LESCHENAULT INLET

DEVELOPMENT AND CONSERVATION

The southernmost waters of Leschenau

Leschenault Estuary and hinterland afford an excellent example of the complex problems involved in the multiple use of a very important estuary—problems common overseas but only now being fully realised in Australia.

Primary concern for the estuary is centred around two opposing interests; development and conservation. To the city dweller an area of protected water such as this provides for a variety of recreational activities; a safe area for boating and swimming, a perfect location for crabbing and fishing and an area of picturesque surroundings to enjoy or perhaps to photograph. To the fisherman it represents his source of income and livelihood; to the teacher it satisfies a practical teaching need in an area of diverse interest; and to the industrialist it can present a variety of uses.

Quite obviously these uses—urban, recreational and industrial—conflict with conservation; that is, maintaining the native state of the estuary. Inevitably, any development in a specific location on the estuary will result in localised or widespread destruction of habitat with a consequent deterioration of the natural state of the estuary as a whole.

The compromise between development and conservation must therefore seek to localise development in areas of minimal value to the conservation interest.

There is another aspect to the problem of development of the Leschenault Estuary. In the past, there has been a lack of unified approach; as is often the case, one group of interests tended to override the other and there was little or no consultation between these groups. Evidence of this may be found in the Report by the Senate Select Committee on Water Pollution. Referring to the disposal of La Porte effluent, the Committee Report stated: "This is a classic case of industrial pollution. When a new industry is to be established in the State, the Government and the enterpreneur are naturally concerned primarily with the economic success of the industry. The judgements made about the side effects of pollution often receive rather less detailed consideration."

To be effective, any plan for development and conservation should set out to achieve the best possible compromise between these opposing interests. Future planning should be undertaken on a unified basis with representation of all interests, and the major consideration of any development should recognize the tolerance limits of the estuary.

henault Estuary which have been isolated from the rest of the Inlet by harbour development.

INTRODUCTION

Reproduced below is a summarised version of the Report on Leschenault Inlet by Dr N. Morrissy, Research Officer, Department of Fisheries and Fauna. The report which was compiled in September last year came about as a result of the urgent need of the Leschenault Estuary Conservation Committee to consider a proposed development in a relatively undisturbed section of the Estuary.

The Leschenault Estuary Conservation Committee was formed in 1965 to co-ordinate the activities of a number of authorities who have some interest in the Estuary and to consider such proposed developments. The Committee has representatives from nearby local authorities, Swan River Conservation Board, Town Planning Board, Public Works Department and Department of Fisheries and Fauna. Dr Morrissy's Report to the Committee describes the area and its present utilization, outlines the hydrological conditions and ecology of the estuary and discusses guidelines for future development.

UTILISATION

The study area, (Fig. 1) consisting of the estuary and environs appears to fall into four major categories and areas at present, with respect to human usage and modification versus the natural habitat.

Area A.

There are three situations:

(1) Koombana Bay, which offers protected recreational beaches and boating waters. The Bay is the site of the present Bunbury Harbour Wharves. It is also important as a crab habitat (see Fisheries and Fauna Journal F.I.N.S. Vol. 3 No. 1 March 1970). The feature reported in F.I.N.S. was part of a three year research programme by Mr T. Meagher. on crab populations in the Leschenault Inlet.

(2) This area comprises the former estuarine waters opposite Bunbury Town. The freshwaters draining into the inlet once gained access to the sea at the western end. This opening was plugged and a new opening was made opposite the Collie River mouth. With the new harbour development, the water of the Preston and Collie Rivers will not influence the waters of Area A which, therefore, can no longer be considered as estuarine.

A deep water channel runs along the southern foreshore and the northern foreshore is flat and swampy.

The semi-tropical mangrove *Abicennia marina* fringes the northern area and also the southern margin of the island whose eastern portion has now been banked for the harbour development. According to G. Smith of the Botany Department, University of Western Australia these mangroves exist in the inlet because of the high water temperatures and salinities which prevail for most of the year; it may be that the changes in water movement will no longer allow their con-

tinued existence. On the northern foreshore Cable (1956) Ltd. are filling some of the swamp with the waste soil from ilmenite extraction.

The man-made aesthetics of this area are rather poor. There is also considerable pollution of the waters with overflow from septic tanks.

(3) The new harbour-development waters and foreshores are, of course, a drastic alteration of the former habitat. There is some trepidation that crabs (juveniles) migrating into the enclosed waters may use the new opening as well as the customary one. If the juvenile crabs migrate into the harbour development waters they would be isolated from the major part of the estuary by the new plug. Much of the dredged material is being used to create the embankment opposite the power station and also to fill out the flats and adjacent bay. The salt marsh between the harbour and the main road appears to be dying.

The Preston River has been diverted to flow into Vittoria Bay from its former course from the main road to a confluence with the estuary close to the power station.

Area B.

This area is in a transient state of development with respect to housing and holiday facilities. East of the main road there is the growing Eaton Township south of the Collie River and Australind Township. The latter is apparently contained at present between the foreshore road, the La Porte factory, the Brunswick River and the northern divergence of the main road in a north-easterly direction over the north-south ridge.

In the area east of the road the important features are the picturesque lower reaches of the broad Collie River and the Tuart-forested slopes of the ridge.

The foreshore area west of the road between the Preston and Collie Rivers and facing Vittoria Bay is semi-rural, the edge of the water being sedge-lined and the land open except on the peninsula at the Collie River mouth. This foreshore is at present zoned open space for recreation, but it may be re-zoned industrial, with the reclamation of Vittoria Bay. Recreational facilities here consist of a boat launching ramp, speedway and caravan park. Further north lies the La Porte development.

Opposite Australind Townsite, housing development and a garage reduce the length of the foreshore available to the public by about half a mile. Elsewhere the sedge-lined foreshore between the water's edge and the road is only about 50 feet wide as compared with the 50 yards or so for about three quarters of a mile adjacent to Australind.

Just north of the housing development is the Paris Road boat-launching facility. The effect of removing the sedges from the waters edge adjacent to the ramp has been to promote shoreline erosion. The deepwater channel across the shallow water flats may provide cover for large fish e.g. Kingfish or Tailor which prey on small juvenile fish growing in the estuary.

The foreshore in this area, and also in Area C, is much used in the summer months by people who wade the shallow waters for crabs. On one Sunday the district fisheries inspector at Bunbury estimated that there were 2,500 people on the foreshore, about one third of whom were wading for crabs. This shallow water of 1-2 ft. in depth extends out for several hundred yards from most of the eastern foreshore. Camping is prohibited along the foreshore and alternative facilities are almost non-existent.

The western shoreline is less suitable for wading being boggy and access by land is difficult.

Area C.

At present this area can be classed as rural cattle grazing land with some large areas of virgin scrub forest. The north-south ridge is well clothed with Tuart forest. There are a few farm houses east of the old coast road.

The sedge-lined foreshore is mostly narrow, about 50 feet, the exceptions being at the wooded promontories in the central area. The northern area is a sedge swamp and at the top of the inlet the land is open for cattle grazing.

It seems likely that housing will extend northwards into this area. The land is freehold and tenure includes the foreshore in the central area where there is a group of old shacks. Freshwater drainage channels off the ridge occur across this area north of and including the central promontories. Peppermints and paperbarks occur on the promontories and line the roads. A large freshwater drainage channel enters the head of the estuary and there are also freshwater pools in this locality.

Area D.

This extensive area of coastal dunes is affected only by cattle grazing, which is probably limited, and, in one locality, by La Porte effluent.

For the most part, it is well forested with Tuarts on the eastern slopes except for the flatter land at Waterloo Head. Freshwater seepage occurs from the dunes. Kangaroo or wallaby tracks are common in this area.

As shown in Fig. 1 the inefficient disposal of La Porte effluent has resulted in:

(1) Killing of Tuarts and other trees over a considerable area.

(2) Limited direct leakage of effluent into the inlet foreshore.

(3) Pollution of the ocean and beach.

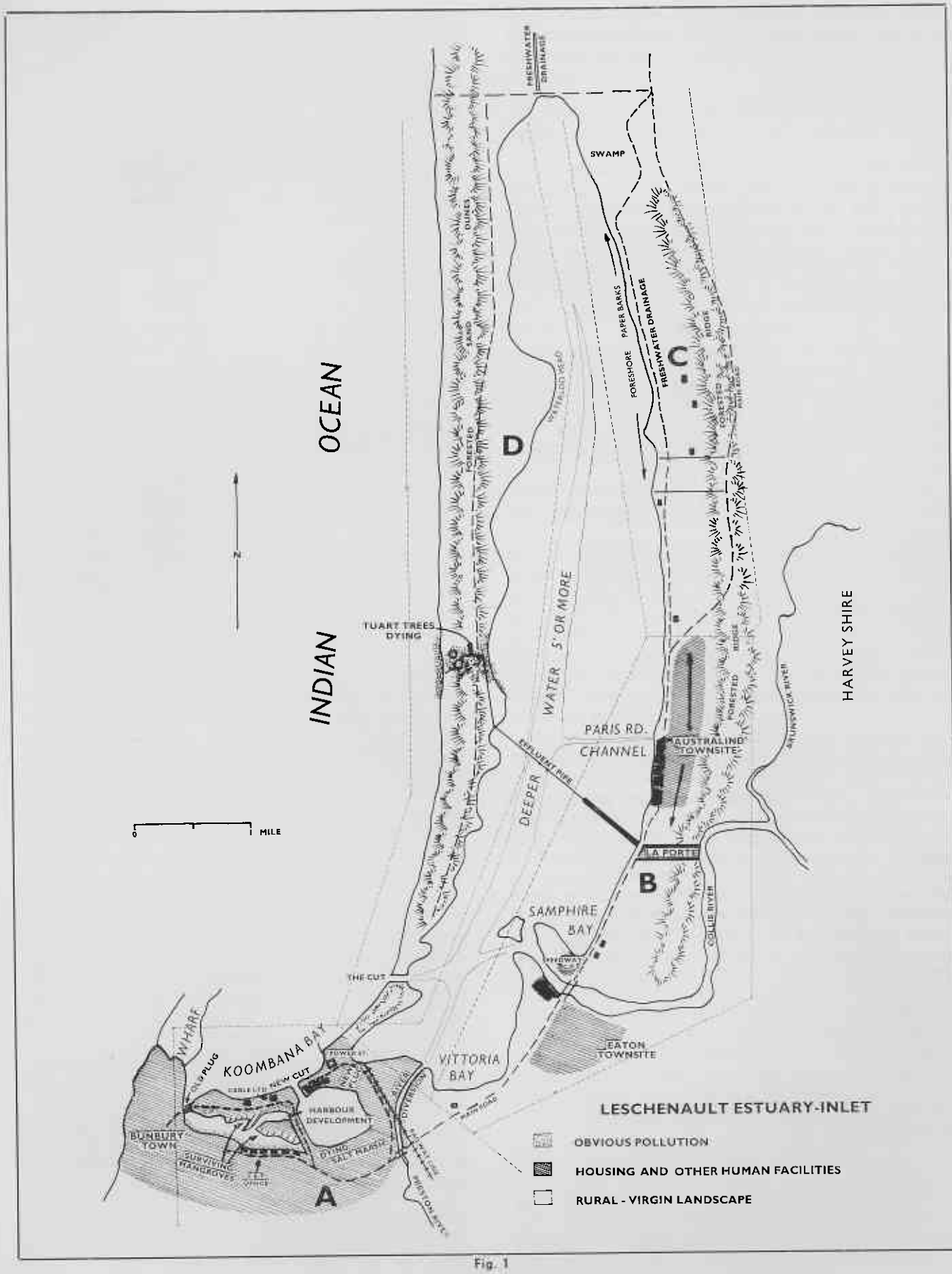
INDIAN OCEAN
N
0
MILE
FRESHWATER DRAINAGE
SWAMP
DUNES
FORESTED SAND RIDGE
FORESHORE
PAPER BARKS
FRESHWATER DRAINAGE
C
D
TUART TREES DYING
WATER S' OR MORE
PARIS RD.
CHANNEL
AUSTRALIND TOWNSITE
HARVEY SHIRE
DEEPER
LA PORTE
B
SAMPHIRE BAY
COLLIE RIVER
THE CUT
WHARF
KOOMBANA BAY
OLD PLUG
NEW CUT
HARBOUR DEVELOPMENT
BUNBURY TOWN
SURVIVING MANGROVES
DYING SALT MARSH
A
VITTORIA BAY
DIVERSION
EATON TOWNSITE
LESCHENAULT ESTUARY-INLET
OBVIOUS POLLUTION
HOUSING AND OTHER HUMAN FACILITIES
RURAL - VIRGIN LANDSCAPE

Fig. 1

The effluent settling ponds no longer work since an impervious layer of precipitate on the bottom has prevented filtration through the sand. The effluent appears to flow straight through the one pond in use down to the beach producing the characteristic red-brown stain in the ocean for several hundred yards along the beach. Sand dunes in this area are also stained.

The effluent disposal site was apparently placed in one of several large "blowouts" through the dunes. The killing of the forest and other vegetation adjacent to the blowout by pollution may lead to further wind induced erosion (in a wind-induced South West/North East line) with disastrous consequences if the effluent-caked sand is swept into the inlet.

HYDROLOGY

The estuary is approximately 12 square miles in extent. Except for a central north-south channel it is very shallow averaging 1-2 feet in depth with the deeper water up to 6 feet in depth. In its present state, and former natural state, the estuary has a very constricted and unusual ocean entrance.

Because of its shallowness, and despite the small tidal variation, up to 45% of ocean exchange can occur.

Water temperatures average 13-14°C in winter (ocean 16-17°C) and 25°C (ocean 20-22°C) in summer. There is a large diurnal variation in temperature from mid-winter to mid-summer increasing in degree towards the head of the estuary.

The salinity decreases from south to north during winter due to northern freshwater drainage and the dilution from the Collie and Preston Rivers extends only to about the La Porte pipeline.

In summer the salinity may reach 45% at the head of the estuary while remaining at seawater values (33%) at the southern end.

There is a large diurnal flux in oxygen content due to filamentous algae photosynthesis and respiration and overnight cooling and daytime heating. One hundred percent saturation daytime values in summer may fall to 35% saturation on the western shoreline and 60% on the eastern shoreline (where algae is not prevalent.)

The turbidity of the estuary varies widely from place to place; the northern parts being clear and the southern usually turbid due either to mud disturbance or unicellular algae.

Dr Hodgkin of the University of W.A. has pointed out that the Swan, Peel and Leschenault Estuaries differ greatly in many features—size, tidal exchange, dilution by drainage, depth, temperature, etc . . . . . Peel and Leschenault being similar because they are both shallow and highly productive—unlike the Swan.

FLORA AND FAUNA

Aquatic Life

Dense blooms of both attached filamentous algae and unicellular algae are characteristic of this warm, shallow and therefore highly productive estuary.

Benthos (particularly amphipods and polychaete worms) and plankton are very abundant.

Netting and inspection of the shallow water shows that the estuary is an extremely important nursery area for breeding and for juvenile fish. Species are blue manna crabs *(Portunas pelagicus)*, King George Whiting *(Sillaginodes punctatus)*, Yellow-finned Whiting *(Sillago schomburgkii)*, Cobbler *(Cnidoglanis macrocephalus)*, Sand Mullet *(Myxus elongatus)*, Yellow-eye Mullet *(Aldrichetta forsteri)*, Bony Herring *(Fluvialosa vlaminghi)*, Smelt *(Craterocethalus sp.)*, and Black Bream *(Mylio butcheri)*. Greasy-back Prawns occur infrequently.

Although there are 18 licensed professional fishermen in the Bunbury-Harvey area, only 7 fish consistently. Talks with these fishermen revealed that the highly seasonal incidence of maturing fish, the nuisance of meshing crabs in summer, and the depressed state of fish prices does not allow full-time fishing. There does, however, seem to be plenty of scope for amateur fishing.

Birdlife

Mr T. Riggert, of the Department of Fisheries and Fauna Research Section has pointed out that coastal inlets and estuaries are of minimal value for large-scale breeding of ducks. Estuaries are, however, very important as summer refuges for ducks when inland waters dry up. The ducks can feed on filamentous algae, etc. in brackish water but require freshwater soakages and springs for drinking water (at night).

These requirements of ducks are well met by conditions in the top end of the estuary where some breeding occurs. In these summer shallow water habitats ducks require protection from excessive disturbance (as produced by human shoreline activity, shooting and power boating.) The estuary is frequented by Black Swans, particularly in the north-west corner and Vittoria Bay area where there are mud banks.

Dr D. L. Serventy could not give a complete summary of the wildlife on the estuary but he thought that the avi-fauna would be substantially similar to that of Peel Inlet. Dr Serventy also said that the area appears to be a very important feeding ground for the northern migrants of waders which breed in Siberia. He added that the development of the Swan River Estuary has decreased the extent of their feeding grounds in that area.

In December, Mr J. Lane of the Department's Fauna Research Section, conducted two, four-day surveys of the birdlife of Leschenault Inlet. The survey did not include the area of new harbour development because of the drastic alterations to the waters and foreshores. The remainder of the inlet comprised four distinct waterbird habitats.

(1) **East Shore.**

On the sand flats of the eastern shore large numbers of Swans were observed feeding along

Aerial photograph of the study area taken from 20,000 ft. in January, 1966.

with White Egrets and Pelicans. On the sedge-lined foreshore only three species of wading birds (Greenshank, Grey Plover and Bar-tailed Godwit) were seen.

Scattered groups of Mountain Ducks were also seen feeding on the shallow flats of the eastern shore.

(2) **Head of the Inlet.**

The flats in this area consist of thick black mud and since public access is difficult, the head of the inlet forms a suitable refuge for ducks and swans. Large numbers of Mountain Duck, Black Duck, Grey Teal and Wood Duck were observed. These flats are also favoured as a feeding ground for White-headed Stilt, White Egret and White-faced Heron.

(3) **West Shore.**

The western shoreline supports an abundance of estuarine fish and as such the shallows provide important feeding grounds for Crested and Caspian Terns, White-faced Heron, White Egret, Swans and Pelicans.

Very few wading birds frequent this area.

(4) **Collie River Delta.**

The sandflats formed at the mouth of the Collie River are important resting grounds for Cormorants, Pelicans and Swans. The delta flats are also feeding areas for wading birds—Bar-tailed Godwit, Greenshank, Grey Plover, Red-necked Avocet, Little Stint and White-headed Stilt, Swans, Pelicans, Cormorants and Terns feed in the adjacent deeper water, and Pelicans, Cormorants, Terns, Egrets, Herons and Darters feed along the edges of the Collie River.

Mr Lane has concluded from his observations that Leschenault Estuary compares less favourably with the Swan River, Peel Inlet, and Harvey Estuary for species diversity and, in relation to bird numbers, Leschenault carries substantially less birds than Peel Inlet and Harvey Estuary. Mr Lane believes that representative areas of each of the four waterbird habitats will have to be retained to ensure the continued residence of the 25 species of birds recorded.

Foreshore.

It is fairly obvious that the marginal fringe of sedges on the perimeter of most of the estuary plays an important part in preventing shoreline erosion. If this feature is removed, the often limited width of foreshore will be further reduced.

Tuart Forest.

Mr G. Smith of the Botany Department, University of Western Australia points out that Tuarts have a restricted formation as a narrow strip along the coast on limestone soils. Mr Smith also points out that most flora and fauna reserves occur well inland from the coast and that there is a great practical teaching need for areas of natural biological interest close to coastal towns, such as Bunbury.

DISCUSSION AND RECOMMENDATIONS.

The following guidelines for the future development and conservation are made with regard to specific features and areas, and as an entity.

Area A.

The emphasis in this area of intensive housing and industrial development should be on attaining a higher standard of man-made aesthetics on the inlet foreshores. Special attention should be given to preserving the unique mangrove and in controlling aqueous pollution.

Areas B and C

(1) **Areas east of the Main Road (B) and the Old Coast Road (C).**

As well as promoting high grade housing and landscaping, attention should be given to providing attractive and spacious camping areas and facilities along the road.

(2) **Foreshore.**

Only a small fraction of the total perimeter of the Estuary is attractive, undeveloped and also accessible. This area is confined to the eastern foreshore.

This foreshore constitutes the primary location of public attraction to the estuary, most importantly, crabbing. The location of housing or shacks benefits very few people while decreasing both the scenic attraction and length of foreshore available to the public.

It should be pointed out that people are drawn to the area almost solely by its natural assets. Housing and unattractive facilities, particularly in Area C, should be restricted to the eastern side of the road. Some effects of the development of this area of the estuary would be to encroach on the refuge areas of ducks by more intensive boating activities and by human activity near the freshwater soakage.

Power boating may adversely affect the productivity of these clear shallow waters by increasing turbidity.

There is also a very bad mosquito problem towards the northern end of the estuary. Solutions to this problem, such as drainage of freshwater pools or spraying with insecticides, would disrupt or destroy the area as a duck refuge and nursery area for juvenile fish.

Area D.

This area is very important from a conservation point of view as a potential "A" Class Reserve. The northern part of the estuary should also be given protection for wildfowl refuge.

In summary the four areas A to D appear to offer excellent prospects for a planned compromise between future development on the estuary and conservation. Because of the manner in which development has extended out from Bunbury an ideal opportunity exists at this time to provide suitable areas for tourism, recreation and preservation of the natural habitat.