COMMONWEALTH OF AUSTRALIA.

DEPARTMENT OF NATIONAL DEVELOPMENT.

BUREAU OF MINERAL RESOURCES
GEOLOGY AND GEOPHYSICS.

RECORDS.

RECORDS 1958/3

SUMMARY OF ACTIVITIES, 1957

GEORGINA BASIN AREA

by

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INTRODUCTION In 1957 a B.M.R. party, consisting of geologists J.N. Casey, M.A. Reynolds, D. Dow, R. Vine, P. Pritchard, R. Paten (Q'ld. Geol. Survey Representative) and assistants R. Hamilton (cook), A. White (mechanic) and F. Smithers (field assistant) with two International trucks, five landrovers, two water trailers and one jeep-type trailer, commenced the mapping of the Georgina Basin. The field work extended from 1st July to 16th October (15 weeks) and mapping was concentrated on the Boulia (F/54-10) 4 mile Military map sheet.

Aerial photographs, flown by the R.A.A.F. in 1951 at an approx. scale of 1" = 3/4 mile, were used to plot all information and from them ultraphane overlays were made; the information on these overlays will be plotted on 1 mile to 1 inch base maps which are being controlled and prepared by the Army, under contract to National Mapping; a controlled 4 mile to 1 inch map is also in preparation by the Army and when the geological and topographic information is plotted from the photo-overlays to the 1 mile sheets, the 1 mile sheets will be reduced and compiled into a 4 mile map for publication. Meanwhile, until the controlled base maps are available, a progress map has been compiled at 4 mile scale using National Mapping uncontrolled 4 mile photo-mosaic as a base; it shows general geology, barometric heights, main tracks, fences and bores, and important topographic information.

An extensive collection of fossils was made at many localities. The Cambrian and Ordovician fauna is being worked on by Dr. A.A. Öpik and Miss J.G. Tomlinson, who visited the party in the field for 6 weeks, the Mesozoic (Upper Jurassic-lower Cretaceous) plants by Mrs. M. White and M. Pulley, the Lower Cretaceous megafossils by Q'ld. University and the Lower Cretaceous microfossils by Miss I. Crespin.

Dr. Hyle and Mr. Phillips from Frome-Broken Hill Co. visited the area in October to obtain specimens from the Cambrian and Ordocician limestones, the specimens will be analysed for residual petroleum.

A gravity party, under Mr. Van Son from the geophysical section B.M.R., also worked in the Georgina Basin and adjoining Precambrian areas in 1957; survey work for this party was done by Mr. D. Cook of Dept. Interior, Canberra.

Barometric traverses were run through most of the area; main road benches and surveyed gravity stations provided accurate height control for barometric work. The logs from about 600 water bores were collected and plotted and in most cases the height of each bore was determined by barometer.

The total cost of the field part of the survey to date is £4,650 (excluding geologist's salaries), made up of the following :- Wages and allowances £2,300, Fares £200, Consumable Stores and Write-offs £250, Petrol and Vehicle spare parts £900, Vehicle hire £1,000 at £6.10. -. per week per landrover, £6 per International Truck, £1 per water trailer and 5s. per trailer.

Each landrover travelled about 7300 miles during the time of hire of the vehicle from Dept. of Supply.

OBJECT The object of the survey was to continue to the south the regional survey of the Cambrian, Ordovician and Mesozoic sediments of the Northern Territory and N.W. Queensland, and to assess the oil prospects of the Georgina Basin.

DEFINITION The meaning given to "Georgina Basin" by previous authors is confusing and they have used it to mean a drainage basin, a region, or a general locality name. A brief resume of the history and meaning of the name is given. The brackets at the end of each reference is the present author's interpretation of the meaning inferred by the use of "Georgina Basin".

Jack (1895) first used the name in the title of his paper when he described early bores drilled for water in the area; but no further mention of the name was made; (geographical).

Whitehouse (1931 p.118) referred to a collection of Cambrian trilobites collected by C. Ogilvie from "grey limestones in and around the basin of the Georgina River" and who in a footnote mentioned that "Ogilvie proposes the term 'Georgina Limestones' for this important stratigraphic series"; (drainage basin).

David (1932 p.118) used "Camooweal Basin" as "the eastern extension of an immense belt of limestone extending from the WA. border beyond Wave Hill, N.E. to near Katherine, in Northern Australia, by way of Daly Waters, Newcastle Waters, Anthony's Lagoon and Alexandra Downs to the sources of the Gregory and O'Shanassy Rivers and thence to Camooweal and Boulia. The term 'Camooweal Basin' may be used to denote the eastern end of this important belt where the water is distinctly moving S.E.....

From Camooweal to Boulia the extensive groundwater from these limestones go to reinforce the water in the intake beds of the Great Artesian Basin near Boulia". On David's map (p.116) it occupies an area similar in position to the Barkly Tablelands. The geological age of sediments in the basin is given as Cambrian to Proterozoic (David 1932, table p.118); (sedimentary basin). It is appropriate to use Camooweal Basin as that containing sediments of the ?Upper Proterozoic Camooweal Dolomite which seems to have been deposited in a shallow re-entrant or basin.

Whitehouse (1936 p.64) refers to "the basin of the Georgina River and most of its main tributaries lie in a great tongue of limestones with a general north-south elongation. To these beds the name Georgina Limestone has been given (Whitehouse 1931)"; a map showing the "geology of the Georgina Basin" is also figured in this report but the Basin is not described; (drainage basin).

Whitehouse (1940 p.23) referring to Tertiary limestone deposits mentions their occurrence "in the southern portion of the Georgina River basin"; (drainage basin).

David and Browne (1950 p.115) refer to the "Georgina Region" as having an area of 60,000 sq. miles, partly in western Queensland and partly in eastern Northern Territory, and most of it lies in the basin of the Georgina River. The boundaries of the region are given in a sketch map (after Whitehouse 1936) entitled geology of the Georgina Basin, which extends from Elkedra, to Brunette Downs to Riversleigh and south to Boulia. The section on p.116 shows a thickening of sediments between Avon Downs and the Georgina River and "the broad structure appears to be that of a shallow synclinal basin

or trough with submeridional axis" and "the total thickness of the beds is quite unknown but must be some thousands of feet". On p.694 the Georgina Basin is referred to informally: "the intensity of folding diminishes considerably to the east, and in the Georgina basin the Cambrian beds, with a thickness of some thousands of feet, rest directly on the Older pre-Cambrian platform and are practically horizontal", but further "the Cambrian strata of the Georgina Region were deposited on a block so rigid that they have remained undeformed till this day"; (drainage and sedimentary basin). Confusion still obviously exists between basin and region.

Reeves (1951 p.2485) classified the Georgina Basin as one with no oil prospects, covering 60,000 sq. miles and containing 2,000-3,000 ft. of Ordovician? and Cambrian marine sediments. On his accompanying map the position of the Basin is approximately that of the Barkly Tableland. On p.2523 it is stated that the Georgina Basin has no oil prospects "because of the probability that only the oldest formations occupy the crest of folds and have little thickness"; (sedimentary basin).

Noakes (1952) used Georgina Valley as one of two physiographic units which form the Barkly Tableland; the second unit being the Barkly Internal Drainage Basin which was subsequently referred to as the Barkly Basin, therebye inferring a physiographic and not a sedimentary basin; (drainage area).

Noakes and Traves (C.S.I.R.O. 1954 p.39) referring to the Tertiary cycle of erosion state that the Georgina Basin was "already established as an internal drainage basin and the topography of the Georgina Valley ~~was much as it~~ appears now"; no further mention was made of the Georgina Basin but reference is continually made to the Georgina Valley; (drainage basin).

Stewart (C.S.I.R.O. 1954 p.43) uses Georgina Basin Division as one of his geomorphological units of the Barkly Region which "is drained by the southward flowing Georgina River and its tributaries"; (drainage basin).

Traves and Stewart (C.S.I.R.O. 1954 p.60) use Georgina Basin as a surface hydrological or drainage unit.

Raggatt (1954) and Condon (1956) both figured the Georgina Basin on a map accompanying their reports, but the basin was not defined in the text. The area covered on the map by the outlines of the Georgina Basin is similar to the topographic unit known as the Barkly Tableland, except the basin extends further to the N.E. than the Camooweal Basin figured by David (1932).

Condon et al (1957) referring to the Georgina Basin (p.51) write that "little is known of the detailed stratigraphy and structure of this basin except where it overlaps the Precambrian of the Mt. Isa-Cloncurry area. There, marine Cambrian and Ordovician sediments fill synclinal areas and plunge off the Precambrian geoanticline, thickening away from the Precambrian outcrop. Trace petroleum has been reported from these sediments. The Amaroo Bore is at the western margin of this basin". Also in this record (p.51) is mentioned the Barkly Basin which, "apparently shallow, contains Proterozoic and Cambrian sediments, probably marine. Little is known of the details of stratigraphy and structure"; this basin apparently forms part of the Georgina Basin of Condon et al (1957). Opik (1956 p.3) points out that the Georgina Series (Whitehouse 1931) included the Camooweal Dolomite (upper Proterozoic or lower Cambrian) "as well as rocks of the Undilla Basin which do not belong to the Georgina Basin at all", presumably referring

to the Georgina drainage basin in the sense of Whitehouse (1931). Opik (1956 p.242) refers to the Barkly Tableland (which has been referred to loosly as the Georgina area by some authors) as a "grass plain on the Camooweal Dolomite and adjacent Cambrian rocks....It is sometimes referred to as the 'Barkly Basin' but no basin structure is evident, for Cambrian rocks form a blanket and Camooweal Dolomite is an extended sheet".

Noakes, on a map of "Australia - Elements of Geology and structure" to be published in 1958 in lexicons of the Stratigraphy of the Australian States, includes much of the Barkly Tableland in the "Barkly Basin" containing Adelaidean (Upper Precambrian) rocks, presumably the Camooweal Dolomite; the Cambrian of the Undilla Basin (Opik 1956) and Lower Palaeozoic of the Boulia area are not included in the confines of his Barkly Basin.

The meaning of the name "Georgina Basin" still leads to much confusion.

To use the term as a drainage basin or as a region seems preferable at this stage than to use it as a sedimentary basin, the true nature and form of which is not known at present. It is not yet clear whether the region of the Georgina drainage basin viz. the Georgina River and its tributaries, contains any sedimentary basin or basins; the region, except for the Camooweal Basin (David 1932) which may represent a shallow basin, may represent a "blanket" of Cambrian and Ordovician sediments deposited on an undulating basement floor, and a thicker sequence of sediments or a sedimentary basin may occur outside the Georgina region, as for example, the Undilla basin (Opik 1956).

Opik was aware of the danger of calling the Georgina drainage area a sedimentary basin, and in 1956 p.3, points out that "the Cambrian deposits of Queensland and Northern Territory are nowhere continuous and form two separate provinces".

Until the results of geophysical work are known and the basement contour underlying the Cambrian and Ordovician sediments is known regionally, it is not considered appropriate here to try to define a Georgina sedimentary basin, but to use the term "Georgina Basin" as referring to the region of the Georgina drainage basin in which is exposed several thousand feet of fossiliferous marine calcareous Cambrian and Ordovician sediments which may have been deposited in one or more sedimentary basins, as some sedimentary basins are already known viz. Camooweal and Undilla Basins.

GEOLOGY Field mapping in 1957 was concentrated on the Boulia Sheet, which had not previously been systematically investigated. Some reconnaissance traverses were made on Glenormiston Sheet (Cottonbush Creek, Mindyalla Creek, Glenormiston Homestead areas) and to the south on Springvale, and to the south-east on Mt. Whelan Sheet to the Mulligan River and Carlo Station.

Dr. Opik, who has been engaged in elucidating the stratigraphy and structure of the Cambrian sediments in N.W. Queensland and eastern Northern Territory since 1948, has made traverses on the Boulia Sheet and his unpublished and published (Opik 1956) papers on the regional and detailed geology of the area have been of great benefit in the present systematic mapping.

The Precambrian rocks were examined mainly for the effect they may have on the distribution and structure of the Palaeozoic and Mesozoic sediments, and as a source of material

for these younger sediments; they do not contain economic minerals in the area under investigation.

The stratigraphy is outlined in Table 1.

TABLE I - STRATIGRAPHY OF BOULIA SHEET

AGE	NAME	THICKNESS (IN FEET)	OUTCROPS	TOPOGRAPHY	LITHOLOGY	STRUCTURAL RELATIONSHIPS	FOSSILS
Quaternary	Soils	Up to 40	Extensive	Good grass lands in most cases	Sand, alluvium, brown loam, black limestone soils.	As mantle over older formations	No
Tertiary	Noranside Limestone (New Name)	30	Burke River near Noranside, Corrie Downs, Fort William.	Forms black soil plains	Limestone, marl, chalcedony.	It overlies Strathelbiss Sandstone and lateritised Cretaceous sediments; it is not affected by lateritisation.	Gastropods
Tertiary-Cretaceous	Strathelbiss Sst. (New Name)	50	Lower part Burke R. Two Rivers, Strathelbiss, Badalia Stn.	Forms pebbly residual plains.	Sandstone, conglomerate, sandy siltstone.	Overlies lateritised Mindyalla Formation.	Fossil wood
Lower Cretaceous	Momedah Formation (New Name)	100	Between Black Mt. and Hamilton R., west of Black Mt.; on Burnham Stn.	Forms up to 100 ft. high mesas and low lateritised scrubby hills in north of sheet.	Siltstone, probably radiolarite, sandy siltstone.	Is silicified and lateritised; unconformably overlies Precambrian and conformably overlies Wilgunya Formation.	Radiolaria, gastropods.
	Mindyalla Formation (New Name)	90	De Little Ra., & between Wills Ck. and west border of sheet.	Forms 70' high mesas and low lateritised rises near Aldenby and Stockport.	Siltstone and sandy siltstone. Top normally silicified.	Overlain disconformably by Strathelbiss Sst. and overlies Longsight Sst.	Radiolaria, gastropods.
	Wilgunya Formation (incl. Toolebuc Member) (New Name)	640	East side of Hamilton River and south towards Springvale; in the Pathunjra area and at head of Momedah Creek.	Forms 199' mesas with ferruginous ironstone slopes and grassy plains at base.	Blue clay, sst., glauconitic sst., calcareous sst. (with concretions), siltstone, gypsum.	Overlies the Datchet Formation; it is lateritised at top. This formation includes what was mapped earlier as the "Pathunjra Shale".	Pelecypods, gastropods, foraminifera, fish scales and vertebrates
	Longsight Sandstone (New Name)	100	From Herrods Tank south to Stockport Stn.	Forms ferruginised rubble plains or as prominent bench below overlying siltstone formations.	Sandstone, conglomerate, sandy siltstone.	Unconformably overlies dolomite of Ninmaroo Limestone; overlain by Mindyalla Formation.	Pelecypods, gastropods, foraminifera, plants.
	Datchett Formation (New Name)	80	Datchet Downs, Burnham Stn., east side Black Mt., head of Momedah Ck.	Low pebble rise, very scrubby.	Sandstone, conglomerate.	Unconformably overlies Ninmaroo Limestone, overlain by Wilgunya Formation.	-
Post Lower Ordovician	Digby Peaks, Breccia. (New Name)	50	Digby Peaks, small outliers near Swift Hills.	Prominent capped mesas	Silicified breccia of mainly chert fragments.	Overlies Ordovician Swift Beds. It is silicified and lateritised and is an exceptional occurrence of the normally less than 5 ft. thick breccia cap overlying Swift Beds.	-
Lower Ordovician	Swift Beds (New Name)	60	Swift Hill, Digby Peaks, west side of Black Mt.	Hills protected by silicified cap of chert breccia which is normally less than 5 ft. thick.	Silicified siltstone, chert, sandstone, silicified calcarenite.	Conformably overlies Ninmaroo Limestone; capped by a "subsoil" breccia of which Digby Peaks Breccia is a particular case.	Trilobites, brachiopods, nautiloids.
	Ninmaroo Limestone (Whitehouse 1936)	2,000	Digby Peaks, Signal Hill, Cottonbush Ck., Alderby, Black Mt. (E & W side), Mt. Ninmaroo, Mt. Datson.	Hills and benches spinifex covered; forms sink holes and rough clay soils.	Calcarenite, intraformational breccia, calcilutite, dolomite.	Overlain by Swift Beds or by Mesozoic formations; underlain by Upper Cambrian limestones.	Nautiloids, brachiopods, crinoids, gastropods riberoids,
Upper Cambrian	"Black Mt. Core" of Ninmaroo Limestone.	1,000'	Core of Black Mt., Mt. Ninmaroo, Mt. Datson.	As lower hills surrounded by high hills of Ninmaroo Limestone.	Calcarenite and calcilutite.	Forms part of Ninmaroo Limestone, and lithologically it is almost impossible to map it separately.	Agnostid trilobites, brachiopods.
	Chatsworth Limestone (New Name)	600	Near Chatsworth Stn.; outcrop near head of Momedah Ck. may later be given separate name.	Low spinifex covered hills and benches.	Calcarenite, calcilutite, marl.	Conformably overlies the "Pomegranate Limestone" and probably passes into the Black Mt. core above.	Trilobites, brachiopods.
	Wills Creek Formation (New Name)	40	De Little Ra., and south of Buckingham Downs.	Lateritised rises and at base of Cretaceous hills.	Shale, chert, sandstone.	Overlies "Pomegranate Limestone" and is unconformably overlain by Cretaceous sediments. It is possible that this shale is equivalent to the Swift Beds.	-
	"Pomegranate Limestone". (Opik 1956) (Georgina Limestone Whitehouse 1931).	50 (probably 500 in bores)	De Little Ra., near Rocky Tank and in bores on Buckingham Downs.	Low turkey-bush rises or black soil plains.	Calcarenite, calcilutite, chert nodules.	Underlain Wells River Shale or Cretaceous sediments; base not exposed but on Duchess Sheet it overlies Selwyn Limestone.	Agnostid trilobites. Brachiopods.
Middle Cambrian, Lower Cambrian and Precambrian rocks.							

Formations separated by _____ are older or younger units.

Formations that are not separated by lines are regarded as contemporaneous or partly equivalent to each other. See table 2 for further relationships.

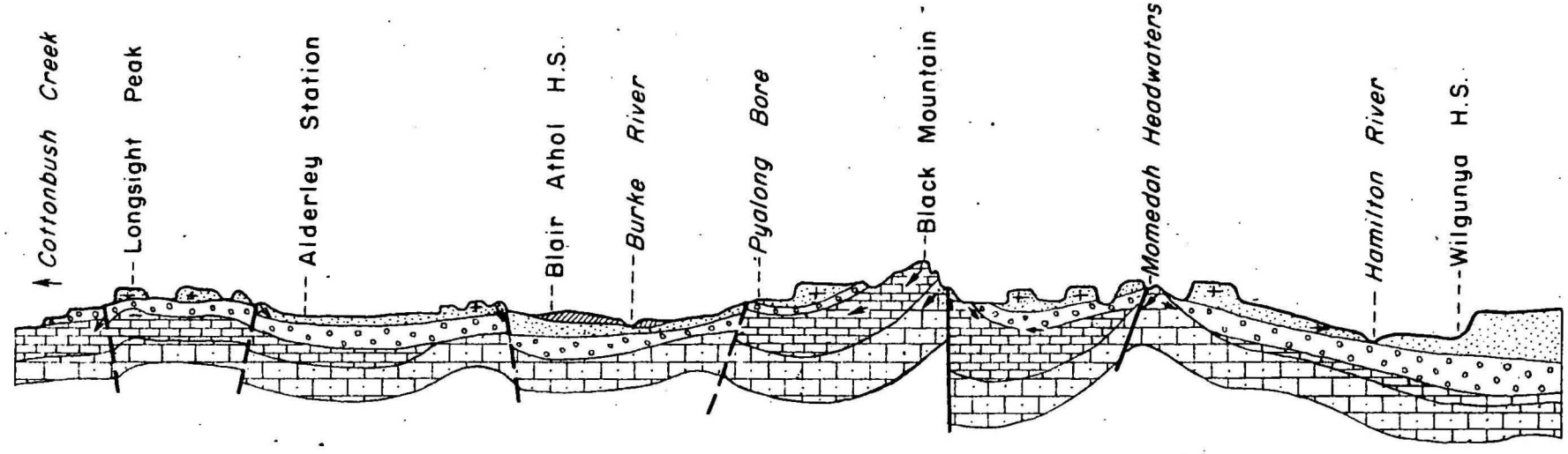
Correlation:

Table 2 shows the correlation of units in the Boulia area with those of other areas in, and forming the margin of, the Great Artesian Basin.

TABLE 2 - CORRELATION OF MESOZOIC AND PALAEOZOIC UNITS N.W. QUEENSLAND

AGE	BOULIA	SELWYN R. DUCHESS	GLENORMISTON and QUITA CK.	GREAT ARTESIAN BASIN
Cretaceous	Strathelbis Sandstone			Winton ?Formation
	Mindyalla Formation / Wilgunga Formation / Momedah Formation	Undifferentiated	Mindyalla Formation	Tambo Formation / Roma Formation
	Longsight Sst. / Toolebuc Member / Datchett Formation		Longsight Sst.	Blythsdale Formation
Lower Ordovician	Swift Beds	Swift Beds		
		Ninmaroo Limestone	Ninmaroo Limestone	
Upper Cambrian	Black Mt Core / Ninmaroo Limestone / Chatsworth Limestone	Chatsworth Limestone		
	Wills Ck. Formation	O'Hara Shale	Georgina Limestone	
	Pomegranite Limestone	Pomegranite Lst.		No record
			Unexplored	
Upper Middle Cambrian	No record	Selwyn Lst. / Devoncourt Limestone / Roaring Siltstone / ? ? / Inca Form. / Beetle Ck. / Thorntonia Limestone	Steamboat Sandstone / Quita Form. / Blazan Shale / Beetle Ck. / Thorntonia Limestone	
Lower Cambrian	No record	Mt. Birnie Beds	"Sun Hill Sequence"	

The Cambrian of Selwyn Range and Quita Creek areas is in part after Opik (1956).



Section — Diagramatic Only ; not to scale.

- Tertiary sandstone and limestone.
- Cretaceous siltstone and radiolarite
- Cretaceous sandstone and conglomerate.
- Ordovician Ninmaroo limestone.
- Upper Cambrian limestone.

- Shows dip of bed at surface.
- Fault — hade known.
- Fault — hade unknown.

Bureau of Mineral Resources, Geology and Geophysics, Feb. 1958.

Q51-1 F.J.R.

STRUCTURE The main structures in the area are the "Burke River Structures" first recognised by A.A. Öpik in 1954; the structures begin on the southern border of the Cloncurry sheet to the north, and were traced south across Duchess and Boulia sheets to Mt. Datson. Now it is seen to extend south to the Dribbling bore on Boulia sheet and occurs once more on the surface on the Springvale sheet. There, on the Springvale sheet one outcrop (photo interpreted) shows that the structural line is still persisting although in most places it is covered by Mesozoic sediments in this southern area (see map). The "Burke River Structure" at Black Mountain, Mt. Ninmaroo and Mt. Datson is a N.N.W. trending fault, with a downthrow of about 1,000 ft. to the east. At Black Mountain, the upper Cambrian Black Mountain Member west of the fault is brought against Ordovician Ninmaroo Limestone on the east. The beds are folded as well as being faulted, and the dips flatten rapidly as the distance from the fault line is increased.

Other series of parallel structures with N.N.W. trending fault lines and/or asymmetrical anticline axes, occur on the Boulia sheet.

To the east of Black Mountain, near the head of Momedah Creek, a sharp asymmetrical fold (with steep flank on west side) with some minor faulting occurs; it affects both the Cambrian calcareous sequence and the unconformably overlying Cretaceous sediments. The folding and faulting is such as to give a downthrow to the west. Thus between Black Mountain and Momedah is a "graben" which has preserved the Cretaceous sediments overlying Ordovician Ninmaroo Limestone.

West of the Burke River erosion has not dissected the overlying Cretaceous sediments to reveal clearly the pre-Cretaceous structure. But structural trends, parallel to the "Burke River Structure" are visible in the Cretaceous sediments which show dips up to 25° along such lines, compared with subhorizontal dips elsewhere. The direction of movement in this area is down to the east.

A section from W to E across the sheet gives some idea of the effect of the structures:

Some of the faulting and folding is post-Cretaceous, but the main movement has followed the Ordovician deposition and before Cretaceous sedimentation. The Cretaceous sediments were therefore deposited over and against an eroded topography

of folded and faulted Cambrian-Ordovician sediments.

The results of gravity work are required in all areas, particularly where Cretaceous sediments cover older rocks, before the correct displacement of Cambrian-Ordovician sediments along these fault lines is known.

PETROLEUM A sequence of 3,000' plus of upper Cambrian-lower Ordovician fossiliferous marine limestone has been measured. It is probably a continuous sequence without any major unconformities. Cap-rocks exist in the shale-siltstone sequence of Wills Creek Formation (?Cambrian) and Swift Beds (Ordovician). Source rocks occur throughout the sequence in dark grey fossiliferous limestones which give a "smelly" petroliferous odour when split; these are being analysed for residual petroleum by M. Konecki whose analysis of a specimen from the Pomegranate Limestone near Chatsworth Station gave a bituminous content (extractable by toluene) of 0.17% by weight which is equivalent to 13.2 barrels per acre-ft.; the porosity of the sample was 3.95% but the permeability, both horizontal and vertical was nil. Much of the lack of permeability is due to calcite recrystallisation after diagenesis. Suitable structural traps may be found along the line of the "Burke River Structure" or along parallel lines.

RESULTS Important results or additions to the knowledge of the stratigraphy and economic potentials in the Georgina Basin are:

1. Proved thickness of 3,000' plus of lower Palaeozoic fossiliferous marine calcareous sediments with no major unconformity separating the beds;

2. Recognition of beds in the upper Cambrian and lower Ordovician which are "smelly" and which yield residual petroleum on analysis;

3. Recognition of a shale-siltstone sequence in the Cambrian and Ordovician succession which may act as cap-rocks;

4. Proved that the "Burke River Structure" persists as a major structure for over 200 miles in a north-north-west direction and that other parallel similar (though maybe smaller) structures occur;

5. Proved that the conglomerate-sandstone sequence at the base of the Cretaceous forms the main aquifer of the area and that its occurrence in the bed of the Hamilton River makes it one of the most important intake beds for the north-west part of the Great Artesian Basin;

6. Discovered that the Cretaceous fossiliferous marine Toolebuc Member has a greenish-yellow radioactive mineral (probably phosphatic uranium) adhering to the fish scales and this gives the rock a count of 3-4 times background;

7. Discovered (with Dr. Ö̈pik) that the springs in the Mulligan River area, south-west of Boulia, do not mark the edge of the Mesozoic sequence in the Great Artesian Basin but emerge, probably through fractures in the Ordovician sandstone-shale sequence; Mt. Whelan is a high level extinct mud spring of similar origin to the existing springs near the Mulligan River;

8. Proved that the Wilgunya Formation which is equivalent to all or part of the Roma and Tambo Formations grades laterally

to the north-west into a radiolarian siltstone referred to as the Momedah and Mindyalla Formations; the radiolarian siltstone was probably deposited over pre-Mesozoic "highs".

PROBLEMS ON BOULIA SHEET All the surface geology has been covered and more detailed work is not required at the present time.

Gravity results of traverses done in 1957 must be analysed in conjunction with the surface geology, in order that the subsurface relief, particularly with regard to Precambrian basement, may be determined. Only then can a site for a stratigraphic bore be chosen to test the unexposed Cambrian in this part of the Georgina Basin.

Many stratigraphic problems cannot be decided until the palaeontological significance of the fauna already collected is determined. When that is done revision of the interpretation of some of the outcrops may become necessary and more palaeontological collecting may be required.

SUGGESTED FUTURE WORK It is suggested that:-

1. The mapping of the Boulia sheet be continued to the west on to the Glenormiston sheet and attention be directed to Cambrian - Ordovician sediments in this area. Problems will involve (a) Tracing the change of lithology of the Middle Cambrian Steamboat Sandstone on Urandangi sheet to a limestone in the south which is lower Upper Cambrian in age. (b) Distinguishing and mapping the dolomite sequence in the Ordovician Ninmaroo Limestone from the dolomite of the Upper Proterozoic Camooweal Dolomite which continues south from Urandangi and which is overlapped by the Ninmaroo Limestone.

2. The Sun Hill Upper Proterozoic sequence be mapped to determine its structural relationship to the Upper Cambrian sediments surrounding it.

3. The deepest part of the Georgina Basin, near the Toko Range area, be mapped and that this mapping be continued to the south where the gibber plains blanket further exposures, e.g. to the Carlo Springs area on the Mulligan River.

4. The east-west contact exposed west of Glenormiston between Upper Cambrian limestone (Georgina Limestone) dipping 60° and dolomitic beds probably of the Ninmaroo Limestone sequence, be investigated to give a structural relationship between these units.

5. That the continuation of the "Burke River Structure" to the south on Springvale sheet be investigated.

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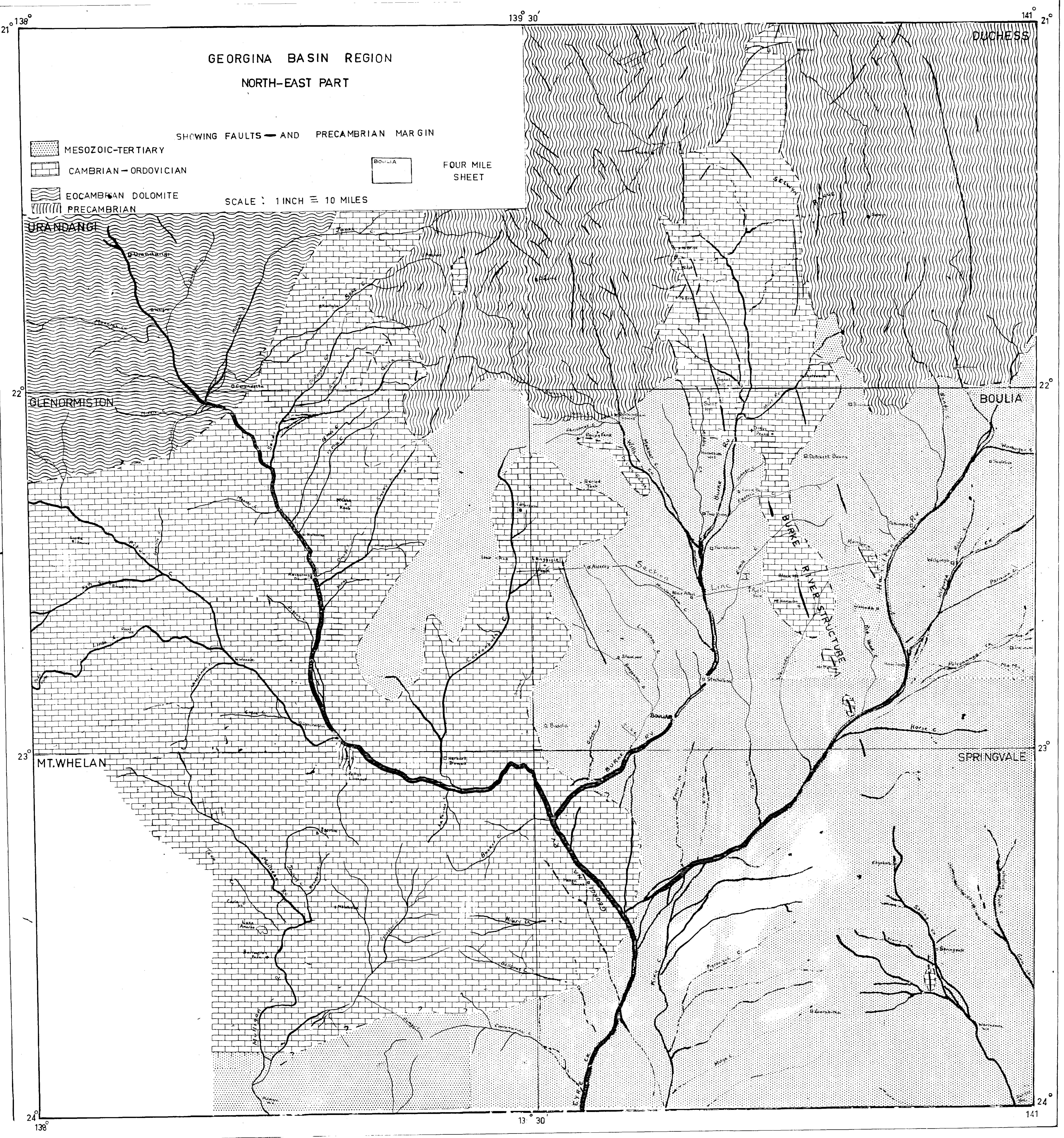
GEORGINA BASIN REGION
NORTH-EAST PART
SHOWING FAULTS — AND PRECAMBRIAN MARGIN
MESOZOIC-TERTIARY
CAMBRIAN – ORDOVICIAN
EOCAMBRIAN DOLOMITE
PRECAMBRIAN
BOULIA
FOUR MILE SHEET
SCALE : 1 INCH = 10 MILES
138°
139° 30′
141°
21°
22°
23°
24°
URANDANGI
GLENORMISTON
MT.WHELAN
DUCHESS
BOULIA
SPRINGVALE
SELWYN RANGE
BURKE RIVER STRUCTURE
BURKE RY
GEORGINA
EYRE CK
Mulligan R.
Horse C
King C
Muga C
Pigeongah C
Spring Ck
Bellevue C
Milary Ck
Sylvester C
Herbert Downs
Glenormiston
Urandangi
Carandotta
Selwyn
Springvale
Section Line