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ON AN ARCHAEAN MARUNDITE OCCURRENCE
(CORUNDUM-MARGARITE ROCK) IN THE
BARBERTON MOUNTAIN LAND,
EASTERN TRANSVAAL

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by

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ABSTRACT

A marundite occurrence, situated in an Archaean greenstone xenolith in the trondhjemitic gneisses south of the Barberton greenstone belt is described. The corundum-bearing unit, which is about 3 metres wide, outcrops poorly over a strike length of approximately 500 metres, and is associated with metamorphosed mafic and ultramafic rocks (amphibolites, talc schists, serpentinites). Migmatites occur in the areas flanking the xenolith and are considered to have developed as a result of the interaction of the trondhjemitic gneisses and the greenstones.

The marundites occur as heavy, massive, granulite textured, blue-grey rocks and consist mainly of corundum, margarite, biotite, sericite and gibbsite. Accessory components include apatite, tourmaline, garnet, epidote, rutile, magnetite, muscovite and hydromuscovite.

Three new chemical analyses of marundites are presented and compared with similar rocks found in the Northeastern Transvaal. The marundites are characterized by high percentages of alumina, and relatively low amounts of silica. Margarite, the calcium-rich 'brittle mica', is largely responsible for the relatively high CaO values reflected in the analyses.

Marundite genesis is briefly reviewed and, according to Hall (1922), these rocks are intimately linked with plumasites (corundum-feldspar pegmatites), but represent the pneumatolytically altered equivalents - the feldspar having been converted to margarite. Although this origin for the Barberton occurrence cannot be discounted, it is suggested, in view of the absence of signs of pegmatites in the area, that the marundites described in this paper might represent a metamorphosed or metasomatized alumina-rich stratigraphic interlayer, similar to those reported in the Theespruit Formation of the Onverwacht Group.

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I. INTRODUCTION

During the course of a field mapping project aimed at a detailed examination of the Archaean granite-greenstone terrane south of the Barberton greenstone belt, the writer encountered an occurrence of marundite associated with a highly fragmented greenstone xenolithic remnant. The xenolith, which straddles the Badplaas-Lochiel road approximately 8 km northwest of Lochiel on the farm Weergevonden 173 IT, in the Carolina District, is only one of many xenoliths occurring in the granitic terrane in the area (Figures 1 and 2).
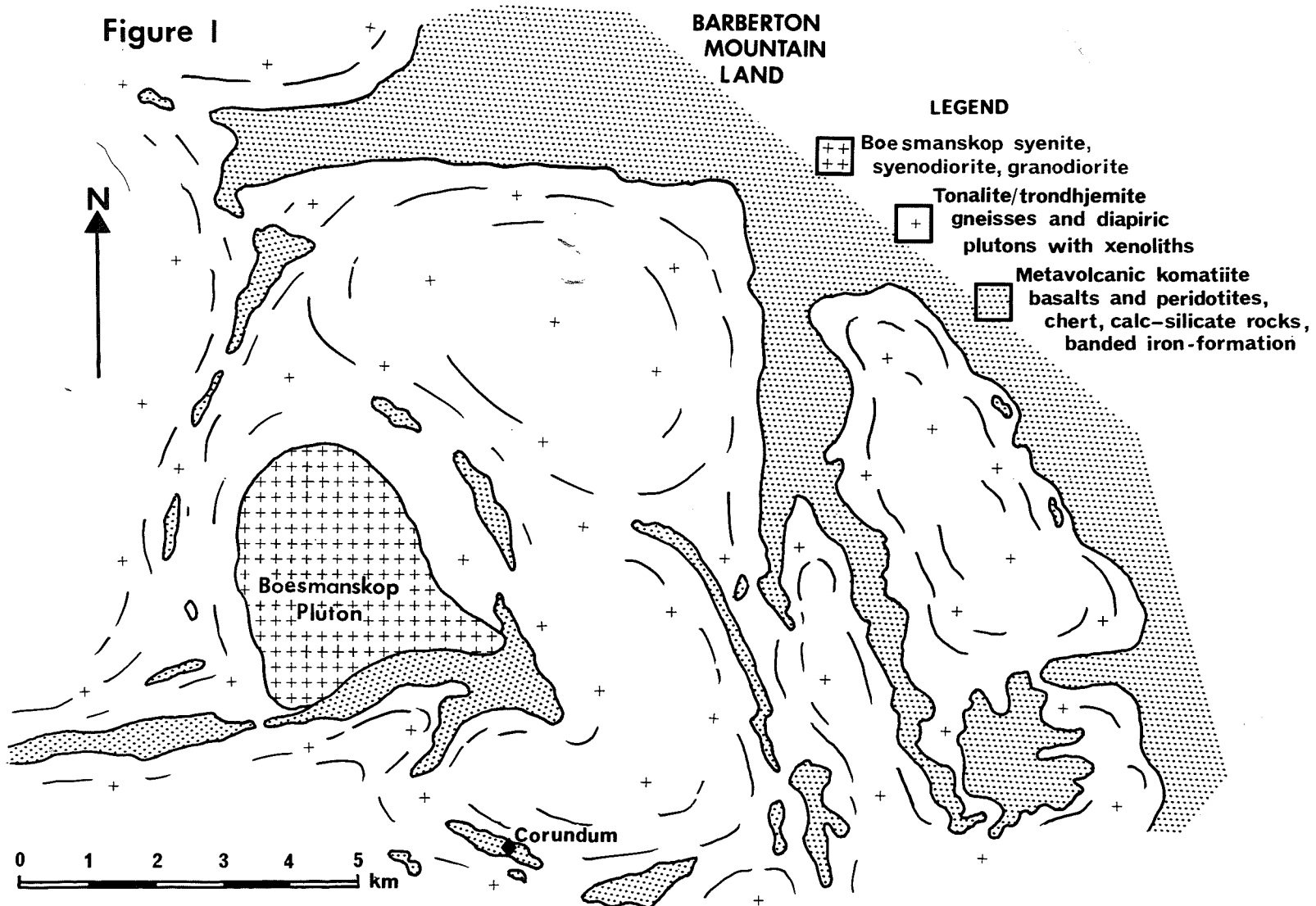

Figure 1 : *Generalized geological map of the granite-greenstone terrane south of the Barberton greenstone belt showing the relationship of the diapiric trondhjemite plutons to the greenstone xenoliths. The marundite occurrence is situated south of the Boesmanskop syenite pluton which, in turn, is located approximately 14 kilometres southeast of Badplaas in the Eastern Transvaal.*

The term *marundite*, compounded from the names of the two essential minerals, margarite and corundum, was first employed by Hall (1920), who undertook extensive examinations of the corundum fields in the Northern and Northeastern Transvaal. In a follow-up study, Hall (1922) provided further details of marundites and allied corundum-bearing rocks in the Leydsdorp District, south of the Murchison greenstone belt in the Northeastern Transvaal.

Marundites are comparatively rare rocks, having only been reported in southern Africa in the Pietersburg, Zoutpansberg, and Leydsdorp districts of the Transvaal (Hall, 1920, 1922; Kupferburger, 1935; Van Eeden, et al. 1939), and in the Nkandhla area of Natal (Du Toit, 1918, 1931). Much more common are plumasite deposits like those first described by Lawson (1904), who applied the term to a corumdum-plagioclase pegmatite dyke he found intruded into peridotites in Plumas County, California. Rocks of this type are widespread in the Northern Transvaal between Pietersburg, Louis Trichardt and Messina (Wagner, 1918; Hall, 1920; Kupferburger, 1935), and have also been reported from Natal (Du Toit, 1918, 1931), and various localities in Rhodesia (Morrison, 1972).

The comparative rareness of marundites stems largely from the fact that margarite, which is a calcic dioctahedral mica, is itself a rare mineral, highly localized in occurrence, and probably representing special compositional or physical conditions of formation (Velde, 1971). The common micas have potassium as the inter-layer cation and this is often replaced to a small degree by calcium and to a greater extent by sodium. According to Deer et al (1971), the distinct mineral species paragonite has nearly all its inter-layer cations occupied by sodium. More rarely, as in margarite and clintonite, calcium is the main inter-layer cation and this substitution is compensated by an increased $[Al]^4$:Si ratio. These minerals have the typical appearances of mica but are harder and their cleavage sheets are less elastic, so that they are often called the 'brittle micas'.

In southern Africa most of the margarite occurrences are associated with the corundum deposits already mentioned but other examples have been reported from the Marvel Mine, near Filabusi in Rhodesia (Macgregor, 1928), from near the Pongola River on the farm Landsend 54 HU, in the Piet Retief District, and from sporadically distributed deposits in the Hlatikulu-Goedgegun areas of Swaziland (Kupferburger, 1935; Hunter et al. 1962). Also in Swaziland Pretorius (1948) reported an occurrence of margarite associated with cassiterite and tourmaline in a pegmatite intruding talc schists in the Forbes Reef area. No corundum was recorded at this locality.

In the Barberton Mountain Land there is only a single reported occurrence of corundum, the latter first located by Hall (1918). The corundum, which occurs together with tourmaline and sillimanite, is situated north of the old Bullion Gold Mine between Noordkaap and Joe's Luck Siding. Viljoen (1963), who later remapped the area, found that the occurrence fell within the high temperature aureole created by the intrusion of the Nelspruit Granite along the northern contact of the Barberton greenstone belt. No explanation was offered for the origin of the corundum but it appears that both the sillimanite and the corundum were developed from an alumina-rich 'quartzitic' rock (probably an altered siliceous and aluminous felsic tuff) like those reported from the Theespruit Formation in the Jamestown Schist Belt and in the Komati River Valley (Viljoen and Viljoen, 1969; Anhaeusser, 1972).

This paper is intended to document a further corundum occurrence to the south of the Barberton greenstone belt, the latter highlighted by the presence of margarite mica. The marundite occurrence appears to be of academic interest only as in recent years deposits of this nature no longer seem to warrant exploitation.

II. GENERAL GEOLOGY

The area south of the Barberton greenstone belt (Figure 1) consists mainly of ancient tonalitic or trondhjemitic gneisses, the latter occurring in the form of numerous diapiric plutons intruded into the basal units of the Onverwacht Group of the Swaziland succession. In the process, the granites have rafted off variably sized remnants or xenoliths, the latter comprising mainly mafic and ultramafic volcanic rocks together with subordinate, but important, marker horizons made up of banded iron-formations, quartz-sericite schists (altered felsic tuffs or pyroclasts), calc-silicate rocks (garnet-diopside-amphibole rocks), and banded chert or ferruginous chert units.

In one of these xenoliths, south of the Boesmanskop syenite pluton, is the marundite occurrence described in this paper. Figure 2 outlines the detailed geology of the xenolith on the farm Weergevonden 173 IT. Amphibolite schists (mainly hornblende and actinolite) make up most of the greenstone remnant which is approximately 1,5 km long, and which strikes in an east-southeasterly direction. Ultramafic rocks, now comprised of serpentinite pods and lenses as well as talc schists, occur conformably with the mafic rocks in the xenolith and are also found as smaller, isolated rafts enveloped by the trondhjemitic gneisses in the areas flanking the main xenolith.

Exposure of the rocks in the area is variable, being relatively good near the Badplaas-Lochiel road as well as in the stream to the east, but poor in the vicinity of the marundite occurrence. The xenolith is fragmentary and is intruded by numerous small lenses, tongues, and pods of granite, some of which have resulted in the development of hybridized rocks containing material derived from the assimilation of the amphibolites, serpentinites and talcose rocks in the area. Spectacular migmatites (Plate 1A), believed to have formed as a result of the interaction of the trondhjemitic gneisses and the greenstones (Anhaeusser, in preparation), occur mainly along the strike projection of the xenolith and are also well-exposed in the stream section to the east of the prominent bend in the Badplaas-Lochiel road shown in Figure 2.

Numerous mafic dykes intrude the gneisses in the area, and these have a predominant north-westerly orientation parallel to a major fault zone (the Mlingase Fault Zone, Anhaeusser, 1978), situated approximately one kilometre south of the region shown in Figure 2. The dykes are mainly medium-grained diabase intrusions showing very little variation from one place to another. However, the narrow dyke immediately north of the marundite occurrence is full of siliceous inclusions that are probably altered fragments of granite stoped from the walls during dyke emplacement.

Most of the rocks in the greenstone xenolith have a schistose texture and generally dip to the north or northeast at angles ranging between 35 and 60 degrees. Shearing parallel to the
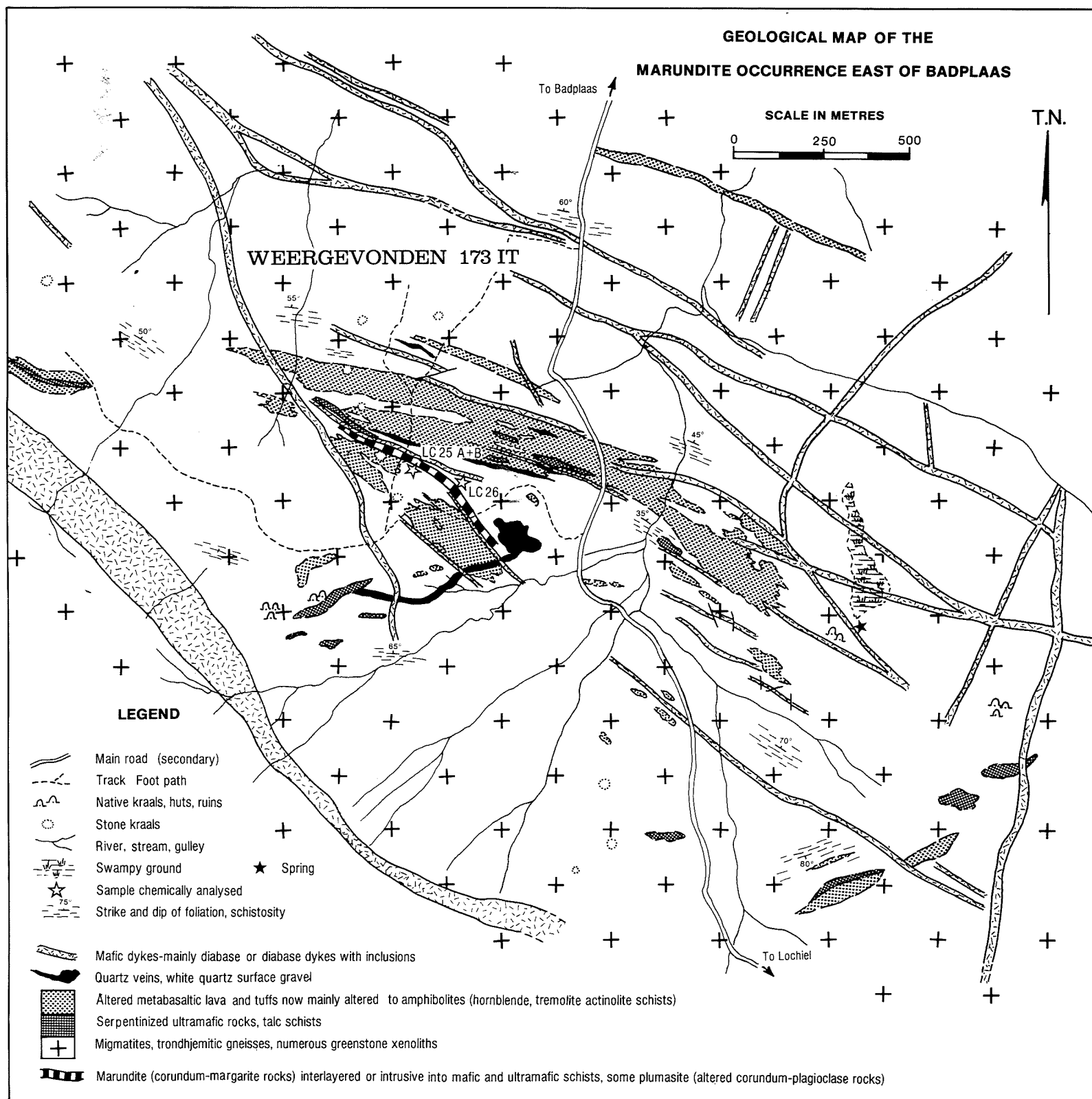
GEOLOGICAL MAP OF THE

MARUNDITE OCCURRENCE EAST OF BADPLAAS

SCALE IN METRES

T.N.

WEERGEVONDEN 173 IT

LEGEND

	Main road (secondary)
	Track Foot path
	Native kraals, huts, ruins
	Stone kraals
	River, stream, gulley
	Swampy ground ★ Spring
☆	Sample chemically analysed
	Strike and dip of foliation, schistosity

Mafic dykes-mainly diabase or diabase dykes with inclusions

Quartz veins, white quartz surface gravel

Altered metabasaltic lava and tuffs now mainly altered to amphibolites (hornblende, tremolite actinolite schists)

Serpentinized ultramafic rocks, talc schists

Migmatites, trondhjemitic gneisses, numerous greenstone xenoliths

Marundite (corundum-margarite rocks) interlayered or intrusive into mafic and ultramafic schists, some plumasite (altered corundum-plagioclase rocks)

Figure 2

strike of the formations has led to the development of numerous white quartz veins. A prominent white quartz vein south of the marundite occurrence appears to transgress the strike of the amphibole schists and terminates in the east by forming a low domical hill, the latter strewn with white quartz scree and gravel.

III.   THE MARUNDITE DEPOSIT

A.   Field Occurrence

Occupying an approximately central position in the xenolith is the marundite occurrence, which outcrops sporadically over a distance of about 500 metres. Due to poor exposure the contact relationships of the marundite with the country rocks are not clear, and the true thickness of the corundum-bearing unit could not be ascertained. However, judging from the distribution of the large blocks of 'boulder corundum' present in the area it is estimated that the unit could be up to three

metres wide. In the west, the marundite unit appears to lie conformably within the surrounding mafic and ultramafic schists but in the east, the exposure is poor and it is not clear whether the occurrence crosscuts the formations or if it has been deflected by the intrusion of granite.

As mentioned above the deposit is marked by the presence of loose blocks and it cannot be stated with certainty that they are *in situ*. Hall (1922) noted that most, but not all, of the marundite occurrences in the Leydsdorp District were also found mainly as loose boulders and he compared many of them with eluvial deposits in which the boulders represent the residue of a 'reef' which formerly existed at a higher level, but which had been removed in the wearing down of the surface by denudation. It is thus possible that the marundite rocks seen in the Weergevonden area might represent the disintegrated remnant kernels (resistant boulder corundum) of a once continuous unit. Only trenching of the zone along which the corundum-rich boulders occur will resolve the issue.

The marundite boulders have a distinctive,rough-weathering,surface crust resembling weathered dolomite (Plate 1B) and the material is extremely hard. The rocks are medium- to fine-grained granulitic in texture, and are generally pale violet grey (dove grey) due to the presence of abundant corundum crystals, the latter commonly constituting over 60 per cent of the specimens examined.

Distinctive in some of the boulders is the margarite which occurs in highly lustrous, silvery white or pale pearly pink micaceous flakes. Brownish-red coloured biotite is also present in some specimens but is erratically distributed. Apart from the colour and hardness of the marundites a further distinguishing feature of the rocks in the field is their high specific gravity.

B. Petrology and Geochemistry

The marundites, as their name implies, contain mainly the minerals corundum and margarite in varying proportions. In addition, however, a wide range of accessory components were also encountered, the most prominent of which was reddish-brown coloured biotite which is visible in hand specimens. Other minerals noted include apatite, tourmaline, magnetite, chlorite, rutile, sericite, gibbsite, epidote, garnet, muscovite and hydromuscovite.

Marundites, in contrast to plumasites, contain little or no plagioclase. Hall (1920, 1922) considered, however, that the margarite found in marundites had been derived principally from the alteration of feldspars and he cited several occurrences in the Northeastern Transvaal where this relationship could be seen. No plagioclase was found in the Weergevonden occurrence although epidote, a common saussuritization product of this mineral, was noted in some specimens.

The apatite, tourmaline, garnet, and some of the corundum found in the rocks generally occurs in euhedral crystal form. In some specimens apatite is relatively abundant and this reflects in the high P_2O_5 content of the rocks (Table 1, column 1). Most of the corundum occurs in granular aggregates surrounded by a microcrystalline matrix of sericite or gibbsite and separated by flakes of margarite or other micas (Plate 1C). Elsewhere some of the larger corundum crystals show euhedral, six-sided, crystal outlines, as well as crystal zoning and inclusions (Plate 1D and E), including minute rutile needles arranged in three directions at 120 degrees (Plate 1F).

The granular corundum aggregates lack good crystal outlines like those displayed by the larger crystals illustrated in Plate 1 D, E and F. Hall (1922) also noted this feature which, he maintained, characterized corundum crystals in marundites as opposed to the strikingly idiomorphic crystals found in the plumasites. He was of the opinion that the early formed corundum had reacted with later formed plagioclase which led to the formation of margarite (a process requiring the abstraction of silica from the feldspar). Margarite, which contains a high percentage of alumina $(Al_2O_3 = 51,18\% -$ average of seven analyses, Table 2), obtained some of this element from the partial resorption of early formed corundum - hence the corrosion and rounding off of the corundum idiomorphs.

Three samples of marundite from Weergevonden 173 IT were selected for bulk analysis. Although basically similar, each sample showed a slight mineralogical variation, the latter also being reflected in the chemical compositions of the rocks which are listed in Table 1, columns 1-3. In the first sample (LC25A) apatite constituted a prominent accessory mineral and the rock yielded a relatively high P_2O_5 value. In the remaining two samples biotite featured prominently and the amounts of Fe, Ti, Mn and Mg show a slight increase over the biotite-free sample.

The most striking features of the marundite chemistry centres around the high Al_2O_3 and CaO values and the low SiO_2 contents relative to other alumina-rich rocks such as plumasites and pyro-phyllite, andalusite, or sillimanite-rich schists listed for comparison in Table 1. The consistency of the marundite compositions can be judged by comparing the Weergevonden examples with six samples from the Leydsdorp corundum field (Table 1, columns 4-9). Hall (1922) concluded that the high percentage of alumina, and the markedly lower percentage of silica, as compared with plumasite, as well as the distinct increase in the amount of combined water over that of plumasite, supported a view, previously suggested by field evidence, that the formation of marundite depends upon loss of silica, accompanied by the formation under magmatic - and probably also pneumatolytic conditions - of margarite from lime-soda feldspar.

TABLE 1

CHEMICAL ANALYSES OF MARUNDITES, PLUMASITE, AND SELECTED ALUMINA-RICH ROCKS ASSOCIATED WITH THE ARCHAEAN GRANITE-GREENSTONE TERRANE IN THE TRANSVAAL AND RHODESIA

	MARUNDITES									PLUMASITE	ALUMINA-RICH LITHOLOGICAL UNITS FROM VARIOUS ARCHAEAN GREENSTONE BELTS				
	BADPLAAS-LOCHIEL AREA			LEYDSDORP DISTRICT, NORTHEASTERN TRANSVAAL						BANDELIERKOP AREA					
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	LC25A+	LC25B+	LC26+	583c4	586c4	593c4	890c4	901c4	584c4		AT2	J14	BR23	G502	G501
SiO_2	21,45	20,46	21,53	15,80	18,20	22,20	29,90	14,90	31,45	45,90	59,93	78,28	58,12	61,65	26,37
TiO_2	0,31	0,70	0,39	0,30	0,15	0,10	0,05	0,10	0,10	0,05	0,45	0,55	0,13	1,71	2,73
Al_2O_3	60,79	59,41	60,56	62,05	61,65	62,90	56,20	71,75	55,15	41,40	26,26	17,52	24,45	26,69	60,33
Fe_2O_3	0,32	0,87	0,47	1,30	5,30	1,30	1,10	1,45	1,00	0,55	0,29	0,39	1,31	0,42	4,50
FeO	1,01	3,67	2,43	2,45	1,30	1,40	0,90	1,00	1,40	0,60	1,64	1,01	1,00	0,52	0,84
MnO	0,03	0,14	0,06	-	-	-	-	-	-	-	0,02	0,01	0,06	nil	tr.
MgO	0,60	1,90	0,79	3,90	1,60	tr.	tr.	1,20	tr.	0,30	1,26	0,46	2,85	1,34	0,71
CaO	6,34	7,32	7,57	7,10	4,45	6,00	1,05	3,45	3,70	4,15	0,42	0,30	0,23	0,30	0,35
Na_2O	0,78	0,86	1,05	2,10	2,15	2,20	2,50	1,30	4,60	5,40	3,75	0,53	0,40	0,22	1,13
K_2O	2,39	0,37	0,13	0,10	0,80	1,10	2,60	0,45	0,80	0,60	1,63	1,48	7,92	3,16	0,74
P_2O_5	2,42	0,14	0,16	-	-	-	~	-	-	-	0,05	0,11	-	0,02	0,07
H_2O^+	3,01	3,83	4,19	5,10 }	4,10 }	3,30 }	5,85 }	4,70 }	2,30 }	1,55 }	3,72	0,88	3,34	2,93	1,68
H_2O^-	0,07	0,05	0,09								0,32	0,20	0,13	0,17	0,03
CO_2	0,11	0,07	0,05	-	-	-	-	-	-	-	0,12	-	0,03	nil	nil
Cr_2O_3	-	-	-	-	-	-	-	-	-	-	-	-	-	1,19	0,65
Rb ppm	178	44	14	-	-	-	-	-	-	-	-	-	-	-	-
Sr ppm	871	1514	1650	-	-	-	-	-	-	-	-	-	-	-	-
Zr ppm	359	454	317	-	-	-	-	-	-	-	-	-	-	nil	nil
Ba ppm	388	155	109	-	-	-	-	-	-	-	-	-	-	-	-
TOTALS	99,63	99,79	99,47	100,20	99,70	100,50	100,15	100,30	100,50	100,50	99,86	101,72	99,95	100,32	100,11

Analysts: + National Institute for Metallurgy, Johannesburg.

Columns : 1. Marundite (margarite, corundum, apatite), Weergevonden 173 IT, 8 km northwest of Lochiel, Eastern Transvaal.
2. Fine-grained marundite (margarite, corundum, biotite, epidote), Weergevonden 173 IT,   ditto.
3. Medium-grained marundite (corundum, margarite, biotite), Weergevonden 173 IT,   ditto.
4. Coarse-grained marundite (margarite, corundum), Rainbow Camp, Olifants River Mica and Corundum Fields (Hall, 1922).
5. Coarse-grained marundite (margarite, corundum, biotite), Beehive Camp, 24 km east of Mica Siding (Hall, 1922).
6. Very coarse marundite (margarite, corundum, biotite), Sudimani Spruit, 16 km east of Mica Siding (Hall, 1922).
7. Very coarse marundite (corundum, margarite), Corundum Kop, near junction of Selati and Olifants Rivers (Hall, 1922).
8. Coarse white marundite (margarite, corundum, biotite), Sudimani Spruit, 16 km east of Mica Siding (Hall, 1922).
9. Coarse marundite (margarite, corundum, biotite, plagioclase, garnet), Rainbow Camp, 23 km east of Mica Siding (Hall, 1922).
10. Plumasite (oligoclase, corundum) Bandelierkop, Northern Transvaal (Hall, 1922).
11. Aluminous felsic tuff (pyrophyllite), Theespruit Formation, Komati River Valley, Barberton area (Viljoen and Viljoen, 1969).
12. Aluminous quartz-sericite schist (andalusite, chloritoid), Jamestown Schist Belt, Barberton area (Anhaeusser, 1972).
13. Aluminous mica schist, Odzi Gold Belt, Rhodesia (Swift, 1956).
14. Aluminous mica schist (fuchsite, andalusite), Somerset Farm, Mazoe District, Rhodesia (Ferguson and Wilson, 1937).
15. Andalusite-corundum granulite (fuchsite, sillimanite), Somerset Farm, Mazoe District, Rhodesia (Ferguson and Wilson, 1937).

The CaO contents of the marundites largely reflects the contribution made by the margarite to the bulk composition of the rocks. Although no analyses were undertaken of the margarites in the Weergevonden samples other naturally occurring micas of this type generally show relatively high CaO values (Table 2).

IV. GENESIS OF MARUNDITES

Corundum-bearing rocks and their genesis received considerable attention during the first half of this century when between them South Africa and Rhodesia supplied most of the world's requirements of this mineral which was used extensively at the time as an abrasive and as a source of alumina in the refractory industry. The literature discussing theories of formation of corundum is extensive and the reader is referred to some of the more important contributions that have appeared in the past (Du Toit, 1918, 1946; Hall, 1920, 1922; Kupferburger, 1935; Brandt, 1946; Strauss, 1946; Van Eeden, 1946; Morrison, 1972).

The early views propounded by Hall were based on extensive field observation and, as far as the writer is aware, still largely account for many of the problems attendant upon the genesis of plumasites and marundites. Hall (1920, 1922) considered that all the corundum deposits originated as pegmatitic derivations of granitic magma. Whether or not this relationship accounts for every

TABLE 2

CHEMICAL ANALYSES OF NATURAL MARGARITES

	1	2	3	4	5	6	7
SiO_2	27,90	29,84	37,10	35,79	30,64	29,86	29,84
TiO_2	-	-	-	-	tr	tr	tr
Al_2O_3	53,80	53,84	51,05	48,02	50,33	51,06	50,18
Fe_2O_3	1,10	0,30	0,95	1,03	0,09	0,77	1,35
FeO	-	-	-	-	0,89	0,28	0,66
MnO	-	-	-	-	tr	0,03	tr
MgO	0,25	0,24	0,50	-	0,09	0,14	0,05
CaO	12,95	10,38	5,50	5,49	11,39	11,79	10,69
Na_2O	2,45	2,46	-	2,27	1,25	1,75	2,15
K_2O	0,15	-	-	2,82	1,25	0,05	0,48
P_2O_5	-	-	-	-	0,03	tr	0,09
Li_2O	-	-	-	-	tr	tr	0,21
H_2O^+	1,55 }	1,32 }	2,90 }	5,40 }	4,83	4,52	4,78
H_2O^-					0,02	0,01	0,03
Total	100,15	98,38	98,00	100,82	100,81	100,26	100,51

Columns 1-4 after Hall (1922)
Columns 5-6 after Velde (1971)

corundum occurrence remains debatable as there are many corundum showings, including the Weergevonden marundites, that are not well-exposed.

Morrison (1972), in reviewing corundum occurrences in Rhodesia, reaffirmed some of Hall's findings when he pointed out that the deposits were characteristically situated in rocks of the Archaean greenstone belts, often being more specifically associated with magnesian-rich rocks such as serpentinites, pyroxenites or amphibolites. Furthermore, Morrison (1972) found that all the Rhodesian deposits are in close proximity to intrusive rocks, most being situated near the margins of the greenstones which, at these localities are intruded by granite. Elsewhere, where the corundum occurrences are well-removed from the greenstone contacts small granite stocks intrude the formations.

Hall (1920) maintained that the pegmatites or granitic tongues which intruded the basic magnesian rocks became supersaturated in alumina, which caused this excess to separate as corundum, leaving the balance as feldspar (plumasite). The supersaturation came about through removal of silica (a process more commonly referred to as 'desilication'), which converted the wall rocks into talc along a 'contact' zone. This desilication process continued, in some cases, beyond the stage necessary to form the corundum-feldspar plumasites and resulted, ultimately, in the development of marundites in which margarite replaced the feldspar due to a rearrangement of the albite and anorthite molecules in the presence of magmatic fluids (magmatic or pneumatolytic processes).

Any theory on the origin of the Weergevonden marundites must of necessity be speculative in view of the poor exposure of the deposit. It is tempting, therefore, to draw on the experience and findings of workers like Hall (1920, 1922) to elucidate the genesis of the corundum occurrence. However, following from the detailed stratigraphic mapping of select areas in the Barberton greenstone belt (Viljoen and Viljoen, 1969; Anhaeusser, 1972) as well as from the work of Morrison (1972), who reviewed the Rhodesian corundum occurrences, it appears that some of these deposits could represent the metamorphic and/or metasomatic products of lithologies already present in the greenstones. In the Barberton area the stratigraphy of the lower Onverwacht Group (particularly the Theespruit Formation) has been shown to contain distinctive felsic marker units that are often enriched in alumina. These rocks commonly occur as quartz-sericite (fuchsite) schists, but in many cases contain abundant sillimanite, andalusite or pyrophyllite, depending upon metamorphic grade. In Table 1, columns 11 to 15, chemical analyses of alumina-rich lithological units from the Barberton greenstone belt as well as from Rhodesia, are listed. These rocks can, in many instances, be shown to have been derived from felsic tuffs or agglomerates and are conformably interlayered with mafic and ultramafic lava sequences. Their anomalous alumina contents suggest that they may have acted as a source for

this element which became concentrated in corundum deposits either as a result of metamorphism, metasomatism, or by pegmatite involvement.

Detailed mapping of many of the greenstone xenoliths in the granitic terrane south of Barberton has revealed that they consist of lithologies identical to those reported in the basal units of the Onverwacht Group in the Barberton greenstone belt. This includes the presence of interlayered felsic schists, the closest occurrences to the Weergevonden marundites being in the large greenstone remnant flanking the Boesmanskop syenite pluton, and shown in Figure 1.

Whatever mechanism may have been responsible for the development of corundum (pegmatite intrusion, metamorphism, metasomatism) the process clearly involved desilication. In the Weergevonden occurrence the abstraction of silica from the unknown original host rock probably led to the formation of talc in the adjacent country rocks flanking the marundite body. In addition, it is possible that the migration of silica also formed lenses or veins of quartz in the vicinity of the corundiferous rocks - a feature that was also noted in the Northeastern Transvaal by van Eeden et al. (1939), Brandt (1946), and van Eeden (1946).

V. CONCLUSIONS

1. The Weergevonden marundites are heavy, massive, granulite textured, pale blue-grey coloured rocks, some of which display the brightly lustrous pearly pink calcium mica known as margarite.

2. The marundite occurrence which appears to form a subvertical lense or layer over 500 metres long and approximately 3 metres wide consists mainly of corundum, margarite, biotite, sericite and gibbsite, but has accessory amounts of apatite, tourmaline, garnet, epidote, rutile, magnetite, muscovite and hydromuscovite.

3. The corundum-bearing rocks are associated with metamorphosed mafic and ultramafic rocks (amphibolites, talc schists, serpentinites) that form part of a fragmented greenstone xenolith intruded by trondhjemitic gneisses. The interaction of the trondhjemites and the greenstones has resulted in the development of complex migmatites in the areas flanking the xenolith.

4. Chemically, the marundites are characterized by a very high percentage of alumina (up to 61 per cent), and relatively low amounts of silica. The calcium contents of the rocks largely reflects the presence of the brittle mica margarite.

5. The origin of the Weergevonden marundites remains obscure. In the past it has been generally accepted that the marundites elsewhere in South Africa were intimately associated with plumasite rocks and that these had been altered pneumatolytically to form intermediate margarite-plumasites and, ultimately, marundites.

6. The suggestion is made, in view of the absence of signs of pegmatite, that the Weergevonden marundites might represent a reconstituted (metamorphosed or metasomatised) alumina-rich stratigraphic interlayer, the latter possibly similar to the Al-bearing quartz-sericite schists like those reported in the Theespruit Formation of the Onverwacht Group.

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PLATE 1

A.   Migmatites exposed in the stream flowing through the eastern portion of the Weergevonden
     greenstone xenolith shown in Figure 2. The migmatites are considered to have formed as a
     result of the interaction of the trondhjemitic gneisses with the greenstones.

B.   Photograph of a marundite showing the differentially weathered surface crust which closely
     resembles that commonly displayed in dolomite outcrops. The rock also exhibits banding,
     the latter due to variations in the amount of corundum, margarite and biotite present in
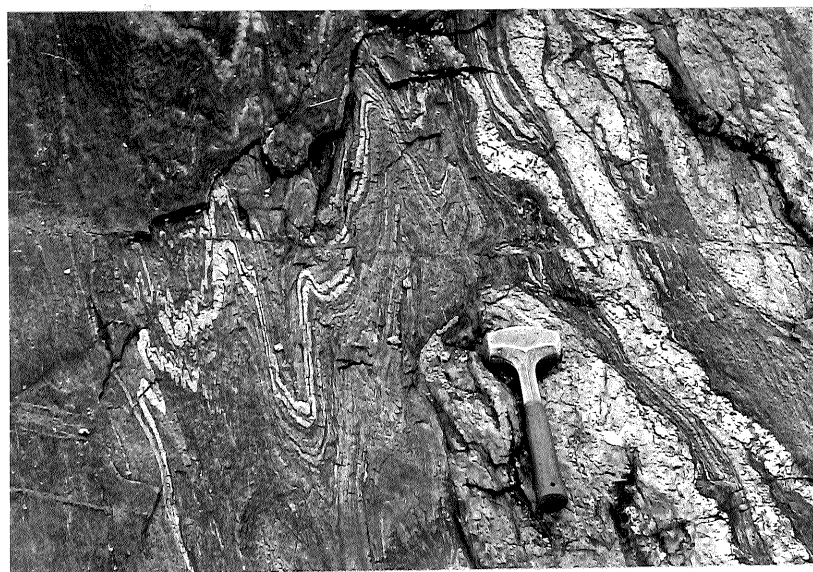   the specimen.

C.   Photomicrograph showing partially rounded corundum crystal aggregates and margarite mica
     (centre). The granular corundum has probably lost its idiomorphic crystal shape due to
     resorption of corundum during the formation of margarite.

D.   Photomicrograph showing several large zoned idiomorphic corundum crystals separated by a
     matrix mosaic of sericite and gibbsite. A tabular crystal of apatite occurs in the top
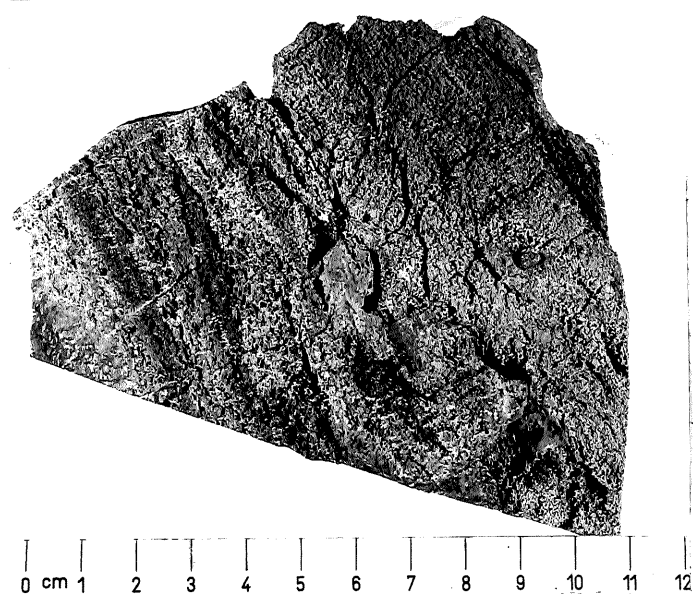   left corner of the photograph.

E.   Photomicrograph showing a large idiomorphic corundum crystal containing an opaque,
     inclusion-filled, core. Surrounding the large idiomorphic crystal are anhedral grains
     of granular corundum, the rounded outlines of which probably result from the resorption
     of the crystal boundaries during the formation of the margarite seen occurring between
     the corundum granules.

F.   Photomicrograph showing an idiomorphic zoned corundum crystal containing minute rutile
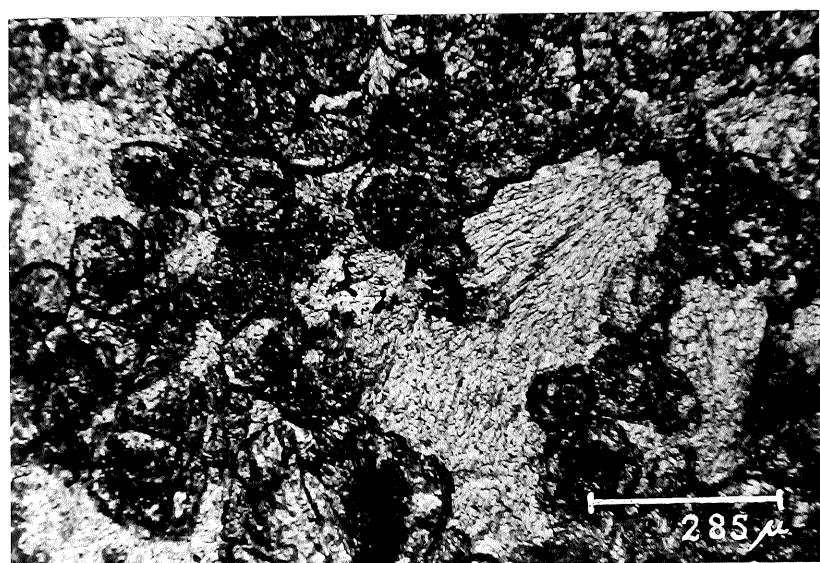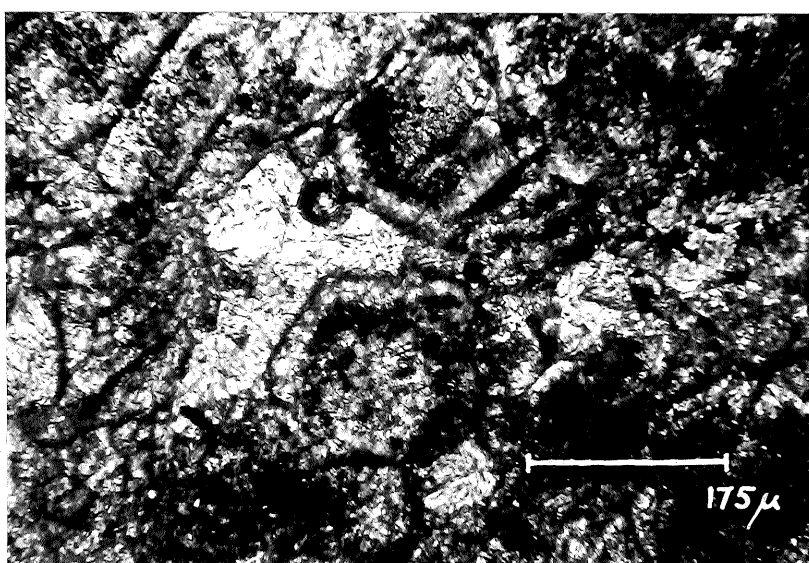   needles, the latter arranged in three directions at 120 degrees.

PLATE 1

A

B

0 cm 1 2 3 4 5 6 7 8 9 10 11 12

C

285 μ

D

175 μ

E

175 μ

F

130 μ