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1967/95

A RECONNAISSANCE OF THE ASHMORE REEF

by

R.G. Dodson

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 It may not be published in any form or used in a company prospectus without the permission in writing of the Director, Bureau of Mineral Resources, Geology and Geophysics.

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PLATE

Ashmore reef and locality map

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SUMMARY

A brief visit was made to Cartier Island and the islands of Ashmore Reef in January 1967. The voyage was made in the minesweeper, H.M.A.S. Teal. All the islands visited are of similar composition; they are of accumulated shell and coral debris, locally loosely cemented to form calcarenite. Phosphate derived from guano is distributed patchily on the islands of Ashmore Reef.

A single specimen of compact flaggy limestone was discovered on West Island and boulders of porphyritic rock were found on Middle and East Islands of the Ashmore Reef. These rocks may have been brought to the Ashmore Reef by man.

INTRODUCTION

In January 1967 the writer made a brief visit to Cartier Island and the main islands of the Ashmore Reef, situated over 500 miles west from Darwin. The voyage was made in the minesweeper H.M.A.S. Teal by arrangement with the Royal Australian Navy. At both Cartier and Ashmore Reef, H.M.A.S. Teal was anchored in deep water, visits to the islands being made in a dinghy equipped with an outboard motor.

The voyage took one week, allowing only brief visits to Cartier Island and "West", "Middle" and "East" Islands of the Ashmore Reef.

PREVIOUS GEOLOGICAL WORK

During a survey of possible sources of phosphate on the islands off the northern coast of Australia, McQueen (1958) made a brief survey of a number of off-shore islands, including Cartier and the islands of the Ashmore Reef. Prospecting pits were dug and material sampled for phosphate analysis on West, Middle, and East Islands, of Ashmore Reef. McQueen noted that the islands are composed of shell debris with patchy deposits of guano. He concluded that the phosphate deposits are too thin to be exploited economically. His report contains numerous determinations of P_2O_5 content and an estimate of resources of phosphatic sand. Taube (1964) made a survey of the off-shore areas of North-West Australia; he described the superficial geology of several islands, including those of Cartier and Ashmore Reef. The report includes an appendix "Notes on Reefs and Islands Visited" by Captain T. Milner. Aero Service Ltd

(1964) made a magnetic survey of the north-west continental shelf of Australia for Woodside (Lakes Entrance) Oil Co. N.L.

GEOLOGY

CARTIER ISLAND is a roughly oval-shaped island less than eight feet above mean sea level. It is composed of pale fawn calcareous sand, made up of shell and coral fragments. On the southern side of the island, cemented shell and coral debris forms an outcrop of what appears to be solid rock but is actually soft, friable, loosely-cemented sand, covered by fine marine growth. The cemented sands exhibit slight banding of alternating coarse and fine texture and many are cross-bedded. The shell and coral fragments in the rock are relatable to present-day shells and coral scattered about the island.

The consolidated sediments dip gently to the south (10° - 15°); their orientation was apparently controlled by the beach slopes over which they were laid.

ASHMORE REEF (see Plate)

West Island is roughly oval shaped, and has an east-west long axis. It is a flat, low-lying island, supporting a patchy growth of shrubs and weeds. The island is inhabited by large numbers of birds. An automatic weather station is in operation on the island.

The island is made up of shell and coral debris with thin local patches of phosphate derived from guano. In places along the shore line the shelly sands are cemented to form soft, incohesive calcarenite. The rocks dip at between 5° and 10° away from the island; the dips apparently reflect the shoreline slope over which the sediments were deposited. The centre of West Island is patchily covered with guano deposits, which yield values of up to 21% P_2O_5 (McQueen, 1958).

During a visit to West Island, Lieutenant Commander Eagen, Commanding Officer of H.M.A.S. Teal, who accompanied the writer ashore, discovered a slab of fine-textured, compact, fissile limestone. The rock was found at the westerly tip of the island in a few inches of water. A later visit was made to the island during low tide but despite a careful search no further specimens of similar rock were found. The rock may have been introduced to the island

by human agency - either during the building of the automatic weather station or by Indonesian fishermen who visit the Ashmore Reef each year. Alternatively the rock, about eighteen inches long, may have been derived from a nearby source and was washed up on the shore by wave action.

Pumice is scattered about the island and along the shoreline.

A shallow well on West Island provides fresh water. If the need for a further supply of fresh water arose during a temporary settlement of the island, further wells could be dug but care should be exercised not to pass through what is clearly a perched water table, into underlying sea water.

Middle Island is an oval-shaped island, slightly longer in a north-westerly direction than in other directions. It is composed of shell and coral debris similar to that which forms Cartier Island and West Island.

Two specimens of porphyritic volcanic rock less than eight inches long were discovered on the island. The rocks were found around a disused fire place, presumably made in the past by Indonesian fishermen. The origin of the volcanic rock is obscure; either it was brought to the island, in fishing vessels as ballast or for use around a fire place, or it is derived from a nearby submarine source. Numerous marine birds nest on the island.

East Island is roughly oval-shaped, with the long axis north-west. The island is composed essentially of shell and coral debris similar to the sediments of the other islands. Locally the shell and coral debris is loosely cemented. Patchy deposits of guano cover parts of the island and on the western shore line a crust of fairly compact pale grey calcium phosphate rock has been formed by reaction between the guano and the calcareous sands. In the centre of the island thin layers of soil are composed of fine grains of calcium phosphate, organic matter derived from vegetation and, possibly, a small quantity of wind-blown sediment. Three specimens of porphyritic volcanic rock similar to those found on Middle Island were discovered on East Island. These rocks, too, were found around a disused fire place.

The island supports a sparse cover of weeds. A single coconut palm grows in the centre of East Island. Numerous marine birds inhabit the island.

A shallow well near the coconut palm tree yields fresh water at a depth of just over four feet.

Five samples of lime sand from the islands of Ashmore Reef were bulked together as a composite sample, and analysed by the N.T. Mines Branch chemist. The results were:

CaO	51%
MgO	2.2%
SiO ₂	0.1%
Fe ₂ O ₃ + Al ₂ O ₃	0.1%
CO ₂	45%
H ₂ O	0.5%
Total	<hr/> 98.9%

This is a high quality lime sand, suitable for making lime or cement.

CONCLUSIONS

Cartier and Ashmore are coral reefs in the Timor Sea. The islands protruding from the reefs are composed of heaped accumulations of shell and coral debris derived from presently available shells and coral scattered about the reef. On the shore lines the sediments are patchily compacted to form shelly limestone or calcarenite.

The discovery of the specimen of compact flaggy limestone on the beach at the western extremity of West Island is worth further investigation, possibly in the form of drilling by portable drill. The results of a magnetic survey by Aero Service Ltd (1964) indicate that Ashmore Reef and Cartier Island are situated over basement "highs", that form ridge-like features at depth parallel to major physical elements such as Timor Island.

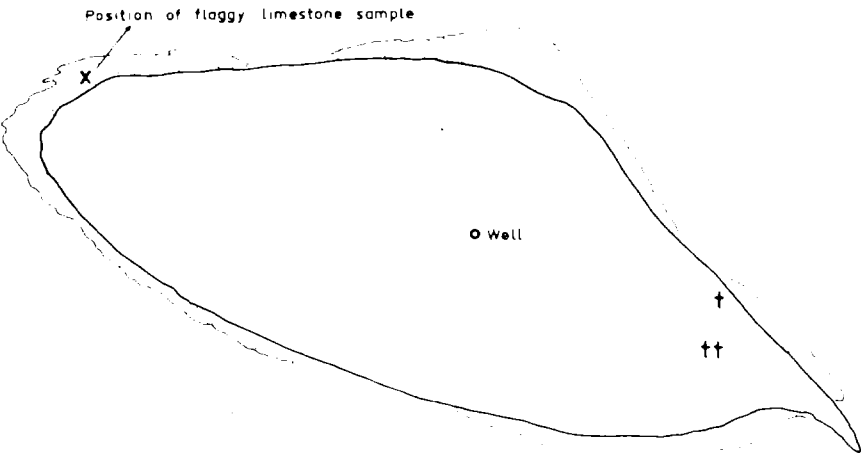
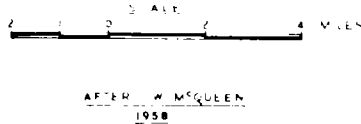
Taube (1964) provided a description of the marine conditions around the islands. Oil drilling equipment could probably be landed by flat-bottomed barges during high tide.

Deposits of high-quality lime sands occur on the reefs.

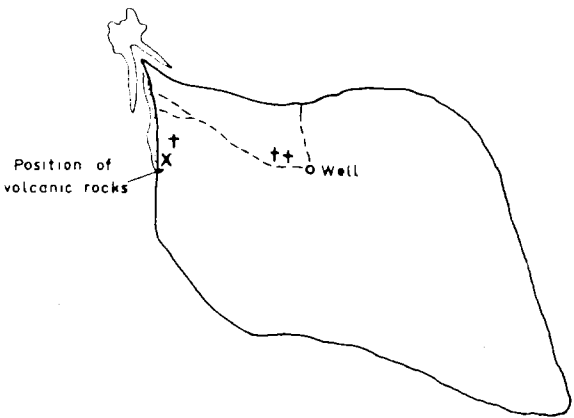
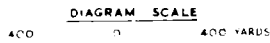
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- TAUBE, A., 1964 - Australian North-Western Offshore Areas reconnaissance and submarine sampling report. Burmah Oil Company of Australia Ltd.

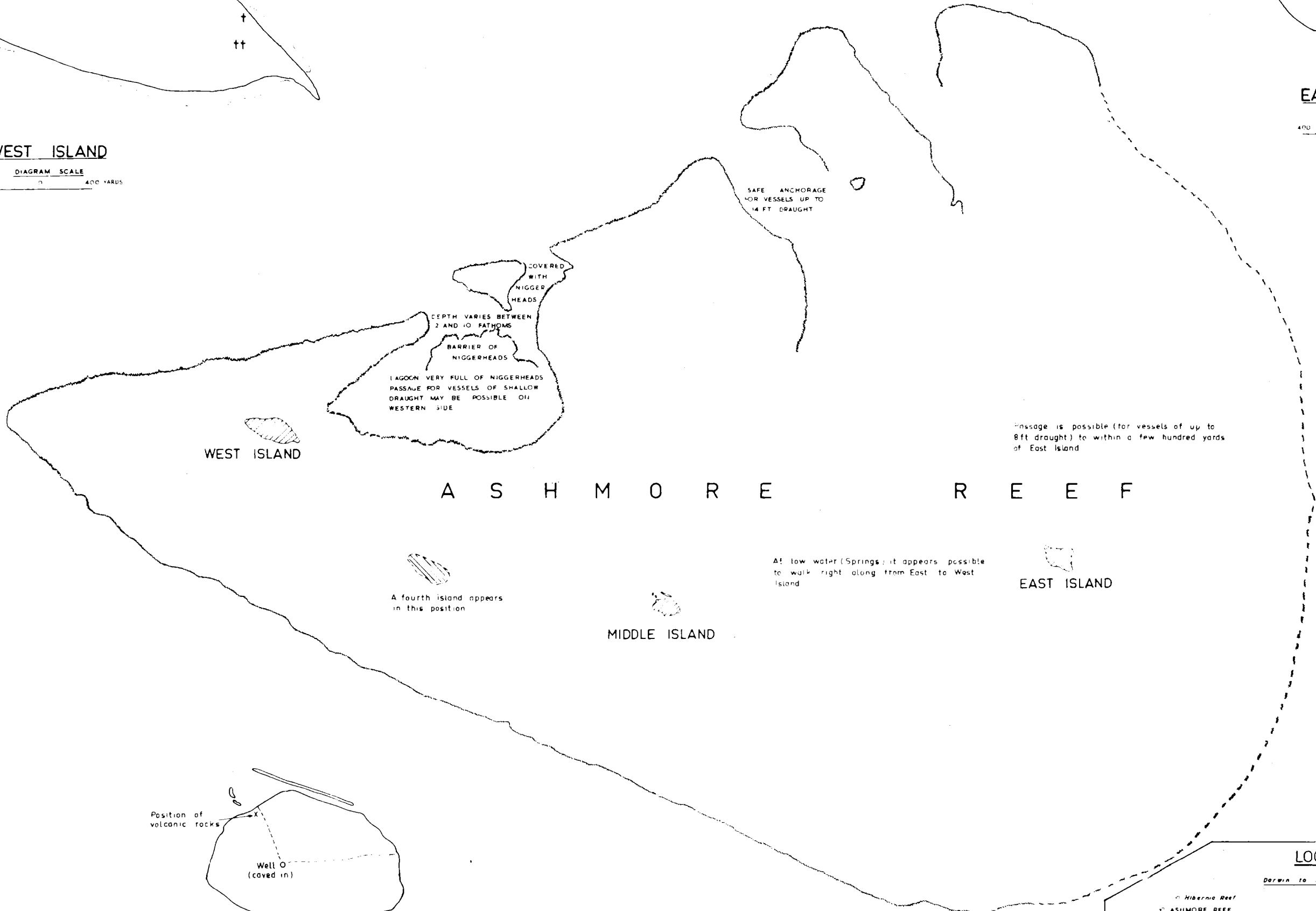
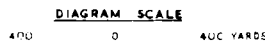
ASHMORE REEF
SHOWING ENCLOSED ISLANDS



WEST ISLAND

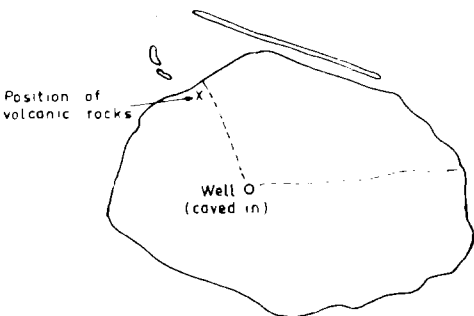


EAST ISLAND

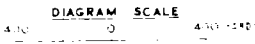


REFERENCE

- Reef position accurate
- Reef position doubtful
- Vegetated shelly island
- Non vegetated, low shelly bank
- Calcarene
- Well
- Grave
- Track



MIDDLE ISLAND



LOCALITY MAP

