COMMONWEALTH OF AUSTRALIA.

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**DEPARTMENT OF NATIONAL DEVELOPMENT.**

# BUREAU OF MINERAL RESOURCES GEOLOGY AND GEOPHYSICS.

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**RECORDS.**

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1962/173

Notes on Field Trip 1962

by

M.A. CONDON

# LOCALITY MAP

200 0 200 400
MILES

114° 120° 126° 132° 138°

12° 20° 28° 36°

DARWIN
DALY R.
KATHERINE
DALY RIVER
VICTORIA RIVER DOWNS HS
DALY WATERS HS
BASIN
GEORGINA
BRUNETTE DOWNS HS
MT DRUMMOND
Frewena HS
TENNANT CREEK
BARKLY HIGHWAY
MT ISA
N.T.
QLD.
FITZROY RIVER
GRANT RA
Fitzroy Crossing
FITZROY
POOLE RANGE
BASIN
CANNING BASIN
CAR-NARVON BASIN
W. A.
MT LIEBIG
HERMANNSBURG
ALICE SPRINGS
Mbas
Aroyonga Miss HENBURY
LAKE AMADEUS
RODINGA
AMADEUS BASIN
S. A.
PERTH
Woolmulla
Jurien
BASIN
PERTH
ADELAIDE

1:250,000 map series
Highways
Non-prospective areas

Bureau of Mineral Resources, Geology and Geophysics. August, 1963.

To accompany Records 1962/173

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# NOTES ON FIELD TRIP 1962

by

M.A. CONDON

Records 1962/173

In August and September, 1962 in company with Mr. J.N. Casey, I travelled to Perth, Fitzroy Crossing, Darwin, Tennant Creek and Alice Springs in order to visit subsidised operations, a contract seismic party, Bureau geological and seismic parties and Bureau resident geologists.

These notes record some of the observations made and ideas discussed at the various places visited.

## PERTH BASIN

### Jurien No. 1.

The basal granitic sands were being drilled.

No permeable zones had been found in the Triassic and Permian so no testing was contemplated.

Cores in the Permian sequence show joints sealed by calcite: this suggests some prospect of the developing of fracture porosity in non-calcareous formations and would justify testing of any shows of hydrocarbon or lost circulation zones even where intergranular porosity is not indicated by cores or logs.

A well-equipped logging unit was operating in conjunction with Wapet's well-site geologist. Equipment includes a gas-recorder, porosity-permeability equipment, microscopes, a typewriter including lithogical symbols for direct typing of the graphic lithogical log, and a small printer.

Insufficient information is available at present clearly to indicate the regional sedimentary environments of the Beagle Ridge area in the Permian and Triassic. However, the absence of the Permian glacial sediments suggests that the area was high enough topographically to prevent deposition of those sediments during the Sakmarian. Artinskian sediments on the east side of the Ridge (at B.M.R. 10A and Jurien 1) are moderately deep marine or terrestrial and the only shallow marine unit (the sandstone roughly equivalent to the High Cliff Sandstone of the Irwin River area) is

cemented by calcite and therefore of low porosity and permeability. The Triassic, also, consists mainly of moderately deep-water marine sediments.

If, as seems possible, the open sea was to the west of Beagle Ridge, an area of high wave and current energy is likely along the western flank of the ridge. In such an area, clean sandstones may be deposited in the same parts of the sequence as cemented or silty sandstone or sandy siltstone in more protected areas. The only place where the west flank is available on land is near the coast south-west of Jurien 1, and the Beagle Ridge cannot be regarded as adequately tested until this flank is drilled.

Calcite-sealed fractures in Artinskian silty fine-grained sandstone suggest the possibility of fracture reservoirs in this rock in areas where the fractures have not been filled. Much more information on the structure and tectonics of this region would be required to indicate where these may be, except that they are likely to be found in areas of strong structural curvature, such as may occur along the Beagle Hinge (or "Fault").

Hill River No. 3 (Structure Hole)

Shallow bores were being drilled in the area of the Hill River structure in order to establish the near-surface formation in the several fault blocks, since there is no distinctive seismic reflection event that can be correlated with certainty across faults.

In the course of this drilling, the nature of the Jurassic sequence in this area is being established. Previously, only poorly exposed and deeply weathered outcrops were availab.e

The Wapet well-site geologist runs the electric log which is a Widco unit mounted in a Land Rover.

Woolmulla Seismic Survey.

The G.S.I. crew's operations were inspected.

Reflections were being obtained except where the traverse crossed fault zones. The use of variable area sections, produced in the field, facilitates assessment of the usefulness of the records.

Wapet's older magnetic records were being converted, in this crew's recording truck, to tape that can be used by the field playback equipment. This has resulted in improved records from, for example, the Cape Range area.

FITZROY BASIN

Poole Range Seismic Survey.

The C.G.G. crew's operations were inspected: at the time of the visit refraction surveys were being undertaken, to map deep refractors.

The progress results were examined in order to decide on the second part of the seismic programme.

Experimental reflection seismic surveys had been carried out along a north-south line over the crest and north flank of the surface structure. Records were poor even when very large patterns of shot holes and geophones were used.

Refraction shooting established several refractors with velocities increasing downwards to a probable basement velocity.

Shooting was aimed at following the deeper refractors and this was accomplished.

The north-south profile across the surface anticline showed a broad anticline generally conformable with the surface structure down to the 17,000 ft/sec. refractor (at about 18,000 feet depth). The "basement" refractor on the other hand is generally synclinal but somewhat irregular. Large, down to south, faults were encountered at each end of the line and refractors had not been established beyond the faults.

Closure on the 17,000 ft/sec refractor is of the order of 1500 to 3000 feet compared with about 1,000 feet in the outcropping Permian.

Although the results established that the Poole Range anticline continues to a depth of about 18,000 feet they show no evidence of any

large unconformity within the sedimentary sequence. Therefore, it is considered that the prospective formations (Lower Carboniferous, Devonian and Ordovician) are unlikely to be significantly less deep than in Grant Range. It follows that no stratigraphic target is available within 10,000 feet of the surface.

The following programme was recommended:

1. Continue refraction shooting along the established line to north and to south to establish refractors beyond the fault.
2. Continue the southward profile to the large positive gravity anomaly to determine if the anomaly has structural significance.
3. If the anomaly area has anticlinal structure carry out additional surveys (possibly by reflection shooting) to outline the structure.
4. Continue the profile across the Fenton Hinge.
5. If no anticlinal structure is found at the gravity anomaly and if time allows run a refraction line parallel to the established line and to the east to determine if additional structural elevation is present.

The absence of reflections in the central area of the structure established as sensibly unfaulted by the refraction survey, may be caused by multiple small faults (such as are known in outcrop), by strongly developed open jointing, or by both.

Significant joint porosity and permeability is not indicated by available logging techniques. It is quite essential in drilling such structures for the well site geologist to examine cores and cuttings for evidence of open fractures and for the drillers to pay particular attention to mud losses, as relatively small mud loss not related to the porosity of the rocks as shown in cuttings may be the only evidence available of porous zones. Where such mud losses are accompanied by oil flourescence or oil staining in the cuttings or by gas shows in the mud, testing should be undertaken even despite the absence of any clear indication of porosity or of hydrocarbons in the logs.

DALY RIVER N.T.

On the flight from Victoria River Downs to Darwin the Upper Proterozoic sediments of the Victoria River Basin are very well seen.

Northward from Victoria River Downs the sediments have a very gentle regional north dip and the sequence in ascending order appears to be: about 400 feet of sandstone, about 200 feet of calcareous sediments, about 200 feet of lutites, about 100 feet of sandstone and 300 feet of calcareous shale. This upper 300 feet appears to grade northwards into an interbedded lime-silt-sand sequence dipping gently south.

About 25 miles south of the Daly River a major fault trending about 100° separates the Victoria River Basin sediments (downthrown to south) from strongly folded (?Agicondian) sedimentary rocks with abundant dykes and a large quartz reef parallel to the fault and north of it. This fault is not shown on the Tectonic Map.

BARKLY BASIN N.T.

The black soil plains of the Brunette Downs area make impossible any complete assessment of the geology of the region until adequate subsurface information is available.

However, there are some areas where small parts of the sequence are exposed or strike ridges and pseudo dip-slopes are preserved. In the northern part of the Brunette Downs sheet lateritized asymmetric ridges suggest an east-west anticline with axis passing close to Wendy Bore.

In quarries along the Barkly Highway westward from east of Frewena, sections of "Detrital laterite" are seen. East of Frewena, 2 to 6 feet of ironstone gravel consisting of pebbles ½" to 2" of pisolitic limonite with a minor amount of red quartz sand overlies fluvialite quartz sand with pebbles of quartz and sedimentary rocks. The upper one to two feet is recemented by limonite. West of Frewena the detrital ironstone gravel includes fragments of sediments and low grade metamorphic rocks, the proportion of which increases westward.

AMADEUS BASIN

Lake Amadeus Sheet

In the centre and south flank of Dead Horse Anticline several new observations were made.

The Bitter Springs Limestone is exposed in a straight section without the usual contortions. In the upper part of the exposed sequence are thick beds of clean porous quartz sandstone which grade laterally into small algal reefs.

The Areyonga Formation outcrops and is well exposed in a few places. Varved siltstone/fine sandstone was observed near the top of the exposed sequence.

On the north-western end of the anticline limestone overlying the Bitter Springs and Areyonga with strong angular unconformity includes beds with a strong kerosene odor.

The sequence conformably below the Pacoota Sandstone includes hematitic siltstone (of iron-formation type). This may grade into iron ore else here in the basin.

On the Henbury Sheet, near Areyonga Mission, the shale of the Pertatataka was seen to be green in unweathered exposure not chocolate brown as usually observed.

South of the road between Areyonga and Hermannsburg at Katapata Gap the fault between the Bitter Springs Limestone (to the south-west) and the Pertnjara Formation was examined. It is very well exposed: Pertnjara sandstone is overturned synclinally, cleavage in the fault breccia zone (30 yards wide) dips 70° south-west. This is interpreted as confirming that the fault is a steep reversed fault which may be the surface outcrop of the low angle thrust located by the B.M.R. seismic traverse in this area.

On the Hermannsburg Sheet the Ellerys Creek type localities were re-visited.

Varved siltstone/fine sandstone were observed in the Areyonga Formation.

A low angle thrust was seen in the Heavitree Quartzite at Ellerys Big Hole. This thrust dips north at about 15°.

On the Alice Springs sheet the section at Ooraminna Anticline was examined. Deep weathering has altered the character of the carbonates near the bottom of the exposed section so that in the upper parts of the cliff exposures they appear as sandstone. The leaching out of material is evident in the vughy texture of the sandstone -- holes as large as several grains are common, and the packing of the sand grains is very irregular. Followed down to the river bed they are identified in fresh exposure as sandy carbonates some still with the surface appearance of sandstones.

At Loves Creek the Pertatataka equivalent is seen to include a thick sandstone in the lower part and a thick carbonate member in the upper part. Shale of lithology similar to that in the Pertatataka overlies the Arumbera Greywacke. The Pertaoorta equivalent is here dominantly carbonate (Joklik's Ross River Group). The Pacoota is very thin and is overlain unconformably by a formation, about 100 feet thick, of greywacke and siltstone which grades up into the Mereenie Sandstone.