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1960/10
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ANNUAL REPORT

1960 - 1961

RESIDENT GEOLOGICAL SECTION

NORTHERN TERRITORY

by

P.W. Crohn

The information contained in this report has been obtained by the Department of National Development, as part of the policy of the Commonwealth Government, to assist in the exploration and development of mineral resources. It may not be published in any form or used in a company prospectus without the permission in writing of the Director, Bureau of Mineral Resources, Geology and Geophysics.

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ANNUAL REPORT, 1960-1961

RESIDENT GEOLOGICAL SECTION, NORTHERN TERRITORY

The Resident Geological Section consists of officers of the Bureau of Mineral Resources, seconded to the Northern Territory Administration in order to supply geological advice and services to Government Departments, the mining industry and the general public.

A. STAFF

During the year 1960-1961, the staff consisted of the following officers:-

Darwin	: P.W. Crohn	- Senior Resident Geologist
	J. Hays	- Geologist Grade III
	P.G. Dunn	- Geologist Grade I
Alice Springs	: T. Quinlan	- Geologist Grade III
	D. Woolley	- Geologist Grade II
	K.A. Rochow	- Geologist Grade I

Towards the end of the year, a geological office was also established in Tennant Creek, and J. Barclay, Geologist Grade II, took up duty there on June 21st.

There were no other staff changes during the year.

B. WATER SUPPLY INVESTIGATIONS

Water supply investigations undertaken by the Resident Geological Section during the year comprised the selection of bore sites for pastoralists, stock routes and Aboriginal Settlements, the intensive investigation of areas under development as sources for the town supplies of Alice Springs, Darwin, and Tennant Creek, the investigation of a proposed dam site on the Adelaide River, and the regional investigation of groundwater occurrence in the Kulgera-Ayers Rock area.

(i) Selection of Bore Sites

Towards the end of the year, the demand for geological advice and written opinions in the selection of bore sites showed a sharp increase, owing to the coming into force of the Water Development Ordinance.

Bore sites were selected at the following places:-

Hooker Creek Aboriginal Settlement	...	1
Beswick Aboriginal Settlement	...	1
Barkly Stock Route	...	2
Borrooloola Stock Route	...	1
Coolibah Stock Route	...	1
Wave Hill Stock Route	...	1
Camfield Station	...	6
Mountain Valley Station	...	3
Agricultural Lease 500 Manton River	...	1
Moroak Station	...	4
Ayers Rock Reserve	...	2
Mt. Olga Reserve	...	2
Maryvale Station	...	8
Ringwood Station	...	4

Ti Tree Stock Reserve	...	2
Tarlton Station	...	1
Todd River Station	...	3
McLaren Creek Station	...	1
Kurundi Station	...	3
Epenarra Station	...	1
Indiana Station	...	7
Plenty River Downs Station	...	2
Jervois Station	...	7
Areyonga Aboriginal Settlement	...	1
Haasts Bluff Aboriginal Settlement	...	1
Mt. Ebenezer Station	...	4
Mt. Riddock Station	...	2
Bushy Park Station	...	2
Idracowra Station	...	1
Horseshoe Bend Station	...	1
The Garden Station	...	2
Oorastippra Station	...	3
Marqua Station	...	2
Palmer Valley Station	...	1
Henbury Station	...	1
Alice Springs Farm Area	...	1

(ii) Town Supply Investigations(a) Alice SpringsTown Basin

The supervision of the drilling programme, requested by the Department of Works, continued. During the year 37 bores were drilled for a total footage of 2,050 feet. Of these, 33 were drilled as 6-inch test holes to outline the south-eastern edge of the basin and to find sands, suitable for development, in the areas about Calacag Park and the 8AL Transmitting Station.

Three eight-inch holes and one twelve-inch hole were drilled at Calacag Park. They were completed by different methods in an attempt to determine suitable methods of completion. Only one of the bores was successful; this was drilled with perforated casing. The failure of the attempts using screens is attributed to the lack of permeable sands opposite the intervals screened and to sloughing and collapse of the roof. Further investigations into suitable methods of development will be undertaken.

The compilation of information on the Town Basin continued during the year and the bedrock contour map was revised.

Routine water level measurements were taken at monthly intervals until 1st November 1960, when the responsibility for them was assumed by the Water Resources Branch.

The volume of saturated alluvium at the beginning of October for each year from 1953 to 1960 was calculated. These are:-

<u>Date</u>		<u>West of Railway</u>	<u>East of Railway</u>
September, 1953	:	496 million cubic feet	984 million cubic feet
October, 1954	:	423 " " "	969 " " "
" 1955	:	447 " " "	1036 " " "
" 1956	:	436 " " "	1004 " " "
" 1957	:	404 " " "	945 " " "

<u>Date</u>	<u>West of Railway</u>	<u>East of Railway</u>
October, 1958 :	433 million cubic feet	987 million cubic feet
" 1959 :	380 " " "	833 " " "
" 1960 :	320 " " "	754 " " "

The programme of investigation will be continued during the year 1961-1962.

Farm Basin

Geological advice was given to the Water Resources Branch concerning their drilling programme at Amoonguna Native Settlement. Cuttings were logged from the seven holes drilled (total footage 2,630 feet). Potable water is available from the sediments associated with the unconformity between the Quaternary and the Mesozoic. Because of the fall of 6 feet in water levels in four years the yield from this aquifer has declined. Water is also available from aquifers within the Mesozoic sediments. The salinity of this water is variable, but it can be expected to be of reasonable quality in proximity to the unconformity with the Quaternary sediments.

The drilling programme in this area was suspended towards the end of the year until the geological information already obtained could be compiled.

(b) Tennant Creek

Cabbage Gum Basin

Work on the evaluation of this basin was continued. During the year 41 rotary drill holes totalling 6,221 feet, were put down by the Water Resources Branch and 16 diamond drill holes totalling 2,060 feet were put down by the Mines Branch. Cores and cuttings from these holes were logged in detail, and this information was supplemented by surface mapping, air photo interpretation and a helicopter reconnaissance over the area.

The potable water of this basin is contained in two main aquifers, consisting respectively of a series of poorly sorted sediments, up to 100 feet thick, and of a zone of decomposition in the granite which forms the bedrock underlying the greater part of the basin. The distribution of both these aquifers is largely controlled by a system of faults and shear zones, the most important of which have a general north-easterly trend. A limited town supply scheme, based on a withdrawal of 150,000 gallons per day, is now programmed for construction.

Tennant Creek Flood-Out Area

Eight shallow drill holes were put down by the Mines Branch in the flood-out area of Tennant Creek, east of the old Telegraph Station, to test whether any old alluvium-filled creek channels were present in the area. However, the maximum thickness of alluvial material encountered was only 37 feet.

Vicinity of Seven-Mile Bore

Six diamond drill holes, totalling 877 feet, have been put down by the Mines Branch in this area in order to determine the extent of the aquifer drawn on by the Seven-Mile bore and well. Preliminary indications are that the aquifer extends for at least half a mile

to the east, north-east, and south of the Seven-Mile bore, and pump tests on several of these holes will be carried out in the near future.

Vicinity of Peko Mine

At the request of Peko Mines No Liability, a drilling programme was begun by the Mines Branch towards the end of the year in order to locate additional water supplies for use in the proposed extension of the mine's treatment plant. However, the first two holes, located on the projected extension of a major shear zone, about two miles north-east of the mine, encountered only a small quantity of water.

(c) Darwin

Berri Springs

An investigation of the Berri Springs area as a possible source of a supplementary town supply was begun towards the end of the year. Twelve rotary drill holes were put down by the Water Resources Branch, but owing to poor exposures the regional geological structure has not yet been fully determined.

(iii) Dam Site Investigations

Adelaide River

At the request of the Water Resources Branch, a preliminary examination was made of a proposed dam site on the Adelaide River, one mile west of Adelaide River township. Provided that the existence of satisfactory foundation conditions is confirmed by diamond drilling, the site is thought to be satisfactory for the construction of a 150-foot retaining wall, but subsidiary construction may be required at two low saddles in the catchment area.

(iv) Regional Investigations

Ayer's Rock and Kulgera Four-Mile Areas

Information on the occurrence of groundwater in these two areas is being collected and compiled.

Form lines on the water table have been constructed, and they indicate the presence of a groundwater trough which lies to the north of the chain of salt lakes. The form lines indicate that the main movement of groundwater is from the south, through the salt lakes to the bottom of the trough. Much smaller quantities of groundwater move into the trough from the north. This explains the prevalence of saline groundwater north of the lakes.

Supplies of stock quality water have been obtained from bores to the north of the salt lakes, and to the south and west of the Ebenezer and Sunday Ranges. This water is distinguished by a high sulphate and a very low chloride and carbonate concentration. The standing water level in these bores is higher than that in the surrounding bores, which obtained saline water. The stock quality water is considered to be localised and perched in jointed zones in Palaeozoic and/or Proterozoic gypseous and calcareous shales and siltstones.

Anomalies in the regional pattern have been found in the areas around mound springs. Analyses show that the water samples from the springs contain relatively lower concentrations of chloride, sodium, potassium and magnesium ions and higher concentrations of calcium, sulphate and bicarbonate ions than waters from adjacent areas within the salt lakes.

(v) Compilation of Bore Data and Water Supply Maps

It has always been the aim of the Geological Section that all information on bore logs, bore locations and water analyses should be recorded and indexed as it becomes available. However, owing to pressure of other work, this could not always be done during the past year.

C. MINES AND METALLIFEROUS DEPOSITS

Close liaison was maintained throughout the year between the Resident Geological Section and the mining companies and prospectors who are engaged in production from and exploration of mineral deposits in the Northern Territory.

(i) Tennant Creek

Enterprise Mine

Following an application by the lease-holder for assistance under the Mining Development Ordinance, a detailed survey of part of the underground workings at this mine was carried out and recommendations for a programme of exploratory long-hole drilling at the 183-foot, 223-foot and 295-foot levels were made to the lease-holder. Approximately 1,250 feet of drilling have been completed, but no substantial ore reserves have been established to date.

Other Mines

Surveys were also carried out at the Eldorado, Northern Star, Hammerjack and Caroline Mines to assist the lease-holders in planning development and exploration programmes and to bring plans of the mine workings up to date.

West Peko Diamond Drill Hole

At West Peko, approximately one mile west of Peko mine, a diamond drill hole was put down by the Bureau of Mineral Resources under an agreement with Peko Mines No Liability to test a major magnetic anomaly. The hole reached a depth of 2,227 feet, but no massive ironstone bodies and no indications of gold or copper mineralization were encountered, and it is now thought probable that this magnetic anomaly is due to finely disseminated magnetite in the Warramunga sediments.

Regional Investigation

In addition to the various specific surveys listed above, a comprehensive report on the geology and mineral deposits of the Tennant Creek one-Mile Area is in preparation.

(ii) Mount Wells Area

The Mount Wells and Mount Harris areas experienced a considerable upsurge of mining and prospecting activity during the year, owing to the beginning of construction of the Mount Wells Government Battery.

Detailed surveys were carried out at Jessop's Lode and the Mavis Alice and Big Drum tin mines, and a portion of the Prices Springs granite complex and its surrounding rocks were mapped on a regional scale.

The tin-bearing lodes of this district range from friable iron-rich types, represented by Jessop's Lode, through quartz reefs carrying both tin and sulphide minerals, such as Mount Masson, Big Drum and Mount Wells itself, to pure quartz-cassiterite lodes such as the Mavis Alice. The complex mineralogy of some of the lodes raises considerable difficulties to the quick assessment of their value by field methods, and investigations to overcome this are now in progress.

(iii) Iron Blow and Coronet Hill Mines

At the Iron Blow Mine, near Grove Hill, a geological survey was carried out by the Resident Geological Section concurrently with a geophysical survey by officers of the Bureau of Mineral Resources. The underground workings of this mine are no longer accessible, but old records suggest that a substantial tonnage of complex gold and base metal ore remains in the mine, and a diamond drilling programme to test this prospect is now under consideration by the Bureau.

Geologists of the Resident Section also maintained close liaison with a Bureau of Mineral Resources party who carried out a detailed survey of the Coronet Hill copper mine, about 30 miles east of Pine Creek.

(iv) Yeuralba

At Yeuralba, near Maranboy, a survey was undertaken to assess the extent of tin-bearing alluvial deposits in the valley of Sandy Creek, and assistance was given to the lease-holders in siting and sampling test pits. The evaluation of these deposits is still incomplete.

(v) Iron Ore

Since the lifting of the embargo on the export of iron ore, there has been a great increase in the amount of exploration for iron ore deposits, and a considerable portion of the time of the Resident Geologists during the year was spent in assisting prospectors and mining companies in this search, especially in the northern portion of the Territory.

Deposits at Roper Bar (Murphy's Lode), near the Cosmopolitan Howley Mine (Brook's Creek district), and at George Creek (south of Adelaide River) were examined but were found to be too small to warrant development at the present time. In the Hundred of Waterhouse, about 15 miles south of Batchelor, a number of hematite occurrences show favourable surface indications, but the testing of these deposits has not yet reached the stage where any estimates of grades and tonnages can be made.

Since the end of 1960, a group of substantial deposits has also been discovered at Frances Creek, about ten miles east of Burrundie, and these are now being intensively tested by means of diamond drilling, waggon drilling and costeaning. These discoveries were the direct result of close co-operation between a prospecting syndicate of Darwin businessmen and geologists of the Resident Geological Section.

(vi) White Range Goldfield

A plane table survey of the area around McIntyre's adit was carried out. This showed that the orebody which had been mined in the old surface workings had decreased substantially in size at depth, but a further visit to the area will be required before the report on this survey can be completed.

(vii) Harts Range and Plenty River Mica Fields

A survey of most of the mines worked in recent years was carried out, bringing the plans of each mine up to date. Low prices for mica have caused the desertion of the field, even though there is still a large amount of good quality mica present in some of the larger mines, e.g. Ophir and Mirror Finish Mines. Accessory minerals, such as beryl, zircon, and garnet, present in some mines, do not occur in sufficient quantities to warrant mining.

(viii) Box Hole Lead Prospect

A geological survey of this prospect, which occurs in silicified dolomites of Upper Cambrian age, approximately 30 miles southwest of Ooratippra Homestead, was carried out at the request of the lease-holder. This survey was necessarily inconclusive, due to the strongly leached nature of the surface outcrops, but indicated that further testing by diamond drilling was warranted. The prospect has since been the subject of a diamond drilling programme carried out by Enterprise Exploration Pty Ltd.

(ix) Anningie Tin and Lead Prospects

The Anningie Field was examined at the request of the lease-holder. The concentration of tin in the pegmatites of the field generally appears to be far below economic grade, and most of the rich alluvial tin deposits adjacent to those pegmatites have been worked out. Small concentrations of tin still remain in creeks in the northern part of the field, but none of these are worth prospecting on a large scale.

Small lenses of high-grade galena were found in joints and minor shears in an amphibolite, but the occurrences are too small to warrant further testing.

However the Anningie area generally contains so many small occurrences of tin, tantalite and lead mineralisation that some further regional prospecting appears to be warranted.

(x) Utopia Tantalite

Several small workings in the Utopia area were examined at the request of a prospector. The tantalite occurs as rich pockets within pegmatites, but the overall grade is very low. Selective working of the pegmatites and associated alluvium was recommended.

(xi) Renner Springs Manganese Deposits

These deposits were re-surveyed and plans of the workings brought up to date. Much of the easily accessible ore has been removed and the field is at present deserted, but some further testing by long-hole drilling or diamond drilling is warranted.

(xii) The Granites Goldfield

A re-survey of part of the Granites Goldfield was carried out at the request of the lease-holder, and an exploration programme by costeaning and long-hole drilling was suggested.

(xiii) Other Mining Areas

Other surveys were carried out during the year at gold prospects near Kurundi and Kurannelli in the Hatches Creek district, and at Union Reefs near Pine Creek. Visits were also paid to the McArthur district, where a prospecting party from Mount Isa Mines is operating, and to the Tanami district, which is being investigated by a party from Zinc Corporation.

D. GENERAL INVESTIGATIONS(i) Quarry Sites

Existing quarry sites in the Darwin area were inspected and advice on further development and alternative sites was given to R.A.A.F. authorities and private operators.

(ii) Clay Deposits

Clay deposits in the Shoal Bay and Knuckey's Lagoon area were sampled and arrangements were made for the testing of the samples by the C.S.I.R.O. Division of Building Research.

(iii) Opal Occurrences

Occurrences of opal were reported during the year from Rosewall's Quarry, Alice Springs, and from Helen Springs Station, north of Tennant Creek. However, the quality and quantity of opal at both these localities is insufficient to warrant systematic development.

(iv) Curtin Springs Evaporite Deposits

The occurrence of evaporites in the Lake Amadeus salt lake system was investigated at the request of Enterprise Exploration Ltd. The salts concentrated in the lakes consist predominantly of sodium and calcium chlorides and sulphates. No significant amounts of nitrate, boron or potassium were found in the lakes.

E. ADMINISTRATION, OFFICE, ETC.(i) Petroleum Advisory Board

The Senior Resident Geologist attended five meetings of the Board, and J. Hays attended one meeting.

(ii) Visitors and General Enquiries

A number of visitors, comprising representatives of mining companies, companies engaged in the search for oil, Government Departments and overseas organisations, were escorted on visits to mines, mineral deposits and critical geological sections. Numerous enquiries for maps, air photos, mineral identification and general geological advice were answered.

(iii) Meetings and Conferences

P. Crohn and K. Rochow attended the Annual Conference of the Australasian Institute of Mining and Metallurgy at Mount Isa in August 1960.

T. Quinlan attended the "Arid Zone Technical Conference" at Warburton, Victoria, in December 1960.

T. Quinlan and J. Hays attended the Northern Territory Scientific Liaison Conference in Darwin in February 1961.

F. REPORTS

The following reports, written by geologists of this Section, were incorporated in the Bureau of Mineral Resources Record Series during the year:-

<u>Record</u>	<u>Title</u>	<u>Author</u>
1960/134	Geology of the Mavis Tin Lease, Grove Hill area, N.T.	P. Dunn
1961/7	Report on the Enterprise Mine, Tennant Creek, N.T.	J. Hays
1961/12	Ground Water Resources of the Cabbage Gum Basin, Tennant Creek. Progress Report No. 4	P. Crohn
1961/83	Preliminary Geological Investigation of Adelaide River Dam Site	J. Hays
1961/25	Water Resources of Central Australia.	T. Quinlan
1961/42	The Occurrence of Lead at Boxhole Mine, Central Australia.	D. Woolley K. Rochow

Reports, which had been completed at the end of the year, and which may subsequently be included in the Record Series of the Bureau, include the following:-

<u>Title</u>	<u>Author</u>
The Geology of the Iron Blow Mine, Grove Hill area, N.T., with diamond drilling recommendations.	P. Dunn
Ironstone Occurrences east of the Cosmopolitan Howley Mine, Brock's Creek area, N.T.	P. Crohn
Report on a visit to the Granites Gold Field, October 1960.	P. Crohn
The Geology of the BW Iron Claim, Hundred of Waterhouse, N.T.	P. Dunn
Test Drilling at Bent Tree Well, Alice Springs, N.T.	T. Quinlan D. Woolley
Harts Range and Plenty River Mica Fields.	K. Rochow

Reports, which had been compiled at the end of the year, and which will be published by the Commonwealth Scientific and Industrial Research Organization, include the following:-

<u>Title</u>	<u>Author</u>
An Outline of the Water Resources of the Alice Springs area (Revised)	N.O. Jones T. Quinlan
An Outline of the Geology of the Alice Springs area (Revised)	T. Quinlan
Preliminary Assessment of Groundwater suitable for Irrigation in the Alice Springs Area, and its Agricultural Significance.	R.A. Perry T. Quinlan N.O. Jones J.J. Basinski