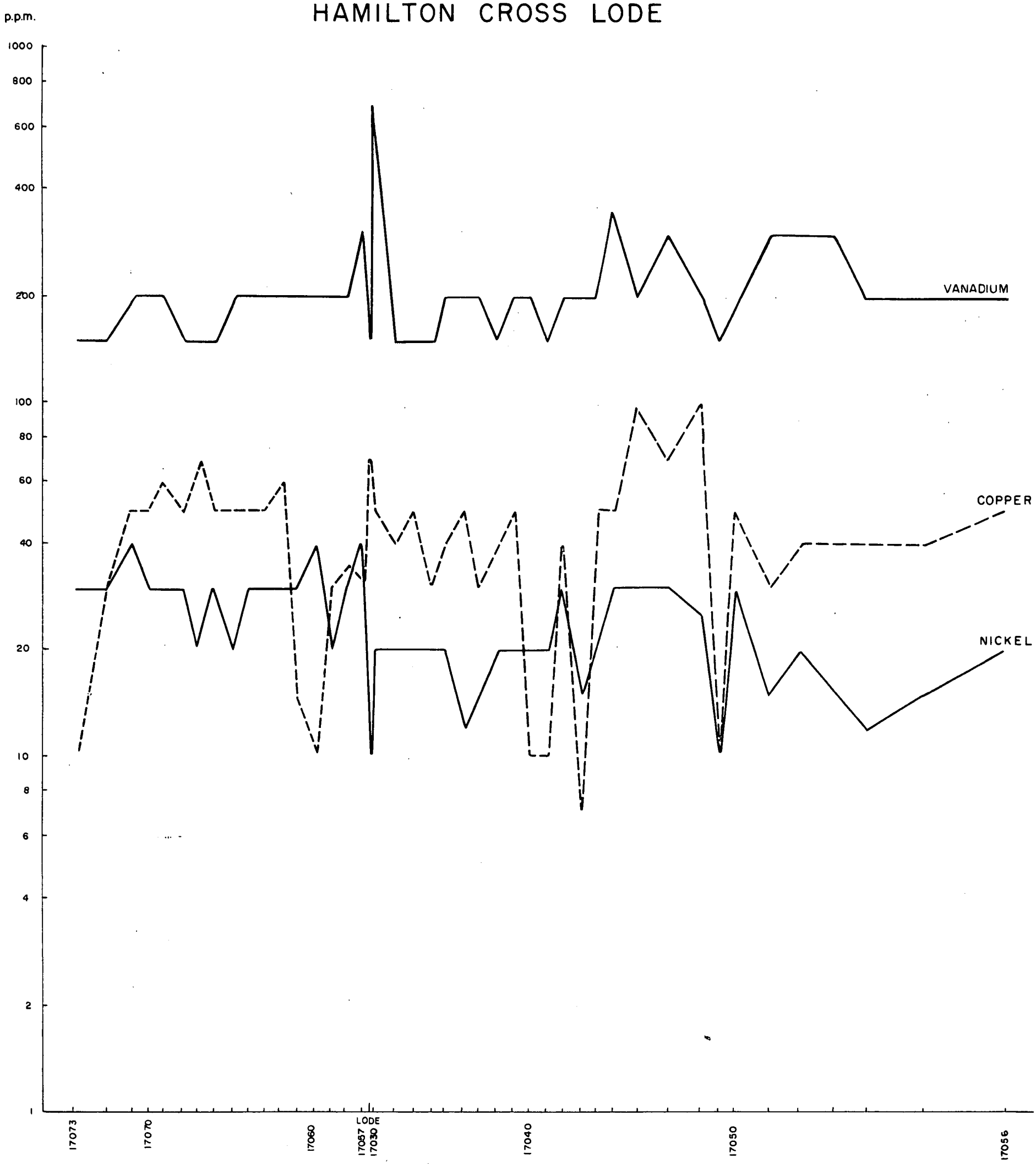
SCALE 1" : 5'

To accompany Record 1966/97

H51/A/6

Fig. 7.

HAMILTON CROSS LODE



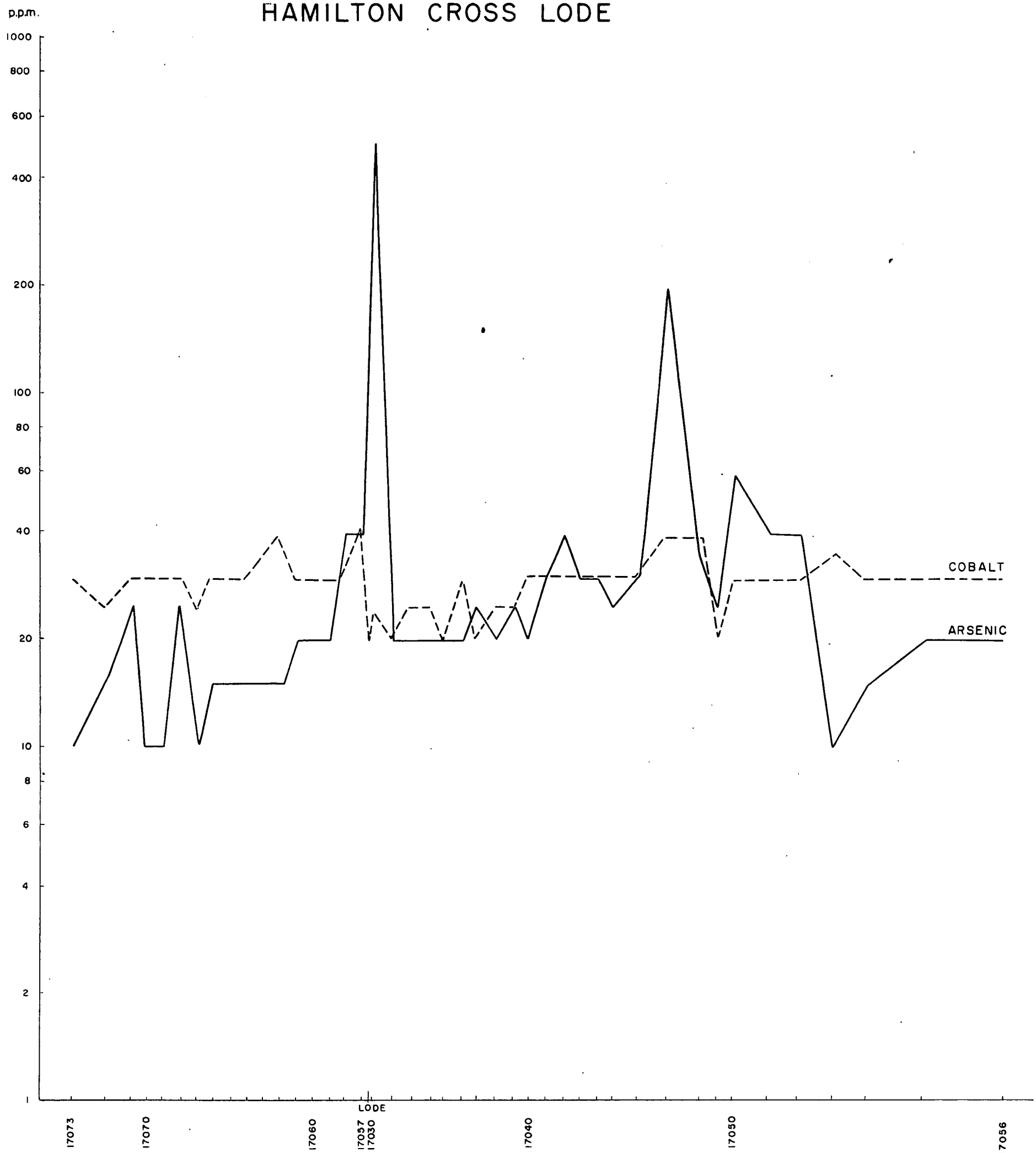
SCALE 1 cm : 5'

To accompany Record 1966/97

H51/A/7 JK

Fig. 8.

HAMILTON CROSS LODE



SCALE 1cm : 5'

To accompany Record 1966/97

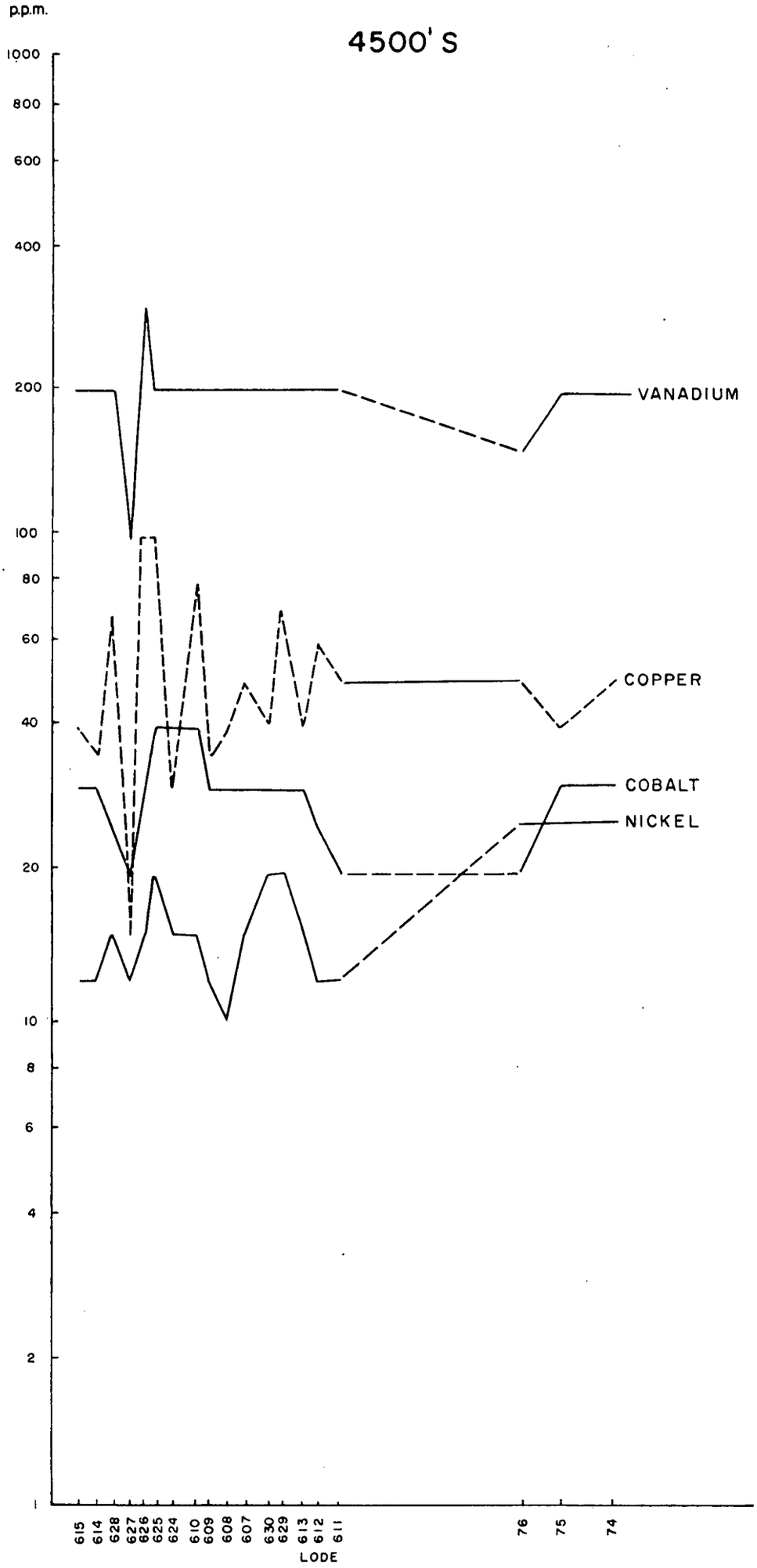
H51/A/8

JK

Fig. 9.

WMC SECTION MAP

4500'S



SAMPLE POINTS

SCALE 1" : 200'

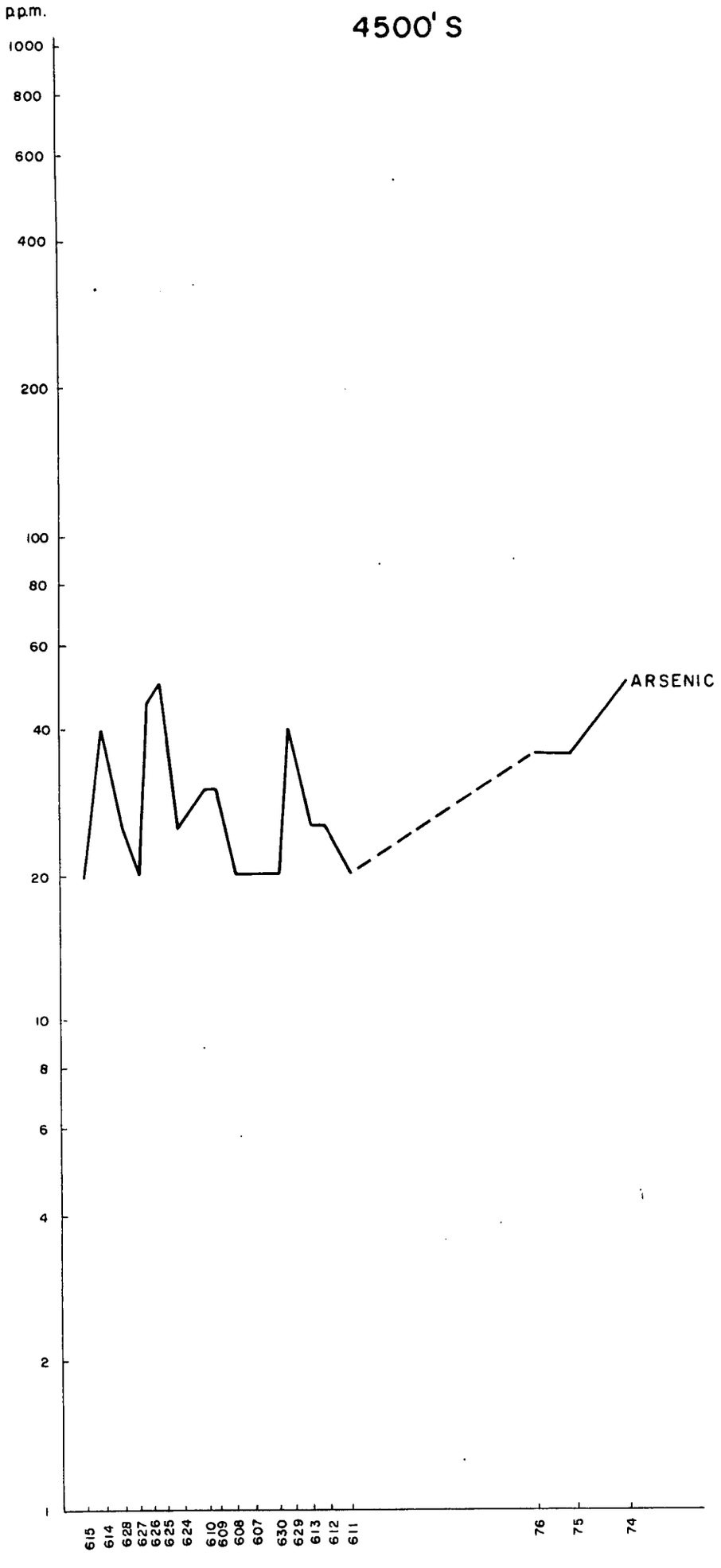
To accompany Record 1966/97

H51/A/9 JK

Fig. 10.

WMC SECTION MAP

4500'S



SAMPLE POINTS

SCALE 1": 200'

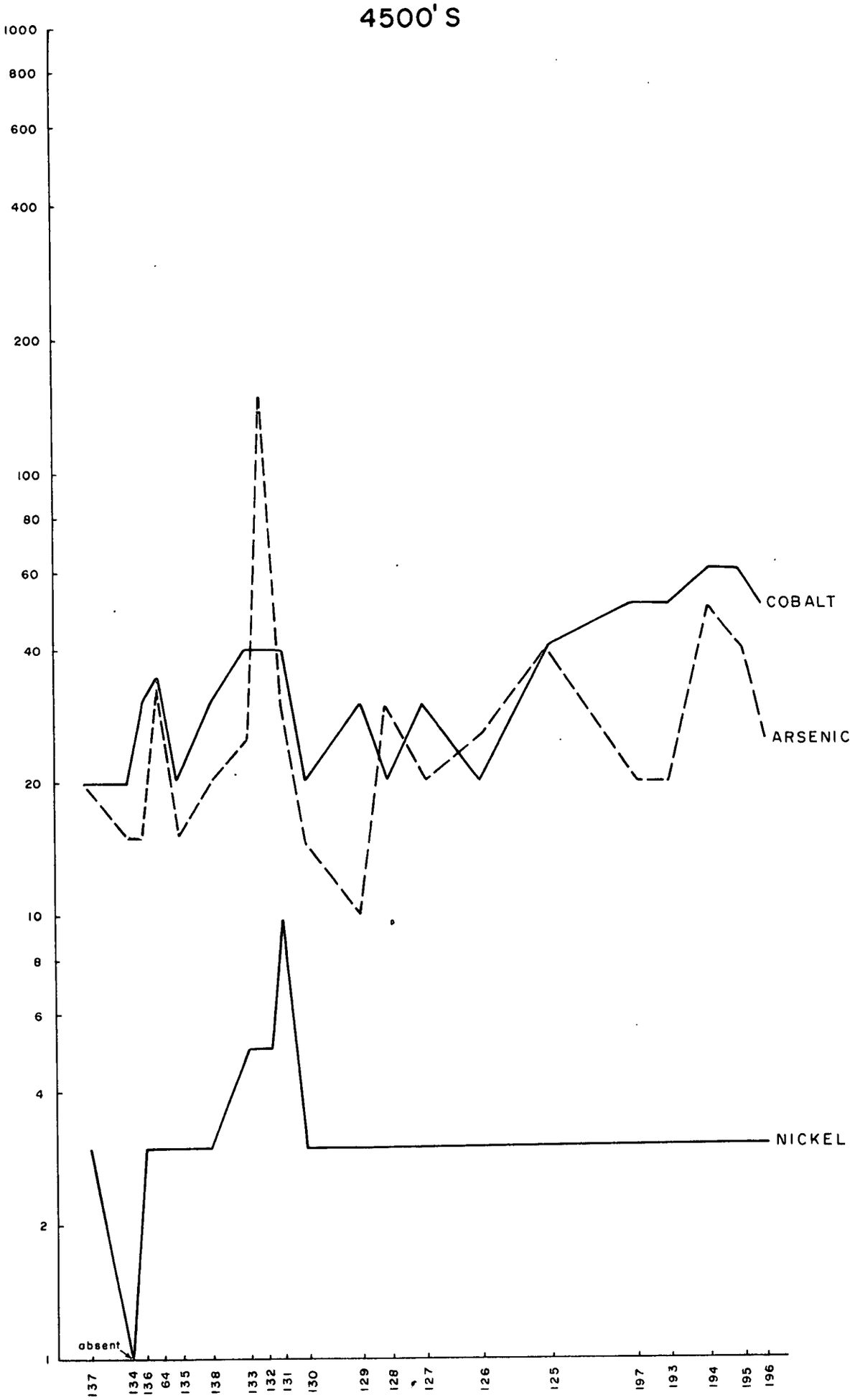
To accompany Record 1966/97

H 51/A/10 JK

Fig. II.

WMC SECTION MAP

4500'S



SAMPLE POINTS

SCALE 1" : 200'

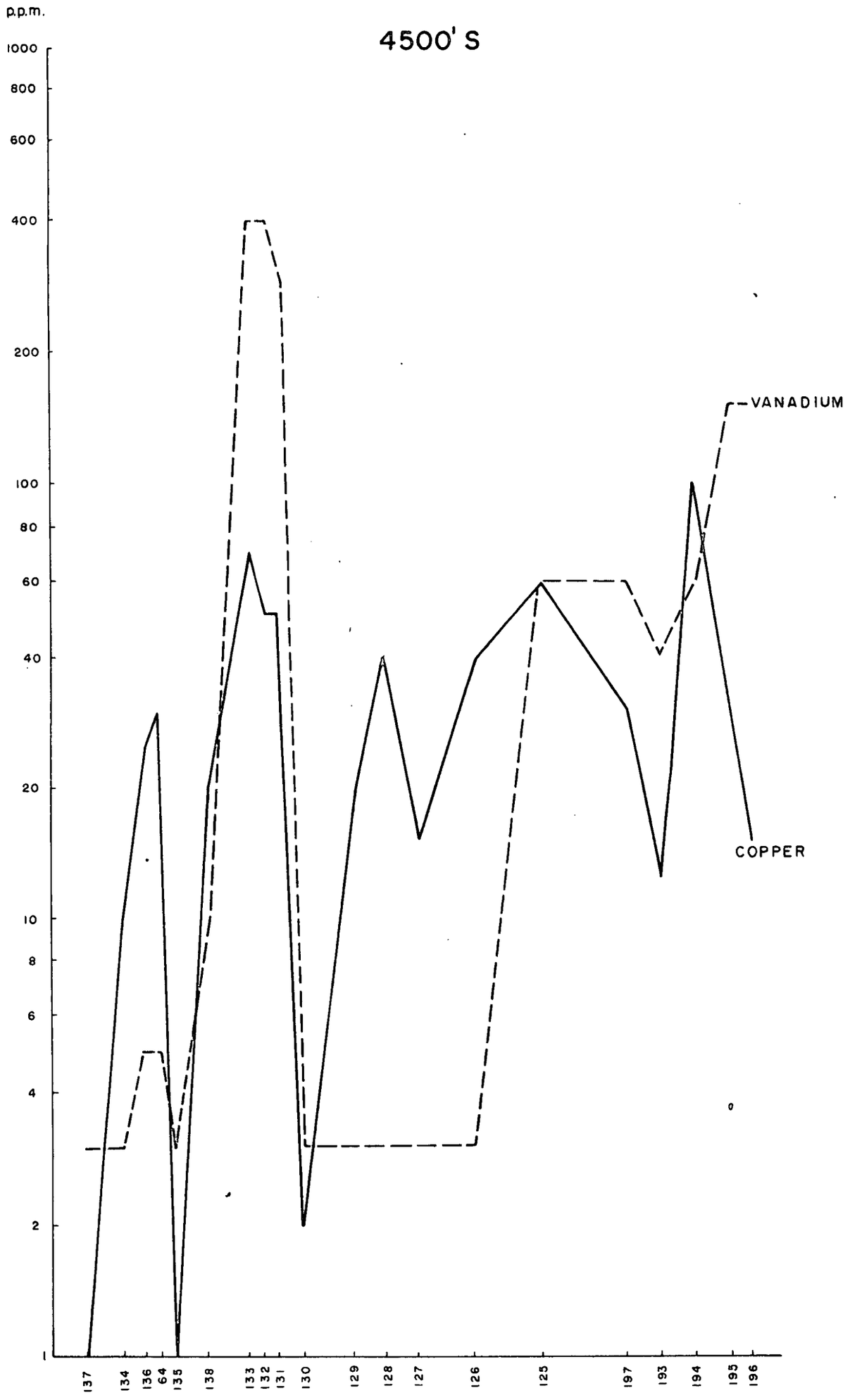
To accompany Reccord 1966/97

H51/A/11

Fig. 12.

WMC SECTION MAP

4500' S



SAMPLE POINTS

SCALE 1" : 200

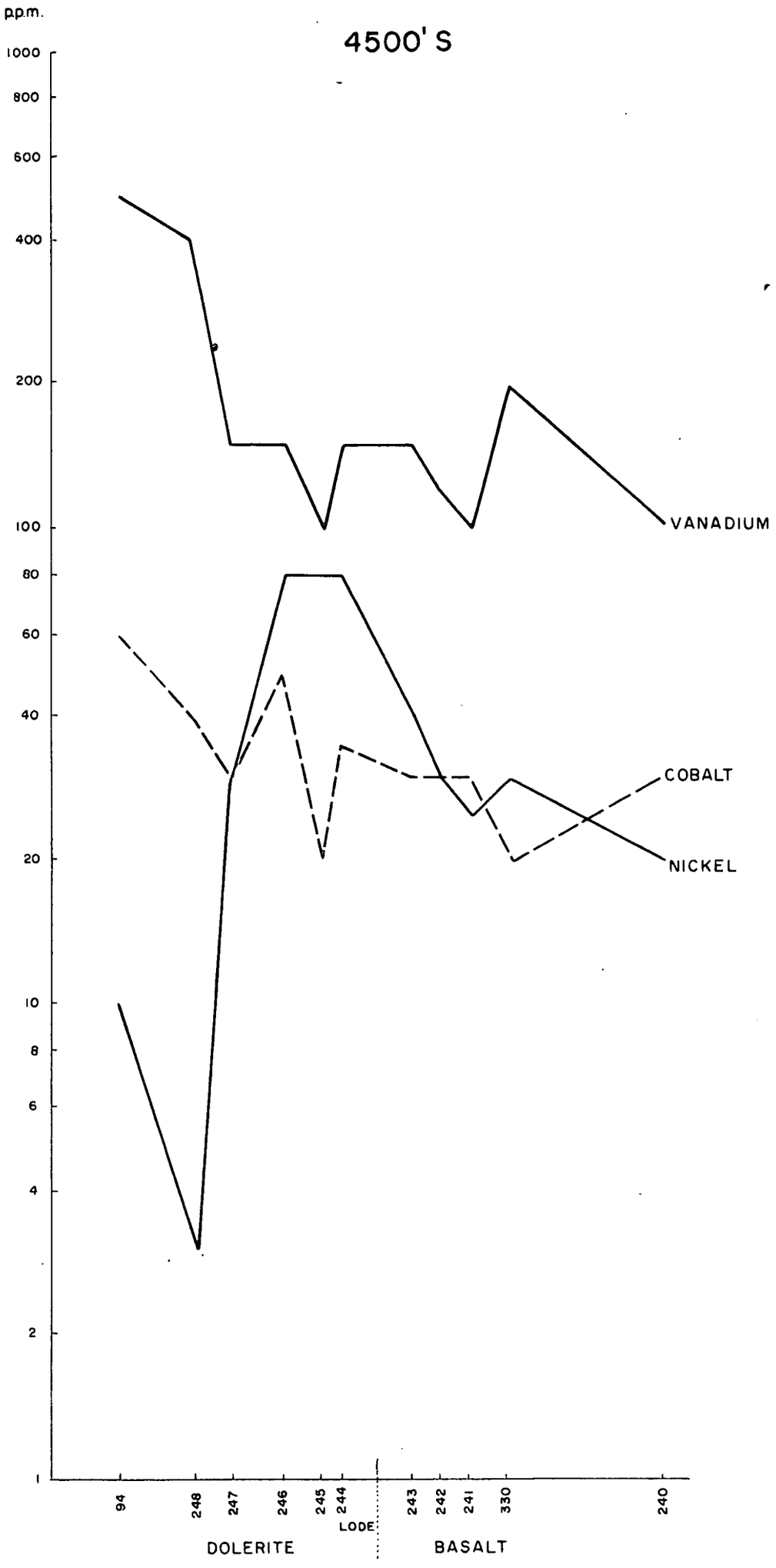
To accompany Record 1966/97

H51/A/12 JK

Fig. 13.

WMC SECTION MAP

4500'S



SAMPLE POINTS

SCALE 1" : 200'

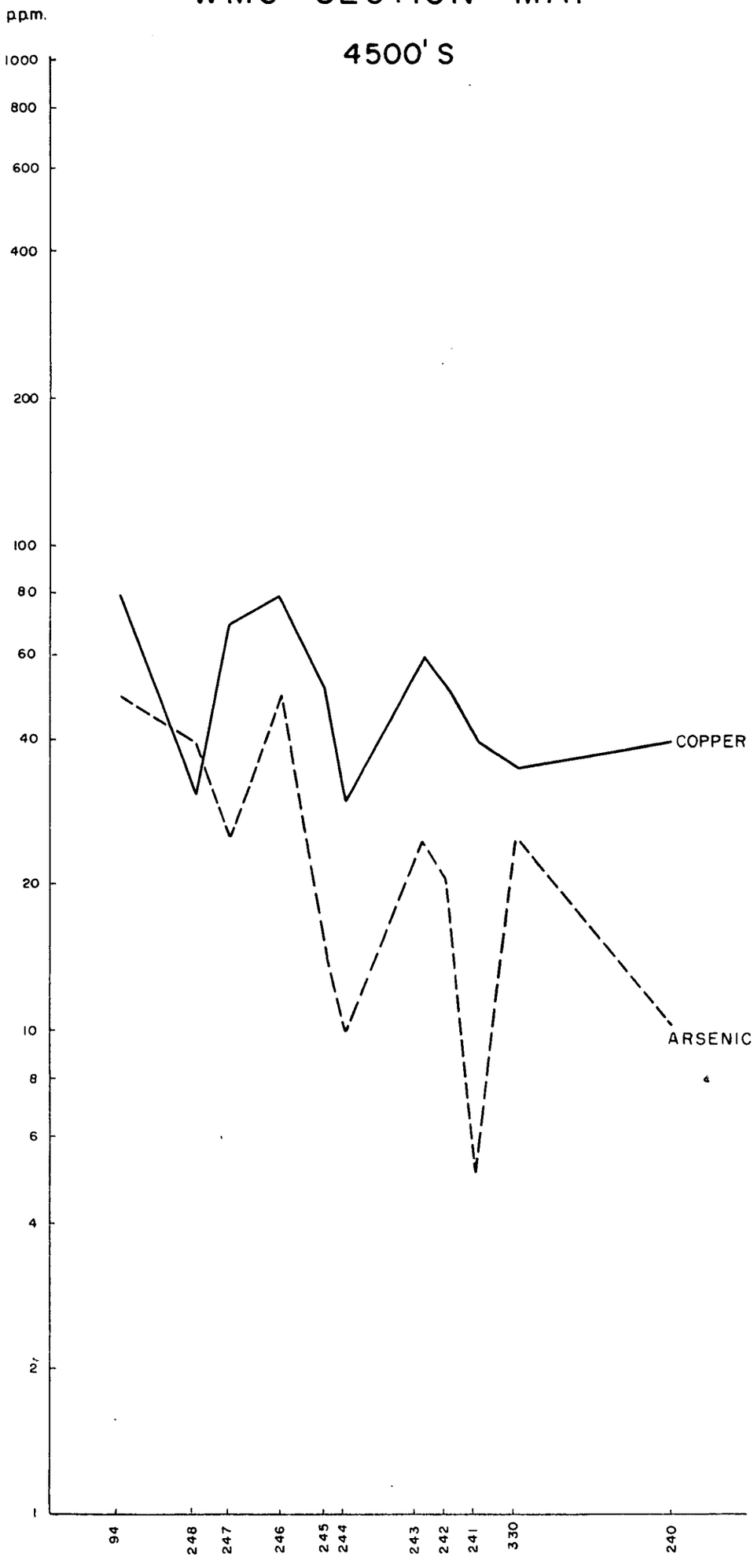
To accompany Record 1966/97

H5!/A/13 JK

Fig. 14.

WMC SECTION MAP

4500'S



SAMPLE POINTS

SCALE 1": 200

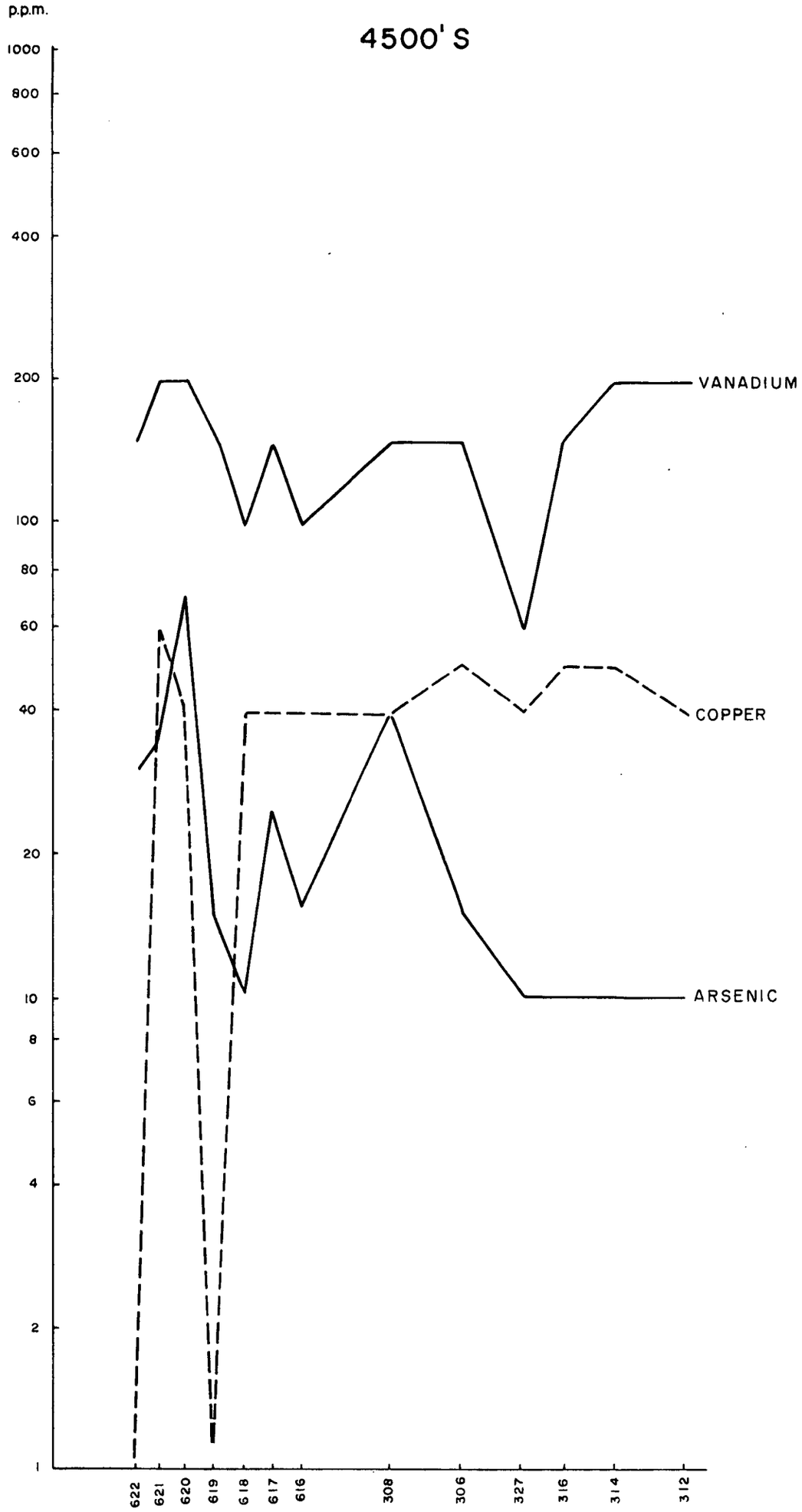
To accompany Record 1966/97

H51/A/14 JK

Fig. 15.

WMC CROSS SECTION MAP

4500'S



SAMPLE POINTS

SCALE 1" : 200'

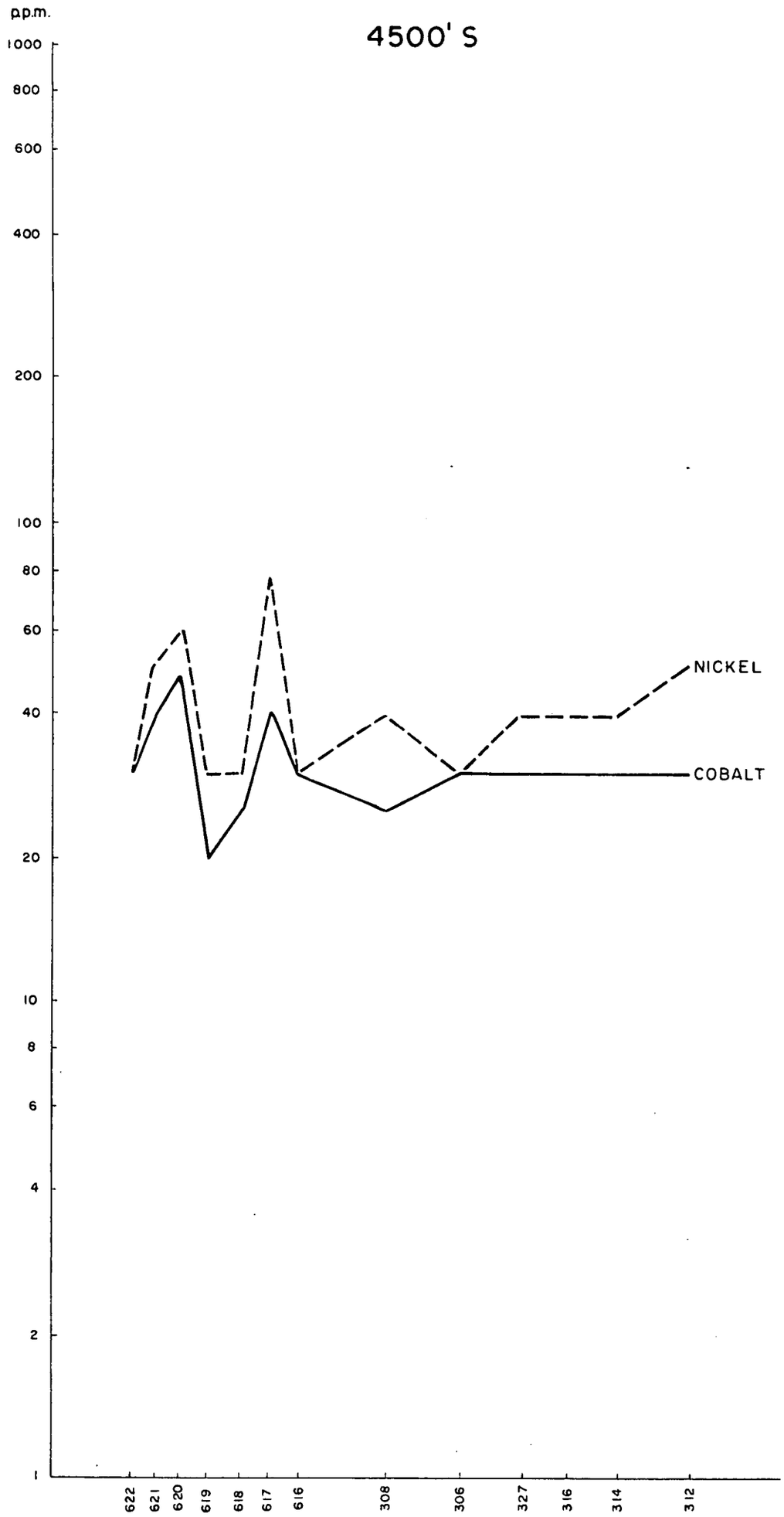
To accompany Record 1966/97

H51/A/15 JK

Fig. 16.

WMC CROSS SECTION MAP

4500' S



SAMPLE POINTS

SCALE 1" : 200'

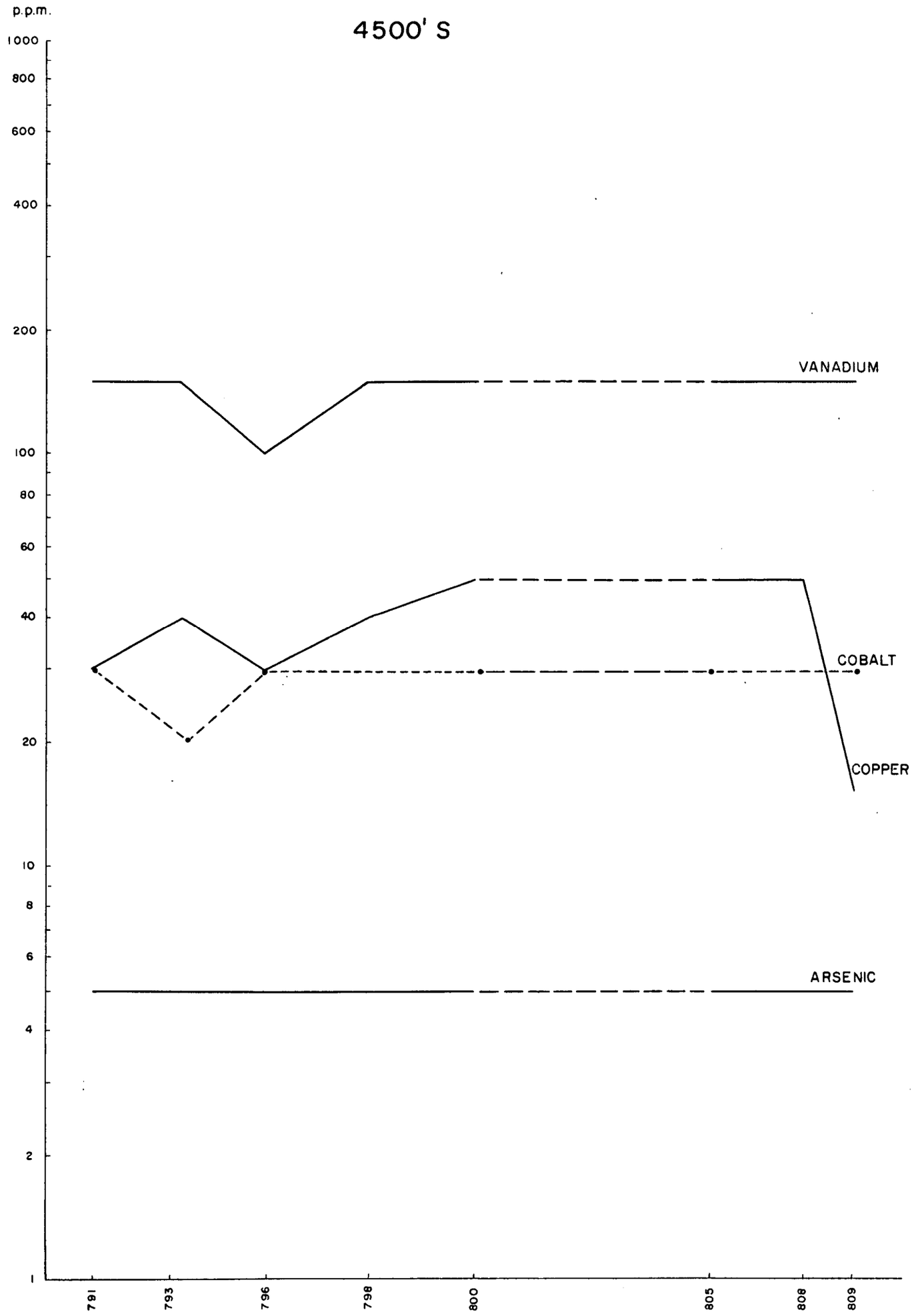
To accompany Record 1966/97

H51/A/16 JI

Fig. 17.

WMC CROSS SECTION MAP

4500' S



SAMPLE POINTS

SCALE 1" : 200'

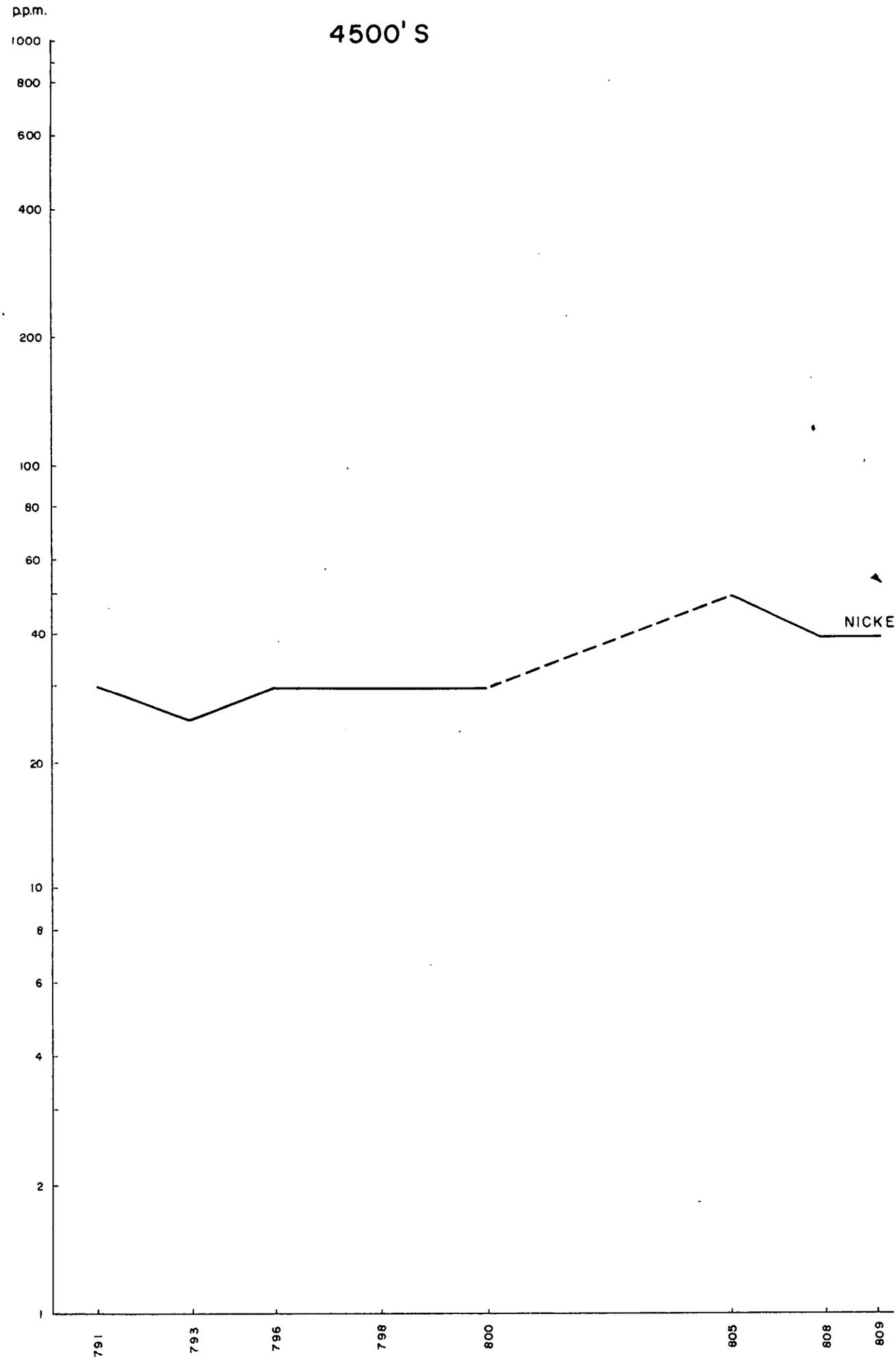
To accompany Record 1966/97

H51/A/17 JI

Fig. 18.

WMC CROSS SECTION MAP

4500'S



SAMPLE POINTS

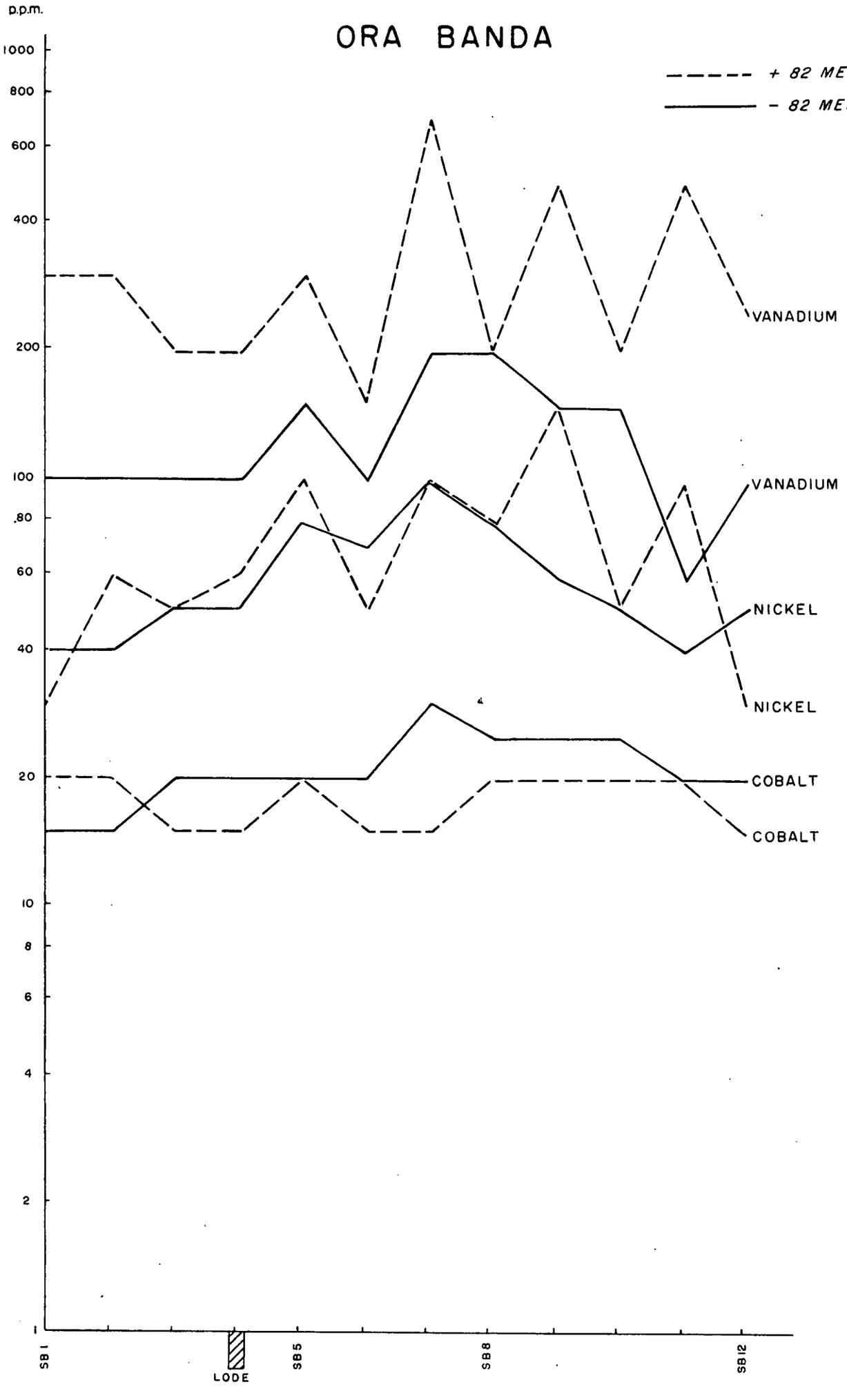
SCALE 1" : 200'

To accompany Record 1966/97

H51/A/18

Fig. 19.

SLEEPING BEAUTY LODE
ORA BANDA

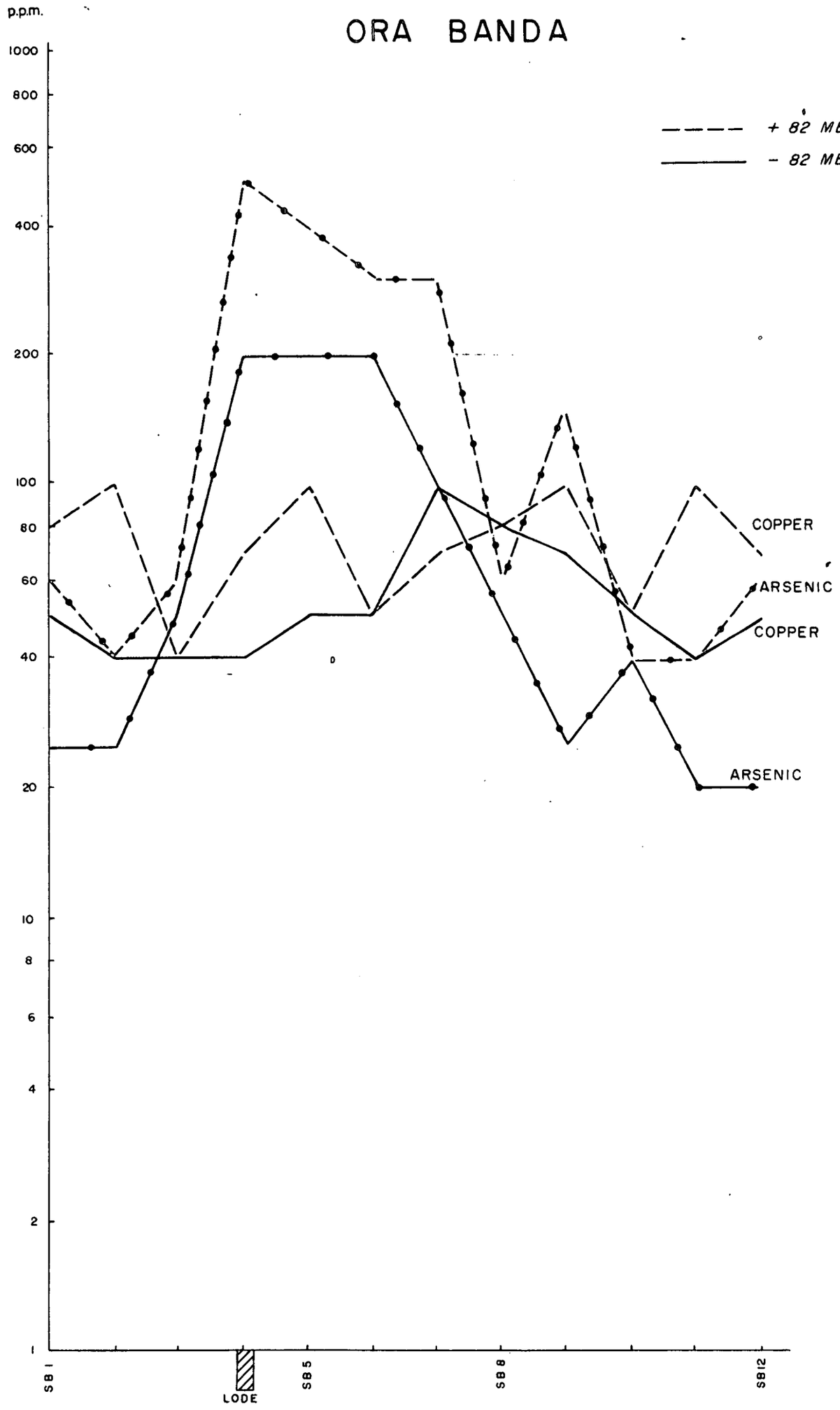


SCALE 1" : 100'

To accompany Record 1966/97

H51/A/19 JH

SLEEPING BEAUTY LODE
ORA BANDA



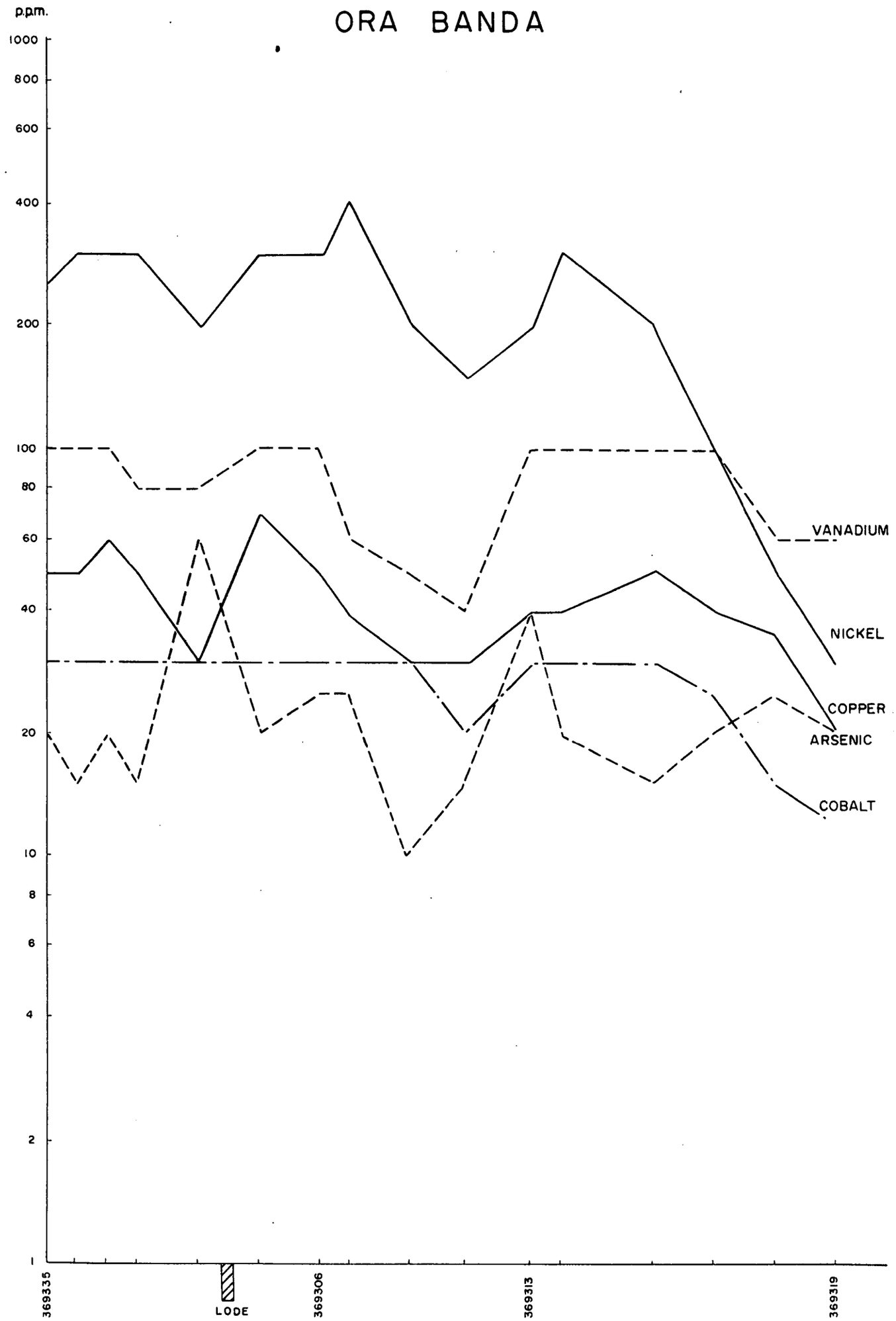
SCALE 1" : 100'

To accompany Record 1966/97

H51/A/20

Fig. 21

SLIPPERY GIMLET LODE
ORA BANDA



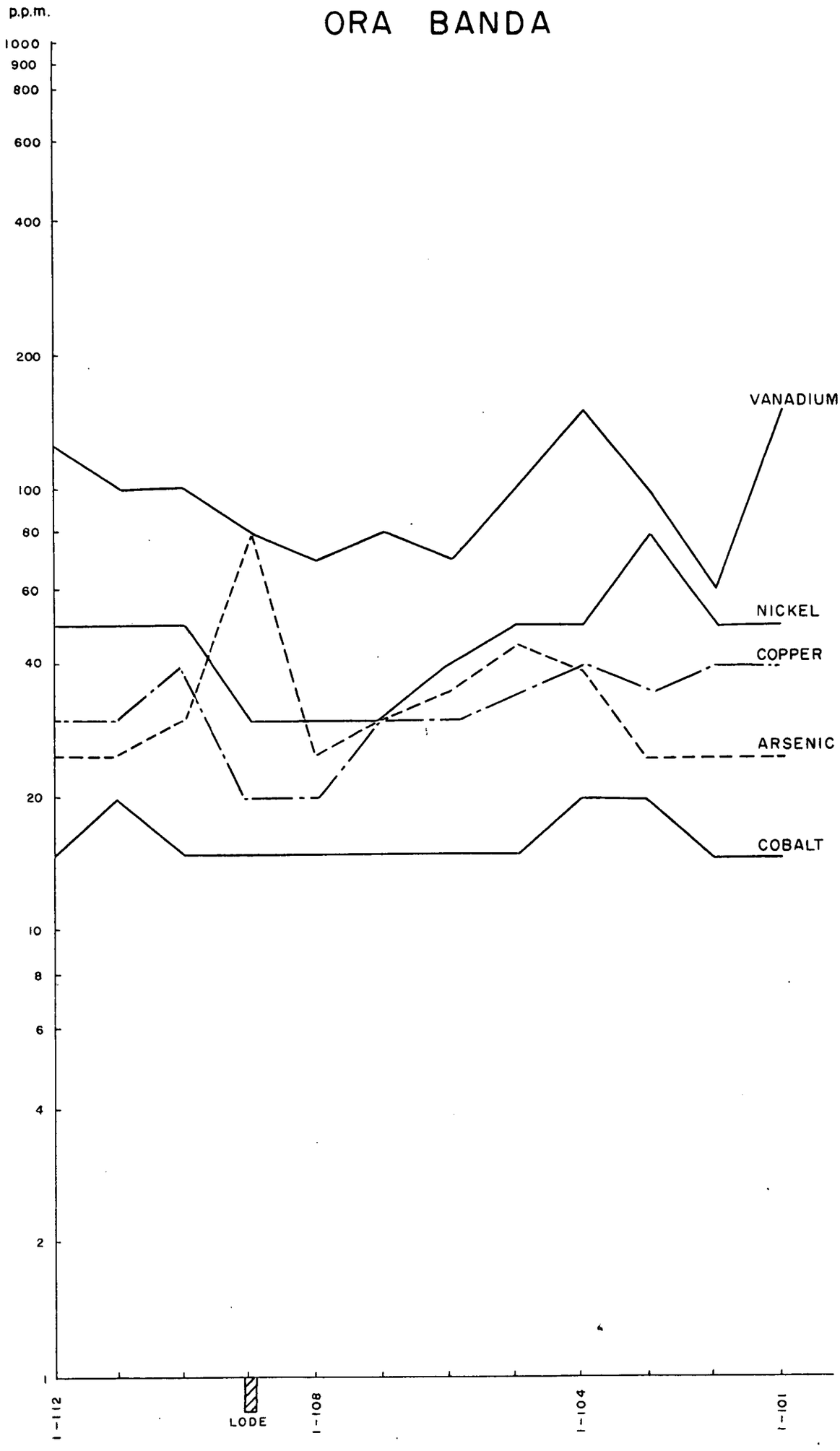
SCALE 1": 100'

To accompany Record 1966/97

H51/A/21 JK

GIMLET SOUTH LODE

ORA BANDA



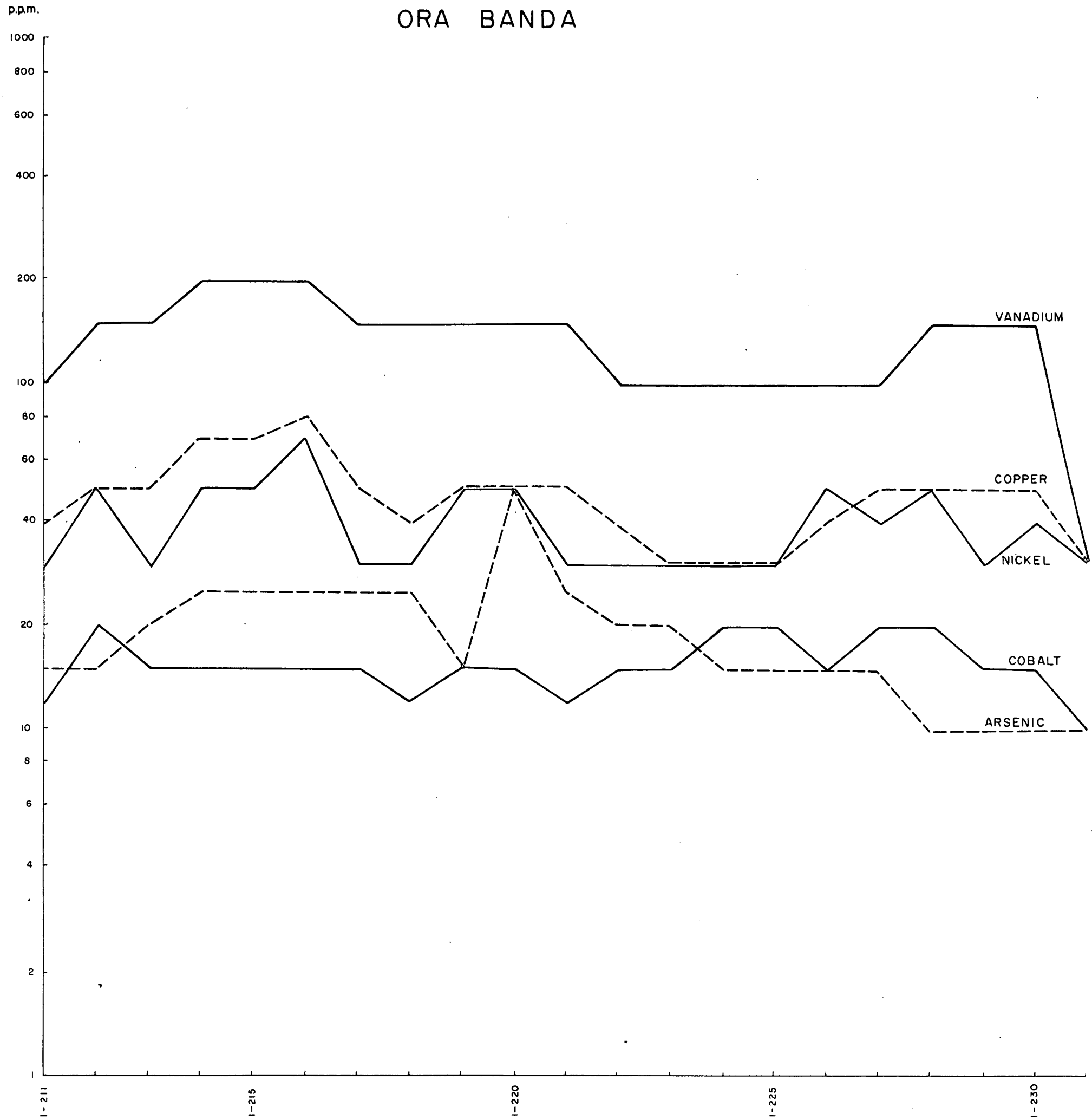
SCALE 1" : 100'

To accompany Record 1966/97

H51/A/22 JK

Fig. 23

NEW AREA
ORA BANDA



SCALE 1": 100'

To accompany Record 1966/97

H51/A/23 JK