POINT SAMSON - DELAMBRE ISLAND

WESTERN AUSTRALIA 1:50 000 URBAN GEOLOGY SERIES

GEOLOGICAL SURVEY OF WESTERN AUSTRALIA

SHEET 2356 IV AND PART OF SHEET 2357 III

URBAN GEOLOGY OF THE POINT SAMSON - DELAMBRE ISLAND SHEET

The aim of this Urban Geology survey is to provide information for those concerned with aspects of raw material and water supply, rural, urban, industrial or transport development. The intention is to point out geological factors which may affect planning on a broad, rather than a specific, basis. Detailed site investigations will still be required, but it is hoped that this information will provide a useful framework for such further work.

The major industrial complex in the sheet area is the Cliffs Robe River Iron Associates iron-ore pelletizing and loading establishment at Cape Lambert. Stock grazing is carried out on Mount Welcome station which extends onto the southern portion of the sheet. A small-scale commercial fishing industry is centred on Point Samson. Gravel and sand, mainly for roads, are excavated at numerous points, and aggregate for railway ballast is quarried and crushed at a site near Poverty Well. The main urban area is Wickham townsite, which covers some 1.5 km² and is currently being extended. A minor settlement is established at Point Samson, the settlement of Conack, the original port serving Roebourne, is now abandoned. The total land surface is 281 km² of mainland and 10 km² of islands.

The geology of the Roebourne 1:250 000 sheet, which includes Point Samson and Delambre Island, was mapped previously by Ryan, Kriewaldt, Bock and Horwitz of the Geological Survey of Western Australia in 1962-3 (published 1966). The Point Samson and Delambre Island Sheet was remapped in 1976 by Archer of the Survey. For the mainland section of the sheet, extensive field traverses were carried out on a base-map scale of 1:50 000 using 1971 and 1972 air photographs for minor extrapolation. The offshore islands were mapped entirely by air-photograph interpretation. The Precambrian rock subdivision of the early mappers was used, with minor modification.

PHYSIOGRAPHY

The physiography of the Point Samson and Delambre Island Sheet is broadly divided into the units shown on the inset map. The northern part of the Delambre Island is formed of a low but rugged east-west trending ridge of limestone the remainder of the island is flat-lying to gently undulating. The coastal flats include tidal mangrove swamps and samphire flats, as well as extensive flats of mud and silt which are submerged by exceptionally high tides. The coastal plain is generally flat-lying or of low relief, but includes coastal dunes up to 20 m high. The isolated hills division includes volcanic hills and ranges, steep ridges of banded cherts and a variety of other hilly landforms formed by outcrops of Precambrian rock. The majority of off-shore islands, which have a core of Precambrain rock, are included in this division. The maximum elevation in the sheet area is a little over 100 m.

STRATIGRAPHY

Throughout the mapped area, rocks of Archaean and Proterozoic ages crop out, in places thickly mantled by Quaternary sediments or capped by Tertiary laterite.

PRECAMBRIAN

Archaean

The oldest part of the Archaean succession occurring within the mapped area is a series of **cherts and clastic sediments**, which have undergone some dynamic metamorphism. As a result of their resistance to erosion, the chert horizons of this unit are conspicuous, but they are interbedded with a variety of clastic sedimentary rocks which are generally less well exposed. Cherts are varicoloured, but predominantly white, grey or black, and are finely laminated to massive. Clastic rocks identified include quartzites (commonly schistose), calcareous schists, fuchsite schists, amphibole schists, tuffs, silicified ash and minor dolomitic horizons. Minor quartz veining is common, generally parallel with bedding.

The **basic and intermediate volcanic** unit forms a series of rounded hills in the western part of the Point Samson Sheet area, and higher, craggier hills around, and to the south of, Conack. The predominant rock types are altered basalts, some spilitic, andesites with minor acid volcanic and dolomite horizons also occur. The basalts are dark blue-grey and are composed of augite, hornblende and feldspar; disseminated pyrite is a common accessory. The intermediate volcanics are paler, blue-grey, or green-grey, and have been identified as metamorphosed andesites and dacites. Both the basalts and the intermediate volcanics are cleaved, strongly in places, and minor quartz veining is common. In the Conack area, the volcanic rocks are interbedded with pyroclastic rocks, cherts and minor horizons of clastic sediments. Intrusions of dolerite and gabbro are common, notably in the west of the sheet area. They are typically more massive and less sheared than the enclosing volcanic rocks, but are generally not mappable as distinct dykes or intrusive bodies. An exception is the small ridge of metamorphosed dolerite on the western edge of the sheet, south of Cleaverville. It is a fine- to medium-grained grey rock with scattered microlites and phenocrysts. A small body of dark green, medium- to coarse-grained gabbroic crops out on the southern margin of the sheet, near the Harding River.

The **Cleaverville Formation** forms prominent ridges trending predominantly north to northeast from Point Samson southwestwards through Wickham, and also in the Cleaverville area. A banded iron-formation, it consists mai.ly of very fine-grained cherts, shales and jaspers interlaminated with hematite. Leaching and silicification or iron laminae has produced some massive quartz horizons. Micro- and macro-tectonic effects, and quartz veining are common.

Proterozoic

The **Mount Roe Basalt** unconformably overlies the Archaean succession forming a series of high, dissected hills in the area between Rocky Creek Well and Cape Lambert. The basalt is a hard blue-grey rock composed of plagioclase feldspar and pyroxene with minor sericite, epidote, chlorite, and secondary silica, indicating a low metamorphic grade. It is typically massive and amygdaloidal, commonly containing distinctive stellate clusters of feldspar phenocrysts. Minor horizons of pyroclastic and intermediate volcanic rocks are included.

The **boulder agglomerate** overlying the Mount Roe basalt, north of Mount Ackstell, is composed of rounded pebbles and boulders (up to 15 cm diameter) of granite, jasper, quartz and other Archaean rock types in a basaltic matrix.

Undifferentiated

In the extreme west of the Point Samson sheet, south of Cleaverville, a marked unconformity cuts steeply dipping basic volcanic rocks which are strongly weathered indicating a considerable time-lapse before the deposition of the overlying beds. The unconformity is overlain by a sequence of variably dipping quartzo-feldspathic sediments exhibiting false bedding and features of channel sedimentation. The rocks are predominantly coarse-grained (feldspathic grits, arkoses and quartzites) near the base of sequence but fine upwards into interbedded cherts and shales. Previously considered as Archaean, regional evidence suggests these sediments may be Lower Proterozoic.

Basic intrusive rocks occur south of Cleaverville and southwest of Wickham. They are massive, medium-grained, blue-grey to green-grey altered gabbros. Although they are only known to intrude Archaean rocks they are probably Proterozoic in age.

CAINOZOIC

Tertiary

Remnants of massive **laterite** cap several chert ridges, but most outcrops are too small to be represented at this scale. Typically, it is a massive brown and blue-black (iron- and manganese-stained) rock as in the outcrops northwest of Point Samson and at Cleaverville. However, pisolitic varieties also occur, notably in the two outcrops south of Wickham, where the pisoliths are partially cemented by calcrete.

Quaternary

Calcrete commonly occurs as thin sheets or encrustations around the flanks of hills formed of Precambrian rocks, and underlies other Quaternary sediments in the Coastal Plain (see below). In the mapped area, however, outcrops are too small and scattered to be represented.

The red-brown **silty sand** which forms the widespread 'red soil plains' includes a variety of sediment types in a flood plain environment. The sand is composed of unsorted to poorly sorted, fine to coarse, frosted, angular to sub-rounded quartz grains, and small but significant, quantities of limonite and feldspar. Silt content varies considerably, and minor amounts of clay and gravel are commonly present. Pebbles, cobbles and boulders of adjacent and/or durable bedrock are common, in places completely covering the land surface following erosion of finer material. Nodules and discontinuous sheets of calcrete occur typically one to two metres below surface. The sand is predominantly alluvial, but in part colluvial and elwial. Although dated as Pleistocene, some Holocene reworking of surface material may have occurred locally.

These sub-units of the silty sand have been identified. The **clayey sand** is distinguished by its much higher clay and silt content, and the almost complete absence of coarser sand, gravel or pebbles. It is typically dark brown and has a complete cover of wild grasses as opposed to the predominant patchy spinifex cover on the silty sand. The presence of expanding clay minerals has caused the widespread development of minor crabholes. The clayey sand is presumed to have been deposited by slowly moving or still waters.

Eolian reworking of the silty sand has taken two forms. The inland **dune sand** is a medium-grained, red-brown slightly silty sand occurring as large accumulations on the eastern flanks of prominent outcrops of Precambrian rocks in the Wickham area. The sand is predominantly formed of sub-rounded quartz grains with a few rounded Archaean rock fragments and minor limonite. The dunes are gently rounded, locally dissected by eastward flowing drainage and are generally well vegetated by a variety of shrubs and grasses. The **eolian sand** is a pinkish-brown, slightly silty, quartz sand occurring as small circular or elongate accumulations on a 'floor' of red-brown very silty sand. The 'dunes' are generally less than two metres high and 20 m long, and vary from widely scattered to interfingering. In the latter case, an almost complete cover of eolian sand is common.

These three sub-units have only been mapped where they are sufficiently extensive to be shown at this scale. However, rapid lateral variations in lithology are common on the coastal plain, and in many areas separation of the sub-units is impractical. The silty sand should therefore be considered as commonly containing minor elements of clayey sand and eolian sands. Close to the coast, mixing with coastal sands is also common.

Dune limestone occurs on Delambre Island and in two small outcrops northwest of Wickham. The limestone is a pinkish-buff to pale-brown, fine to medium-grained lithified calcareous sand, commonly exhibiting cross-bedding. It has been correlated with the Tamala Limestone which occurs extensively along the west and south coasts of Western Australia.

Colluvium is widespread on hill slopes in the area, but has only been mapped where it forms a major topographical feature, typically as scree slopes on the flanks of chert ridges. The material is unsorted, ranging from clay particles to angular and subangular boulders of the parent rock-type. The size and quantity of coarse particles decreases away from bedrock outcrop.

Alluvium occurs in all watercourses, ranging in width from less than a metre to 200 metres. The sediments range from silts and silty sands, particularly near present-day sea level, through coarse sands to accumulations of cobbles and boulders which predominate in the higher reaches. The alluvium of the Harding River, east of Common Well, includes reworked Quaternary sediments.

The **quartz sand** occurring in the southeast of the sheet area is pinkish-beige, fine- to medium-grained and subangular to subrounded. It forms a thin, patchy cover fringing the coastal mud flats or flanking 'islands' of Precambrian rock. In the latter case, the sand is noticeably reddie due to mixing with eloval material from the Precambrian rocks. Similarly, the quartz sand close to the southern edge of the sheet shows evidence of mixing with material derived from the red-brown silty sand, and the area of silty sand mapped south of the Harding River is covered, in places, by small accumulations of pinkish-beige quartz sand. The quartz sand contains a few shell fragments and is believed to be a decalcified variety of the younger coastal shell sands.

At and near present-day high tide levels, a **lime-cemented beach conglomerate** occurs at several places along the coast. It consists of angular to subrounded shells and cockade, grit, cobbles and boulders of many rock-types, set in a hard, pale orange-fawn calcareous matrix which tends to deep orange below high water mark.

The Holocene **silty sand** is distinguished from its Pleistocene counterpart by the presence of *Anadara granosa* often in profusion as fragmented or whole shells (see sketch). Other mollusc shells and fragments may occur in smaller numbers. The sand is red-brown and formed of fine to coarse, subangular to subrounded quartz grains. It contains up to ten per cent shell fragments, and commonly contains subangular to subrounded pebbles of Precambrian rock. Silt content varies considerably and in some areas sandy silts predominate. Some surface mixing with coastal calcareous sands is noted. As it occurs on the lower side of a small break in slope, this horizon is probably derived from the Pleistocene silty sand by marine reworking during Holocene times.

Two phases of accumulation of shelly sand along the coast have been identified. The **younger shelly sand** forms the present beaches and the coastal dune system. It is fine-grained on the beaches, becoming fine- to medium-grained and subangular to subrounded in the dunes. The colour varies from white to pale pinkish buff. The sand is formed of shell fragments (up to 70 per cent) with quartz and minor amounts of small Precambrian rock fragments. Whole *Anadara* and other molluscs are common, and massive corals occur on the beaches. The coastal dunes are generally low and gently undulating, but in places have sharper relief and reach elevations of up to 20 m above sea level. Soil development is generally poor and vegetation is patchy. Unvegetated **mobile dunes** have been mapped as a sub-unit southwest of Cape Lambert and in the southeast of the sheet. The **older shelly sand** is lithologically similar to the younger sand, but is distinguished by the partial development of soil, giving rise to an almost complete cover of grasses and shrubs, and by its flat-lying to very gently undulating relief. The sand is buff to pale-brown, fine, or fine- to medium-grained, and subangular to subrounded. Shell content is generally lower than in the younger sand; whole shells are much scarcer, and shell fragments are generally smaller and pitted. The boundary between the older shelly sand and the decalcified (quartz) sand is gradational. Several phases of accumulation of shelly sand can be identified on the Point Samson peninsula, but cannot be separated at this scale. The sands have, therefore, been divided into two broad units, which are correlated with the younger and older shelly sands.

The **mud and silt** unit is currently being deposited within the intertidal zone, and recently in the supratidal zone. Lithologies range from brown and black muds, through grey-brown silts to brown and mottled silty sand, all heavily salt-impregnated. Much of the mud and silt unit of the supratidal zone has a thin surface dusting of wind-blown coastal sand, and colonization by samphire and other halophytes is common. Mangrove thickets are colonizing the ocean margins.

STRUCTURE

The Archaean layered rocks form large complex folds with north-easterly trending axes. A major synclinal axis passes beneath Wickham and Point Samson, and a major anticlinal axis beneath the Big Tree Well area. A minor synclinal axis has been identified on Dixon Island. The Proterozoic basaltic rocks overlie the centre and flanks of the major Archaean anticline.

Minor faulting is common in the sheet area, but the only major dislocation is a north-south trending fault to the west of Poverty Well which has caused a 3 km dextral displacement of both Archaean and Proterozoic rocks.

ECONOMIC GEOLOGY

CLAY

No good-quality clay is known in the area. Small lenses of brick clay may occur in the clayey sand unit southeast of Common Well.

CONSTRUCTION MATERIALS

Two kilometres east-northeast of Poverty Well, basaltic rock is quarried and crushed, formerly for use as ballast on the Paruaweniia–Cape Lambert railway, and latterly, for a variety of applications.

A small quarry has been excavated in quartzo-feldspathic sediments 3 km south of Port Robinson, to provide stone for the construction of a nearby causeway.

Numerous shallow excavations for 'gravel' for road surfacing have been opened in or close to the foot of colluvium slopes. Pisolitic laterite for road construction has been extracted from a small pit 4 km south of Wickham. Shelly sand for fill has been obtained from pits near Poverty Well, Cape Lambert and Point Samson.

GOLD

In 1900, several pits sunk into a quartz reef 2 km southwest of Big Tree Well yielded 0.30 kg of gold from 7.5 t of ore. The reef is probably an extension of the one exploited at the Lydia mine, 2 km to the west-southwest (on the adjacent Nickol Bay/Legender Sheet).

IRON

Banded iron-formation and ferruginous chert of the Cleaverville Formation are not known to contain any deposits which could be commercially exploited under present conditions.

LIMESTONE AND LIMESAND

Mineral leases for limestone and limesand cover most of Delambre Island but no production has taken place to date. Reserves of high-grade limestone have been estimated at about 8 Mt and of high-grade limesand at over 30 Mt.

The limesand potential of the coastal shelly sand units on the Point Samson and Delambre Island short is largely unknown. However, mineral leases for limesand have been pegged at Cleaverville and production of 93 740 t was reported to the Mines Department between 1974 and 1976. Reserves of moderate-grade (70–80 per cent Ca CO_3) limesand at Cleaverville are estimated at about 4 Mt.

WATER

The annual rainfall, which falls between December and April, averages about 300 mm, but is unreliable and mainly cyclonic. Creeks and rivers flow only briefly, after heavy rain.

There are no large supplies of fresh water, and the town of Wickham is supplied by pipeline from Millstream, about 100 km to the south. Groundwater is available in most of the area, but this is generally only suitable for stock. It is most readily obtained from alluvium along larger creeks and towards the base of colluvium and silty sand slopes. The alluvium often contains layers or lenses of calcrete (impure limestone) from which bore yields of 100 m^3/day or more are possible. Elsewhere, bores are unlikely to yield more than 50 m^3/day. Small supplies of groundwater can sometimes be obtained from fractured Precambrian bedrock.

The water is usually at a depth of between 5 and 15 m, depending on ground elevation. Over most of the area, salinity is less than 5 000 mg/l TDS (Total Dissolved Solids), but it increases near the coast and to the east of the Harding River. Groundwater in the Harding River alluvium is probably salty in tidal reaches because of sea-water contamination.

In the higher, inland parts of the sheet, small supplies of domestic-quality water (less than 1 500 mg/l TDS) may be obtained. In the coastal dune sands, and the dune limestone on Delambre Island, there is commonly a one- to two-metre thick layer of fresh water on top of salty water and this thin fresh layer can be exploited by shallow wells for domestic use.

ENGINEERING GEOLOGY

The engineering properties of rocks, depend on geological factors such as mode of origin, composition, and the degree of metamorphism, weathering and erosion. The generalised engineering properties of the rocks that occur in the area are described with this in mind.

PRECAMBRIAN

Archaean

The Archaean rocks are variable and have a wide range of engineering properties. Of the cherts and clastic-sediments unit, the more abundant sediments are generally weak. Where they are exposed in shallow excavations beneath superficial material, they are often soft and weathered. They may not stand well in excavations, but would be satisfactory as foundations for structures of moderate loading. The properties of the sediments differ widely from those of the interbedded chert, which more commonly crops out and is hard and resistant to weathering. Engineering problems could arise with the rock unit as a whole, because of the differing properties of the two closely associated rock types. For example, slopes and excavations could be unstable, and differential settlement could occur beneath foundations. They are unsuitable as a source of aggregate.

The Cleaverville Formation, which is generally durable, forms ridges, but contains well-developed bedding and joint surfaces that aid the production of abundant rock fragments in the colluvium that forms on the slopes. This contributes to the suitability of adjacent superficial deposits as construction materials. The occurrence of thin interbedded shales gives the Cleaverville Formation, as a whole, some of the engineering defects of the previously described unit, such as instability on slopes and in excavations, but the sections in which chert predominates would make satisfactory foundations in flat areas even for high-load structures.

All the Archaean igneous rocks are strong and stable when fresh, but near the surface, are generally weakened and less stable due to weathering of either the rock substance or along joints.

Although the igneous parts of the basic and intermediate volcanic unit are resistant to erosion, detailed examination shows many defects and complex variations in composition and structure. In addition to jointing, the rocks are foliated in part, contain lenses of schist and other weak material, and are cut by quartz veins and minor dykes of varied composition. These features may, but do not necessarily, make them unstable on slopes or in excavations, or reduce their suitability as foundations. However, these features detract from the value of the rock as a source of aggregate. Sedimentary horizons within the unit will have similar defects to clastic sediments described above.

The metamorphosed dolerite is probably more susceptible to weathering than the basic and intermediate volcanic rocks, but will have equally good engineering properties unless weathered to clay. The gabbro is massive and no major problems are foreseen except where weathering is advanced.

Proterozoic

The Mount Roe Basalt is more uniform and less deformed than the Archaean volcanic rocks. It is generally competent and, except where extensively jointed or weathered, is expected to have satisfactory engineering properties. It is currently being crushed for use as railway ballast and concrete aggregate, but it should be noted that the presence of siliceous amygdales gives a potential for reaction with high-alkali cement.

The boulder agglomerate will tend to have more variable engineering properties than the Mount Roe Basalt, as a result of its heterogeneous structure, but its extent on this sheet is limited.

Undifferentiated

The quartzo-feldspathic sediments are moderately strong to weak, and have superior engineering properties to the sedimentary phases of the Archaean chert and clastic-sediments unit.

No engineering problems are foreseen with the basic intrusive rocks except where they are strongly weathered.

CAINOZOIC

Tertiary

Laterite is a rock with varying engineering properties depending on its state of erosion, but is of minor engineering significance in this area.

Quaternary

The Quaternary units include a wide variety of superficial sediments with complex field relationships and differing engineering properties. For example, the behaviour of a unit can be modified by the properties of an underlying unit, level and salinity of the local groundwater, and the pH of the unit. As this material occurs in the flatter parts of the area, where future development is expected, its varying properties and complex distributions are significant. It is stressed that detailed investigation at the site of proposed development is necessary and the information given here can only serve as a guide.

One of the major engineering problems with the superficial materials is the presence of expansive clays in some parts of the silty sand, particularly in the clayey sand sub-unit. Areas underlain by expansive clays are characterised by the development of crabholes, These materials contain a relatively high proportion of montmorillonite, thought to be derived from the weathering of ferromagnesian minerals in the basic and intermediate rocks.

If the material containing expansive clays cannot be avoided in the siting of engineering works, it should either be removed or allowed for in the design of foundations. Allowance can be made by placing a foundation pad of stable material over it, or by taking foundations below the surface zone of fluctuating moisture content. Both methods have been used in the area.

Low permeability in the superficial deposits inhibits drainage and causes the water table to rise in irrigated areas such as housing development. Low permeabilities occur in the clayey parts of the silty sand, and in the colluvium and sheet-wash soils with high pH values. In these latter soils the clays disperse when wet, further reducing permeability. These types of soils should be avoided for housing development, or precautions taken, such as provision of adequate drainage. In these areas, the construction of foundation pads aids the solution of both drainage and foundation problems.

The mud and silt of tidal areas is a weak material and poses foundation problems for roads. These problems can be solved by building stable embankments of suitable, properly compacted material. Suitable materials for embankments include colluvium and alluvium, as well as rock fill obtained from stronger parts of the older rock units. Weak, unconsolidated mud and silt are displaced from beneath the fill during its emplacement.

As well as providing suitable fill for the construction of foundations, the less clayey parts of the superficial units, such as colluvium, alluvium, inland dune sand, eolian sand and parts of the silty sand which are free of expansive clays, make suitable foundations for structures of moderate loading, provided normal precautions are taken.

The various beach and dune deposits are generally friable, and when loose, they may be unstable in excavations and on slopes. They are liable to erosion if cleared of vegetation. The younger deposits close to the coast are of limited use in construction due to their salt-content.

In many areas, the superficial deposits are thin or of too limited extent to have any engineering significance.

ENVIRONMENTAL GEOLOGY

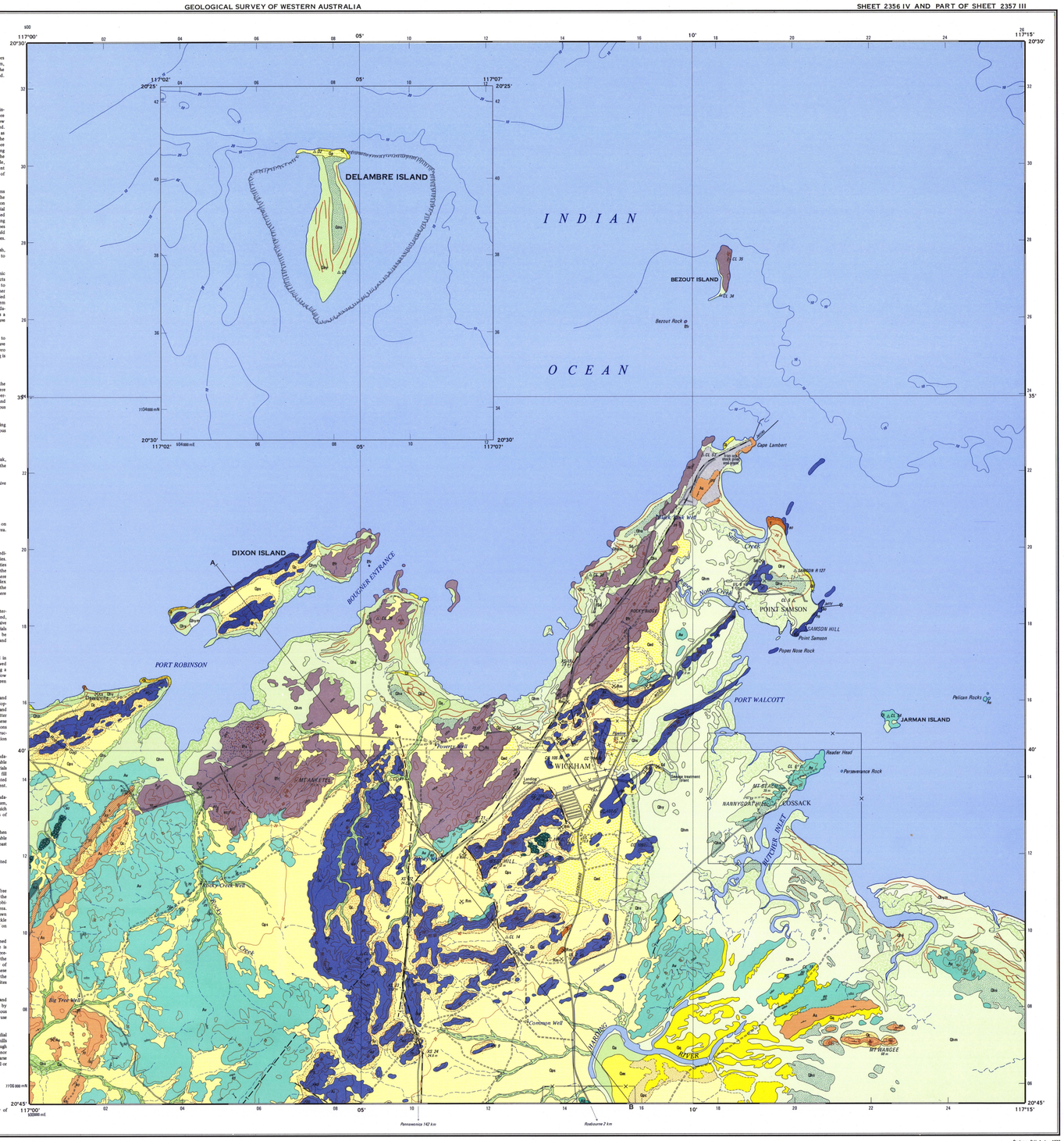
The finer, silt fraction of the coastal plain sediments inhibits free flushing of groundwater and this has probably contributed greatly to the retention of salts in the soil profile. Indiscriminate irrigation may remobilize these salts and cause salt-scalding down-slope from the irrigated area. Watering to establish vegetation elsewhere in the region has already drawn attention to this problem. It can be alleviated by the use of a trickle irrigation system in place of sprinklers. Irrigation should be avoided on fine-grained soils unless adequate drainage has been provided.

Waste disposal may present problems, especially when the planned extension of Wickham takes place. Above-ground disposal of waste is often unacceptable, both aesthetically and because of the cost of preventing disposal by wind. Suitable disposal sites are limited by the thinness of soils in much of the mapped area; however, a number of possible sites exist, most notably, the coastal dune sand-pits, when these have been worked out. Waste disposal should not be considered on the flood-prone flats which fringe much of the coastal zone. No suitable sites for toxic-waste disposal occur within the mapped area.

Several small gravel pits have been opened alongside roads and tracks. These cause visual pollution and lead to a waste of resources by piecemeal excavation. Future extraction should be from inconspicuous sites, grouped for maximum resource utilization and for possible use as waste disposal areas when exhausted.

Soil erosion is a minor problem on the coastal plains, local remedial action being sufficient to repair gullying. The vestigal soil on the hills appears to be stable and at present is little affected by man. Although areas of mobile sand exist, and over many of the coastal dunes minor damage from human activities has occurred, the sand is relatively coarse and the danger of a major blow-out seems low. No information on soil or dune stability on the offshore islands is available.

Further information may be obtained from the Geological Survey of Western Australia, Mineral House, Perth.



Compiled and published by Geological Survey of Western Australia. Cartography by Geological Mapping Section, Department of Mines. Topographic base from compilations by Department of Lands and Surveys. Printed by Government Printing Office, Perth.

Copies of this map may be obtained from the Geological Survey of Western Australia, in Perth.

Geology: R.H. Archer, 1976

DECLINATION DIAGRAM

The lines indicate magnetic declination, 1976. To convert a magnetic bearing to true bearing, add 0° 30' (easterly) to compass bearing to give true bearing. Annual change is 1° westerly

INDEX TO ADJOINING SHEETS

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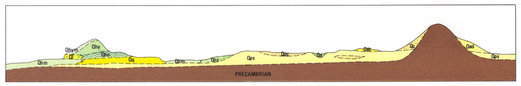
QUATERNARY SEDIMENT RELATIONSHIP DIAGRAM

(Not to scale)



HON. A. MENSAROS, M.L.A.
MINISTER FOR MINES

J. H. LORD, DIRECTOR, GEOLOGICAL SURVEY

SCALE 1:50 000

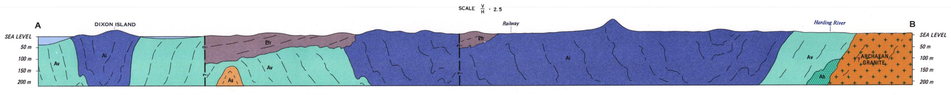
KILOMETRES

CONTOUR INTERVAL 20 m

Tints inside the street edge represent 3000 metre intervals of the superimposed Australian Map Grid. Zone 50 AUSTRALIAN NATIONAL SPHEROID

DIAGRAMMATIC SECTION A–B

SCALE $\frac{V}{H}$ · 2.5



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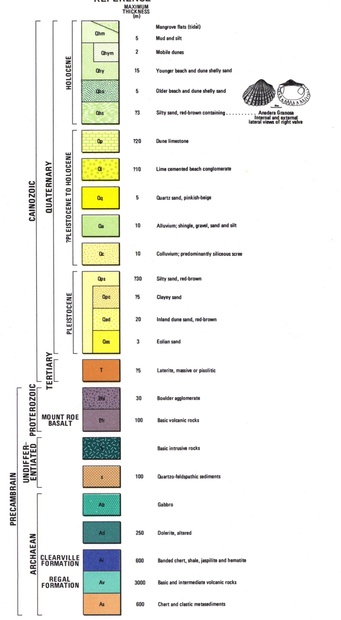
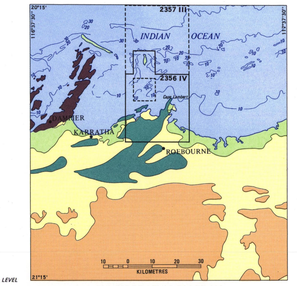


SYMBOLS

Geological boundary
Accurate
Approximate or transitional
Unconformable
Fault
Accurate
Inferred
Bedding
Strike and dip
Strike and dip, air photo interpretation
Vertical
Strike and dip of lowa
Strike and dip of lows, air photo interpretation
Strike of vertical lowa
Facing from pillow lowa
Facing from sedimentary rocks
Foliation
Strike and dip
Folds
Plunge of fold axis
Plunge of drag fold
Mine, abandoned
Pit or quarry
Shallow excavation
Mineral occurrence
Gold Au
Limesand Ls
Crushed rock aggregate Rc
Road material Rm
Sand Sd
Contour in metres
Cliff
Dune crest (at September 1971)
Bathymetric contour in metres
Watercourse
Pipeline
Windsprung on well or bore
Tank
Major road
Minor road
Track
Railway
Horizontal control; major, minor
Bench mark, height accurate
Trianlate boundary
Lighthouse
Reef

The representation on this map of a track does not imply right of way



PHYSIOGRAPHIC DIAGRAM

Limestone Islands
Dampier Archipelago
Coastal Flats
Coastal Plain
Isolated Hills
Dissected Upland

POINT SAMSON – DELAMBRE ISLAND URBAN GEOLOGY

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