DEPARTMENT OF MINES
SOUTH AUSTRALIA

SUMMARY REPORT

NICKEL EXPLORATION CLAUDE HILLS

NORTHWEST PROVINCE

by

P. G. Miller
Assistant Senior Geologist
GEOCHEMICAL EXPLORATION SECTION

CONTENTS

Title	Plan No.
Claude Hills, Northwest Province Plan Showing Existing and Proposed Exploration work. Scale 1 inch = 60 chains	S 5060

Rept. Bk. No. 62/48
G.S. No. 3396
D.M. 1535/65

22nd February, 1966.

Rept. Bk. No. 62/48
G.S. No. 3396
D.M. 1535/65

DEPARTMENT OF MINES
SOUTH AUSTRALIA

SUMMARY REPORT NICKEL EXPLORATION, CLAUDE HILLS NORTH WEST PROVINCE

INTRODUCTION

An occurrence of nickeliferous ochre was located at Claude Hills in the Mt. Davies area by a subsidiary of International Nickel Company in 1956. Exploration of the area has been undertaken in several phases, culminating in an intensive exploration programme in 1965 by the South Australian Geological Survey.

The following is a brief summary of exploration work to date, with recommendations for further investigations.

LOCATION AND TOPOGRAPHY

The Claude Hills are a range of hills, adjacent to and paralleling the Northern Territory - South Australian border, which is here unmarked. The eastern extremity of the range curves to the E.N.E. and extends into the Northern Territory, but the main range, situated 12 - 18 miles northwest of Mt. Davies, is in the northwest corner of South Australia.

Access is by track from the graded Giles-Kulgara road, the turn off being approximately 4 miles north of the Mt. Davies airstrip.

The topography is subdued with isolated low relief rock masses rising above an extensive sand dune and sand plain area, situated on the northern flanks of the rugged Tomkinson Ranges.

GEOLOGICAL ENVIRONMENT

The nickeliferous ochre is associated with an E-W to E.N.E. trending elongate intrusion of Giles Complex norites and pyroxenites, within Archean metasediments. Outcropping ochre occurs near the northern margins of the intrusion, and is underlain in several localities by weathered serpentenite. Outcrop is poor in the area, but from the available surface information, and interpretation of gravity profiles, the ochre occurs as more or less discrete, canoe-shaped weathering residuals in the central portion of the Giles Complex intrusion.

The ochre is a yellow-brown cellular hydrated iron oxide, (goethite), often with well preserved relict textures after pyroxene and olivine. The nickel content varies from 0.2% to 2.2%, the higher values occurring at the base of the ochre zone.

It is a residual ochre, formed by the leaching of iron rich ultra mafic rocks, under conditions of high seasonal rainfall, and is probably of Tertiary age. The silica and magnesium have been leached from the original ultra mafic rocks which contained approximately 0.2% Ni, leaving the iron as goethite, with a several-fold concentration of the nickel. In many cases incomplete or restricted leaching is evident from the accumulation of silica as jasper, and magnesium as magnesite at the base of the ochre profile.

The form in which the nickel occurs within the ochre is as yet undetermined. Recent work with the electron probe micro analyser on ochre samples from the Claude Hills area has indicated that the nickel occurs intimately associated with cobalt and manganese, but not with iron, within the goethite framework. The study has also shown that the primary nickel is contained almost wholly in the olivine of the ultra mafic rocks, and nickeliferous ochres are generally derived from the olivine rich varieties, (dunite, picrite, peridotite). These varieties are

also more prone to chemical weathering because of the instability of olivine under such conditions.

The leaching of the silica and magnesium from the ultra mafic rocks lowers the S.G. from 3.2 to 1.6-1.7 in well developed ochre, and it is this feature which permits the successful application of gravity methods in concealed areas. In a gravity profile over an ochre occurrence, the ochre is indicated by a "low" in the plateau associated with the dense ultra mafics.

EXPLORATION WORK

Exploration of the Claude Hills area has been undertaken in three main phases:-

1. 1955 - 1958 Southwestern Mining Ltd. (a subsidiary of International Nickel Company). Detailed geological mapping of the area, with test drilling of the outcropping ochre by six percussion drill-holes.

2. 1959 - 1960 South Australian Department of Mines. Geological mapping of the area as part of the Mann 1:250,000 series, with surface sampling and reinterpretation of the Southwestern Mining work. A gravity survey was carried out in the vicinity of the outcropping ochre, and proved the applicability of the method. As a result of the programme known reserves in the area were calculated, and recommendations for further exploratory work were made by Thomson & Mirams (1961). The reserves were as follows:-

		1.5% Ni			1 to 1.5% Ni	
Probable Ore	1,000,000 tons	1.73% Ni	42.5% Fe	2,600,000 tons	1.18% Ni	39.5% Fe
Additional Possible Ore	400,000 tons	1.6% Ni	42% Fe	1,300,000 tons	1.2% Ni	40% Fe
Total	1,400,000 tons	1.65% Ni	42% Fe	3,900,000 tons	1.2% Ni	40% Fe
Overburden	2,500,000 tons	0.57% Ni	27% Fe			

Further aspects of ochre and its mode of formation were published by Thomson (1963, 1965), based on samples taken during the main survey, and from some later limited field sampling.

3. 1965 South Australian Department of Mines.

Extension of the 1960 gravity survey in both easterly and westerly directions from the outcropping ochre, and 12 drillholes on sites selected from the gravity traverses. This was portion of a more extensive survey embracing all known ochre occurrences in the Mt. Davies area. A plan showing the extent of the exploration work in the Claude Hills area is attached.

RESULTS AND CONCLUSIONS

The gravity surveys of the 1965 programme indicated that in the eastern Claude Hills area the zone of high density Giles Complex thickens to the east, and probably extends into the / Northern Territory. Within this high density zone there are three distinct low density zones, one associated with the outcropping ochre, and two in concealed areas. The most easterly zone extends E.N.E. into the Northern Territory.

Test drilling revealed that both high and low grade ochre is associated with the low density zones in the concealed areas, but insufficient drilling was done to outline the limits of the ochre occurrences. The high grade ochre was intersected

in the most easterly low density zone, where drillhole sample assays were 1.02% Ni from a depth of 23 feet to 100 feet, and 1.57% Ni from 100 to 217 feet. This zone is worthy of further exploration.

The other concealed low density zone was also test drilled, but low grade siliceous ochre was revealed, and further exploration is not warranted.

RECOMMENDATIONS

Further exploration work to define the most easterly low density zone is recommended. For the area in South Australia, closer spaced drilling is required to delineate the limits of the economic grade ochre, and four to six drillholes are suggested.

The eastern limits of this zone which fall in the Northern Territory have not been drilled, and two to four drillholes are suggested.

Additional ochre occurrences are limited to the eastern extension of the Giles Complex intrusion. The thickening of this body in the Northern Territory merits further exploration, because of the possibility of larger ochre occurrences which could be associated with the increased width of the intrusion. Extension of the existing gravity grid into the Northern Territory is recommended, with a series of gravity traverses, approximately 4,000 feet long, and at 2,000 feet intervals. The total number of such traverses would be dependent upon the continuance of the high density zone. Additional drilling would be required should further "lows" be detected.

Details of the recommended exploration work are shown on the attached plan. The proposed investigation in the Northern Territory is contingent upon right of entry being granted by the Northern Territory Administration.

P. G. Miller
Assistant Senior Geologist
GEOCHEMICAL EXPLORATION SECTION

PGM:AGK
22/2/66

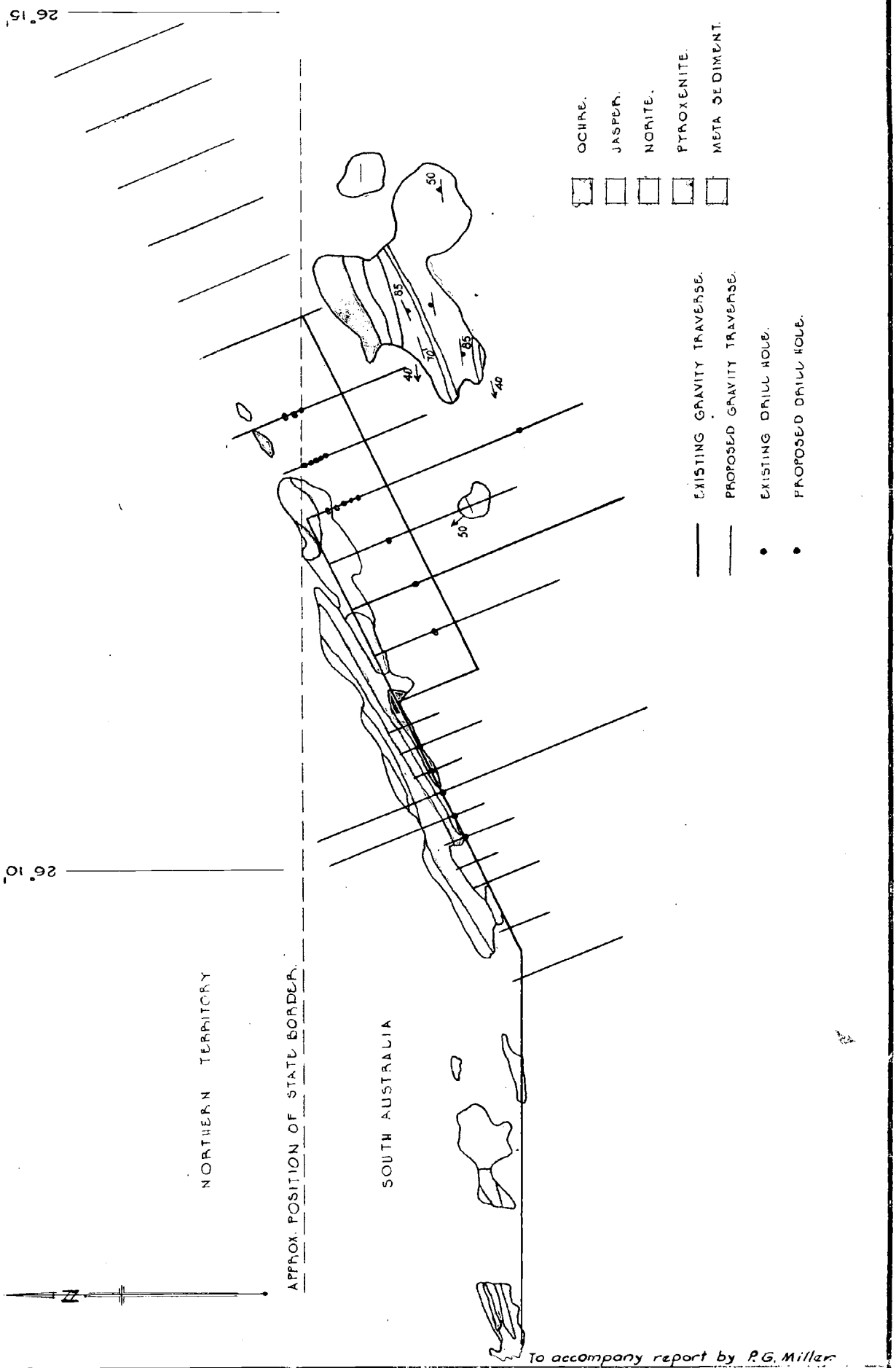
REFERENCES

MIRAMS, R.C., 1964. The Geology of the Mann 4-Mile Sheet. Geol. Surv. of S.Aust. Rept. of Invest. No. 25.

THOMSON, B.P. and MIRAMS, R.C., 1961. Nickel Exploration, Special Mining Lease No. 33. Tomkinson Ranges. Geol. Surv. of S.Aust. Rept. No. 659(b) (unpublished).

THOMSON, B.P., 1963. Nickel Mineralization and the Giles Complex in the Tomkinson Ranges S.Australia. Geol. Surv. of S.Aust. Quart. Notes No. 8.

THOMSON, B.P., 1965. Weathering and related Nickel Mineralization Mt. Davies Area. Geol. Surv. of S.Aust. Quarterly Notes No. 16.



DEPARTMENT OF MINES — SOUTH AUSTRALIA

	Drn. PGM.	CLAUDE HILLS NORTHWEST PROVINCE PLAN SHOWING EXISTING AND PROPOSED EXPLORATION WORK	SCALE - 1 INCH = 60 CHAINS. S 5060 Ad. DATE: 18 - 2 - 66
	Tcd. S.C.W.		
	Ckd. L.Y.W.		
	Exd.		