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# AUTHORITY TO PROSPECT 207P

## REPORT ON

## INITIAL REGIONAL RECONNAISANCE AND RECOMMENDATIONS FOR CONTINUATION OF WORK PROGRAMME

SAMPEY EXPLORATION SERVICES
PERTH BRISBANE

C197/8-Z

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## 1. INTRODUCTION

This report describes the results of reconnaissance work carried out over the Lower Cambrian Antrim Plateau Volcanics, and local geological investigations over Precambrian sediments within A to P 2077. Recommendations for continuing the exploration programme are put forward and the costs are estimated.

For the sake of clarity, work completed and work recommended have been set out separately.

## 2. WORK COMPLETED

### 2.1 Reconnaissance of Cambrian Volcanics

The Antrim Plateau Volcanics are a series of Lower Cambrian (tholeiitic) lavas, interbedded with sediments including laminated cherts and limestones, and some pyroclastic rocks. The total thickness is thought to be in excess of 800 feet. The volcanics are virtually flat-lying, with some dips of 2-3° to the south-east. Very little deformation has occurred but there are areas of intense shearing within the basalts.

#### 2.1.1 Geological examination of visually located prospects

No visible copper mineralization was located during the initial survey. It is now believed that copper carbonate staining previously reported in the basalts is generally the result of the mis-identification of green zeolite, silicate and clay minerals.

At many localities within the Antrim Plateau Volcanics, there are deposits of semi-precious gemstones, notably agate and prehnite. The most important occurrence of agate is on line VR160 at 7570. Prehnite, a massive green silicate ($Ca_2 Al_2 Si_3 O_{10} (OH)_2$) which usually occurs as infillings in vesicles in lavas, in some places in the A to P forms massive sheets up to 2 inches in thickness. Prehnite deposits found during the reconnaissance are on line VR200-6100 and on the Lochardt Creek crossing on the Mt. Sandford road.

#### 2.1.2 Coarse reconnaissance soil sampling

Approximately 4,500 soil samples have been collected at 200 ft. intervals along 10

traverses, 10 miles apart, across the regional strike of the Antrim Plateau Volcanics. All these samples have been analysed for copper, nickel, cobalt, lead and zinc.

There are no significantly anomalous results for any elements other than copper. The copper results are presented in Figures 2 to 5A inclusive and the results for the other elements are summarised in Figures 6 to 15 inclusive.

Sediments interbedded with basalts in the Antrim Plateau Volcanics have been tested in the field for their phosphate content.

No sedimentary horizon in the Antrim Plateau Volcanics was found to contain any phosphate when tested in the field. However, a limestone analysed in the laboratory yielded 0.12% $P_2O_5$, and a sandstone unit in the Cretaceous rocks overlying the Antrim Plateau Volcanics yielded 0.42% $P_2O_5$.

As a result of the soil sampling programme, 15 areas with anomalous copper values have been located. The locations of these anomalies are shown on Figure 1. Their co-ordinates are included in Table 1. Folding has not affected the Antrim Plateau Volcanics, but fauling (shearing) may be important. There is a close association of the Retreat Spring anomaly (No. 2 on Fig. 1) with a large shear zone. Other anomalies located do not appear to be associated with shear zones, and it is possible that they are related to metal enrichment in individual flows. Anomalous horizons, shown to be present in water boreholes, substantiate this possibility.

## 2.2 Reconnaissance of Precambrian Sediments

The Precambrian rocks within the authority all belong to the Victoria River Group. Underlying the Antrim Plateau Volcanics, they comprise sandstones, siltstones and limestones. They have been extensively folded, and the sandstone members are often strongly jointed (particularly the Jasper Gorge Sandstone). Noteworthy is the Skull Creek Limestone, which outcrops extensively (approximately 400 square miles) within the authority. Galena is found in the Skull Creek Limestone at several localities, but its occurrence appears to bear no relation to any visible feature of the limestone unit.

#### 2.2.1 Colt Prospect

The Colt Prospect is located only 1 mile north of Victoria River Downs Station (Figure 16). Galena is found in cubes of up to 1 inch sides in a white to buff crystalline limestone unit of the Skull Creek Limestone. At this locality the limestone is flat lying.

#### 2.2.2 Battle Creek Prospect

The Precambrian rocks around Battle Creek belong to the Coolibah Formation, and comprise purple and yellow calcareous siltstones (Figure 17). They have been deformed into a series of low amplitude folds, and are generally well jointed. The manganese occurs as nodules and coatings up to one inch thick, principally within the purple unit. In this unit, manganese is also dispersed throughout the groundmass. The nodules analyse at 55% Mn (88% $MnO_2$) and the groundmass at 2% Mn (3.1% $MnO_2$). Manganese occurs as only very thin smears on joint planes in the yellow siltstone, and is also sometimes concentrated as a detrital heavy sand in favourable locations (inside meanders).

### 2.3 Reconnaissance for Uranium

#### 2.3.1 Associated with Cambrian Volcanics

A hand-held scintillometer was carried during the coarse reconnaissance soil sampling work over the Antrim Plateau Volcanics but no obviously anomalous radioactivity was detected. Further work on the evaluation of this data is required.

## 3. RECOMMENDATIONS FOR CONTINUING THE EXPLORATION PROGRAMME

### 3.1 The Antrim Plateau Volcanics

#### 3.1.1 Evaluation of the deposits of semi-precious gemstones

Besides being unusual geologically, gemstones such as agate and prehnite can be used for a variety of lapidary purposes. If found in sufficient quantities, these gemstones can return a considerable sum for very little expenditure.

The market value of prehnite is not known,

but should be ascertained. It could be worth up to 50 cents per pound.

Marketing possibilities for agate should be investigated to allow assessment of the value of the deposit, the viability of which is favoured because of the ease with which these agates could be collected. It is possible that the quality of agate found at this location would sell for 10-15 cents per pound, thereby returning $20,000 to $30,000 per 100 tons. It is estimated that at least 100 acres containing good quality agate were seen at one locality, with the probability that more exists in the vicinity. An estimate, made without any testing, is that it may be possible to collect about a ton per acre.

### 3.1.2 Fine reconnaissance soil sampling

It is recommended that the copper anomalies in the Antrim Plateau Volcanics be investigated by further soil sampling. The possibility of a structural control localising copper mineralization should be checked by additional work in the vicinity of the Retreat Spring anomaly. Of greater importance is the need to confirm or disprove the existence of flows with an unusually high copper content. Within such anomalous horizons, the extent and grade of copper enrichment is likely to be variable. There is, it is estimated, a 1,000 to 1 chance of an orebody. There are other areas in the world where basalts are associated with extensive copper mineralization, e.g. the Portage Lake Lava Series of Michigan (refer Appendix 1).

A stratigraphically aligned orebody of, say, 20 million tons and only 5 feet thick, would have a plan area of about 2 square miles. At 20 feet thick, the plan area would reduce to only half a square mile for the same tonnage.

It should be remembered that the initial spacing of lines at 10 miles apart was designed only to locate areas for detailed investigation. The additional soil sampling is proposed in detail in Table 1 and Appendix 2, and is designed to check whether any of the anomalies located in the initial reconnaissance reflect a stratigraphic unit containing anomalous amounts of copper. Should this be the case anywhere, the soil

sampling should be continued along the strike until the horizon is fully delineated. Sample and line spacing have been planned on the assumption that the target covers only half a square mile.

3.2 Further Evaluation of the Precambrian Sediments

No additional information has become available to allow alteration of the initial proposals as outlined in the recommended work programme dated 15th May, 1969. The possibility of the Skull Creek Limestone being the equivalent of the MacArthur River Group in which have been found extensive stratiform lead-zinc deposits, has been investigated no further. Evaluation of the B.M.R. mapping is not yet available. A deferment of this aspect until January/February, 1970 is suggested, by which time the B.M.R. will have assessed their field work and a visit to Canberra would be needed for discussions.

3.2.1 Colt Prospect

The Colt lead prospect warrants no further local exploration. However, it occurs within the Skull Creek Limestone and lends weight to recommendation 3.2 above.

Stream sediment sampling should be carried out over the Precambrian sediments with special emphasis over the known limestone outcrop area. The target of exploration is possibly quite extensive, and the probable value of such a target, if ore were to be found, would more than justify the exploration cost. This work would be best undertaken during the 1970 dry season, and should be programmed in detail in the light of information gained from a visit to the B.M.R. in Canberra.

3.2.2 Battle Creek Prospect

It is recommended that no further work be carried out on the Battle Creek manganese deposit. The exposed mineralization is not at all extensive, totalling less than 1 square mile. The surrounding plain is covered with alluvium to a depth of about thirty feet, in which manganese nodules still persist. Further exploration would only be possible by drilling the surrounding alluvium. The possible yield from such a programme, considering the type of mineral-

ization already exposed, does not justify the large expense which would be incurred.

3.3 Reconnaissance for Uranium

3.3.1 Associated with the Antrim Plateau Volcanics

The readings obtained on the scintillometer at the coarse reconnaissance soil sampling sites should be plotted and soil samples from selected anomalies should be analysed for uranium. If justified, further work on the ground would be carried out at the same time as that recommended under 3.1.2.

3.3.2 Water reconnaissance for uranium over the whole A to P

It is recommended that water reconnaissance for uranium, as proposed in the initial outline (Stage 3, Phase 6), be undertaken at the onset of the 1969-1970 wet season. A copy of the details of the original recommendation is included as Appendix 3.

## 4. COST ESTIMATES

Set out below is the estimated cost of the work recommended herein.

| | Estimated Cost |
|---|---|
| **4.1 The Antrim Plateau Volcanics** | |
| **4.1.1 Evaluation of the deposits of semi-precious gemstones** | |
| Investigation of the marketing possibilities for agate and prehnite should involve no more than 4 days work (in communications and correspondence) for a senior geologist @ $120 per day | 480 |
| **4.1.2 Fine reconnaissance soil sampling** | |
| Details are set out in Table 1 and Appendix 2. | |
| 116 man days @ $30 per man day (Note: Productivity per man day | 3,480 |

| | Estimated Cost |
|---|---|
| is lower than originally estimated to allow for more access time which has been found, by experience during the coarse reconnaissance soil sampling, to be 50% of direct working time.) | |
| Accommodation 116 man days @ $4 per man day | 464 |
| Vehicle for 60 days @ $20 per day | 1,200 |
| Air fares - two men Brisbane/ Victoria River Downs return | 600 |
| Analysis of an estimated 6,080 samples, plotting of results etc. @ $1.50 per sample | 9,120 |
| Supervision (Travelling expenses $300; senior geologist for 5 days @ $120 per day $600; accommodation $30) | 930 |
| | $15,794 |

4.2 Further Evaluation of the Precambrian Sediments

| | |
|---|---|
| Three to five days senior geologist in Canberra for discussions with B.M.R., @ $120 per day - maximum | 600 |
| Air Fare Perth/Canberra return | 300 |
| Accommodation in Canberra | 50 |
| Three to five days senior geologist in Perth (including preparation of report detailing recommendations with estimated costs) - maximum | 600 |
| | $1,550 |

| | Estimated Cost |
|---|---|
| 4.3 Reconnaissance for Uranium | |
| 4.3.1 Evaluation of radiometry over Antrim Plateau Volcanics | |
| Plotting and assessment | 200 |
| Uranium analyses | 100 |
| | $300 |
| 4.3.2 Water reconnaissance for uranium over the whole A to P | |
| As for Phase 6, initial outline of recommended work, copy of which is included in Appendix 3 | $1,250 |
| The total estimated cost of carrying out the recommendations arising from the initial reconnaissance is | $19,379 |
| Note: Detailed proposals resulting from recommendation 3.2 would be submitted on completion of the further evaluation of the Precambrian sediments in February, 1970. The additional cost of, say, stream sediment sampling 300 square miles could be of the order of | $45,000 |

## 5. CHARGES FOR S.E.S. STAFF

Charges for professional and technical staff will be in accordance with the attached schedule as related to salaries at daily, weekly or monthly rate according to amount of continuous time spent on project.

Consulting is regarded as initial planning by either D. Sampey or D. Zimmerman and preparation of final reports. The remainder is at contracting rates.

## 6. ACCOUNTS

Sampey Exploration Services (hereinafter called the Contractor) will receive, verify, and pay all accounts for supplies, materials, travelling expenses and services in the field. The Contractor will operate, on behalf of Hooker Corporation Limited (hereinafter called the Client), an imprest account for this purpose, commencing with an initial advance of $100 which has already been provided by the Client in June, 1969, and which is held by the Contractor.

Accounts for operating expenses will be presented with a progress statement fortnightly. The Client will then pay forthwith the amount of the invoices listed to bring the amount impressed back to the $100.

On completion of field work and finalising of field accounts, the Contractor will refund the imprest advance of $100 to the Client.

Fees for professional staff will be presented monthly and, for technical staff, fortnightly. These will be summarised on a monthly statement issued on the last day of each month and payment is required within 30 days of the date of the statement.

## 7. RESPONSIBILITY

The Contractor will be sole manager for the project and fully responsible for its execution under the terms of acceptance agreed to by the Client. The Contractor will engage such subcontractors, geophysicist etc. as required, and work within budget limits predetermined by mutual discussion.

## 8. REPORTING

The Contractor will provide monthly progress reports promptly, as well as quarterly review reports. All field staff will report to the Client through either D. Sampey or D. Zimmerman. Sampey and Zimmerman will be available for comment or discussion at any normal time. If detailed reports are required, at least six days notice will be required.

Reports for the Mines Department, as required under State Mining Laws, will be prepared. However, progress expenditure figures will have to be provided by the Client after he has added expenses such as office overheads etc.

9. TERMINATION OF PROGRAMME

The Client may terminate the programme by giving twenty-one days clear notice in writing, by Certified Mail, to the Contractor at P.O. Box 134, Midland, Western Australia 6056. Likewise, the Contractor shall have the right to terminate the contract by giving twenty-one days clear notice in writing, by Certified Mail, to the Client at Box 2724, G.P.O., Sydney, New South Wales 2001.

10. LEGAL AGENTS AND CONSULTING ACCOUNTANTS

The Contractor is represented by :

Robinson, Cox & Co.,
Solicitors,
20 Howard Street,
Perth, W.A. 6000

and

Hendry, Rae & Court,
Accountants,
442 Murray Street,
Perth, W.A. 6000

Prepared by
SAMPEY EXPLORATION SERVICES

per .....
(D. Sampey)
GENERAL MANAGER.

19 May, 1969.

## CONTRACTING - PROFESSIONAL PERSONNEL

| Yearly Salary | | | $4000 | $4500 | $5000 | $5500 | $6000 | $6500 | $7000 | $8000 | $9000 | $10,000 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rate Per | Hour | (.00162)* | 6.50 | 7.30 | 8.10 | 8.90 | 9.75 | 10.50 | 11.40 | 12.50 | 14.00 | 16.00 |
| | Day | (0.01296)* | 52.00 | 58.00 | 65.00 | 71.00 | 78.00 | 84.00 | 91.00 | 100.00 | 113.00 | 130.00 |
| | Week (5 days) | (0.06480)* | 250.00 | 280.00 | 310.00 | 340.00 | 370.00 | 400.00 | 430.00 | 475.00 | 540.00 | |
| | Month (24 days) | (0.31104)* | 1200.00 | 1350.00 | 1480.00 | 1630.00 | 1780.00 | 1930.00 | 2070.00 | 2280.00 | 2580.00 | |

## CONTRACTING - TECHNICAL PERSONNEL

| Weekly Salary | | $50.00 | $55.00 | $60.00 | $65.00 | $70.00 | $75.00 | $80.00 | $85.00 | $90.00 | $95.00 | $100.00 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rate Per | Hour | 3.50 | 3.85 | 4.20 | 4.55 | 4.90 | 5.25 | 5.60 | 5.95 | 6.30 | 6.65 | 7.00 |
| | Day | 28.00 | 30.80 | 33.60 | 36.40 | 39.20 | 42.00 | 44.80 | 47.60 | 50.40 | 53.20 | 56.00 |
| | Week (5 days) | 140.00 | 154.00 | 168.00 | 182.00 | 196.00 | 210.00 | 224.00 | 238.00 | 252.00 | 266.00 | 280.00 |
| | Month (24 days) | 672.00 | 739.20 | 806.40 | 873.60 | 940.80 | 1008.00 | 1075.20 | 1142.40 | 1209.60 | 1276.80 | 1344.00 |

## CONSULTING

| | | D.O. Zimmerman | D. Sampey |
|---|---|---|---|
| Rate Per | Hour | 20.00 | 25.00 |
| | Day | 160.00 | 200.00 |

* Factors by which annual salary is multiplied to arrive at charge rate.

## APPENDIX I

## DISCUSSIONS ON THE ANTRIM PLATEAU VOLCANICS AND COMPARISONS WITH THE PORTAGE LAKE LAVA SERIES OF MICHIGAN

Possible ore controls within the Antrim Plateau Volcanics were outlined at the beginning of the field programme on purely theoretical grounds. They include :

1. Base metal enrichment in individual flows, particularly near the tops of flows where they become vesicular.

2. The alteration of basaltic rocks to spilitic rocks is sometimes associated with mineralization; the presence of spilitic rocks could, therefore, be of interest.

3. Differentiation of basalts can lead to late stage concentrations of metals; any such differentiates could, accordingly, be of interest.

4. Vesicular basalts could act as solution channels for ascending mineralizers.

5. Sediments associated with the volcanics could represent favourable geological environments for the formation of syngenetic mineralization, metals derived from the volcanics being deposited in the sediments.

6. Structural features such as folding and faulting may act to localise any mineralization, either as structural traps (folding) or as solution channels (faulting).

As a result of the initial soil sampling and geological survey, some of these controls can be discarded as inapplicable to the Antrim Plateau Volcanics. No spilitic rocks have been found, and there is no evidence to suggest that the basalts have been differentiated to any marked degree. None of the sediments sampled gave anomalous results. The possible controls remaining are structural (especially shears) and stratigraphic (metal enrichment in individual flows).

The targets which remain, therefore, are individual horizons in lavas (1. above) and favourable structural zones (6. above).

A brief comparison of the Antrim Plateau Volcanics and the Portage Lake Lava Series of Michigan, shows the type of mineralization which may be expected.

The Portage Lake Lavas consist of a series of interbedded lavas and sediments from which native copper has been mined for many years. The copper occurs in amygdaloidal basalts, and in felsitic "conglomerates". The amygdaloidal basalts have quartz, prehnite, epidote and calcite as well as some zeolites filling vesicles. These secondary minerals are all found filling vesicles in the Antrim Plateau Volcanics.

Stoiber and Davidson (1959) suggest that these secondary minerals may be spatially associated in some way with the copper mineralization of the Portage Lake Lavas. A complete description of the geology of the Michigan copper deposits is found in Reference (1).

It would be perilous, however, to take the comparison between the two areas too far. There are several important features of the Portage Lake Lavas which are not found in the Antrim Plateau Volcanics. The Portage Lake Lavas are steeply dipping, providing solution channels for any ascending "mineralized solutions". These "channels" will extend to a considerable depth. The Antrim Plateau Volcanics are virtually flat-lying, and so solution channels of this type are unlikely to extend to any significant depth.

The Portage Lake Lavas are also associated with a major fault zone, related to the Keweenaw Fault, again providing major solution channels and favourable pressure zones for mineralization.

Although the mineralization cannot be proved to be related to these fault zones in all cases, it is thought that these faults may have played a significant role in localizing some ore bodies.

The Portage Lake Lavas have basic felsite intrusives associated with them. The Antrim Plateau Volcanics have no associated intrusive bodies. Again, the actual significance of these intrusive bodies is not known, and they may or may not be important.

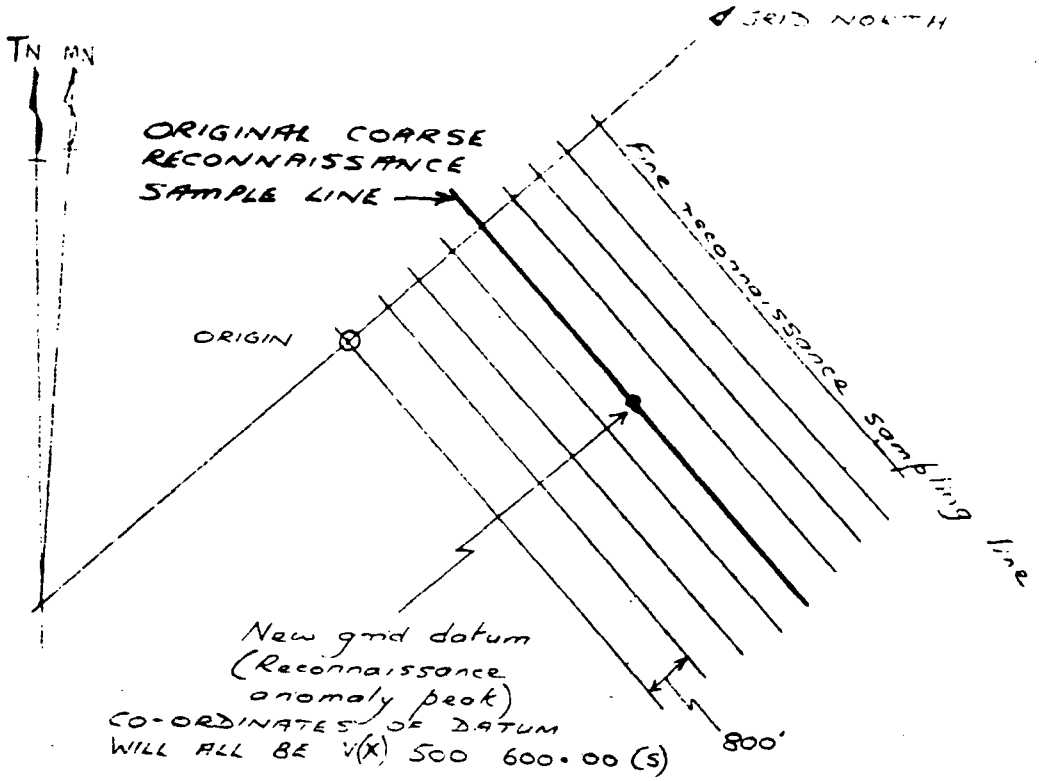
The comparison between the two areas is only useful as a general guide to exploration of the Antrim Plateau Volcanics. It provides a background against which potential target areas may be evaluated geologically, with the knowledge that there are other areas in the world where basalts are associated with extensive copper mineralization.

REFERENCES


| | | | |
|---|---|---|---|
| (1) | Broderick T.M., Hohl C.D. and Eidemiller H.N. | 1946 | Recent contributions to the geology of the Michigan copper district. Econ. Geol., V.41, p.p. 675-725 |
| (2) | Randal M.A. and Brown M.C. | 1967 | The geology of the Northern part of the Wiso Basin, Northern Territory. Bureau of Mineral Resources Geology and Geophysics Records 1967/110. |
| (3) | Stoiber R.E. and Davidson E.S. | 1959 | Amygdale mineral zoning in the Portage Lake Lava Series, Michigan copper district. Econ. Geol., V.54, p.p. 1250-1277 and 1444-1460. |

# APPENDIX 2

## DIAGRAMMATIC ILLUSTRATION OF RECOMMENDED GRID LAYOUTS FOR FINE RECONNAISSANCE SOIL SAMPLING




The portion of the fine reconnaissance lines sampled will vary between grids as the length of line sampled will encompass the extents indicated in Table 2.

1. This allows for 49,000 feet of sampling grid north of the datum and 50,000 feet of sampling grid south. It also allows for 60,000 feet of sampling grid west of the datum and 39,000 feet of sampling grid east of the datum. Furthermore, the sample interval can be closed to 1 foot without having to renumber samples.

2. Sample intervals of 100 feet at line separation of 800 feet gives about 1 sample per 20,000 square feet.

3. New grid north corresponds to initial grid north, i.e. 049° M.

4. The number of new lines on each grid is indicated in Table 1.

## APPENDIX 3

## COPY OF INITIAL OUTLINE OF RECOMMENDED WORK PROGRAMME FOR WATER RECONNAISSANCE FOR URANIUM

A useful method of screening large areas for uranium mineralization is to collect water samples at a density of about one sample for 200 square miles. The water is passed through an ion exchange resin which extracts all of the dissolved salts (including uranium) from the water. The resin samples are then ashed and analysed for uranium.

The best time for carrying out this type of survey is immediately after the streams start to flow at the beginning of the wet season.

This is a very coarse screening method. During 1955 in a four day field trip catchment basins found to be potentially uraniferous were outlined using this method in the South Alligator River area. To date no uranium mineralization has been found outside the areas indicated by this 1955 survey. The results of this survey have not been published.

### Estimated Costs

| | |
|---|---|
| Estimated six days for two men to complete the field work - 12 man days @ $30 per man day | 360 |
| Vehicle - 6 days @ $20 per day | 120 |
| Accommodation - 12 man days @ $4 per man day | 50 |
| Transport (air fares) Brisbane/Victoria River Downs return | 600 |
| Analysis of and plot 20 samples @ $6 each | 120 |
| | $1,250 |

## APPENDIX 4

## CALENDAR OF RECOMMENDED WORK AND COST ESTIMATE

| Date | Description of Work Recommended | Estimated Cost |
|---|---|---|
| October/November 1969 | Uranium prospecting (3.3.1, 3.3.2) | $ 1,550 |
| December/January 1969/1970 | Assessing market for semi-precious stones (3.1.1) | $ 500 |
| February/March 1970 | Evaluation of B.M.R. work and planning of reconnaissance over areas of Precambrian rocks (3.2) | $ 2,000 |
| Dry Season 1970 | Fine reconnaissance soil sampling for copper mineralization in volcanics (3.1.2) | $16,000* |
| | Drainage reconnaissance in areas of Precambrian rocks | Of the order of $45,000* |
| | Details of this work would be prepared during February/March as noted above. | |

*Note: These two items would be carried out at a monthly expenditure of approximately $11,000.

C197/8-(2)

9 October 1969

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WORK PROGRAMME

TABLE 1

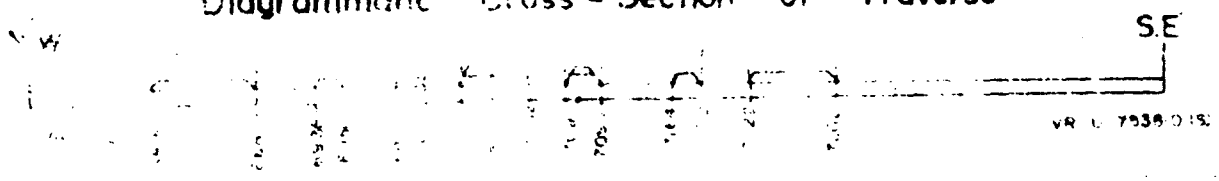
| ANOMALY No. | LINE No. (VR) | GRID CO-ORDINATES (original sample grid) | Peak Cu (ppm) | Contrast Ratio | NEW GRID DATUM POINT | NEW CO-ORDINATES OF DATUM | Length of New Lines | No. of New Lines | No. of Samples | Man days required | ANOMALY NAME |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 170 | 6690-6868.0 (S) | 230 | 12 | VR170 6844.0(S) | MC500 600.00(S) | 14,000 | 10 | 1,400 | 28 | Middle Creek |
| 2 | 190 | 6066-6184.0 (S) | 120 | 5 | VR190 6074.0(S) | RS500 600.00(S) | 10000 | 10 | 1,000 | 20 | Retreat Spring |
| 3 | 200 | 6956-6970.0 (S) | 105 | 6 | VR200 6958.0(S) | BC500 600.00(S) | 4,000 | 8 | 320 | 6 | Bull Creek |
| 4 | 200 | 6522-6528.0 (S) | 70 | 5 | VR200 6524.0(S) | MO500 600.00(S) | 3,000 | 8 | 240 | 4 | Mt. Compton |
| 5 | 200 | 6032-6042.0 (S) | 75 | 5 | VR200 6034.0(S) | GC500 600.00(S) | 3000 | 8 | 240 | 4 | George Creek |
| 6 | 190 | 7194.0 (S) | 140 | 5 | VR190 7194.0(S) | CC500 600.00(S) | 1,000 | 4 | 40 | 1 | Coolibah Creek |
| 7 | 150 | 8216-8240.0 (S) | 150 | 5 | VR150 8236.0(S) | MN500 600.00(S) | 3,000 | 8 | 240 | 4 | Mt. Northcote |
| 8 | 190 | 7324-7336.0 (S) | 100 | 4 | VR190 7326.0(S) | CY500 600.00(S) | 3,000 | 8 | 240 | 4 | Companion Yard |
| 9 | 160 | 7082-7094.0 (S) | 80 | 4 | VR160 7092.0(S) | MR500 600.00(S) | 8,000 | 8 | 640 | 12 | Mt. Crawford |
| 10 | 180 | 6926-6936.0 (S) | 70 | 3.5 | VR180 6932.0(S) | WC500 600.00(S) | 4,000 | 8 | 320 | 6 | Water-bag Cree |
| 11 | 190 | 7010-7052.0 (S) | 90 | 3 | VR190 7050.0(S) | ST500 600.00(S) | 4,000 | 8 | 320 | 6 | Shoeing Tool |
| 12 | 160 | 7194-7188.0 (S) | 60 | 3 | VR160 7190.0(S) | PH500 600.00(S) | 5,000 | 8 | 400 | 8 | Pigeon Hole |
| 13 | 110 | 6948-0 (S) | 90 | 3 | VR110 6948.0(S) | FC500 600.00(S) | 1,000 | 4 | 40 | 1 | Fever Creek |
| 14 | 110 | 7008-7026.0 (S) | 70 | 2 | VR110 7010.0(S) | MB500 600.00(S) | 4,000 | 8 | 320 | 6 | Mt. Baines |
| 15 | 110 | 7224-7236.0 (S) | 70 | 2 | VR110 7226.0(S) | MS500 600.00(S) | 4,000 | 8 | 320 | 6 | Mt. Sandford |
| | | | | | | TOTALS: | | | 6,080 | 116 | |

AUTHORITY TO PROSPECT 2077
REPORT ON REGIONAL RECONNAISSANCE
AND
RECOMMENDATIONS FOR CONTINUATION OF
WORK PROGRAMME

TABLE 2

| ANOMALY | | ANOMALY EXTENT (feet) | |
|---|---|---|---|
| NAME AND NUMBER | | GRID WESTERLY OF DATUM | GRID EASTERLY OF DATUM |
| 1 | Middle Creek | 7,500 | 2,500 |
| 2 | Retreat Spring | 1,000 | 7,000 |
| 3 | Bull Creek | 500 | 1,500 |
| 4 | Mount Compton | 200 | 800 |
| 5 | George Creek | 200 | 1,300 |
| 6 | Coolibah Creek | 200 | 200 |
| 7 | Mount Northcote | 200 | 800 |
| 8 | Companion Yard | 200 | 800 |
| 9 | Mount Crawford | 4,500 | 500 |
| 10 | Waterbag Creek | 1,600 | 400 |
| 11 | Shoeing Tool | 2,000 | 500 |
| 12 | Pigeon Hole | 2,500 | 500 |
| 13 | Fever Creek | 200 | 200 |
| 14 | Mount Baines | 200 | 1,800 |
| 15 | Mount Sandford | 200 | 1,800 |

## Diagrammatic Cross - Section of Traverse

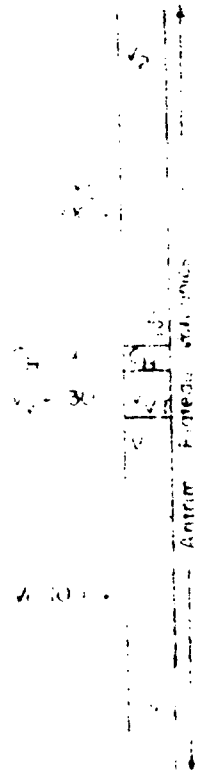



Scale 1" = 2.5 miles (V.E. x 10)

## Average Metal Content of Soils (p.p.m.)

| Horizon | COPPER | NICKEL | COBALT | LEAD | ZINC |
|---|---|---|---|---|---|
| V2 | 35 | 60 | 39 | 34 | 59 |
| CH | 20 | 37 | 39 | 31 | 20 |
| VBT. | 25 | 50 | 22 | 21 | 40 |
| V1 | 19 | 65 | 30 | 18 | 30 |

### Stratigraphic Column



### Description of rock types

[illegible] porphyritic basalt, forms isolated mesas. Flat lying, [illegible] the surface is speckled with white (feldspar) [illegible] crystals.

[illegible] net

[illegible] basalt, top of V2. Free silica minerals, quartz, jasper, some zeolites.

Pisolitic, fine-grained basalt, equigranular, weathered in places, forms extensive flat plains.

| HOOKER CORPORATION LTD. | |
|---|---|
| TRAVERSE No. VR110 GEOLOGICAL VALUES AND GEOLOGICAL SECTION | |
| | Fig. 6 |
| Date 10-10-1969 | |

Prepared by S.E.S.

# Diagrammatic Cross - Section of Traverse

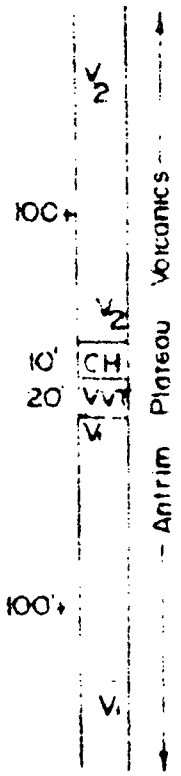
VR 120 7654 0(S) VR 120 8062 0(S)

Scale : 2 5 miles (V.E x 10)

## Average Metal Content of Soils (p.p.m)

| Horizon | COPPER | NICKEL | COBALT | LEAD | ZINC |
|---|---|---|---|---|---|
| V. | 11 | 14 | 23 | 19 | 18 |

Stratigraphic Column




Description of rock types.

Some brown porphyritic basalt as line 110.

Laminated chert.
Vesicular basalt, some free silica minerals.

These rocks are present but not on the line itself

Purple, fine - grained basalt.

HOOKER CORPORATION LTD.

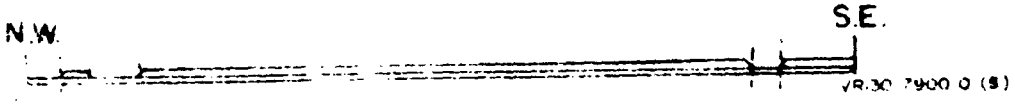
TRAVERSE No. VR120.
GEOLOGICAL VALUES
AND
GEOLOGICAL SECTION

Fig. 7.

Date [illegible] 1969.

[illegible]ared by J. E. S.

## Diagrammatic Cross Section of Traverse

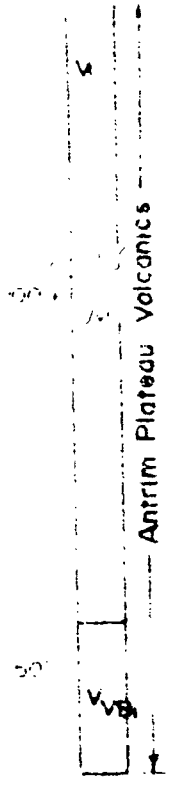



Scale 1" = 2 5 miles (V.E. x 10)

## Average Metal Content of Soils (p.p.m)

| Horizon | COPPER | NICKEL | COBALT | LEAD | ZINC |
|---|---|---|---|---|---|
| $V_1$ | 13 | 23 | 23 | 21 | 16 |
| $V_{VB}$ | 16 | 23 | 23 | 23 | 22 |

Stratigraphic Column




Description of rock types.

$V_1$ Purple fine grained basalt.

$V_{VB}$ Vesicular basalt base of $V_1$

| HOOKER CORPORATION LTD. | |
|---|---|
| TRAVERSE No. VR 130. GEOLOGICAL VALUES AND GEOLOGICAL SECTION | |
| | Fig. 8. |
| Date. 10-10-1969. | |

Diagrammatic ... - Section of Traverse

N.W. S.E.

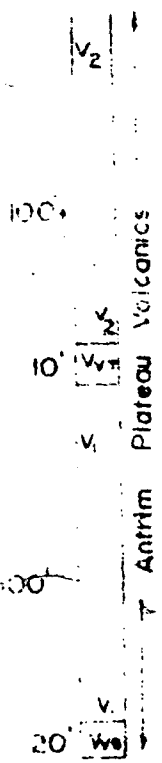
Scale 1" = 2.5 miles (V.E. = 10)

## Average Metal Content of Soils (p.p.m)

| Horizon | COPPER | NICKEL | COBALT | LEAD | ZINC |
|---|---|---|---|---|---|
| $V_2$ | 20 | 21 | 19 | 21 | 22 |
| $V_{ST}$ | 22 | 22 | 20 | 20 | 22 |
| $V_1$ | 21 | 23 | 25 | 21 | 27 |
| VBB | 23 | 38 | 27 | 24 | 28 |

**Stratigraphic Column**

**Description of rock types**




Porphyritic brown basalt speckled in weathered specimen

Vesicular basalt, free silica minerals

Fine grained purple basalt, some epidolization

Vesicular basalt, some zeolites

HOOKER CORPORATION LTD.

...ERTE No VR-40

...LOGICAL VALUES

AND

...SECTION

Fig. 9

# Diagrammatic Cross Section of Traverse

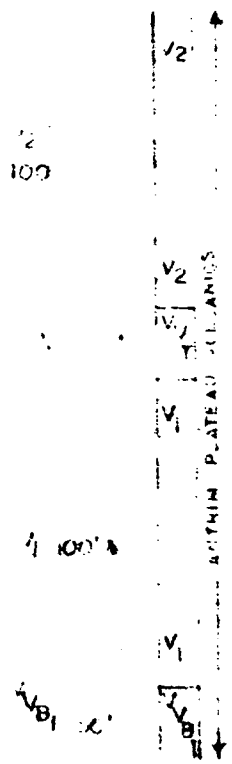
Scale 1" = 2·5 miles (V.E x 10)

## Average Metal Content of Soils (p.p.m.)

| Horizon | COPPER | NICKEL | COBALT | LEAD | ZINC |
|---|---|---|---|---|---|
| V2 | 38 | 32 | 33 | 25 | 78 |
| VVT1 | 14 | 27 | 23 | 13 | 29 |
| V | 23 | 34 | 25 | 15 | 36 |
| VVB1 | 17 | 39 | 25 | 14 | 27 |

Stratigraphic Column

Description of rock types




Porphyritic basalt speckled in weathered o/c.

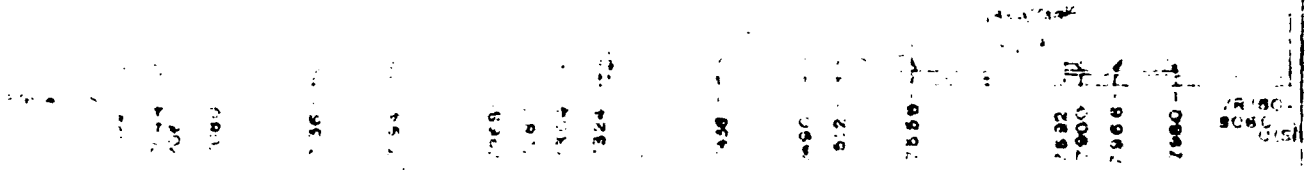
Vesicular basalt free silica, zeolites (?).

Fine grained purple basalt.

Vesicular basalt free silica

| HOOKER CORPORATION LTD. | |
|---|---|
| TRAVERSE No. VR15C. GEOLOGICAL VALUES AND GEOLOGICAL SECTION | |
| | Fig. 10. |
| Date 19.10.1969 | |

## Diagrammatic Cross Section of Traverse

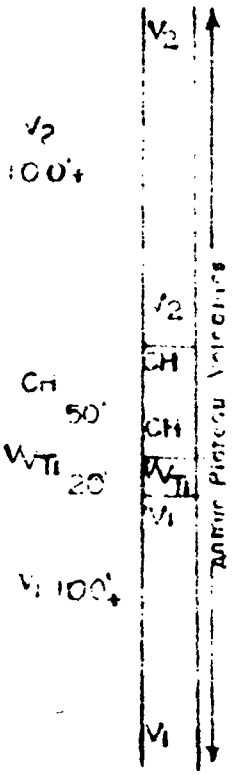


Scale 1" = 2·5 miles (V.E. x 10)

## Average Metal Content of Soils (p.p.m.)

| Horizon | COPPER | NICKEL | COBALT | LEAD | ZINC |
|---|---|---|---|---|---|
| V2 | 19 | 40 | 35 | 17 | 72 |
| CH | 29 | 50 | 20 | 15 | 42 |
| VVTi | 22 | 30 | 27 | 16 | 36 |
| V1 | 32 | 63 | 30 | 21 | 53 |

Stratigraphic Column




Description of rock types.

V2 100'+ — Brown porphyritic basalt with white feldspar phenocrysts. 'Speckled' appearance in outcrop same as 150.

CH 50' — Laminated chert.

VVTi 20' — Vesicular basalt, some zeolites, free silica top of V1(?)

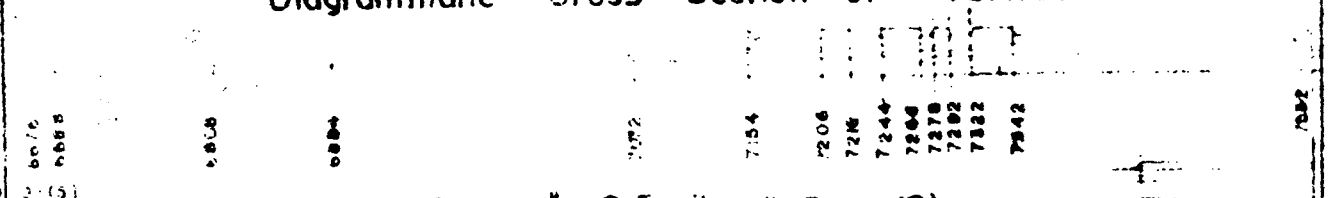
V1 100'+ — Fine grained basalt purple to brown same as 110-150.

| | |
|---|---|
| HOOKER CORPORATION LTD. | |
| TRAVERSE No. VR160, GEOLOGICAL VALUES AND GEOLOGICAL SECTION | |
| | Fig. 11. |
| Date 10 10 1969. | |

Prepared by S.E.S

NW

# Diagrammatic Cross Section of Traverse



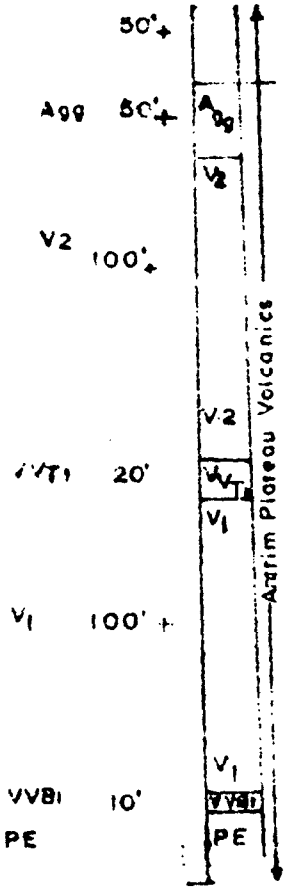
Scale - 1" = 2·5 miles (V.E. x 10)

S.E.

## Average Metal Content of Soils (p.p.m.)

| Horizon | COPPER | NICKEL | COBALT | LEAD | ZINC |
|---|---|---|---|---|---|
| Agg | 26 | 43 | 33 | 32 | 61 |
| V2 | 24 | 35 | 39 | 39 | 63 |
| V/T1 | 21 | 42 | 29 | 40 | 60 |
| V1 | 21 | 37 | 31 | 31 | 46 |
| VVB1 | 37 | 43 | 43 | 32 | 73 |
| PE | 19 | 30 | 21 | 19 | 30 |

Stratigraphic Column




Description of rock types.

Cretaceous sandstone not sampled

Agglomerate

Porphyritic basalt

Vesicular basalt with zeolites

Fine grained purple basalt

Vesicular basalt

Proterozoic sandstone and limestone

| HOOKER CORPORATION LTD. | |
|---|---|
| TRAVERSE No. VR 170, GEOLOGICAL VALUES AND GEOLOGICAL SECTION | |
| | Fig. 12. |
| Date. 10-10-1969. | |

Prepared by S.E.S.

S.E.

# Diagrammatic Cross Section of Traverse

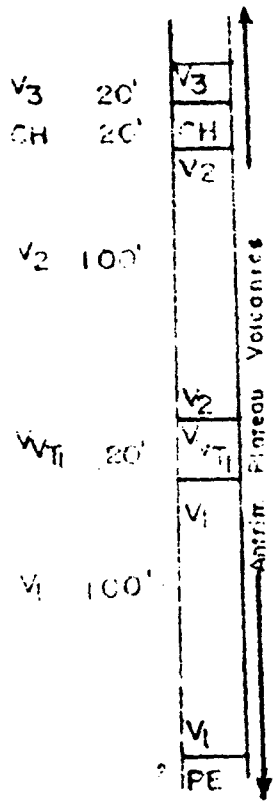
VR 180-
-480.0/S

Scale : 1" = 2·5 miles (V.E. x 10)

## Average Metal Content of Soils (p.p.m.)

| Horizon | COPPER | NICKEL | COBALT | LEAD | ZINC |
|---|---|---|---|---|---|
| V3 | 19 | 28 | 27 | 22 | 90 |
| CH | 27 | 21 | 26 | 26 | 95 |
| V2 | 18 | 20 | 21 | 17 | 21 |
| VVT1 | 36 | 38 | 30 | 32 | 62 |
| V1 | 30 | 32 | 29 | 28 | 40 |
| PE | 17 | 17 | 15 | 17 | 29 |

Stratigraphic Column




Description of rock types

V3 — Fine grained basalt

CH — Laminated chert, some limestone.

V2 — Porphyritic basalt, weathers black

VVT1 — Vesicular basalt, some zeolites, free silica.

V1 — Purple, fine-grained basalt.

PE — Proterozoic sandstone

HOOKER CORPORATION LTD.

TRAVERSE No. VR 180.
GEOLOGICAL VALUES
AND
GEOLOGICAL SECTION

Fig. 13.

Date. 10-10 1969.

Prepared by S.E.S

# Diagrammatic Cross Section of Traverse

5E

Scale 1" = 2.5 miles (V.E. x 10)

## Average Metal Content of Soils (p.p.m.)

| Horizon | COPPER | NICKEL | COBALT | LEAD | ZINC |
|---|---|---|---|---|---|
| VE | 40 | 30 | 37 | 47 | 65 |
| CH | 45 | 31 | 34 | 30 | 53 |
| VVTx | 32 | 30 | 34 | 35 | 44 |
| V2 | 32 | 35 | 30 | 34 | 33 |
| VVT | 31 | 28 | 41 | 39 | 50 |
| V1 | 38 | 48 | 40 | 26 | 30 |
| VVTx | 50 | 48 | 42 | 44 | 72 |
| Vx | 43 | 37 | 30 | 32 | 38 |

Stratigraphic Column

Description of rock types

[illegible] basalt, black weathering same as VE

[illegible] free silica, plus some zeolites

[illegible] basalt

[illegible] free silica

[illegible]

[illegible] CORPORATION LTD.

TRAVERSE [illegible]

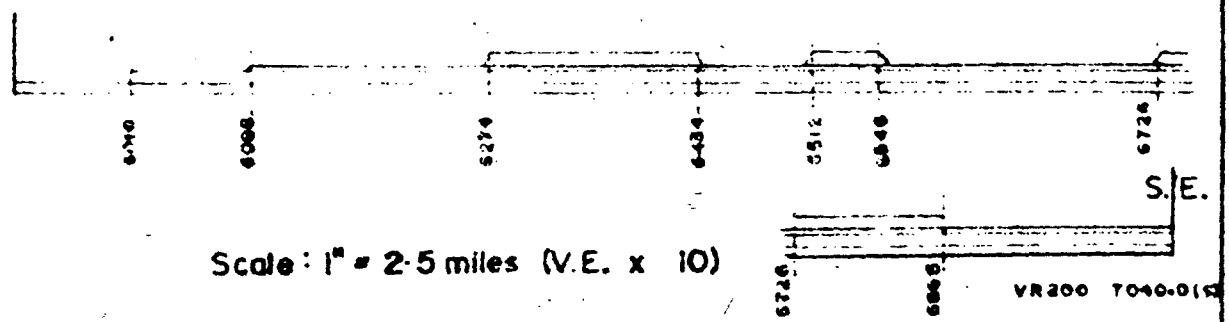
[illegible]

GEOLOGICAL SECTION

Fig. 14

[illegible]

N.W. Diagrammatic Cross Section of Traverse

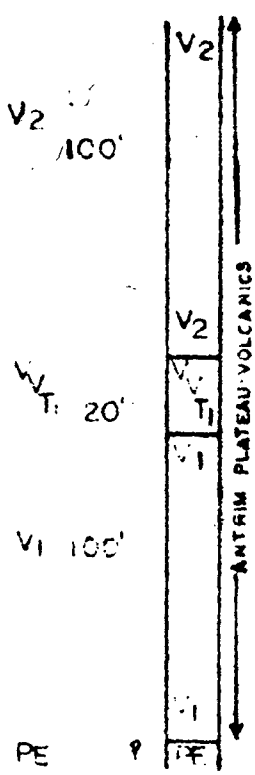



Scale: 1" = 2·5 miles (V.E. x 10)

Average Metal Content of Soils (p.p.m.)

| Horizon | COPPER | NICKEL | COBALT | LEAD | ZINC |
|---|---|---|---|---|---|
| V2 | 21 | 45 | 33 | 41 | 30 |
| VVT1 | 17 | 40 | 30 | 37 | 31 |
| V1 | 20 | 55 | 36 | 46 | 46 |
| PE | 6 | 22 | 15 | 40 | 10 |

Stratigraphic Column




Description of rock types.

V2 — Porphyritic basalt, brown

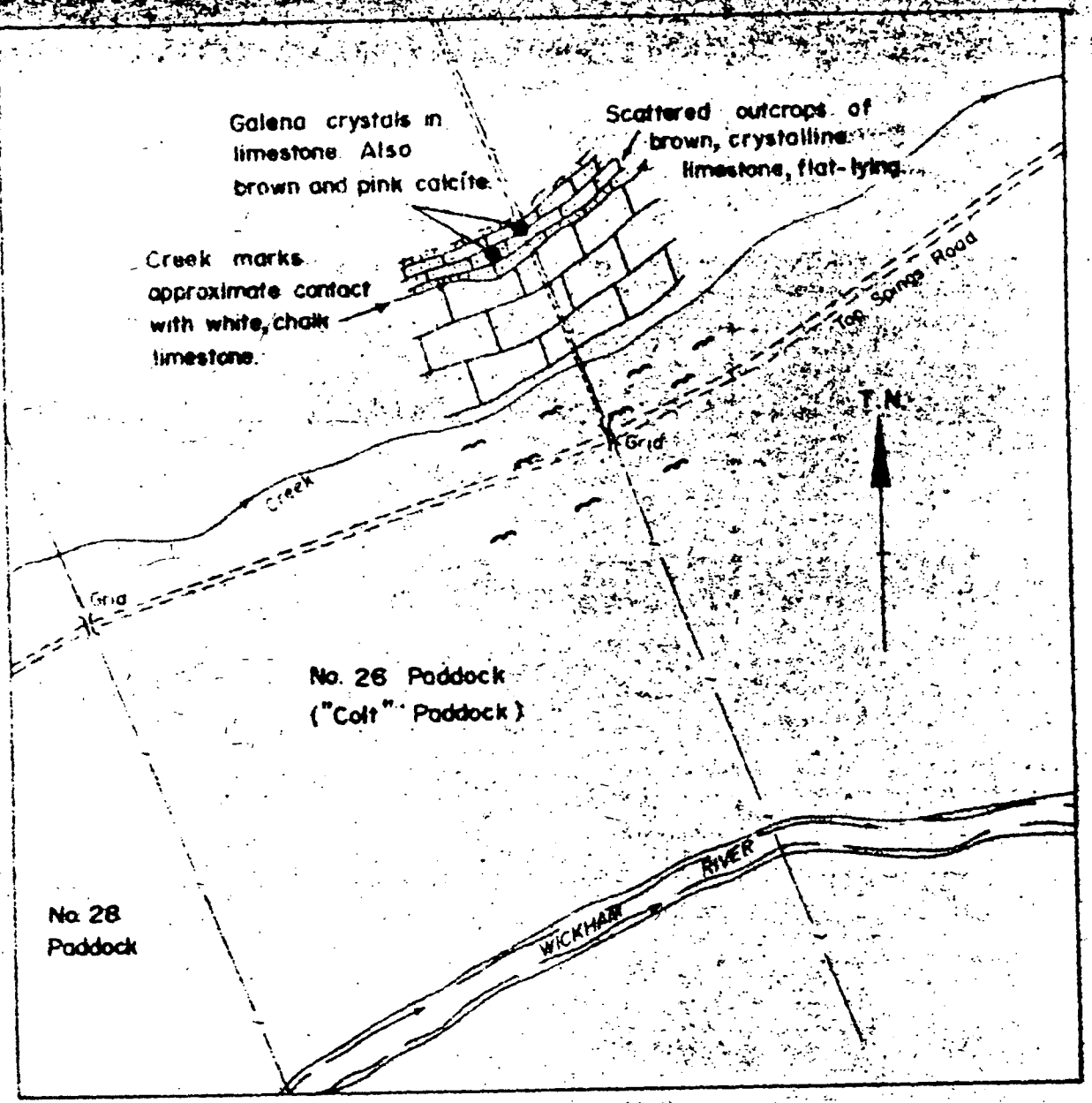
VVT1 — Vesicular basalt, some zeolites, Free silica minerals.

V1 — Fine-grained basalt.

PE — Proterozoic sandstone.

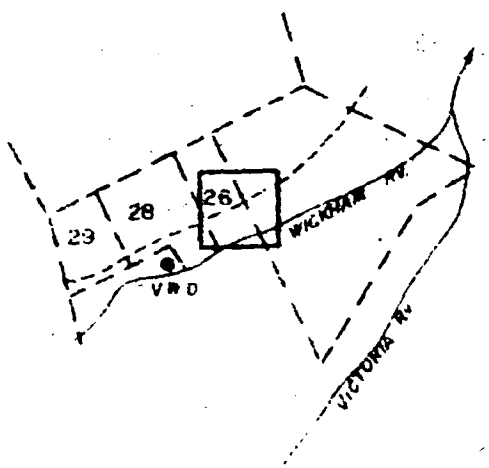
| HOOKER CORPORATION LTD. | |
|---|---|
| TRAVERSE No. VR200<br>GEOLOGICAL VALUES<br>AND<br>GEOLOGICAL SECTION | |
| | Fig. 15. |
| Date. 10·10·1969 | |

Prepared by S.E.S.




LOCALITY PLAN

Scale = 1. 250,000.




REFERENCE

Alluvium

White chalky limestone

Brown crystalline limestone

"Skull Creek" limestone

Proterozoic

Recent

| HOOKER CORPORATION LTD. | |
|---|---|
| GEOLOGICAL SKETCH MAP<br>COLT Pb PROSPECT | |
| | Fig. 16. |
| Scale : 1" = ¼ mile | |

T.N

REFERENCE

- Creek bed sandy alluvium
- Stream sediment
- Purple shale & siltstone outcrop
- rubble
- Yellow shale outcrop
- rubble
- Manganese nodules
- Manganese stains & coatings
- Transported (?) soil & manganese rubble
- Quartz nodules
- Joint
- Minor folds
- Drainage channel
- Water
- Track

HOOKER CORPORATION LTD.

GEOLOGICAL SKETCH MAP
OF Manganese Deposit at
BATTLE CREEK

Fig. 17.

Scale: 1" = 1000'

T.N.

G.N.

Magnetic Variation 4° E.
Grid North is 45° East of Magnetic North.

Puc

SCALE - 1" 250,000

FEET x 1000 0 5 10 15 20 25 30 40 50

MILES 4 0 4 8

LOCALITY MAP

N.T. W.A. QLD

VICTORIA RIVER DOWNS SHEET

HOOKER CORPORATION LTD.

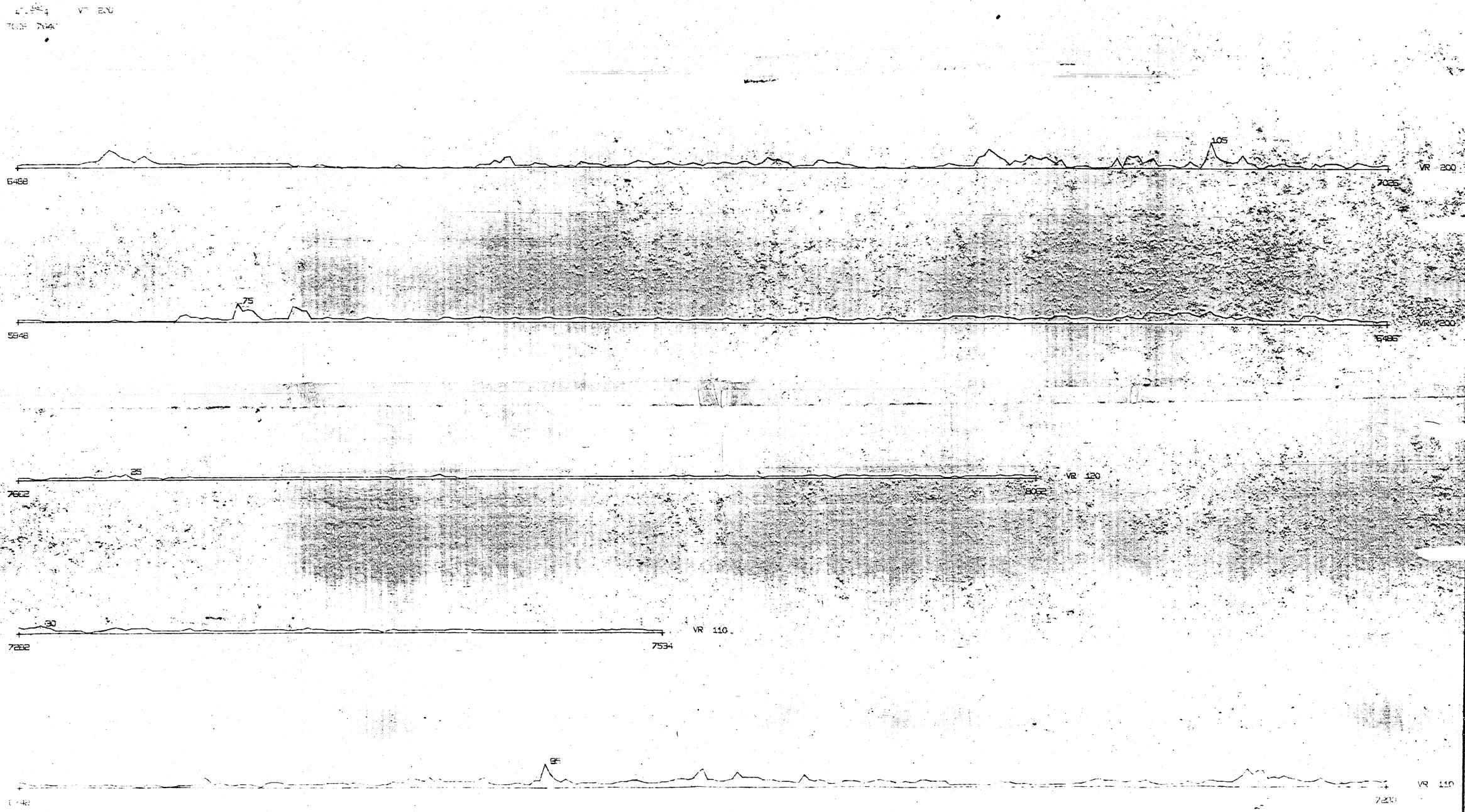
LOCATION of COPPER ANOMALIES,

AGATE & PREHNITE OCCURRENCES

also showing

SKULL CREEK LIMESTONE.

No. KD16-1



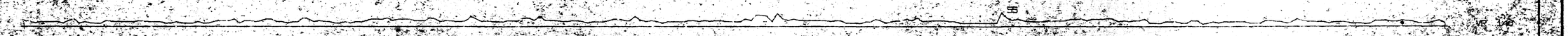

HOOKER CORPORATION LTD.

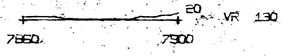
PROFILE PLOT

COPPER

Scale "= 2,000ft.

Fig. 2.

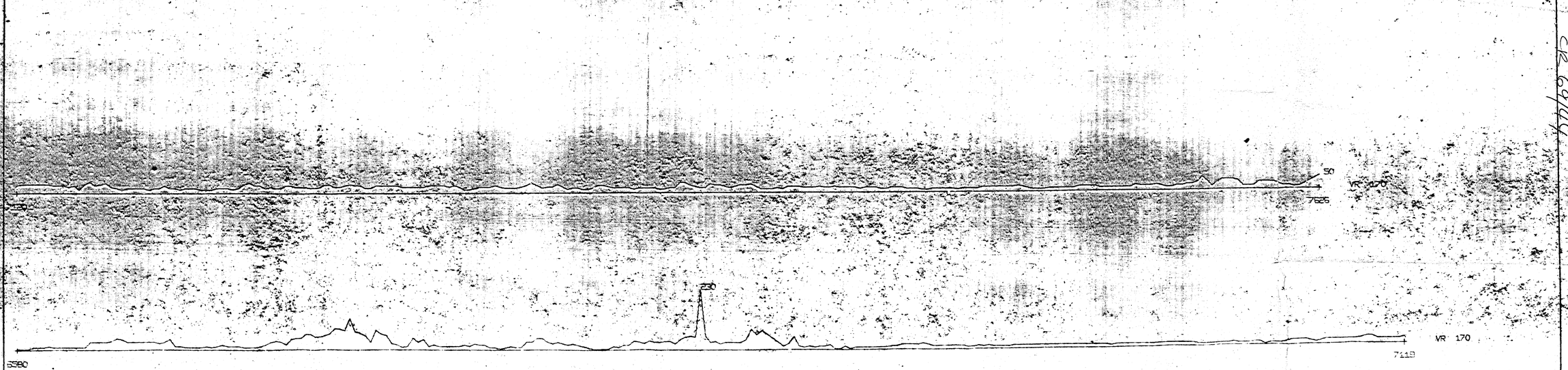





| HOOKER CORPORATION LTD. | |
|---|---|
| PROFILE PLOT<br>COPPER<br>Scale : 1" = 2,000ft | |
| | Fig. 2A. |

PREPARED BY SAMPEY EXPLORATION SERVICES




110

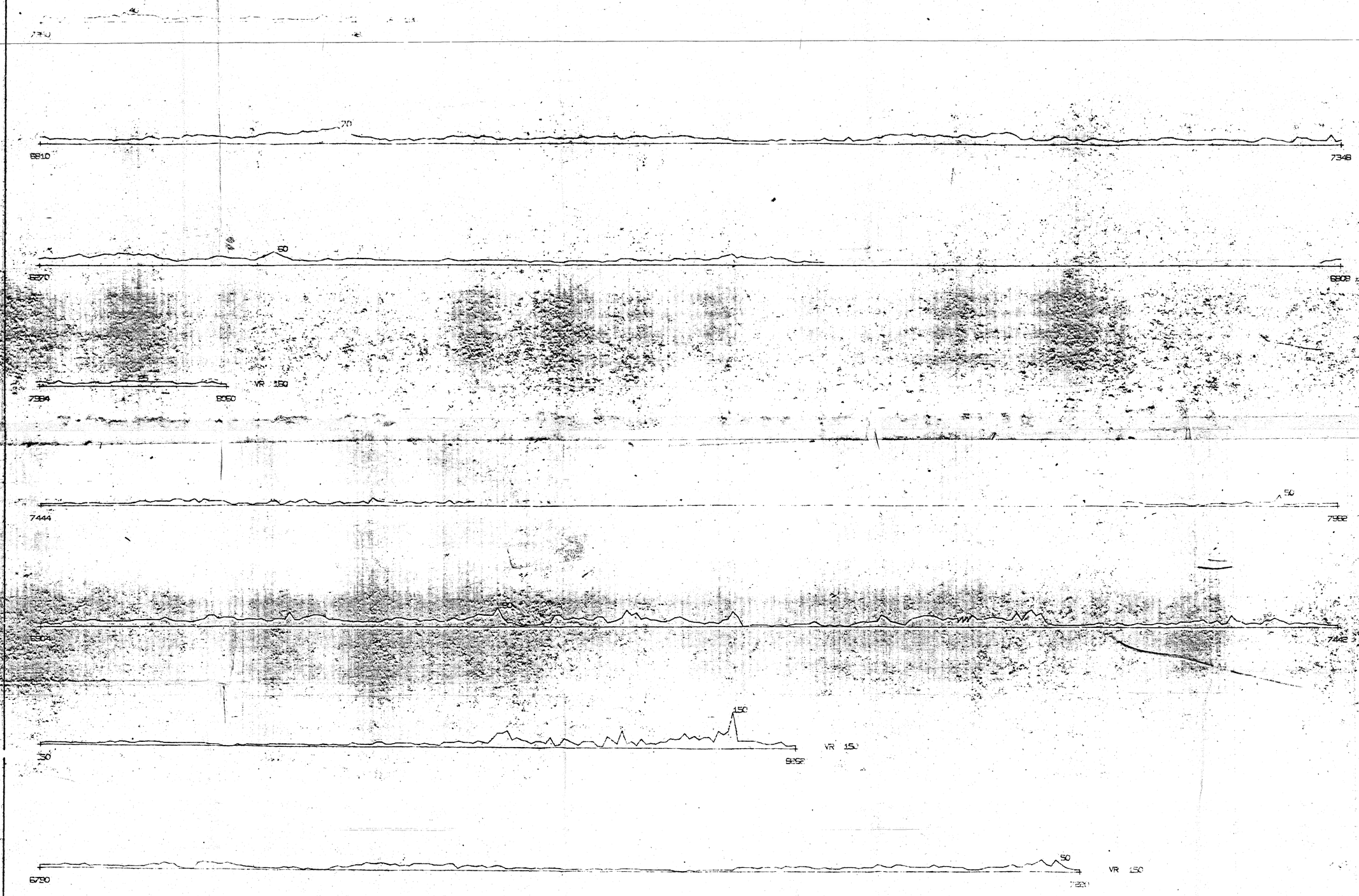
HOOKER CORPORATION LTD.

PROFILE PLOT

COPPER

Scale 1" = 2,000ft.

Prepared by SAMPEY EXPLORATION SERVICES




HOOKER CORPORATION LTD.

PROFILE PLOT

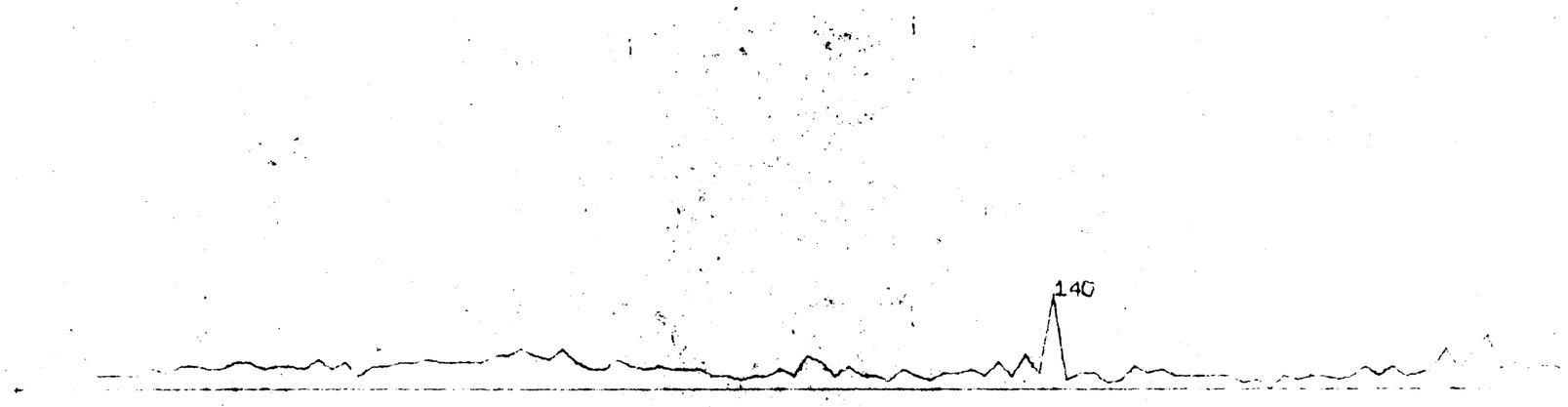
COPPER

Scale: 1" = 2,000ft.

Fig. 4.

Prepared by SAMPEY EXPLORATION SERVICES

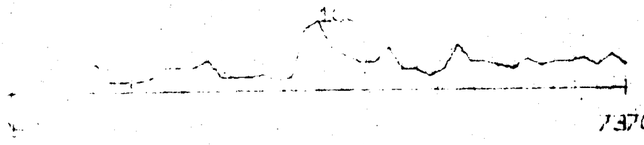
CR 69/169




[illegible] 21-JUL-69 COPPER PROFILE SCALE 200PPM PER INCH HORIZON 1 1/24000

| HOOKER CORPORATION LTD. | |
|---|---|
| PROFILE PLOT<br>COPPER<br>Scale - 1" = 2,000ft. | |
| | Fig. 5. |

Prepared by SAMPEY EXPLORATION SERVICES




11 [illegible] 31-JUL-69 COPPER PROFILE SCALE 200PPM PER INCH HORIZONTAL 1/24000

| HOOKER CORPORATION LTD. | |
|---|---|
| PROFILE PLOT<br>COPPER<br>Scale - 1" = 2,000ft. | |
| | Fig. 5A. |

Prepared by SAMPEY EXPLORATION SERVICES

CR 69/444