FINANCIAL ASSISTANCE FOR MINERAL EXPLORATION (M.E.I.G.A.)

COMPANY: ACMIN EXPLORATIONS (UK) LTD REF: AE 58
MRD 84/6/1
PROJECT: CLEBRIG MRD 144/6/1

The following Open File material is held by B.G.S. in London, Keyworth and Edinburgh. Available for public inspection from 15.12.84.

- Extract from application 9.9.71, statement of geology
- Site plan of Loch Naver
- Report No. 696 - "A Reconnaissance mineral survey of the Clebrig Estate" Feb '72. With the following enclosures:
  1 Major geological units within the survey area
  2 Sample locations
  3 Locations of samples with anomalous metal contents
  4 Location of rock chip samples with anomalous metal contents (Low threshold)
- * Memo No. 1624 - Results of 40 stream sample analyses

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* Not at Keyworth

Department of Trade and Industry.

Background Note on the Company:-

The Department already has in its possession Annual and Interim Reports and Accounts for Acmex Holdings N.L. and Acmin Explorations N.L.; a recent prospectus issued by Acmin Explorations N.L.; and the Memorandum and Articles of Association of the Company. Further copies of the majority of these documents can be provided at short notice if required.

Name of Project:-

"Acmin's Clebrig Project"

Outline of Project:-

Exploration for minerals pursuant to an agreement between the Company and Mrs. P.F. Nicolson dated June 18, 1971, as amended by letter dated September 1, 1971 (copies enclosed in confidence).

Minerals Sought:-

Ores of copper, lead, zinc, chromium, silver, gold, uranium, thorium, beryllium, lithium, tantalum, platinoid minerals and rare-earth minerals; and nickel.

Details of Site:-

Approximately 12,000 acres or 8½ square miles south of Loch Naver, County Sutherland, Scotland. (Plan enclosed).

Statement of Geology:-

The area to the south of Loch Naver is underlain by igneous and metamorphic rocks of Pre-Cambrian age.

1. Lewisian

Rocks of Lewisian 'type' occur in the eastern part of Clebrig Estate extending from Loch nan Uan in the south, through Klibreck Farm in the north. They are some 50' - 100' thick in the south increasing in width to the north. They consist predominantly of striped hornblendic rocks, streaky hornblende gneisses and compact hornblende schists, and show no discordance with the underlying and overlying Moine rocks. Small

Department of Trade and Industry

bosses of serpentine intrude this series with rare granulitised pegmatites and injection veins. Small intrusions of amphibolite and eclogitic amphibolite are also present.

2. Moinian

Siliceous Moinian granulites form a zone some ½ to 1 mile wide striking across the area in a NE - SW direction, parallel to the margins of the Loch Choire Injection Complex. These granulites are frequently invaded by granitic veins, and dip predominantly in a southeasterly direction.

3. Loch Choire Injection Complex

In the Ben Klibreck - Loch Choire - Ben Arhmine area of the complex, the host-rock succession is (i) dominantly siliceous granulites with some semi-pelitic bands and rare pelitic bands (with calc-silicate development); (ii) a more pelitic horizon forming the lowest injection-zone of Ben Klibreck; (iii) a zone of mixed sediments; (iv) altered pelitic schist of Meall nan Con.

The Loch Choire injection-complex may conveniently be divided into several zones.

A. Zone of Veins

This forms the outer part of the complex including siliceous or semi-pelitic Moinian granulites, pelitic Moine schists, and hornblendic rocks of Lewisian type are invaded by granite and pegmatite veins.

B. Zone of Injection

This zone forms the central part of the complex and varies considerably in the amount of injected material present.

C. Granite of the Loch Choire Complex

Below Loch Naver, at its eastern end, a fairly homogeneous granitic rock stretches from Coire nan Feuran northwards to Syre and is known as the Strath Naver Granite. It consists mainly of a pink or red granite

with occasional biotite rich layers and relics of pelitic Moinian rocks. Small areas of brecciation and shearing are common in the Strath Naver Grantie, and may form a linear zone trending NNE - SSW.

D. Intrusive Basic and Ultrabasic Rocks in the Moine Series.

Numerous small ultrabic bosses (greater than 40 have been recorded) occur in the 'Lewisian type' hornblendic rocks outcropping astride Loch Naver. They form prominent, glaciated knolls. Metamorphism has altered the serpentines to talcose minerals, termolite and chlorite. Relics of olivine and iron ore are common.

Small basic bosses of 'eclogitic' rocks have been located in the area, and may be termed eclogite-amphibolites, composed of garnet, pyroxene, hornblende, feldspar and quartz with subsidiary biotite and iron ore. These rocks represent metamorphosed gabbroic intrusions.

ROBERTSON RESEARCH COMPANY LIMITED

REPORT NO. 696

A RECONNAISSANCE MINERAL SURVEY OF THE CLEBRIG ESTATE, SUTHERLAND

by

D. W. MATTHEWS, M.A., Ph.D., F.G.S., A.M.I.M.M.

Project No. IIIA/120

February, 1972

Prepared for

Acmin Explorations No Liability,
G.P.O. Box 4817,
Sydney,
New South Wales, 2001,
AUSTRALIA.

C O N T E N T S

APPENDICES

ENCLOSURES

I

INTRODUCTION

This report contains the results of a reconnaissance mineral survey of the Clebrig Estate, near Altnaharra, Sutherland. This survey involved the collection and geochemical analysis of stream sediment samples, geophysical reconnaissance with a scintillometer and a portable vertical-field magnetometer, chip sampling of rocks for geochemical analysis, and a general geological appraisal of the area with particular reference to the ultrabasic rock and their possible metallic mineral content.

The total area of the survey was 12,000 acres (18.75 square miles), with a maximum height above sea level of 3,100 feet. Access was granted for geological work from October 15th onwards, and fieldwork was in fact started on October 17th. By the middle of November all sampling was complete with the exception of two days work on the highest parts of Ben Klibreck. Because of an unusually early spell of winter weather it was not possible to complete this work before field work was halted on 18th November. It is proposed to complete this field work in the early spring, and to present the results as a separate memorandum. However, since the area affected is economically the most unpromising part of the survey area it was considered undesirable to delay the whole report for a few, probably relatively unimportant results.

II

GEOLOGICAL APPRAISAL

The Loch Naver area forms the northern part of an injection complex which is centred on Loch Choire. The whole of this region is underlain by igneous and metamorphic rocks of Precambrian age. The various rock units identified in the area are described below and the general geology is illustrated in Enclosure 1.

1. Lewisian

Rocks of Lewisian type occur in the eastern part of Clebrig Estate extending from Loch nan Uan in the south, through Klibreck Farm in the north. They are some 50-100 feet thick in the south increasing in width to the north. They consist predominantly of striped hornblendic rocks, streaky hornblende gneisses and compact hornblende schists, and show no discordance with the underlying and overlying Moine rocks. Small bosses of serpentine intrude this series with rare granulitised pegmatites and injection veins. Small intrusions of amphibolite and eclogitic amphibolite are also present.

2. Moinian

Siliceous Moinian granulites form a zone some half to one mile wide striking across the area in a northeast direction, parallel to the margins of the Loch Choire Injection complex. These granulites are frequently invaded by granitic veins, and dip predominantly in a southeasterly direction.

3. Loch Choire Injection Complex

In the Ben Klibreck - Loch Choire - Ben Arhyne area of the complex,

the host-rock succession is

(i) dominantly siliceous granulites with some semi-pelitic bands and rare pelitic bands (with calc-silicate development)

(ii) a more pelitic horizon forming the lowest injection-zone of Ben Klibreck

(iii) a zone of mixed sediments

(iv) altered pelitic schist of Meall nan Con.

The Loch Choire injection-complex may conveniently be divided into several zones.

a. Zone of Veins

This forms the outer part of the complex including siliceous or semi-pelitic Moinian granulites, pelitic Moine schists, and hornblendic rocks of Lewisian type all invaded by granite and pegmatite veins.

b. Zone of Injection

This zone forms the central part of the complex and varies considerably in the amount of injected material present.

c. Granite of the Loch Choire Complex

Below Loch Naver, at its eastern end, a fairly homogeneous granitic rock stretches from Coire nan Feuran northwards to Syre and is known as the Strath Naver Granite. It consists mainly of a pink or red granite with occasional biotite rich layers and relics of pelitic Moinian rocks. Small areas of brecciation and shearing are common in the Strath Naver Granite, and may form a linear zone trending north-northeast.

d. Intrusive Basic and Ultrabasic Rocks in the Moine Series

Numerous small ultrabasic bosses (more than 40 have been recorded) occur in the Lewisian type hornblendic rocks outcropping astride Loch Naver. They form prominent, glaciated knolls. Metamorphism has

altered the serpentines to talcose minerals, dolomite and chlorite. Relics of olivine and iron ore are common.

Apart from those on the upper part of Ben Klibreck, the major rock units have been examined in the field during stream sample and instrument traverses. However, no signs of metalliferous mineralisation were observed apart from a thin veneer of pyrolusite on joint surfaces in certain parts of the Strath Naver granite, and occasional cubes of pyrite in the Moine schists. A speck of molybdenite was found in a quartz vein at sample point 20531. The few exposures of ultrabasic rocks form conspicuous knolls and ridges and these were closely examined and sampled. However, they proved to contain only a very small percentage of spinel and no opaque minerals of any economic interest. They consist mostly of serpentine, tremolite, talc, relict olivine and garnet, none of which have any value in the quantities present.

III

GEOPHYSICAL RECONNAISSANCE

Two geophysical methods were used in this reconnaissance survey to establish a regional background and to detect any major anomalies that might exist. An ABEM Craelius portable vertical field magnetometer and a scintillometer were carried on all sample traverses. Scintillometer readings were continuously monitored, and spot readings of magnetometer and scintillometer were taken at every sample position and at some intermediate positions. In this way, a moderate coverage of the whole survey area was obtained.

The results of this work are not encouraging. Scintillometer readings were consistently low, in the range 0-10 μR/h, and minor variations could almost invariably be correlated with the thickness of the drift cover. Magnetometer readings showed a moderate variation over the area as a whole, the largest anomalies of +1000 γ being in the vicinity of serpentinite knolls, and smaller anomalies of $\pm$500 γ being found near major geological boundaries, particularly the amphibolites and the Strath Naver granite. These values are in no way abnormal for the rock types encountered, and detailed magnetometer traverses therefore were not undertaken.

IV

GEOCHEMICAL RECONNAISSANCE

The geochemical work formed by far the largest part of this mineral reconnaissance, and was concentrated on a programme of stream sediment sampling and spectrographic analysis. At the eastern end of the survey area, particularly in the vicinity of the Strath Naver granite, stream samples were taken in every available stream, at all confluences and at 100-200 yard intervals. In spite of this, however, sample coverage was relatively poor because of the scarcity of streams. Over the rest of the area sampling density was more consistent but the sampling interval was increased to 400-1,000 yards and all confluences. Sample locations and numbers are shown on Enclosure 2.

The sampling and analytical procedures adopted are those chosen as most suitable for northern Scotland on the basis of our own overall experience and of studies carried out by the Institute of Geological Sciences. Sediment was collected from active parts of streams, below the sediment-water interface when possible. The samples were dried, lightly rolled, freed of organic material, sieved to -80 mesh and the fine fraction then crushed to -200 mesh for analysis by optical spectrographic methods. The results are tabulated in Appendix 2. They show consistently low levels in silver and tungsten, and generally low levels in molybdenum and tin. Sample 20269 is an exceptionally anomalous sample with 500 ppm tin, and 20252 with 20 ppm tin is moderately high, but no stream sediment samples show unusually high molybdenum. The levels of chromium, cobalt, nickel and copper are more variable, chromium being moderately high in sample 20311 and nickel in 20315. Lead and zinc, are more variable still, particularly zinc which is generally a 'mobile' element. No samples contain exceptionally high levels of either lead or zinc, but samples 20292 and

20293 with 700 and 850 ppm Zn and sample 20269 (c.f. tin) with 850 ppm lead have the highest concentrations.

From a consideration of all these results, and using also the typical values for this type of area in Scotland obtained by us in regional surveys, the threshold values of the various metals are as follows :

Tin (Sn)	10 ppm
Molybdenum (Mo)	3 ppm
Chromium (Cr)	150 ppm
Cobalt (Co)	30 ppm
Copper (Cu)	100 ppm
Lead (Pb)	100 ppm
Zinc (Zn)	300 ppm
Nickel (Ni)	70 ppm

In addition, silver and tungsten were sought analytically, but in all samples the element levels were below the lower detection limits of 1 ppm for silver and 50 ppm for tungsten.

On this basis, Enclosure 3 shows the location of all samples containing anomalous levels of one or more elements, and also indicates the few samples containing more than twice the threshold value of certain elements. The actual magnitude of the various anomalies can be obtained from Appendix 2.

Rock Chip Sampling

To fully assess the mineral potential of the area, the stream sediment survey was supplemented by a programme of rock chip sampling. Chip samples were collected from the various rock types, but especially from quartz veins (which are present throughout the area and which would probably be associated with any metalliferous deposits derived from the Loch Choire injection complex) and from the Strath Naver granite. Throughout

the collection of these chip samples, observed mineralisation was restricted to a speck of molybdenite in sample 20531 (a quartz vein) and conspicuous but accessory spinel in sample 20575 (a serpentinite). Hence more detailed chip sampling programmes were judged to be unnecessary. Sample locations are shown on Enclosure 2.(It should be pointed out that some large areas of drift cover, particularly in the central part of the survey area, could not be sampled due to the total lack of exposure).

The rock chip samples were crushed, and analysed spectrographically in the same way as the stream sediment samples, and the results are tabulated in Appendix 1. They show lower levels of all elements compared with the stream sediment samples, with the following exceptions. Sample 20575 has 2000 ppm chromium and 300 ppm nickel, and was collected from a serpentinite near Klibreck, and sample 20531 contains 10 ppm molybdenum and has visible molybdenite.

In general, these results are subeconomic, but a few samples can be considered anomalous on the basis of the threshold values given above, and these are shown on Enclosure 3. However, in order to 'magnify' these results and display any possible trends at lower levels of the various elements, Enclosure 4 shows the samples with 'anomalous' element concentrations using arbitrarily lower threshold values of molybdenum 2 ppm cobalt 10 ppm, zinc 50 ppm, and chromium 100 ppm.

DISCUSSION OF RESULTS

Evaluation of the results obtained in this survey shows that there are a number of geochemical anomalies in the survey area, but that none is of a size or nature that might indicate significant mineralisation.

The anomalies obtained from stream sediment sampling, as shown on Enclosure 3, are largely attributable to normal variations in bedrock. For instance, the extensive grouping of small cobalt and chromium anomalies in the Klibreck Burn coincides closely with the outcrop of the amphibolites, and in some cases with the small ultrabasic rocks. For these particular rock types, the element concentrations are by no means abnormal. The smaller grouping of anomalies at the eastern edge of the area, over the edge of the granite, is slightly more interesting; however, new and derelict habitation and an old graveyard have been located here and for this reason, the samples may be contaminated and the results spurious. In particular, sample 20269 with very high lead and tin is probably due to contamination. Other anomalies are scattered and minor.

The chip sample programme indicates principally, that none of the rocks and quartz veins sampled contains a significant metal content. The distribution of samples with element contents higher than an arbitrary level, as shown on Enclosure 4, is partly consistent with the bedrock geology, but is inconclusive except for two high copper values occurring in rock chips from the eastern edge of the granite near the stream sediment anomalies referred to above as of doubtful significance. These levels of copper are sub-economic. Examination of the surface rocks here showed them to contain no visible copper mineralisation.

VI

CONCLUSIONS AND RECOMMENDATIONS

It is concluded that the programme has not indicated any metalliferous mineral potential in the Loch Naver area. Geological, geochemical and geophysical investigations have been undertaken but the only responses have been extremely isolated and very small occurrences of pyrite, molybdenite and pyrolusite. None of these have any apparent economic potential or are judged to warrant further investigation.

Geophysical tests gave no abnormal results that could not be immediately related to lithologic changes. Geochemical analysis of stream and rock chip samples, however, indicated a few anomalous values, most of these occurring in stream sediments and apparently being caused by changes in lithology or by contamination. Above background levels of copper were noted in two rock-chip samples, but the levels were sub-economic.

It is felt that on the basis of these results, no further work can be recommended as likely to yield economically significant results.

APPENDIX 1.

Rock Chip Sample Analyses

			Ag ppm	Cr ppm	Co ppm	Cu ppm	Pb ppm	Zn ppm	Ni ppm
	2	<50	<1	70	15	100	<20	35	<20
<5	2	<50	<1	50	<5	25	<20	<10	<20
<5	<2	<50	<1	70	10	<10	<20	25	<20
<5	<2	<50	<1	70	15	<10	<20	25	<20
<5	<2	<50	<1	70	10	<10	<20	15	<20
<5	<2	<50	<1	100	10	<10	<20	65	<20
<5	<2	<50	<1	70	10	<10	<20	35	<20
<5	<2	<50	<1	70	<5	<10	<20	10	<20
<5	<2	<50	<1	70	10	<10	<20	40	<20
<5	<2	<50	<1	100	10	<10	<20	<10	<20
<5	<2	<50	<1	150	20	<10	<20	40	<20
<5	<2	<50	<1	100	20	<10	<20	30	<20
<5	<2	<50	<1	70	15	<10	<20	60	<20
<5	<2	<50	<1	70	5	<10	<20	15	<20
<5	<2	<50	<1	150	25	<10	<20	35	<20
<5	<2	<50	<1	50	<5	<10	<20	<10	<20
<5	<2	<50	<1	50	<5	<10	<20	<10	<20
<5	<2	<50	<1	50	<5	<10	<20	<10	<20
<5	<2	<50	<1	50	<5	<10	<20	<10	<20
<5	<2	<50	<1	100	15	<10	<20	25	<20
<5	<2	<50	<1	50	<5	<10	<20	10	<20
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<5	<2	<50	<1	70	15	20	<20	30	<20
<5	<2	<50	<1	70	25	<10	<20	95	<20
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<5	10	<50	<1	100	25	25	<20	15	<20
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	<2	<50	<1	70	10	<10	<20	10	<20
	<2	<50	<1	100	20	<10	<20	25	<20
	<2		<1	70	15	<10	<20	25	<20
	<2		<1	50	<5	<10	<20	<10	<20
	<2		<1	50	<5	<10	<20	<10	<20
			<1	50	<5	<10	<20	<10	<20
	<2		<1	50	<5	<10	<20	<10	<20
	<2		<1	50	<5	<10	<20	10	<20
	<2		<1	50	<5	<10	<20	<10	<20

[illegible]	[illegible] ppm	Mo ppm	W ppm	Ag ppm	Cr ppm	Co ppm	Cu ppm	Pb ppm	Zn ppm	Ni ppm
[illegible]	<5	<2	<50	<1	50	<5	<10	<20	<10	<20
20543	<5	<2	<50	<1	50	<5	<10	<20	<10	<20
20544	<5	<2	<50	<1	50	<5	<10	<20	<10	<20
20545	<5	<2	<50	<1	50	<5	<10	<20	<10	<20
20546	<5	2	<50	<1	50	<5	<10	<20	<10	<20
20547	<5	<2	<50	<1	50	20	<10	<20	<10	<20
20548	<5	<2	<50	<1	50	<5	<10	<20	15	<20
20549	<5	<2	<50	<1	50	<5	<10	<20	10	<20
20550	<5	2	<50	<1	50	10	<10	<20	10	<20
20551	<5	<2	<50	<1	50	<5	<10	<20	10	<20
20552	<5	2	<50	<1	50	<5	<10	<20	<10	<20
20553	<5	<2	<50	<1	50	<5	<10	<20	<10	<20
20554	<5	<2	<50	<1	50	<5	<10	<20	<10	<20
20555	<5	<2	<50	<1	50	<5	<10	<20	<10	<20
20556	<5	<2	<50	<1	50	<5	<10	<20	<10	<20
20557	<5	<2	<50	<1	50	<5	<10	<20	<10	<20
20558	<5	<2	<50	<1	50	10	<10	<20	15	<20
20559	<5	<2	<50	<1	50	<5	<10	<20	<10	<20
20560	<5	<2	<50	<1	50	<5	<10	<20	20	<20
20561	<5	<2	<50	<1	50	10	<10	<20	15	<20
20562	<5	<2	<50	<1	50	5	<10	<20	10	<20
20563	<5	<2	<50	<1	50	<5	<10	<20	<10	<20
20564	<5	<2	<50	<1	70	15	<10	<20	25	<20
20565	<5	<2	<50	<1	50	<5	<10	<20	15	<20
20566	<5	<2	<50	<1	50	10	<10	<20	<10	<20
20567	<5	<2	<50	<1	50	5	<10	<20	10	<20
20568	<5	<2	<50	<1	50	<5	<10	<20	<10	<20
20569	<5	<2	<50	<1	50	<5	<10	<20	10	<20
20570	<5	<2	<50	<1	50	<5	<10	<20	10	<20
20571	<5	<2	<50	<1	50	<5	<10	<20	15	<20
20572	<5	<2	<50	<1	50	15	<10	<20	<10	<20
20573	<5	<2	<50	<1	50	<5	<10	<20	<10	<20
20574	<5	<2	<50	<1	50	<5	<10	<20	<10	<20
20575	<5	<2	<50	<1	2000	100	<10	<20	<10	300
20576	<5	<2	<50	<1	50	<5	<10	<20	<10	<20
20577	<5	<2	<50	<1	50	<5	<10	<20	<10	<20
20578	<5	<2	<50	<1	50	10	<10	<20	20	<20
20579	<5	<2	<50	<1	50	<5	<10	<20	<10	<20
20580	<5	<2	<50	<1	50	10	<10	<20	15	<20
20581	<5	<2	<50	<1	50	10	<10	<20	10	<20
20582	<5	<2	<50	<1	50	10	<10	<20	<10	<20

Ref No.	Sn ppm	Mo ppm	W ppm	Ag ppm	Cr ppm	Co ppm	Cu ppm	Pb ppm	Zn ppm	Ni ppm
20583	<5	2	<50	<1	70	30	<10	<20	10	<20
20584	<5	<2	<50	<1	50	<5	<10	<20	<10	<20
20585	<5	<2	<50	<1	70	10	<10	<20	<10	<20
20586	<5	<2	<50	<1	70	10	<10	<20	10	<20
20587	<5	<2	<50	<1	40	<5	<10	<20	<10	<20
20588	<5	<2	<50	<1	50	<5	<10	<20	<10	<20
20589	<5	2	<50	<1	40	<5	<10	<20	<10	<20
20590	<5	<2	<50	<1	50	<5	<10	<20	35	<20
20591	<5	<2	<50	<1	50	<5	<10	<20	15	<20
20601	<5	<2	<50	<1	50	<5	<10	<20	10	<20
20604	<5	<2	<50	<1	50	<5	<10	<20	<10	<20
20605	<5	<2	<50	<1	50	<5	<10	<20	<10	<20
20606	<5	<2	<50	<1	50	<5	<10	<20	<10	<20
20607	<5	<2	<50	<1	50	<5	<10	<20	<10	<20
20608	<5	<2	<50	<1	50	<5	<10	<20	<10	<20
20609	<5	<2	<50	<1	50	<5	<10	<20	<10	<20
20610	<5	<2	<50	<1	50	<5	<10	<20	<10	<20
20611	<5	<2	<50	<1	50	<5	<10	<20	<10	<20
20613	<5	<2	<50	<1	50	<5	<10	<20	<10	<20
20614	<5	<2	<50	<1	50	<5	<10	<20	<10	<20
20615	<5	<2	<50	<1	50	<5	<10	<20	<10	<20
20616	<5	<2	<50	<1	50	<5	<10	<20	<10	<20
20617	<5	<2	<50	<1	50	<5	<10	<20	<10	<20
20618	<5	<2	<50	<1	50	<5	10	<20	10	<20
20619	<5	<2	<50	<1	50	<5	<10	<20	15	<20
20620	<5	<2	<50	<1	70	15	<10	<20	10	<20
20621	<5	<2	<50	<1	100	15	<10	<20	10	<20
20622	<5	<2	<50	<1	50	<5	<10	<20	< 10	<20
20623	<5	<2	<50	<1	70	<5	<10	<20	< 10	<20
20624	<5	<2	<50	<1	50	<5	<10	<20	< 10	<20
20625	<5	<2	<50	<1	70	10	<10	<20	< 10	<20
20626	<5	<2	<50	<1	200	20	20	<20	15	<20

APPENDIX 2.

Stream Sediment Sample Analyses

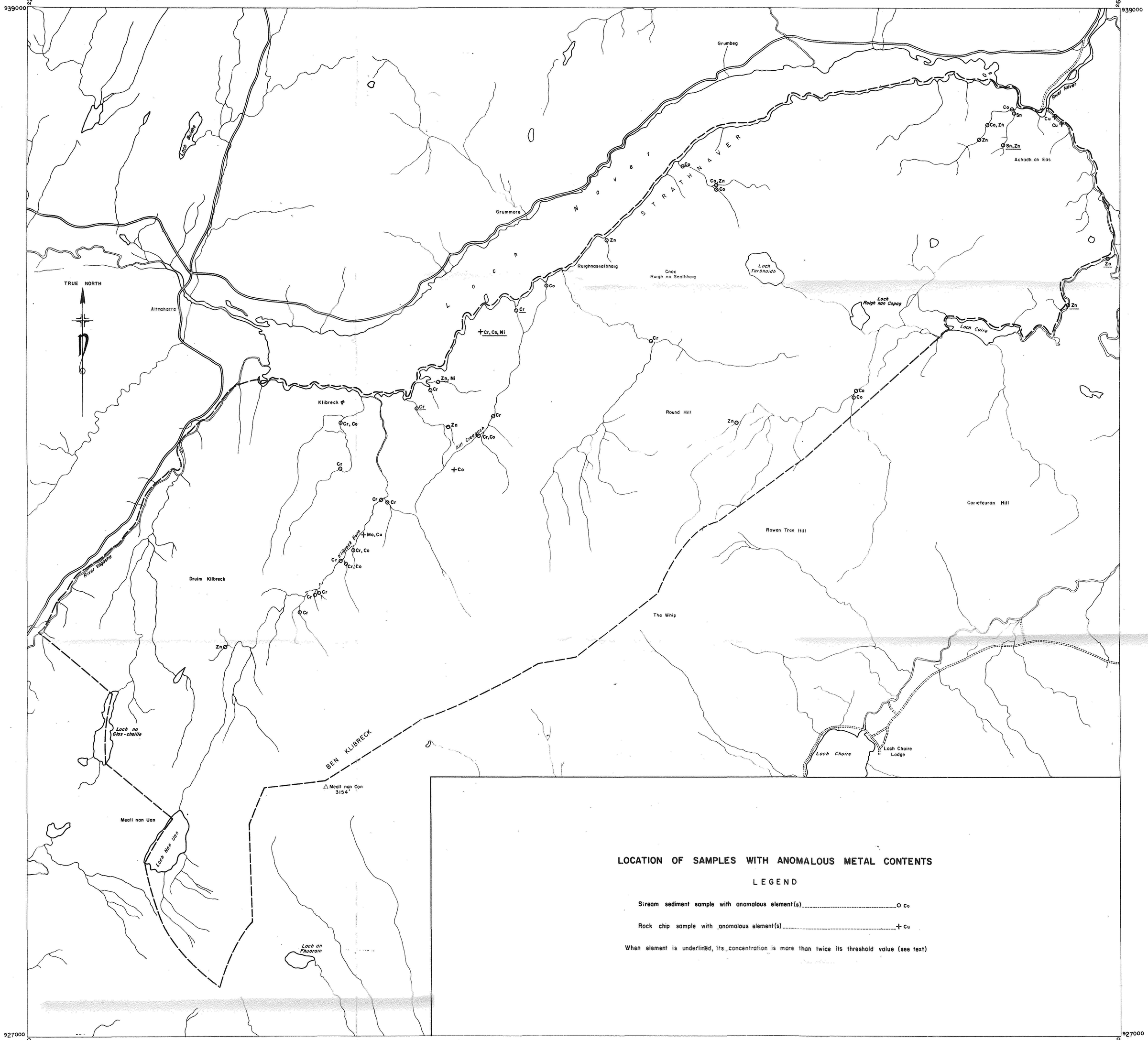
Ref. No.	Sn ppm	Mo ppm	W ppm	Ag ppm	Cr ppm	Co ppm	Cu ppm	Pb ppm	Zn ppm	Ni ppm
[illegible]	<5	2	<50	<1	50	20	10	30	55	20
[illegible]	<5	2	<50	<1	50	20	<10	<20	80	20
[illegible]	<5	2	<50	<1	50	20	<10	20	65	20
[illegible]	<5	2	<50	<1	50	25	<10	<20	65	20
[illegible]	<5	3	<50	<1	200	30	<10	<20	55	30
20205	<5	2	<50	<1	300	30	<10	<20	15	25
20206	<5	2	<50	<1	300	40	<10	<20	30	45
20207	<5	2	<50	<1	200	40	<10	<20	30	25
20208	<5	2	<50	<1	200	30	<10	<20	35	35
20209	<5	2	<50	<1	200	30	<10	<20	35	20
20210	<5	2	<50	<1	200	30	<10	<20	25	<20
20211	<5	<2	<50	<1	50	20	<10	<20	50	<20
20212	<5	<2	<50	<1	100	30	<10	<20	25	<20
20213	<5	2	<50	<1	200	30	<10	<20	30	<20
20214	<5	2	<50	<1	70	30	<10	20	95	<20
20215	<5	2	<50	<1	70	20	<10	<20	60	<20
20216	<5	2	<50	<1	70	20	<10	<20	75	<20
20217	<5	2	<50	<1	30	20	<10	80	500	<20
20218	<5	2	<50	<1	40	5	<10	<20	45	<20
20219	<5	2	<50	<1	100	20	<10	<20	35	<20
20220	<5	<2	<50	<1	100	10	<10	<20	40	20
20221	<5	<2	<50	<1	100	20	<10	<20	35	<20
20222	<5	<2	<50	<1	100	20	<10	<20	30	20
20223	<5	2	<50	<1	70	25	<10	<20	95	20
20224	<5	[illegible]	<50	<1	70	20	<10	<20	55	25
20225	<5	2	<50	<1	100	20	<10	<20	75	25
20226	<5	2	<50	<1	100	30	<10	<20	95	30
20227	<5	2	<50	<1	100	25	<10	<20	10	<20
20228	<5	2	<50	<1	100	25	<10	<20	55	20
20229	<5	2	<50	<1	40	5	<10	<20	70	<20
20230	<5	2	<50	<1	100	30	<10	<20	45	<20
20231	<5	2	<50	<1	200	30	<10	<20	40	<20
20232	<5	<2	<50	<1	70	<5	<10	<20	30	<20
20233	<5	<2	<50	<1	100	20	<10	<20	<10	<20
20234	<5	2	<50	<1	100	20	<10	<20	50	<20
20235	<5	3	<50	<1	150	30	<10	<20	40	<20
20236	<5	2	<50	<1	100	20	10	<20	35	20
20237	<5	<2	<50	<1	100	20	<10	<20	45	25
20238	<5	2	<50	<1	100	20	<10	<20	35	20
20239	<5	2	<50	<1	100	30	<10	40	60	20
20240	<5	2	<50	<1	100	30	<10	<20	55	20

Ref No.	Sn ppm	Mo ppm	W ppm	Ag ppm	Cr ppm	Co ppm	Cu ppm	Pb ppm	Zn ppm	Ni ppm
20241	<5	<2	<50	<1	150	30	<10	<20	25	35
20242	<5	2	<50	<1	200	40	<10	<20	110	<20
20243	<5	<2	<50	<1	100	30	<10	<20	20	20
20244	<5	<2	<50	<1	100	20	<10	<20	45	35
20245	<5	<2	<50	<1	200	30	<10	<20	60	20
20246	<5	2	<50	<1	150	40	<10	<20	140	20
20247	<5	2	<50	<1	100	30	<10	<20	200	20
20248	<5	2	<50	<1	100	40	<10	<20	110	<20
20249	<5	<2	<50	<1	50	20	<10	<20	160	<20
20250	<5	<2	<50	<1	30	10	<10	<20	160	<20
20251	<5	<2	<50	<1	70	20	<10	<20	150	20
20252	20	<2	<50	<1	100	30	<10	25	160	<20
20253	<5	<2	<50	<1	70	40	<10	<20	95	<20
20254	<5	<2	<50	<1	70	30	<10	<20	75	<20
20255	<5	<2	<50	<1	30	30	<10	<20	210	<20
20256	<5	<2	<50	<1	30	40	<10	30	350	<20
20257	<5	<2	<50	<1	30	30	<10	30	330	<20
20258	<5	<2	<50	<1	30	30	<10	<20	220	<20
20259	<5	<2	<50	<1	30	30	<10	40	120	<20
20260	<5	<2	<50	<1	30	30	<10	30	80	<20
20261	<5	<2	<50	<1	30	10	<10	25	110	<20
20262	<5	<2	<50	<1	30	20	<10	20	110	<20
20263	<5	2	<50	<1	30	5	<10	60	40	<20
20264	<5	2	<50	<1	30	20	<10	25	85	<20
20265	<5	<2	<50	<1	60	15	<10	20	90	<20
20266	<5	<2	<50	<1	30	10	<10	<20	210	<20
20267	<5	2	<50	<1	40	15	<10	20	170	<20
20268	<5	<2	<50	<1	40	5	<10	20	85	<20
20269	500	2	<50	<1	50	10	20	850	160	25
20270	<5	<2	<50	<1	50	10	<10	<20	35	<20
20271	<5	<2	<50	<1	50	10	<10	<20	60	<20
20272	<5	<2	<50	<1	50	10	<10	<20	45	<20
20273	<5	<2	<50	<1	50	10	<10	25	45	<20
20274	<5	2	<50	<1	50	5	<10	30	40	<20
20275	<5	<2	<50	<1	30	5	<10	45	30	<20
20276	<5	2	<50	<1	30	5	<10	40	25	<20
20277	<5	2	<50	<1	30	5	<10	50	60	<20
20278	<5	<2	<50	<1	30	5	<10	20	35	<20
20279	<5	2	<50	<1	30	5	<10	30	45	<20
20280	<5	<2	<50	<1	30	<5	<10	35	60	<20
20281	<5	2	<50	<1	30	15	<10	25	75	<20

	[illegible]	Mo ppm	W ppm	Ag ppm	Cr ppm	Co ppm	Cu ppm	Pb ppm	Zn ppm	Ni ppm
[illegible]	<5	<2	<50	<1	50	15	<10	20	70	20
[illegible]	<5	<2	<50	<1	70	15	<10	< 20	60	<20
[illegible]	<5	2	<50	<1	70	20	<10	< 20	75	25
[illegible]	<5	2	<50	<1	150	15	<10	20	120	<20
[illegible]	<5	<2	<50	<1	50	20	<10	< 20	150	20
[illegible]	<5	<2	<50	<1	30	5	<10	30	80	<20
20288	<5	<2	<50	<1	40	10	<10	20	100	<20
20289	<5	<2	<50	<1	30	<5	15	20	60	<20
20290	<5	2	<50	<1	40	15	10	35	90	<20
20291	<5	<2	<50	<1	30	<5	30	25	65	<20
20292	<5	2	<50	<1	30	15	<10	<20	700	<20
20293	<5	2	<50	<1	30	10	<10	<20	850	<20
20294	<5	2	<50	<1	150	20	<10	20	85	20
20295	<5	2	<50	<1	100	10	<10	<20	95	<20
20296	<5	<2	<50	<1	100	20	<10	20	65	<20
20297	<5	2	<50	<1	100	30	<10	<20	170	<20
20298	<5	<2	<50	<1	70	15	10	<20	65	<20
20299	<5	<2	<50	<1	100	15	<10	<20	30	<20
20300	<5	<2	<50	<1	150	20	<10	<20	35	<20
20301	<5	2	<50	<1	200	35	<10	<20	50	<20
20302	<5	<2	<50	<1	100	20	<10	<20	40	<20
20303	<5	2	<50	<1	100	20	<10	<20	35	<20
20304	<5	<2	<50	<1	200	25	<10	<20	30	<20
20305	<5	<2	<50	<1	150	25	15	<20	40	<20
20306	<5	<2	<50	<1	100	25	10	<20	50	<20
20307	<5	<2	<50	<1	100	25	<10	<20	20	<20
20308	<5	2	<50	<1	150	25	<10	<20	15	<20
20309	<5	2	<50	<1	100	20	<10	<20	60	20
20310	<5	<2	<50	<1	150	25	<10	<20	10	<20
20311	<5	<2	<50	<1	700	30	<10	<20	15	<20
20312	<5	2	<50	<1	50	25	<10	55	340	50
20313	<5	2	<50	<1	70	30	<10	35	160	30
20314	<5	<2	<50	<1	150	20	<10	<20	30	25
20315	<5	<2	<50	<1	100	25	<10	<20	650	85
20316	<5	<2	<50	<1	200	20	<10	<20	40	20
20317	<5	<2	<50	<1	30	5	<10	25	60	<20
20318	<5	2	<50	<1	40	20	<10	<20	100	<20
20319	<5	<2	<50	<1	50	20	<10	20	70	<20
20320	<5	<2	<50	<1	30	<5	<10	20	300	<20
20321	<5	2	<50	<1	30	<5	<10	<20	95	<20
20322	<5	2	<50	<1	30	<5	<10	20	30	<20

Ref No.	Sn ppm	Mo ppm	W ppm	Ag ppm	Cr ppm	Co ppm	Cu ppm	Pb ppm	Zn ppm	Ni ppm
20323	<5	2	<50	<1	50	<5	<10	20	70	<20
20324	<5	2	<50	<1	30	<5	<10	20	65	<20
20325	<5	<2	<50	<1	30	<5	<10	20	90	<20
20326	<5	<2	<50	<1	20	<5	<10	<20	85	<20
20327	<5	2	<50	<1	30	<5	<10	20	60	<20
20328	<5	2	<50	<1	20	<5	<10	20	45	<20
20329	<5	2	<50	<1	70	25	<10	<20	160	<20
20330	<5	2	<50	<1	70	20	<10	25	90	20
20331	<5	2	<50	<1	150	30	<10	20	220	<20
20332	<5	<2	<50	<1	50	15	<10	<20	250	<20
20333	<5	<2	<50	<1	50	20	<10	<20	250	20
20334	<5	2	<50	<1	70	20	<10	<20	80	25
20335	<5	<2	<50	<1	70	20	<10	<20	330	<20
20336	<5	2	<50	<1	70	20	<10	<20	270	<20
20337	<5	2	<50	<1	70	25	<10	<20	45	<20
20338	<5	<2	<50	<1	100	25	<10	<20	55	20
20339	<5	2	<50	<1	70	40	<10	<20	500	30
20340	<5	2	<50	<1	100	60	<10	<20	250	<20
20341	<5	<2	<50	<1	100	15	<10	<20	45	<20
20342	<5	<2	<50	<1	100	15	10	<20	170	<20
20343	<5	<2	<50	<1	40	10	<10	<20	140	<20
20344	<5	<2	<50	<1	40	<5	<10	<20	65	<20
20345	<5	<2	<50	<1	40	5	<10	20	50	<20
20346	<5	2	<50	<1	20	<5	<10	20	55	<20
20347	<5	2	<50	<1	40	10	<10	20	25	<20
20348	<5	2	<50	<1	30	20	<10	<20	140	<20
20349	<5	<2	<50	<1	40	20	<10	<20	270	<20
20350	<5	2	<50	<1	400	30	<10	<20	140	<20
20351	<5	2	<50	<1	100	40	<10	<20	160	20
20352	<5	2	<50	<1	150	25	10	<20	55	<20
20353	<5	<2	<50	<1	50	20	<10	20	550	40
20354	<5	<2	<50	<1	50	20	<10	30	110	20
20355	<5	2	<50	<1	150	40	<10	<20	25	<20
20356	<5	2	<50	<1	100	20	<10	<20	65	<20
20357	<5	<2	<50	<1	50	<5	<10	30	120	<20
20358	<5	<2	<50	<1	50	10	<10	25	55	<20
20359	<5	<2	<50	<1	50	<5	<10	<20	25	<20
20401	<5	<2	<50	<1	100	15	<10	<20	85	<20
20402	<5	2	<50	<1	70	10	10	35	95	<20
20403	<5	<2	<50	<1	70	10	10	30	50	<20
20404	<5	<2	<50	<1	70	10	<10	20	50	<20

MINERAL SURVEY OF NAVER AREA, SUTHERLANDSHIRE



LOCATION OF SAMPLES WITH ANOMALOUS METAL CONTENTS

LEGEND

Stream sediment sample with anomalous element(s) ..... O Co

Rock chip sample with anomalous element(s) ..... + Cu

When element is underlined, its concentration is more than twice its threshold value (see text)

SCALE 1 : 25,000

METRES 1000 500 0 1000 2000 3000 METRES

FEET 3000 2000 1000 0 3000 6000 9000 FEET

L E G E N D

Boundary of Survey Area ----- Stream .....

Road ..... Track .....

COMPILATION NOTE

Compiled from Ordnance Survey Sheets NC 43/53, NC 63/73, NC 42/52 at 1:25,000 Scale, with the Sanction of the Controller of H.M. Stationery Office.

ENCLOSURE 3

Map prepared by

ROBERTSON RESEARCH LABORATORIES
'Tyn-y-Coed,'
Llanrhos,
Llandudno,
North Wales.

Map prepared for

ACMIN EXPLORATION N.L.
Level 20,
Norwich House,
6-10 O'Connel St.,
Sydney, N.S.W. 2000.

Drawing No. 1592

Date. 27:1:72

MINERAL SURVEY OF NAVER AREA, SUTHERLANDSHIRE

SCALE 1 : 25,000

METRES 1000 500 0 1000 2000 3000 METRES

FEET 3000 2000 1000 0 3000 6000 9000 FEET

SAMPLE LOCATIONS

LEGEND

Stream sediment sample location and number ..... O 201

Chip rock sample location and number ..... + 555

All sample nos. in the text are prefixed (20)

L E G E N D

Boundary of Survey Area ——— Stream ———

Road ——— Track ———

COMPILATION NOTE

Compiled from Ordnance Survey Sheets NC 43/53, NC 53/73, NC 42/52 at 1:25,000 Scale, with the Sanction of the Controller of H.M. Stationery Office.

ENCLOSURE 2

Map prepared by

ROBERTSON RESEARCH LABORATORIES

'Tyn-y-Coed,'

Llanrhos,

Llandudno,

North Wales.

Map prepared for

ACMIN EXPLORATION N.L.

Level 20,

Norwich House,

6-10 O'Connel St.,

Sydney, N.S.W. 2000.

Drawing No. 1591

Date. 27:1:72

225000 939000 268000 939000

Grumbeg

River Naver

Loch Buidhe

Grummore

N O V E R

STRATHNAVER

Cu, Co, Mo

Cu, Mo

Cr, Co

Co

Co Co

Achadh an Eas

Co

Co

Co, Zn

Co, Zn

Co

Co

Zn

Co

Co, Cr

Zn

Co

Zn

Ruighnaseilbhaig

Cnoc Ruigh na Sealbhaig

Loch Tarbhaidh

Mo

Loch Ruigh nan Copag

Loch Coire

Cr, Co, Ni

Mo

Mo

Co

TRUE NORTH

Altnaharra

Klibreck

Co

Cr, Co

Round Hill

Allt Creagach

Mo, Co

Klibreck Burn

Mo, Co
Cu

River Vagastie

Co

Co

Co

Mo

The Whip

Rowan Tree Hill

Corriefeuran Hill

Loch na Glas-choille

BEN KLIBRECK

Meall nan Con
3154'

Loch Choire

Loch Choire Lodge

Meall nan Uan

Loch Nan Uan

Loch an Fhuarain

LOCATION OF ROCK CHIP SAMPLES WITH ANOMALOUS METAL CONTENTS (LOW THRESHOLD)

LEGEND

Rock chip sample with anomalous element(s) ..... + Cu

When element is underlined, its concentration is more than twice its threshold value (see text)

927000 225000 927000 268000

MINERAL SURVEY OF NAVER AREA, SUTHERLANDSHIRE

SCALE 1 : 25,000

METRES 1000 500 0 1000 2000 3000 METRES

FEET 3000 2000 1000 0 3000 6000 9000 FEET

L E G E N D

Boundary of Survey Area ..... Stream .....

Road ..... Track .....

COMPILATION NOTE

Compiled from Ordnance Survey Sheets
NC 43/53, NC 63/73, NC 42/52
at 1:25,000 Scale, with the Sanction of
the Controller of H.M. Stationery Office.

ENCLOSURE 4

Map prepared by

ROBERTSON RESEARCH LABORATORIES
'Tyn-y-Coed,'
Llanrhos,
Llandudno,
North Wales.

Map prepared for

ACMIN EXPLORATION N.L.
Level 20,
Norwich House,
6-10 O'Connel St.,
Sydney, N.S.W. 2000.

Drawing No. 1593

Date. 27:1:72

Creag a' Mhuilinn
Round Hill
Caann na Beinne Bige
or
Rowan Tree Hill
Corieferan Hill
Whip Corrie
Meall Leathann na Craoibhe
The Whip
Drum Kibrech
Meall Ailein
Meall Meadhonach
Corrie na Bà
Meall nan Con
Meall nan Uan
Loch Nan Uan
Creag nan Gabhar
Loch an Fhuarain
Creag an Lochain
Carn an Fheidh
Cnoc Sgriodain
Alltulaird
Coire Poll Dhomhnuill
BEN KILBRECK
LOCH CHOIRE FOREST
61
62
65
66
67
68
LONG 23°W

MINERAL SURVEY OF NAVER AREA, SUTHERLANDSHIRE

MAJOR GEOLOGICAL UNITS WITHIN THE SURVEY AREA

LEGEND

- X^m_G — Siliceous and semipelitic granulites invaded by many granite veins
- X^m_G — Injection rocks formed of granite and siliceous and semipelitic granulites; igneous and sedimentary proportions equal
- G_m — Injection rocks formed of granite and siliceous and semipelitic granulites; igneous proportion dominant
- X^m_M-G — Injection rocks formed of granite and siliceous, semipelitic and pelitic rocks; igneous and sedimentary proportions equal
- a^m_G — Mica schist invaded by many granite veins
- q^m_G-G — Injection rocks formed of granite and mica schist; igneous and sedimentary proportions equal
- G — Injection rocks formed of granite and mica schist; igneous proportion dominant
- G — Granite of the Loch Choire complex
- A^m_G — Hornblendic rocks of Lewisian type involved in the injection complex
- Serpentinite and related ultrabasic rocks
- Generalised geological boundary

COMPILATION NOTE

Compiled principally from Geological Survey of Scotland, Sheet 108

SCALE 1 : 25,000

METRES 1000 500 0 1000 2000 3000 METRES

FEET 3000 2000 1000 0 3000 6000 9000 FEET

LEGEND

- Boundary of Survey Area
- Road
- Stream
- Track

COMPILATION NOTE

Compiled from Ordnance Survey Sheets NC 43/53, NC 63/73, NC 42/52 at 1:25,000 Scale, with the Sanction of the Controller of H.M. Stationery Office.

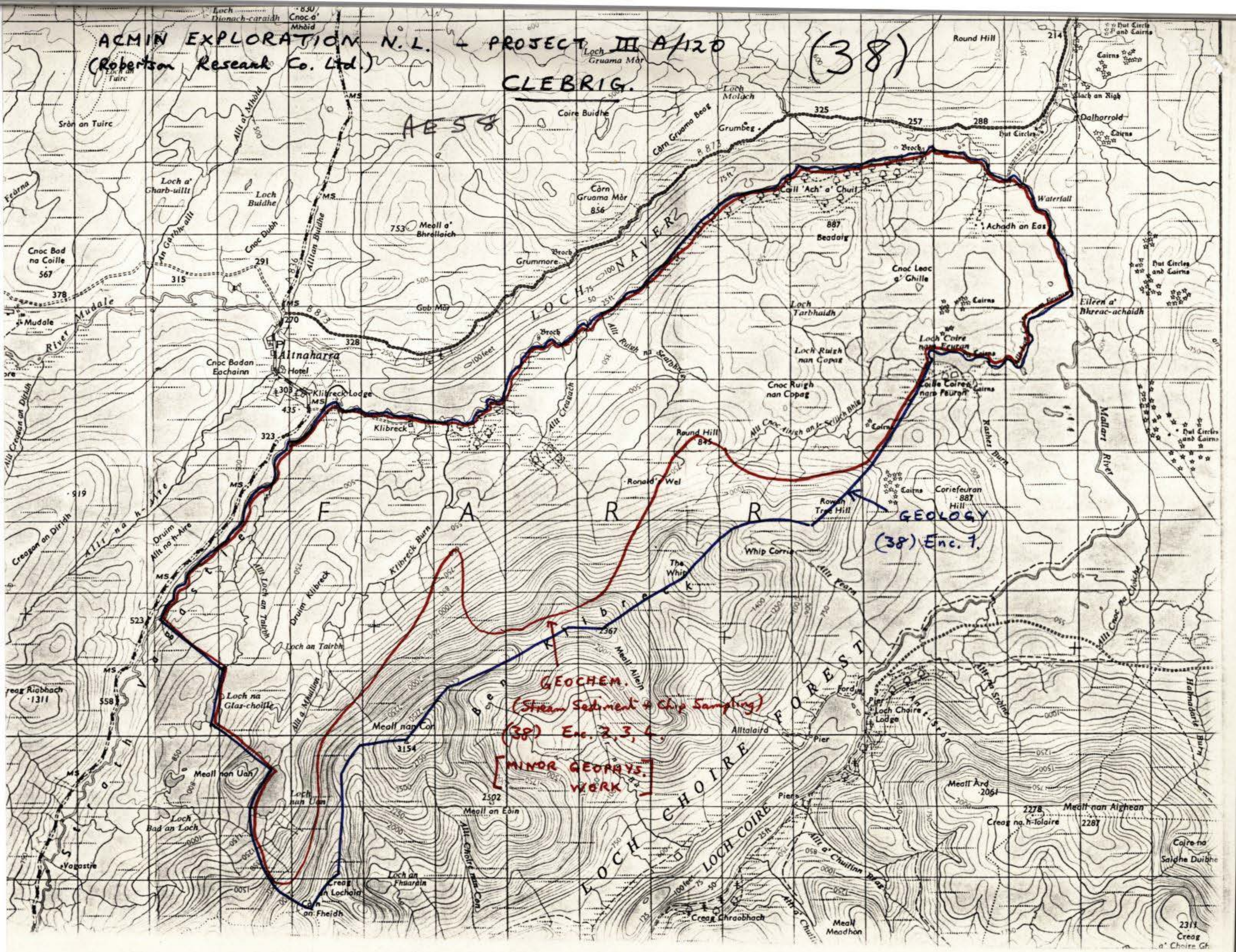
Map prepared by
ROBERTSON RESEARCH LABORATORIES
Tyn-y-Coed,
Llanrhos,
Llandudno,
North Wales.

Map prepared for
ACMIN EXPLORATION N.L.
Level 20,
Norwich House,
6-10 O'Connel St.,
Sydney, N.S.W. 2000.

ENCLOSURE I

Drawing No. 1590

Date. 27 : 1 : 72


ACMIN EXPLORATION N.L. - PROJECT III A/120
(Robertson Research Co. Ltd.)
CLEBRIG.
(38)
AE58
GEOLOGY
(38) Enc. 1.
GEOCHEM.
(Stream Sediment + Chip Sampling)
(38) Enc. 2, 3, 4.
[MINOR GEOPHYS. WORK]
LOCH NAVER
FARR
Ben Klibreck
LOCH CHOIRE FOREST
LOCH COIRE
Altnaharra
Hotel
Klibreck Lodge
Klibreck
Round Hill
845
Ronald's Wel
Rowan Tree Hill
Whip Corrie
The Whip
2367
Meall nan Con
3154
Meall an Eòin
2502
Loch nan Uan
Meall nan Uan
Loch na Glas-choille
Loch an Tairbh
Druim Klibreck
Klibreck Burn
Allt Coire na Con
Loch Coire nam Feuran
Coire Coire nam Feuran
Coriefeuran
887
Cnoc Leac a' Ghille
Loch Tarbhaidh
Loch Ruigh nan Copag
Cnoc Ruigh nan Copag
Mallart River
Achadh an Eas
Waterfall
Eilean a' Bhreac-achaidh
Dalharrold
Hut Circles and Cairns
Cairns
Grumbeg
Grummore
Càrn Gruama Mòr
856
Càrn Gruama Beag
Meall a' Bhrollaich
753
Loch Gruama Mòr
Coire Buidhe
Loch Meadaidh
Round Hill
Beadaig
887
Cnoc Bad na Coille
567
Mudale
River Mudale
Cnoc Badan Eachainn
Loch Buidhe
Loch a' Gharb-uillt
Sròn an Tuirc
Loch Choire Lodge
Pier
Ford
Alltalaird
Meall Àrd
2061
Meall nan Aighean
2287
Creag na h-Iolaire
2278
Creag an Lochain
Càrn an Fheidh
Loch an Fhuarain
Loch Bad an Loch
Vagastie
Creag Chraobhach
Meall Meadhon
Coire na Saidhe Duibhe
2311
Creag a' Choire Gh.
Halmadarie Burn
Allt Chut na Cluiche
Kaimes Burn

AE 58

COMMERCIAL: IN CONFIDENCE (38)

ACMIN EXPLORATION N.L. - PROJECT IIIA/120 CLEBRIG

SUMMARY

This project was undertaken to find out the economic mineral potential of the Clebrig Estate area south of Loch Naver, Sutherland.

The area consists of high grade gneisses and metasediments with numerous intrusive granite bodies. The rocks strike NE and dip steeply SE. East of a line between Loch nan Uan and Klibreck Farm is a band of hornblende and feldspar with gneisses of probable Lewisian age crops out. The rocks are intruded by numerous serpentine bosses. Moinian psammites structurally overlie and underlie the "Lewisian" rocks and to the southeast granitic sheets become abundant in the Moines. The Loch Coire Igneous Complex consists of a series of high grade pelitic to psammitic Moinian metasediments in which granitic veins and sheets become very abundant. In the eastern part of the area the Strath Naver granite forms part of this complex.

In late 1971, Robertson Research Co. Ltd. applied, on behalf of Acmin Explorations N.L., for assistance from the Department of Trade and Industry under the MEIGA scheme. The proposed work comprised a reconnaissance geochemical and geophysical study of the area of the Clebrig Estate (see accompanying maps).

During geochemical sampling a portable magnetometer and a scintillometer were carried. The measurements were not encouraging; magnetometer values only reflected the differing rock types and scintillometer readings were consistently low. Threshold values for the various elements analysed in the stream sediment samples, derived both from this work and other work carried out in the Northern Highlands are given below:-

Sn	Mo	Cr	Co	Cu	Pb	Zn	Ni
10 ppm	3 ppm	150 ppm	30 ppm	100 ppm	100 ppm	300 ppm	70 ppm

Although some anomalous values were obtained, these can generally be attributed to outcrop of amphibolite or ultrabasic rocks (Co and Cr anomalies) or to secondary effects (derelict habitation - Pb and Sn anomalies). Chip sample results were also negative except for two high Cu values at the eastern margin of the Strath Naver Granite. No visible Cu mineralisation was found in this area.

The results have shown conclusively that the metalliferous mineral potential of the Clebrig Estate is very limited. No further work is recommended.

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13 January 1974

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COMMERCIAL : IN CONFIDENCE SG/150/MR/2(38)

Your ref: MMM1/AE58
Our ref : MRD 84/6/1

29 September 1972

M S Morris Esq
Department of Trade and Industry (MMM1)
Thames House South
Millbank
London SW1

Dear Mr Morris

I refer to your letter of 9 August 1972 with which you enclosed an application by Acmin Exploration (UK) Ltd for payment in respect of work carried out on their Clebrig (Kilbrock) project.

In so far as geological information is concerned the report submitted to the company by Robertson Research International Limited complies with the Act, provided that an undertaking is given by the company that the remaining 40 analyses of the 205 stream samples originally budgeted for will be forthcoming in due course. I understand that the early onset of bad weather in November 1971, delayed the collection of these samples until 1972.

The company have not assayed their samples for all the metals noted in their original application; in particular, no action appears to have been taken in respect of gold, uranium, rare earths, beryllium or lithium. However, in view of the considerably greater costs which would have been incurred in analysing samples for all these metals, and the probability that the consultants found little reason to suspect their presence during reconnaissance, we feel there is no reason for withholding payment.

Yours sincerely

Director