Open File Envelope No. 931

SML 180

HOUGHTON

PROGRESS AND FINAL REPORTS TO LICENCE SURRENDER FOR THE PERIOD 15/4/1968 TO 28/2/1970

Submitted by
Noranda Australia Ltd and Unimin Corp.
1970

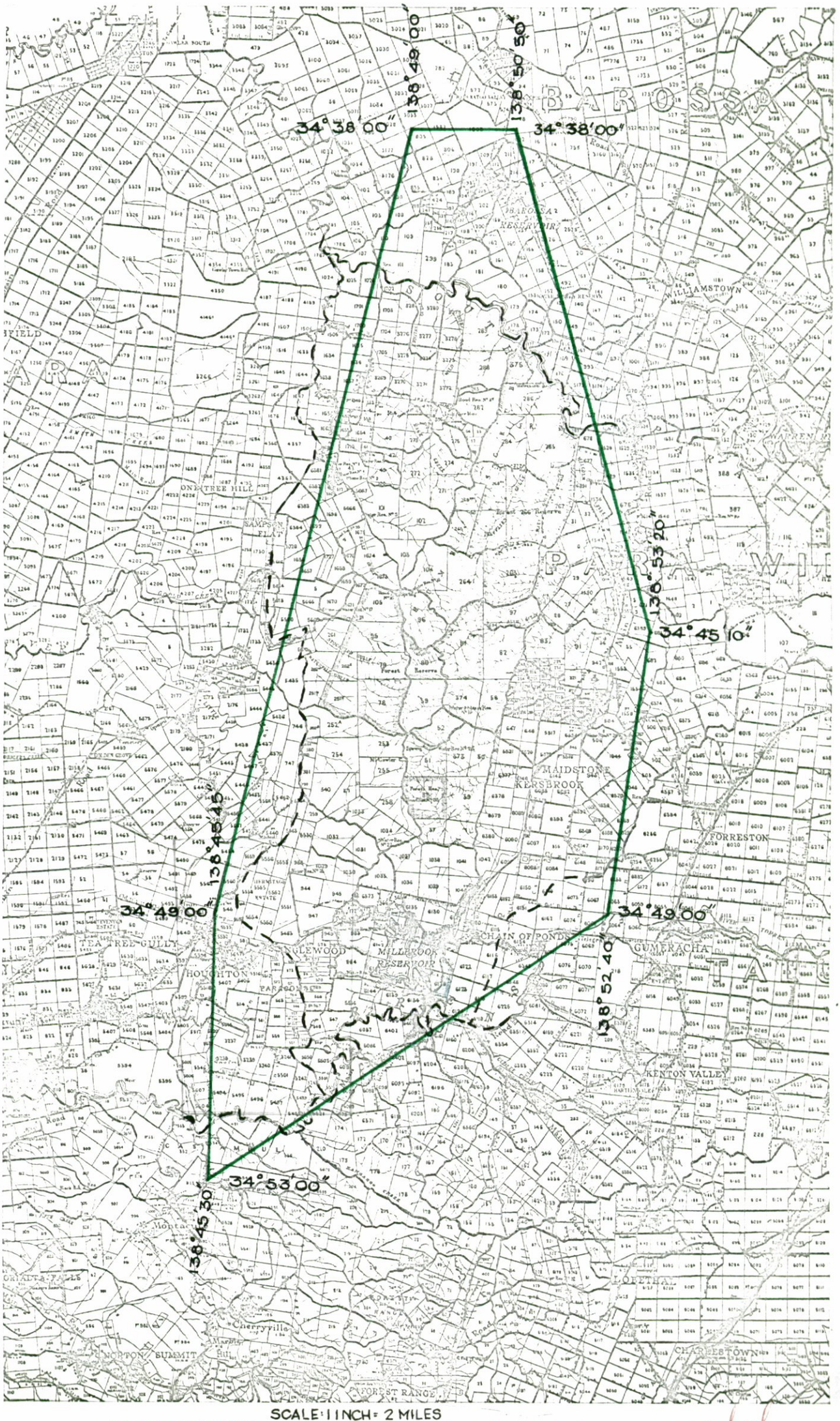
Enquiries: Customer Services Branch
Minerals and Energy Resources
7th Floor
101 Grenfell Street, Adelaide 5000

Telephone: (08) 8463 3000
Facsimile: (08) 8204 1880

Government of South Australia
Primary Industries and Resources SA

FOR URANIUM BEARING MINERALS
AND OTHER MINERALS

COORDINATES DETERMINED
BY C.S.D. 9/7/68



SCALE: 1 INCH = 2 MILES

NORANDA AUSTRALIA LTD.

surrendered 6/5/70

D.M. 389/68

S.M.L. 180

CONTENTS ENVELOPE 931 DM 389/68

TENEMENT: S.M.L. 180

TENEMENT HOLDER: Noranda Australia Ltd.

(page 3 does not exsist)

004 ENV 931

NORANDA AUSTRALIA LIMITED

SPECIAL MINING LEASE NO. 180 - HOUGHTON

REPORT FOR SIX MONTHS ENDED OCTOBER 1, 1968

Noranda Australia Limited was granted a Special Mining Lease over an area of 79 square miles for a term of one year commencing April 1, 1968. One of the conditions under which this Special Mining Lease was granted stipulated that Noranda Australia Limited would submit a progress report at the conclusion of each six months. This report is for the six months ended October 1, 1968.

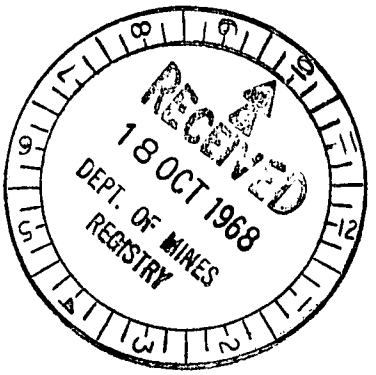
Aerial photographs were purchased to provide stereoscopic coverage of this area. Geological maps have been purchased from the Department of Mines.

Five companies were invited to submit tenders for an airborne spectrometer survey over this Special Mining Lease. Three tenders were received and the contract was awarded to Geophoto Resources Consultants, who have arranged to fly an aircraft and equipment from North America later this year.

Geophoto Resources Consultants will use an Airborne Gamma-ray Spectrometer developed by Texas Instruments. The six large crystal configuration incorporated in this instrument provides a larger detector than that used by the other contractors.

Arrangements have been made to complete this flying prior to the end of 1968.

G. C. Battey,
Chief Geologist.



October 15, 1968.

GCB:GW

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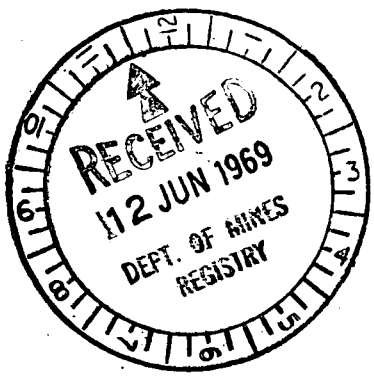


SPECIAL MINING LEASE NO. 180
HOUGHTON, SOUTH AUSTRALIA

REPORT FOR 12 MONTHS ENDED MARCH 31, 1969

Report No. 111

June 1969

by

G. C. BATTEY

Melbourne, Australia

NORANDA AUSTRALIA LIMITED

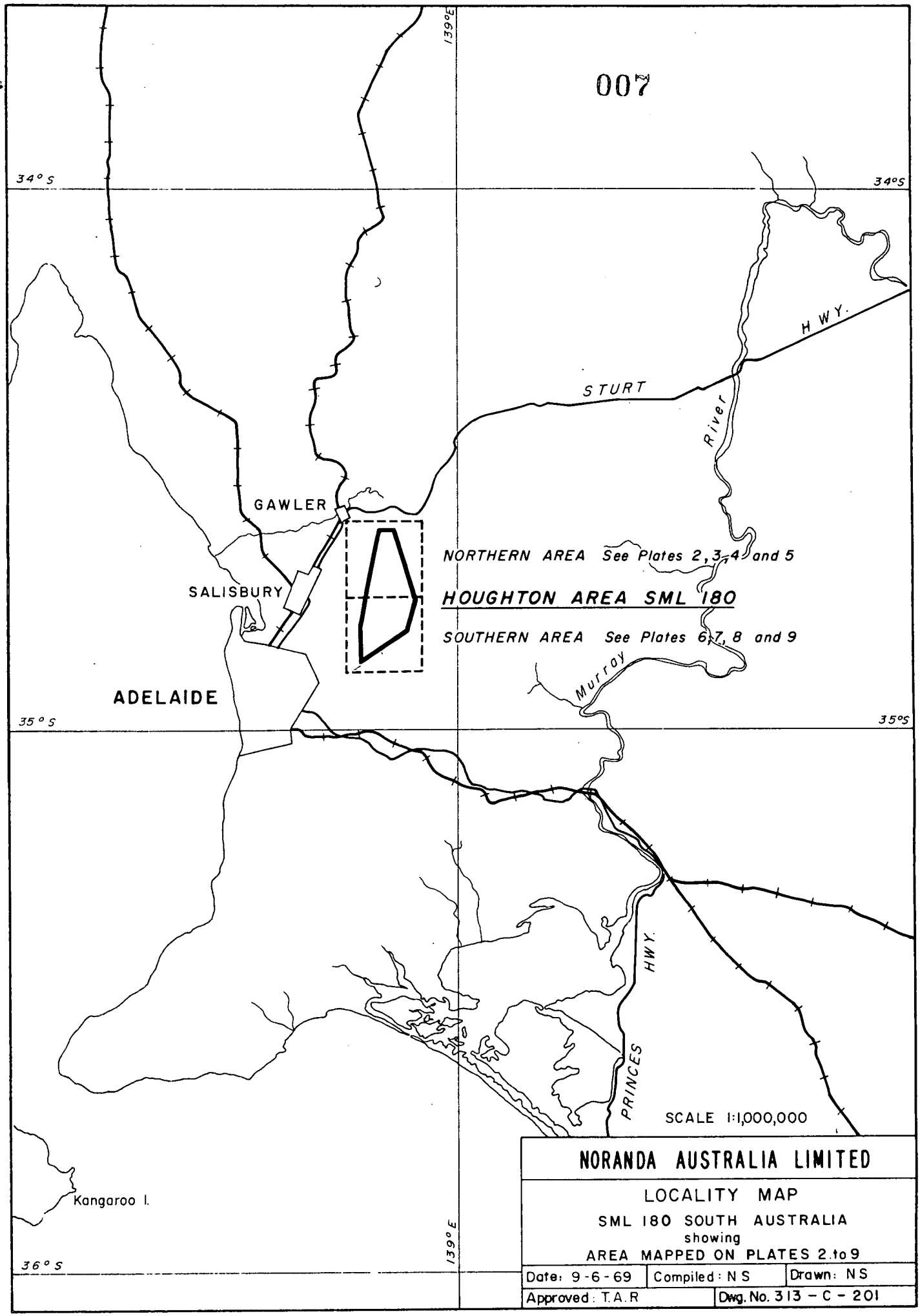
006

S.M.L. NO. 180 - HOUGHTON, SOUTH AUSTRALIA

REPORT FOR 12 MONTHS ENDED MARCH 31, 1969

LIST OF PLATES

(All Plates in plastic pocket at back of report)



NORANDA AUSTRALIA LIMITED

LOCALITY MAP

SML 180 SOUTH AUSTRALIA

showing

AREA MAPPED ON PLATES 2 to 9

Date: 9-6-69	Compiled: N S	Drawn: N S
Approved: T.A.R	Dwg. No. 313 – C – 201	

NORANDA AUSTRALIA LIMITED

SPECIAL MINING LEASE NO. 180
HOUGHTON, SOUTH AUSTRALIA

REPORT FOR 12 MONTHS ENDED MARCH 31, 1969

1. Introduction

Noranda Australia Limited was granted a Special Mining Lease over an area of 79 square miles for a term of one year commencing April 1, 1968. This term has now been extended for a period of one year, expiring on April 14, 1970.

One of the conditions under which this Special Mining Lease was granted stipulated that Noranda Australia Limited would submit a report at the conclusion of each six months. This report is for the 12 months ended March 31, 1969.

2. Literature Study

Mr. A. Thomas conducted a literature study of this area from the reports available at the South Australian Department of Mines.

An airborne scintillometer survey of the area was conducted several years ago. There were a series of east-west traverses at intervals of 500 yards. Four anomalous areas were defined but the original Houghton prospect was not recorded in this survey.

The original Houghton prospect was discovered in 1950. A detailed investigation by the Department of Mines included trenching and shallow drilling. The best exposure was 110 feet of 0.18% U_3O_8 with 23 feet of 0.15% U_3O_8 in a trench at right angles. No significant values were intersected by drilling below this exposure.

Southwest of Inglewood a series of drill holes were completed and some 30,000 tons of 1.4 lbs. U_3O_8 were delineated.

3. Present Investigation

Aerial photographs were purchased to provide stereoscopic coverage of the area. Geological maps were purchased from the Department of Mines.

Five companies were invited to submit tenders for an airborne spectrometer survey over this Special Mining Lease. The contract was awarded to Geophoto Resources Consultants.

The equipment used was an airborne gamma ray spectrometer developed by Texas Instruments and mounted in a DC3. This system is a multiple large crystal system and appears to be the most sensitive system in use in Australia. The data is recorded in digital form on magnetic tape. The results are processed in the U.S.A. and are presented as isoradioactivity contour maps for uranium. Isoradioactivity contour maps have been prepared to illustrate the U/Th and U/K ratios. Maps showing the position of the flight lines are also presented with this report.

A number of anomalies have been outlined as a result of this airborne spectrometer survey and these will be investigated by field parties.

Expenditure figures transferred to D.M. 389/68

ENV 931

HOUGHTON AREA

Bi^{214} RADIOACTIVITY CONTOUR MAP

from

Airborne Gamma Ray Spectrometry

PREPARED FOR

NORANDA AUSTRALIA PTY. LIMITED
MELBOURNE, VICTORIA, AUSTRALIA

BY

GEOPHOTO SERVICES, INC.
SCIENCE SERVICES DIVISION
TEXAS INSTRUMENTS INCORPORATED
DENVER, COLORADO

SCALE
1
24,000

Contour Interval 10 counts per 2 seconds

PLATE 3

138°44'48" 138°45 138°54'58"
722,000y N 722,000y E
34°37'19" 34°37'30"
720,000y N 720,000y N
34°40 34°40
710,000y N 710,000y N
34°43 34°45
34°45'43" 34°45'54"
705,000y N 705,000y N
174,000y E 180,000y E 191,000y E
138°44'35" 138°50 138°54'45"

SOUTH PARA RESERVOIR

Wild RIVER

Mock Creek

Malcolm Creek

Creek

685A14

N

SCALE : 1:24,000 HOUGHTON SHEET 1 OF 2

ENV 931-3

ENV 931

HOUGHTON AREA

Bi^{214}/Tl^{208} ISORADIOACTIVITY CONTOUR MAP

from

Digital Airborne Gamma Ray Spectrometry

PREPARED FOR

NORANDA AUSTRALIA PTY. LIMITED
MELBOURNE, VICTORIA, AUSTRALIA

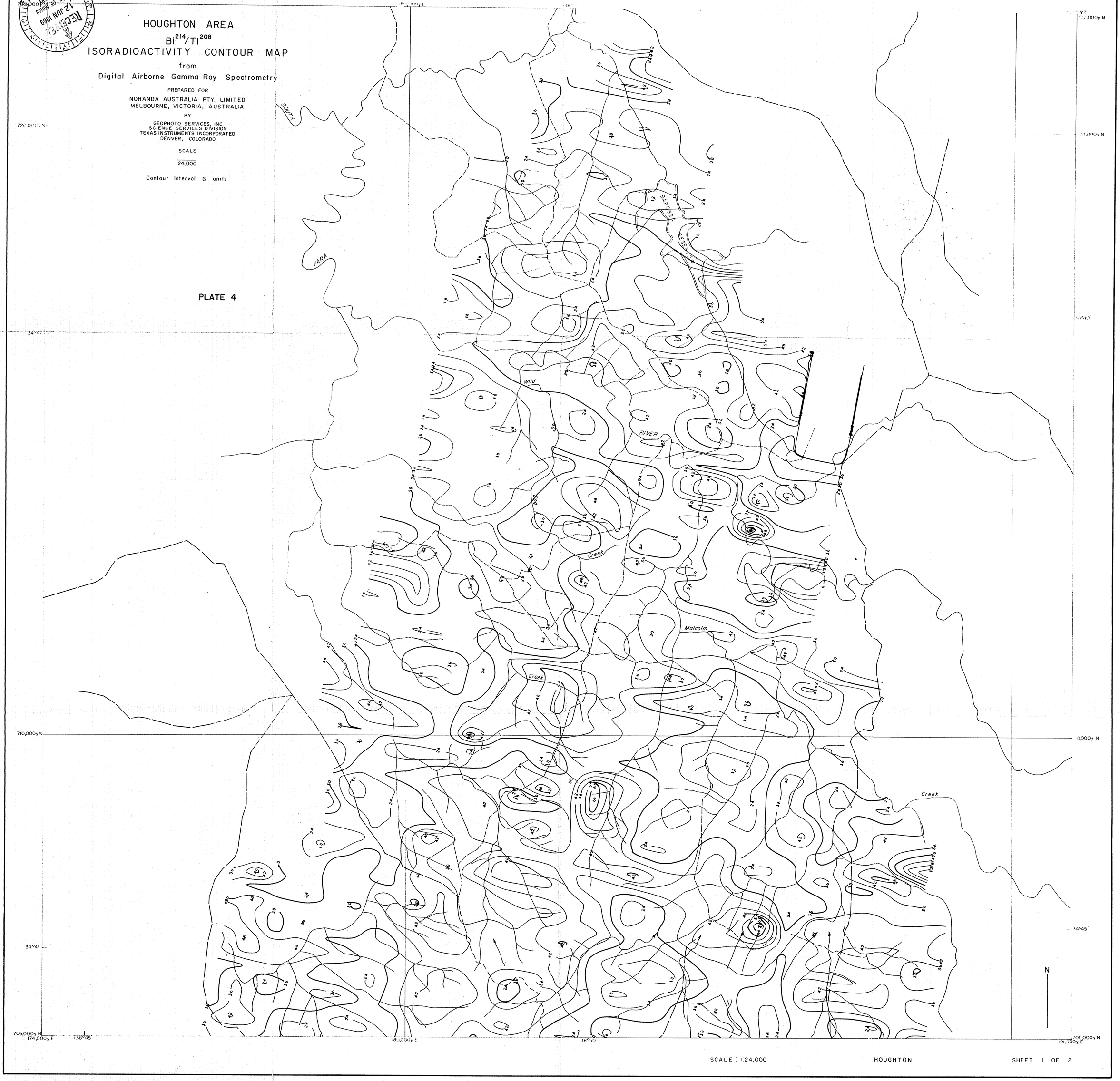
BY

GEOPHOTO SERVICES, INC.
SCIENCE SERVICES DIVISION
TEXAS INSTRUMENTS INCORPORATED
DENVER, COLORADO

SCALE
1
24,000

Contour Interval 6 units

PLATE 4



SCALE : 1:24,000 HOUGHTON SHEET 1 OF 2

ENV 931-4

ENV 931

HOUGHTON AREA

Bi^{214}/K^{40} ISORADIOACTIVITY CONTOUR MAP

from

Digital Airborne Gamma Ray Spectrometry

PREPARED FOR

NORANDA AUSTRALIA PTY. LIMITED
MELBOURNE, VICTORIA, AUSTRALIA

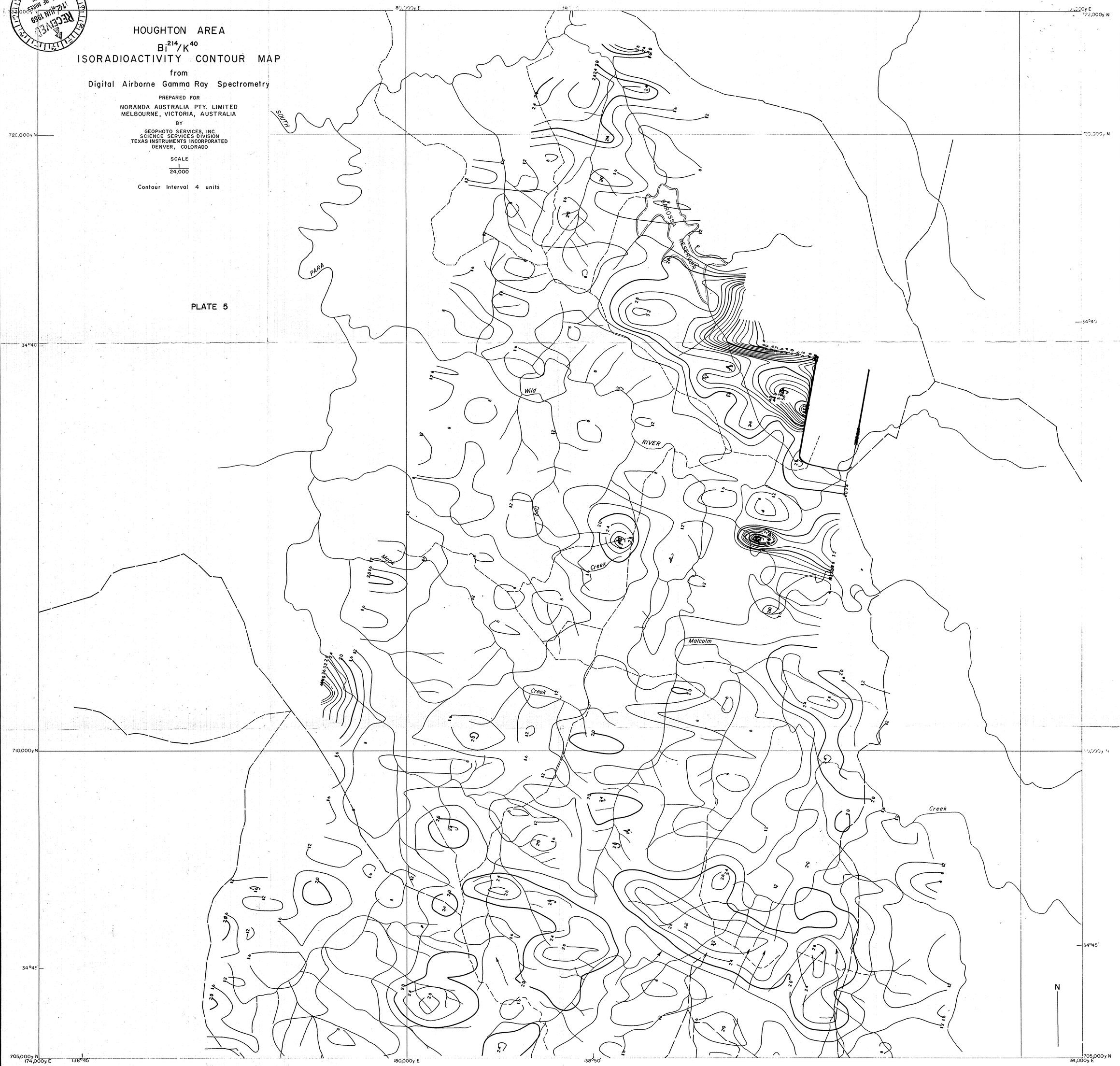
BY

GEOPHOTO SERVICES, INC.
SCIENCE SERVICES DIVISION
TEXAS INSTRUMENTS INCORPORATED
DENVER, COLORADO

SCALE
1
24,000

Contour Interval 4 units

PLATE 5



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ENV 931-5

705,000y N

700,000y N

690,000y N

688,000y N

138°45'

180,000y E

138°50'

190,000y E

195,000y E

KERSBROOK

INGLEWOOD

HOUGHTON

Millbrook Reservoir

CUDLEE CREEK

PARACOMBE

Deep Creek

N

HOUGHTON AREA

Bi^{214}

ISORADIOACTIVITY CONTOUR MAP

from

Digital Airborne Gamma Ray Spectrometry

PREPARED FOR

NORANDA AUSTRALIA PTY. LIMITED
MELBOURNE, VICTORIA, AUSTRALIA

BY

GEOPHOTO SERVICES, INC.
SCIENCE SERVICES DIVISION
TEXAS INSTRUMENTS INCORPORATED
DENVER, COLORADO

SCALE 1 / 24,000

Contour Interval 10 counts per 2 seconds

SCALE : 1:24,000 HOUGHTON SHEET 2 OF 2

PLATE 7

HOUGHTON AREA

Bi^{214}/Tl^{208} ISORADIOACTIVITY CONTOUR MAP

from

Digital Airborne Gamma Ray Spectrometry

PREPARED FOR

NORANDA AUSTRALIA PTY. LIMITED
MELBOURNE, VICTORIA, AUSTRALIA

BY

GEOPHOTO SERVICES, INC.
SCIENCE SERVICES DIVISION
TEXAS INSTRUMENTS INCORPORATED
DENVER, COLORADO

SCALE

1
24,000

Contour Interval 6 units

SCALE : 1:24,000 HOUGHTON SHEET 2 OF 2

PLATE 8

34°45'48" 138°44'35"

138°54'45"
34°45'54"

705,000y N

700,000y N

690,000y N

80,000y E

90,000y E

INGLEWOOD

HOUGHTON

Millbrook Reservoir

KERSBROOK

CUDLEE CREEK

PANACHE RD

Deep Creek

N

34°50'

34°54'07"
688,000y N
138°44'21"

34°54'18"
688,000y N
138°54'33"

685A14

HOUGHTON AREA

Bi^{214}/K^{40} ISORADIOACTIVITY CONTOUR MAP

from

Digital Airborne Gamma Ray Spectrometry

PREPARED FOR

NORANDA AUSTRALIA PTY. LIMITED
MELBOURNE, VICTORIA, AUSTRALIA

BY

GEOPHOTO SERVICES, INC.
SCIENCE SERVICES DIVISION
TEXAS INSTRUMENTS INCORPORATED
DENVER, COLORADO

SCALE

1
24,000

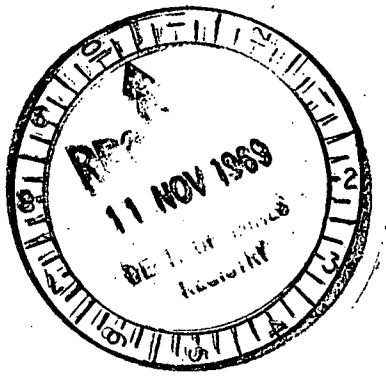
Contour Interval 4 units

SCALE 1:24,000 HOUGHTON SHEET 2 OF 2

PLATE 9

ENV 931-8

EMV 981.



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SPECIAL MINING LEASE NO. 180

HOUGHTON, SOUTH AUSTRALIA

REPORT FOR 6 MONTHS ENDED SEPTEMBER 30, 1969

Report No. 127. November, 1969.

By

G. C. BATTEY

Melbourne, Victoria.

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NORANDA AUSTRALIA LIMITED

SPECIAL MINING LEASE NO. 180.
HOUGHTON, SOUTH AUSTRALIA

REPORT FOR SIX MONTHS ENDED SEPTEMBER 30, 1969.

1. INTRODUCTION

Noranda Australia Limited was granted a Special Mining Lease over an area of 79 square miles for a term of one year commencing April 1, 1968. This term has now been extended for a period of one year, expiring on April 14, 1970.

One of the conditions under which this Special Mining Lease was granted stipulated that Noranda Australia Limited would submit a report at the conclusion of each six months. This report is for the six months ended September 30, 1969.

2. INVESTIGATION

Aerial photographs were purchased to provide stereoscopic coverage of the area. Geological maps were purchased from the Department of Mines.

Five companies were invited to submit tenders for an airborne spectrometer survey over this Special Mining Lease. The contract was awarded to Geophoto Resources Consultants.

The equipment used was an airborne gamma ray spectrometer developed by Texas Instruments and mounted in a DC3. The system is a multiple large crystal system and appears to be the most sensitive system in use in Australia. The data is recorded in digital form on magnetic tape. The results are processed in the U. S. A. and are presented as isoradioactivity contour maps for Uranium. Isoradioactivity contour maps were prepared to illustrate the U/Th and U/K ratios. Maps showing the position of the flight lines, the isoradioactivity contour maps for Uranium and the isoradioactivity contour maps illustrating the U/Th and U/K ratios were prepared and issued to the Department of Mines with the report for the 12 months ended March 31, 1969.

A number of anomalies have been outlined as a result of this airborne spectrometer survey and these will be investigated by field parties.

Work has commenced on the investigation of the anomalies on Special Mining Lease No. 182 but has been interrupted because of the shortage of qualified technical staff. The available technical staff have been operating in the Northern Territory during the winter and are scheduled to commence work on Special Mining Lease No. 180 during the summer months.

Expenditure figures transferred

ENV 931

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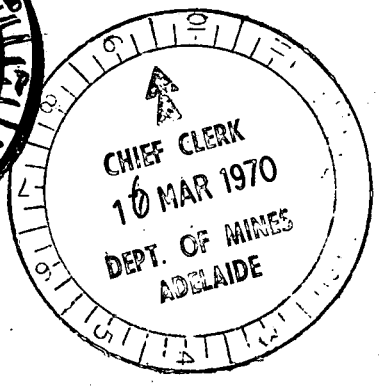

SPECIAL MINING LEASE NO. 180

HOUGHTON AREA, SOUTH AUSTRALIA

UNIMIN REPORT

P. Cremer

&

M. Franklin

February, 1970

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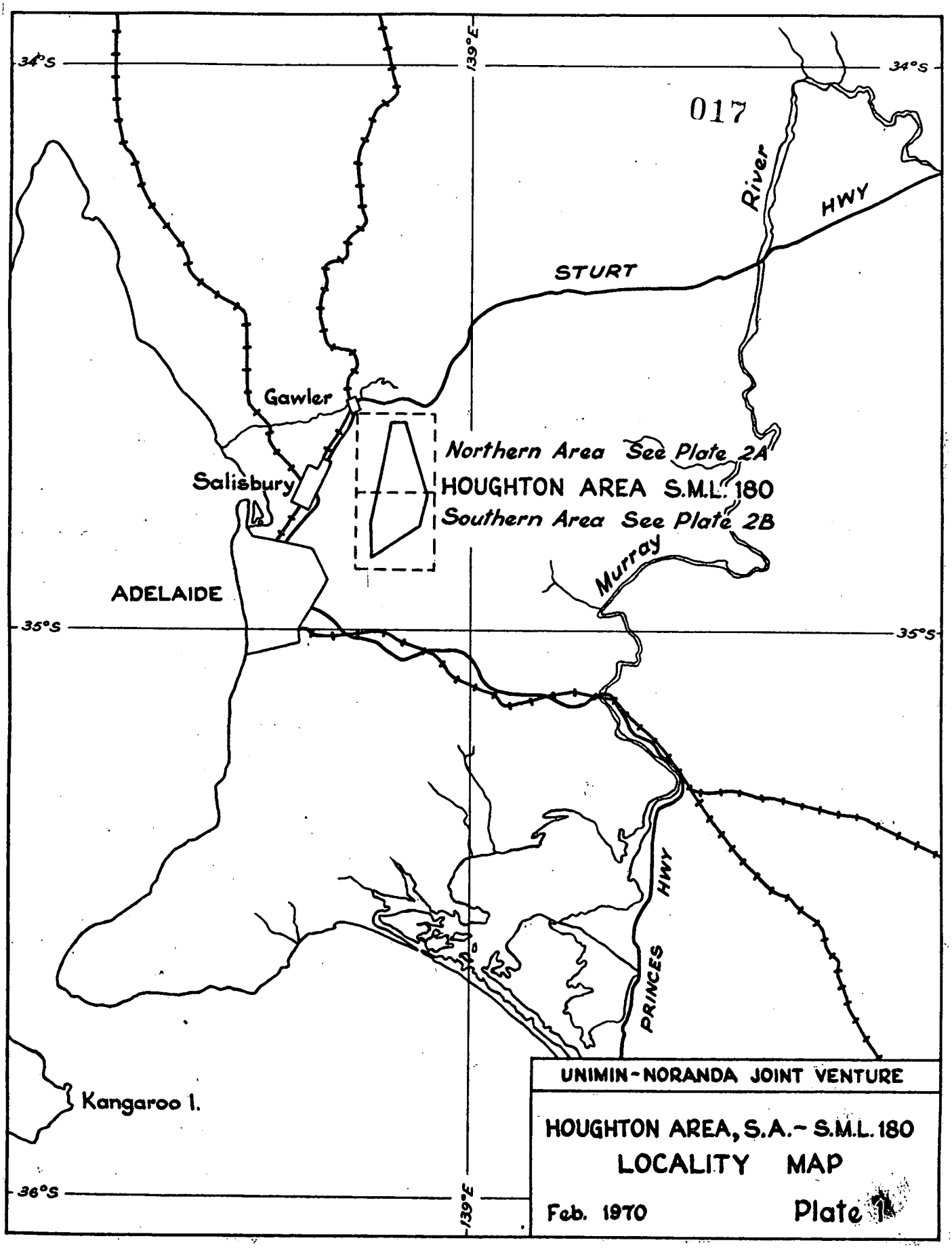
017
34°S
139°E
River
HWY
STURT
Gawler
Salisbury
Northern Area See Plate 2A
HOUGHTON AREA S.M.L. 180
Southern Area See Plate 2B
Murray
ADELAIDE
35°S
PRINCES HWY
Kangaroo I.
36°S
UNIMIN-NORANDA JOINT VENTURE
HOUGHTON AREA, S.A.- S.M.L. 180
LOCALITY MAP
Feb. 1970
Plate 1

1 INTRODUCTION:

The small village of Houghton, approximately 14 miles north east of Adelaide, is located towards the south west corner of S.M.L. 180, which covers an area of approximately 79 square miles. Within the lease, a large Archean inlier is flanked by Torrensian series rocks and both units are overlain by small areas of Tertiary sediments which are generally isolated to the northern half of the lease. A number of minor occurrences of uranium mineralisation have been located; the larger areas are confined to the south-west section of the lease. No production of uranium has been recorded for this lease.

A programme of airborne gamma ray spectroscopy was undertaken by Geophoto Services Inc., under the supervision of Noranda Australia Limited. The anomalous areas indicated by this survey, presented in contour map form, are largely confined to the lower two-thirds of the lease. This is in accord with the results of previous surveys carried out by officers of the South Australian Department of Mines, and later groundwork undertaken by company geologists in January, 1970.

2 GEOLOGY:

2.1 General

The area included by S.M.L. 180 has been mapped by the South Australian Department of Mines on the Gawler & Adelaide 1 mile geological sheets. Outcrop maps drawn at larger scales are included in a number of more detailed reports written by officers of the South Australian Department of Mines.

Sparsely outcropping strongly metamorphosed Archean rocks (schists and gneisses) dominate the geology of the lease. Contacts with the unconformable overlying Proterozoic Torrensian Series (metamorphosed sandstones grits and conglomerates, schists, phyllite, slates, quartzites) are commonly faulted. Small outcrops of (?)Tertiary sediments (clays, sands, gravels) occur within the Archean and Proterozoic areas, and are generally confined to the northern half of the lease.

2.2 Rock Types

Webb & Whittle (1954) have grouped the Archean rocks into three broad field units:

a. Houghton "Diorite" Types - sodic plagioclase and ferromagnesian minerals (amphibole, diopside), commonly occurring in alternating feldspathic and ferromagnesian mineral bands, are the major constituents. Ilmenite, hematite, epidote, sphene, rutile and quartz are accessory minerals.

The main Houghton "Diorite", originally described by Benson (1909) as a metamorphosed igneous rock, is now considered to represent a sequence of metasomatised sedimentary rocks. A variety of Houghton "Diorite", an albite rock, almost wholly composed of sodic plagioclase with subordinate quartz and ferromagnesian minerals, displays a weak gneissic banding.

b. Gneissic Rocks - Quartz-feldspar gneisses composed of microline, orthoclase or perthite and minor albite, quartz, minor amounts of mica (biotite, muscovite, sericite, chlorite) and a little ilmenite.

c. Schistose Rocks - Schists, or micro-augen gneisses, with a fine grained micaceous matrix and rare quartz and feldspar porphyroblasts, grade into the gneissic rocks.

Quartz-feldspar pegmatites are commonly developed in all rock types.

The present field studies have shown that augen gneisses, banded feldspar-biotite gneisses, quartz-feldspar-mica schists, (?)sillimanite schists, pegmatite and aplites are extremely common, although the individual occurrences display only small areas of outcrop. These rock types are intimately associated with one another and with the three major units described above. Epidote-rich horizons and albite-pyroxene-amphibole rocks are associated with the Houghton "Diorite".

2.3 Structure

The Archean rocks form a broad anticlinal structure with a prominently developed schistosity or gneissic banding. South of Inglewood this layering generally strikes northwest, swinging to the northeast, north of Inglewood. Local discordancies in this banding, thought by Webb & Whittle to represent relict bedding in the less sericitic types, are common.

Faulting is a dominant feature of the Archean block and large areas of tectonic breccias are commonly observed. Brecciation of these rocks is also observed on a smaller, more local scale. In general these tectonic breccias, and the pegmatite and aplites, are locally oriented parallel to the banding.

Although jointing has been observed, no rigid pattern could be ascertained, owing to the lack of continuous outcrop.

3 AIRBORNE GAMMA RAY SPECTROSCOPY SURVEY & ITS INTERPRETATION

A gamma ray spectrometer, developed by Texas Instruments, and incorporating digital recording and processing techniques, was used by Geophoto Services Inc., in an airborne survey. Lines were flown at 1000 feet intervals at a mean height of 400 feet, and to assist in surface location of any anomalous zone, a 35 mm strip film photograph was taken at the centre of each counting period. Isoradioactivity contour maps were prepared for Bi 214 (U), Tl 208 (Th, K 40, Bi 214/Tl 208, Bi 214/K 40 and Tl 208/K 40.

No high uranium anomalies were disclosed on the contour maps provided. Hence only areas of 100 counts per 2 seconds (approximately twice background) were investigated by ground studies. This approach delineated 23 areas of which 11 areas displayed readings greated than 120 counts per 2 seconds; 2 areas had readings greater than 140 counts per 2 seconds. A further 2 anomalous areas were disclosed by operation of the B.G.S.1 Scintillometer in the vehicle during road traverses.

It is felt that these latter areas may have been indicated by accurate plotting of readings from the digital record sheets which could not be obtained before completion of the work.

4 DETAILED INVESTIGATION OF THE ANOMALIES

4.1 General

Ground studies of the anomalous areas involved traversing with B.G.S. 1 Scintillometers. If necessary, more accurate traverses were to be undertaken over grids plotted on air photos.

As the work proceeded it became apparent that many of the anomalies could be overlooked. These areas are typified by (a) the size of the anomaly, and/or (b) the absence of a point maximum and/or (c) the topographic expression.

The final criterion, topographic expression, perhaps warrants further explanation. It was found that many of the indicated anomalies, which occur on areas of moderate relief, do not produce analogous readings during ground inspection. It appears that insufficient attention may have been placed on topographic relief during correction of the digitally recorded data and that this inadequacy is reflected in the radioactivity contour plans provided.

Since none of the anomalies is deemed to warrant further investigation, detailed descriptions of the individual areas appear below in alphabetical order, corresponding to the areas indicated on the accompanying plans.

Scintillometer studies by Seedsman (1952) have indicated the following radiation readings for rocks in the lease area :

Houghton "Diorite" 20 - 25 cps

Archean schists and gneisses 40 - 50 cps

Adelaide System sandstone 30 - 35 cps

Lateritised Tertiary sediments 10 - 15 cps

4.2 Anomaly A

Inspection of this area by Webb (1954b) has indicated two small anomalous areas in Archean schists and gneisses with south pitching fold axes and axial planes overturned to the west. The two high points, which are twelve feet apart, give a maximum scintillometer reading of 1200 cps which falls to 120 cps within a few feet. The radioactive source was identified as the uranium colombate,

betafite, but is occurrence is only minor.

No further investigation was undertaken since the anomaly is too small.

4.3 Anomaly B

During geophysical studies of the Houghton-Kersbrook area, Seedsman (1952) found four small radioactive centres over 100 cps (maximum 350 cps) about ½ mile southeast of Paracombe. These centres occur in the vicinity of small outcrops of Houghton "Diorite", albite rock and schist. Since this area includes one of the highest radioactive centres indicated by the airborne survey, further investigation was undertaken.

The main centre of the anomaly occurs on a cleared hillside about 300 feet above the valley floor. Outcrop is confined to a few small scattered boulders of Houghton "Diorite", albite rock (with minor epidote and hematite) and feldspar-mica schist (with minor quartz). The mica is largely sericite and chlorite with patches of relatively coarse-grained, partly altered biotite. The background radiation in the vicinity is 50 cps. Several high readings of approximately 120 cps were recorded, rising to a maximum of 240 cps (420 cps about 6 inches below the surface). The radioactive material appears to be confined to, or adjacent to, the feldspar-mica schist in a zone about two feet wide and 100 feet long, striking 080°.

The intensity of the anomaly as depicted by the airborne studies appears to be largely due to topographic effects, rather than the presence of a strong radioactive source.

4.4 Anomaly C

This is a small anomaly located on the western side of the Gorge Road, about 1 mile from the Paracombe anomaly. This area was not investigated since it is considered to be too small, and it lacks a point maximum.

4.5 Anomaly D

This anomaly, on the eastern side of the Gorge Road, about ¼ mile from Anomaly C, was inspected by Webb (1954 a). Sparse indications of torbernite occur parallel to a north-northwesterly striking steep easterly dipping banded foliation in schists and gneisses (containing quartz and feldspar augen and a poor foliation defined by chloritic material).

This anomaly is also too small, and does not contain a point maximum, and so no field investigation was undertaken.

4.6 Anomaly E

This area is located on a hillside about 1 mile east of Houghton and ½ mile south of Inglewood. Ground surveys carried out by Knapman (1954 b) and McPharlin (1950) indicated a high area about 1000 feet long and 100 feet wide with readings up to 600 cps. The zone giving readings greater than 400 cps extends over 350 square yards. Field inspection has indicated that the anomalous zone coincides with a ridge scattered with large boulders of Houghton "Diorite". The host is a medium-grained, feldspar-rich rock with lenses and irregular patches of green (?) amphibole, black (?) pyroxene (oriented parallel to the foliation) and minor epidote and quartz. The rock has a granular texture and a poorly defined banding and foliation which strikes 335° and dips 55° to the west. Two sets of joints were observed, one near vertical striking 335°, the other striking 175° and dipping 44° east. The background in the area is 40 cps and the highest surface reading, 150 cps, was recorded in several areas up to 200 yards apart. Readings of 100 cps would not extend for more than 50 feet round the central maximum of any one of these anomalies. A reading of 370 cps was obtained by digging six inches into the soil, closer to bedrock. It appears that the radioactive source is located in the "Diorite", and that the observed anomaly broadly follows the ridge top.

4.7 Anomaly F

This anomaly, located adjacent to Houghton Cemetery has also been studied by McPharlin (1950) and Parkin (1953 a and b). It has not been delineated in the recent aerial survey. Closely spaced post holes were sunk a few feet to give bedrock (Houghton "Diorite") readings and a trench was excavated, but not across the centre of the anomaly. The mean radiometric assay over 35 feet was 1.5 lb U_3O_8/long ton. Wagon drill holes proved uranium mineralisation over an area of 2,000 square feet with a thickness of 15 to 30 feet, the maximum thickness on the upper slope. Thus the orebody appears to be sub - horizontal.

35/2000

The outcropping rocks display relict bedding which strikes northwest and dips 30° west.

Ground investigations have revealed a local anomaly of 500 cps (830 cps siz inches into the soil) on the hillside adjacent to the road. The background radiation is about 40 cps, and readings greater than this only extend for about 100 feet around the central maximum. Boulders of the host rock, a weakly banded feldspar-(?) amphibole-epidote rock with minor quartz and (?) pyroxene (Houghton "Diorite") occur over the hillside. The bands are up to ¼ inch wide and represent segregations of the felsic and ferromagnesian minerals.

This zone probably does not appear on the data sheets because of its limited areal extent, but could possibly be delineated from the digital record sheets.

4.8 Anomaly G

A large irregular anomaly was encountered during an aerial survey (Knapman, 1954 a) at Breakneck Hill, about one mile northeast of Inglewood. Augen gneisses and schists form the dominant outcrops, but the hill is generally covered by laterites. Ground traverses revealed a general background of 25 - 35 cps. except in a large irregular area 3,000 feet by 500 feet with readings of 40 - 60 cps. The high point within this zone, a pegmatite outcrop, gave readings of 170 cps.

This anomaly does not appear on the data sheets, and was found during a road traverse. The highest readings were obtained from a 30 feet deep road cutting. To the northeast and southwest of the cutting the readings were about 50 cps, whilst within the cutting the average reading was 100 - 110 cps. The rocks here are highly weathered and contain a high percentage of clays. The dominant rock type appears to have been sillimanite - feldspar schists with biotite-rich bands. The sillimanite has been altered to sericite and clay, the feldspar to clay and the biotite to sericite, chlorite and clay. Small patches of augen gneiss with augen of feldspar (clay) and quartz (now heavily iron stained), and minor occurrences of pegmatite are also prominent. Higher readings up to 170 cps were encountered near several of the numerous heavily iron stained irregular joints. The highest reading of 200 cps was obtained over a 3 foot wide band of altered (?) sillimanite schist. The

anomaly has only a limited extent, the highest readings being confined to the near vertical walls of the road cutting. Once again it is possible that the digital record sheets may have delineated this small zone.

4.9 Anomaly H

Although it does not appear so on the airborne data sheets, this is the most encouraging anomaly inspected. Wade (1950 a, b and c), Webb (1952), Parkin (1953 c) Rowley (1954) and Webb & Whittle (1954) have thoroughly investigated the area, located about two miles north of Houghton near the western boundary of the Archean inlier; six diamond drill holes have been sunk and analysed. Outcrop in the region is dominated by Houghton "Diorite" which here can be further divided into lode rock and wall rock. The lode rock is highly altered and the davidite, or smarksite, occurs in coarse grained brown feldspar grains which poikiloblastically include uralite, diopside, rutile, microcline and albite. Coarse crystals of epidote and actinolite are also commonly associated with the feldspar. The wall rock is a well-banded gneissic rock containing sodic feldspars and uralite, with lesser amounts of epidote, apatite and sphene, associated with occassional rich concentrations of ilmenite and hematite. Other rocks occurring within the anomalous zones are gneisses (displaying relict bedding), pegmatites (thought to have been introduced after the uranium mineralisation) and bands of coarse bronze mica, ranging from a few inches to two feet. These mica occurrences are (a) crushed against pegmatite dykes, (b) in slickensided, contorted beds, or (c) around the areas of local "drag" folds. The total probable length of the mineralisation was thought to be about 170 chains.

Reconnaissance traverses indicated eleven anomalous zones, four of which were trenched. It was found that the lode rock contained 0.08% to 0.44% U_3O_8 and the soft decomposed gneiss 0.02 to 0.05% U_3O_8. It appears that the major mineralisation occurs in a single horizon about 20 feet wide and 600 feet long forming a southerly pitching synclinal structure. The uranium has presumably been introduced during intense sodic metasomatism which has caused widespread feldspathisation of the original sediments. The diamond drill holes indicate that the mineralisation is only local, that there appears

to be some stratigraphic control and that the mineralisation decreases rapidly with depth.

Field investigation indicated that there are several longish anomalies in this area, but that the surface readings reach a maximum of only 700 cps. Broader zones of 400 to 500 cps were encountered, but overall the area is not exceedingly large. The general background count is 50 to 60 cps, rising suddenly to higher readings adjacent to the anomalous zones. Outcrops of epidote-rich "diorite" appear over the anomalous zones, but there is no evidence of uranium minerals, primary or secondary. In some areas the "diorite" appears to be sheared and small occurrences of pegmatite are common.

Readings obtained over this zone are among the highest and are definitely the most extensive of all the anomalies seen throughout the lease. However there appears to be little correlation with the airborne data supplied. Since the zone occurs on a hillside, it may have been underestimated during corrections for topography.

This zone is not an economic consideration, although it is by far the best anomaly encountered in the lease.

4.10 Anomaly I

This anomaly was not investigated since it is very small and occurs on the top of a hill.

4.11 Anomaly J

This anomaly occurs on a ridge. Outcrop is poor and consists mainly of weathered ferruginous quartz-feldspar-biotite schist with scattered pebbles of red brown quartzite containing mica impurities. On top of a small hill, lateritised fragments of schist are abundant.

The general background reading is 80 - 100 cps, dropping to 50 cps over the ferruginous material. A single band of schist about two feet wide gives a reading of 170 cps.

4.12 Anomaly K

This anomaly was not inspected since it was considered to be too small and it occurs in a valley.

4.13 Anomaly L

This zone is perhaps the largest indicated by the airborne survey and it contains two point maxima, both located on the tops of hills. The dominant rock type is feldspar-mica schist, largely altered to clay, talc and chlorite. The background radiation in this zone gives 70 to 80 cps with small, local zones of 90 cps. One small outcrop gives a maximum reading of 130 cps.

It appears that this anomaly has been exaggerated, and that possibly there has been little allowance during correlation of the airborne data for the topographic expression.

4.14 Anomaly M

This area was not inspected since it falls on the boundary of the lease in the Proterozoic rocks, and it displays no point maximum.

4.15 Anomaly N

The airborne survey indicated that the anomaly contained a point maximum as high as that at Paracombe (anomaly B). Feldspar-mica schist associated with talc chlorite rocks and ferruginous quartz pebbles outcrop in the area. The general background radiation reads about 70 cps with a single surface reading of 120 cps and a reading of 160 cps in a four-foot deep road cutting.

As above, this anomaly appears to have been exaggerated by lack of topographic considerations during compilation of the data.

4.16 Anomaly O

This anomaly is a very small, low intensity occurrence located on top of a hill and so it was not inspected.

4.17 Anomaly P

The area is located on a ridge and into a shallow valley, where the outcrop consists of fragments of ferruginous gravel, schist, quartz-feldspar-biotite gneiss and vein quartz. The radiation produces an average of 70 cps and only varies within 5 cps of this value. Once again the anomaly may be attributed to the topographic expression, although the ground readings broadly correlate with those indicated by the aerial survey.

4.18 Anomaly Q

Iron stained sericitic schists (with pseudomorphs after (?) sillimanite) containing patches and lenses of coarse grained quartz-feldspar (clay) gneiss outcrop on the top of a hill. The schistosity here strikes 235° and dips 50° east. The background readings in this area are 100 cps, becoming slightly higher in the schistose rocks. The maximum count of 150 cps was observed near an iron stained quartz vein.

Once again the anomaly has probably been exaggerated by lack of correction for the topography.

4.19 Anomaly R

Outcrops of quartz-feldspar-biotite schist occur atop a low ridge and on the adjacent slopes. Small local outcrops of ferruginous quartzite also occur within the area. The background radiation gives readings between 50 and 60 cps, rising to local maxima of 80 cps.

4.20 Anomaly S

The anomaly occurs on a flat, cultivated area, generally covered by alluvium. A small hill nearby is scattered with large boulders and pebbles of quartzite and vein quartz. The short anomalous zone, striking approximately east-west, appears confined to an altered graphic pegmatite containing quartz, feldspar, biotite and minor amphibole. Generally the scintillometer reading is 50 to 60 cps with two localised readings of 130 cps.

4.21 Anomaly T

Banded quartz-feldspar-biotite gneiss, (?) sillimanite-biotite schist, amphibolite and quartzite outcrop within the anomalous zone. The amphibolite gives readings of 70 to 80 cps and the schist 100 cps. Little variation from these counts was observed.

4.22 Anomalies U, V, W, X, Y

These areas were not inspected since U and W occur atop hills and have no point maxima and the remainder are too small and too weak for consideration.

5 CONCLUSIONS & RECOMMENDATIONS

In general the aerial survey appears to have delineated all the anomalous zones. There is correlation between this survey and the ground inspections, since no major anomaly was encountered in either.

It appears that during interpretation of aerial surveys attention must be paid to the topography, which has led to some exaggeration of the anomalies encountered in the lease.

Of the areas inspected, only Anomaly H would appear to warrant further investigation since no surface indication of uranium minerals was found. However, in lieu of the detailed work undertaken by the Department of Mines, it seems that more work would be totally wasted.

Hence it is strongly recommended that no further investigations be undertaken on Special Mining Lease No. 180.

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705,000y N
138°45'
174,000y E
180,000y E
138°50'
190,000y E
705,000y N
191,000y E
700,000y N
34°30'
690,000y N
688,000y N
174,000y E
138°45'
180,000y E
138°50'
190,000y E
191,000y E
688,000y N

Anomaly N
160-70

Mt. Gawler

Anomaly L
130-75

Anomaly M

Kersbrook

Anomaly J
170-90

Anomaly K

Anomaly

Anomaly H
700-55

Anomaly G
200-100

Inglewood

Anomaly F
830-40

Millbrook
Reservoir

Houghton

Anomaly E
370-40

Anomaly C

Anomaly D

Cudlee Creek

Paracombe

Anomaly B
420-50

Anomaly A

Deep Creek

2000 0 2000 4000
Scale in feet

UNIMIN — NORANDA JOINT VENTURE

HOUGHTON AREA, S.A. — S.M.L. 180
GEOLOGICAL PLAN
F.A.G.S.

Union Miniere Development & Mining Corp. Ltd.
To accompany Report by P. Cremer & M. Franklin
Feb. 1970

For Legend, see Plate 2A

N

Plate 2B

SCALE: 1:24,000	DWG. No.
DRAWN:	DATE:

ENV 531-2

722,000y N
138°45'
174,000y E
180,000y E
138°50'
190,000y E
191,000y E
722,000y N
720,000y N
34°40'
710,000y N
34°45'
705,000y N
174,000y E
138°45'
180,000y E
138°50'
190,000y E
191,000y E
705,000y N

South Para

Anomaly Y

Mill

River

Mock Creek

Malcolm Creek

Anomaly X

Anomaly W

Anomaly V

Anomaly U

Anomaly T 105-100

Anomaly Q 150-100

Anomaly R 80-55

Anomaly S 130-55

Anomaly P 75-70

Anomaly O

Creek

N

2000 0 2000 4000
Scale in feet

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LEGEND

QUATERNARY
- Shallow alluvial deposits of creek channels

TERTIARY
- Undifferentiated sand, clay or gravel
- Fossiliferous marine clayey sands, marls, sands & clays
- Ferruginous & lateritic quartz gravel

PROTEROZOIC
- "Aldgate Sandstone." Sandstones, grits & conglomerates with banded heavy mineral layers. Hematitic beds near base.
- Torrensian Series Undifferentiated. Dominantly phyllitic slates: calcareous or dolomitic in part & passing into schists in zones of pronounced metamorphism
- Dolomite
- Quartzite

ARCHEAN
- Principal zone of "lit-par-lit" injected or banded gneisses
- "Augen" gneisses
- Archean Undifferentiated.
- Albitized zones with actinolite & diopside
- Felspathised gneiss
- Pegmatites & mica pegmatites
- Zone of partial sodic metasomatism
- Tectonic breccia
- Fault - observed
- Shear zone
- Road
- Bi^{214} Isoradioactivity Contours by Geophoto Services Inc.
  - Greater than 140 counts per 2sec.
  - 120-140 counts per 2 sec.
  - 100-120 counts per 2 sec.
  - Less than 100 counts per 2 sec. but showing higher values on ground survey
- 420-50 Maximum total count for anomaly - 420 c.p.s. / Average total count for anomaly - 50 c.p.s. } Scintrex B.G.S.1

Plate 2A

SCALE: 1:24,000 | DWG. No.
DRAWN: DATE:

ENV 931 - 1