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DEPARTMENT OF MINES.

SOUTH AUSTRALIA.

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W.D. 4

WILD DOG URANIUM PROSPECT
SECTION 75, HUNDRED MYPONGA.

PROGRESS GEOLOGICAL REPORT NO. WD4.

by

B. P. WEBB - Geologist.

F. E. HUGHES - Assistant Geologist.

Date 15/1/54 SR 11/2/64

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This document consists of 16 pages

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1. INTRODUCTION.

A preliminary programme of detailed investigations has been carried out following recommendations in previous reports, which will be briefly summarised herein.

Interest has been centred on two separate prospects, Nos. 1 and 2 Lodes, which have been exposed to a limited extent by trenching, and which consist at the surface of rich segregations of secondary Uranium minerals, and in the latter, occasional remnants of pitchblende.

As the basis for detailed work a survey grid at 100 feet centres was laid out over an area of 1,000 feet by 1,200 feet, two concrete bench marks 400 feet apart defining the north-south baseline.

Detailed investigations of the above area consist of:-

1. Detailed geological mapping on a scale of 40 feet to 1 inch, with sampling of the orebodies as far as exposure permitted.
2. A radiometric survey by the Geophysical Section, submitted as an appendix hereto.
3. Petrological study of the main rock types and identification of the dominant uranium minerals by the Petrological Section, a report on which, by A.W.G. Whittle, is appended.
4. A topographic plan with 10 foot contour interval by the draughting section.
5. General matters relating to the further testing of the deposit including:-
   (a) Local supply of water for diamond drilling and mining requirements.
   (b) Location of access tracks of reasonable grade.
   (c) Power supply.

11. LOCATION & ACCESS.

The prospect is located on Section 75 in the Hundred of Myponga, in rough scrub country some three miles southwest of Myponga township, which is 38 miles south of Adelaide. Access at present is by sealed road for 2 miles south-west from

Myponga, thence by gravel road south for 2 miles, and by rough track easterly for 1 mile, vide US-263.

A sharp creek crossing renders the last mile impassable to all but four-wheel drive vehicles, and an alternative site for a graded track over this interval has been selected.

111. GEOLOGY.

The country rocks comprise Archaean metasediments, intruded and altered in places by later pegmatites. The metasediments frequently show development of bedding foliation, and this feature has been carefully mapped in an attempt to unravel the structure of this area.

(i) Rock Types. The metasediments have been subdivided in this field into four main types:-

1) Felspar-actinolite gneiss
2) Felspar-biotite gneiss
3) Felspar-gneiss
4) Sillimanite gneiss.

After the completion of the field mapping specimens of these rock types were collected and examined by the Petrologist, who has pointed out the importance of the variation in degree of sodic metasomatism in them. (See detailed discussion included with this report). This work indicates that these four main types should be designated as:-

1) Albite-diopside granulite
2) Perthite gneiss
3) Orthoclase gneiss
4) Sillimanite-garnet gneiss.

This form of subdivision, permitting the grouping of the rocks according to their sodic content is considered to be a valid and suitable method of mapping in this general area, especially in view of the probably importance of the location of areas of sodic metasomatism in ore search. The rock types in the area of the current investigation will be further sampled in an attempt to clarify the distribution of centres of sodic metasomatism.

The felspar-actinolite gneiss (albite-diopside granulite) is developed in the north western section of this area. An isolated outcrop of similar type rock occurs near the south eastern corner of the area. This rock type occurs as areas of massive angular boulders, clearly derived from solid rock immediately beneath. It frequently shows a well banded bedding foliation structure, but due to lack of outcrop in situ it is not useful as a guide to the local attitude of the foliation. The rock has a characteristic appearance in the field and will form a useful marker for regional mapping within Archaean rocks.

The biotite-felspar gneiss (perthite gneiss) is developed in the core of a north pitching drag fold structure in the central part of the area. These rocks are, in general, characterised by the presence of biotite. They form the country rock in the vicinity of No. 1 Lode, and petrological examination of a specimen immediately east of the lode indicates intense local sodic metasomatism of these rocks.

The felspar gneiss (orthoclase gneiss) are developed around the drag fold in the northern and eastern sections of the area. They are in general more massive and contain less biotite than the biotite felspar-gneiss. They are usually well banded, biotite rich bands alternating with felspar-quartz bands.

The sillimanite gneiss forms a discontinuous narrow belt of country running in a north-westerly direction along the east limb of the drag fold, and forms (locally) a useful marker horizon

Pegmatites.

The pegmatites fall into two types characterised respectively by the presence of a pink soda felspar and a white potash felspar. Quartz and subordinate biotite are present in both varieties. The broad outcrop pattern of area of pegmatites reflect the prevailing north-west structural trend.

(ii) Structure.

Mapping of bedding foliation attitudes has shown the existence of a north-west pitching drag fold structure running through the No. 1 lode area and extending to the north beyond the limits of the area mapped. The existence of this structure is confirmed in a general way, by the broad distribution of rock types. The amount of pitch varies between 15° and 50° and averages about 40°, towards the north-west. The fold is complicated by several minor crenulations, all of which pitch with the major structure.

The overall distribution of rock types indicates that the west limb of the anticline has only limited development, and that the structure is possibly cut off to the west against the felspar actinolite gneiss. Preliminary regional mapping to the north of the grid area suggests that this rock type does not follow round the drag fold structure. The No. 2 lode is close to this possible structural break, and a strong shear zone striking in a north westerly direction, runs through the No. 2 lode workings. (See more detailed discussion under 'Mineralisation').

(iii) Mineralisation.

Two principal loci of mineralisation have been proven in the area, and have been designated No. 1 and No. 2 lodes respectively. (see US-254). Radiometric survey has indicated the existence of at least two other areas of probable mineralisation. (See "Radiometric Survey"). Primary mineralisation has not, as yet, been observed in situ. Two boulders of weathered pitchblende have been obtained from the No. 2 lode surface workings. Secondary Uranium minerals include uranophane, beta-uranotil, and meta-autunite and ore presumably derived from pitchblende.

(a) No. 1 Lode: - No. 1 lode is situated at the crest of a spur which runs in a general west-north-west direction through the area mapped. Here, secondary uranium minerals are distributed along foliation planes and joint surfaces in the country rock, which here is an albitised perthite gneiss. The foliation surfaces appear to be an important control in the distribution of the secondary minerals, and mineralisation is limited to the north and west by a north-west pitching anticlinal fold structure. Secondary mineralisation has been exposed by surface trenching over a length of thirty feet and average width of six feet (US-264). The limits of mineralisation to the east and south have not yet been clearly determined.

(b) No. 2 Lode: No. 2 lode is situated in the north-west section of the area mapped some 500 feet west-north-west of, and 150 feet below No. 1 lode. Here, distribution of secondary uranium minerals follows a well defined linear pattern, apparently along a north-west trending shear zone, over a lengh of 100 feet, with the northerly limit not yet determined. Seven trenches have now been put in across the line of shearing.

The zone of shearing and mineralisation dies out to the south, and does not extend to trench No. 1 (see US-265). In trench, No. 2 secondary uranium minerals are strongly developed across a 3 foot zone in strongly jointed coarse grained felspar gneiss. The limit of mineralisation is clearly defined on the eastern side by a narow biotite rich zone dipping to the west. In trench No. 3 secondary uranium minerals are similarly developed across a 3 foot zone of strongly jointed, and broken felspar gneiss. In trench No. 3 the shear zone is characterised by development of biotite and clay gauge (gouge?), two to three feet wide. Scattered mineralisation occurs in the biotite clay zone, and along joints in the country rock immediately east of the zone for about two feet. In trench 5 there is strong development of biotite-clay gauge with scattered mineralisation over a width of 3 to 4 feet, with mineralisation concentrated along the eastern wall of the shear zone. Biotite-clay gauge is again developed in trench 6, over a width of 5 feet but here mineralisation favours the western side of the zone. The zone of shearing and mineralisation has not yet been exposed in No. 7 trench, which is to be further deepened and extended to the west.

1V. RADIOMETRIC SURVEY.

A detailed report on the radiometric survey of the area by D. Pegum has been attached (see Appendix 1).

This work has established the prospector's original finds (here referred to as No. 1 lode and No. 2 lode) as the most significant surface showings in the area under consideration. The pattern of radiation contours over the No. 2 lode (see US-254) reflects the linear distribution of the mineralisation here, and indicates the importance of further testing along the north westerly extension of the lode structure.

In addition the work has drawn attention to at least two new limited areas of significantly high radiation. These lie some 100 feet west and south west of No. 1 lode. On one of them (located at 10430N, 10710E - US-254) preliminary surface trenching has shown the presence of scattered secondary uranium minerals. Further groupings of localised high count have been established, 300 feet north-west of No. 1 lode.

The suggested north-east south-west trend through No. 1 lode referred to in the attached geophysical report is considered to be more apparent than real in the light of detailed surface mappin

V. ORE RESERVES AND GRADE.

As pointed out in Progress Report WD3, the surface zone of secondary minerals has resulted from a process of leaching and reprecipitation by superficial weathering from a primary pitchblende orebody which is expected at no great depth beneath the surface. The surface values are therefore probably well below those of the primary ore, which however could be more restricted in width.

No. 1 Lode: - The orebody has been opened up over a length of 30 feet with an average width of 6.5 feet. It is possible that the secondary zone of this lode pitches north with the surrounding rocks. Ore in sight amounts to 16 tons per vertical foot, at an average grade of 67.5 lb. U_3O_8/ long ton, or 3% U_3O_8, as based on chemical assay of three channel samples.

No. 2 Lode: - This strong shear zone yields lower assay results, but with the richer segregations of secondary minerals in the southern portion.

The average width is 4.0 feet, at a grade of 6.6 lb. U_3O_8/ long ton. Over a length of 120 feet the ore in sight amounts to 40 tons per vertical foot.

Chemical assays, elsewhere noted to be systematically higher than the corresponding radiometric assays, are not yet available for the samples taken on this lode.

VI. RECOMMENDATIONS.

(1) That the known mineralised zones be further tested. This programme will involve:-

(a) Surface investigations:- Complete exposure of the lodes at the surface to give a rapid and complete picture of the behaviour of the mineralisation and its relationship to surrounding rocks.

No. 1 Lode: Because of its limited extent and shallow depth below surface, the exposure should be done by hand.

No. 2 Lode: Bull dozing could be used to advantage, particuarly along the north-west extension, to expose the shear zone beneath an estimated six feet of soil cover.

Other anomalies: The significance of several smaller anomalies located during the radiometric survey should be investigated by hand trenching.

(b) Underground testing:-

Diamond drilling - A preliminary programme of 9 short diamond drill holes is proposed. The holes are directed to the probable extension of the lodes as governed by observed dip or pitch, to intersect at approximately 50 feet vertical depth. The disposition of these is shown on plans Nos. US-264, 265.

Shaft sinking - The proposed sites for a shallow prospecting shaft on each of the lodes, are shown on plans Nos. US264-265.

(2) Extension of detailed geological mapping and radiation survey.

Present indications point to a strong north-north-westerly trend on No. 2 lode, necessitating an immediate programme of extension of the detailed geological mapping and close radiometric survey of an area to the north of that already covered. An area of 1,200 feet east-west by 500 feet north-south has been selected.

(3) Petrological Studies.

A more complete and systematic programme of sampling the rock types to assist in interpretation of geological structure should be introduced, particularly as mapping is extended, and exposures of bedrock in the lode zones become more complete.

(4) Regional mapping.

A programme of regional geological mapping on a scale of 10 chains to the inch should be undertaken to cover the Archaean rocks in the area, with emphasis on areas of and adjacent to sodic metasomatism.

(5) In conjunction with the detailed mineral investigations some factors which concern the subsequent testing of the deposit have been investigated:-

(a) Water Supply - A soak in the creek bed 1,000 feet west of No. 2 lode would probably, if cleaned out, supply a few hundred gallons of water per day in the summer months, sufficient to provide a start for diamond drilling requirements until a better local supply can be arranged. A large waterhole in the Wild Dog Creek a mile to the west seems likely to supply a few thousand gallons per day.

(b) Access Tracks - The sharp creek crossing in the last mile of rough track to the mine could be avoided if a road were graded across the creek 500 yards further downstream, and then following a low spur to the foot of the hill below the workings. From there a track could be graded on the contour to the No. 2 lode, and another to No. 1 lode at the top of the hill at an average gradient of 1 in 9.

(c) Power Supply - The prospect lies two miles south-east of the nearest point on the main 33,00 volt power supply line to Rapid Bay.

Sgd. B. P. Webb,
Geologist.

15/1/54.

Sgd. F. E. Hughes,
Assistant Geologist.

PETROLOGICAL LABORATORY REPORT NO. 1/54.

SR 26/4/17.

GENERAL PETROLOGY - MYPONGA URANIUM FIELD, S. A.

A selection of rocks was made recently in the field for petrographic study of this uranium occurrence. The suite collected is not a detailed coverage of the area, but represents major rock horizons. It is proposed that on the basis of these results, more detailed petrology may be justified to assist field mapping.

Descriptions of the several rock types follows, grouped according to the results of the examinations.

(1) Normal rocks typical of the Barossian Complex.

Three groups may at present be distinguished as separately mappable horizons, based largely on compositional differences which probably reflect lithological and hence stratigraphic units. Because of the lack of bedding structure in the field due to its obliteration by superimposed foliation, compositional variation amongst the gneisses is important for ascertaining structure.

(a) Perthitic gneiss:

Two samples were collected. That from 10700N x 10260E is dark coloured with strong foliation, the relation of which to bedding is not clear. It is composed largely of granular xenomorphic microperthite and strongly pleochroic black biotite with minor interstitial quartz. Metamorphic segregations resulted in lighter bands rich in felspar and quartz, interspersed with thinner biotite rich bands in which preferred orientation imposed a marked lineation. Radioactive zircons encased in pleochroic haloes are abundant in many micas. This disposition of the lineation in space should be ascertained in relation to overall structure.

A sample of perthitic gneiss from 10650N x 10800E has similar composition. The foliation banding is more irregular in nature, being closer or more widely spaced in various parts of the rock. Lineation is not important in this rock. Perthite and minor quartz from the lighter coloured bands whereas the darker bands are rich in biotite. Opaque detrital grains are disseminated abundantly throughout the rock.

Both rock types may be named similarly, viz. perthite-biotite-quartz gneisses.

(b) Orthoclase gneisses:

The distinction between these and those of group (a) lies in the dominance of ordinary potash felspar and the presence of a little detrital plagioclase. There is minor perthite in these rocks also.

These are well banded rocks in which metamorphic segregation has produced biotite rich bands distinct from, and alternating with, felspar-quartz bands. Lineation is weak to non-apparent in hand specimen as well as in thin section. Felspar in these rocks are largely altered to sericite, clay and calcite producing a mirly grey colour in the lighter coloured bands. This may prove of some help in distinguishing these rocks in the field from those of group (a) in which the felspathic (perthitic) bands are whiter due to lesser alteration. Examples of group (b) come from 11000N x 10560E and from 10200N x 11230E.

(c) Sillimanite-garnet gneisses:

A higher grade of regional metamorphism is apparent in these rocks due to an original compositional difference from those of groups (a) and (b).

An example from 10960N x 10730E is a streaky grey poorly banded gneiss, the lineation in which is manifest by the disposition of sheafs of sillimanite needles. Incipient banding in the rock is due to partial segregation of highly stressed quartz with degenerated orthoclase. The latter are pseudomorphed in sericite, calcite and clay and preserve their preexistent graphic texture towards quartz inclusions which have resulted from exsolution phenomena during the formation of the felspar.

Biotite flakes are lesser, muscovite are well oriented. The biotite is completely chloritised. Originally porphyroblastic almandine now exists as ragged scattered fragments enclosed in areas of ultrafine micas and chlorite indicating the extent of the former crystal. Sillimanite is prominent as sheafs of elongate crystals in perfect preferred orientation.

(2) Houghton "Diorite" types.

There are two examples comparable with the type rocks at Houghton, Yankalilla, elsewhere in the Wild Dog Creek area as well as in the Barossian complex at Aldgate.

The examples, from 10100N x 11220E and from 10640N x 10070E are fine-grained equivalents of the type rocks from the localities mentioned above. They are essentially albite-diopside granulites or broadly banded gneisses. Albite is the major constituent forming a granoblastic mosaic which makes up some 60% of the rock. Xenomorphic colorless diopside is evenly disseminated and variously uralitised to pale green actinolite or to colorless tremolite. Aggregates of epidote are common throughout. Ilmenite, surrounded by alteration rims of leucoxene is abundant and may occur to the extent of 10% of the rock. Differences amongst these rocks lie in the relative abundance of apatite, sphene and ilmenite the presence of more or less, but always relatively subordinate, potash, felspar and the degree of uralitization of diopside.

(3) Albitised rocks.

The degree of albitisation (metasomatism) is variable. The country rock alongside the shear at No. 2 lode (10690N x 10340E) is a fine, even grained, massive quartzite in which incipient albitisation is apparent. The quartzite is recrystallised with the obliteration of its sedimentary structure and has assumed a granoblastic structure with interlocked interpenetrant grain texture. The grains are severely stressed. Albite occurs as subhedra replacing the quartz mosaic to the extent of some 10%.

By contrast, the country rock adjacent to No. 1 lode is a weakly banded gneissic rock, rich in biotite which has undergone large-scale albitisation. Albite constitutes some 50-60% of the rock. There remains about 10% of quartz. The rock may be considered as a normal Barossian type, group (a) or (b) strongly metasomatised near the uraniferous lodes.

A light coloured, fine, evenly granular rock which may be considered as an albitised member of the perthitic gneisses; group (a) comes from 10450N x 10615E. It consists almost wholly of finely twinned albite and microperthite. A few biotite flakes and crystals of sphene occur both disseminated and in poorly developed bands.

(4) Igneous rocks?

Only one group of rocks, viz. pegmatites, appear to be of an intrusive igneous nature. An example at 10750N x 10170E is a coarse-grained, pink, quartz microcline albite pegmatite containing minor biotite. Albite is the major constituent but there is considerable microcline and quartz. The texture of the rock is typically igneous, viz. hypidiomorphic coarsely granular.

The lode and shear at No. 2 Prospect.

The peculiar coarse flaky grey mica which is abundant in the shear was examined and found to consist of phlogopite. It has a very small eptic angle and its refractive indices are:-

$$x = 1.540$$
$$y = 1.580$$

Mingled with this are other normal micas, biotite and muscovite.

An examination was made of bright orange-yellow coloured secondary uranium mineral now exposed in pits along the shear. This mineral is ultrafine in form and was identified as betauranotil, a mineral related to uranophane. Its properties are as follows:-

biaxial negative
very small optic angle
anomalous birefringence - strong dispersion

x	1.660
y	1.697

SUMMARY.

Petrographic study has permitted the discrimination of a confusing suite of rocks into several intelligible groups on which mapping may be based. Further work along these lines may be found desirable.

It is apparent that albitisation by metasomatic means is as important as the structure in localisation of the ore.

The lodes are now known to contain pitchblende, gummite, beta-uranotil and possibly meta-autunite. Albite occurs in direct association with pitchblende and its alteration products.

It is suggested that mapping of lineation may help considerably in a final appraisal of the role played by structure.

15-1-54.

Sgd. A. W. G. Whittle.
Petrologist.

REPORT ON A RADIOMETRIC SURVEY OF THE WILD DOG PROSPECT. SECTION 75 HUNDRED OF MYPONGA.

Summary.

A radiometric survey has been carried out in the area of the Wild Dog Prospect (Section 75, Hd. Myponga) using a hand scintillometer. Results are presented in the form of a plan with contours of equal gamma ray intensity. Five considerable radio-active anomalies were found, the two largest of which are located over and adjacent to the known lode outcrops. (A number of smaller anomalies were also found). The radiation intensity shows in places some correlation to the geological structure and rock type.

Area Investigated.

The area investigated covers the rectangle 1000ft. by 1200ft. which has been surveyed and divided into 100ft. squares for the geological mapping of the area.

Methods used.

A Halross Scintillometer Model 939 was read at stations at 20ft. intervals on traverse lines 20ft. apart. The stations were located by measurement and pacing from the 100ft. square grid laid out for the geological mapping of the area. The readings were taken with the instrument approximately three feet from the ground. In addition the instrument was observed while being moved between stations and extra stations made where any unexpected count was obtained.

Results and Conclusions.

Radiometric contours of equal gamma ray intensity in the area covered by the survey are shown in the accompanying plan, together with the topographic contours.

A considerable number of the anomalies are located on a line running approximately north-east south-west through the largest anomaly (Lode No. 1).

This is not related to any known geological structure.

There is also a region of high counts trending north-west from the second large anomaly (Lode No. 2). This region is located along a fault zone.

For a number of the anomalies which occur on steep slopes, the high readings extend further on the downhill side of the maximum value than on the uphill side. This is apparently the result of movement of the radioactive material downhill from a source at or near the point of the peak value of the anomaly.

There is some general relationship between rock type and radiation intensity.

The outcrops of felspar actinolite gneiss occur in places of low radioactivity while a high background is generally obtained over the biotite felspar gneiss.

This relationship is obscured by the depth of soil cover which is the main factor controlling the radiation intensity. The region of low background in the south and southwest of the area surveyed is an area of apparently deep soil cover with little or no outcrop.

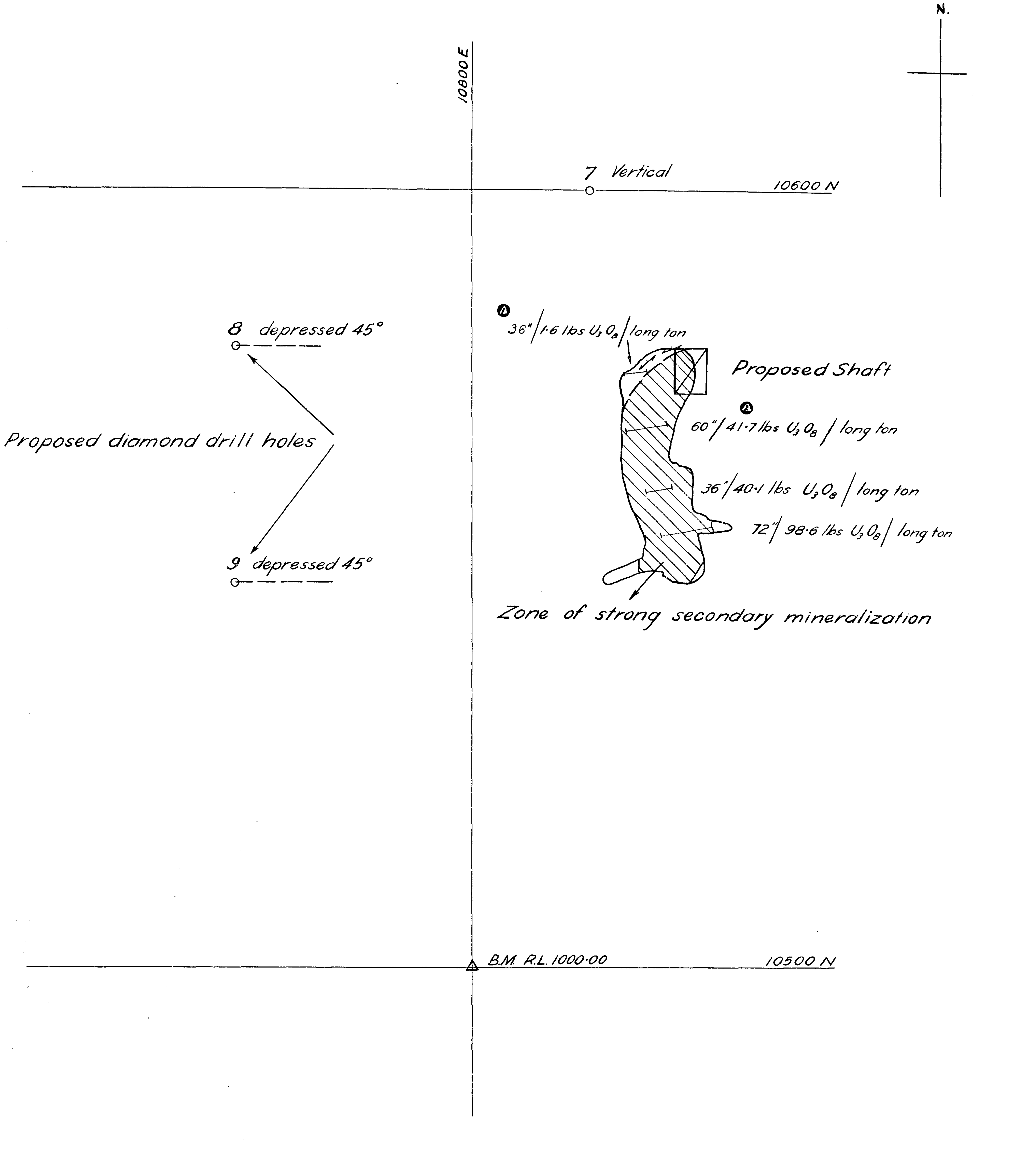
RECOMMENDATIONS.

For the anomalies where over 50 counts were obtained a measurement of the radioactivity of the bedrock could be obtained by trenching or sinking postholes over the anomalies.

From the radioactivity measurements the areas in which further anomalies might be found are along the north-east southwest line through Lode No. 1, and also in a north westerly direction from Lode No. 2. Of these, further results seem most likely in these areas to the north of the rectangle surveyed.

Sgd. D. M. Pegum.
Assistant Geophysicist.

23-12-53.
Drawing US257.



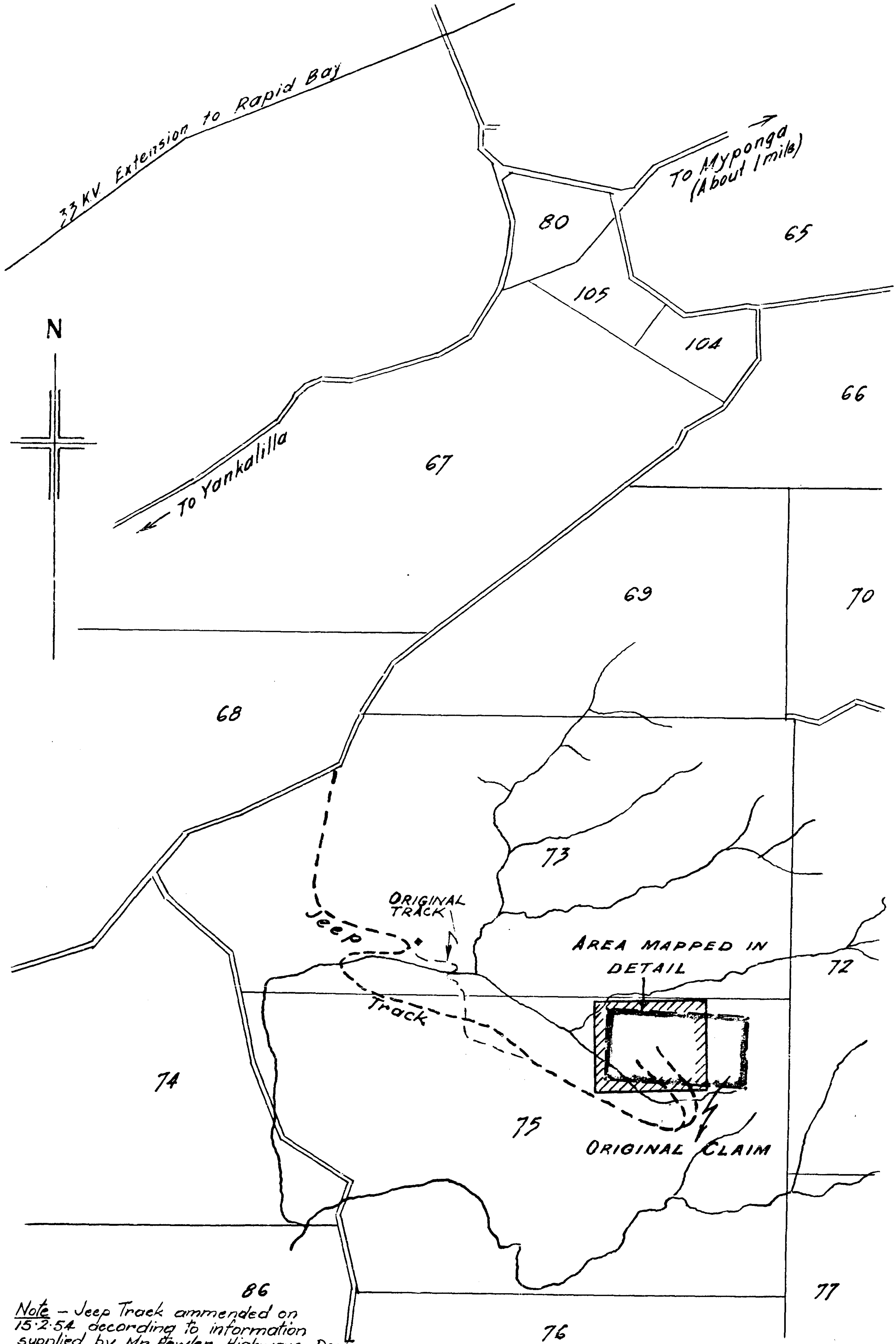
To accompany report by B.P. Webb & F.E. Hughes

S. A. DEPT. OF MINES

No.	Amendment	Exd.	Date
②	41·7 lbs. was 46·7 lbs.	A.G.	18·2·54
①	36" was 48"	A.G.	18·2·54

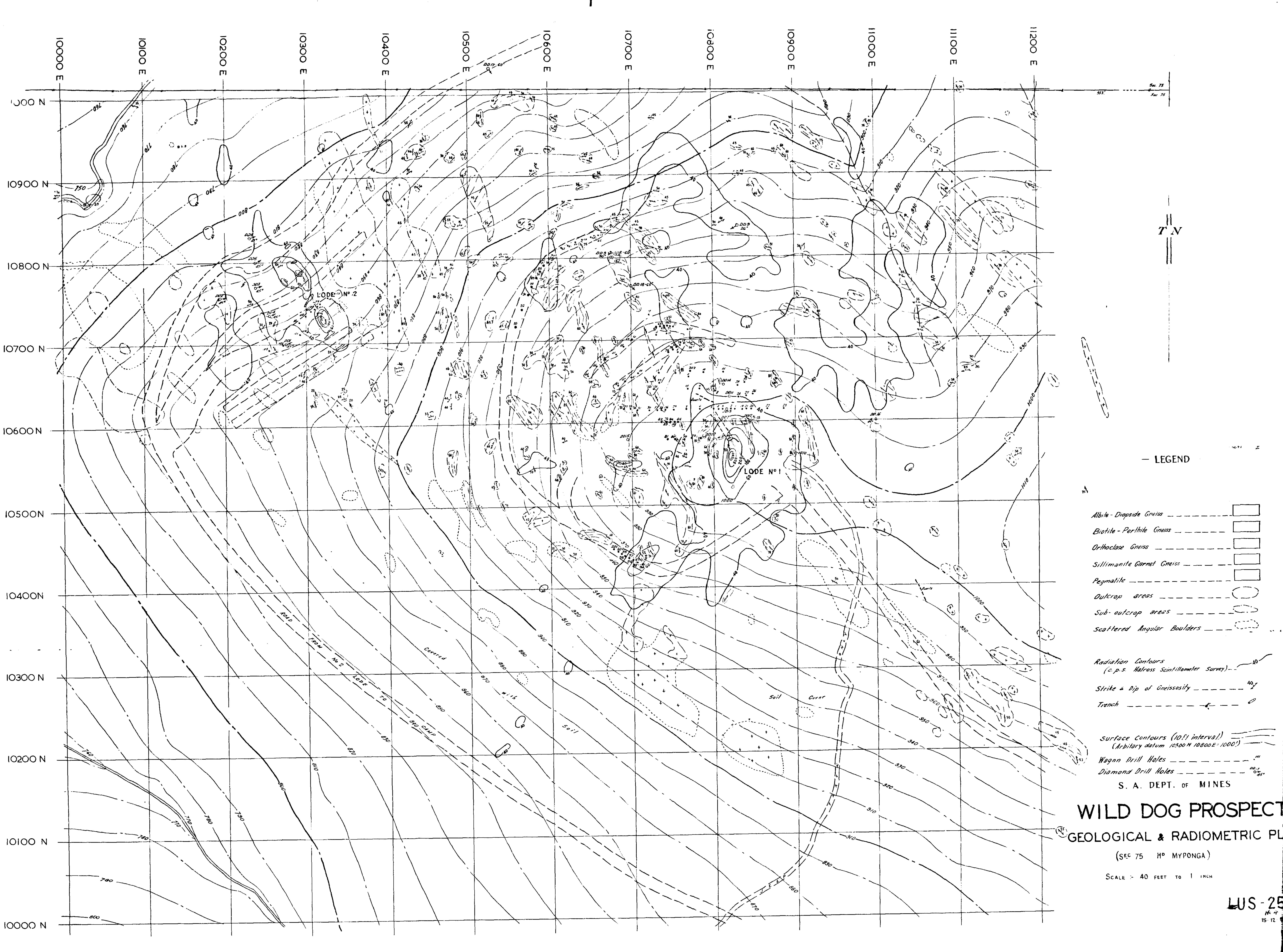
WILD DOG PROSPECT Nº 1 LODE
SURFACE WORKINGS AND PROPOSED DEVELOPMENT

Approved: Director
Passed: B.S.G. per R.R.
Drn. Tcd. A.T. Ckd. Exd.
Scale 1 in to 10 ft.
US 264 A B
Hc 4
Date 11·1·54

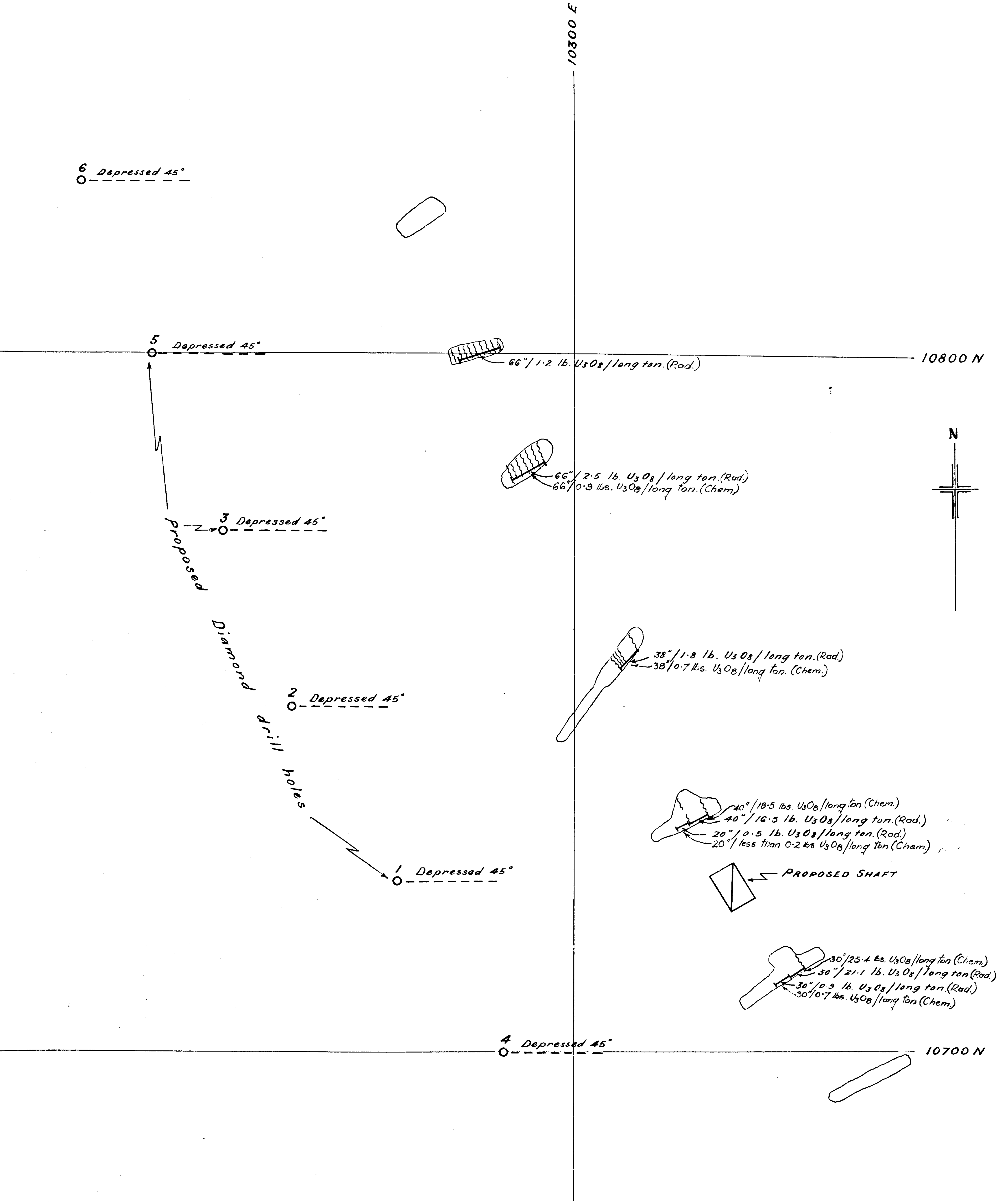


S.A. DEPARTMENT OF MINES

Approved	Passed	Drn.	WILD DOG PROSPECT	D.M.	Scale 20 CHNS. TO 1 IN.
		Tcd.	Hd MYPONGA SEC. 75	Reg.	SUS 263 Hc 4
	B.S.G. per R.R.	Ckd.	LOCALITY PLAN		
Director		Exd.			Date 11·1·54



Geology by F. Hughes & B. Webb. Geophysics by D. Pegum



To accompany report by B. Webb & F.E. Hughes.

S. A. DEPT. OF MINES

No.	Amendment	Exd.	Date
1	Chemical Assay Values Added	[signature]	18·2·54

WILD DOG PROSPECT No. 2 LODE

SURFACE WORKINGS AND PROPOSED DEVELOPMENT

Approved	Passed		Scale. 10 FT. TO 1 IN.
Director	BSG per R.R.	Drn. / Tcd. / Ckd. / Exd.	US 265 Hc. 4
			Date 11·1·54

A B