COMMONWEALTH OF AUSTRALIA.

DEPARTMENT OF NATIONAL DEVELOPMENT.

BUREAU OF MINERAL RESOURCES GEOLOGY AND GEOPHYSICS.

RECORDS:

1963/134

EXPLANATORY NOTES ON THE WESSEL ISLANDS - TRUANT ISLAND 1:250,000 GEOLOGICAL SERIES SHEET SC 53 - 15/16.

Compiled by

K.A. Plumb

EXPLANATORY NOTES ON THE WESSEL ISLANDS - TRUANT ISLAND
1:250,000 GEOLOGICAL SERIES SHEET SC 53 - 15/16.

Compiled by

K.A. Plumb

RECORDS 1963/134

CONTENTS

Contents (cont.)

Explanatory Notes on the Wessel Islands - Truant Island Geological Sheet

Compiled by

K.A. Plumb

The Wessel Islands - Truant Island 1:250,000 Geological Sheet area lies within the Arnhem Land Aboriginal Reserve. It includes the Wessel Islands 1:250,000 Sheet area and the western third of the Truant Island 1:250,000 Sheet area of the Australian National Grid. It lies between latitudes 11°00'S and 12°00'S and longitudes 135°00'E and 137°00E and contains the Wessel, Cunningham and most of the English Companys groups of islands.

There are no settlements on the Sheet area, although Elcho Island Mission Station is only two miles south of the southern Sheet border. Access to the area is by sea and air; a disused airstrip occurs at the northern tip of Marchinbar Island and airstrips are maintained at Elcho Island Mission; a weekly air service from Darwin calls at the Mission. A vehicle track runs along Elcho Island and connects with the Mission which is six road miles south of the Sheet border.

The average annual rainfall on the Sheet area is about 50 inches, most of which occurs during the summer months from December to April under the influence of the north-west monsoon; only scattered light showers fall during the "dry" season. The average daily maximum and minimum temperatures are 90°F and 84°F during November and 81°F and 70°F during July.

Maps and air photographs covering the Sheet area and available during the course of the survey were; air photographs at a scale of 1:50,000 flown by the Royal Australian Air Force in 1950 and 1952; uncontrolled photomosaics of Wessel Islands - Western Extension and Wessel Islands - Eastern Extension at a scale of approximately 4 miles to 1 inch; and topographic maps of Wessel Islands and Truant Island Sheet areas, at a scale of 1:250,000, prepared by the Royal Australian Survey Corps from controlled, photo-scale, slotted template assemblies. The geological map was compiled, using the 1:250,000 maps as a base, from an assembly of photo-overlays reduced to 1:250,000 scale.

Previous Investigations

Geological observations were made on the Sheet area by Matthew Flinders in 1803 and by King in 1818 whilst charting the coastline of Australia (Flinders, 1814; King, 1826). A paper describing geological features of the North Australian coast, including the Sheet area, was read before the Geological Society of London in 1825 by William Fitton; he obtained specimens and information from Flinders and King; the paper appears as an appendix in King (1826). Cadell (1868) made further observations whilst surveying the coast. Brown (1908) and Jensen (1914) made fairly detailed studies of some of the sections exposed on the Sheet area and Wade (1924) visited the area when assessing the petroleum prospects of North Australia.

Bauxite was discovered on Marchinbar Island and Truant Island in 1949; as a result Owen visited Marchinbar Island in 1951 (Owen, 1954) and, in 1952, Puckey and Richardson, of the British Aluminium Co. Ltd., tested the deposits and studied surrounding areas (Puckey and Richardson, 1952).

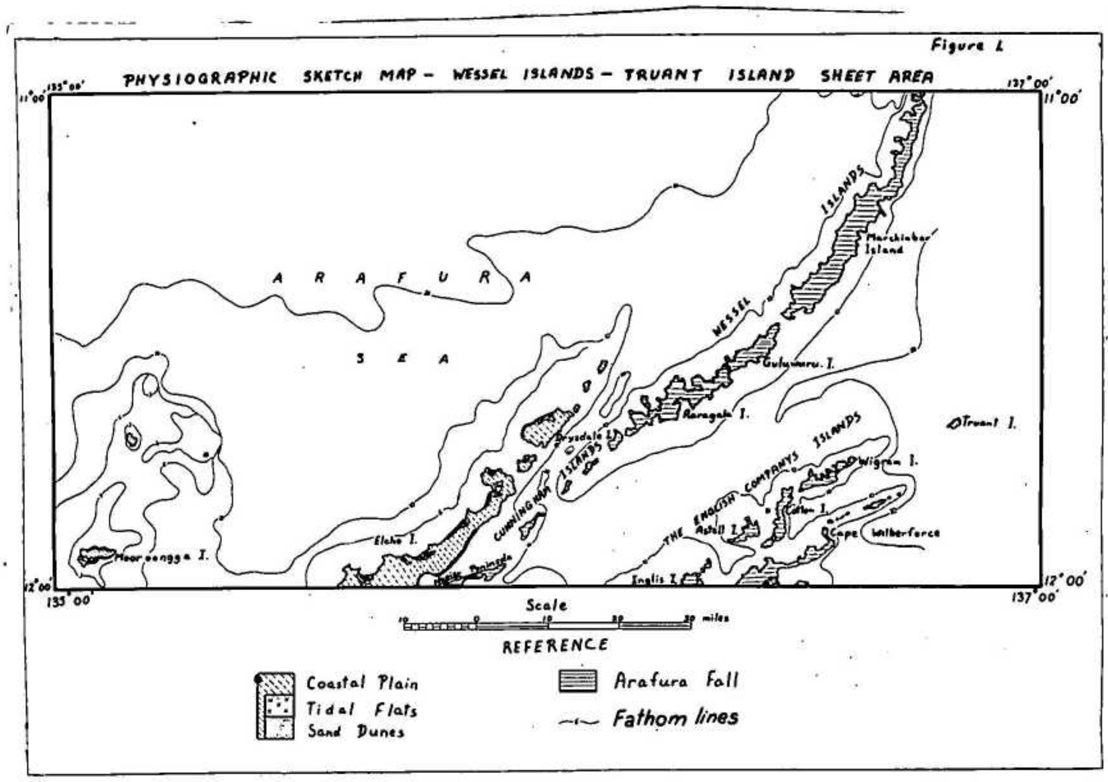
These notes, and the geological map which they accompany, are based on a survey of Arnhem Land carried out during 1962 by geologists of the Bureau of Mineral Resources.

PHYSIOGRAPHY

The physiography of the Wessel Islands - Truant Island Sheet area is the result of the Pleistocene(?) submergence of an ancient topography. At the present time, the land is undergoing slight emergence.

The submarine topography of the Sheet area has very little relief. Available bathymetric information shows a maximum depth of greater than 20 fathoms.

Remnants of two of the major physiographic divisions of Arnhem Land, the Arafura Fall and the Coastal Plain (Roberts & Dunn, in prep.), can be recognised on the Sheet area (Figure 1). Within the Coastal Plain, Tidal Flats and Sand Dunes can be differentiated



The Arafura Fall, on the mainland, is defined as the dissected, hilly country in which the streams drain into the Arafura Sea. On the Sheet area it is represented by the Wessel Islands, The English Companys Islands, and the mainland in the vicinity of Cape Wilberforce. The topography, is controlled by differential erosion of the bed-rock. In the English Companys Islands, the Cape Wilberforce area of the mainland, arcuate lines of hogback ridges and cuestas protrude from the sea. These are formed by resistant beds of the Malay Road Group. Cliffs, up to 230 feet high, occur on the south-east coasts, but the north-west coast slope gradually down to sea-level. Most of the islands rise to about 250 feet above sea level, but Cotton Island ranges up to 420 feet.

The Wessel and Cunningham Islands, and Napier Peninsula, have a cuesta cross-section; the resistant Marchinbar Sandstone dips at about 3° to the north-west. Elevations range up to 330 feet on Marchinbar Island, but the average is only about 150 feet; the cliffs on the south-east coast are generally about 50 feet high.

The Coastal Plain, on the mainland, is the area of low relief bordering the coast. Remnants on the Sheet area are represented by the Elcho-Drysdale line of islands, Mooroongga Island, and Truant Island. Most of the islands are almost flat; the elevation at the centre is usually only about 60 feet, and the islands are almost invariably bounded by a small cliff about 20 to 30 feet high, produced by wave erosion of the soft laterite. Extensive wave-cut platforms have developed, on which ferruginous material is being deposited within the tidal zone. In places, such as the south-western end of Elcho Island, scarps and hills up to 70 feet high are present.

The Tidal Flats occupy depressions on the coast and represent emerged lagoons. They are filled with deposits of fine sand, silt, and evaporites, and are subjected to seasonal and tidal inundation.

Sand Dunes occur in two main forms. The most prominent are emerged off-shore bars, probably modified by recent wind action, which now form barriers enclosing the seaward edge of the Tidal Flats. In many places lines of parallel ridges occur, probably representing successive shore lines formed during emergence.

The second type are normal beach deposits built up by wave and wind action at sea level; many of these deposits contain abundant shell material. Raised beaches are represented by cemented, shelly, dune deposits occurring up to forty feet above sea level.

STRATIGRAPHY

The oldest rocks exposed in the area, the Wilberforce Beds, are regarded as Lower Proterozoic in age. They are unconformably overlain by the Upper (?) Proterozoic Malay Road Group, which is about 5,000 feet thick. This is intruded by a dolerite sill, and is unconformably overlain by the Cambrian (?) Wessel Group, about 4,600 feet thick. A thin cover of Lower Cretaceous sediments, the Mullaman Beds, unconformably overlie the older rocks. Large parts of the area are covered by Cainozoic laterites, soils, and sand.

The stratigraphy of the Sheet area is summarised in Table 1. The thicknesses given are approximate, as they are based only on visual estimates and from measurements and the incomplete nature of the sections increases the possible margin of error.

PRECAMBRIAN

LOWER (?) PROTEROZOIC

Only the uppermost strata of the poorly resistant Wilberforce Beds are exposed on the Sheet area. In the Arnhem Bay - Gove area (Dunnet, 1963) they are inferred to be about 5000 feet thick, but, there also, only the top 200 feet of section is exposed. The exposed part of the unit comprises interbedded flaggy black shale (which may be slightly dolomitic), micaceous shale, and fine sandstone. The Beds are unconformably overlain by the Malay Road Group; the unconformity is well exposed in the cliff section south-west of Cape Wilberforce.

UPPER (?) PROTEROZOIC

Malay Road Group. Owing to the similarity in lithology, and general order of superposition of the rocks, the Malay Road Group is tentatively correlated with the Roper Group, which is exposed in the Blue Mud Bay - Port Langdon area (Plumb and Roberts, 1963) and in the Mount Marumba area (Roberts and Plumb, 1963). The sections are not identical, however, and the lack of exposure makes overall correlation of the succession difficult. The stratigraphic succession of the Malay Road Group is incompletely known as large sections occur only beneath the sea.

The basal unit, the Mallison Sandstone,* crops out well, and is very uniform in lithology. The unit consists of pink

* The Mallison Sandstone is misnamed 'Mallison Formation' on Plate 1.

and brown, fine to medium-grained quartz sandstone with cross-bedding and regular jointing.

Only part of the Wigram Formation is exposed. On Arnhem Bay - Gove Sheet area (Dunnet, 1963) the base of the unit is a flaggy to fissile, greenish-grey, fine-grained sandstone. The lowest bed exposed on the Wessel Islands - Tennant Island Sheet area is a distinctive flaggy, probably dolomitic, black shale, which crops out in the base of the cliffs on Cotton Island. This is overlain by about 100 feet of flaggy grey and red shales, fine sandstone, and micaceous shales, with two 10 foot interbeds of blocky, buff, medium-grained quartz sandstone. These strata are overlain by blocky and massive, pale grey, fine-grained sandstone, and again by fissile, micaceous, fine sandstones and siltstones, and flaggy quartz sandstones.

The contact with the overlying Pobassoo Formation is gradational. No marker beds occur in the Formation, which consists, on the whole, of an interbedded sequence of micaceous and glauconitic siltstones, sandstones, and quartz greywackes; the dominant purple to red colour, and the abundance of mica, are characteristic, as is the occurrence of flaggy fine-grained sandstones with abundant, well-developed, slump structures. Laminated, green, glauconitic sandstones occur at the top of the Formation.

The Astell Sandstone is uniform in lithology in the small area exposed, but is difficult to distinguish from the overlying Buckingham Bay Sandstone.

A sill of massive Dolerite intrudes the black shale beds of the Wigram Formation. It is generally concordant but does cross-cut stratigraphic horizons in places.

PALAEOZOIC

CAMBRIAN(?)

Brown (1908) and Jensen (1914) placed the rocks of the north coast of Arnhem Land in the "Permocarboniferous", while Wade (1924) regarded rocks on Elcho Island (Elcho Island Formation) as being either Lower Cambrian or Precambrian in age.

Rocks of the Wessel Group are at present regarded as being of Cambrian age because of the presence of Scolithus ("pipe-rock") in the lower beds (Fig.2); the unconformity at the base of the sequence; and the lithological similarity of the lower units to the Cambrian Bukalara Sandstone and Cox Formation of the Limmen Bight River district in the southern part of the

Carpentaria Province (Dunn, Smith and Roberts, in prep.).

The Wessel Group was deposited in the Arafura Basin (Roberts & Dunn, in prep.). The north-easternmost exposures of the rocks of the Basin occur in the Wessel Islands - Truant Island Sheet area. The Group has been divided into four formations.

Only the lower part of the Buckingham Bay Sandstone is exposed on the Sheet area. The base is a cross-bedded, medium grained quartz sandstone (with a basal conglomerate in places), and is overlain by alternating blocky to massive reddish-brown fine sandstone, white quartz sandstone, and purple-brown quartz greywacke, which weathers into large rounded boulders. On Arnhem Bay - Gove Sheet area the upper half of the unit (not exposed on Wessel Islands - Truant Island Sheet area) consists of cross-bedded, white, quartz sandstone. 'Pipe-rock' accurs in the lower part of the unit (Figure 2).

Figure 2: Medium grained quartz sandstone ("pipe-rock") of the Buckingham Bay Sandstone showing vertical tubes formed by burrowing organisms - Scolithus?.

Most of the overlying Raiwalla Shale is not exposed on the Sheet area, being beneath the sea. Scattered outcrops on the Arnhem Bay - Gove Sheet area show it to be a succession of fissile grey, green, and purple shales and flaggy fine grained sandstones. Outcrops are poor. Figure 3 shows an exposure of the units on Napier Peninsula.

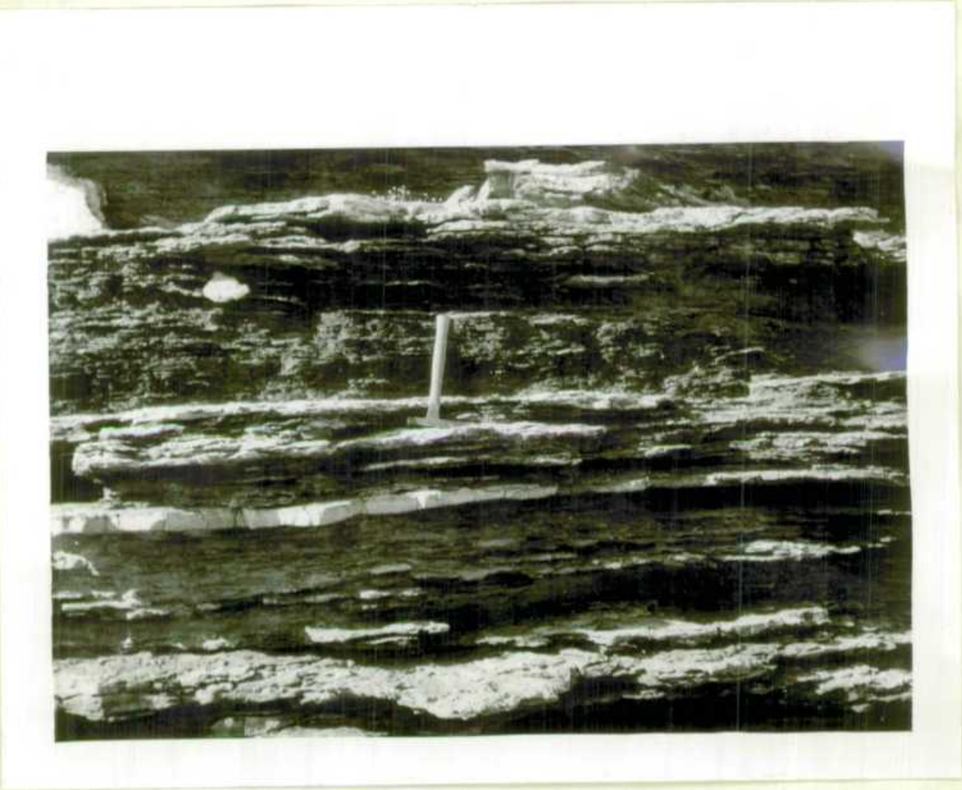


Figure 3: Strata near the top of the Raiwalla Shale, Napier Peninsula.

The lower half of the Marchinbar Sandstone consists of thinly bedded quartz sandstone with abundant ripple marks. The upper half is thicker bedded. Shale bands occur but rarely crop out.

The Elcho Island Formation crops out very poorly; it has been extensively lateritised and fresh outcrops (figure 4) are found only on wave cut platforms, below the laterite profile. The best exposures are found in cliff sections at Elcho Island Mission Station, just to the south of the Sheet area. Here the base consists of 50 feet of flaggy and blocky, dark brown, fine grained ferruginous sandstone overlain by 50 feet of interbedded flaggy, green-grey, slightly micaceous glauconitic fine sandstone and fissile, green, micaceous sandstone and shale. This is overlain by a blocky ferruginous sandstone. A discontinuous section occurs along the coast to the north, grading up into flaggy, interbedded, leached dolomitic siltstone and chert, with abundant slump structures and lenses of slumped chert breccia. These are the highest beds exposed (figure 4). Wade (1924) reported bitumen in the beds near Elcho Island Mission.

Figure 4: Dolomitic siltstone, chert and chert breccia of the Elcho Island Formation on the north coast of Elcho Island overlain by ferricrete (dark outcrops along shoreline).

MESOZOIC

LOWER CRETACEOUS

Scattered small erosional remnants of the Mullaman Beds occur on the mainland area to the south-west of Cape Wilberforce. The basal bed is a massive, black manganiferous quartz sandstone; this is overlain by highly leached, massive siltstone occurring within the pallid zone of a laterite profile.

CAINOZOIC

Laterite: A laterite profile, about 30 feet thick, has developed on the Elcho Island Formation, and small outcrops of laterite, formed on Lower Cretaceous rocks, occur in the Cape Wilberforce area. The laterite is probably of Tertiary age but there is no definite evidence of age.

On the western side of Elcho Island the exposed profile is about 20 feet thick. A pallid zone of white clay grades up through a poorly defined mottled zone to the upper zone, which consists of a reddish-purple ferruginous loam. In places this profile is overlain by 2 to 3 feet of dark brown pisolitic ironstone; it is not known whether this band is part of the weathering profile or belongs to a later period of iron precipitation. The profile on the eastern side of the island, and extending onto Marchinbar Island, is more complete; the lower limit however is controlled by the top of the Marchinbar Sandstone, which is not lateritised. The most complete profile observed was on Nyugamiringora Island, where the parent rock is micaceous shale and fine sandstone. The pallid zone, about 8 feet thick, consists of white clay with small fragments of sandstone; at the top the clay becomes mottled. This is overlain by a 2 feet thick band of fragmented ferruginised shale. Overlying this is a ferruginous concretionary zone, 8 feet thick, made up of tubular laterite. The tubes are subvertical and consist of reddish-purple hematite with abundant sand grains set in a yellow-brown matrix. The tubular zone is overlain by 4 feet of brown pisolitic ironstone, identical to that in the previous profile; the boundary between the two zones is very sharp and even.

In places the tubular zone sits directly on Marchinbar Sandstone and, in two areas (Marchinbar Island and the eastern coast of Elcho Island) the tubular zone is overlain by pisolitic bauxite. The Marchinbar bauxite has red pisolites set in a light brown matrix. The pisolites on Elcho Island are orange in colour and very little matrix is present; the bauxite is quite friable. On Marchinbar Island pisolitic bauxite up to 16 feet thick has been found.

Ferruginous material is at present being deposited within the tidal zone of the beaches and on wave-cut platforms; in areas of shallow water extensive reefs of the material occur. The deposits are topographically below the level of the laterite profile and sit directly on fresh bed-rock (Fig. 4).

The best exposure observed shows three distinct layers. The base is a ferruginous conglomerate or breccia, with fragments of the bed-rock set in a matrix of spongy ferruginous material. This is overlain by up to 10 feet of "mottled ferricrete", consisting of spherical hematitic nodules, up to ½ inch in diameter, in a yellow-brown matrix. The top of the sequence is a band, about 2 feet thick, of brown pisolitic ironstone, very similar in appearance to that capping the laterite profile.

TABLE 1.

STRATIGRAPHIC TABLE - WESSEL ISLANDS - TRUANT ISLANDS SHEET AREA

ERA	AGE	ROCK UNIT AND MAP SYMBOL	MAXIMUM THICKNESS IN FEET *	LITHOLOGY	TOPOGRAPHY	DISTRIBUTION	REMARKS
CAINOZOIC	QUATERNARY	(Qa)	-	Alluvium	Bordering streams	South-west of Cape Wilberforce	
		(Qa)	-	Coastal alluvial deposits. Unconsolidated fine sand, silt and evaporites.	Tidal flats, behind sand dune barriers.	Elcho-Drysdale Islands; Crocodile Islands, south-west of Cape Wilberforce.	Represent emerged lagoons. Subject to seasonal and tidal inundation. Generally formed behind sand dune barriers.
	Undifferentiated	(Czs)	-	Sand dunes, cemented calcarenite dunes.		Bordering shorelines throughout area	Calcarenite dunes and sand dunes distinct in mode of occurrence.
		(Czs)	-	Sand, residual soil	Areas of low relief and plateau surfaces.	Widespread	
		(Czl)	10 (Ferruginous zone)	Laterite, lateritic soil, cemented ferruginous detritus.	Areas of low relief; plateau cappings; wave-cut platforms.		Laterite profile up to 30 feet thick developed on variety of rocks. Cemented ferruginous detritus deposited on wave-cut platforms within tidal zone. Bauxite deposits associated with laterite profile.
				UNCONFORMITY			
MESOZOIC	LOWER CRETACEOUS	Mullaman Beds (Klm)	20 (No top exposed)	Massive leached siltstone; claystone massive, black, manganiferous sandstone.	Small mesas; cliffs along coast.	Mainland area south-west of Cape Wilberforce.	Sandstone forms base. Siltstone usually crops out within pallid zone of laterite profile.
				UNCONFORMITY			
PALAEOZOIC	CAMBRIAN(?) WESSEL GROUP	Elcho Island Formation (Ꞓe)	500+ (No top exposed)	Interbedded, flaggy, green-grey, slightly micaceous glauconitic fine sandstone and fissile green micaceous sandstone and shale; flaggy and blocky dark brown, fine ferruginous sandstone; pink, fine quartz sandstone; flaggy, leached, dolomitic siltstones and chert; chert breccia.	Crops out poorly in cliffs and wave-cut platforms.	Elcho and Drysdale Islands.	Ripple marks and cross-bedding in sandstones. Slumping in dolomitic siltstone. Chert breccia discontinuous - small slump deposits. Ferruginous sandstone at base, dolomitic siltstone highest observed unit. Outcrops discontinuous. Section not complete.
		Marchinbar Sandstone (Ꞓm)	800	Massive outcrops thinly bedded medium quartz sandstone; blocky to massive fine quartz sandstone. Cross-bedded and ripple-marked. Minor sericitic shale.	Resistant unit. Crops out as line of cuestas - Wessel Islands.	Elcho-Drysdale Islands. Napier Peninsula to Wessel Islands.	Thin bedded sandstone, strongly ripple-marked, in lower half of unit, massive fine sandstone, strongly cross-bedded at top. Shales rarely crop out.
		Raiwalla Shale (Ꞓr)	1800 Only top 150	Fissile, interlaminated grey dolomitic(?) shale and fine white sandstone quartz sandstone; fissile purple-brown shale. Mud cracks, ripple-marks.	Soft unit. Crops out in cliffs below Marchinbar Sandstone along coast.	Napier Peninsula and Wessel Islands.	Most of unit beneath sea on Sheet area. Mud cracks in shale; ripple marks in 2 inch lenticular quartz sandstone interbeds. Distinctive lithology.

ERA	AGE		ROCK UNIT AND MAP SYMBOL	MAXIMUM THICKNESS IN FEET *	LITHOLOGY	TOPOGRAPHY	DISTRIBUTION	REMARKS
PALAEOZOIC	CAMBRIAN (?)	WESSEL GROUP	Buckingham Bay Sandstone (Ꞓk)	1500	Alternating, blocky to massive, reddish-brown, fine sandstone and white, medium quartz sandstone; purple brown quartz greywacke; conglomerate. "Pipe-Rock". Cross-bedding.	Crops out on back-slopes of islands. Resistant unit.	Northern edge of the English Companys Islands.	Section incomplete; only basal 200 to 300 exposed. Cross-bedded quartz sandstone forms base. Basal conglomerate in places.
					UNCONFORMITY			
PRECAMBRIAN	UPPER PROTEROZOIC (?)		(Bdl)	-	Massive dolerite. Porphyritic and vesicular in places.	Crops out at waters edge at base of cliffs.	The English Companys Islands.	Sill intrudes Wigram Formation.
		Malay Road Group	Astell Sandstone (Baa)	600+ No top exposed	Cross-bedded, white medium quartz sandstone.	Crops out well. Resistant unit; forms cuesta section.	Astell Islands.	Only base of unit exposed. Difficult to distinguish from Buckingham Bay.
			Pobassoo Formation (Bap)	1600	Flaggy to fissile, red to purple and green, micaceous siltstone and quartz greywacke; cross-bedded, flaggy, white, medium micaceous sandstone; flaggy buff to light grey, fine sandstone with abundant slumping; laminated green glauconitic sandstone.	Forms capping to back slopes of large ridges. Moderately resistant.	The English Companys Islands	Characterized by dominance of purple and red micaceous sediments and slump structures. Section incomplete; no outcrop between Cotton and Astell Islands.
			Wigram Formation (Baw)	2000 Only top 300 exposed	Flaggy black shale; blocky to massive; pale grey, fine grained sandstone; fissile, dark green to grey, shale and flaggy fine sandstone; blocky, buff quartz sandstone; flaggy, grey and purple, micaceous siltstones and quartz greywacke.	Crops out poorly. Only exposed in coastal cliffs beneath more resistant rocks.		Black shale (probably dolomitic) and pale grey, fine sandstone are characteristic. Blocky buff quartz sandstone forms prominent outcrops. Contact with Pobassoo Formation gradational.
	(?)		Mallison Sandstone (Bam)	900	Massive, pink and pale purple-brown, fine to medium-grained, quartz sandstone.	Crops out well as prominent cuestas.	Bromby Islands, Cape Wilberforce, and mainland to south-west	Very uniform lithology. Unconformably overlies Wilberforce Beds.
					UNCONFORMITY			
	LOWER (?) PROTEROZOIC		Wilberforce Beds (Bwi)	5000' + Only top 200 exposed	Flaggy black shale; flaggy micaceous shale and fine sandstone.	Crops out only in coastal cliffs beneath capping of Mallison Sandstone.	Cape Wilberforce and Bromby Islands.	Only top of unit exposed Bulk of unit is covered by lateritized Lower Cretaceous rocks.

* NOTE: No Measured sections available. All thicknesses are approximate and based on estimates from maps.

Soils. Much of the Sheet area is now covered by residual soil, sand, and alluvium. They are discussed in Table 1 and in the physiography of the Coastal Plain.

STRUCTURE

The structure of the Wessel Islands - Truant Island Sheet area is very simple. The Proterozoic rocks of The English Companys Islands have a prevailing, uniform dip of 5° to 6° to the north-north-west. One fault has been observed on the Sheet area, just to the south of Cape Wilberforce. It strikes north-west and is a wrench fault showing left lateral displacement. The extension of this fault has caused a flexure, without any fault displacement, of the beds on Cotton Island. The strike of the beds changes from east-north-east to north and dips steepen to up to 10°west. A similar flexure can be seen on the mainland area to the south of Pobassoo Island.

The Cambrian(?) rocks are undeformed and show a uniform dip of about $1\frac{1}{2}^{\circ}$ to 3° to the north-west, probably reflecting the original sedimentary dip within the Arafura Basin, which occupies most of the Sheet area. The Lower Cretaceous rocks are horizontal.

GEOLOGICAL HISTORY

Following deposition of the Wilberforce Beds they were uplifted and eroded. Further subsidence followed and a succession of alternating sandstones and siltstones, the Malay Road Group, was deposited on a subsiding shelf; rapid subsidence at times resulted in extensive deposits of micaceous greywacke and siltstone. This was followed by intrusion of a dolerite sill and subsequently by minor faulting and folding, with associated uplift and erosion.

During the Cambrian(?) the Arafura Basin developed in the northern part of Arnhem Land and the Wessel Group, a succession of sandstones, quartz greywacke, carbonates and shales, was deposited in a dominantly shallow sea on a subsiding shelf.

During the remainder of the Palaeozoic and the lower part of the Mesozoic the area was very stable, with only slight epeirogenic uplift and erosion.

A marine transgression during the Lower Cretaceous resulted in deposition of the Mullaman Beds on a stable shelf.

Following regression of the sea, slight erosion occurred and at some later period, probably during the Tertiary, widespread lateritisation of the exposed rocks took place.

Subsequent epeirogenic uplift during the Cainozoic resulted in erosion and dissection of the earlier laterite plain. A rise in sea level, probably during the Pleistocene resulted in the DROWNING ~~draining~~ of low-lying coastal areas. Subsequent slight emergence of the land is probably proceeding at the present time.

ECONOMIC GEOLOGY

Bauxite

The first reference to bauxite in the Northern Territory was made by Brown (1908) when he described a siliceous pisolitic laterite from Coburg Peninsula, near the western border of Arnhem Land. This report drew the attention of Owen (1954) to the Arnhem Land coast, while engaged in an Australia wide survey for bauxite between 1945 and 1952. The Northern Territory Coast Patrol Service was requested to collect pisolitic material from the Arnhem Land coast and in 1949 Captain F.E. Wells and Seaman F.J. Waalkes forwarded specimens, containing between 34.6% and 40.8% available alumina, from Truant Island and the Wessel Islands. Following a reconnaissance visit to the deposits in 1951 by Owen and Wells the Australian Aluminium Production Commission, in 1952, carried out an extensive testing program on the deposits; this was supervised by Puckey and Richardson of the British Aluminium Co. Ltd. While this work was being carried out further extensive deposits were discovered on Gove Peninsula and the Cato Plateau, on the Arnhem Bay - Gove Sheet area. No further work has been done on the Wessel Islands since 1952; later work has been centred on the more extensive deposits on Gove Peninsula.

During the present survey a new occurrence of siliceous bauxite was found on the eastern coast of Elcho Island.

On Marchinbar Island testing has defined seven economic deposits. Owen (1954) gives the following figures: reserves total 8,980,000 tons of proved ore containing between 48.0 and 53.3 per cent Al_2O_3; available alumina ranges between 43.5 and 47.8 per cent and total silica is between 4.1 and 8.8 per cent. In addition there is a further 800,000 tons of indicated ore containing 47.7 per cent Al_2O_3; 42.8 per cent available Al_2O_3 and 6.8 per cent SiO_2. The average depth of bauxite present in the various deposits ranges between 4.5 and 8 feet; the maximum thickness of pisolitic bauxite is 16.5 feet. The largest individual deposit, the Able Deposit, has a reserve of 4,627,000 tons of ore averaging 47.1 per cent of available Al_2O_3 and 4.2 per cent SiO_2.

Chemical analyses show that the bauxite is composed essentially of the tri-hydrate form, $Al(OH)_3$.

The deposit on Truant Island was considered too small to warrant further investigation.

The deposit on Elcho Island consists of orange pisolites with very little matrix material. The pisolitic zone, which is covered by sand dunes inland from the shore, appears to be about 6 feet thick and scattered outcrops have been observed over a distance of about two miles. A single specimen assayed 45.7 per cent total Al_2O_3 but contained 25 per cent SiO_2.

Oil

Wade (1924) reported bitumen occurrences in rocks of the present Elcho Island Formation on Elcho Island. In August 1963 P. Rix (pers. comm.) examined the supposedly bituminous strata but was unable to confirm Wade's report. However numerous flat cokes of pliable bitumen were found along the beaches of the west coast of the Island in positions suggesting that they may have been washed up from the sea under the influence of the north-west monsoon. The source of the bitumen must remain open to conjecture.

The bitumen was first noticed by the Reverend Jennison in 1922; a syndicate was formed to drill on Elcho Island but it ceased operations in 1925 after having drilled one 300 foot hole and a number of shallower holes.

Before the present survey the Arafura Basin was not known as a geologic entity. Its probable Palaeozoic age, its lack of major structural deformation, and the thickness and apparent marine origin of the strata it contains make the Basin worthy of investigation as a potential site of petroleum accumulation.

Water

Surface water on the Sheet area is scarce due to the lack of any extensive drainage system. Small springs occur in places and, on Marchinbar Island, fresh water lagoons have accumulated in coastal depressions where sand dunes have dammed the seaward edge.

BIBLIOGRAPHY

BROWN, H.Y.L., 1908 - Geological Reconnaissance from Van Dieman Gulf to McArthur River by the Government Geologist, 1907. S.Aust. parl. Paper 25.

CADELL, 1868 - Northern Territory exploration, 1867 S.Aust. parl. Paper 178, 1867-68.

DUNN, P.R., SMITH, J.W., and ROBERTS, H.G., in prep. - Geology of the Carpentaria Proterozoic Province, Part I - Roper River - Queensland/Northern Territory Border. Bur.Min.Resour. Aust.Bull.

DUNNET, D., 1963 - Explanatory Notes on the Arnhem Bay - Gove 1:250,000 Geological Series Sheet SD53-3/4 Bur.Min.Resour.Aust. Rec. (in prep.) unpubl.).

FITTON, W.H., 1826 - An account of some Geological Specimens, collected by Captain P.P. King, in his Survey of the Coasts of Australia, and by Robert Brown,Esq., on the Shores of the Gulf of Carpentaria, during the Voyage of Captain Flinders - in King, P. - 1826.

FLINDERS, M., 1814 - A Voyage to Terra Australis (Lond.)

HOSSFELD, P.S., 1954 - Stratigraphy and Structure of the Northern Territory of Australia. Trans.roy.Soc.S.Aust., 77, July.

JENSEN, H.I., 1914 - Geological Report on the Darwin Mining District; McArthur River District; and the Barkly Tableland. Bull.N.Terr.Aust., 10.

KING, P., 1826 - Narrative of a survey of the Intertropical and Western Coasts of Australia. London.

OWEN, H.B., 1954 - Bauxite in Australia. Bur.Min. Resour.Aust. Bull. 24.

PERRY, W.J., 1962 - Report on Photogeology of Arnhem Bay and Wessel Islands. Institut Francais du Petrole. Report AUS/56 (unpubl.).

PLUMB, K.A., and ROBERTS, H.G., 1963 - Explanatory Notes on the Blue Mud Bay - Port Langdon 1:250,000 Geological Series Sheet SD 53 - 7/8 Bur.Min.Resour.Aust. (in prep.) (unpubl.).

PUCKEY, J.V., and RICHARDSON, A.J., 1952 - Report of a survey for Bauxite of Selected Areas in North East Arnhem Land, Northern Territory. N.Terr. Admin. Mines Branch. Rep. J2-4 (unpubl.).

RIX, P., 1963a - Explanatory Notes on the Milingimbi 1:250,000 Geological Series Sheet SD53-2. Bur.Min.Resour.Aust.Rec. 1963/115 (unpubl.).

RIX, P., 1963b - Explanatory Notes on the Junction Bay 1:250,000 Geological Series Sheet SC53-14. Bur.Min.Resour.Aust.Rec. 1963/122 (unpubl.).

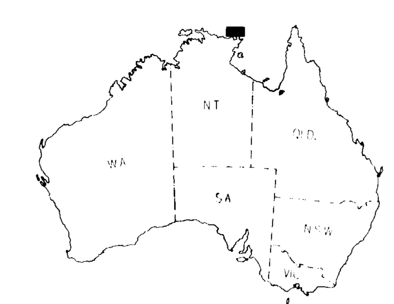
ROBERTS, H.G., and PLUMB, K.A., 1963 - Explanatory Notes on the Mount Marumba 1:250,000 Geological Series Sheet SD 53-6. Bur.Min.Resour. Rec. (in prep.) (unpubl.).

ROBERTS, H.G. and DUNN, P.R., in prep. - Geology of the Carpentaria Proterozoic Province, N.T. - Part II: Arnhem Land. Bur. Min.Resour.Aust. Bull.

WESSEL ISLANDS AND TRUANT ISLAND

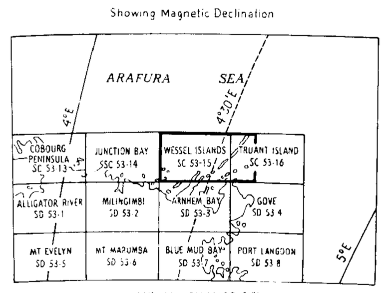
NORTHERN TERRITORY

Compiled and issued by the Bureau of Mineral Resources, Geology and Geophysics, Department of National Development. Topographic base compiled by Royal Australian Survey Corps. Aerial photography by the Royal Australian Air Force; complete vertical coverage at 1:50,000 scale. Transverse Mercator Projection.

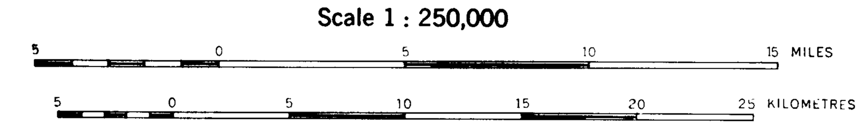


INDEX TO ADJOINING SHEETS

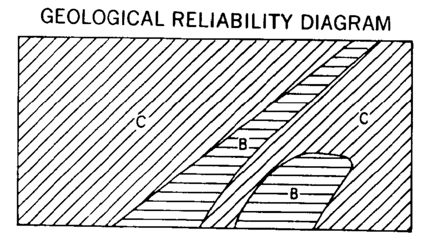
Showing Magnetic Declination



Scale 1 : 250,000



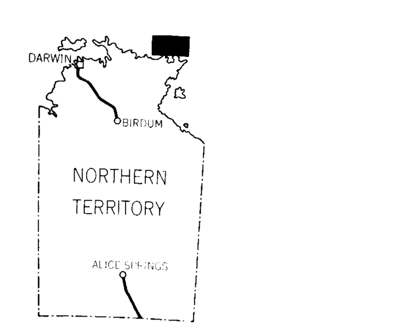
GEOLOGICAL RELIABILITY DIAGRAM



B - *Reconnaissance - air-photo interpretation, ground and helicopter traverses*

C - *Air-photo interpretation*

Geology, 1962, by: K.A. Plumb, P. Rix, D. Dunnet
Compiled, 1963 by: K.A. Plumb, A.S. Mikolajczak
Drawn by: A.S. Mikolajczak



Section

Scale $\frac{V}{H} = 2$

(Cainozoic sediments omitted from section)