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DEPARTMENT OF NATIONAL DEVELOPMENT.  
BUREAU OF MINERAL RESOURCES  
GEOLOGY AND GEOPHYSICS.

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RECORDS.

1956/67

REPORT ON A GAS OCCURRENCE IN A BORE ON  
AMMAROO STATION, NORTHERN TERRITORY.

by

N. J. Mackay and N. O. Jones.

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CONTENTS.

INTRODUCTION

THE GAS OCCURRENCE

GENERAL GEOLOGY

(a) Area around Cherry Creek Bore

(b) Ammaroo Basin

CONCLUSIONS

PLATES.

PLATE 1. Map showing extent of Ammaroo Basin  
Scale: 1 to 1,000,000

2. Geological Map of an Area near Cherry  
Creek Bore.  
Scale:  $1\frac{1}{2}$  inches = 1 mile

3. Diagrammatic Section across Ammaroo Basin  
Scale: 1 inch = 4 miles.

## INTRODUCTION

On 20th June, 1956, an explosion occurred in a bore hole being drilled by a percussion drilling plant belonging to M.P.M. Drilling Co. on Ammaroo Station in the Northern Territory. The depth of the bore was approximately 135 to 140 feet when a piece of hot welding rod was accidentally dropped down the bore hole and ignited gas which had accumulated in the hole. The bore hole, named Cherry Creek Bore in this report, is situated 170 miles north-east of Alice Springs (see Plate 1) and 13 miles north-east of Ammaroo Homestead. The approximate position of the bore hole is Longitude 135°45'E, Latitude 21°40'S. Plate 2 is a map of the area near Cherry Creek Bore.

Cherry Creek Bore was inspected by the Director of Mines on 2nd July when the depth of the bore was 176 feet. A slow but steady flow of gas was issuing into the bore hole from the side of the hole. Samples of sludge with a distinctly aromatic smell were collected by the Director of Mines from the bottom of the hole and have been forwarded to the Bureau of Mineral Resources, Melbourne, for analysis.

At the request of the Acting Administrator the writers proceeded to Cherry Creek Bore and carried out an examination of the bore and surrounding country in the period 6th to 9th July. The gas was still issuing from the side of the hole when the writers arrived and the aromatic odour was quite noticeable at the top of the hole. By lowering a hose 155 feet down into the bore hole and sealing the top of the hole, samples of the gas were collected and subsequently forwarded to Bureau of Mineral Resources, Melbourne, for analysis. The gas collected had quite a distinct petroliferous odour similar to the odour of the sludge samples collected by the Director of Mines.

The site of Cherry Creek Bore is on an alluvial flat in an area of low relief. Rock outcrops are scarce, most of the high ground being covered with rubble and the broad flats filled with alluvium and sand.

## THE GAS OCCURRENCE

The following log of Ammaroo Bore has been compiled from verbal information, sludge samples and an examination of the bore drains:

<u>Depth</u>	<u>Description</u>
0-20 feet	Soil and clay
20-45 "	White travertine
45-80 "	Grey fine-grained fossiliferous limestone with thin bands of shaly limestone or shale.
80-80'4"	Clayey material
80'4"-190 feet	Grey fine-grained fossiliferous limestone with bands of shaly limestone or shale and veinlets of recrystallised limestone.

The depth of the above bore was 190 feet on 9th July. Drilling was subsequently stopped by the drillers at a depth of 205 feet due to hard drilling conditions in the limestone.

The lowest level at which gas is issuing into the bore hole was found by testing to be 171-173 feet. Below this level no gas is apparently entering the hole. It is known that there was gas in the hole at 135-140 feet where the original explosion occurred and it appears that gas is still entering the hole at various levels from 173 feet up to at least 135 feet and probably higher in the hole. The gas was still issuing at a steady rate when the writers left the area on 9th July. No traces of oil could be seen in sludge samples taken from the

hole when it was deepened from 176 feet to 190 feet. However, small amounts of an oily substance were seen adhering to limestone chips taken from 155-145 feet and 172 feet down the bore. This oily substance had the same aromatic odour as the gas present in the bore hole.

The high proportion of coarse fragments of limestone present in the sludge, the slaty nature of the fragments and the relatively slow rate of drilling suggest that the limestone is thin-bedded and probably contains interbedded shale. These shale beds would act as caps to the gas occurring in cracks and joints in the limestone reservoir beds. Rock chips collected from sludge samples from various depths in the bore have been forwarded to the Bureau of Mineral Resources, Canberra for examination. Fragments of brachiopods were identified in some of the limestone chips.

A black film was noticed on the surface of sludge water bailed from the bore hole and this is thought to consist of carbonaceous material. A sample of the sludge water and black film has been sent to Canberra for identification. Small black specks seen in the limestone chips may be the source of the black film.

#### GENERAL GEOLOGY

##### (a) Area Around Cherry Creek Bore

The area is shown on Plate 2. Cherry Creek Bore was drilled through sedimentary rocks which consist of interbedded thick and platy limestone beds with narrow bands of calcareous shale. These sedimentary rocks are considered to be Cambrian in age and form part of the Cambrian sequence in this area. The northern extent of the Cambrian strata is approximately 10 miles north of Cherry Creek Bore where they unconformably rest on strongly folded rocks of Proterozoic age.

The stratigraphic sequence is poorly exposed in the area near Cherry Creek Bore but three broad units in the Cambrian strata were recognised. (1) The basalt unit consists predominantly of conglomerate, sandstone and shale with occasional limestone beds. Fossils collected from this unit in adjoining areas have previously been determined as belonging to the lower part of the Middle Cambrian. (2) Overlying the basal unit is a limestone sequence consisting of coarse, fragmental limestone and massive, fine-grained limestone interbedded with shale. The gas occurrence lies within this unit, probably in the upper part of the unit. (3) The uppermost unit exposed in the area consists predominantly of shale and sandstone with thin beds of limestone. All three units are richly fossiliferous and contain numerous trilobites and brachiopods. Specimens, including some from several distinct horizons in the middle unit, have been forwarded to the Bureau of Mineral Resources, Canberra, for examination and age determination. The fossil localities are shown as Plate 2.

The sedimentary sequence dips at a shallow angle to the south. The major trend of the sediments is south-east and recorded dips range from 15° to horizontal. Local irregularities in both the strike and dip of the strata indicate that closed structures may be present in the area.

Ferruginous laterite covers many of the small hills in the area and there are many surface exposures of chert rubble which are considered to have been formed by replacement of the original limestone and shale by siliceous solutions during lateritisation. Travertine of Quaternary age occurs on the crests of small rises near Cherry Creek Bore and fragments of fossiliferous limestone are present in the travertine outcrops.



(b) Ammaroo Basin

An area of Cambrian and Ordovician sediments, approximately 60 miles wide in the north-south direction and at least 120 miles long in an east-west direction, has been named Ammaroo Basin (see Plate 1). To the east the basin widens and joins the broader Georgina Basin which extends to the Queensland border. Very little detailed structural information is available about Ammaroo Basin but minor dome and basin structures are known to occur in the Huckitta area. A diagrammatic geological section across the basin is shown in Plate 3.

The Cambrian and Ordovician sediments vary widely in thickness and distribution within the basin, but a reasonably complete stratigraphic sequence is present in the Huckitta area on the southern flank of the basin. It is considered that this sequence represents the thickest part of the basin and the sequence is tabulated below:

<u>Age</u>	<u>Main Rock Type</u>	<u>Possible Thickness</u>
Ordovician	Sandstone	1,000 ft.
Ordovician	Limestone and Shale	200 ft.
Upper Cambrian	Sandstone	500 ft.
Middle Cambrian	Limestone, Dolomite and Shale - in places Sandstone	1,500+ft.
		<u>3,200+ ft.</u>

The possible thicknesses given above are not based on any measured sections but are given in order to show the approximate order of thickness of Palaeozoic sediments on the southern side of the Basin.

Very little is known regarding the thickness of sediments on the northern side of the basin but the total thickness is thought to be considerably less than in the Huckitta area. The thickness of Cambrian sediments at Cherry Creek Bore is considered to be at least 400 feet, although it may be a good deal thicker.

On the northern side of Ammaroo Basin the Cambrian sediments rest unconformably on highly folded and faulted metamorphic and volcanic rocks of Proterozoic age. The Precambrian rocks have been intruded by granite. To the south the Cambrian strata overlie sedimentary rocks of Upper Proterozoic age. These rocks have been gently folded and rest unconformably on metamorphic rocks considered to be Archaeozoic in age.

Rocks of Mesozoic age are not known to be present within Ammaroo Basin. Tertiary sediments consist of laterite and thin remnants of limestone of fresh-water origin. Alluvium and sand ridges cover an extensive part of the basin.

CONCLUSIONS.

There is a definite occurrence of gas in sedimentary rocks of Cambrian age at Cherry Creek Bore. The nature of the gas is unknown at present but the aromatic smell indicates that it is of petroliferous origin.

The sedimentary rocks in which the gas occurs form part of the Ammaroo Basin. This basin covers a considerable area about which there is very little geological information.

There is no evidence of any major tectonic disturbance or igneous intrusion since the deposition of the Cambrian

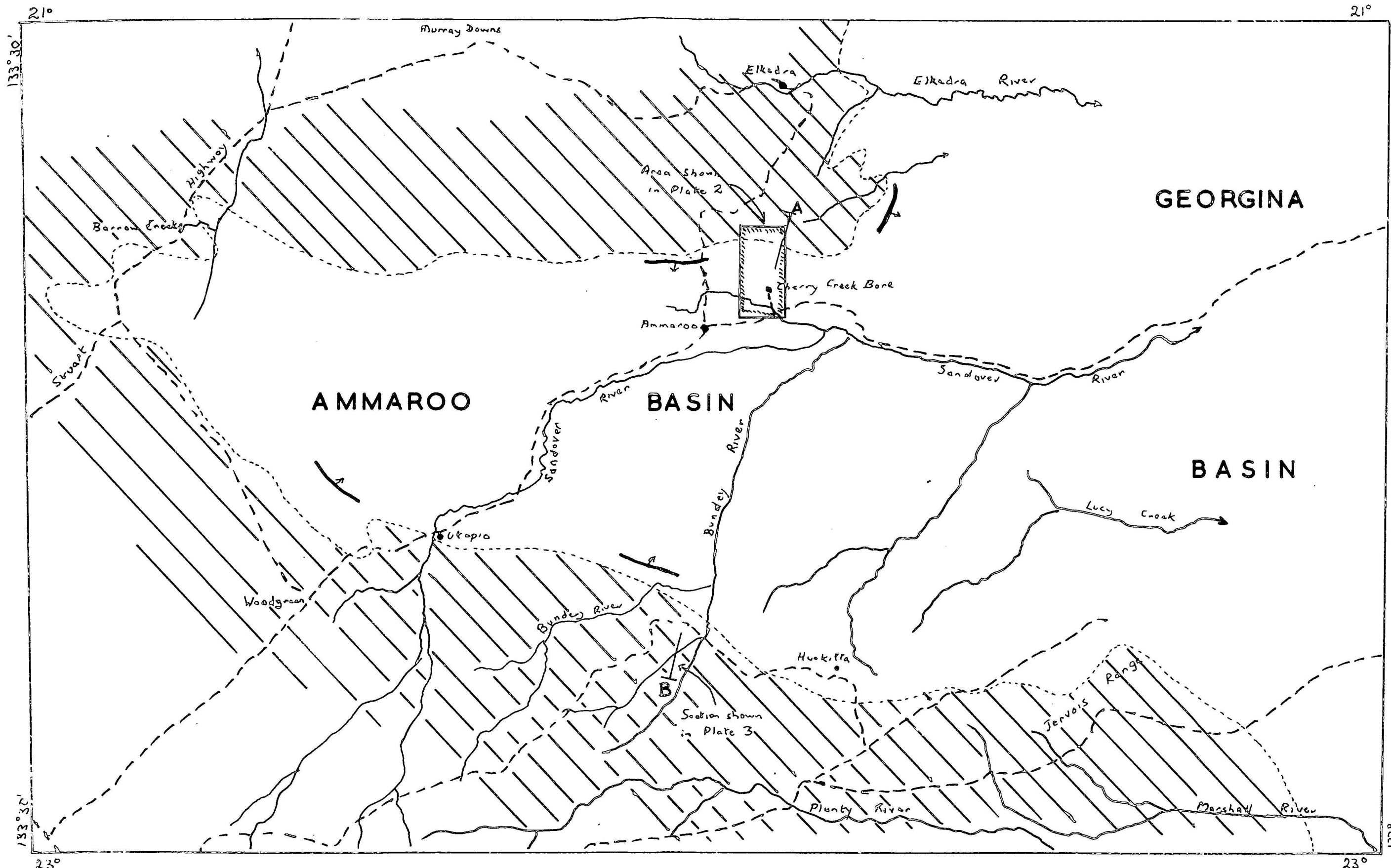
sediments in the Ammarco Basin. The sediments are gently folded and show very little alteration.

It is not known how the gas occurs in the limestone beds at Cherry Creek Bore. Apparently sufficient cap rocks, probably shale beds, are present to prevent the gas escaping to the surface.

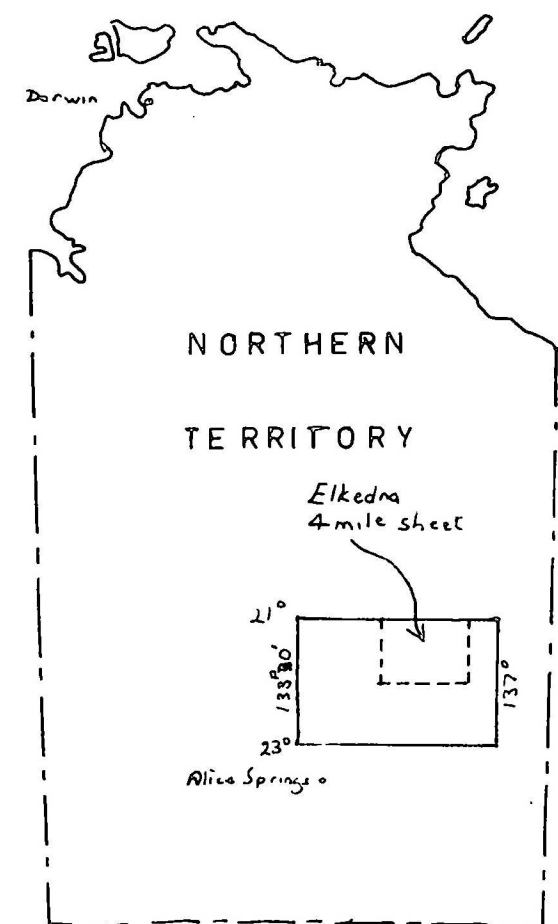
The existence of a gas occurrence in an area of Lower Palaeozoic sedimentary rocks shows that the Ammarco Basin has definite prospects for the accumulation of oil if the analysis of the gas shows it to be of petroliferous origin. Only detailed geological and geophysical surveys followed by test drilling will determine whether commercial accumulations of oil are present in the area. It is hoped that the gas occurrence will stimulate interest and encourage close examination of the area.

N. J. Mackay  
Darwin.  
20/7/56.

# MAP SHOWING EXTENT OF AMMAROO BASIN

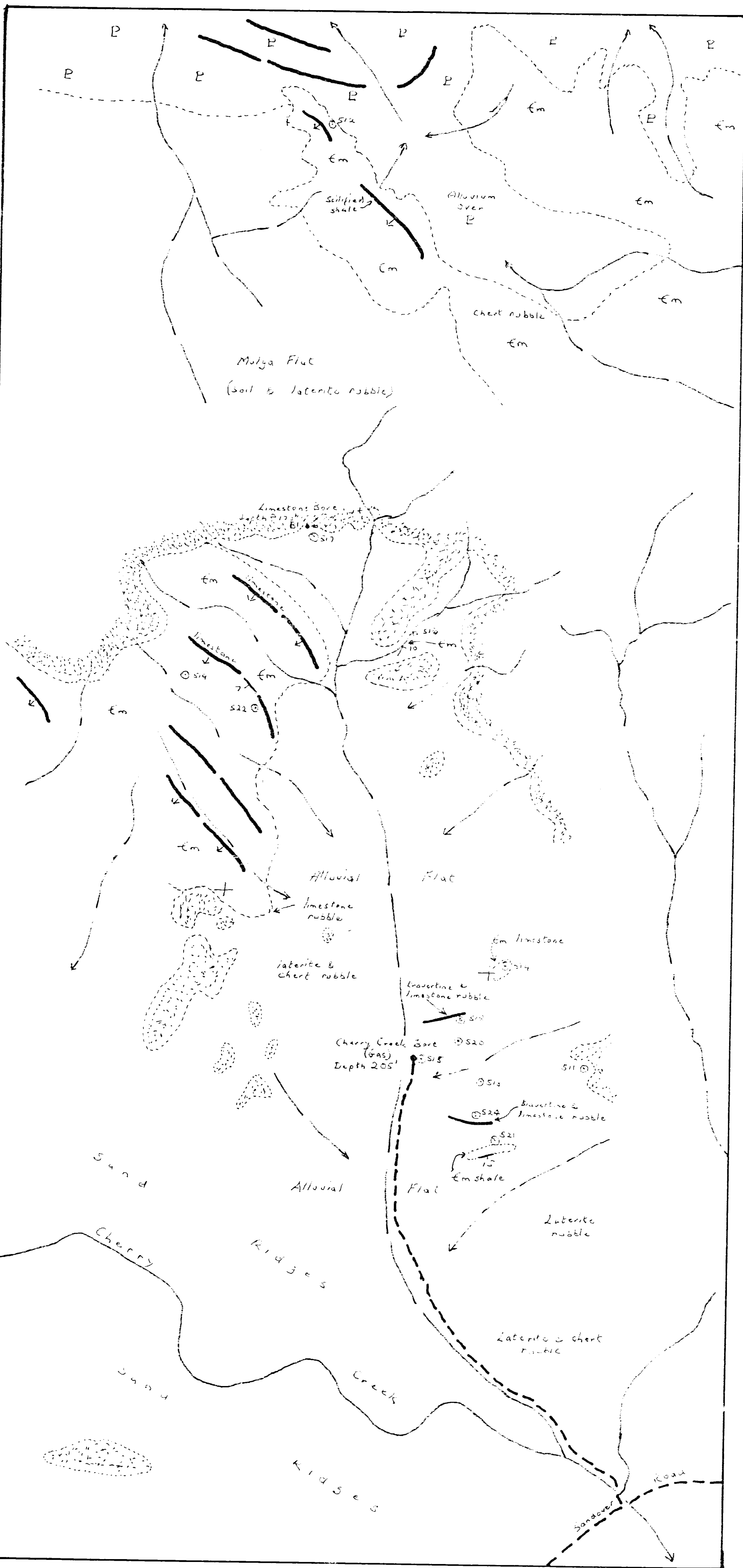


## LOCALITY MAP



## REFERENCE

- Drainage
- Tracks
- Approximate geological boundary
- Trend line with dip of strata
- Cambrian & Ordovician sedimentary rocks
- Precambrian rocks



? Tertiary		Laterite
Middle (?) Cambrian		Limestone sandstone & shale
Proterozoic		Quartzite, slate & volcanic rocks

----- Approximate geological boundary

T Strike & dip of strata

⊥ Horizontal strata

BSM Marine fossil locality with specimen number

—— Trench line

—— Trench line — dip  $30^{\circ}$  —  $45^{\circ}$


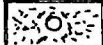
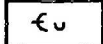
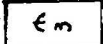
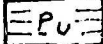
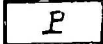
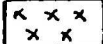
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# DIAGRAMMATIC SECTION ACROSS AMMAROO BASIN

PLATE 3

## REFERENCE

Palaeozoic	Cainozoic		Limestone & alluvium
	Ordovician		Sandstone with basal limestone
	Upper Cambrian		Sandstone & shale
	Middle Cambrian		Limestone, dolomite, sandstone & shale
Pre-Cambrian	Upper Proterozoic		Sandstone, shale & dolomite
	Proterozoic		Quartzite, slate & volcanic rocks
	Archeozoic		Metamorphic & Granite rocks

