

Summary Report
on
Hampshire Magnetite

Apr '74

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INTERNAL CORRESPONDENCE

AUSTRALIA AND NEW ZEALAND EXPLORATION COMPANY BOX 3972 G.P.O. SYDNEY., N.S.W. 2001 AUSTRALIA

To R.T. Brandt Date April 12, 1974

Location Burnie, Tasmania Originating Dept. Burnie, Tasmania

Answering letter dated

Copy to J.S. Hollingsworth Subject Summary Report on Hampshire Magnetite
T.S. Ary

The geology and magnetics of the Hampshire Magnetite has been explained and discussed in several previous reports. A couple of months ago, auger drilling was completed on the prospect with a total of 28 holes being drilled. These holes were logged and assayed at three-foot intervals (see attached reports). The Hampshire Magnetite prospect map shows the auger hole locations together with magnetics, geology and soil grid geochemistry. Also accompanying this final report are three cross-sections with assay results.

Cross-sections 2 and 3 show a definite synclinal structure in the otherwise moderately southwest dipping sediments. The magnetite-hematite appears not to be over 50 feet in thickness and is only 20 feet in most places. In the locality of the 1000 ppm soil sample, auger holes 52, 53 and 33 were definitely anomalous but nothing over 750 ppm was recorded and this was in a fairly restricted area. Combinations of cross-sections 1 and 3, in particular auger holes 38, 44 and 46, show a hint of increasing mineralization downward, but it is thought to have a limited thickness and, probably, no value greater than 1000 ppm would be obtained. Unfortunately, the area to the west of the road is covered with pines and auger drilling was forbidden. If slightly better values had been obtained in the eastern portion, steps would have been taken to try to obtain permission to enter the pines area.

As the prospect stands today, no proposal for a diamond drill site will be made. The only area of interest is that marked in red on the prospect map, however, no work program is recommended. The prospect is now a low-priority area.

D.R. Kruger

CENTRAL MINERALOGICAL SERVICES

Date 22nd November 1972.

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

Job No. CMG 72/11/23 Date Received: 20th November 1972Reference Letter Mr. Gibbs.Sample No. 187 ft.Nature of Sample: D.D. Core.

DESCRIPTION SECTION No. 10398.

a. Hand Specimen:

Brown, puggy argillaceous rock.

b. Microscopic:

This strongly kaolinitic rock is undoubtedly intensely weathered or even hydrothermally altered.

It consists dominantly of very fine kaolinitic aggregates, often with outlines suggesting that the rock is a breccia. The kaolinite is generally structureless, but occasional coarser patches may be pseudomorphs after a fibrous-prismatic mineral (? tremolite).

Opagues occur throughout; these are goethite patches, sometimes with a micaceous texture which probably indicates a heavily iron-stained mica (? weathered biotite).

Small, irregular garnet grains are fairly common, and small prismatic colourless tourmaline (elbaite) is present. There are many individual flakes and clusters of fresh muscovite-hydro-muscovite throughout.

It is believed that this rock was probably a skarn type, and has been severely altered, with the introduction of ? elbaite and muscovite. There is a possibility that the mica (and the tourmaline) is a lithium bearing variety.

H.W. Fander, M.Sc.

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

Job No. CMS 72/11/22 Date Received: 20th November 1972Reference Letter Mr. R.T. Brandt.Sample No. Stowport/1Nature of Sample: Mineral fragments.

DESCRIPTION SECTION No.

a. Hand Specimen:

Waxy yellow-brown mineral which swells and disintegrates in water.

b. Microscopic:

The mineral was identified by XRD as one of the montmorillonite-group members, most probably saponite.

Examination of the mineral under the stereobinocular microscope showed no sedimentary or pyroclastic features. It is associated with small veinlets and coatings of hematite and MnO_2 , and is structureless. For these reasons, the saponite is thought to be of hydrothermal origin.

The montmorillonites are commonly formed by hydrothermal alteration or weathering of basic igneous rocks and pyroclastics. Thus the origin of this sample is consistent with the general environment described in the letter; perhaps hydrothermal alteration along fractures, or junctions of flows, caused this material to form.

The montmorillonite layers could presumably act as huge ion-exchange systems and thus actually purify the water in those aquifers.

H.W. Fander, M.Sc.

004

REPORT: CMS 72/11/5; CMS 72/11/9

Introduction.

This report gives a brief summary of the mineralogy and petrology of two batches of samples from drillhole 132. It was thought more convenient to combine the two reports into one, since they concern the same drill-hole.

Thin-sections were prepared of both core and sludge samples. This was essential because of the need to identify the correlate rock-types. Also, a confirmatory XRD powder pattern was prepared of the white garnet in the core at 330 ft.

The main characteristics of the samples are detailed below.

Petrology. (TS Nos. 10296 - 10310 refer)

105-110 ft. Sludge. The sample consists of fine fragments of quartz and iron oxides, with altered feldspar, altered olivine (iddingsite) and minor pyroxenes. The sample is partly derived from a dolerite-basalt.

In all sludge samples, the harder, more abrasion-resistant minerals are dominant; the softer alteration-products would naturally "Slime" and remain in suspension. Hence the distribution and relative quantities of minerals present in the sludge samples (and the thin-sections prepared from them) can be quite misleading.

138 ft. Core. This is an altered olivine-dolerite. The unusual feature is the almost total argillisation of the plagioclase phenocrysts and lathes, with the preservation of the pyroxene (this is the reverse of the normal situation and suggests a selective, denteric alteration). The rock consists of altered plagioclase and olivine phenocrysts, in a flow-lined groundmass (medium-grained) of feldspar laths (altered), granular fine pyroxene, and minor interstitial devitrified glass.

155.5 ft. Core. This is obviously the same rock-type as that at 138 ft. i.e., an altered olivine-dolerite. However, it is so severely altered that no primary minerals have survived; the fabric is very well-preserved and diagnostic.

157 ft. Core. This sample consists of quartz and kaolinitic clay. It was at first thought perhaps to be a rhyolitic type, but further examination shows that the quartz occurs as angular fragments and splinters, in a wide range of sizes and showing strain-extinction. These are not likely to be relict phenocrysts; rather, this is more probably a quartz-kaolinite fault-filling or zone. It does not appear to be a sediment. *Tuff??*

144 - 148.5 ft. Sludge. Fragments of olivine-basalt or dolerite; grainsize (i.e. of the original rock) cannot be determined. This rock is very similar to the core at 138 ft., but is fresher and contains unaltered labradorite fragments. In addition, there are quartz and iron-oxide grains (op 105-110 ft) of unknown derivation.

155.7 - 159.1 ft. Sludge. The main components are quartz splinters and opaque grains (iron oxides), but crushed dolerite/ basalt (fresh) is also present, though in smaller amounts than at 144 ft.

REPORT: CMS 72/11/5; CMS 72/11/9

164 - 169 ft. Sludge. This consists dominantly of quartz and opaques, with minor basalt/ dolerite fragments.

Through the last three sludge samples, there has been a decrease in the basalt/dolerite component. The significance of this observation cannot be assessed, because of lack of knowledge of the lithology (particularly above 105 ft.).
(Another core specimen sent)

195 ft. Core An altered, vesicular basalt. This is almost certainly the same rock as the olivine-dolerite at 138 ft., but is appreciably finer-grained. It may be the base of a flow, or the (presumably lower) contact of an intrusion.

199 ft. Core. Highly-altered garnetiferous rock, banded or gneissose. It is composed mainly of decussate aggregates and streaks of a type of fibrous chlorite (? amesite), which may represent hydrothermally altered fibrous amphibole (possibly tremolite-actinolite). Fine garnet is reasonably common, poorly defined and perhaps even fractured. Goethite is present, and fine sphene occurs in traces.

202 - 207 ft. Sludge. Garnet is abundant in this sample (due to winnowing of soft material), and asbestiform or fibrous chlorite also occurs. Goethite is abundant, but quartz scarce. Traces of vesuvianite and ? scheelite are also present. This sample was derived from a rock such as that from 199 ft., and represents a type of skarn (tactite).

267 - 272 ft. Sludge. This is very similar in mineralogy to the sample from 202-207 ft., and contains traces of epidote and ? diopside in addition. These are typical of skarn assemblages.

279 ft. Core The dominant constituent is finely-fibrous chloritic materials (? amesite) probably derived from amphibole. Minor, finely-granular sphene is present, and ultrafine garnet occurs, apparently as splinters and angular fragments. This may represent portions of altered, fragmented, originally larger crystals.

291 ft. Core. Banded or gneissose garnet-clay rock with minor vesuvianite and ultrafine sphene. Most probably an altered skarn. Secondary Mn O₂ - staining is present.

322 ft. Core. This garnet-clay rock is very similar to that at 291 ft., containing some vesuvianite and sphene, and a possible trace of scheelite. The rock is Mn - stained.

330 ft. Core. A garnet-clay rock, with much coarser, white garnet (XRD confirmation), which in hand-specimen has the appearance of quartz. The rock is believed to be hydrothermally altered, i.e., argillised. It is lightly iron-stained and appears substantially different, in hand-specimen, to the intersections at 291 ft. and 322 ft.

006

CENTRAL MINERALOGICAL SERVICES

602008

Date 31st October, 1972.

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

Job No. CMS 72/10/32 Date Received: 25/10/72Reference Letter dated 23/10/72Sample No. L.C. 1Nature of Sample: Hand specimenDESCRIPTION SECTION No. 10251

a. Hand Specimen:

Buff-coloured, medium-grained porphyritic granitoid rock. K-feldspar stain test positive.

b. Microscopic:

This is a porphyritic biotite-microgranite. The phenocrysts, which are not abundant, consist of orthoclase and of quartz. The orthoclase is generally perthitic, and sometimes shows poorly-developed microcline (grid-) twinning, perhaps caused by stress. There are also patches of micrographically intergrown quartz and orthoclase. Occasional, relatively large flakes of biotite occur and may be regarded as phenocrysts. The groundmass, constituting the bulk of the rock, consists of even-grained quartz and orthoclase, with minor oligoclase.

The components are slightly stressed (especially noticeable in the quartz), and the feldspar is partly argillised and ironstained.

The rock is assumed to be of magmatic origin, in the absence of petrographic evidence to the contrary.

H.W.Fander, M.Sc.

| IDENTIFICATION |
|-----------------------------------|
| L.C. 1 |
| Porphyritic biotite-microgranite. |

Laurel Creek Tranches

CENTRAL MINERALOGICAL SERVICES

Date 31st October, 1972.

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

Job No. CMS 72/10/32 Date Received: 25/10/72Reference Letter dated 23/10/72Sample No. L.C.2Nature of Sample: Hand specimen

DESCRIPTION SECTION No. 10252

a. Hand Specimen:

Pale green, medium-grained quartzose rock with small hematite flakes. K-stain test negative.

b. Microscopic:

This thoroughly sericitised rock is believed to be the altered equivalent of L.C.1 and is thus a sericitised porphyritic microgranite. The introduction of hematite appears to be related to the sericite.

The rock consists of medium-grained, anhedral quartz and rather shapeless aggregates of fine, flaky sericite (probably hydromuscovite). The former presence of phenocrysts and micrographic intergrowths is recognizable by the relict textures.

There is no evidence of biotite having occurred, but in any case L.C.1 contained very little.

The sericitisation of this rock is a low-temperature hydrothermal alteration, similar to "greisening" or muscovitisation, but lacking the intensity. It may however, be worth following up this alteration in the host-rock, as it may merge into greisening zones and could then be accompanied by W, Mo and Sn mineralisation.

H.W.Fander, M.S.

| IDENTIFICATION |
|--|
| L.C.2 |
| Sericitised porphyritic microgranite. |

Laurel Creek Tranche

Date 31st October, 1972.

008 CENTRAL MINERALOGICAL SERVICES

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

Job No. DMS 72/10/32 Date Received: 25/10/72Reference Letter 23/10/72Sample No. L.C.3 and L.C.4Nature of Sample: Hand specimen

DESCRIPTION SECTION No. 10253, 10254

a. Hand Specimen:

L.C.3:- Massive, coarse, bladed hematite.

L.C.4:- Fine-grained micaceous hematite.

b. Microscopic:

Both samples were mounted, polished and carefully examined.

L.C.3: This consists of coarse blades or platy, crystals of titaniferous hematite. Both the optical properties and Vickers Microhardness determinations agree well with Ti-hematite. A composite sample was crushed and examined by XRD to check whether any wolframite might be present (not detected in polished section), but none was found.

L.C.4: This also consists of fine lamellae of Ti-hematite, with no other opaque minerals detected, despite careful examination.

The fact that the mineral is Ti-hematite rather than the normal variety, accounts for the absence of (or scarcity of) red internal reflections, and the lack of the characteristic reddish streak.

H.W.Fander, M.Sc.

IDENTIFICATION

L.C.3, L.C.4

Ti-hematite only.

*Harold
Creek
Trenches*

REPORT CMS 72/5/7PETROLOGY - MINERALOGY OF DRILLCORESINTRODUCTION

Thin sections were prepared of all samples. Prior to sectioning, each cut surface was examined in short-wave UV, and as far as possible, areas of fluorescence were included in the thin-sections. Thus in terms of mineralisation, the sections are biased, but in any case the most important consideration is that of paragenesis.

Descriptions of the samples are given below, and are followed by summary and conclusions.

PETROGRAPHIC DESCRIPTIONSDDH 11474 ft. (T.S. 9034)

Dark, magnetite-rich rock; minor scheelite.

The main constituents are pale-brown garnet, magnetite, and diopside. The garnet (from R.I. determination and colour) is probably a member of the grossularite-andradite series, nearer to the andradite end. However, further determinations (SG, unit cell size) would be needed to be certain of the precise species. It forms small and large subhedral crystals, with interstitial, much smaller prismatic diopside crystals, and a "cement" of magnetite. Patches of scheelite up to 3 x 2 mm occur sporadically.

Some garnet is marginally altered to a pale biotite and magnetite is superficially oxidised in some places.

92 ft. (T.S. 9035)

Pale greenish-cream rock.

This rock consists almost entirely of granular diopside, as large and small subhedral to granular crystals. The rock is cut by quartz-calcite veins. A few yellow fluorescing patches seen in hand specimen are carbonate, probably dolomite (they do not give a calcite stain reaction). Traces of sphene are present.

99 ft. (T.S. 9036)

Fine-grained green siliceous rock.

May be termed an epidote-metacartzite. It consists mainly of typical metamorphic mosaic-quartz, with zones and patches of fine epidote, generally intergrown with fibrous diopside and apparently replacing the quartz. Occasional small patches of carbonate occur. There are traces of fine sphene, and one patch of granular apatite was seen.

Encl:

DLM:vew

010

119 ft. (T.S. 9037)

Fine-grained, pale brownish rock.

This is a granular vesuvianite-garnet-diopside rock. It consists of small diopside crystals embedded in anhedral masses of pale yellow-brown garnet, generally slightly anisotropic. Larger, yellow crystals of vesuvianite also occur, as porphyroblasts and matrix material, and often show sector twinning. The rock is cut by carbonate-quartz-chlorite veinlets.

124 ft. (T.S. 9038)

Pale-green, granular crystalline rock.

In thin section this is a banded diopside-garnet rock, with minor vesuvianite in some layers. The rock is composed of layers of quite coarsely-crystalline, interlocking prismatic diopside crystals, alternating with layers in which diopside is embedded in garnet, and layers of finer diopside-garnet-vesuvianite.

131 ft. (T.S. 9039)

Green/black rock with appreciable magnetite.

This is a diopside-magnetite rock, composed principally of granular to subhedral, prismatic diopside crystals and patches, lenses and streaks of magnetite aggregates. Small tremolite veins with minor vesuvianite cut the rock.

DDH 117

56 ft. (T.S. 9040)

Magnetite-rich granular brown rock.

A garnet-magnetite rock, with areas of diopside and minor quartz and carbonate. The garnet is quite well zoned and in parts anisotropic. Magnetite is fine-grained and intergrown with garnet. Some angular interstitial areas contain mosaic quartz, some contain carbonate. No scheelite occurs.

77 ft. (T.S. 9041)

Finely-granular greenish-brown rock.

Essentially a fine-grained diopside-epidote rock, with fine interstitial micaceous material. The rock consists of a matted growth of small, prismatic diopside crystals and granular epidote, with scattered sphene. Fine, flaky, brownish chloritic material occurs interstitially; it may be a degraded biotite or a similar alteration product.

89 ft. (T.S. 9042)

Fine-grained pale green rock.

This diopside rock is virtually monomineralic, and is composed of medium to fine interlocking prismatic crystals of diopside. The rock is cut by veinlets of magnetite, garnet, and epidote. The diopside shows strain extinction, which is probably related to the fracturing and veining.

Encl:
DLM:vew

011
96 ft. (T.S. 9043)

Greenish, magnetite-rich rock; minor scheelite. Dominantly a diopside-magnetite rock. It is composed of aggregates of interlocking, small subhedral diopside crystals, and masses of granular magnetite with interstitial or embedded diopside. Occasional patches of anhedral apatite crystals are present. There is one pod of garnet, with associated scheelite grains up to 1.2 mm in size. Occasional areas of aggregates of degraded biotite probably represent altered garnet.

104 ft. (T.S. 9044)

Pale, fine-grained siliceous, micaceous rock. This is best termed an epidote-biotite-quartz-orthoclase hornfels. It is clearly derived by contact metamorphism from a fine-grained micaceous (and argillaceous) sandstone, as the rounded shapes of the original quartz grains are still recognisable. The rock consists mainly of fine mosaic quartz and anhedral orthoclase, with numerous small flakes of pale reddish biotite (altering to chlorite), granular fine sphene, and irregular patches and veins of epidote (metasomatic). There are also small goethite patches with boxworks; these represent pyrite and possibly chalcopyrite, and belong to the same phase as the metasomatic epidote. The amount of orthoclase present is quite large (about 50%), and it may be in part metasomatic also, but preceding the epidotisation.

DDH 121

152 ft. (T.S. 9045)

Magnetite-rich rock with appreciable coarse scheelite. This is a scheelite-magnetite rock. The thin section consists of about 30% scheelite, as coarse anhedral crystals up to 10 mm or more across. Apart from minor areas of diopside and garnet, the remainder of the rock consists of magnetite. It would appear that the scheelite is younger than the magnetite, which itself probably postdates the garnet and diopside. Large areas of scheelite enclose magnetite crystals.

172 ft. (T.S. 9046)

Brown garnet rock; minor fine scheelite. This garnet rock consists virtually entirely of zoned, anisotropic garnet (grossularite) of a yellow-brown colour. Angular interstitial areas are filled with mosaic quartz. Small well-formed (euhedral) crystals of scheelite are embedded in the garnet, and range from 0.3 mm to 0.8 mm in size. However, they transect the zoning of the garnets and may be younger.

One patch (0.5 mm) of chalcopyrite was observed in the hand specimen.

012

186 ft. (T.S. 9047)

Friable, magnetitic, biotitic rock; minor scheelite.
A biotite-magnetite rock, composed chiefly of small (0.15 mm) euhedral magnetite crystals, with interstitial small flakes of degraded green biotite (hence the friable nature of the rock). There are sporadic patches of epidote, and appreciable amounts of scheelite (apparently partly masked in hand specimen due to fine magnetite). The scheelite crystals range from 0.15 mm to 2.0 mm in size, and are apparently younger than the other components. Small patches of fluorite are also present, up to 0.6 mm in size. The rock is somewhat altered (weathered, perhaps by circulating groundwaters).

a

196 ft. (T.S. 9048)

Coarse magnetite-actinolite rock.
This rock is essentially an actinolite-magnetite rock, in which the major minerals are matted, fibrous aggregates of actinolite and large crystals of magnetite. It appears that at least some of the actinolite represents partly replaced diopside. Secondary chlorite and epidote occur, and there are veinlets of carbonate.

A small patch of scheelite (0.15 mm) with associated fluorite occurred within the actinolite.

209 ft. (T.S. 9049)

Finely-granular dark rock; trace of scheelite.
Essentially a diopside-ferrohastingsite rock, with distinctive fabric. It consists of mutually intergrown poikiloblastic crystals of diopside and ferrohastingsite amphibole; in some areas, the two minerals are segregated into monomineralic patches. Magnetite is scattered through the rock. Veinlets of fluorite-magnetite cut the rock, and carry small amounts of scheelite (up to 0.2 mm wide).

220.5 ft. (T.S. 9050)

Streaky brown rock with magnetite. Minor scheelite.
Mainly brown isotropic garnet (grossularite), as finely-granular masses, with lenses and streaks of diopside crystal aggregates in some areas, and poikiloblastic patches of ferrohastingsite (enclosing garnet) in others. Minor magnetite occurs in zones and veinlets (i.e. younger), probably due to shearing, and traces of scheelite occur in these zones (0.1 - 0.5 mm anhedral crystals), together with traces of fluorite.

230 ft. (T.S. 9051)

Finely-granular greenish-brown rock.
A fine to medium-grained garnet-diopside rock, composed of granular grossularite and small prismatic, subhedral crystals of diopside. Occasional small areas of ferrohastingsite occur interstitially and are younger than the other components. The rock is quite featureless.

Encl:
DLM:vw

013

236 ft. (T.S. 9052)

Garnet-magnetite rock with fine scheelite.

This is a banded garnet-diopside rock, with broad crosscutting zones of ferrohastingsite, with patches of fluorite (quite conspicuous, up to 2 mm in size), and areas of magnetite-ferrohastingsite. Minor scheelite occurs in these metasomatic zones, as anhedral patches 0.2 - 1.5 mm in size. Thus there seems to be a clear association between scheelite, fluorite, magnetite and ferrohastingsite.

254 ft. (T.S. 9053)

Fine-grained greenish rock; trace scheelite.

Appears to be a metasomatised metaquartzite, in which much of the quartz has been replaced chiefly by diopside and epidote; large patches consist almost entirely of these two minerals, with isolated scheelite crystals (up to 0.5 mm) embedded in diopside aggregates. There are poikiloblastic patches of calcite, containing small, well-formed fluorite crystals (<0.15 mm). What little metaquartzite has survived replacement consists of typical stressed metamorphic quartz with interlocking texture. Minor amounts of magnetite and ferrohastingsite are seen.

276 ft. (T.S. 9054)

Fine-grained pale-green rock.

The three main constituents are vesuvianite, garnet and diopside. These occur as fairly fine, granular crystals, though the vesuvianite often occurs as larger poikiloblastic patches (optically continuous) crowded with diopside. The rock is cut by epidote and garnet veins.

SUMMARY AND CONCLUSIONSGENERAL PETROLOGY

Virtually all the cores examined are metasomatic rocks; only one was still recognisable as an altered sediment, though a few of the others are metaquartzites and presumably derived from sediments.

The metasomatism has been intense, with complete replacement of host rocks by secondary minerals in most cases. These secondary minerals are typical of tactites or skarns and represent Ca-Fe metasomatism. This has produced diopside, magnetite, grossularite (probably with an andradite component), epidote, vesuvianite, and in some cores there is evidence of minor Na also where ferrohastingsite has developed, and K where biotite occurs.

These minerals appear to have been formed in a fairly definite paragenetic sequence, though this may not have been separated by an appreciable time interval. The mineral formation sequence probably belonged to the same overall phase, though there is evidence of late-stage, minor fracturing and veining.

Encl:
DLM:vew

014

Minor amounts of fluorite, apatite, carbonate, scheelite and sulphides are present and all appear to belong to the latest (i.e. youngest) part of the metasomatic phase.

Since virtually nothing is known of the composition of the original host-rocks, it is difficult to envisage the nature of the chemical additions and subtractions to the system.

MINERALISATION

Allowing for the fact that the core samples examined may not be representative of the deposit, the scheelite distribution appears to be erratic.

However, a few generalisations may be made which may or may not be valid for the deposit as a whole, and may need considerable modification in the light of other data.

It seems that the scheelite was introduced at a late stage, after the magnetite. There is evidence that the magnetite itself was one of the last minerals to be introduced, and there is an association between scheelite and magnetite. This may be useful in exploration. There is also an association between a late-stage development of ferrohastingsite, an emplacement of fluorite, and some scheelite. However, it would be misleading to be too dogmatic about the paragenetic position of the scheelite; it is possible that this mineral occurs throughout the paragenetic sequence, with an emphasis on the latest stages of metasomatism.

The presence of chalcopyrite (and pyrite) is interesting, though not economically significant. However, it does suggest that other sulphides (e.g. molybdenite) could occur elsewhere in the deposit, particularly in view of the yellowish-white fluorescence of the scheelite which indicates an appreciable Mo content (up to 1% in the scheelite). Ag and Au are two elements which may be present also and should be checked at some stage.

H.W. Fander, M.Sc.

Encl:
DLM:vew

CENTRAL MINERALOGICAL SERVICES

Date 14th March, 1972

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

Job No. CMS 72/3/14 Date Received: 13/3/72
 Reference Letter dated 7/3/72
 Sample No. 1
 Nature of Sample: Hand-specimen

DESCRIPTION SECTION No. 8677

a. Hand Specimen:

A coarse-grained, pink granite. *from Montagu Gully road, Tasmania*

b. Microscopic:

This rock is a pink granite in which the dominant constituents are:-

| | |
|------------------------------------|--------|
| Quartz | 20% |
| Perthite | 55-60% |
| Plagioclase (An ₁₀₋₁₅) | 10-15% |
| Biotite (altered to chlorite) | 7-10% |
| Opagues | <3% |
| Accessories | |

The textures are typically hypidiomorphic granular and grainsizes average 2-2.5mm. The perthitic orthoclase is heavily clouded with hematite dusty discolouration (giving the pink colour to the mineral), while the plagioclase feldspar is partly altered to epidote, sericite, chlorite and dusty kaolinite.

Magnetic opaques are invariably related to the medium-grained chloritised biotite flakes and accessory zircon (very common), apatite, epidote. Very minor chloritised hornblende can be recognised because of the secondary epidote inclusions (and relict cleavages), whereas the biotite has been replaced by chlorite and minor (?) sphene.

Sixteen euhedral zircons present in a heavy mineral concentrate prepared from the sample have average length to breadth ratios of 2.5:1. Of these six contained tiny inclusions in the form of opaques, negative crystals and bubbles. Traces of metamict zircon were noted in thin section and occasionally zircon grains have a very pale yellow colour. Very pale pink fluorescence is a feature of the zircon in this sample.

Comparison with TC2 (Report CMS 72/2/24):

IDENTIFICATION

1

Pink granite.

016

A re-examination of this earlier sample showed that only one-tenth of the zircons were euhedral, but of seven grains measured the length to breadth ratios were similar to the granite zircons (2.75:1).

Inclusions of opaques and negative crystals were noted in many euhedral grains, but none were characteristic enough to be directly compared with the granite zircon inclusions.

The hyacinth varieties were rounded, but the pink fluorescent varieties were identified as being sub-rounded.

No euhedral zircons were identified in "A.R. conc". Some fluorescence was however traced to topaz grains as well as zircon grains.

I.F.Scott, M.Sc.

*North and West
of main building
Access at Kern Hall*

017

REPORT CMS 71/7/10

The sample received, K1-3, gave an assay of 1.83% WO_3 and it was requested that the tungsten mineral(s) be identified.

2

PROCEDURE

The sample was treated as follows:-

1. Lumps were broken up by light crushing.
2. A magnetic fraction was removed with a powerful hand-magnet.
3. The magnetic fraction obtained was divided into a weakly magnetic and a strongly magnetic fraction.
4. The non-magnetic residue was separated in TBE (S.G. = 2.95). The heavy fraction consisted mainly of earthy brown goethitic material.

The fractions were examined in oil mounts and also in polished section. A short wave UV check was also made.

No tungsten minerals of a primary or secondary nature were identified, despite a careful search.

Three fractions were then submitted to Amdel for WO_3 analysis, with the following results.

- | | |
|--|--------------|
| a. MAG (magnetic) | 0.88% WO_3 |
| b. WM (weakly magnetic) | 1.12% WO_3 |
| c. NM HF (non-magnetic heavy fraction) | 2.90% WO_3 |

The earthy sample NM HF was also submitted for a full x-ray diffractometer chart trace with a request to identify any tungsten minerals.

The assay of 2.90% WO_3 for this fraction was quite high enough for any discrete, crystalline tungsten mineral to be detected by this method. However, apparently no such mineral was detected. The constituents of NM HF were goethite, hematite and clays. A point of significance however, was that the goethite unit cell size was distinctly smaller than normal. This phenomenon is known to occur in lateritic goethite in which Ni partly replaces Fe.

Since the ionic radius of the tungsten ion, W^6 , is 0.62A compared with the ferric iron Fe^3 , which is 0.64A, it would seem quite feasible for a partial substitution of Fe^3 by W^6 to occur. Hence, a discrete tungsten mineral would not be detected.

Since the MAG and WM fractions also contain appreciable WO_3 , this may be due to W^6 substituting for Fe^3 in hematite (martite) or to admix "tungstic goethite".

018

The other possibility is that the tungsten mineral is amorphous, and thus not detectable by x-ray diffraction.

Electron-probe microanalyses of these fractions would establish the relationship between tungsten and say , iron in goethite and/or hematite.

2

It is still possible that small amounts of wolframite occur in the MAG and WM fractions, though the polished section was carefully searched and only magnetite, martitised magnetite, hematite and goethite were identified.

H.W. Fander, M.Sc.

jw

CENTRAL MINERALOGICAL SERVICES

Date: 22nd March, 1971.

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

Job No. CMS 71/3/22 Date Received: 12/3/71Reference Request -- Mr. K.J.CallowSample No. No. 1Nature of Sample: Hand-specimen

DESCRIPTION SECTION No. 5216

a. Hand Specimen:

*Area No 1
South Extension*

Brown, massive garnet rock.

| IDENTIFICATION |
|---------------------------------|
| No. 1 |
| Grossularite- Diopside Rock. |

Microscopic:

This garnet rock consists principally of well-zoned, birefringent grossularite garnet.

Where the garnet projects into cavities, it is euhedral. The cavities contain calcite or quartz.

Small subhedral crystals of diopside are scattered through the garnet. There is no indication of relict textures or minerals, and the nature of the original rock is not known. If this rock is metasomatic, then the original host may have been a limestone or marble, or similar highly calcareous type.

H.W.Fander, M.Sc.

602022

CENTRAL MINERALOGICAL SERVICES

Date: 22nd March, 1971.

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

Job No. CMS 71/3/22 Date Received: 12/3/71

Reference Request -- Mr. K.J. Callow

Sample No. No. 2

Nature of Sample: D.D. Core -- hand-specimen

DESCRIPTION SECTION No. 5217

a. Hand Specimen:

Kara No. 1
South extension

Fine-grained grey ?hornfels with traces of sulphide.

| IDENTIFICATION |
|--------------------------------------|
| No. 2 |
| Biotite metaquartzite (Hornfels). |

Microscopic:

This is a fine-grained biotite-metaquartzite.

It consists of small interlocking quartz grains and minute flakes of reddish biotite (partly chloritised), with scattered sphene, epidote and apatite grains. Occasional small grains of detritally rounded zircon are seen, indicating that the original rock was a sediment (siltstone). This rock may be regarded as a biotite hornfels produced by contact metamorphism.

H.W.Fander, M.Sc.

602023

021
CENTRAL MINERALOGICAL SERVICES

Date: 22nd March, 1971.

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

Job No. CMS 71/3/22 Date Received: 12/3/71

Reference Request -- Mr. K.J.Callow

Sample No. No. 3

Nature of Sample: Hand-specimen

DESCRIPTION

SECTION No.

a. Hand Specimen:

Vitreous black columnar crystals, with fine garnet.

*Kara No. 1
South Extension.*

IDENTIFICATION

No. 3

?Fergusonite.

Ilvaite

Microscopic:

A number of tests were carried out on the crushed mineral to determine its optical and physical properties.

The mineral is uniaxial negative, pleochroic from green to dark brown, with an R.l. > 1.74 and SG > 3.3.

Its properties strongly suggest a complex oxide, and correspond quite well with fergusonite, $Y(Cb, Ta)_2O_6$.

However, confirmatory analyses and/or X-Ray diffraction should be done on the sample. This can be arranged if authorized.

The multiple or complex oxides are a difficult group to identify, specifically and caution must be exercised before placing too much reliance on this identification.

H.W.Fander, M.Sc.

10th February, 1971.

Date:

022

CENTRAL MINERALOGICAL SERVICES

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

Job No. CMS 71/1/45 Date Received: 21/1/71Reference Day Book No. 12163Sample No. TK1Nature of Sample: Hand-specimen

DESCRIPTION

SECTION No. 4754

Kara No. 1

a. Hand Specimen:

Light and dark grey, bedded, fine-grained, sulphide-bearing, (?) calc-silicate rock.

b. Microscopic:

This rock is a fine-grained, bedded calc-silicate which has formed by metamorphism of what was probably a calcareous siltstone. The bedding is caused by fine shaley layers interbedded with slightly coarse silty beds. Fine-grained opaques form 2-3% of the rock. Hand specimen examination indicated that some of these opaques are iron sulphides. Throughout the very fine-grained matrix of the rock, relict quartz grains are evident, but intense cloudy development of zoisite has taken place and minor spots of scapolite are also evident. Accessory tourmaline was observed in association with slightly coarser-grained zoisite (all <0.1mm) and secondary sulphide grains. Epidote veins transect the bedding caused epidotization of adjacent shaley material. No mineralisation is related to veining.

IDENTIFICATION

TK1

Fine-grained calc-silicate rock.

H.W. Fander, M.Sc.

602025

Date: 10th February, 1971.

CENTRAL MINERALOGICAL SERVICES

SAMPLE REPORT (Mineralogy, Petrology, Ore Microscopy)

Job No. CMS 71/1/45 Date Received: 21/1/71Reference Day Book No. 12163Sample No. TK2Nature of Sample: Hand-specimen

DESCRIPTION

SECTION No. 4755

a. Hand Specimen:

Kara No. 1

A coarse-grained, brown (?) garnet rock.

b. Microscopic:

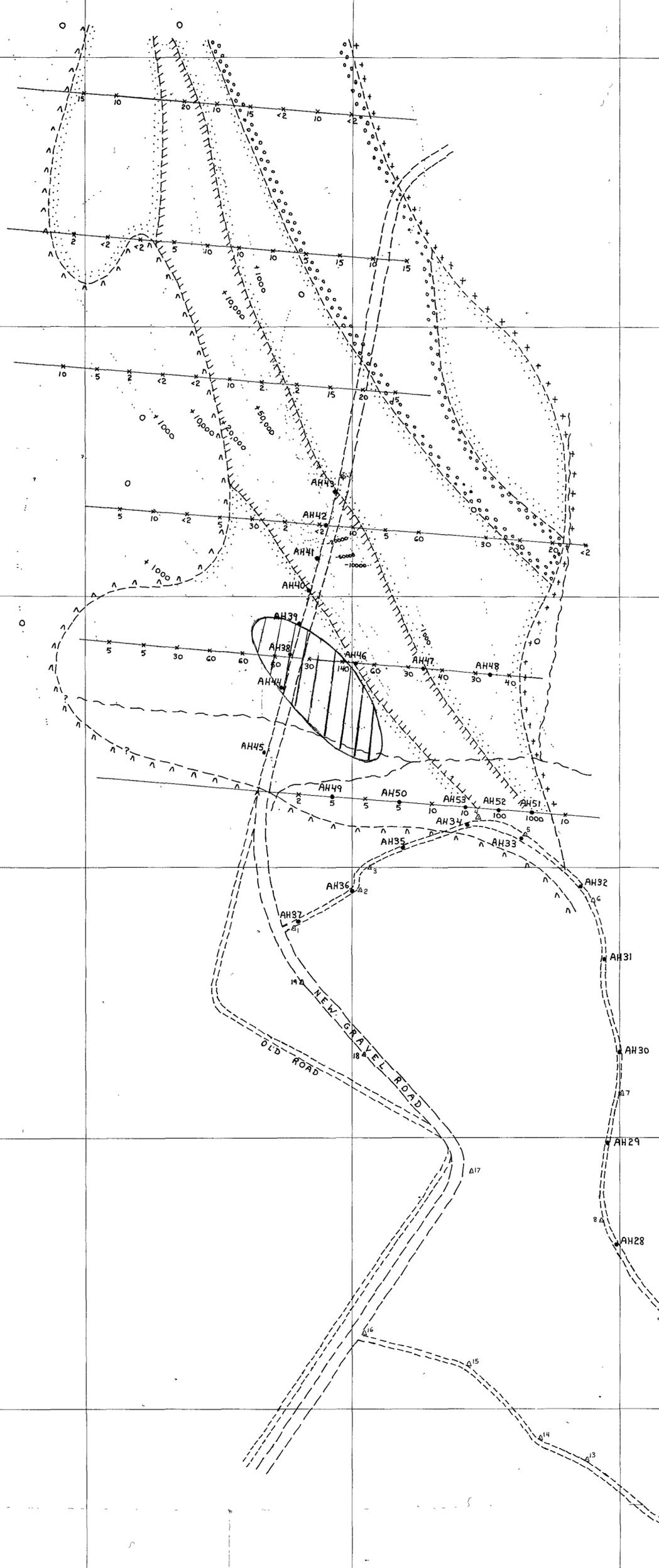
This rock is composed of coarse to fine-grained garnet (probably grossular), and relatively fine-grained diopside crystals in a coarse-grained quartz matrix. It is a common calc-silicate assemblage formed from calcareous rocks. The garnet is pale brown, and strongly anisotropic in thin section. Small crystals (0.2mm) of diopside occur as inclusions in the garnet or in the enveloping quartz areas. The darker iron-stained, irregular bands through the rock are iron-stained diopside-rich areas. Alteration of the diopside to a pale brown micaceous mineral accompanies the iron staining in some parts of the rock.

H.W. Fander, M.Sc.

IDENTIFICATION

TK2

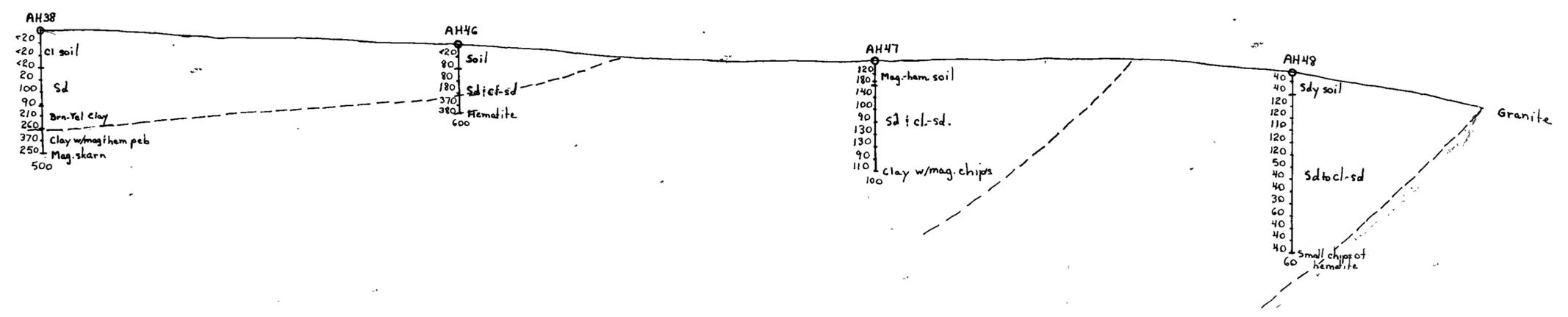
Garnet-quartz-
diopside calc-
silicate rock.



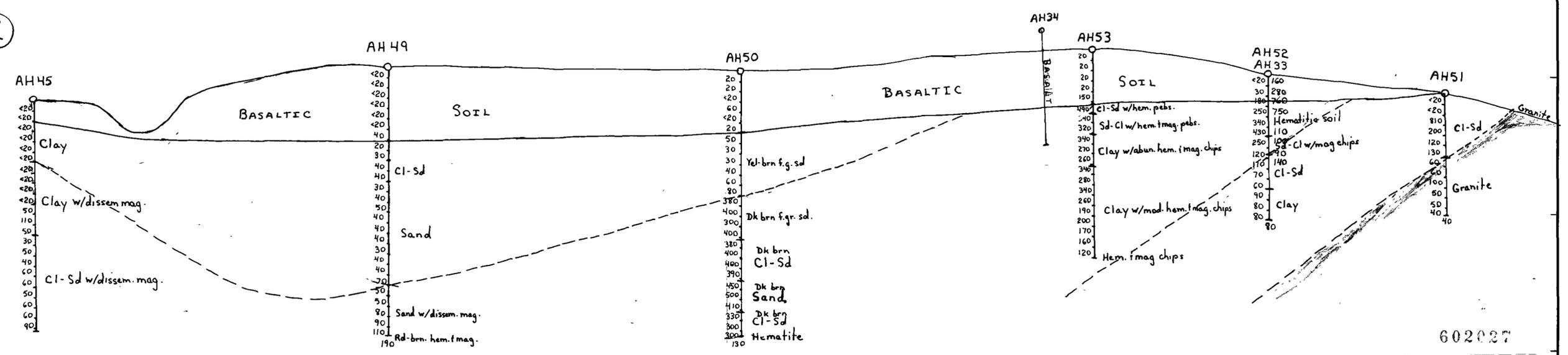
002026 74-1007

| GEOLOGY | | REFERENCE | SCALE | AUSTRALIA AND NEW ZEALAND EXP. |
|--|--|--|--|---|
| <ul style="list-style-type: none"> Basalt Conglomerate Sandstone Magnetite (skarn) Granite Geologic contacts | <ul style="list-style-type: none"> Tertiary Ordovician Devonian | <ul style="list-style-type: none"> Soil grid with ppm W Magnetometer survey with gamma con. Roads and tracks Creeks AH38 Auger hole location Survey Peg | <p>1:1200</p> <p>metres 40 30 20 10 0 20 40</p> <p>1 inch to 100 feet</p> <p>feet 100 50 0 100 200</p> <p>5 cm</p> | <p>HAMPSHIRE MAGNETITE PROSPECT BURNIE, TASMANIA</p> <p>DATE February 29, 1974 PREPARED BY D.R. KRUGER</p> |

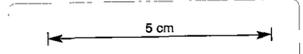
1



2



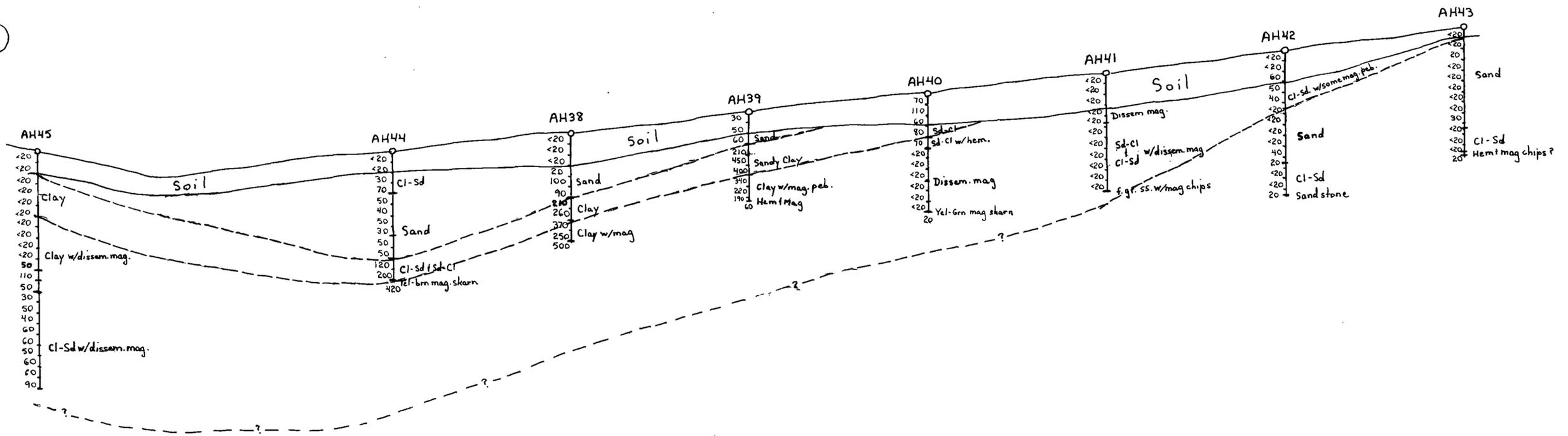
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74-1007

| | | |
|---|-----------------------|----------------------|
| AUSTRALIA AND NEW ZEALAND EXPLORATION COMPANY | | |
| HAMPSHIRE MAGNETITE | | |
| CROSS SECTIONS 1 & 2 | | |
| Prepared by, D. R. Kruger | Drawn by, | |
| Scale, 1" = 20' | Date, April 12, 1974 | Proj. N ^o |
| Drawing N ^o | Report N ^o | Lib. N ^o |

3



602028



74-1007

| | | |
|--|-----------------------|----------------------|
| AUSTRALIA AND NEW ZEALAND EXPLORATION COMPANY | | |
| HAMPSHIRE MAGNETITE | | |
| CROSS SECTION 3 | | |
| Prepared by, D. R. Kruger | Drawn by, | |
| Scale, 1" = 20' | Date, April 12, 1974 | Proj. N ^o |
| Drawing N ^o | Report N ^o | Lib. N ^o |