COMMONWEALTH OF AUSTRALIA.

DEPARTMENT OF NATIONAL DEVELOPMENT.

BUREAU OF MINERAL RESOURCES
GEOLOGY AND GEOPHYSICS.

RECORDS.

RECORDS 1959/41.

REPORT ON ROCKHOLE AND O'DWYER'S PROSPECTS

SOUTH ALLIGATOR RIVER AREA, NORTHERN TERRITORY

MAY, 1958.

by

R. BRYAN.

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C O N T E N T S

SUMMARY

Rockhole and O'Dwyer's Prospects are located close to the unconformity separating the Lower Proterozoic Koolpin Formation, from the Upper Proterozoic Kombolgie Formation. The boundary has been disturbed by a north-west striking reverse fault, which has produced a narrow zone of fault breccia.

The uranium mineralization is restricted to two narrow ore bodies, both occurring along the one fault plane. This fault appears to be the main ore control.

It is recommended that No. 2 Orebody be tested for a continuation at depth, by means of three inclined diamond drill holes.

INTRODUCTION

In October, 1957 and in May, 1958, the Bureau of Mineral Resources carried out geological investigations of the surface and underground workings of Rockhole and O'Dwyer's Prospects. The work was carried out by R. Bryan, J. Herlihy and R. Ruker under the supervision of B.P. Walpole.

Location and Access.

Rockhole and O'Dwyer's Prospects are the most northerly of the known uranium occurrences in the South Alligator Field. They are 1200 feet apart, and occur on the north-eastern side of the South Alligator River Valley.

Access to the prospects is by means of a road which branches off the Stuart Highway at Pine Creek, 160 miles south of Darwin. The road runs north-east for 50 miles to Goodparla Homestead, and then 20 miles eastwards to the South Alligator River. A branch road leads to the prospects, which are 2 miles north of the river crossing.

History.

The prospects were discovered in 1954 by Uranium Development and Prospecting No Liability. At that time, only Rockhole Prospect was investigated underground. No. 1 Adit was driven to its present limit of 120 feet and No. 2 Adit for 112 feet.

In 1955, one vertical diamond drill hole was bored to a depth of 174 feet. This was radiometrically logged by the Bureau of Mineral Resources, but failed to locate any ore. The collar of the hole is now obscured by mullock, but was close to 19,965 W., 19,800 N. (Plate 2).

During 1956, seven wagon drill holes were put down close to the portal of No. 2 Adit. These were also logged by the Bureau of Mineral Resources, and in all cases, high counts were recorded between 25 ft. and 35 ft. below the surface (Lord 1956).

Late in 1956 both prospects were acquired by South Alligator Uranium No Liability, which has since extended No. 2 Adit to its present length of over 1,000 feet. An adit was also driven for 260 feet at O'Dwyer's Prospect, but this was subsequently abandoned.

In October 1957, the writer together with J.H. Herlihy, mapped the surface geology of both prospects at a scale of

40 feet to the inch, using a plane table and telescopic alidade (Plate 2).

In May 1958, the writer together with R.A. Ruker, mapped the accessible underground workings of both prospects, at a scale of 20 feet to the inch (Plate 3).

GENERAL GEOLOGY

Regional Setting.

The prospects are situated on the north-east side of the South Alligator Valley. This valley has a length of 60 miles and width of from 2 to 4 miles.

Most of the outcropping rocks within the valley are Lower Proterozoic sediments, while the bounding scarps are of Upper Proterozoic sediments and volcanics. An unconformity which separates the two groups, can be traced along the margins of the valley.

At some points the unconformity has been obscured by faults which strike parallel to the valley. The faults cut both Lower and Upper Proterozoic rocks.

Practically all the uranium mineralization that has been discovered in the South Alligator River area is located in the foothills along the north-east margin of the valley.

GEOLOGY OF THE PROSPECTS

Rocks of both Lower Proterozoic and Upper Proterozoic age crop out on the surface.

Lower Proterozoic :

These rocks form part of the Koolpin Formation and consist of ferruginous and carbonaceous siltstones, containing chert nodules, lenses, and bands. Four rock types were distinguished in the underground workings of the two prospects; the sequence in which these rocks occur is as follows :-

Massive and bedded chert: This is a grey rock, and may contain thin layers of ferruginous siltstone. The origin of the chert is not certain, but it may be silicified dolomite.

Red ferruginous siltstone enclosing chert nodules and bands : It forms lenticular beds commonly interbedded with the massive and bedded chert, and in some places grades into red ferruginous siltstone. The maximum observed thickness of the lenticular beds is 12 feet. The red iron oxides are most probably derived from the oxidation of pyrite.

Red ferruginous siltstone: This is a fissile rock in which the cleavage is generally along the bedding plane. It occupies about half the thickness of the observed sequence, and overlies the more siliceous rock types.

Black carbonaceous siltstone: It occurs within the red ferruginous siltstone, as lenticular beds up to 3 feet across. It is very incompetent rock, and in places, has been converted by shearing to a graphitic slate.

Upper Proterozoic :

The rocks form part of the Kombolgie Formation and consist of quartz arenite and conglomerate, with interbedded

rhyolite and rhyolitic tuff.

The sediment consists of sub-rounded grains of quartz, up to 3 mm. across. Some fine interstitial material is present, and has acted as a cement. Flat, oval-shaped pebbles of chert, ranging up to 6 inches across, are scattered evenly throughout the rock; the flattened faces are commonly parallel to bedding. In places the pebbles are in contact or form conglomerate layers.

The rhyolite is a grey rock showing flow banding, and containing some fine material, probably of tuffaceous origin.

Structural Geology:

The Koolpin Formation has a constant north-west strike throughout the prospects. The beds dip to the south-west at angles ranging from 60° to 80°. No indication of any major fold structure, or any pitch direction, was noted.

A marked unconformity separates the Koolpin Formation from the younger Kombolgie Formation. The geology of No. 2 Adit indicates that the surface of unconformity dips towards the north-east at angles ranging from 20° to 30°.

At the prospects the sediments of the Kombolgie Formation also dip to the north-east, at angles of 20° to 30°. At one surface exposure of the unconformity close to the portal of O'Dwyer's Adit, the basal conglomerate of the Kombolgie Formation rests on a very uneven surface, made up of vertically dipping siltstone. The attitude of the conglomerate changes from flat to steeply dipping, over a distance of a few feet. This would suggest that the surface of unconformity was very irregular, and that the north-east dip of the Kombolgie Formation at the prospects could be a depositional rather than a tectonic feature.

Faulting along a north west line is well developed. On the surface, one shear zone has been traced intermittently for 550 feet, and this corresponds to the major shear zone underground, which has been followed in No. 2 Adit for 1020 feet (Plates 2 and 3). Several small subsidiary faults parallel the major north-west shear, but they appear to be only of minor importance. The major shear dips steeply south west, and judging from the minor drag folds against the shear, the hanging-wall has moved upwards relative to the footwall. The amount of displacement on the shear is not known.

The position of this shear has to some extent been controlled by the presence of lenticular beds of incompetent carbonaceous siltstone, within the Koolpin Formation. Commonly the carbonaceous siltstone has been utilized as a plane of movement, and as a result, has been converted to graphitic slate. Wherever the ferruginous siltstone and chert have been involved in the faulting, a gouge or fault breccia has been produced.

ECONOMIC GEOLOGY

Surface showings of uranium minerals have been found at the portals of No. 1, No. 2, and O'Dwyer's Adits. All have been investigated along strike by means of adits, and in the case of No. 2 Adit by rising and winzing.

No ore has yet been stoped, but about 1,000 tons of development ore has been mined, and is lying at grass. A 15 ton sample has been sent to the Department of Mines South Australia for metallurgical tests.

The showings of uranium minerals around the portals of No. 1 and O'Dwyer's Adits have been removed, and no further mineralization has been found in the underground workings. In No. 2 Adit, two ore bodies have been located. These have been called No. 1 and No. 2 Ore bodies.

No. 1 Orebody

This is a small ore shoot controlled by the major north-west striking shear. The ore shoot has been traced for 80 feet along the adit, and has been tested by a winze at 50 E. and a rise at 100 E. (Plate 4).

The mineralization occurs as pitchblende veins up to 6 inches across, within the quartz arenite of the Kombolgie Formation. The veins follow joint planes developed in the quartz arenite, close to the fault. Some uranium mineralization of ore grade also occurs as disseminations through the quartz arenite, but again this is only found close to the fault.

In May, 1958 the Bureau of Mineral Resources estimated the proved reserves of this ore shoot at 1,200 tons, averaging 1.8% eU_3O_8 (Prichard 1958).

No. 2 Orebody

This orebody is localized into two large ore shoots and into three much smaller ones (Plate 4). All are sheet-like bodies paralleling the major north-west shear, and occuring entirely within the Koolpin Formation. They have been tested by means of eight winzes and seven rises, over a length of 650 feet along No. 2 Adit.

The mineralization occurs as small veinlets and patches of pitchblende and carnotite. The host rock is a brecciated and sheared chert, and ferruginous siltstone. The brecciated zone is usually less than 12 inches wide.

In many places, the rock immediately overlying the fault breccia is strongly sheared graphitic slate. This is unmineralized, indicating that the brecciated nature of the mineralized rock may be significant as an ore control.

In May 1958 the Bureau of Mineral Resources estimated that the proved reserves of this ore body were 4,300 tons, averaging 1.36% eU_3O_8. (Prichard 1958).

RECOMMENDATIONS

The main ore control at the Rockhole Prospect is the well defined north-west fault, although there are some minor effects due to change in lithology of the host rock and proximity to the Lower Proterozoic - Upper Proterozoic uncomformity.

All other known oreshoots in the South Alligator valley are localized on faults: but none attain the strike length of the No. 2 orebody at the Rockhole Prospect. This feature in itself offers a possibility of the oreshoot extending in depth or a repetition of the shoot occurring on the shear.

An intersection of ore at depth in the South Alligator field would be an important advance and would give impetus to further testing of the known shoots at other mines on the area.

It is recommended that these diamond drill holes be bored to test for extension of the No. 2 orebody in depth or for repetition of the oreshoot. The holes should be sited as follows (see plates 2 and 4).

Proposed Hole No. 1:

Collar at 19526 W., 19700 N. Inclination of 70° on a bearing of 24° east of magnetic north.

Proposed intersection at 410 feet.

Proposed Hole No. 2:

Collar at 19669 W., 19714 N. Inclination of 70° on a bearing of 24° east of magnetic north.

Proposed intersection at 310 feet.

Proposed Hole No. 3:

Collar at 19400 W., 19714 N. Inclination of 75° on a bearing of 24° east of magnetic north.

Proposed intersection at 365 feet.

Hole No. 1 will test for an extension of ore 250 feet beneath its present known limit, and Holes No. 2 and 3 at 160 feet and 180 feet respectively.

If the results of the first hole warrant it the inclinations of the remaining two holes can be increased to give deeper intersections of the ore horizon.

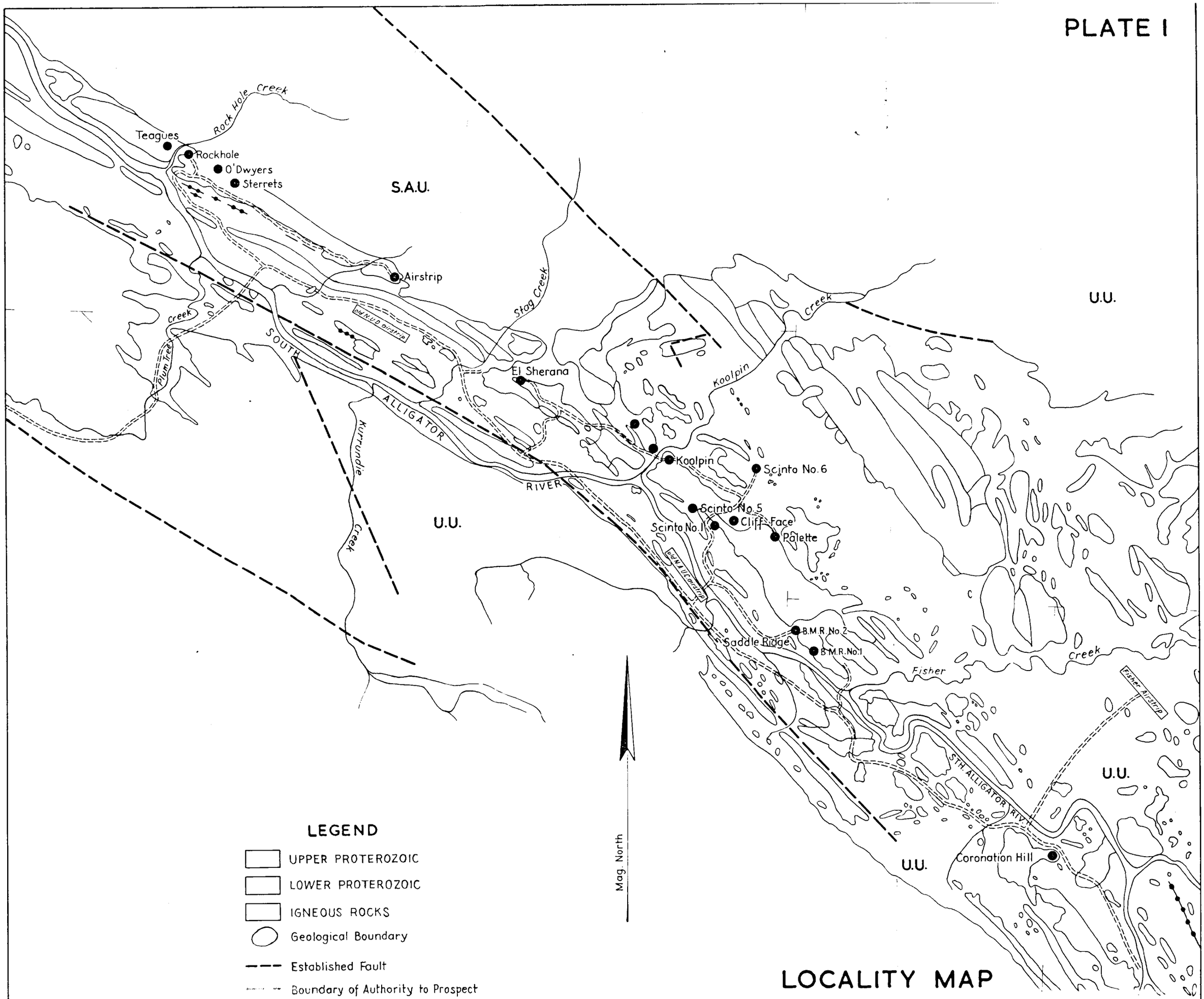
If the drilling is successful, a new level should be opened beneath the No. 2 Adit.

REFERENCES

LORD, J.H. 1956 - Report on Activities of the Darwin Uranium Group for June, 1956. Bur. Min. Resour. Aust., Rec 1956/-

PRICHARD, C.E. 1958 - Report on a Quarterly Inspection of the South Alligator River Uranium Area, Northern Territory, May, 1958. Bur. Min. Resour. Aust. Rec 1958/-

PLATE I



LEGEND

- UPPER PROTEROZOIC
- LOWER PROTEROZOIC
- IGNEOUS ROCKS
- Geological Boundary
- Established Fault
- Boundary of Authority to Prospect
- Uranium Prospect
- Vehicle Track
- Quartz filled fracture

LOCALITY MAP

SOUTH ALLIGATOR RIVER AREA N.T.

SHOWING URANIUM PROSPECTS

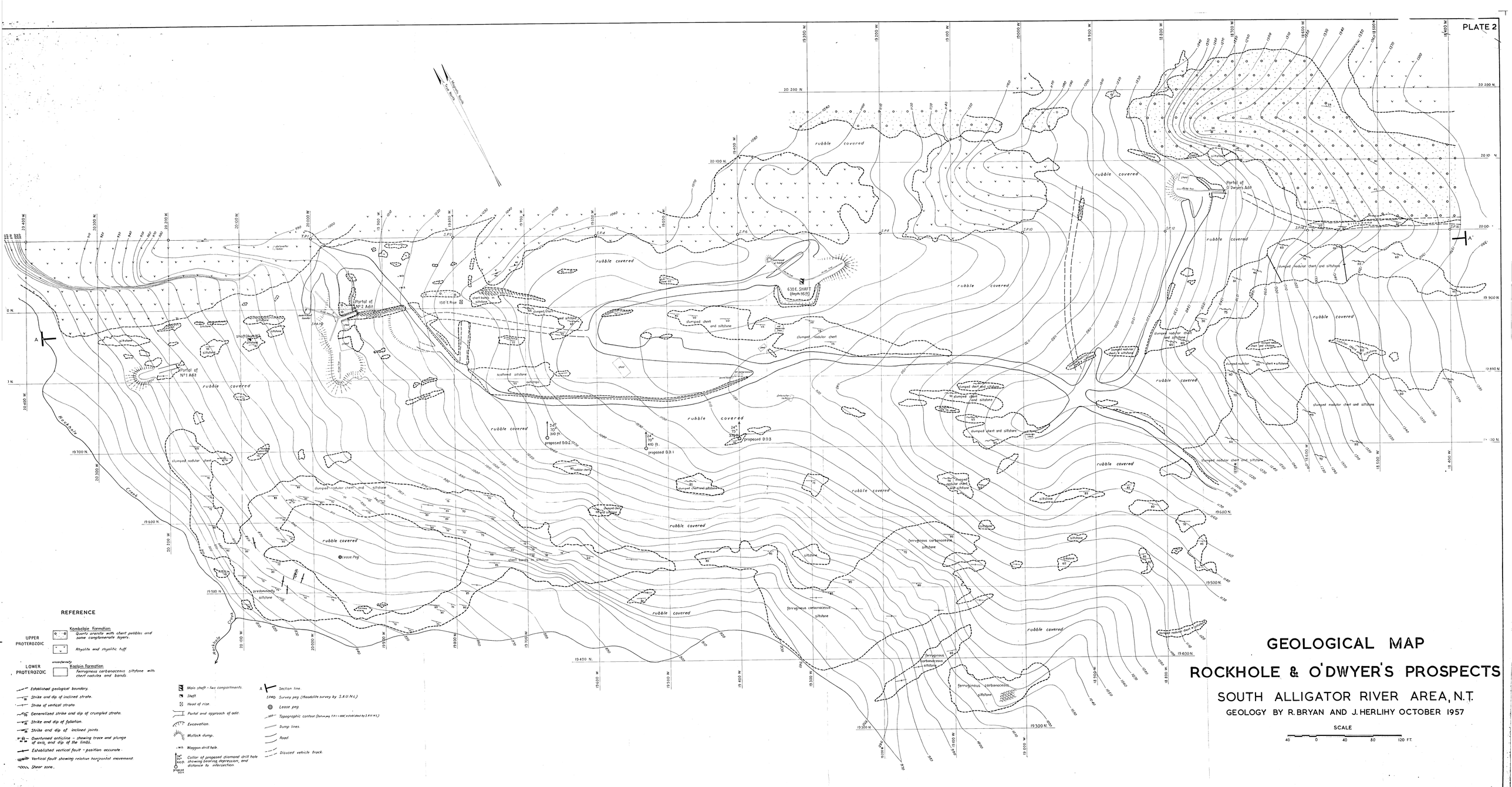
SCALE

1 0 1 2 MILES

Bureau of Mineral Resources, Geology and Geophysics, Darwin, July 1958

H13

PLATE 2



REFERENCE

UPPER PROTEROZOIC

Kombolgie Formation — Quartz arenite with chert pebbles and some conglomerate layers.

Rhyolite and rhyolitic tuff.

unconformity

LOWER PROTEROZOIC

Kodjon Formation — Ferruginous carbonaceous siltstone with chert nodules and bands.

Established geological boundary.

Strike and dip of inclined strata.

Strike of vertical strata.

Generalized strike and dip of crumpled strata.

Strike and dip of foliation.

Strike and dip of inclined joints.

Overturned anticline - showing trace and plunge of axis, and dip of the limbs.

Established vertical fault - position accurate.

Vertical fault showing relative horizontal movement.

Shear zone.

GEOLOGICAL MAP

ROCKHOLE & O'DWYER'S PROSPECTS

SOUTH ALLIGATOR RIVER AREA, N.T.

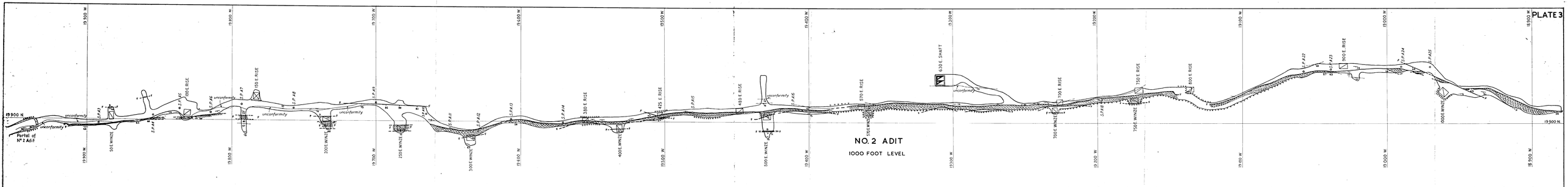
GEOLOGY BY R. BRYAN AND J. HERLIHY OCTOBER 1957

SCALE

40 0 40 80 120 FT.

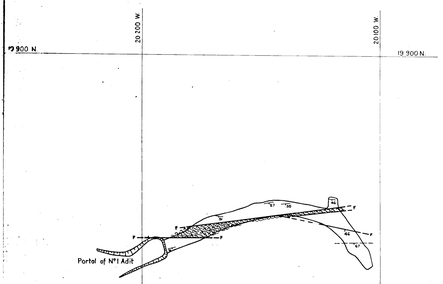
Bureau of Mineral Resources, Geology and Geophysics, Darwin, June 1958.

PLATE 3



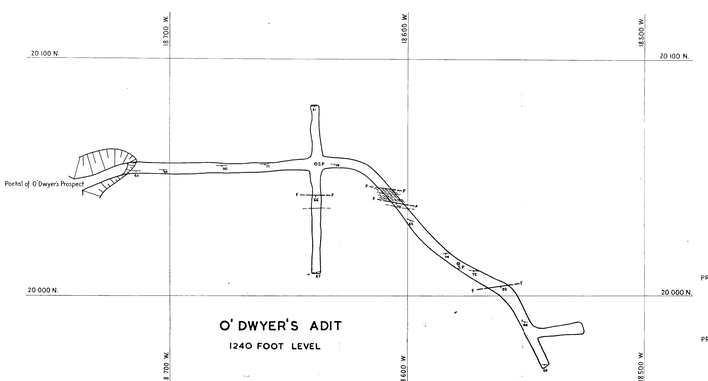
NO. 2 ADIT

1000 FOOT LEVEL



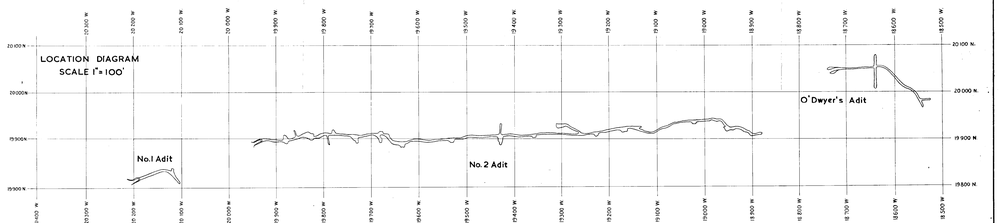
NO. 1 ADIT

880 FOOT LEVEL



O' DWYER'S ADIT

1240 FOOT LEVEL



REFERENCE

UPPER PROTEROZOIC
- Kombolgie Formation
- Rhyolite and rhyolitic tuff.
- Quartz arenite, with chert pebbles and conglomerate bands.

LOWER PROTEROZOIC
- Red ferruginous siltstone.
- Black carbonaceous siltstone.
- Red ferruginous siltstone enclosing chert nodules and bands.
- Grey massive and bedded chert

- Established boundary, position accurate, with dip where known.
- Established boundary, position approximate.
- Strike and dip of inclined strata.
- Strike of vertical strata.
- Established fault with measured dip.
- Established vertical fault.
- Fault showing relative movement of blocks, where substantiated
- Established fault, position approximate.
- Shear zone coinciding with fault plane.

- Main shaft - two compartments.
- Foot of rise.
- Head of winze.
- Rise and winze extending through level.
- Portal and approach of adit.
- Excavation of portal of adit.
- Timbering along both sides of adit.
- 63 S.P. 46 Survey peg.

LEVEL PLANS OF ROCKHOLE AND O'DWYER'S PROSPECTS

SOUTH ALLIGATOR RIVER AREA, N.T.

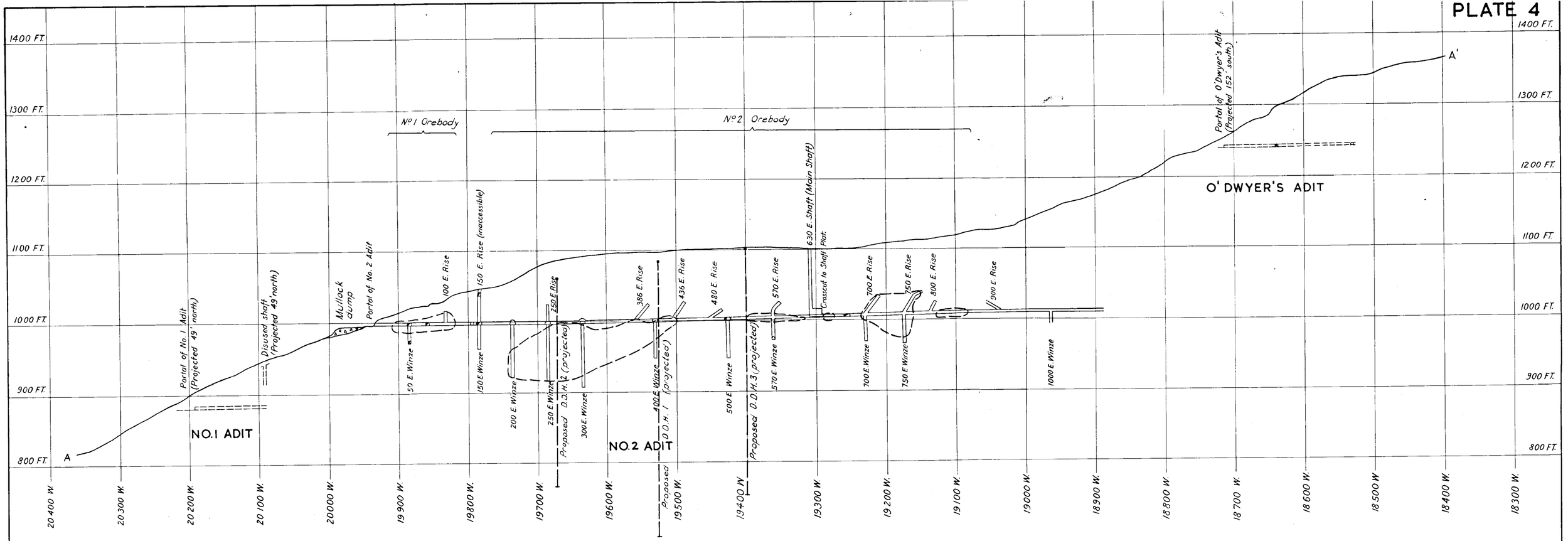
GEOLOGY BY R. BRYAN AND R.A. RUKER, MAY 1958.

SCALE

20 10 0 20 40 60 FT.

Bureau of Mineral Resources, Geology and Geophysics, Darwin, June 1958

PLATE 4



REFERENCE

- Underground workings located on plane of section
- Underground workings projected onto plane of section
- Cross-section of cross cut, same side of plane of section as observer.
- Cross-section of cross cut, opposite side of plane of section from observer.
- Cross-section of cross cut, extending across plane of section.
- Probable outline of ore shoot - cut off grade ·25 %
- Proposed diamond drill hole (projected).

Reduced Level: Based on Survey Station T.P.1 = 1000' as used by South Alligator Uranium N.L.

Grid: Based on theodolite survey carried out by S.A.U.N.L.

SCALE

100 0 100 200 FT.

LONGITUDINAL PROJECTION

ROCKHOLE & O'DWYER'S PROSPECT

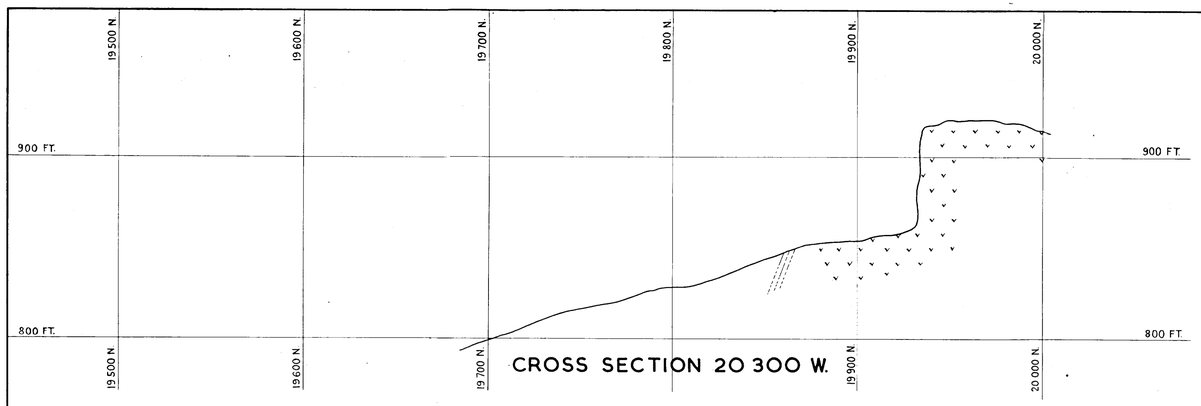
SOUTH ALLIGATOR RIVER AREA

N.T.

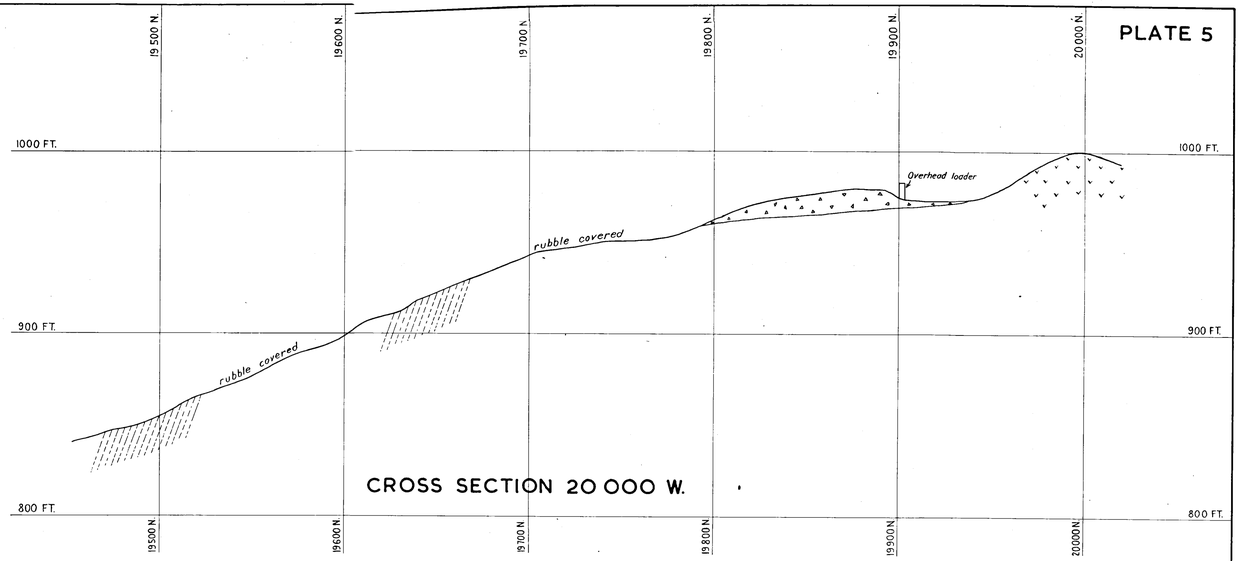
Bureau of Mineral Resources, Geology and Geophysics, Darwin, May 1958.

11145

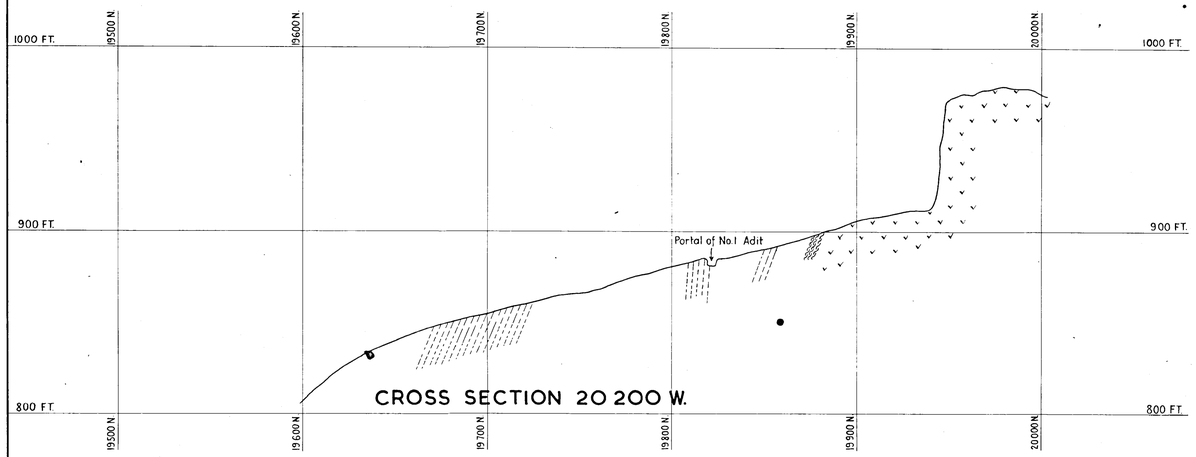
PLATE 5



CROSS SECTION 20 300 W.



CROSS SECTION 20 000 W.



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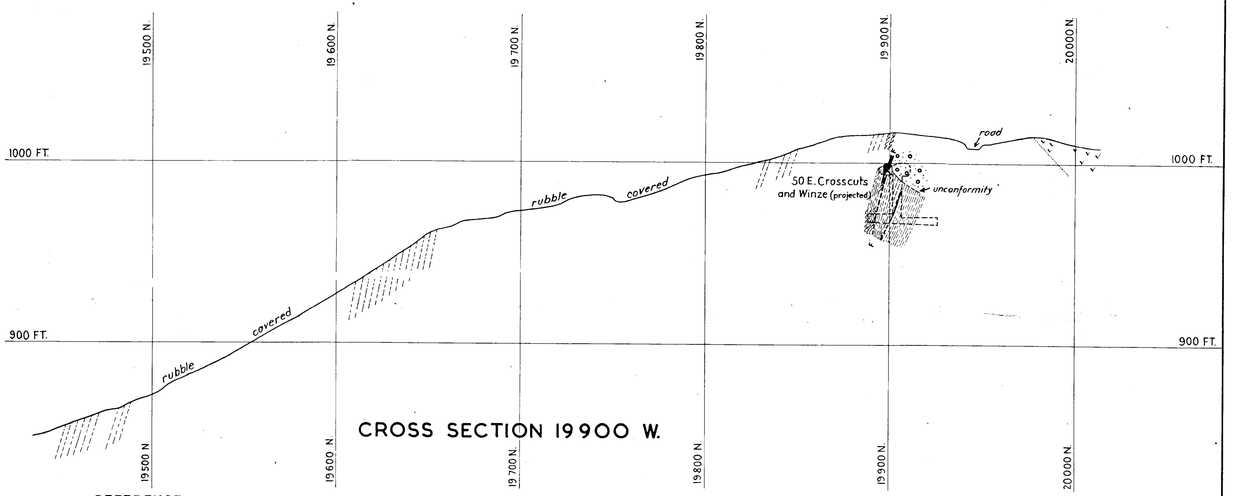
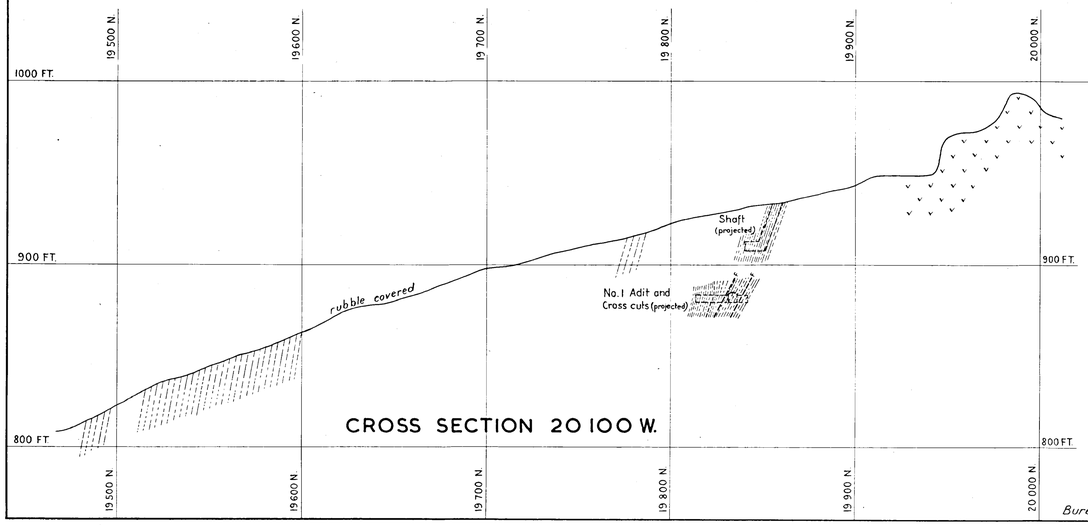


CROSS SECTION 19 900 W.



CROSS SECTION 20 100 W.

REFERENCE

UPPER PROTEROZOIC
- Kombolgie Formation — *Quartz arenite with chert pebbles, and conglomerate bands.*
- *Rhyolite and rhyolitic tuff.*

unconformity

LOWER PROTEROZOIC
- Koolpin Formation — *Undifferentiated ferruginous carbonaceous siltstone, with chert nodules and bands.*
- *Black carbonaceous siltstone.*
- *Red ferruginous siltstone enclosing chert nodules and bands.*
- *Grey massive and bedded chert.*

- *Established boundary - position accurate.*
- *Established boundary - position approximate.*
- *Established boundary - concealed by rubble.*
- *Established fault - position accurate.*
- *Established fault - position approximate.*
- *Shear zone.*
- *Cross section of adit - projected.*
- *Cross section of adit - extending across plane of section.*
- *Projected shaft, winze or cross cut.*
- *Mullock dump.*

Reduced Level:- Based on Survey Station T.P.1 = 1000' as used by S.A.U.N.L.

Bureau of Mineral Resources, Geology and Geophysics, Darwin, July 1958.

CROSS SECTIONS
20 300 W., 20 200 W., 20 100 W., 20 000 W., 19 900 W.

ROCKHOLE & O'DWYER'S PROSPECTS

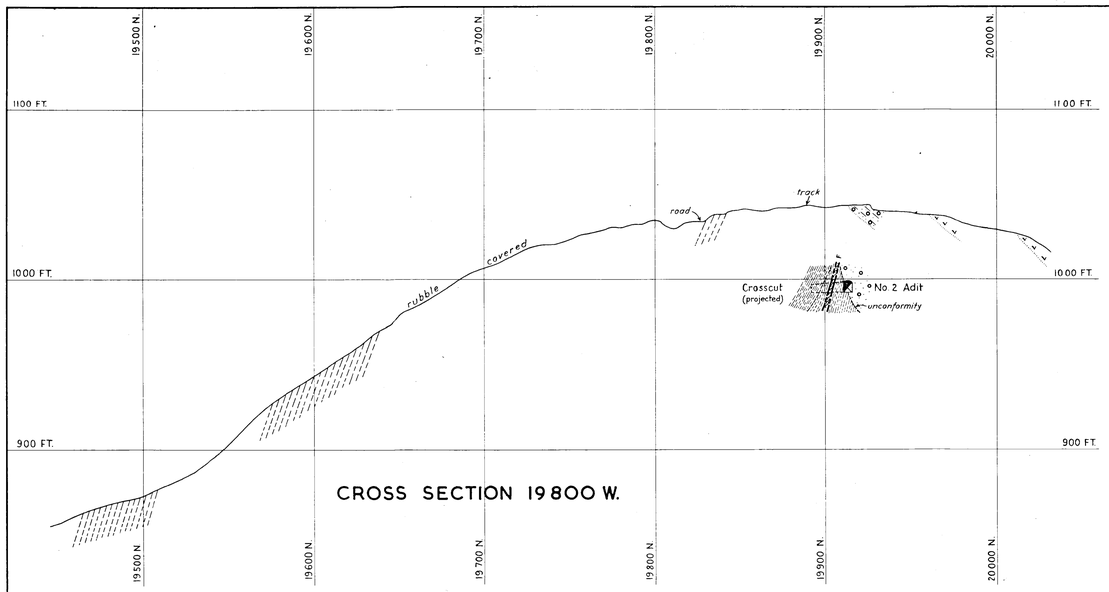
SOUTH ALLIGATOR RIVER AREA, N.T.

SCALE

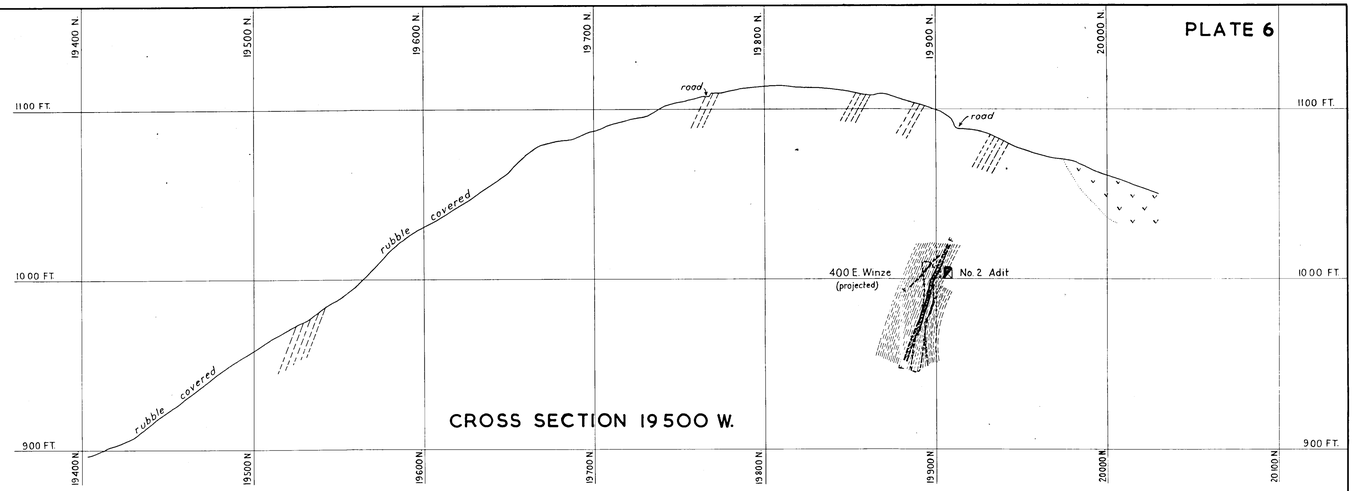
40 0 40 80 120 FT.

H 146

PLATE 6



CROSS SECTION 19800 W.



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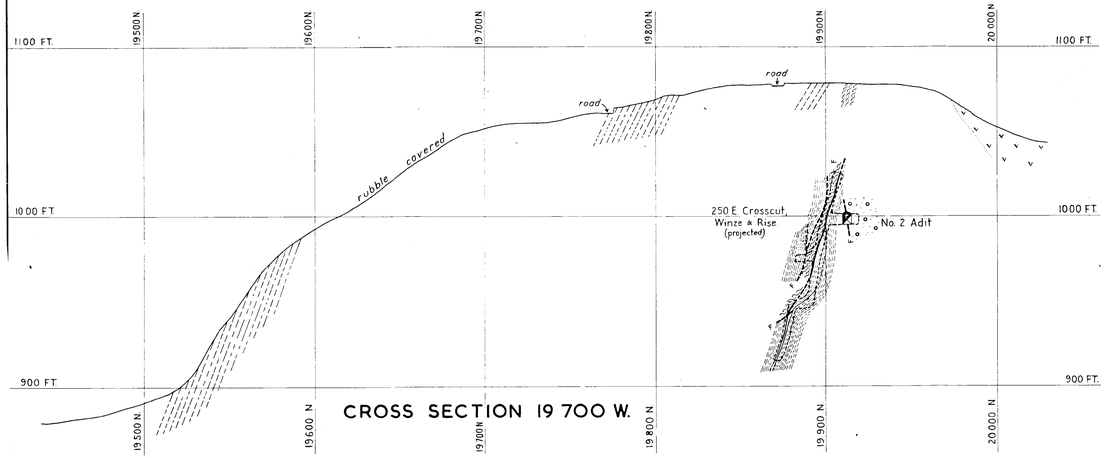

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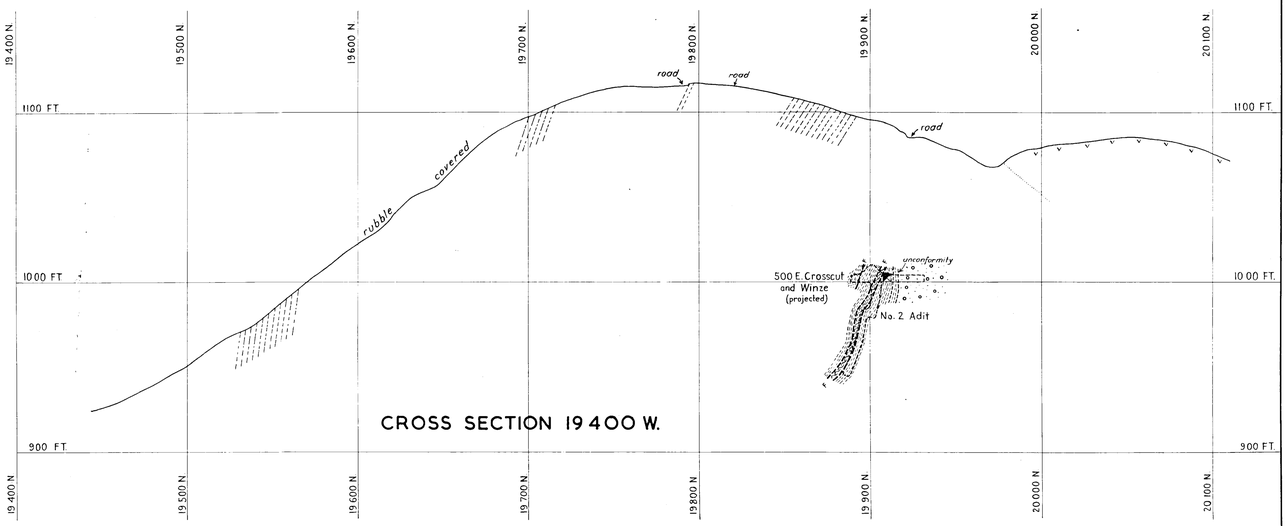

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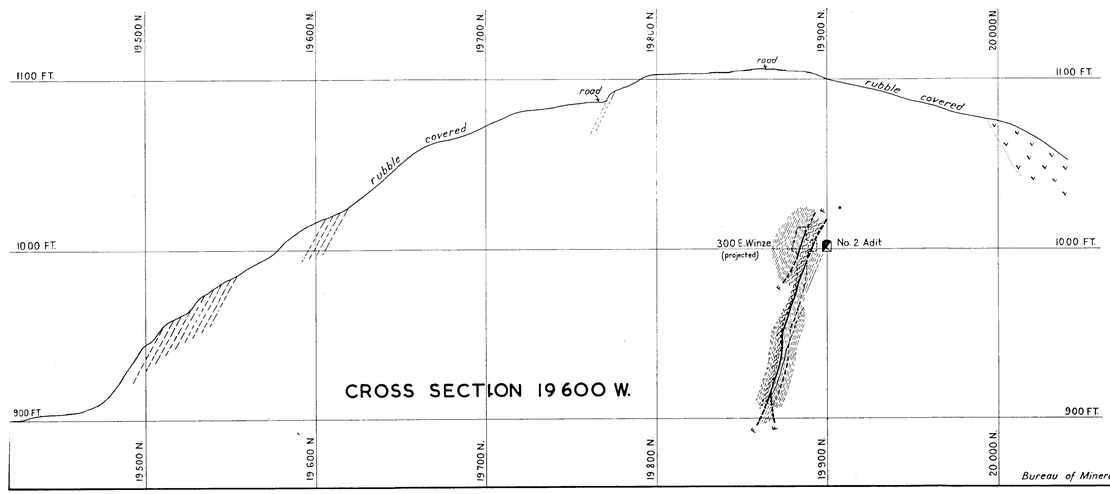


CROSS SECTION 19600 W.

REFERENCE

UPPER PROTEROZOIC

- Kombolgie Formation — *Quartz arenite with chert pebbles, and conglomerate bands.*
- *Rhyolite and rhyolitic tuff*

unconformity

LOWER PROTEROZOIC

- Koolpin Formation — *Undifferentiated ferruginous carbonaceous siltstone with chert nodules and bands*
- *Red ferruginous siltstone.*
- *Black carbonaceous siltstone.*
- *Red ferruginous siltstone enclosing chert nodules and bands.*
- *Grey massive and bedded chert.*

- *Established boundary - position accurate.*
- *Established boundary - position approximate.*
- *Established boundary - concealed by rubble.*
- *Established fault - position accurate.*
- *Established fault - position approximate.*
- *Shear zone.*
- *Cross - section of adit - extending across plane of section.*
- *Projected rise, winze and crosscut.*

Reduced Level: *Based on Survey Station T.P.1 = 1000' as used by S.A.U.N.L.*

CROSS SECTIONS
19800W., 19700W., 19600W., 19500W., 19400W.

ROCKHOLE & O'DWYER'S PROSPECTS
SOUTH ALLIGATOR RIVER AREA, N.T.

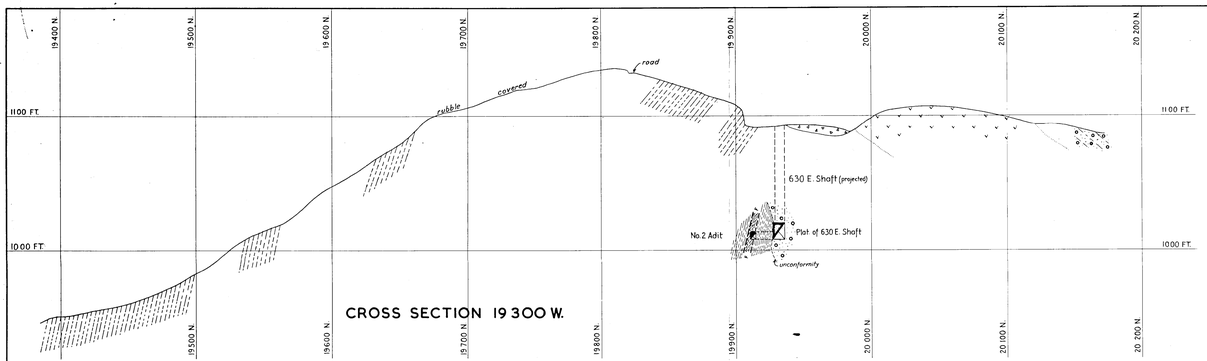
SCALE

40 0 40 80 120 FT.

Bureau of Mineral Resources, Geology and Geophysics, Darwin, July 1958.

N 147

PLATE 7



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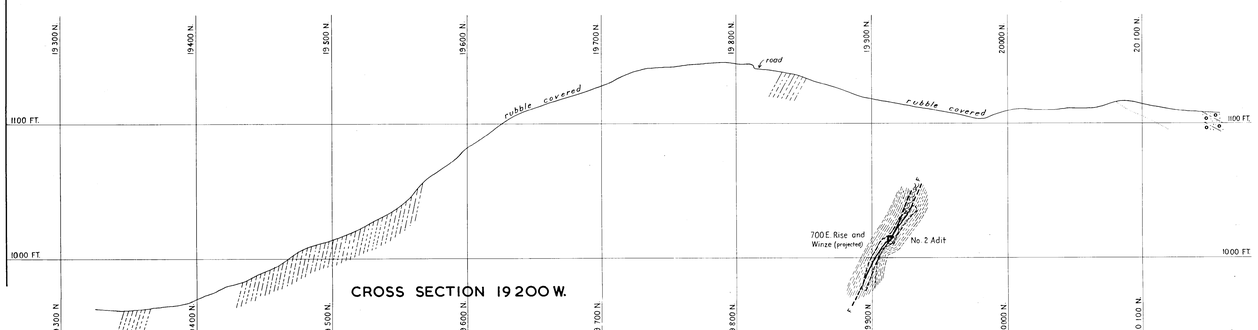

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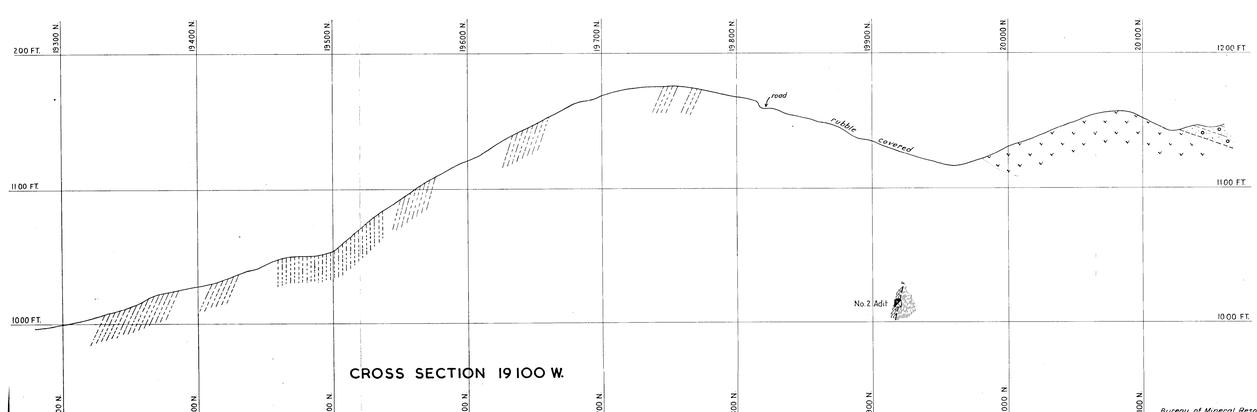

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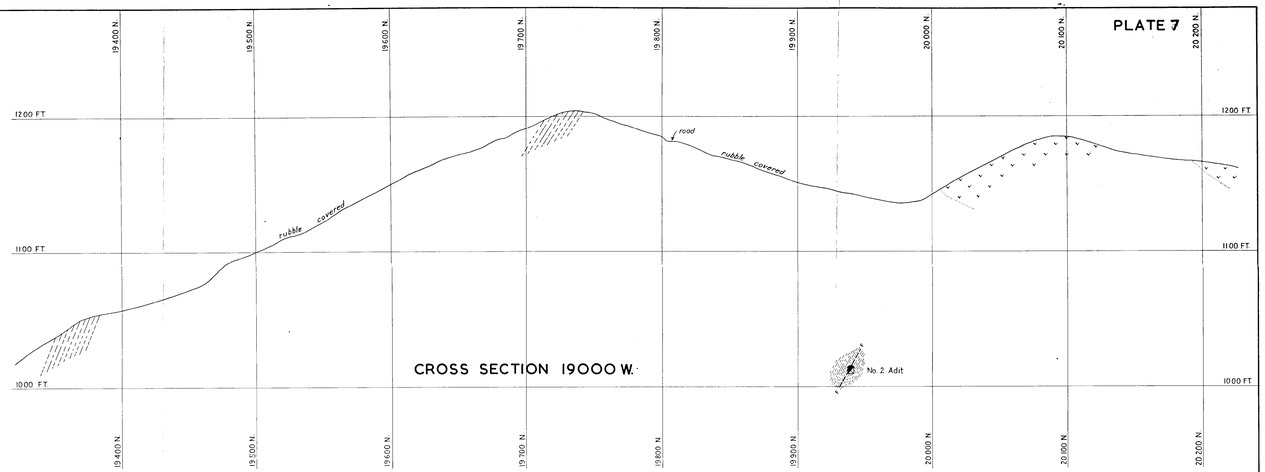

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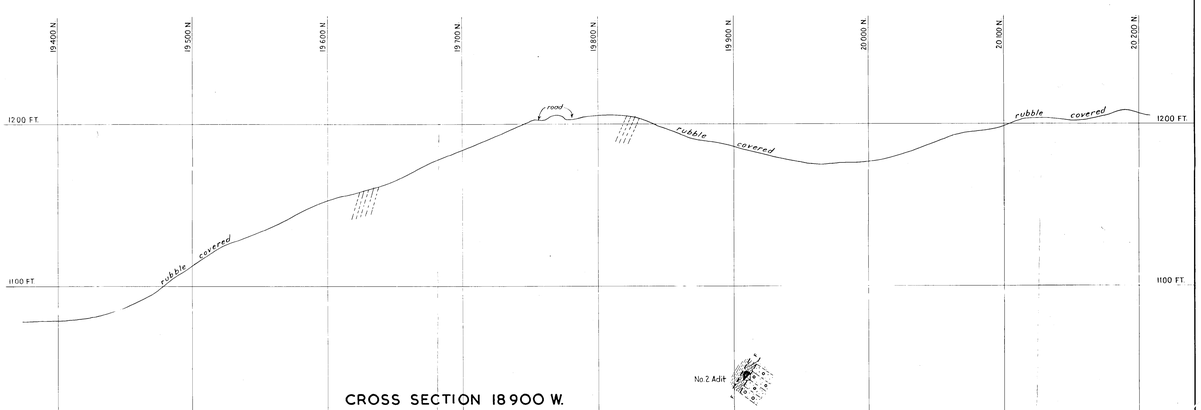


CROSS SECTION 18 900 W.

Bureau of Mineral Resources Geology and Geophysics, Darwin, June 1958.

REFERENCE

UPPER PROTEROZOIC
- Kombolgie Formation: Quartz arenite with chert pebbles, and conglomerate bands.
- Rhyolite and rhyolitic tuff.

unconformity

LOWER PROTEROZOIC
- Koolpin Formation: Undifferentiated ferruginous carbonaceous siltstone, with chert nodules and bands.
- Red ferruginous siltstone.
- Black carbonaceous siltstone.
- Red ferruginous siltstone enclosing chert nodules and bands.
- Grey massive and bedded chert.

- Established boundary - position accurate.
- Established boundary - position approximate.
- Established boundary - concealed by rubble.
- Established fault - position accurate.
- Established fault - position approximate.
- Shear zone.
- Adit or platform - extending across plane of section.
- Projected shaft, rise and winze.
- Mullock dump.

Reduced Level: Based on Survey Station T.P.1 = 1000' as used by S.A.U.N.L.

CROSS SECTIONS 19 300 W., 19 200 W., 19 100 W., 19000 W., 18 900 W.

ROCKHOLE & O'DWYER'S PROSPECTS

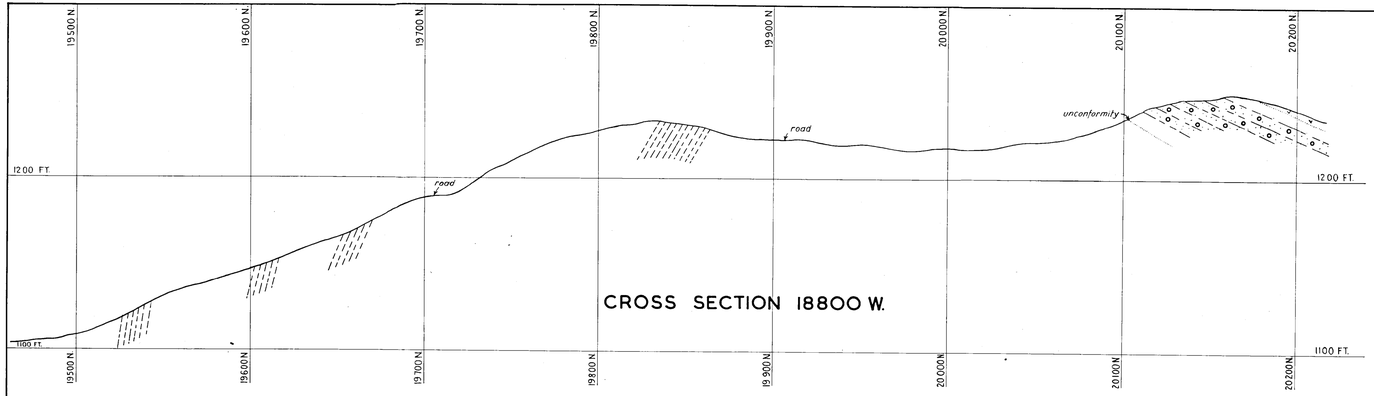
SOUTH ALLIGATOR RIVER AREA, N.T.

SCALE

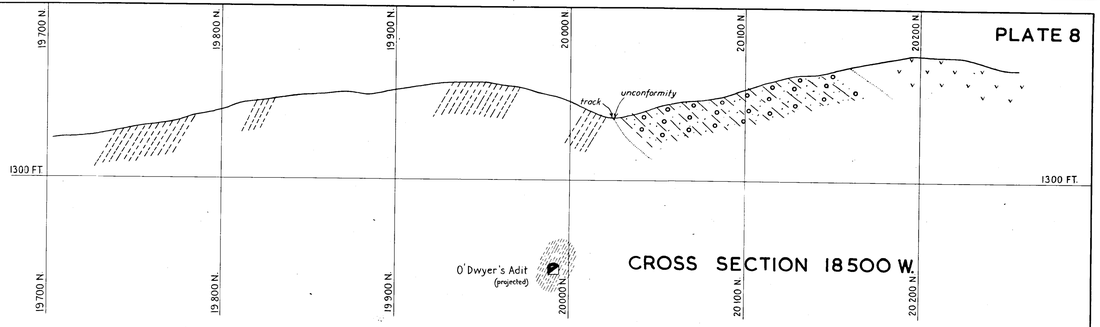
40 0 40 80 120 FT.

N 14

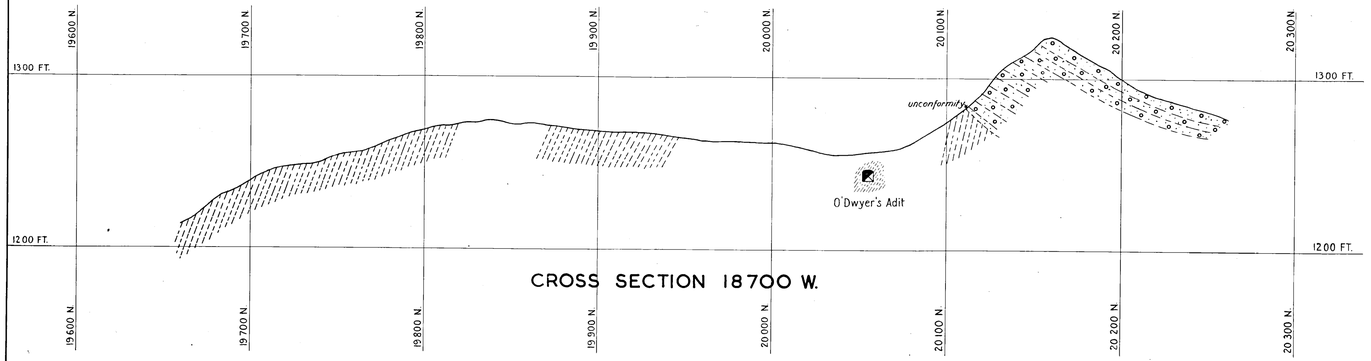
PLATE 8



CROSS SECTION 18800 W.



CROSS SECTION 18500 W.



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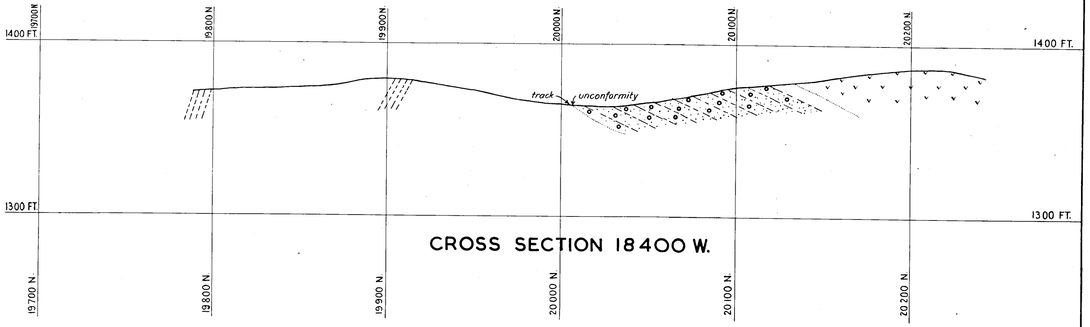
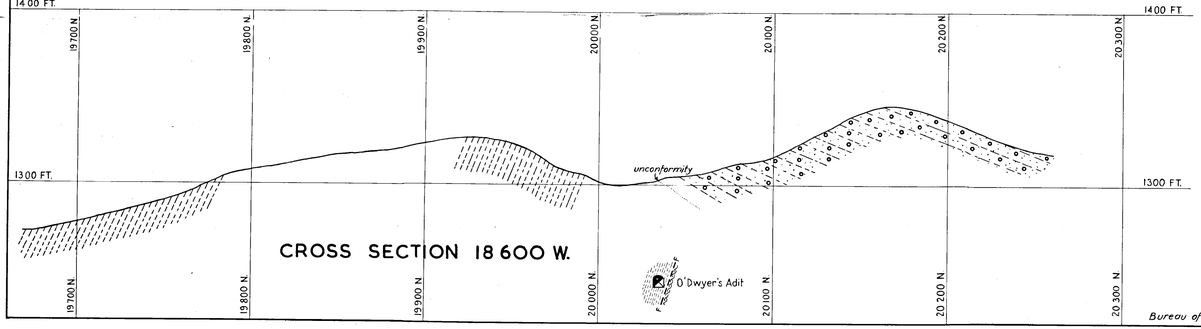


CROSS SECTION 18400 W.



CROSS SECTION 18600 W.

REFERENCE

UPPER PROTEROZOIC
- Kombolgie Formation — Quartz arenite with chert pebbles, and conglomerate bands.
- Rhyolite and rhyolitic tuff.

unconformity

LOWER PROTEROZOIC
- Koolpin Formation — Undifferentiated ferruginous carbonaceous siltstone, with chert nodules and bands.
- Red ferruginous siltstone enclosing chert nodules and bands.

- Established boundary - position approximate.
- Established boundary - concealed by rubble.
- Established fault - position approximate.
- Shear zone.
- Cross section of adit - opposite side of plane of section from observer.
- Cross section of adit - extending across plane of section.

Reduced Level: Based on Survey Station T.P.1 = 1000' as used by S.A.U.N.L.

Bureau of Mineral Resources, Geology and Geophysics, Darwin, June 1958.

CROSS SECTIONS
18800 W., 18700 W., 18600 W., 18500 W., 18400 W.

ROCKHOLE & O'DWYER'S PROSPECTS

SOUTH ALLIGATOR RIVER AREA, N.T.

SCALE

40 0 40 80 120 FT.