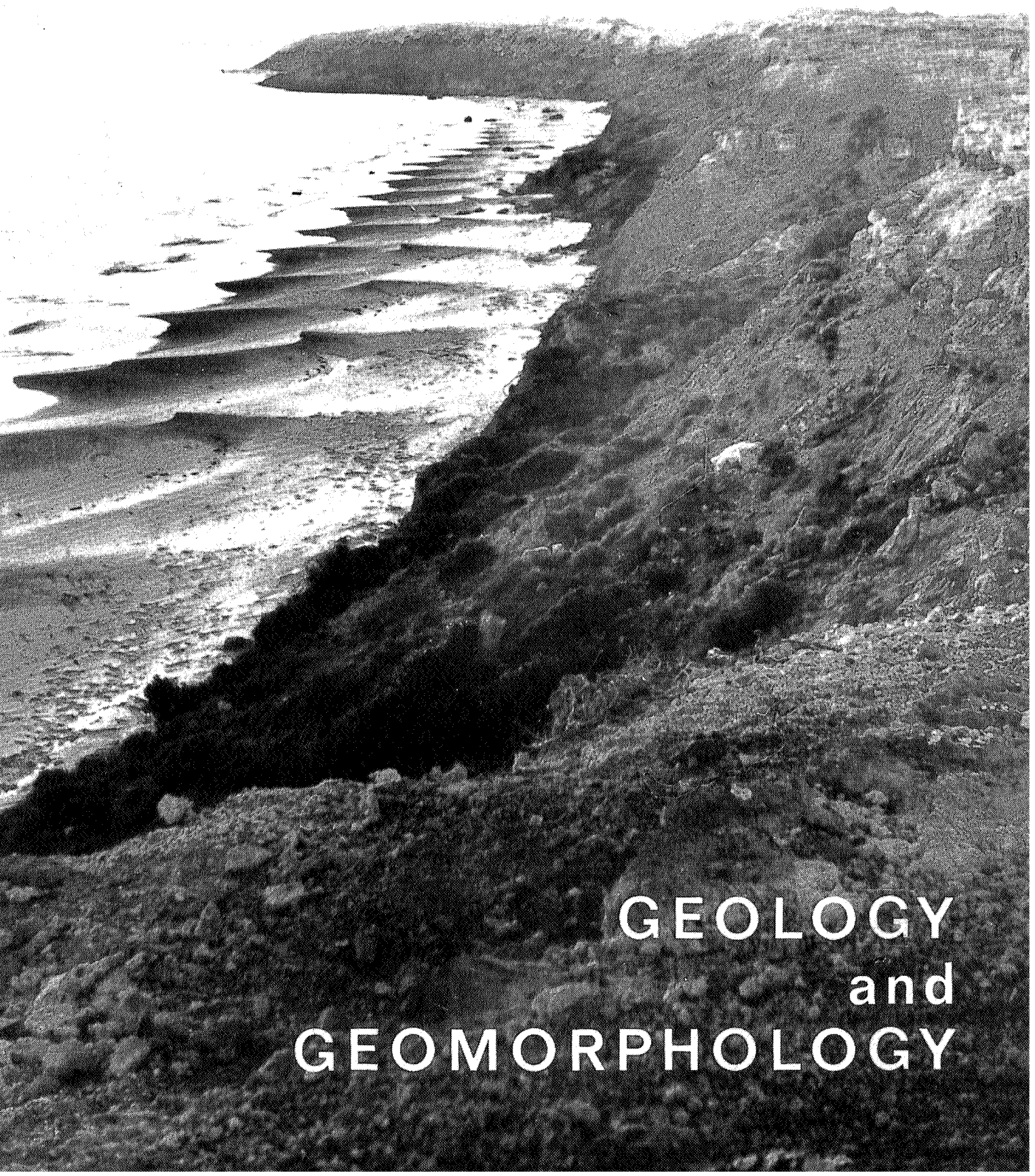
YORKE COAST PROTECTION DISTRICT



GEOLOGY and GEOMORPHOLOGY

COVER DESIGN: W.F. JEFFERY
PHOTOGRAPHY: J.M. SCRYMGOUR

Gullied cliff and sandy bayhead beach showing two generations of beautifully developed beach cusps. Approx. 4 km. west of Troubridge Hill.

YORKE COAST PROTECTION DISTRICT

Geology and Geomorphology

A report to the Coast Protection Board

by

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ADELAIDE, MARCH 1976

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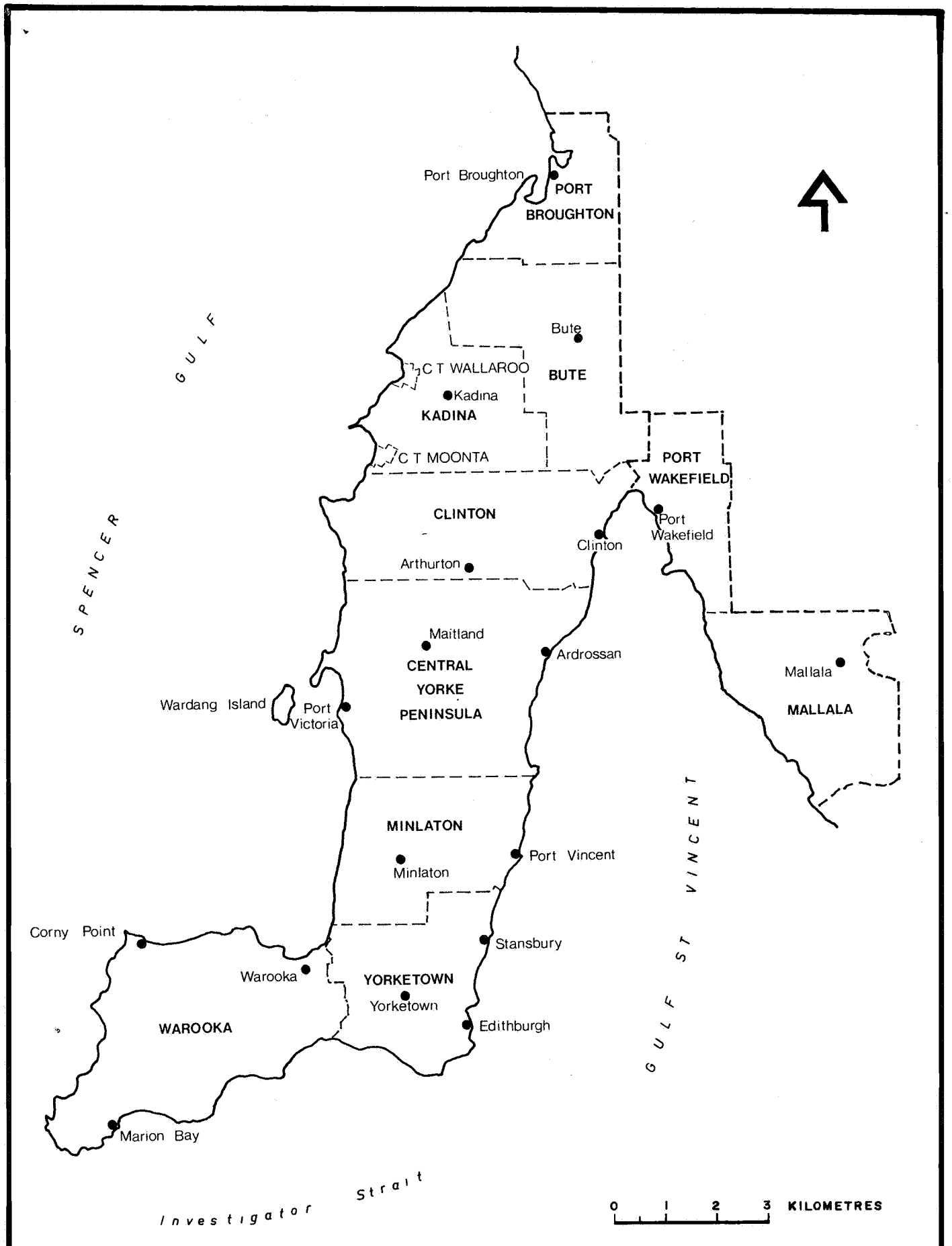


BASE PLAN SUPPLIED BY COAST PROTECTION BOARD

FIG.1

RESOURCE PLANNING	DEPARTMENT OF MINES—SOUTH AUSTRALIA	SCALE. 1:100,000
COMPILED:	YORKE COAST PROTECTION DISTRICT	DATE: 23RD. AUGUST 1976
DRN: CKD.	LOCALITY MAP SHOWING COUNCIL AREAS	PLAN NUMBER: S12305

SIGNIFICANT GEOLOGICAL AND GEOMORPHOLOGICAL FEATURES OF THE YORKE COAST PROTECTION DISTRICT

ABSTRACT

The coastline is the major scenic feature of Yorke Peninsula, providing landscapes of outstanding beauty, beaches for leisure activities and abundant natural vegetation. It contrasts dramatically with the flat terrain of the inland areas now largely cleared for farming.

The coastal zone has particular relevance for the study and teaching of geology and geomorphology. Here, in the coastal cliffs, shore platforms and raised beaches, are found the principal exposures of the Cambrian and Precambrian basement and the younger sedimentary sequences. Their local significance is increased by the virtually complete masking of these older rocks by Quaternary sediments in the inland regions of the Peninsula.

Preservation of the coastal zone in its natural state is thus of paramount importance for scientific study and for maintenance of the striking beauty of the coastal landscape.

This objective must take precedence over all development proposals for tourist and leisure activities and in the long term will enhance the area for these purposes.

Known geological and geomorphological features are classified in this report according to their scientific value and vulnerability to human activity.

Periodic review of new scientific data is necessary to update the contents of this report. Regular inspection of the coastline is recommended to identify endangered areas and formulate more effective protection measures.

INTRODUCTION

The Yorke Coast Protection District extends from Port Gawler northwards to Pt. Wakefield, around Yorke Peninsula to the northern boundary of the District Council of Pt. Broughton (see Figure 1, plan S12305) and comprises a zone extending to 3 nautical miles seaward of low water mark and 100 m inland of high water mark. For the purpose of this study features lying beyond the landward limit,

but having an influence on the coast, are also included.

The Coast Protection Board sought independent submissions from the S.A. Museum, the S.A. Department of Mines and the Geological Monuments Sub-Committee of the Geological Society of Australia (S.A. Division) to assist in the preparation of a management plan. The objectives of the enquiry are summarised by the following extract from the initiating brief:-

> "Particular rock outcrops or cliff faces of educational interest should be noted and recommendations made regarding these. If the outcrop is extensive, or occurs frequently, the most important part of it should be identified. Recommendations could include measures to protect the feature, or to improve or restrict access to it or other action as may be appropriate".

This report results from the formation of a working group to combine the contributions of the three organisations into a single document. Dr. Twidale of the Geography Department, University of Adelaide, joined the group because of the intimate relationship which exists between geology and geomorphology. The authors and associates in their respective organisations provided the input of data and this was supplemented by field inspections conducted by J.M. Scrymgour and S.G. Carr in January 1975. A draft report was prepared and critically

reviewed by all authors. The final text, prepared by M.N. Hiern, represents a consensus of views.

Photographs illustrating the text have been obtained from many sources and are acknowledged within the report.

The accompanying plan (76-99) was produced in the drafting office of the Department of Mines.

A separate report on mineral resources has been prepared by Hiern (1975).

GEOLOGICAL AND GEOMORPHOLOGICAL SETTING

The most comprehensive description of the geology of Yorke Peninsula is that of Crawford (1965). Regional correlations and updated stratigraphic data are contained in Parkin (1969). Detailed local studies have been conducted by the many workers listed in the Bibliography.

Yorke Peninsula lies on the southeastern margin of the Australian Precambrian Shield and is underlain by metasediments and intrusive rocks of Lower Proterozoic age. These are referred to collectively as crystalline basement and with a few exceptions, are only exposed in the coastal zone, particularly in shore platforms and at the base of the cliffs along the southern and western coasts of Yorke Peninsula.

Flat-lying Adelaidean and Cambrian sedimentary rocks overlie the crystalline basement. The unconformity between these sediments and basement is a significant geological feature, representing a time break of many hundreds of millions of years. Surface exposures of the

Adelaidean rocks comprise mainly sandstones and quartzites, but volcanics and other rocks have been intersected in deep drilling in the Bute district (Thomson 1973). The Cambrian sequence comprises predominantly carbonate rocks.

Permian glaciation affected southern Yorke Peninsula. Clayey till with abundant erratic boulders is exposed in the cliffs of southern Yorke Peninsula and forms the impermeable floor of the widespread lakes and swamps of the Yorktown district.

Flat-lying Tertiary sediments, deposited in the St. Vincent Basin graben, occur along the east coast of the Peninsula. The basal Eocene beds, which contain lignite north of Clinton, do not outcrop, but excellent exposures of Oligocene and Lower Miocene sands and silt, grading upwards to limestone, occur in the cliffs between Ardrossan and Waterloo Bay. A thin marine sequence of sand and limestone of similar age is exposed in low cliffs between Wallaroo and Tickera.

Quaternary accumulations cover the Tertiary and older rocks over large areas of the Peninsula and the plains around Pt. Wakefield. The most widespread is calcrete, a thin nodular to massive limestone crust of pedogenic origin formerly referred to as travertine or kunkar. Other important units are Pleistocene clays and aeolianite, coastal dunes comprised mainly of carbonate sand, inland dunes of red or white silica sand, shelly beach deposits and alluvial clays and silts.

From a geomorphological point of view Yorke Peninsula consists of a high plain standing 60-200m above sea level, attaining a maximum elevation of 229 m near

Arthurton and falling close to sea level in the lake-strewn "ankle" area of the "boot-like" land mass. Over much of its lergth the Peninsula is bounded by a dramatic and spectacular cliffed rock coast. The cliffs are mainly of aeolianite, but in many places this Pleistocene rock can be seen to rest on platforms eroded in crystalline rocks. The base of the latter unit is irregular, for while the unconformity can be observed to stand several metres above sea level in many places it is also known to extend many metres below sea level elsewhere . Many of the beaches are backed by coastal foredunes which, though mainly stabilised by vegetation, are active in some areas and have advanced many hundreds of metres inland.

In the northeast there is a narrow coastal plain backed by the Kulpara Fault Scarp. Ferruginised rocks of Plio-Pleistocene age are exposed near the crest of this escarpment, but by far the greater part of the Peninsula is covered by Quaternary materials and particularly by NW-SE trending, longitudinal sand dunes. These are now stabilised like their counterparts on Eyre Peninsula, the Adelaide Plains and the Murray Plains. They are probably of late Pleistocene age. In their morphology and genesis they are to be compared with the contemporary dunes of the Simpson Desert.

The high plain, traversed by sand ridges with broad interdune corridors, displays a few lake depressions. Lakes achieve their greatest concentration in the south,

in the ankle of the boot. The lowland in which these lakes occur appears to be coincident with a NW-SE trending fault zone and where there has been considerable marine aggradation.

SIGNIFICANT GEOLOGICAL FEATURES

Most of the exposures of the pre-Quaternary rocks lie in the coastal areas of Yorke Peninsula because of the almost total masking of the inland districts by Quaternary sediments. Thus the coastal zone is of paramount significance for studies of the geological record of this part of the State.

Geomorphological features are well displayed in the spectacular coastal scenery and have great aesthetic appeal as well as intrinsic scientific value.

Many important botanical and zoological ecosystems are intimately dependent on geological and geomorphological features and processes. Extensive clearing for agricultural purposes inland has resulted in most of these phenomena being now confined to the coastal zone.

Significant geological and geomorphological features are shown on Figure 2 (plan 76-99) and described in Appendix 1.

These may be grouped as follows:-

1. Aeolianite cliffs showing large-scale cross bedding.

2. Crystalline basement exposures of varied lithology.

3. 'Type section' where sedimentary sequences representing specific periods of geological time are so well exposed that they are incorporated in the literature as standard reference sections.

4. Unconformities representing time breaks in the sedimentary cycle.

5. Glacial erratics consisting of pebbles and boulders of exotic rocks transported into the area by moving ice.

6. Folds, faults and other structural features.

7. Cuspate forelands.

8. Shore platforms and elevated beach deposits providing evidence of either sea level fluctuation or movement of the land mass.

9. Submerged and coastal dunes.

10. Mangrove swamps and estuarine lakes.

11. Various cliff features.

Except for the type section, these features are found at many localities around the coast and the various combinations of them account for the changing coastal scenery. Although each occurrence has value as a specific example, there are certain places where individual features are particularly well developed. These localities have special value and warrant positive action to ensure their protection and preservation.

It must be recognised that scientific knowledge is never static and that further study will inevitably reveal new phenomena or localities at which known features are better developed. Provision for regular updating of

data should be made in the management plan.

RANKING AND CLASSIFICATION

A ranking system, described below, has been evolved to identify those localities of vital scientific value which require special protection measures in the management plan.

RANK A - features of vital significance because of their state of perfection, value as permanent reference sections or possession of other unique characteristics.

RANK B - features of high significance because of their value for teaching purposes, their contribution to coastal scenery or general public interest.

As well as this value ranking, the vulnerability of the various features to human interference must be taken into account in the management plan.

The following classification of vulnerability is adopted.

Class xx - features which are vulnerable to small scale interference such as slight human activity.

Class x - features which are vulnerable only to moderate or large scale interference such as concentrated human activity or major earthworks.

Each feature shown on Figure 2 is ranked and classified in Appendix 1.

Type sections are indicated by 'r' in the classification.

ACCESS AND CONTROL

It is anticipated that the greatest demand on the coastal zone will be for tourism, holiday resorts and leisure pursuits by people with a wide variety of tastes, interests, physical capacity and mobility.

The coastline, particularly that around southern Yorke Peninsula, has long stretches of superb coastal scenery and the management plan should contain positive proposals for providing controlled access for a wide range of activities consistent with the preservation of the natural features where safety is not endangered by erosion processes. This should include the retention of existing scenic coastal drives for the less physically able. Access to other areas should be restricted to tracks of suitable quality leading in at right angles to the coast from the inland road system. The coastal dunes should be protected by prohibiting all other access.

Cliff excavations for access and other engineering purposes usually provide excellent exposures for geological study. The authors are not averse to engineering works on the coast as such, providing that all proposals are examined by competent persons prior to construction to ensure that sensitive or unique features are not destroyed and providing also that design includes measures to prevent erosion.

Increasing numbers of brochures describing natural features are being prepared by organisations promoting tourism. It is becoming a necessary practice overseas to

delete reference in these to valuable scientific sites and this procedure should be followed in the management plan for the Yorke Coast District. To achieve this, the contents of Appendix 1 and Figure 2 should remain confidential to the Coast Protection Board and be used at the Board's discretion.

Areas of the coast listed below contain a wide variety of features of general interest which will be increasingly used by the public. Detailed investigation of these is necessary to determine whether present access is satisfactory or whether additional or alternative access points are necessary. Regular inspections should be made so that areas suffering excessive damage are identified and better protected.

Between Ardrossan and Black Point Tertiary sediments and Precambrian rocks with clearly defined unconformities are exposed in the cliffs. A range of mineral specimens and fossils may be found.

Hillock Point displays excellent examples of shore platforms developed at various levels relative to the present tidal range. Excellent examples of aeolianite, cliff erosion, shore platforms and stranded beach deposits occur.

The Corny Point-Port Turton section of the coast exhibits shore platforms in Precambrian rocks, aeolianite cliffs, Tertiary limestone, glacial erratics, stranded beach deposits and dune formations.

In the Balgowan-Pt. Victoria-Wardang Island area are Precambrian, Permian and Quaternary rocks as well as well-developed dunes and aeolianite formations.

In the Moonta Bay area the unconformity between the Adelaidean and older Precambrian rocks is exposed on the shore platform while the cliffs contain various Quaternary sediments.

The waters and coast around the head of St. Vincent Gulf, are a large regional feature, containing many sensitive interdependent eco-systems which are vulnerable to even moderate scale interference. Unlike the head of Spencer Gulf, this area is still largely unaltered by industrial development and the management plan should contain positive proposals for restricting development which will interfere with the natural state of the area.

With respect to mining, the authors support the principle of reserving a coastal strip of 800 m from the Mining Act. The present policy of the Board to prohibit subdivisions adjacent to coastal cliffs and on major dune developments is applauded.

Marine erosion is occurring along the southern coast but the authors are not aware of any natural features which are endangered. Some erosion affecting the safety of the scenic drive along Sturt Bay was noted. Detailed study of deposition and sediment transport along the entire coast is necessary to enable a thorough assessment of the coastal balance to be made.

Human interference with coastal dunes should be strictly controlled to prevent erosion and damage to sensitive eco-systems, particularly in areas of shack development.

CONCLUSIONS AND RECOMMENDATIONS

The coastal zone of Yorke Peninsula is of vital geological significance because of the almost total masking of inland areas by Quaternary rocks. Cliff sections and shore platforms thus provide the main exposures for study of the geology of this part of the State.

Geomorphological processes are responsible for the often spectacular coastal scenery and many excellent examples of these features exist for study and teaching purposes. Associated with these are several dependent botanical and zoological eco-systems.

Protection and preservation of significant features must take precedence over development proposals for the wide variety of tourist and leisure activities which are anticipated in the future. Such action will enhance the area for public use.

The known geological and geomorphological features have been classified according to their scientific value and vulnerability to human interference.

Certain specified areas, classified Axx, are recommended for restricted access to preserve valuable features.

Other localities contain features of value for teaching purposes and public observation. Further investigation of these is necessary to select suitable access points and to formulate protective measures consistent with their availability for public enjoyment.

Access roads and other earthworks on the

coast are not opposed as such, but provision should be made in the management plan for individual proposals to be examined by competent persons to ensure that unique or valuable features are not destroyed or that severe erosional processes are not generated as a result of development works.

Future scientific study will reveal new features of importance with some consequent changes to the data provided in this report. Regular inspection of the various features identified is necessary to ensure that they are not damaged through over-use.

It is recommended that a group be appointed under Section 18 of the Coast Protection Act 1972, to provide the Board with new geological and geomorphological data as they become available and advise on other relevant matters.

In accordance with the initiating brief, this report only discusses existing features of scientific value. It is recommended that a detailed study of active physical processes be carried out to ensure the long term protection of the coast from natural forces.

In common with overseas practice, it is recommended that Figure 2 and the contents of Appendix1 remain confidential to the Board.

BIBLIOGRAPHY

Bayly, M.R., 1973. Sedimentary environments of northern St. Vincent's Gulf near Port Arthur, South Australia. Unpublished Honours B.Sc. Thesis, Flinders University.

Brooks, L.J., 1973. A stratigraphic and mineralogical study of a Recent carbonate environment at the head to St. Vincent's Gulf. Unpublished Honours B.Sc. Thesis, Flinders University.

Carmichael, E., 1973. National Parks of southern Yorke Peninsula.

Clark, E.V., 1928. A Recent raised beach near Port Turton, Yorke Peninsula. Trans. Roy. Soc. S.A. 52 pp. 189-190.

Cooney, A.M., 1965. Submarine geological exploration, Gulf of St. Vincent, South Australia. Jour. Aust. Petroleum Exploration Assoc., 5: 88-92.

Corbett, D. (Ed.), 1973. Yorke Peninsula, a natural history. Dept. Adult Education, University of Adelaide, 211 pp.

Crawford, A.R., 1965. The geology of Yorke Peninsula. Geol. Surv. S. Aust. Bull. 39. 96 pp.

Crocker, R.L., 1946. Notes on a Recent raised beach at Point Brown, Yorke Peninsula, South Australia. Trans. Roy. Soc. S. Aust. 70(1): 108-109.

Ellis, G.K., 1974. Gulf St. Vincent Basin, geology and hydrocarbon potential. Dept. Mines unpublished report RB74/89.

Field Geology Club of S.A. A field guide to the geology of Yorke Peninsula - in preparation.

Firman, J.B., 1967. Stratigraphy of late Cainozoic deposits in South Australia. Trans. Roy. Soc. S. Aust. 91 pp. 165-180

Firman, J.B.,and Chugg, R.I. 1963. Marine erosion and stranded beach deposits near Pt. Wakefield. Geol. Surv. S. Aust. Quart. geol. Notes 8, pp. 4-5.

Foster, C.B., 1974. Stratigraphy and palynology of the Permian at Waterloo Bay, Yorke Peninsula, South Australia. Trans. Roy. Soc. S. Aust. 98(1): 29-42.

Glastonbury, J.O.G., 1939. The geology of the Cape Spencer area, Yorke Peninsula. Trans. Roy. Soc. S. Aust. 63(1): 14-16.

Greenway, T.C., and Phillips, M.T., 1902. Notes on the geological features of southern Yorke Peninsula. Trans. Roy. Soc. S. Aust., 26: 268-277.

Hansen, P.S.,1973. A Recent carbonate environment of the northern most St. Vincent's Gulf. Unpublished Honours B.Sc. Thesis, Flinders University.

Harris, R.F.,1971. Geology of Permian sediments and erratics. Troubridge Basin, South Australia. B.Sc. Honours Thesis, University of Adelaide.

Henningsen, Florence M., 1974. Some aspects of the coastal geomorphology of Eastern Yorke Peninsula. Murray Park C.A.E. Semester paper Geography B - unpublished.

Hiern, M.N., 1975. Mineral resources of the Yorke Coast Protection District - Dept. of Mines Report in preparation.

Horwitz, R.C., 1961. The geology of the Wakefield military sheet. Geol. Surv. S. Aust. Rept. Invest. 18.

Howchin, W., 1918. Notes on the geology of Ardrossan and neighbourhood. Trans. Roy. Soc. S. Aust. 42: 185-225.

Lindsay, J.M., 1970. Melton Limestone: Multiple mid Tertiary transgressions, southeastern Gawler Platform. Geol. Surv. S. Aust. Quart. geol. Notes, 33: 2-10.

Manuel, M.D., 1971. Coastal geomorphology of Cape Spencer region. Unpublished Honours B.A. Thesis, University of Adelaide.

Metcalf, Pamela P., 1971. Coastal geomorphology of the Hillock Point area, southwestern Yorke Peninsula S. Aust. unpublished Honours B.A. thesis, University of Adelaide.

Pappageorgiou, D.B., 1973. Cliff morphology and processes along the Ardrossan coastline, on east coast of Yorke Peninsula. Unpublished Honours B.A. Thesis, Flinders University.

Parkin, L.W., (Ed.), 1969. The Handbook of South Australian Geology. Govt. Printer, Adelaide.

Smith, Dianne M., 1971. Geomorphology of the coast from Corny Point to Browns Beach, Yorke Peninsula. Unpublished Honours B.A. Thesis, University of Adelaide.

Sprigg, R.C., 1962. The application of colour photography in the investigation of submarine geology in Gulf St. Vincent: for Beach Petroleum N.L. S.A. Dept. Mines open file Env. 239 - unpublished.

Stuart, W.J., 1969. Stratigraphic and structural development of the St. Vincent Tertiary Basin, South Australia. Unpublished Ph.D. Thesis, University of Adelaide.

Stuart, W.J., 1970. The Cainozoic stratigraphy of the southeastern coastal area of Yorke Peninsula, South Australia. Trans. Roy. Soc. S. Aust. 94: 151-178

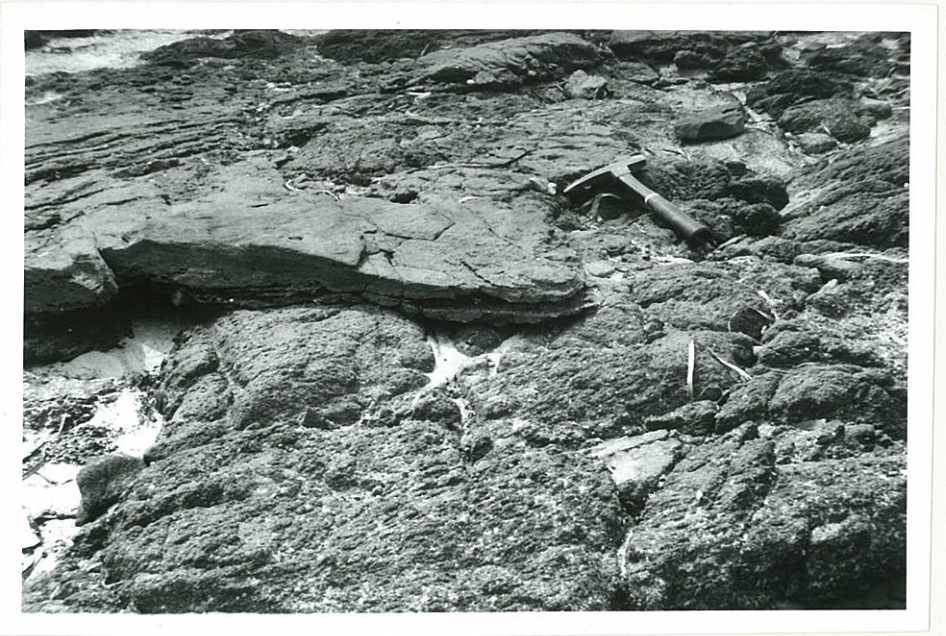
Tepper, J.G.O., 1879. Introduction to the cliffs and rocks at Ardrossan, Yorke Peninsula. Trans. Phil. Soc. S. Aust. 2: 71-79.

Tepper, J.G.O., 1882. Sketch of the geological and physical history of the Hundred of Cunningham and neighbouring regions. Trans. Roy. Soc. S. Aust. 4: 61-70.

Thomson, B.P., 1973. Torrens Hinge Zone Project; Bute region. Rept. No. 1. Dept. Mines unpublished report RB.73/8.

Von der Borch, C.C., 1957. The crystalline rocks of Yorke Peninsula - unpublished Honours B.Sc. Thesis, University of Adelaide.

Zimmerman, D., 1973. Shallow marine carbonate sedimentation in the northern part of Gulf St. Vincent, S.A. Unpublished Honours B.Sc. Thesis, Flinders Univesity.



Adelaidean sandstone unconformably overlying Lower Proterozoic gneiss in shore platform. Moonta Bay.
S.G. Carr Dept. of Mines.

Tertiary cliff sequence, shore platform in Lower Proterozoic rocks with small remnant Tertiary Stack. Between Pt. Riley and Tickera
Dept. of Mines No. 1923

Port Julia Greensand at base of Tertiary Section south of Pt. Julia.

Department of Mines No. 1962

Permian glacial clays and granite erratic, 3 km north of Pt. Vincent.

Dept. of Mines No. 6192

High and low shore platforms in lower Proterozoic gneiss uncomformably overlain by aeolianite. West of Stenhouse Bay.

C.R. Twidale, University of Adelaide.

Active dunes - Formby Bay

C.R. Twidale, University of Adelaide.

Cuspate foreland. Port Vincent.

Coast Protection Board.

Aeolianite cliffs east of Cape Spencer.

Dept. of Mines No. 6298

Raised shell bed at Parara Point showing shell grit mining.

S.G. Carr. Dept. Of Mines

Kaolinised aplite, unconformably overlain by Muloowurtie. Formation. Section 42A Hd Muloowurtie.

Department of Mines
No. 1957

Coastal cliff, 2 km south of Clinton with mangrove swamp.

Dept. of Mines No. 6184

Rogue Formation unconformably overlying Cambrian Limestone. Sliding Rocks. Section 185 Hd Muloowurtie.
S.G. Carr Department of Mines.

APPENDIX

YORKE COAST PROTECTION DISTRICT
DESCRIPTION AND RANKING OF SIGNIFICANT GEOLOGICAL AND GEOMORPHOLOGICAL FEATURES

Location 1:	Hundreds Port Gawler, Dublin, Inkerman
Extent:	PORT GAWLER - SANDY POINT
Feature:	Coastal mangroves, beach ridges.
Description:	Coastal mangrove - samphire association, shell grit beach ridges. Provided there is no interference with the mangroves and samphire swamps this general area does not seem to be threatened.
Rank/Class:	Bx
Location 2:	Hundreds Inkerman, Clinton, Cunningham
Extent:	SANDY POINT - PRICE AREA and south.
Feature:	Head of St. Vincent Gulf
References:	Horwitz 1961, p. 6-7; Henningsen 1973; Zimmerman 1973: Bayly 1973; Hansen 1973; Brooks 1973.
Description:	Area of recent and present day sedimentation including carbonate sediments. Unique because of the high rate of sedimentation and progradation and the most restricted environment (in terms of circulation) in South Australia. In contrast to northern Spencer Gulf this area is practically unaltered by man. "Anadara trapezia" beds occur at the base of the low cliffs surrounding sub-coastal lakes. Important teaching area. Many important off-shore features. North of Clinton to south of Price:- mangroves with samphire inland. The vegetation influences tidal flat sedimentation and mangroves are intimately involved in sedimentary processes and features. The extension of the existing Clinton Reserve further northwards is recommended to provide a more adequate protected area.

Rank/Class: Axx

Locality 2A: Hundred Inkerman, Sections 425, 106, 104, 102, 98, 99, A and further north.

Extent: SANDY POINT

Feature: Coastal cliffs, "Anadara" shell beds.

References: Firman & Chugg, 1963

Description: An excellent example of a stranded sea cliff extends continuously north from Sandy Point. "Anadara trapezia" occurs in shelly sand at swamp level at the extremities. Its absence at the foot of the cliff provides evidence of the relative ages of calcrete in the cliff and the "Anadara" -bearing sediments.

The cliff is a striking feature that would be vulnerable to development.

A calcrete layer is present in the mangrove zone below low tide mark.

Rank/Class: Axx

Location 3: Hundred Cunningham, Sections 388, 387, 371, 381, 355, 360, 375, 356.

Extent: TIDDY WIDDY-ARDROSSAN

Feature: Erosional and depositional features of cliffs.

References: Crawford, 1965, Pappageorgiou 1973.

Description: Cliffs with mottling possibly representing old weathering profile.

Rank/Class: Bx

Location 4: Hundred Cunningham, Sections 357, 358.

Extent: PARARA POINT

Feature: Recent shell beds and raised beach:

Reference: Crawford, 1965.

Description: Parara Point: Shell beds up to 2m thick with "Lithothamnium" occur about 2m above high water mark. The raised shell beds also contain "Anadara trapezia"

and other fossils. Has been quarried. Some should be preserved.
Horse Gully: Type Section for Cambrian occurs inland between Parara Point and Rogue Point.

Rank/Class: Axx

Location 5: Hundred Muloowurtie, Sections 182, 185, 186, 165.

Extent: ROGUE POINT - MULOOWURTIE POINT

Feature: Tertiary sequence including type sections, resting unconformably on Cambrian Kulpara Limestone.

References: Stuart 1969, 1970; Crawford, 1965; Tepper, 1879.

Description: Tertiary sequence consists of, in ascending order, Muloowurtie Formation, Throoka Silts and Rogue Formation. The sequence shows considerable lateral lithological variation but comprises biogenic calcarenites, quartz sands and conglomerates, silts and clays of both marine and lagoonal origin. The beds are fossiliferous, display many sedimentary features including disconformities. The unconformity with the Cambrian is a major feature. Type sections occur within the area and are listed below.

Rank/Class: Ax except localities 5A, 5B, 5C.

Locality 5A: Hundred Muloowurtie, Section 185.

Extent: SLIDING ROCKS (Between Rogue Pt. and Muloowurtie Pt.)

Feature: Type section - Muloowurtie Formation. Seaward dipping Cambrian limestone provide an unusual feature.

Reference: Stuart, 1970.

Description: 12m thick sequence of Muloowurtie Formation unconformably overlying Cambrian limestone. Muloowurtie Formation comprises green glauconitic quartz sands with pebble lenses, richly fossiliferous sands grading up to calcareous silty fine sands with ripple marks and burrows, calcareous medium to fine sands often argill-

aceous and silty and capped by thin bedded sandstone and sand with inter-bedded clay.

Sliding Rocks are formed by Cambrian limestones dipping seaward at a moderate angle.

Rank/Class: Arxx.

Locality 5B: Hundred Muloowurtie, Section 182.

Extent: MIDWAY BETWEEN SLIDING ROCKS AND MULOOWURTIE POINT

Feature: Type section - Throoka Silts.

Reference: Stuart, 1970.

Description: Laminated to very thinly bedded quartz sands with subordinate silty and arenaceous clays.

Lateral facies variations exist including silicified wood at Rocky Point much further south.

Rank/Class: Arxx.

Locality 5C: Hundred Muloowurtie, Section 182.

Extent: MULOOWURTIE POINT

Feature: RogueFormation.

Reference: Stuart, 1973.

Description: There is no specified type locality for the Rogue Formation because of marked lateral facies variations. Stuart (1973) proposes a composite type section extending from ½m S. of Rogue Point to 100 yds. north of Hart's Mine. This includes Muloowurtie Point which he stresses must be preserved at all costs (pers. comm.).

Rank/Class: Arxx.

Location 6: Hundred Muloowurtie, M S 17782.

Extent: HARTS MINE

Feature: Older Precambrian basement, Cambrian arkose, Muloowurtie Formation. Secondary copper mineral specimens.

Reference: Stuart, 1970

Description: In the cliffs, Muloowurtie Formation unconformably overlies older Precambrian basement. On the shore platform the basal Muloowurtie Formation beds rest on Cambrian arkose.

Secondary copper mineral specimens are found at the mine.

The workings should be checked for safety. Also the track to the mine is in an unsafe condition and should be upgraded to permit access to this portion of the coast north of Pine Point.

Rank/Class: Ax

Location 7: Hundred of Muloowurtie, Sections 41^{A}, 42^{A}, 178, 168, 169. Mineral sections.

Extent: 3KM NORTH OF PINE POINT, SOUTH FOR 1KM

Feature: Kaolinised aplite of basement, Cambrian sedimentary breccia, Muloowurtie Formation, raised beach.

References: Crawford, 1965; Stuart, 1970.

Description: Variety of deeply weathered older Precambrian basement rocks including kaolinised aplite unconformably overlain by Muloowurtie Formation. On the shore platform Cambrian sedimentary breccias overlie Precambrian basement.

At Pine Point a small raised beach and stranded cliff are present. Post Cambrian faulting is also visible.

Rank/Class: Ax

Location 8: Hundred Muloowurtie, Block A.

Extent: ROCKY POINT

Feature: Type section of Quartoo Sands. Unconformity with Muloowurtie Formation and Cambrian conglomerate. Plant remains.

Reference: Crawford, 1965; Stuart, 1970.

Description: The cliffs contain a full Tertiary section of Muloowurtie Formation, with the type section of the Quartoo Sands Member overlain by Throoka Silts and a thick development of Rogue Formation. This sequence rests unconformably on Cambrian conglomerate but the unconformity is exposed only over a very small area. The Throoka Silts contain plant remains.

Rank/Class: Arxx

Location 9: Hundred Muloowurtie, Block C; Hundred Curramulka, Sections 299, 301.

Extent: FOR 2 KM NORTH AND SOUTH OF BLACK POINT

Feature: Cuspate foreland, coastal dunes.

Reference:

Description: Cuspate foreland due to accummulation of debris in spits under the influence of wind driven waves primarily from the south-east, but with spits and bars oriented in relation to northerlies also significant.

Rank/Class: Ax.

Location 10: Hundred Curramulka, opp. Section 101.

Extent: PORT JULIA

Feature: Port Julia Greensand Member of the Rogue Formation type section and anticlinal fold. Raised beach deposits.

References: Crawford, 1965; Stuart, 1970.

Description: Type section of the Port Julia Greensand Member is located in the cliffs 250 m south of the Port Julia Jetty and is part of the Rogue Formation which is well exposed in this part of the coast. Rogue Formation is overlain by a calcarenite facies

of the Port Vincent Limestone. The soft glauconite greensand south of the jetty is susceptible to erosion and human interference. An anticlinal fold is well displayed in the cliffs in this area. Raised beach deposits occur at the jetty. Good teaching area.

Rank/Class: Arx

Location 11: Hundred Curramulka, Sections 279-282, 298, 321, opp. Section 44.

Extent: SHEOAK FLAT AND COASTAL AND INLAND CLIFFS IMMEDIATELY SOUTH OF THE FLAT.

Feature: Tertiary sequence

Reference:

Description: Stuart (pers.comm.) recommends that a continuous stretch from just south of Port Julia to immediately north of Sheoak Flat should be left in its natural state.

Rank/Class: Ax

Location 12: Hundred Curramulka, opp. Section 16, Sections 10, 317;
Hundred Ramsay, Sections, E, D, 206, 205, 204, 3, 5.

Extent: SHEOAK FLAT - PORT VINCENT

Feature: Rogue Formation, Port Vincent Limestone at Sheoak Flat. Hallett Cove Sandstone north of Port Vincent, Permian sediments.

Reference: Stuart, 1970.

Description: Because of facies changes there is no standard type section for Rogue Formation. A thick sequence of variable lithology Rogue Formation is exposed in the cliffs in this section. Approximately 5 km north of Port Vincent the Tertiary rests on Permian beds. The Port Vincent Limestone is only present at Sheoak Flat - south of here Hallett Cove Sandstone rests on Rogue Formation.

Rank/Class: Bx

Location 13: Hundred Ramsay, Sections 3,5.

Extent: PORT VINCENT (NORTH AND SOUTH OF)

Feature: Cuspate foreland, erratics on beach, Permian beds.

References: Crawford, 1965; Stuart, 1969.

Description: Port Vincent is built on a cuspate foreland. At low tide erratic boulders of Victor Harbour type granite are seen on the beach north of the town, lying on Permian sediments. Permian clays and erratics are visible in low cliffs, a small fold being seen at one place.

The type section of Port Vincent Limestone is located in Section 4, Hundred of Ramsay 2 Km south of Port Vincent.

Rank/Class: Arxx

Location 14: Hundreds Ramsay, Dalrymple, Melville.

Extent: PORT VINCENT - EDITHBURGH

Feature: Port Vincent Limestone, Rogue Formation, unconformity with Hallett Cove Sandstone.

Reference: Stuart, 1970.

Description: From Port Vincent to near Section 4, Hundred Ramsay the cliffs show both Rogue Formation and Port Vincent Limestone, south of this point the cliff face is almost completely composed of bryozoal Port Vincent Limestone. The unconformity with the Hallett Cove Sandstone is frequently exposed. Some stretches of this area should be preserved due to variations in lithology and thicknesses of sedimentary strata. (Stuart pers. comm.).

Rank/Class: Bx but some local areas should be delineated and ranked Axx.

Location 15:	Hundred Ramsay, Section A.
Extent:	9 KM NORTH OF STANSBURY
Feature:	Alunite seams in red clay filling large erosional hollow in Port Willunga Beds (Port Vincent Limestone)
Reference:	Crawford, 1965, p. 39.
Description:	A large erosional hollow in the Port Willunga Beds (Port Vincent Limestone) is filled with Ardrossan Clays containing thin seams of alunite. Some early mining took place.
Rank/Class:	Bx.
Location 16:	Hundred Dalrymple
Extent:	STANSBURY
Feature:	Cuspate foreland (Oyster Point)
Reference:	
Description:	Cuspate foreland of similar origin to Black Point.
Rank/Class:	Bx
Location 17:	Hundred Dalrymple, Sections 393, 390, 389, F, 380.
Extent:	WOOL BAY - FROM JETTY FOR 2 KM NORTH
Feature:	Solution cavities in Port Vincent limestone.
Reference:	Crawford, 1965, p. 35.
Description:	Deep solution cavities in Port Vincent Limestone are infilled with Tertiary clays. Visible in cliffs and in a road cut south of the entrance to Wool Bay Jetty.
Rank/Class:	Bx.
Location 18:	Hundred Melville, Sections 320, 5137D, part 5137A.
Extent:	GILES POINT

Feature: Hallett Cove Sandstone with oysters.

Reference: Stuart, 1970, Crawford, 1965.

Description: Arenaceous limestones of the Hallett Cove Sandstone contain numerous oysters and other fossils. The oysters are often oriented parallel to bedding and show contact relationships one to another.

Rank/Class: Axx

Location 19: Hundred Melville, Sections 183, 184, 185, 186, 189, 190, 191, 192, A, 635.

Extent: SULTANA POINT

Feature: Complex cuspate foreland, off-shore islands, inland lagoon.

Reference: Crawford, 1965.

Description: A scenic road exists from Sultana Pt. to approximately Troubridge Hill. Sited too close to cliff edge. After about 2 years banks down to beach become badly channelled and barely negotiable.

Stabilised and vegetated dunes from Wattle Pt. to Troubridge Hill. Vegetation here and all around southern coast very important (M. Kenny, pers. comm.).

Rank/Class: Bx.

Location 20: Hundred Melville, Sections J, H, 627,626, 622, 621, Blocks K, L, O, P, Q. Hundred Moorowie, Sections, 72, 232.

Extent: WATERLOO BAY - TROUBRIDGE HILL TO POINT GILBERT

Feature: Permian till, erratics, Hallett Cove Sandstone, wave cut notch, aeolianite, sand dunes.

Reference: Crawford, 1965; Foster, 1974.

Description: A variable sequence of Permian glacial sediments, Tertiary limestone and Quaternary sediments is exposed in many cliff sections along the bay. At Pt. Gilbert unusual patterns on calcrete blocks on the beach.

Rank/Class: Ax except locality 20A below.

Locality 20A: Near Section 626 4a Moorowie.

Extent: PORT MOOROWIE

Feature: Wave cut notch, Permian erratics.

Reference:

Description: Wave-cut notch in cliff, 3½ km east of Point. Good track down to beach. Small erratics on base of cliff in situ, but could easily be disturbed or destroyed.

Rank/Class: Axx.

Location 21: Hundred Moorowie, Hundred Coonarie.

Extent: STURT BAY : PT. GILBERT TO 10 KM WEST

Feature: Coastal dunes, inland swamp, cuspate foreland.

Reference:

Description: Coastal dunes form a protective barrier to Peesey Swamp.

Rank/Class: Bxx.

Location22: Hundred Coonarie, Sections 102, 103, 104, 105, 34, 35, 36, 2, 3, 4.

Extent: POINT DAVENPORT & TEA TREE SWAMP

Feature: Saline swamp, older and younger dunes, cuspate foreland.

Description: A large coastal swamp existing in its natural state and thus of value for scientific study. The swamp is protected from the sea by coastal dunes. Considered suitable for a conservation park.

Rank/Class: Axx

Location 23: Hundred Coonarie, Section 111.

Extent: POINT YORKE TO STENHOUSE BAY

Feature: Precambrian basement, shore platform.

Reference: Crawford, 1965.

Description: The most easterly exposure of crystalline basement rocks occur at Point Yorke. They comprise pink biotite para-gneisses and some amphibolites.
Exposures extend continuously to the west.

Rank/Class: Bx.

Locality 23A: Hundred Warrenben, Section 5.

Extent: HILLOCK POINT AND ENVIRONS.

Feature: Shore platforms, unconformity, aeolianites.

Reference: Crawford, 1965; Metcalf, 1971.

Description: Stepped shore profile with several shore platforms in granite rocks below a cliff in which aeolianite rests upon the granite. There is a weathering profile with granite corestones below the unconformity. The land is privately owned with facilities for camping and there is a fee for admission to the area. The owner has established a tourist drive along the cliff top, known as Hillock Drive and has prepared a brochure. Area suitable for teaching purposes.

Rank/Class: Bx.

Location 24: Hundred Warrenben, Carribie.

Extent: STENHOUSE BAY TO CORNY POINT

Feature: Shore platform, Precambrian basement, raised beach, aeolianite cliffs, coastal dunes.

Reference:

Description: Long stretch of coast with shore platform, and raised beaches, high aeolianite cliffs and coastal dunes which in combination produce many varied vistas of excellent coastal scenery little modified by man. Partly within Innes National Park.

Rank/Class: Bx except for localities below.

Locality 24A: Hundred Warrenben, Section 2, G, 3B.

Extent: STENHOUSE BAY

Feature: Precambrian basement, inland gypsum lakes, coastal dunes, raised beaches, aeolianite cliffs.

References: Crawford, 1965; Greenway and Phillips, 1902.

Description: Massive outcrops of coarse grained biotite gneiss occur at the base of the aeolianite cliffs, around the jetty. Coastal dunes east of the jetty protect the inland gypsum lakes from the sea.

Raised beaches occur at Emu Waterhole, Stone Hut and Hilderowie West.

Approximate eastern limit of high aeolianite cliffs which extend around the coast to Corny Point and provide spectacular scenery. The town area has been purchased for tourist development and seems ideal for such use.

Rank/Class: Bx

Locality 24B: Hundred Warrenben, Section 1.

Extent: CAPE SPENCER

Feature: Shore platform cut in Precambrian basement with intrusive dykes, aeolianite cliffs, raised beach.

References: Crawford, 1965; Von der Borch, 1957; Glastonbury, 1939.

Description: Dykes of altered basic igneous rocks cut the lower Proterozoic gneisses on a shore platform and high

aeolianite cliffs form spectacular scenery. A raised beach is developed at Cable Bay, 5 km west of Cape Spencer.

Rank/Class: Ax

Locality 24C: Hundred Warrenben, Sections 85, 86, 87, 88, portion 35.

Extent: WEST CAPE, GREEN BAY AND PONDALOWIE BAY

Feature: Aeolianite cliffs, cliff erosion, shore platform, stranded beach deposits, coastal dunes.

References: Crawford, 1968; Glastonbury, 1939.

Description: Spectacular scenery - we support the suggestion that Pondalowie Bay should be added to the Innes National Park. Severe damage could occur to dunes by inappropriate access road.

Rank/Class: Ax.

Locality 24D: Hundred Warrenben, Sections 3A, 35.

Extent: BROWN'S BEACH

Feature: Shore platform, Precambrian basement with intrusive dykes, aeolianite cliffs, coastal dunes.

Reference: Von der Borch, 1957.

Description: Dykes of altered basic igneous rocks cut lower Proterozoic gneisses in the shore platform, aeolianite cliffs capped by calcrete and coastal dunes overlie crystalline basement. Road across inland swamps in bad condition.

Rank/Class: Bx.

Locality 24E: Hundred Carribie, Sections L, M.

Extent: DALY HEAD

Feature: Shore platform, Precambrian basement, aeolianite cliffs, vegetated dunes.

Reference: Crawford, 1965.

Description Lower Proterozoic crystalline basement occurs in the shore platform and is overlain by aeolianite. Likely to be subject to intensive

use for teaching purposes. Area should be closely monitored for damage, particularly the dunes.

Rank/Class: Bx except the dunes which are Axx.

Locality: Hundred Carribie, Sections 119, 120, 64, 122, 140, 141.

Extent: BERRY BAY

Feature: Shore platform, Precambrian basement, aeolianite cliffs.

Reference: Crawford, 1965.

Description: Massive whaleback beach outcrops of coarse grained augen gneiss with finer grained schistose bands, with apatite.

Rank/Class: Bx.

Locality 24G: Hundred Carribie, Section 121.

Extent: CORNY POINT

Feature: Shore platform, Precambrian basement, intrusive dykes, aeolianite cliffs, raised sea beach.

Reference:

Description: An excellent example of a shore platform exposes meta-sediments of lower Proterozoic age. These are intruded by a hornblende-lamprophyre dyke. The shore platform matches the height of the raised sea beach. Aeolianite cliffs contribute to spectacular natural scenery. A beautiful place, unspoilt and one of the best teaching areas along the coast because of the range of rock types, an unconformity and geomorphological features.

Facilities to cater for increasing numbers of visitors should be established and maintained.

Rank/Class: Ax.

Location 25: Hundred Carribie, Hundred Para Wurlie.

Extent: CORNY POINT TO POINT SOUTTAR

Feature: Raised beach, beach dune ridges.

References: Crawford, 1965; Greenway and Phillips, 1902.

Description: A raised beach exists between these two points extending up to 5 km inland. Beach dune ridges are well developed with a back ridge up to 20 m high. Much natural vegetation has already been cleared with consequent disturbances of the dune ridges and the dune ecology. Extensive shack development in small areas.

Back dune is very well developed to the east in Section 136, Hundred Para Wurlie.

Rank/Class: Bxx.

Location 26: Hundred Para Wurlie, Sections 130, 131, 132.

Extent: POINT SOUTTAR

Feature: Shore platform, Precambrian basement, Permian till.

References: Crawford, 1965, Greenway and Phillips, 1902.

Descroption: Lower Proterozoic red feldspathic gneisses extend for some distance in a shore platform either side of Point Souttar. Permian pebbly till exposed in beach excavations mark the western limit of the Permian on this part of the coast - exposures are reported to be subject to beach sand movement.

Rank/Class: Bx.

Location 27: Hundred Para Wurlie, Sections 70, 71.

Extent: POINT TURTON

Feature: Type section of Point Turton Limestone.

References: Greenway and Phillips, 1902; Crawford, 1965; Clark, 1928.

Description: Approximately 1m of Permian boulder till is exposed about 460 m west of the point, also east of the jetty. Facetted erratics of Kanmantoo Group type rocks are found at the former place. Raised beach deposits occur along the coast. The type section of the Pt. Turton Limestone (of Crawford) is in the cliffs near the jetty. The limestone is also well exposed in the old quarry now forming the caravan park.

Rank/Class: Arx.

Location 28: Hundred Para Wurlie, Section 1.

Extent: HARDWICKE BAY (EAST OF PT. TURTON)

Feature: Beach dune ridges, coastal dunes.

References: Crawford, 1965.

Description: Beach dune ridges and coastal dunes bar the sea from Peesey Swamp thus protecting an important inland ecosystem. Dunes are well developed.

Rank/Class: Bxx.

Location 29: Hundreds of Tickera, Wallaroo, Tiparra, Kilkerran, Wauraltee, Koolywurtie, Minlacowie, Moorawie.

Extent: PORT MINLACOWIE TO PORT VICTORIA

Feature: Dunes along coast.

Reference:

Description: These are the finest carbonate sand dunes on the Peninsula. They are protected between settlements by a low grade road which would prevent access by most vehicles. A number of widely different plant communities also vary in degree of maturity. They support important eco-systems and it is recommended that the whole stretch of dunes, including the inland dunes at Locality 29C

be made a reserve. It would seem to be an ideal area for a joint

detailed study by a botanist and geomorphologist.
Existing settlements should not be extended.

Rank/Class: Axx except existing settlements.

Locality 29A: Hundred Koolywurtie, Sections 185, 186.

Extent: BROWN POINT (THE BLUFF)

Feature: Raised Beach.

Description: A thin shell bed containing the now extinct (in S.A.) "Euplica bidentata" overlies 5m of calcrete. The shell bed is itself covered by calcrete and low dunes.

Rank/Class: Axx

Locality 29B: Hundred Koolywurtie, Sections 180, 200, 205.

Extent: PT. RICKABY

Feature: Permian glacial till, Quaternary sequence.

Reference: Crawford, 1965.

Description: A few cms of green clay are visible at some localities above high water mark and are overlain by a Quaternary calcareous sequence which demonstrates various relationships of calcrete to other rocks.

Rank/Class: Bx except Permian which is Axx.

Locality 29C: Hundred Wauraltee, Sections 249, 49 E & W 47, 48 E & W, 247, 248.

Extent: PT.VICTORIA

Feature: Coastal dunes, inland beach dune ridges.

Reference:

Description: A coastal dune separates an extensive area of inland dunes considered to represent former beach dune ridges. The feature represents a former embayment of the sea or

an inland swamp now preserved in its natural stage. The area requires further examination before a ranking can be assigned.

Locality 29D: Hundred Wauraltee, Sections A,B, C,D.

Extent: PT. VICTORIA

Feature: Permian siltstone with small erratics. Precambrian basement, shore platform.

Reference: Crawford, 1965.

Description: Red feldspathic gneisses of older Precambrian form a shore platform.

50 m north of the jetty is a small patch of Permian siltstone with small erratic pebbles. This is the most northerly recorded occurrence of Permian on the west coast of the Peninsula.

Rank/Class: Bx with Permian outcrop ranked Axx.

Location 30: Wardang Island

Extent WARDANG ISLAND

Feature: Aeolianite, Hallett Cove Sandstone, Precambrian basement, shore platform.

Reference: Crawford, 1965.

Description: A bed less than 1 m thick of richly fossiliferous Hallett Cove Sandstone overlies older Precambrian basement on the south coast of the island. Aeolianite blankets most of the island.

Rank/Class: Bx

Location 31: Hundred Kilkerran - Aboriginal Reserve

Extent: POINT PEARCE PENINSULA

Feature: Shore platform, Precambrian basement.

Reference: Crawford, 1965.

Description: Basement consists of red feldspathic gneiss, grey gneiss, epidote amphibolite with small pegmatitic intrusions.

Rank/Class: Bx

Location 32: Hundred Kilkerran, Sections A&B

BALGOWAN

Feature: Quaternary sequence.

Reference: Crawford, 1965.

Description: The cliffs north of the jetty contain excellent exposures of Pleistocene clay overlain by younger sequence of calcareous deposits. The latter provide a good locality to study the processes involved in calcrete formation.

Rank/Class: Bxx

Location 33: Hundred Wallaroo, Sections 277, 231, 232, 235, 239, 747, B, D.

Extent: MOONTA BAY TO POINT HUGHES

Feature: Lower Proterozoic basement, Adelaidean sandstone, unconformity, shore platform, Pleistocene clays with alunite, pisolitic iron and silcrete, Melton Limestone.

Reference: Crawford, 1965; Lindsay, 1970.

Description: A shore platform exposes Lower Proterozoic basement which is overlain by conglomerate and quartzitic sandstone of the Adelaidean. The unconformity is a highly significant feature and is seen only in isolated places and is ranked Axx. The low cliffs contain older Pleistocene sediments with an indurated capping. The Melton Limestone is exposed in cliffs at Point Hughes.

Rank/Class: Bx with the exception of the Adelaidean unconformity which is ranked Axx.

Location 34: Hundred Wallaroo, Sections 13, 83, 287, 288.

WARBURTO POINT AND BIRD ISLAND REEF

Feature: Lower Proterozoic basement, Adelaidean conglomerate unconformity.

Reference: Crawford, 1965.

Description: At Warburto Point about 2 m of Adelaidean conglomerate and sandstone overlies older Proterozoic basement. The unconformity itself is a highly significant geological feature and is ranked Axx.

Rank/Class: Bx except unconformity ranked Axx.

Location 35: Hundred Wallaroo, Section 1727, 1728.

WALLAROO HARBOUR RAILWAY YARD

Feature: Lower Proterozoic basement, Cambrian dolomitic limestone.

Reference: Crawford, 1965.

Description: Red gneisses of the crystalline basement outcrop in a small area at the eastern end of the railway yard. In a cutting in the railway yard the Kulpara Limestone contains abundant basement rock debris. Crawford reports an exposure showing a dyke intruding the Kulpara Limestone which was destroyed by widening of the cutting. Further excavations in the railway yard may expose significant rock relationships.

Location 36: Hundred Wallaroo, Sections 924, 925. Hundred Tickera. Sections, 1, 3, 35, 33, 34, 88 N & S, 90 E & W, 91

Extent: PT. RILEY TO TICKERA

Feature: Lower Proterozoic shore platform, Melton Limestone, raised beach.

References: Crawford, 1965; Lindsay 1970.

Description: Continuous exposures of older Proterozoic occur in a shore platform along this portion of the coast. Some amethyst occurs in quartz veins. Melton Limestone up to 8 m thick is exposed in cliffs above Tickera granite and Lower Proterozoic metasediments. Quaternary sequences are also present.

Rank/Class: Bx except for localities listed below.
Locality 36A; Hundred Wallaroo, Section 925.

PT. RILEY

Feature: Quaternary cobble bed in raised beach.

Reference: Crawford, 1965, p. 47.

Description: Cobbles of lower Proterozoic metasediments and Tertiary limestone overlie Pleistocene clays.

Rank/Class: Ax.

Locality 36B: Hundred Tickera, Section 34.

MYPONIE POINT

Feature: Melton Limestone.

Reference: Lindsay, 1970.

Description: About 5 feet of unnamed basal Oligo-Miocene fossiliferous sand occurring a few feet above beach level, is overlain by up to 30 feet of Melton Limestone displaying a disconformity and karst features. This locality could become a reference section. Also an unconformity with Tickera granite.

Rank/Class: Axx.

Locality 36C:

Extent: 1 m S.W. Tickera.

Fracture: Melton Limestone, basement unconformity.

Reference: Lindsay, 1970.

Description: Melton Limestone unconfomably overlying a whaleback of Carpentarian gneiss and Tickera Granite.

Rank/Class: Ax

Locality 36D: Hundred Tickera, Section adj. 504.

TICKERA LANDING

Fracture: Melton Limestone.

Reference: Lindsay, 1970.

Description: Low cliffs expose 8 feet of basal Oligo-Miocene sand with alunite seams which is overlain by Melton Limestone.

Rank/Class: Axx.

Locality 36E: Hundred Tickera, adjacent Sections 526, 527.

Fracture: Melton Limestone, coastal fault.

Reference: Lindsay, 1970.

Description: Three members of Melton Limestone dip steeply north west possibly along a coastal fault.

Rank/Class: Ax.

Location 37: Hundreds Tickera, Wokurna.

Extent: TICKERA TO PT. BROUGHTON

Feature: Mangrove swamps, samphire flats.

Reference:

Description: Shallow sand shoals are backed by stranded shell banks, with small areas of mangroves and larger samphire swamps.

Rank/Class: Bx.

Location 38: Hundred Mundoora

Extent: PORT BROUGHTON TO NORTHERN BOUNDARY

Feature: Mangrove swamps, estuary, coastal dunes.

Reference:

Description: The tidal channels of Mundoora Arm and Fisherman Bay, are backed by extensive tidal mud flats and samphire swamps. Mangrove swamp is represented immediately west of Port Broughton.

Rank/Class: Bx.

PORT BROUGHTON TO NORTHERN BOUNDARY (38)
MANGROVE SWAMPS.
ESTUARY.
COASTAL DUNES.
SAMPHIRE SWAMP.

TICKERA TO PORT BROUGHTON (37)
MANGROVE SWAMP.
SAMPHIRE SWAMP.

TICKERA (36D) (36E)
OLIGO-MIOCENE SAND.
MELTON LIMESTONE.
COASTAL FAULT ?.

1·5Km SOUTH WEST OF TICKERA (36C)
PRECAMBRIAN BASEMENT
UNCONFORMABLY OVERLAIN
BY MELTON LIMESTONE.

POINT RILEY TO TICKERA (36)
PRECAMBRIAN BASEMENT IN SHORE PLATFORM.
TERTIARY MELTON LIMESTONE.
RAISED BEACH.

MYPONIE POINT (36B)
MELTON LIMESTONE.

POINT RILEY (36A)
QUATERNARY COBBLE BED
IN RAISED BEACH.

WALLAROO HARBOUR RAILWAY YARD (35)
PRECAMBRIAN BASEMENT.
CAMBRIAN DOLOMITIC LIMESTONE.

WARBURTO POINT & BIRD ISLAND REEF (34)
PRECAMBRIAN BASEMENT UNCONFORMABLY
OVERLAIN BY ADELAIDEAN CONGLOMERATE.
(LATER PRECAMBRIAN)

MOONTA BAY TO PORT HUGHES (33)
PRECAMBRIAN BASEMENT UNCONFORMABLY
OVERLAIN BY ADELAIDEAN SANDSTONE IN
THE SHORE PLATFORM.
TERTIARY MELTON LIMESTONE.
QUATERNARY CLAYS WITH ALUNITE.

BALGOWAN (32)
QUATERNARY SEQUENCE.

POINT PEARCE PENINSULA (31)
PRECAMBRIAN BASEMENT IN
SHORE PLATFORM.

WARDANG ISLAND (30)
PRECAMBRIAN BASEMENT
IN SHORE PLATFORM.
HALLETT COVE SANDSTONE.
AEOLIANITE.

PORT VICTORIA (29D)
PRECAMBRIAN BASEMENT
IN SHORE PLATFORM.
PERMIAN SILTSTONE WITH
SMALL ERRATICS.

6km SOUTH OF PORT VICTORIA (29C)
COASTAL DUNES.
INLAND BEACH.
DUNE RIDGES.

PORT MINLACOWIE TO PORT VICTORIA (29)
CARBONATE DUNES ALONG COAST.

PORT RICKABY (29B)
PERMIAN GLACIAL TILL.
QUATERNARY SEQUENCE.

BROWN POINT (29A)
RAISED BEACH.
SHELL BED.

POINT SOUTTAR (28)
PRECAMBRIAN BASEMENT
IN SHORE PLATFORM.
PERMIAN TILL.

CORNY POINT TO POINT SOUTTAR (25)
RAISED BEACH AND BEACH DUNE
RIDGES.

CORNY POINT (24B)
SHORE PLATFORM OF PRECAMBRIAN
BASEMENT WITH INTRUSIVE DYKES.
RAISED SHORE PLATFORM AND
SEA BEACH.

BERRY BAY (24F)
PRECAMBRIAN BASEMENT
IN SHORE PLATFORM.

DALY HEAD (24E)
PRECAMBRIAN BASEMENT
IN SHORE PLATFORM.

STENHOUSE BAY TO CORNY POINT (24)
AEOLIANITE CLIFFS.
RAISED BEACH.
COASTAL DUNES.
SHORE PLATFORM.

BROWNS BEACH (24D)
PRECAMBRIAN BASEMENT
IN SHORE PLATFORM
INTRUSIVE DYKES.

WEST CAPE, GREEN BAY & PONDALOWIE BAY (24C)
STRANDED BEACH DEPOSITS.
SHORE PLATFORM.
DUNES.
AEOLIANITE CLIFFS.

CAPE SPENCER (24B)
PRECAMBRIAN BASEMENT IN
SHORE PLATFORM WITH
INTRUSIVE DYKES.
AEOLIANITE CLIFFS.
RAISED BEACHES.

STENHOUSE BAY (24A)
PRECAMBRIAN BASEMENT.
INLAND GYPSUM LAKES
PROTECTED BY DUNES.
RAISED BEACHES.
AEOLIANITE CLIFFS.

POINT YORKE TO STENHOUSE BAY (23)
PRECAMBRIAN BASEMENT IN SHORE
PLATFORM.

HILLOCK POINT (23A)
SEVERAL SHORE PLATFORMS IN
PRECAMBRIAN BASEMENT GRANITE.
WEATHERED PROFILE BELOW THE
OVERLYING AEOLIANITE.

POINT DAVENPORT & TEA-TREE SWAMP (22)
COASTAL SALINE SWAMP
PROTECTED BY OLDER
AND YOUNGER DUNES.
CUSPATE FORELAND.

STURT BAY (21)
DUNES PROTECTING
PEESEY SWAMP.

WATERLOO BAY (20)
PERMIAN TILL WITH ERRATICS.
HALLETT COVE SANDSTONE.
WAVE CUT NOTCH.
AEOLIANITE CLIFFS AND
SAND DUNES.

PORT MOOROWIE (20A)
ERRATICS IN PERMIAN TILL.
WAVE CUT NOTCH.

POINT TURTON (27)
POINT TURTON LIMESTONE.
PERMIAN BOULDER TILL
WITH FACETED
KANMANTOO GROUP
ERRATICS.

HARDWICKE BAY (26)
BEACH DUNE
RIDGES PROTECT
PEESEY SWAMPS.

SANDY POINT (2A)
STRANDED SEA CLIFFS.

SANDY POINT TO PRICE (2)
RECENT CARBONATE
SEDIMENTATION AND
MANGROVES.

PORT GAWLER TO SANDY POINT (1)
COASTAL MANGROVES.
BEACH RIDGES.

ARDROSSAN (3)
QUATERNARY IN CLIFFS.

PARARA POINT (4)
RECENT SHELL BEDS.

ROGUE POINT TO MULOOWURTIE POINT (5)
TERTIARY UNCONFORMABLY OVERLYING CAMBRIAN.

SLIDING ROCKS (5A)
MULOOWURTIE FORMATION.

THROOKA SILTS. (5B)

MULOOWURTIE POINT (5C)
ROGUE FORMATION.

HARTS MINE (6)
PRECAMBRIAN BASEMENT
UNCONFORMABLY OVERLAIN
BY CAMBRIAN.
COPPER MINE.

PINE POINT (7)
PRECAMBRIAN BASEMENT UNCONFORMABLY
OVERLAIN BY CAMBRIAN BRECCIA AND
TERTIARY MULOOWURTIE FORMATION.
RAISED BEACH.

ROCKY POINT (8)
QUARTOO SANDS.
CAMBRIAN CONGLOMERATE
UNCONFORMABLY
OVERLAIN BY TERTIARY.

BLACK POINT (9)
CUSPATE FORELAND.
COASTAL DUNES.

PORT JULIA (10)
PORT JULIA GREENSAND.
POST-TERTIARY IN CLIFFS.
RAISED BEACH.
ANTICLINE.

SHEOAK FLAT (11)
TERTIARY IN CLIFFS.

SHEOAK FLAT TO PORT VINCENT (12)
ROGUE FORMATION.
PORT VINCENT LIMESTONE.
HALLET COVE SANDSTONE.
PERMIAN GLACIALS

PORT VINCENT (13)
CUSPATE FORELAND.
PERMIAN GLACIAL SEDIMENTS
WITH LARGE ERRATICS OF
VICTOR HARBOUR-TYPE GRANITE.

9km NORTH OF STANSBURY (15)
ALUNITE SEAMS IN ARDROSSAN CLAYS
FILLING EROSIONAL HOLLOW IN
PORT VINCENT LIMESTONE.

STANSBURY (16)
CUSPATE FORELAND.

PORT VINCENT TO EDITHBURGH (14)
PORT VINCENT LIMESTONE.
ROGUE FORMATION.
UNCONFORMITY WITH
HALLETT COVE LIMESTONE.

WOOL BAY (17)
SOLUTION CAVITIES IN
PORT VINCENT LIMESTONE.

GILES POINT (18)
HALLETT COVE SANDSTONE
WITH NUMEROUS OYSTERS
AND OTHER FOSSILS.

SULTANA POINT (19)
COMPLEX CUSPATE FORELAND,
OFF SHORE ISLANDS.
INLAND LAGOON.

GULF ST VINCENT

SPENCER GULF

Port Broughton
Alford
Bute
WALLAROO
KADINA
Moonta
Paskeville
Kulpara
Port Wakefield
Clinton Centre
Sandy Point
Price
Wild Horse Plains
Arthurton
Maitland
Ardrossan
Parham
Windsor
Dublin
Great Sandy Point
Port Prime
Lower Light
Two Wells
Middle Beach
Port Gawler
Virginia
Sandilands
Pine Point
Port Julia
Curramulka
Minlaton
Port Vincent
Stansbury
Wool Bay
Edithburgh
Yorketown
Warooka
Port Victoria
WARDANG ISLAND
Port Minlacowie
Point Turton
Corny Point
Inneston
Stenhouse Bay
Balgowan

N

LEGEND

(12) APPROXIMATE EXTENT OF COASTAL FEATURE OF GEOLOGICAL INTEREST.

APPROXIMATE INLAND EXTENT OF ESSENTIALLY COASTAL FEATURE WHICH EXTENDS INLAND BEYOND ½ km OF THE COAST

SCALE IN KILOMETRES
5 0 5 10 15 20 25 30

DEPARTMENT OF MINES-SOUTH AUSTRALIA

YORKE COAST PROTECTION DISTRICT
SIGNIFICANT GEOLOGICAL FEATURES

ENVIRONMENT & RESOURCE DIVISION	COMPILED S.G.C.	DRN L.C.	SCALE 1:250 000	PLAN NUMBER
DIRECTOR OF MINES	S.G. CARR	CKD	DATE FEBRUARY '76	76-99

59, G7, 75, G6