Coastal Management Plan Kalbarri Townsite

Department of
Conservation and Environment
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Coastal Management Plan

Kalbarri Townsite

A study promoted by the

Department of Conservation and the Environment
and the
Coastal Management Co-ordinating Committee
of Western Australia

in co-operation with the
Shire of Northampton

C. E. Chalmers

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Cover Photograph. Murchison River Estuary and Kalbarri Township by Stuart Chape.

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Coastal Planning in Western Australia

In 1982 the Western Australian Government established a Coastal Management Co-ordinating Committee comprising representatives from a number of State authorities to:

- advise government about coastal management policies, legislation and administrative arrangements;
- co-ordinate departmental activities on the coast through the exchange of information and views, and review expenditure programmes and priorities;
- overview the preparation and implementation of coastal management plans at regional and local levels, for various locations on the coast of WA.

This is the third plan prepared under this programme and the locations covered by other plans are shown on Map 1.

Summary — Coastal Management Plan — Kalbarri Townsite

During the preparation of the Shire of Northampton Town Planning Scheme No 4, Kalbarri, Town Planning Consultants Russell Taylor and William Burrell expressed concern about the coastal areas in the town. They recommended that the foreshore be subject to investigation by the Environmental Protection Authority, and that development and management of the area be guided by a coastal management plan, prepared by the Department of Conservation and Environment (DCE) in consultation with Council.

In December 1982 a Draft Development and Management Plan was prepared in accordance with the Town Planner's recommendations. Comments were made about the draft by the Departments of Public Works, Town Planning, Marine and Harbours, the National Parks Authority and the W.A. Museum. In addition Council and members of the community offered advice.

After considering those comments this plan was produced. It involves a study of the area's resources and the use pressures placed upon it, and outlines the following aims and objectives to guide Council and government agencies in the development and management of the area:

- conserve the natural systems;
- provide for appropriate recreational use;
- provide for the needs of professional fishermen and other boat owners;
- develop a programme of public education which will aid in the conservation of the area and assist public enjoyment of the district;
- preserve and improve the landscape of the reserve.

This plan contains development and management proposals which have been prepared to assist in achieving these aims. Finally, a chapter on implementation gives recommendations concerning priorities and procedures required to effect the aims outlined above.

This plan will be subject to review in 1988. Amendment before that date will be undertaken after consultation between Council, DCE and other interested authorities and people.

Introduction

Location

Kalbarri is a small fishing and tourist centre at the mouth of the Murchison River 590 kilometres north of Perth. The town centre is located at 27° 42' north and 114° 12' east, and is in the Shire of Northampton 165 kilometres, by road, north of Geraldton (see Map 1).

Background

Russell Taylor and William Burrell, Consultants in Town Planning and Urban Design, have prepared the Shire of Northampton, Town Planning Scheme No 4, Kalbarri, for the Shire of Northampton. The scheme describes nine planning precincts based on geographical and social factors which are used as a basis for town planning. The precincts are as shown on Map 2 and are as follows:

1. Town Centre — Commercial Industry
2. Holiday Accommodation
3. Community Services
4. Medium Density Housing
5. Low Density Housing
6. Industry

7a, b & c. Open Space/Recreation

8. Public Purposes (water)
9. Rural and Special Rural

The Town Planning Scheme divides precinct 7 into three areas with 7c designated as the River Foreshore and Dune Area. The Town Planning Scheme states:

"This whole precinct is one of considerable concern due to the pressures placed upon it by heavy seasonal use by the tourist population.

Part of the estuary foreshore is developed for passive recreational use and for boating activities (both commercial and recreational) with random mooring and beaching of small private vessels.

Development Policies

It is recommended that the Council adopt strong environmental management policies to control both the use and development of the frontal sand dunes. These management policies should be set out in accordance with advice from the Department of Conservation and Environment.

It is also recommended that the Council undertake a study, in conjunction with the above, to determine the possibility of a small marina/jetty system to provide moorings to alleviate the currently ad-hoc moorings in the estuary.

Council will from time to time as circumstances warrant initiate studies of specific Coastal Management Areas in order to determine an appropriate Management Plan.

Upon preparation of such a plan for an area, Council will adopt management strategies and will thereafter determine development in accordance with that strategy.

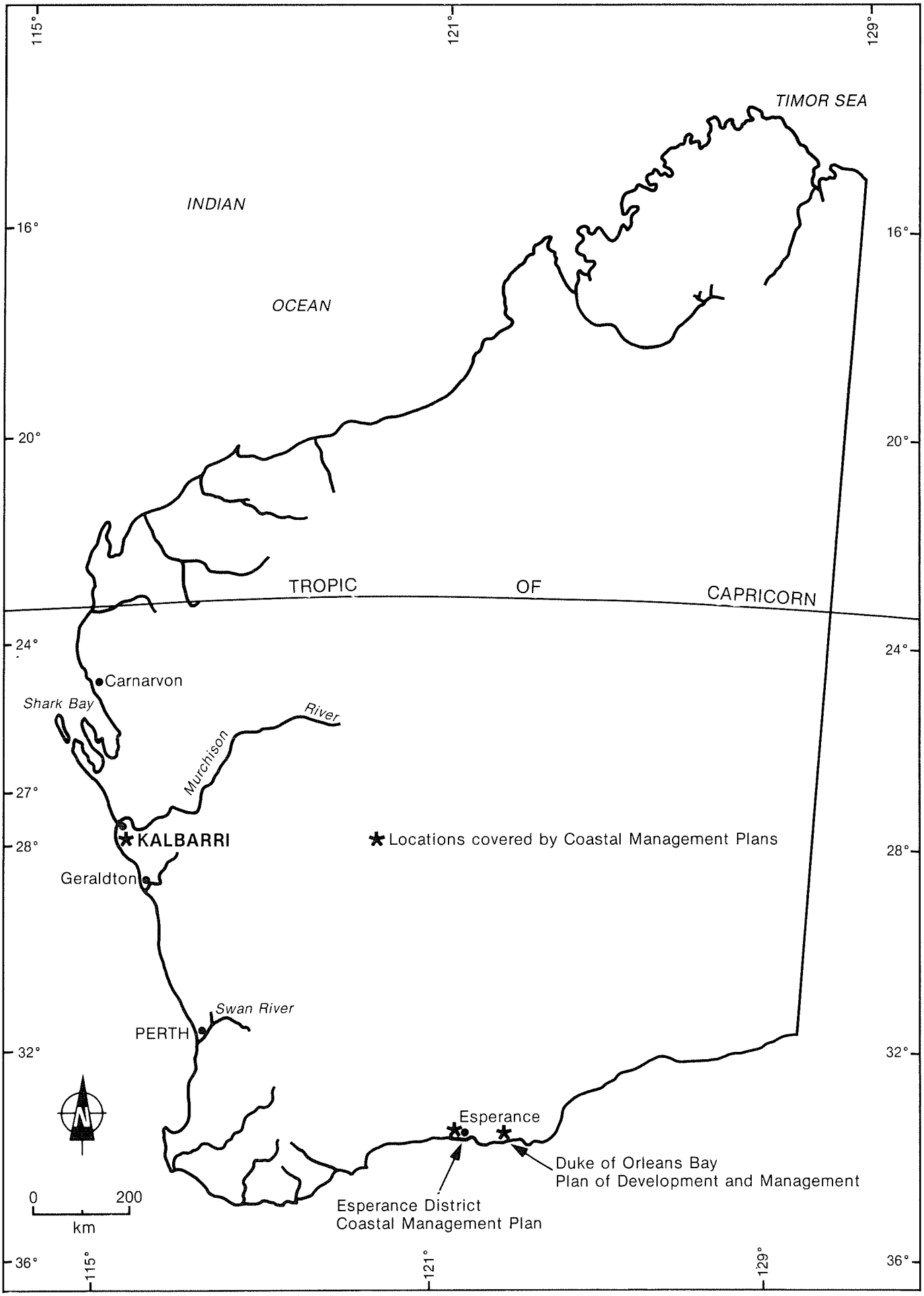
Prior to adoption of a Coastal Management Plan, and the strategies resulting therefrom, Council will refer any development proposals falling within a Coastal Management area to the Environmental Protection Authority and request that Authority to advise on the proposal and submit to the Council any requirements recommended by the Authority.

Upon receipt of advice on recommendations from the Environmental Protection Authority, Council may either approve the development proposal with or without conditions or may require an Environmental Review and Management programme to be prepared."

Purpose of the Plan and Plan Reviewal

This plan has been prepared in accordance with the Town Planning Consultants' recommendation and collates their planning and management recommendations with those of DCE, other interested authorities, Council and interested public. It will assist the orderly long term development of the coastal area within the townsite.

This plan will be reviewed after 31 December 1988. Any amendments required prior to that date will be made after consultation between Council, DCE and other interested authorities and people.



MAP 1 KALBARRI FORESHORE RESERVE LOCATION AND RELATIONSHIP WITH OTHER COASTAL MANAGEMENT PLANS

Name of the Reserve

The land described in this plan includes a number of Crown reserves and vacant Crown land, which is or will be vested in the Shire of Northampton or other authorities for various purposes.

To provide continuity of nomenclature these areas will be known publicly as the Kalbarri Foreshore Reserve, and in the rest of this text it will be described as the reserve.

Study Boundary

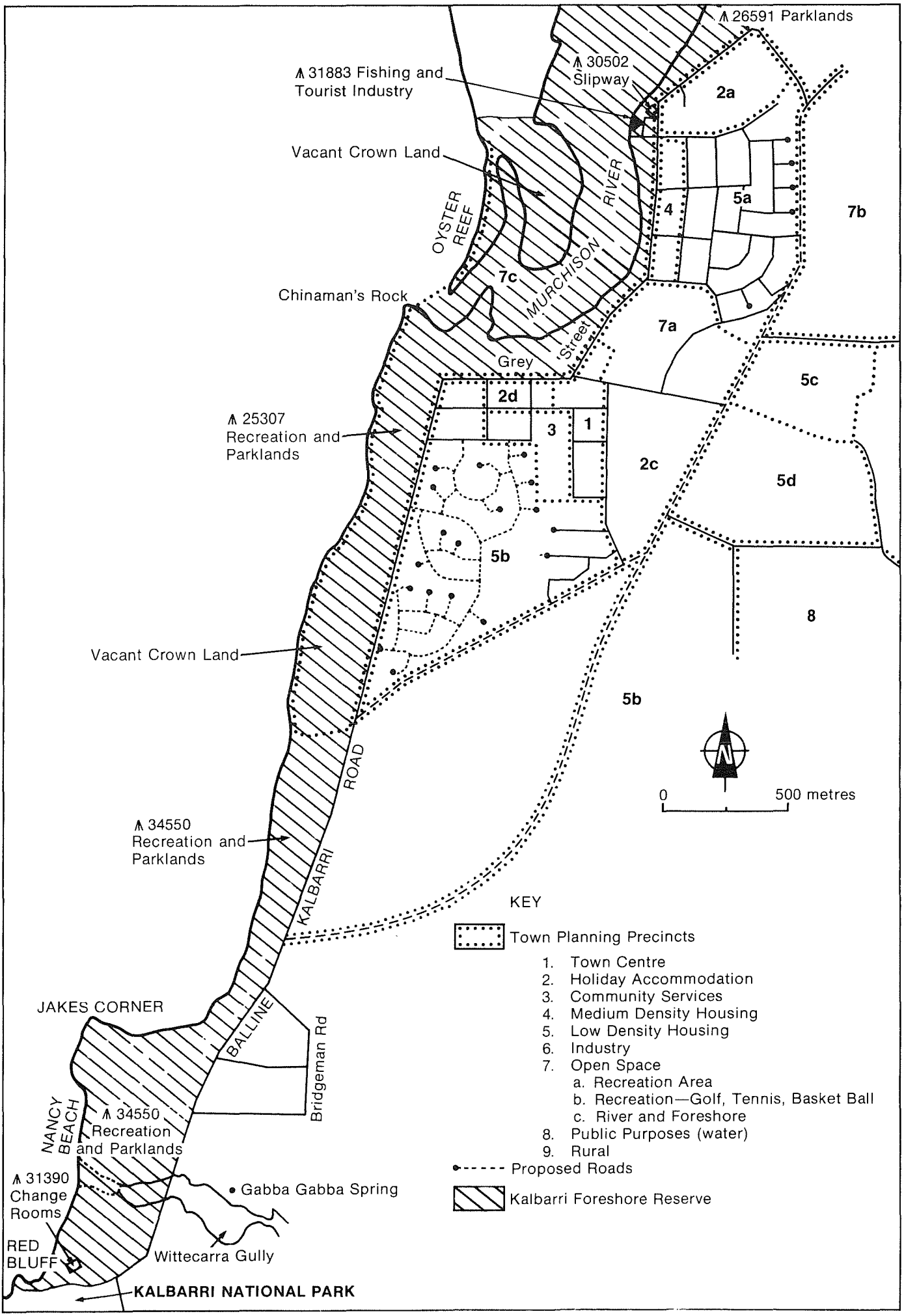
The reserve is bounded by the northern boundary of reserve 26591, western and northern sides of Grey Street, western side of the Balline-Kalbarri Road, and the southern side of reserve 34550. The Kalbarri Foreshore Reserve includes the areas described in Table 1 and shown on Map 2.

The southern portion of the reserve has a common boundary with the Kalbarri National Park and the two areas form an important part of the regional environment. Development and management of the reserve are undertaken to preserve its value in a regional context.

Table 1 — Areas included in the Kalbarri Foreshore Reserve

Reserve	Vesting Date	Area (ha)	Purpose	Vested Authority
26591	11/1/63	69.9	Parklands	Shire of Northampton
30502		0.0405	Slipway	Unvested
31883	13/4/73	0.5903	Fishing & Tourist Industry	Shire of Northampton with power to lease for 21 years
A 25307	30/6/78	26.3046	Recreation and Parklands	Shire of Northampton
34550	4/3/77	52.3556	Recreation and Parklands	Shire of Northampton
31390	7/7/72	.2094	Change Rooms and Park	Shire of Northampton

In addition the area includes the vacant Crown land known as Oyster Reef and the adjacent sand bar, and the vacant Crown land between reserves A 25037 and 34550.



MAP 2 TOWN PLANNING PRECINCTS, RESERVE NUMBERS AND VESTINGS, EXISTING AND PROPOSED SUBDIVISIONS

Resources

Geology and Topography

The Kalbarri area has not been mapped in detail at 1:250.000 scale by the Geological Survey of WA.

However some valuable information can be obtained from other sources including the Geological Map of WA (1:2 500 000 scale), J. S. Beard's report, the Vegetation of the Ajana Area Western Australia, and by field observation.

Kalbarri is in the Carnarvon Basin which is underlain by sediment. The reserve overlies Silurian Continental sedimentary rocks which are marine in origin. These rocks protrude to form headlands and cliffs along the coast and they are overlain by relatively thin tertiary deposits including marine deposits, Pleistocene limestone and Holocene sands (Geological Survey of Western Australia). Geology and landforms are shown on Map 3.

Pleistocene limestone forms a series of reefs along the shoreline of Ganthaeme Bay including Oyster Reef and the shoals which surround the Blue Hole. These reefs dissipate wave energy to varying degrees and influence the shape of the coast.

The older marine deposits form the relatively flat areas between the Murchison River and Grey Street. These deposits have developed a well defined soil profile containing quantities of clay, silt and shells.

Recent Holocene deposits comprise the steep and sharply dissected sand dune system which exists between the Balline-Kalbarri Road and the sea. The sand in this system is of recent origin and as a result very little humus exists in the profile and the area is potentially unstable.

Older sand deposits exist east of the road and this area is flatter. The soil profile contains humus to approximately 0.5 metres and the area is relatively stable. Soils vary from red to brown-grey.

Coastal Processes

The coastline of Kalbarri is exposed to long periods of wave activity caused by storms and summer winds. The energy produced by this wave activity is largely dissipated by the limestone reef system and headlands. However the area is vulnerable to damage caused by severe storms with associated surges which may lift sea levels sufficiently to be active above the reef system.

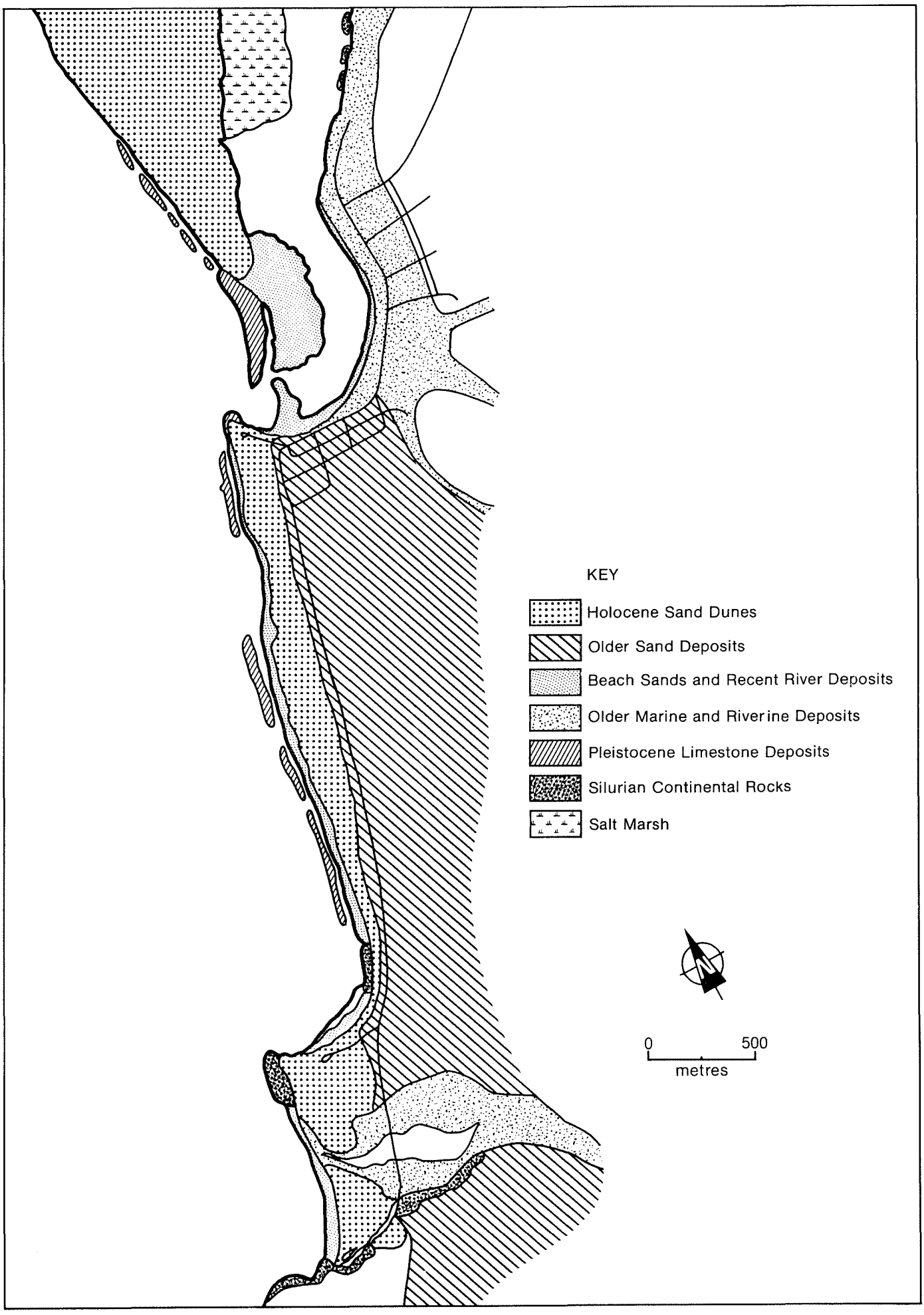
The older marine deposits are relatively stable and should not be affected by wind erosion. However these deposits developed during a period in which the river followed a different course from present. It is possible that further changes in river course could occur after a period of extremely heavy rain. The stability of the river bank could also be threatened by waves during a period of storm surge.

The recent sand dunes are irregular in form and are stabilized by dune vegetation. They will become unstable and mobile if areas of vegetation are removed and the bare sand exposed to the prevailing winds.

Vegetation

The vegetation of the Ajana area is described by Beard (1976). The reserve lies in the Zuytdorp System described by Beard as *Acacia rostellifera* thicket in association with scrub and coastal heath.

The older marine deposits support areas of open woodland including *Eucalyptus camaldulenis* var *obtusa* (Blunt River Gum), *Casuarina obesa* (Swamp Oak) with clumps of *Acacia rostellifera* over a pasture of introduced grasses. In places non-endemic tree species have been planted.



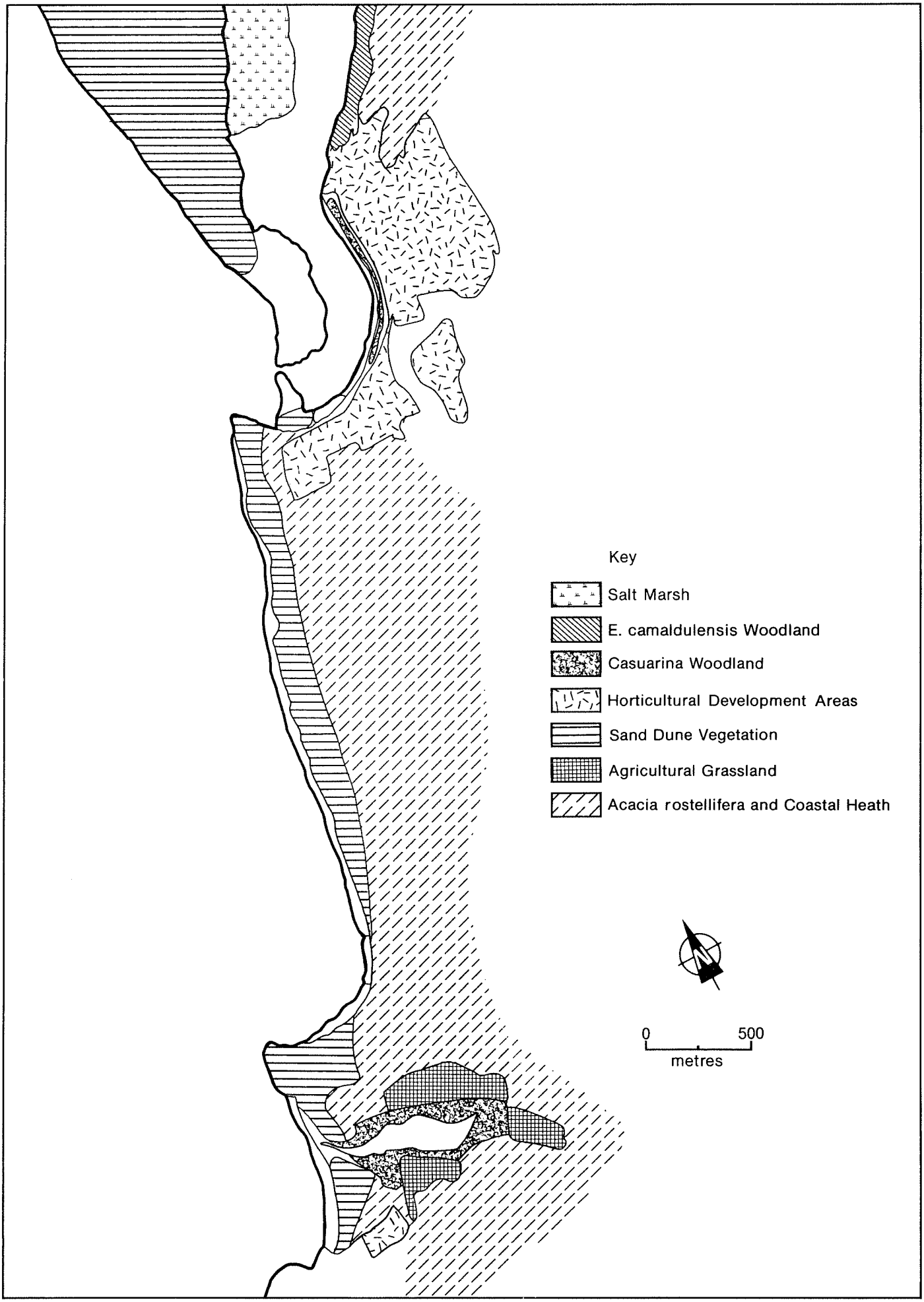
MAP 3 GEOLOGY AND LANDFORM

The Holocene sands support typical dune vegetation with *Spinifex longifolius* and *Olearia axillaris* (Coast Daisy) on the foredune (see Photograph 1). The primary dune also supports *Scaevola crassifolia* and *Eremophila subfloccosa*. The vegetation on the sheltered side of the primary dune also includes *Acacia rostellifera, Scholtzia uberiflora* and *Calothamnus oldfieldii*.

Photograph 1: Foredune vegetation (*Spinifex longifolius* and *Olearia axillaris*), brush mulch has been used to stabilize the blowout in the foreground.

The more developed soils of the older dune deposits support a dense coastal heath comprising *Grevillea unnulifer, Acacia rostellifera, Santalum acuminatum* (Quandong), *Tersonia brevipes* (Butter Creeper) and *Diplolaena microcephala* (Lesser Diplolaena).

The marine deposits associated with Wittecara Creek support a closed woodland of *Casuarina obesa* (Swamp Oak). An ecosection of the Sand Dune Unit is shown on Figure 1 and vegetation is shown on Map 4.



MAP 4 VEGETATION

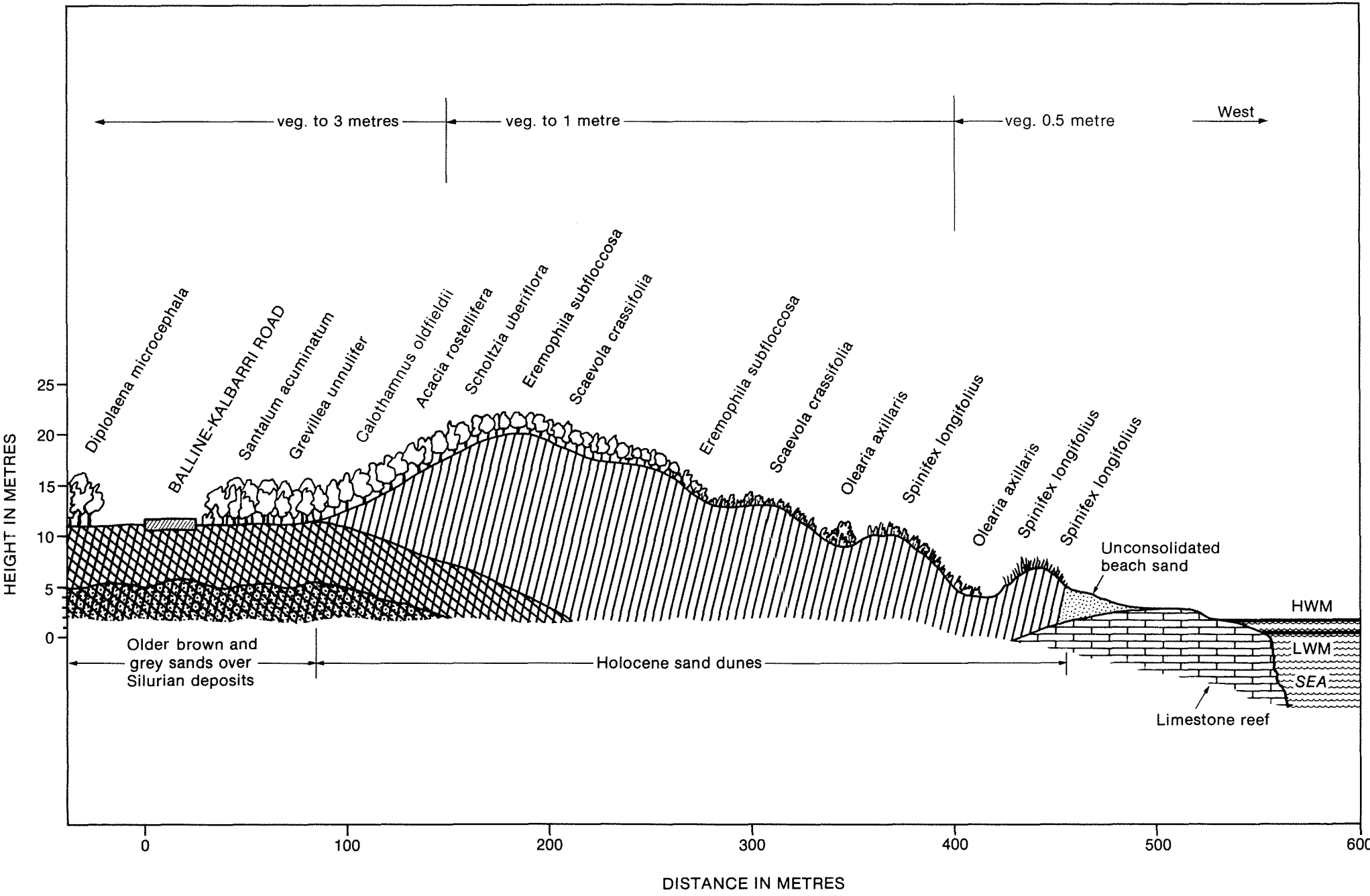


FIGURE 1 ECOSECTION SAND DUNE UNIT

Climate

Because of the sparse population in the region there are few meteorological recording stations. The limited information available indicates that the annual rainfall is approximately 390 mm with the heaviest falls occurring in winter and spring, and the growing season begins in May lasting about four months.

Even in winter temperatures are rarely cold, summers are generally hot with February having the highest average temperature of 32.8°C. During January, February and March an average of 65 days out of 90 have temperatures over 30°C. Relatively little rain falls during this period and the majority of days are cloudless. The average temperature range for the year is 11.2°C.

It is largely Kalbarri's climate in conjunction with its water resources which make it attractive to tourists. The warm to hot year round climate with few rainy days, even in winter, provides an ideal resort for people seeking a hot summer holiday or respite from the wetter south-western climate. Kalbarri is particularly popular in springtime (Taylor and Burrell 1983).

Landscape

The Kalbarri district provides some of the most attractive coastal landscape in Western Australia. The landscape associated with the reserve includes views of red sandstone headlands, fine white beaches, blue ocean and a wide calm estuary.

Landscape quality is dependent upon various attributes including topography, vegetation patterns, the existence of bodies of water and man-made influences. Often it is easy to alter these characteristics but most difficult to recreate them. Therefore there is a need for landscape assessment before development occurs to ensure that the most significant landscape features are protected. Important landscape elements of the Kalbarri foreshore are shown on Map 5.

Existing Access and Facilities

The reserve is serviced by a well developed access system based upon Grey Street and the Balline-Kalbarri Road, a series of minor roads and car parks as shown on Maps 6-8.

In addition a series of tracks has developed between the road and the beach as a result of the activities of off-road vehicle operators joy riding and seeking vehicular access to the beach. Rationalization of the access system is considered an important objective in this plan. At the northern end of the reserve there is a jetty used by professional fishermen and anglers and a slipway and storage shed used by professional fishermen.

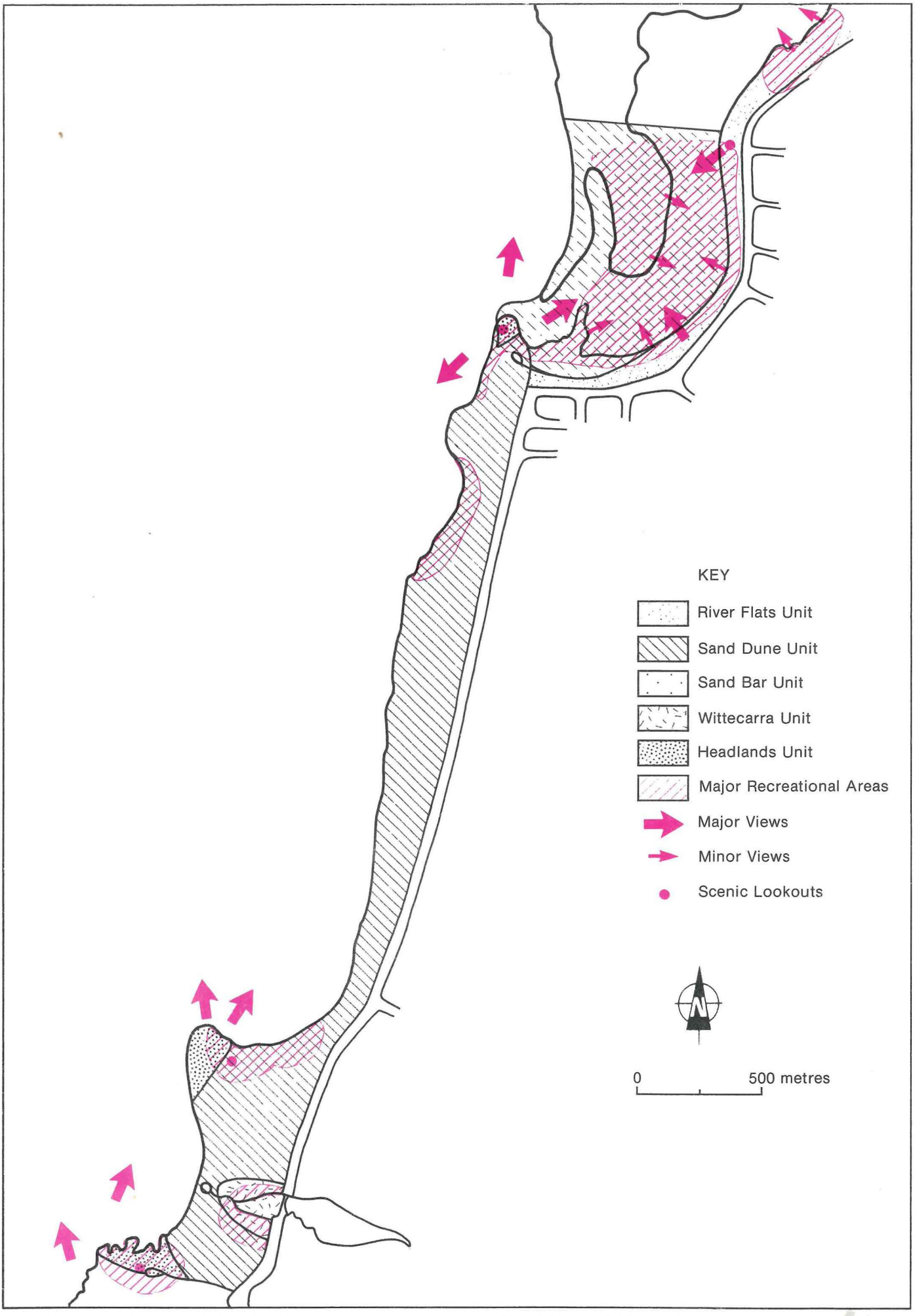
A pleasure boat launching ramp and associated car parks are located near the intersection of Grey and Porter Streets and a small boat launching facility is located at the northern end of the reserve.

Management Planning

Land use planning is a process involving the consideration of an area's resources, the land's ability to support particular uses, constraints on use and likely use pressures. The allocation of the appropriate uses to areas of land capable of sustaining those uses is an essential step in management planning. If this step is not taken environmental degradation may occur, resulting in the loss of amenity and increased management costs.

The reserve has the following significant resources:

- coastal scenery including headlands, beaches, an attractive estuary, sand dunes and landscaped areas; the scenery is in harmony with the landscape of the adjacent national park;



MAP 5 MANAGEMENT UNITS, LANDSCAPE FEATURES AND RECREATION AREAS

- open surf beaches, which are suitable for use by experienced surfers, beach fishermen and sightseers;
- quiet estuarine waters which provide a safe area for bathing, canoeing, sailing, angling and boat moorings;
- areas of flat stable land which are suitable for the development of recreational facilities;
- a system of roads, tracks and car parks;
- a management infrastructure based on the facilities and staff of the Northampton Shire.

Use Pressures

While information about Kalbarri is difficult to obtain the permanent and visitor population appears to be increasing steadily. Developments planned for the area should continue this trend. The number of dwellings in Kalbarri has increased from 299 in 1976 to 480 in 1980, an increase of 60.5%. In addition there are four caravan parks in the town.

Tourism

Taylor and Burrell conducted an investigation of the tourist industry at Kalbarri and drew the following conclusions:

Activities associated with tourism are the main source of employment and income in Kalbarri. A large part of the employed population at Kalbarri are concerned with providing accommodation and entertainment to holiday visitors.

Future growth of Kalbarri is almost certain to be caused by a continuation of the present expansion of the tourist industry. It is therefore essential to look closely at the nature of tourism in Kalbarri. Findings of the domestic tourism monitor (DTM) reported by the WA Department of Tourism (1980) provide an up-to-date analysis of travel activity.

The foreshore and estuary at Kalbarri are among the major attractions to the town and pressure on these areas will increase directly as use increases.

Kalbarri is situated within the mid-west region (see Figure 2). Apart from Geraldton, other towns within this region would attract few visitors and tourists. Thus, trends relating to travel in the mid-west region would represent quite closely those in Kalbarri.

It was estimated that 318,000 visits were made to the mid-west region in 1978/79. This is 8.2% of total visits made within WA. Of these, 94.4% of visits originated from within WA (69.7% from Perth and 24.7% from other parts of WA). South Australians made 3.4% of visits, Victorians 1.4% and people of NSW 0.7%.

Figure 3 shows that September and October constitute the peak tourist season in the mid-west region. At this time of year many people from the south-west take holidays in the warmer northern area of Kalbarri and Geraldton. The scheduling of second term school holidays in this period augments this trend. There are secondary visitor peaks during the December-January holiday period and in April. The summer holiday peak is less pronounced in the mid-west region than throughout the State as a whole where it is the main holiday season.

Figure 4 shows that for 56.7% of visitors, the main purpose for visiting the region was to have a holiday, somewhat more for the overall State. A further 14.1% of trips were generated for the purpose of visiting friends; another pleasure-type reason. Although over 20% of visitors claimed to be on business, it is likely that this figure relates more to people visiting Geraldton and other parts of the region rather than Kalbarri, where business and industry are relatively unimportant. Other reasons for visiting the region were relatively insignificant. These statistics support the general belief that Kalbarri functions primarily as a holiday/tourist pleasure centre.

The Bureau of Industry Economics (1979) revealed that accommodation is the main source of expenditure by tourists. In the mid-west region, a house or flat belonging to friends or relatives was the main form of accommodation used by visitors and accounted for 24.2% of total visitor nights spent in the region. The next most important form of accommodation (accounting for 17% of visitor nights) was a visitor's own caravan or tent parked in a caravan park. Hotels and motels accommodated only 13% of visitors. These trends are fairly typical of the accommodation habits of visitors throughout all of WA.

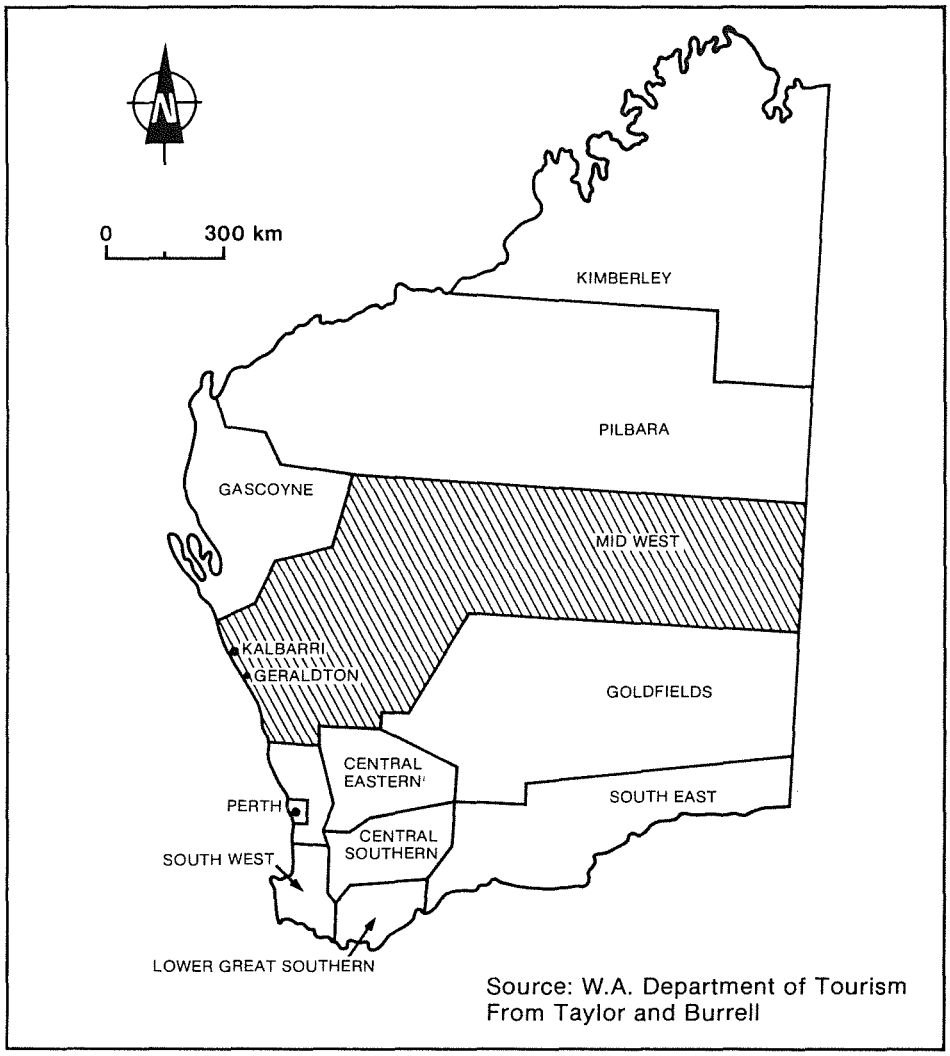


FIGURE 2 TOURISM MONITOR REGIONS SHOWING LOCATION OF KALBARRI AND THE MID-WEST REGION

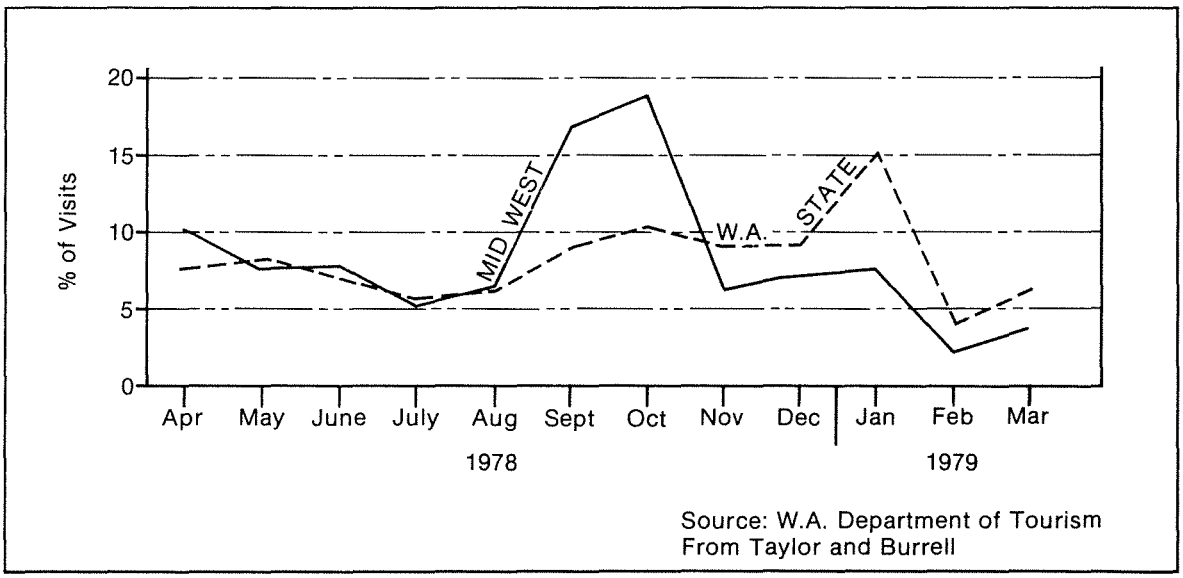


FIGURE 3 MONTH OF VISIT TO MID-WEST TOURISM REGION AND STATE TOTAL APRIL 1978 — MARCH 1979

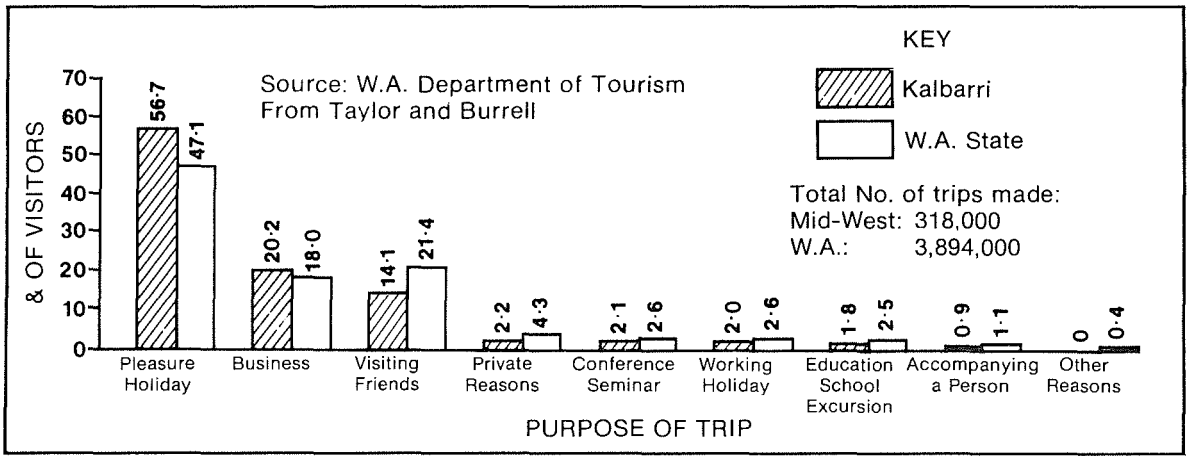


FIGURE 4 MAIN PURPOSE OF TRIP TO REGION MID-WEST AND W.A. TOTAL APRIL 1978 — MARCH 1979

Commercial Fishing

At present there are 23 commercial fishermen operating out of Kalbarri, including 22 WA Rock Lobster fishermen and one wet line operator. However, during the Rock Lobster season up to 50 boats may use the facilities on the Murchison River at one time. As the Rock Lobster fishery is a closed industry, pressure from this source is not expected to increase significantly (see Photograph 2).

Amateur Fishing

A large number of amateur fishermen use the river for launching and mooring boats. There are two launching ramps and two hire boat operators on the river. The jetty, beaches and Chinaman's Rock are popular fishing places and during peak periods these facilities are strained and pressure from anglers is likely to increase.

Fish species caught in the area include Black Bream, Tailor, Tarwhine, Kingfish, Spotted Cod, Whiting, Flathead, Flounder, Pilchards and Mangrove Crabs and Blue Manna.

Pleasure Boating

Pleasure boating, including the use of powered craft, dinghies, yachts and canoes, is a most popular activity for visitor and permanent populations in Kalbarri. As these populations increase the pressure for space, launching facilities, moorings and trailer parking areas will increase (see Photograph 2).

Bathing and Beach Games

The river and beaches are popular for swimming, sunbathing, surf-board riding, skin-diving and other beach activities. As many of the favoured locations are a considerable distance from residential areas and caravan parks, they produce considerable pressure for vehicle access and car parking.

Off-Road Vehicles

In the past vehicles were driven indiscriminately over the reserve. The recent construction of fences and car parks has controlled these activities in the area north of Grey Street but the problem still exists in the southern section of the reserve. It is considered that the sand dune system in the area is not capable of sustaining uncontrolled vehicle traffic.

Future Residential Development

The proposed development of residential land south of Glass Street will increase the pressure on the ocean beaches. This will increase the need to rationalize the pedestrian access and car parks on the southern section of the reserve (Photograph 5).

Sightseeing

Several points in the reserve are attractive to short term visitors. These visitors require a system of convenient car parks and walking trails which enable attractive areas to be utilized.

Development and Management Aims

The following development and management aims are defined to guide the Northampton Shire and government authorities in the long term care of the reserve:

- conserve the natural systems of the area;
- provide for the recreational use of the area in a manner consistent with its protection;
- develop a programme of public education which will aid in the conservation of the reserve and assist the public in their enjoyment of the district;
- incorporate existing developments into the planning process, and undertake any rationalization or improvements which may assist in achieving the other management aims;
- preserve and improve the landscape of the reserve;
- provide for the needs of professional fishermen.

Development and Management Objectives

To assist in achieving the aims listed above a number of objectives have been defined:

- rationalize and upgrade the system of roads, tracks, car parks and walking trails within the reserve. These facilities should be designed to enable adequate access to the reserve without impairing the landscape, or damaging the vital vegetation cover;
- develop facilities which will make boating in the area safer and more pleasant;
- undertake beach management programmes which will provide visitors and staff ready access to beaches, without degrading sand dune systems or interfering with coastal processes;
- implement a soil conservation programme to prevent erosion;
- develop an efficient system of garbage disposal and litter control;
- provide an effective system of signs and interpretative material to orientate, educate and control visitors;
- undertake a tree planting programme which will improve the amenity and provide shade and shelter;
- develop picnic facilities at appropriate locations;
- encourage recreational activities which are least damaging to natural ecosystems and restrict potentially damaging activities.

Management Units

A system of management units has been identified to define areas of the reserve with differing ability to support development and use. These units are based on soil type, landform, elevation, slope, stability, vegetation and landscape character. The units are shown on Map 5 and described in Table 2.

River Flats Unit

The unit is an area of Riverine Sediment overlying Silurian Continental Rock. The soil has considerable amounts of silt and clay in the profile and is considered stable.

The land is relatively flat (0-5%) and runs down to river level. The vegetation comprises River Gums, *E. camaldulensis*, with clumps of *A. rostellifera* over a sward of introduced grasses (see Photograph 3).

Table 2 — Planning Units — Kalbarri Foreshore Reserve

Unit Name	*Geology*	*Soil*	*Slope and elevation*	*Stability*	*Vegetation*	*Landscape*	*Use constraints*	*Land use capability*
River Flats Unit	Riverine and marine sediments over Silurian rocks	Grey sandy loam	0-5% slope 0-8 metres elevation	Highly stable. Resistant to wind and water erosion	River Gums over sward of introduced grasses	Pleasant parklike landscape	Some flood risk in lower areas	The unit's low elevation, proximity to the river, sheltered location and landscape make the area ideal for the development of boating facilities and recreation
Sand Bar Unit	Holocene sand deposits over Silurian rocks and limestone	Beach sands	0-5% slope 0-2 metres elevation	Highly unstable, prone to wind, and wave erosion	Sand dune species some Acacias and Casuarinas	Beach and estuarine views	Unstable, prone to flooding and wave attack	Location makes this area valuable recreational land. However, because of instability and the danger of flooding, development must be limited
Sand Dune Unit	Wind blown Holocene deposits	Sandy soil little or no profile	10-32% slope 0-26 metres elevation	Potentially unstable	Sand dune vegetation and coastal heaths	Beach views many sheltered areas	Unstable and exposed in places	Unsuitable for most use. Development should be limited to the rationalization of access and beach management
Headlands Unit	Parent rock protruding above the dune system	Thin sandy cover or no soil	10-80% slope 0-40 metres	Rock areas generally stable — some erosion in sandy areas	Some dune vegetation, coastal heath and bare rock	Some of the most pleasant views in the reserve	Need to protect landscape and steep slopes	Any development is likely to impose upon the landscape. Development should be restricted to the provision of access and beach management
Wittecarra Unit	Deep riverine sediments over Silurian bedrock	Heavy black clay	0-10% slope 1-6 metres elevation	Stable	Casuarinas and salt tolerant vegetation	Attractive shady areas	Water logging	Some potential for picnic area development although salinity will limit vegetation growth

The flat nature of the area and good access to the river makes it most suitable for the development of boating facilities and water based recreation, and picnic areas (Photograph 4).

Sand Bar Unit

Holocene Sands overlying Silurian Continental Rocks and Pleistocene Limestone Reefs form the geological base for this unit. The soil comprises unconsolidated sands with little or no humus and no soil profile. The unit is considered most unstable and at risk from erosion resulting from wind and wave action and the flow of the river during periods of flood.

The unit begins at river level and is relatively flat with grades of between 0 and 8%. The vegetation consists mainly of *Spinifex longifolius* with individual specimens of *Casuarina obesa* and *Acacia rostellifera.*

The location and landscape of this unit makes it a most valuable recreational area. The unstable nature of the land in the unit and the use pressure on it make conservation and management difficult. Development should be limited to that required to provide reasonable access to the area and landscaping. All development could be threatened during a storm or period of high river flow (see Photograph 3).

Sand Dune Unit

A series of parallel and parabolic Holocene sand dunes lies over limestone and Silurian rock on the western side of the Balline-Kalbarri Road. The soil may have a little humus in the top 2-3 cm, otherwise there is no profile at all.

The unit contains many steep slopes which, combined with the lack of soil structure and exposed location, provide poor stability. If the cover of sand dune vegetation or coastal heath is removed erosion will occur.

Generally the unit is not capable of sustaining heavy use and development should be limited to the rationalization of the existing track system and the provision of access to the beach (Photographs 3 and 5).

Headlands Unit

At several locations along the coast Silurian sediments form headlands into the ocean. The areas can be steep and usually support little soil or vegetation.

The headlands have considerable recreational and scenic value and are heavily used by sightseers, surfers and fishermen. To preserve the integrity of the landscape in the reserve, development of the headlands should be restricted to the provision of access and limited picnic facilities.

The southern portion of the Headlands Unit is on the boundary of the Kalbarri National Park (see Photographs 3 and 6).

Wittecara Unit

The flood plain of the Wittecara Creek is defined as a separate planning unit. This area is composed of riverine deposits overlying the Silurian bedrock. The soil is dark and the profile contains a large clay portion. The area is relatively flat (0-10%) and is considered stable, but has a high salinity level.

A small woodland comprising *Casuarina obesa* provides a pleasant shady environment. The shade and the creek with its historic links with the "Batavia" incident make the unit attractive. It may have potential as a picnic area.

Structure Plan

The Structure Plan (Maps 6-8) has been prepared to nominate, describe and locate the works required to achieve the objectives set out on page 15 and includes the following projects.

Kalbarri — Coastal Resources

2

3

4

5

6

7

Photograph 2: Boating on the Murchison River. The existing boat ramp and trailer parking area.

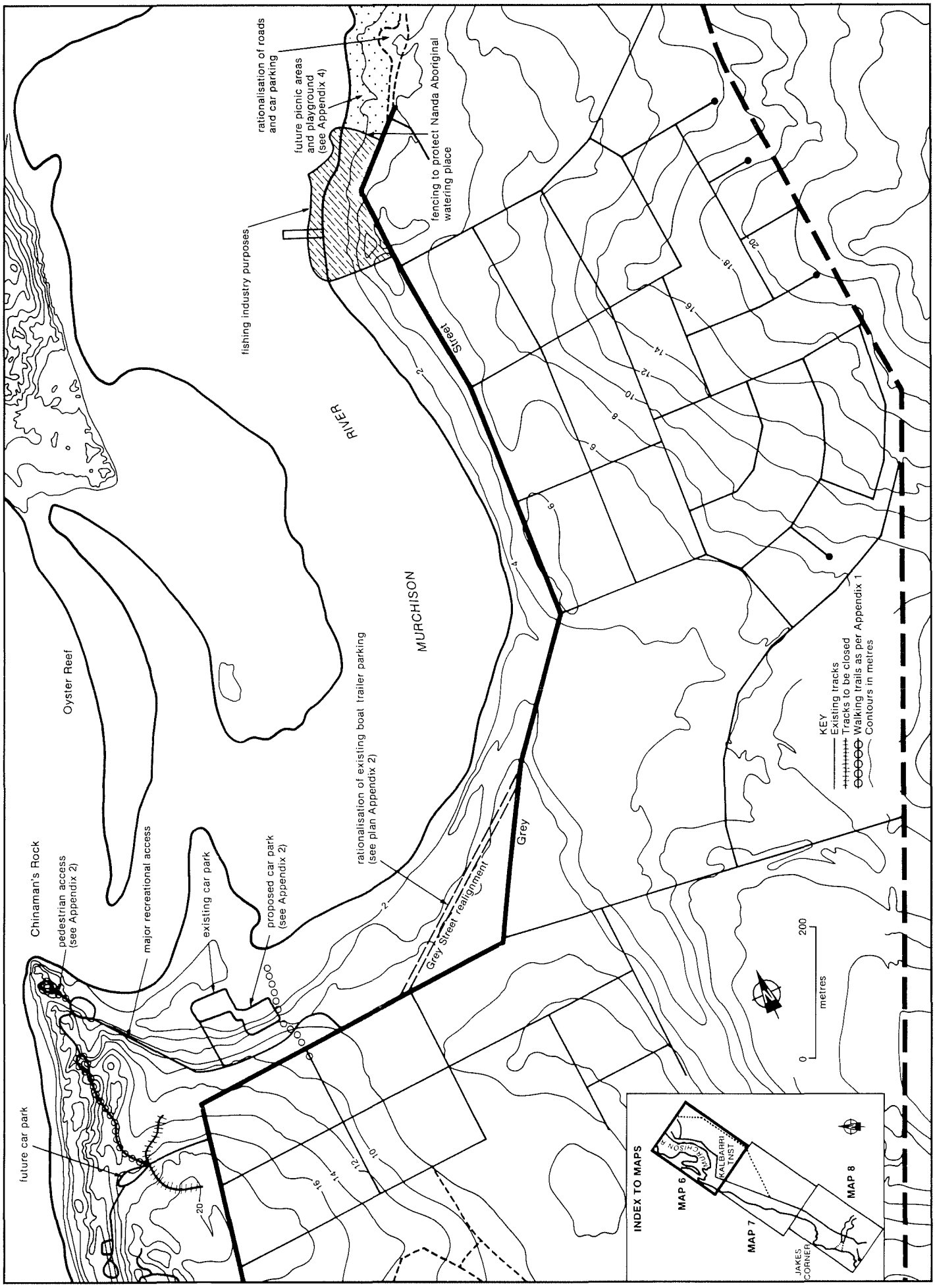
Photograph 3: Planning Units
1. River Flats Unit
2. Sand Bar Unit
3. Sand Dune Unit
4. Headlands Unit

Photograph 4: River Flats Unit. This relatively flat stable land is suitable for intensive recreational use and boat repair yards.

Photograph 5: Balline-Kalbarri Road. The land east of the road is relatively flat and stable, and is suitable for further residential development. On the seaward side of the road the land is comprised mostly of Holocene sand dunes, which are considered potentially unstable and use must be limited to controlled beach access.

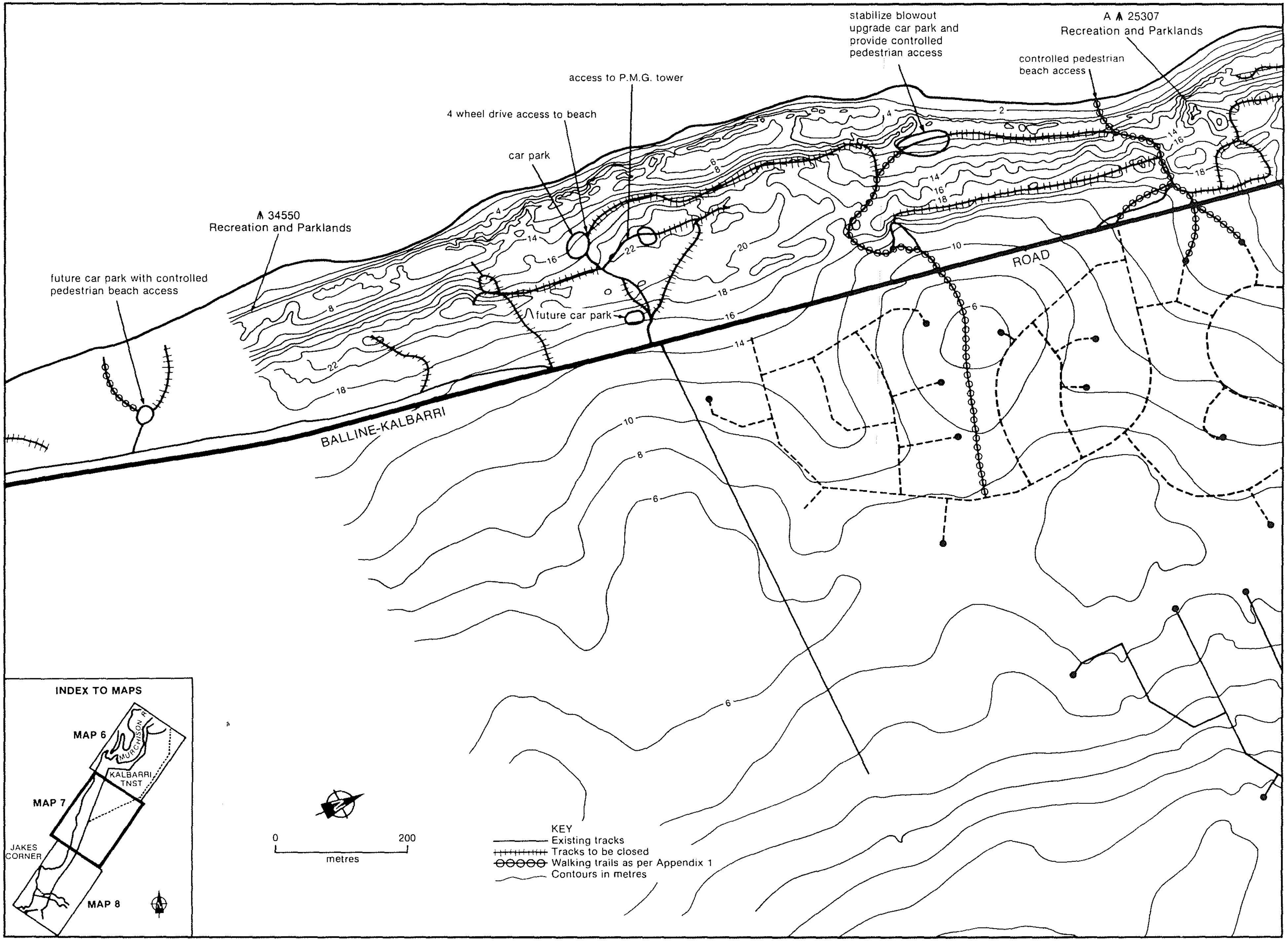
Photograph 6: Portion of the Headlands Unit.

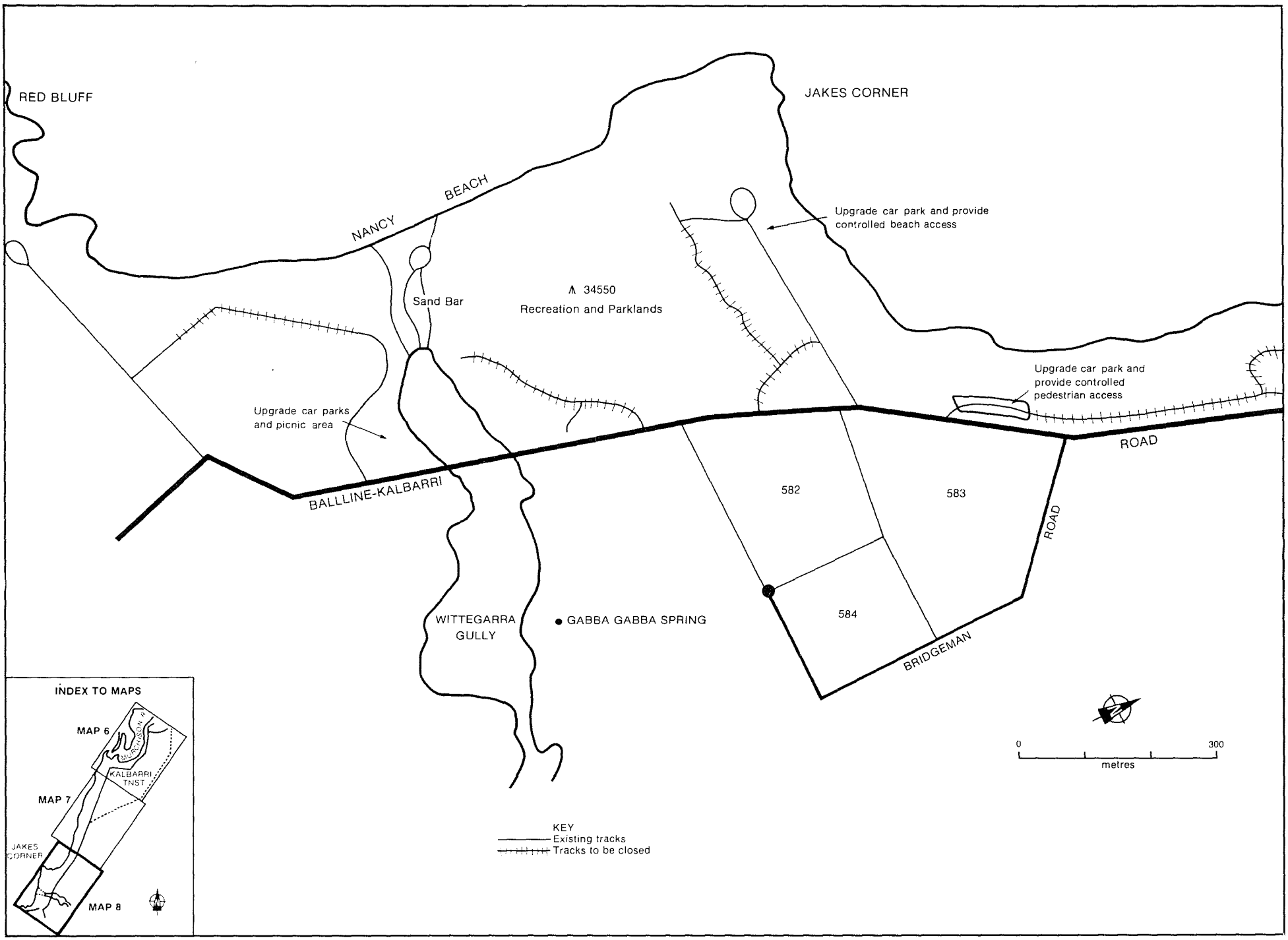
Photograph 7: River Flats Unit at the site of the existing boat launching ramp and trailer parking area. This site is suitable for more intensive development of boating facilities.



MAP 6 STRUCTURE PLAN PART 1, EXISTING AND PROPOSED DEVELOPMENTS AND ACCESS

MAP 7 STRUCTURE PLAN PART 2, EXISTING AND PROPOSED DEVELOPMENTS AND ACCESS




RED BLUFF
JAKES CORNER
NANCY BEACH
Sand Bar
34550
Recreation and Parklands
Upgrade car park and provide controlled beach access
Upgrade car park and provide controlled pedestrian access
Upgrade car parks and picnic area
BALLLINE-KALBARRI ROAD
582
583
584
ROAD
BRIDGEMAN
WITTEGARRA GULLY
GABBA GABBA SPRING
0
300
metres
KEY
Existing tracks
Tracks to be closed
INDEX TO MAPS
MAP 6
MAP 7
MAP 8
KALBARRI TNST
JAKES CORNER

Existing and Proposed Roads and Trails

Upgrading and rationalization of the existing access system will be an integral part of the development of the reserve, because it will provide an opportunity to increase public use of the area and assist in protecting the coastal environment. Grey Street and the Balline-Kalbarri Road are on the boundary of the reserve and provide the basis of the access system.

A number of illegal vehicle and pedestrian tracks have developed in the Sand Dune Unit. Many of these tracks are unnecessary and as they create an erosion risk and degrade the landscape, they will be closed.

The location of the recommended road and track system is shown on Maps 6-8 and trail designs are in Appendix 1.

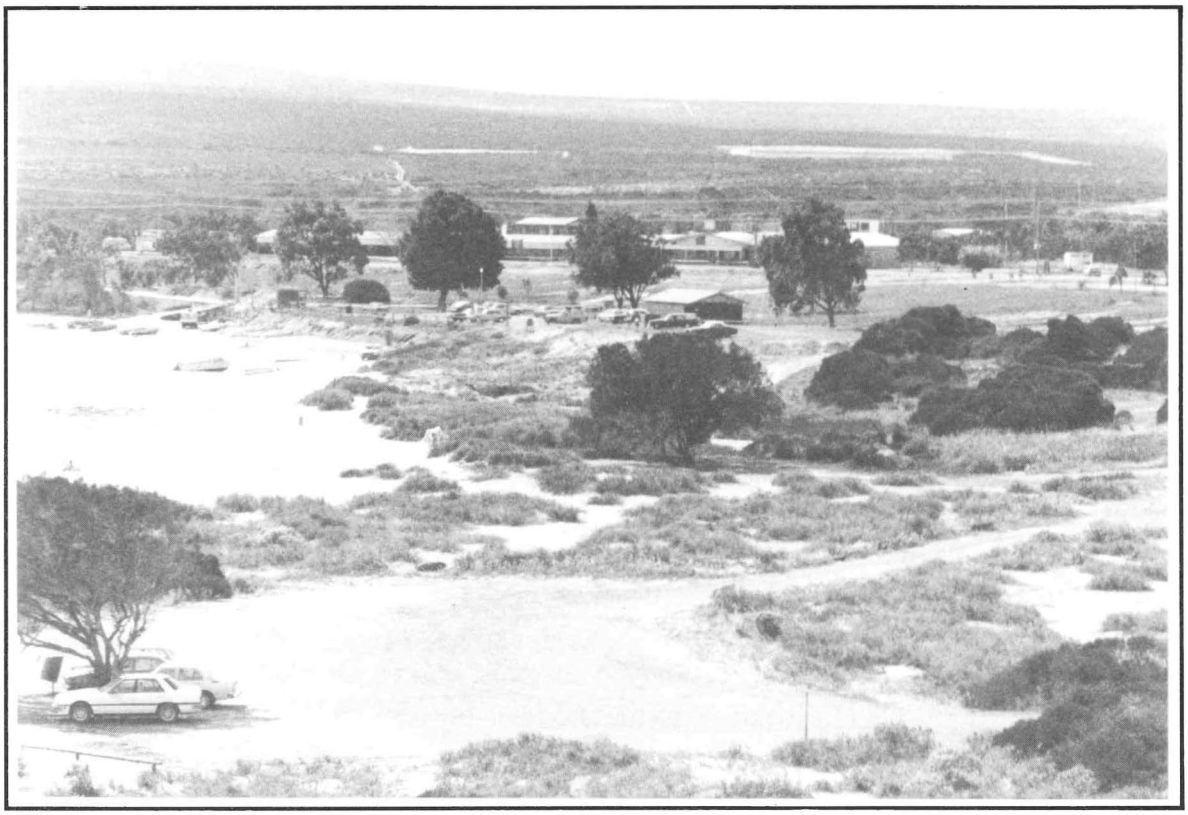
Car and Boat Trailer Parking Areas

Much of the accommodation in Kalbarri is remote from the foreshore and so visitors often drive to the beach, generating a demand for car parks. In addition the high use of trailed boats provides a need for car and boat trailer parking facilities.

Currently a number of parking facilities exist in the reserve but most require some modification to increase their capacity, improve aesthetics and reduce engineering problems. Existing parking facilities are shown on Maps 6-8 and redesign proposals are shown in Appendices.

The boat trailer parking area has been redesigned to assist in achieving the orderly launching and retrieval of boats. The revised design provides for organized queues at both the launching and retrieval stages to reduce conflict between users during busy periods (see Photograph 7).

Future parking facilities will be required as visitor numbers increase and to assist in the rationalization of the existing system. They will be set back from the foreshore to maintain the maximum recreational space on the beach and avoid storm damage (see Photograph 8).



Photograph 8: The existing car park at Chinaman's Beach. Future parking areas will be set further back to provide the maximum space for recreation on the beach.

Boat Moorings

There is an urgent need to rationalize pleasure craft moorings in the Murchison River, particularly near the main boat ramp. Council will seek the advice of the Harbours and Rivers Branch of PWD and the Department of Marine and Harbours about the feasibility of installing mooring poles on the eastern bank of the River, as shown in Appendix 2C.

Pedestrian Access

As the size of the permanent and visitor populations increases, the number of people seeking access to the beach will grow. As there is a limit to the area available for car parking, provision will be made for improved pedestrian access to and within the reserve. A proposed footpath and pedestrian trail system is shown on Maps 6-8. Path specifications are shown in Appendix 3.

Picnic Facilities

A number of picnic areas have been developed around the reserve and their locations are shown on the Structure Plan. Other areas are suitable for this use and are also shown. Suggested layouts for these facilities are in Appendix 4.

Commercial Fishing Facilities

Commercial Rock Lobster and wet line fishermen use the Murchison Estuary as a home port and operating base. The industry requires an area of river frontage for management and maintenance operations. The recommended area is shown on Map 6.

Facilities in this area are designed and constructed by the Harbours and Rivers Branch of the Public Works Department and managed by the Department of Marine and Harbours.

Pleasure Boating Facilities

Two boat launching ramps have been constructed on the Murchison Estuary, and small boats, canoes and yachts are launched at various locations on the foreshore.

During the holiday periods the river can become congested and it may be desirable to establish water ski and swimming areas and impose speed limits on some sections of the river.

The responsibility for the design and construction of boat launching facilities lies with the Harbours and Rivers Branch.

Management Proposals

Management of the reserve involves a series of activities which are undertaken to fulfil the reserve's purpose. The management objectives provide a framework for conserving the reserve's resources, for integrating the reserve into its regional environment and for accommodating environmentally compatible public use. Management activities include the following operations:

Access Management

The maintenance of roads, car parks, footpaths, tracks and trails is the responsibility of the Shire of Northampton.

Vehicle use of the area must be confined to designated roads and tracks to prevent damage to the vegetation and associated erosion, and to provide reasonable safety for pedestrians in the reserve.

The control of vehicles will be best undertaken using the following techniques:

- the provision of adequate access to popular areas, which can be achieved by the staged development of the roads, tracks, car parks and footpaths shown on the Structure Plan;

- education of the public by providing adequate information concerning the access system and the need to conserve the coastal environment;
- implementation of the provisions of the Control of Vehicles (Off-Road Areas) Act 1978. The entire reserve should be declared a prohibited area for all motor vehicles, with an exception of the designated vehicle access roads, tracks and car parks.

Use of the access system will be monitored to enable an objective appraisal of existing and potential needs and compliance with regulations.

Fire Management

The vegetation of Australia has evolved in the presence of fire and plants use a variety of strategies to survive burning. Some plants regenerate vegetatively from parts of their roots and stems, while others recover by means of seeds stored on the plant or in the soil. However sand dune communities recover slowly after fire and the erosion risk is high until the vegetation recovers, which may take several years. The danger of erosion is higher if the area is subject to intensive public use. As a result it is considered that management should attempt to exclude bushfire from the reserve, and if fire does occur it should be confined. The following programme is recommended to reduce the risk of widespread damage by fire:

- the lighting of fires in the reserve will be prohibited except in properly constructed fire places;
- the public education programme will include information concerning the danger of fire in the area, and the responsibilities of people in relation to the lighting of fires;
- the roads, tracks and car parks in the reserve can be used as fire breaks, and the appropriate location of fire breaks has been considered during the preparation of the Structure Plan;
- the Shire will develop its fire fighting capacity by periodically obtaining and upgrading equipment. Provision will be made for training Council staff in fire fighting techniques;
- a fire management plan for the Kalbarri townsite will be prepared in co-operation with the Bush Fires Board, National Parks Authority and surrounding land holders. The plan should specifically exclude burning off in the reserve under the provisions of Section 21 of the Bush Fires Act.

Quarrying

Quarrying will be prohibited in the reserve to protect landscape and recreational values and to reduce the risk of erosion. Materials required for development will be obtained from other sources.

Soil Conservation

Soil erosion caused by running water, the wind and the sea is a natural process which has occurred in the region for many thousands of years. This soil movement has been a major influence in the shaping of landforms which exist along the coast today. Man's activities also produce erosion because the sandy soils of the area lack structure and become mobile if the protective vegetation is removed.

Erosion degrades the landscape and creates engineering problems when roads become impassable because of drift sands and gullying. When the dunes erode, sands become mobile and move inland, burying the vegetation and man's improvements, thereby reducing the recreational value of the area. Poor soil fertility and the excessive drainage of drift sands makes revegetation of eroding areas difficult and expensive, therefore the prevention of erosion is important.

Erosion can be prevented if the vegetation cover is maintained and roads, car parks and beach access systems are well designed and carefully constructed. When vegetation is removed to allow development, areas of bare soil will be surfaced with gravel or revegetated. Surface drainage from these facilities will be diverted onto existing waterways, vegetated areas or rock faces. Where pedestrians require access from car parks or camping areas to beaches, properly designed beach access systems are required. Normally these will include clearly defined and fenced pathways which protect dune vegetation from trampling. When paths cross sandy slopes they should be surfaced with gravel, limestone rubble or a board and chain pathway. On steep slopes simple steps may be required.

Fences are best constructed of pine log rails which provide an effective but aesthetically acceptable barrier. Some situations may require a stronger barrier and agricultural type fences should be used. Details are shown in Appendix 6.

The control of erosion in the reserve is the responsibility of the Shire of Northampton. The Department of Agriculture may provide advice if required.

Dieback Prevention

Dieback is a plant disease caused by the fungus *Phytophthora cinnamomi*, commonly known in this State as Jarrah dieback. Introduced into Western Australia early in the century, the disease was not identified until the 1960s. By that time it had been spread unwittingly throughout much of the forest near Perth, particularly by the heavy machinery used after World War II to build roads, clear the way for powerlines or for logging operations.

At the time this plan was prepared there had been no report of dieback in the reserve. However, many of the plant species in the district are in the taxonomic groups considered susceptible to attack from the disease, and so dieback is considered a significant threat.

As there is no known cure for the disease on a broad scale it is important that the organism responsible is not introduced to the reserve. Infection is most likely to occur if soil or road building materials are imported from affected districts. Plant seedlings used for landscaping in the reserve will come from a nursery using sterilized materials. Plant and equipment will be cleaned before it is used.

Exotic Flora and Noxious Plant Control

With the exception of some Australian trees and shrubs which may be brought into the reserve, to form windbreaks and visual screens, introduced plants should be discouraged. The low nutrient status of the soil in the reserve makes invasion of the area difficult for most plant species, providing bare areas which are suited to the establishment of introduced plants are kept to a minimum.

Noxious weeds should be eliminated immediately they occur. Advice concerning the control of noxious plants is available from the Agriculture Protection Board.

Landscape Protection

The landscape of the reserve is a valuable resource which would be degraded by unplanned development and poor management. The careless design or location of buildings, roads, car parks, borrow pits and refuse dumps, or the firing of vegetation will quickly detract from the beauty of the area. The absence of large trees and the open nature of the country allow man-made structures to intrude on to the landscape. This problem can be ameliorated by the careful siting of structures and the use of materials and colours which harmonize with their surroundings.

Where possible, developments will occur on the edge of spaces which are defined by hills, sand dunes and clumps of tall vegetation. Structures will not occur in the middle of open spaces and heathlands. Buildings, water tanks and powerlines will not be higher than the skyline formed by nearby hills and bushland.

Toilet blocks and similar structures will not occupy the central or highest point in any area. They are best located away from the foreshore and screened by clumps of natural vegetation. People wishing to use facilities of this type will notice directional signs if they are properly located.

Caravan parks, picnic areas, car parks and camping areas will be screened with trees and shrubs. If these plantings are carried out correctly they will assist in landscape protection, provide shade and make an effective barrier to the persistent winds which at times can make the reserve an unpleasant place to stay. Suitable species and windbreak design are shown in Appendix 5. Suggested planting sites are shown on Maps 6-8.

The roads in the reserve will be designed so that they harmonize with the landscape through which they pass. It is not necessary for them to meet the technical standards of other rural roads in the Shire, as vehicle road speeds should be low.

Public Education Programme

The public education programme should be part of a wider programme for the Kalbarri district. The objectives of the programme should be to orientate visitors, interpret the natural features and to influence the behaviour of people.

Visitors will be orientated by providing them with information about the natural and man-made attractions of the district and where to find them. This could be achieved by:

- the preparation of a pamphlet containing details of roads, paths, boat launching areas, fishing spots, caravan parks, scenic areas, beaches, wildflowers, picnic areas and historic sites;
- the pamphlet will also contain information about the proper use of vehicles and boats in the district;
- erection of well designed signs at appropriate locations;
- continuing contact between Shire staff and the public.

Interpretation of the natural features of the district is required so that the local people and visitors have a greater understanding of the environment and an increased sympathy for its conservation. This would be best achieved by:

- including relevant information in the pamphlet;
- continuing contact between Shire staff and the public.

Implementation

The implementation of this management plan is primarily the responsibility of the Shire of Northampton, but various government agencies may provide further advice and assistance. This section discusses assistance which will be required to effect the plan.

Reserve Vesting

The proper management of the reserve will require alterations to the vesting of some land in the study area. These alterations include:

- the area of vacant Crown land between reserves A25307 and 34550 will be included in 34550 and vested in Council for Parks, Recreation and Foreshore Protection purposes;
- the Oyster Reef area and the adjacent sand bar as shown on Map 2 will be vested in Council for Parks, Recreation and Foreshore Protection;
- reserve 30502 (slipway) will be vested in the Minister for Transport.

Council will approach the Under Secretary for Lands seeking these changes.

Funding

Finance is required to undertake any development or management operation and currently most of this cost is borne by the Shire. Periodically grants are available from the Public Works, Tourism, and Conservation and Environment Departments.

Most facilities and services provided on the foreshore are funded by ratepayers, through the Northampton Shire. As these facilities are generally used by tourists who do not contribute toward the expense of their development and maintenance, the cost burden falls unfairly on the ratepayers.

Financial assistance for specific projects may be available from the Department of Tourism, PWD or DCE, and Council will seek funds from these authorities when appropriate.

In addition, Council will investigate the feasibility of installing voucher parking in the boat trailer parking area after it has been upgraded.

Access

Rationalization of access will be an important programme in the implementation of the plan. The Shire will write to the Chairman of the Ministerial Advisory Committee on Off-Road Vehicles requesting that portion of the Shire west of the North West Coastal Highway be made subject to the provisions of the Control of Vehicles — Off-Road Areas Act 1978.

The entire Kalbarri Foreshore Reserve will be declared a prohibited area with the exception of designated roads, tracks and parking areas. Council will inform the Chairman that

- road registered and unregistered vehicles are creating environmental problems and are a danger to the public;
- Council wishes to have control over vehicles in the area;
- designated roads, tracks and car parks will be signposted;
- the Shire Ranger is available to inform the public and enforce the provisions of the Act.

River Management

Development and management of the river for boating is the responsibility of the Harbours and Rivers Branch of PWD and the Department of Marine and Harbours. Council should maintain contact with these authorities and seek assistance with development works and management operations.

People using the mooring poles described on page 24 will pay a weekly rent.

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Beard, J.S. (1969) *The Vegetation of the Boorabbin and Lake Johnston Areas W.A. Proc. Linn. Soc. N.S.W.*, 93, 239-269.

Beard, J.S. (1976) *The Vegetation of the Ajana Area, Western Australia: Map and Explanatory Memoir*, Vegetation Survey of Western Australia 1:250,000 Series, Vegmap Publications, Perth.

Bureau of Industry Economics (1979) *Economic Significance of Tourism in Australia*, Research Report 4, AGPS, Canberra.

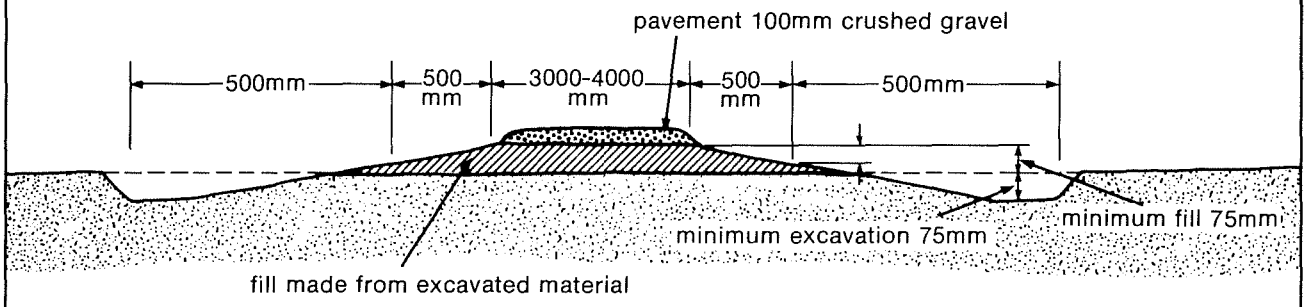
Commonwealth Bureau of Meteorology (1962) *Average Annual Rainfall Map of Western Australia*, Government Printer, Perth.

Taylor, R. and Burrell, W. (1983) *Shire of Northampton, Town Planning Scheme* No. 4.

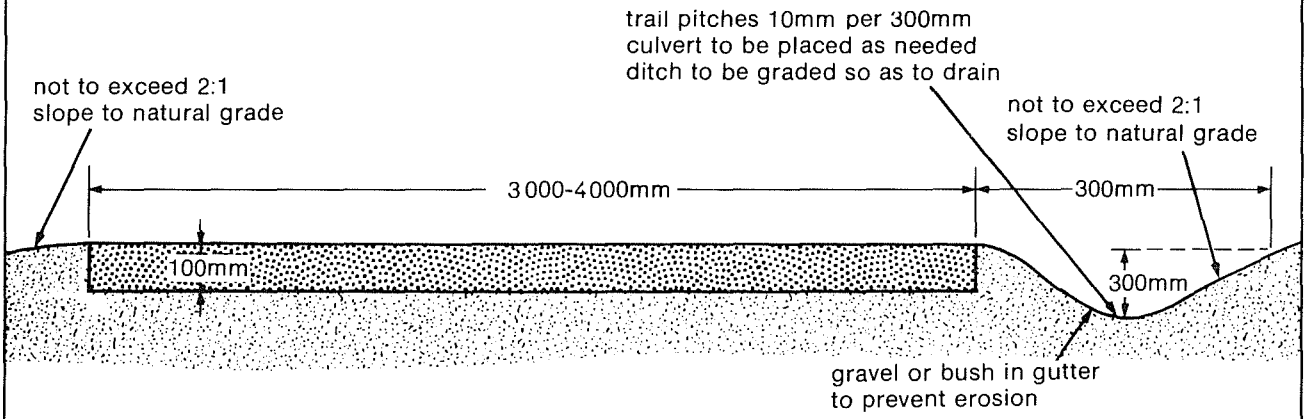
Western Australian Department of Tourism (1980) *Domestic Travel in Western Australia: April 1978 — March 1979.*

Appendices

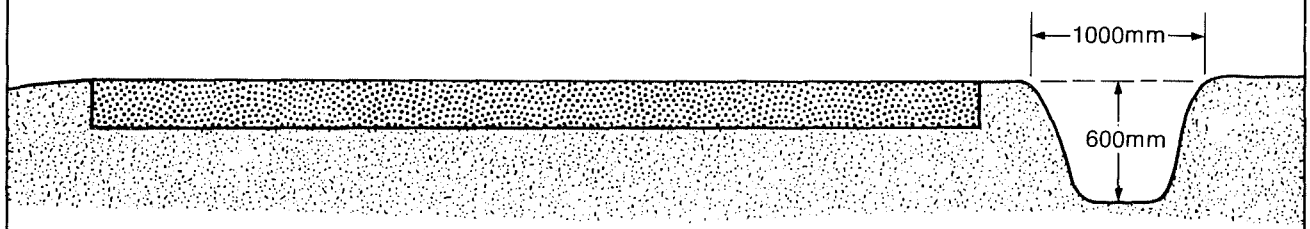
section— typical low key flat surface access track



section— typical low key sloping site access track

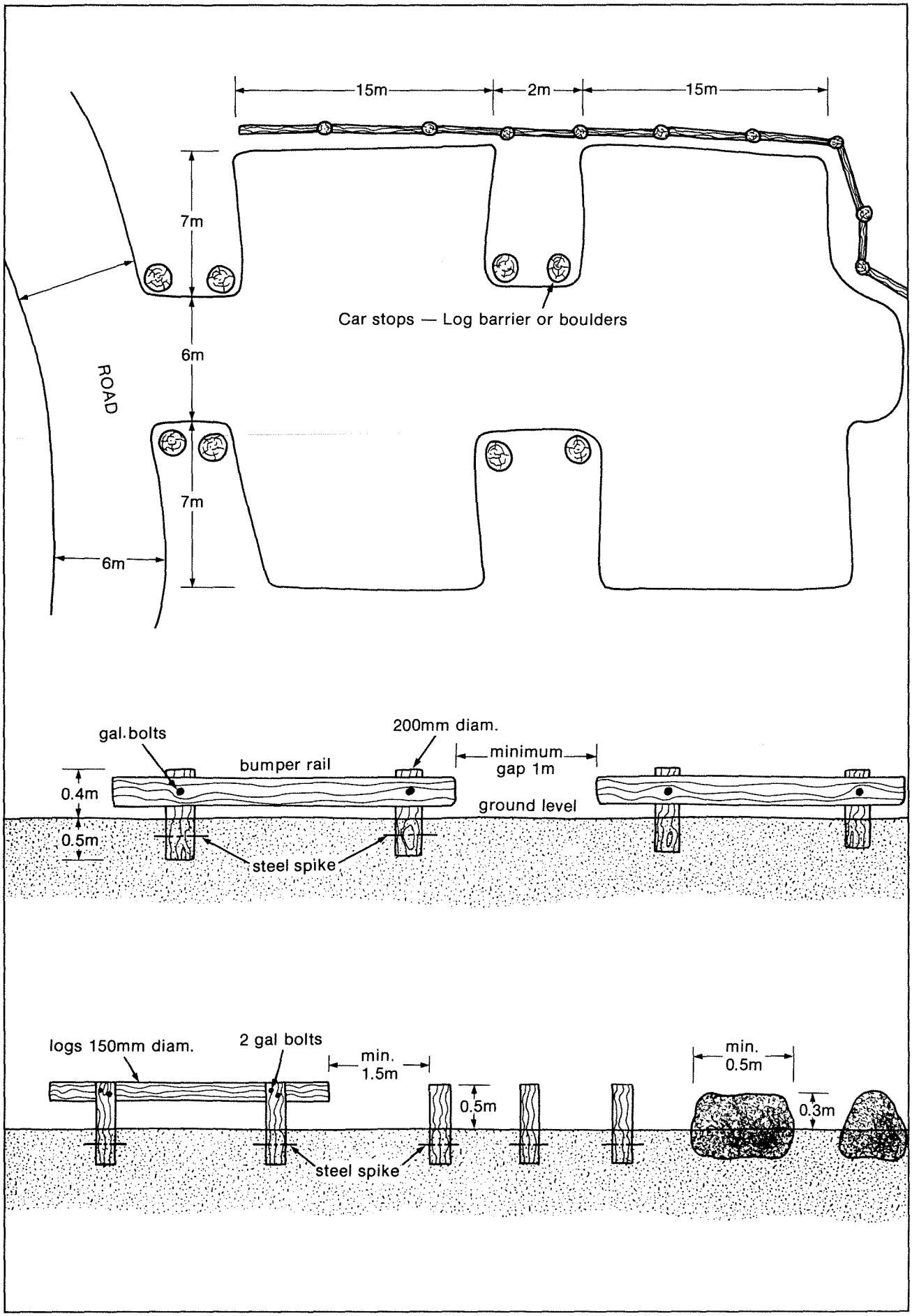


section — low key access track when table drain is to be used as car stop

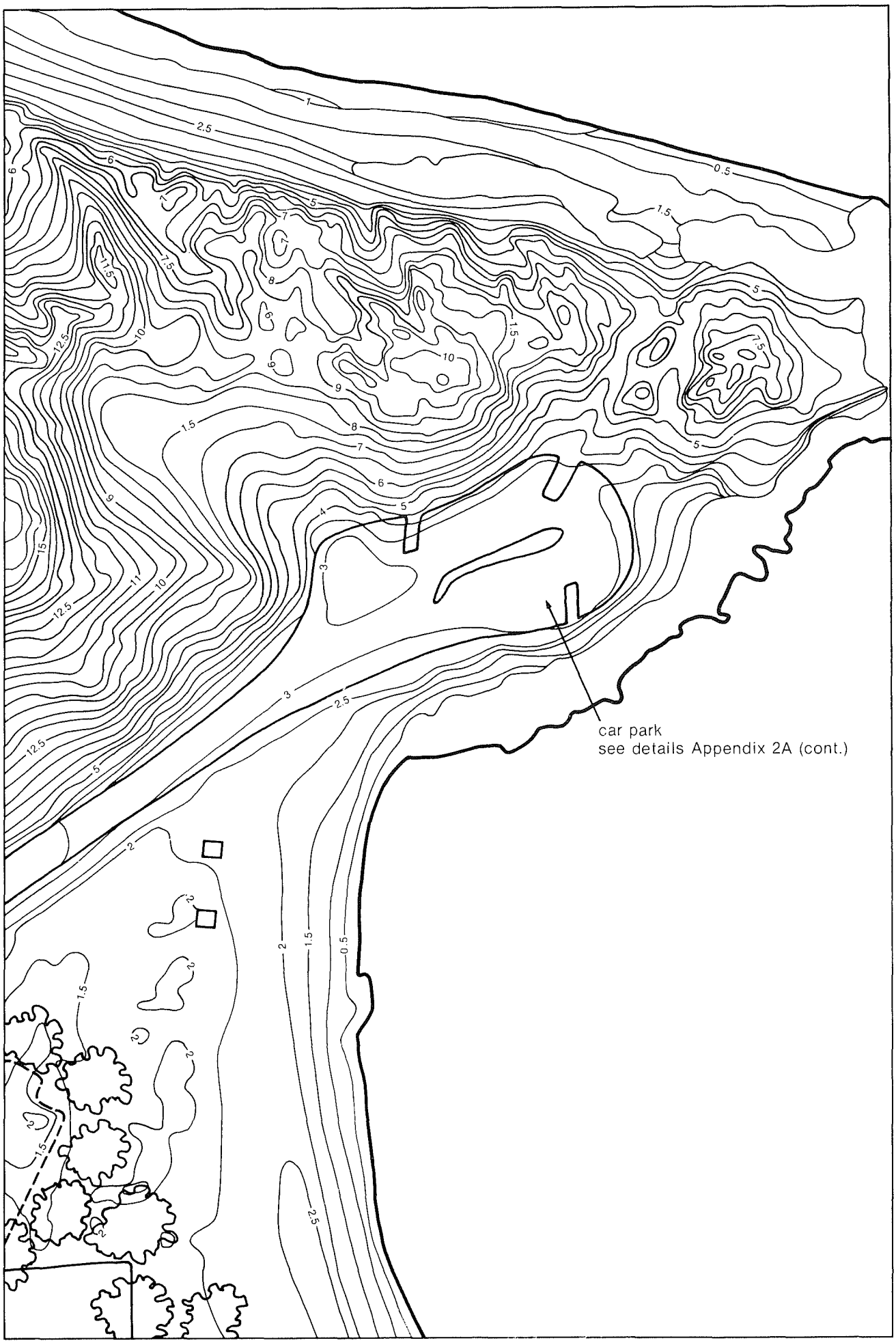


road details as above

APPENDIX 1 TRAILS AND ROADS

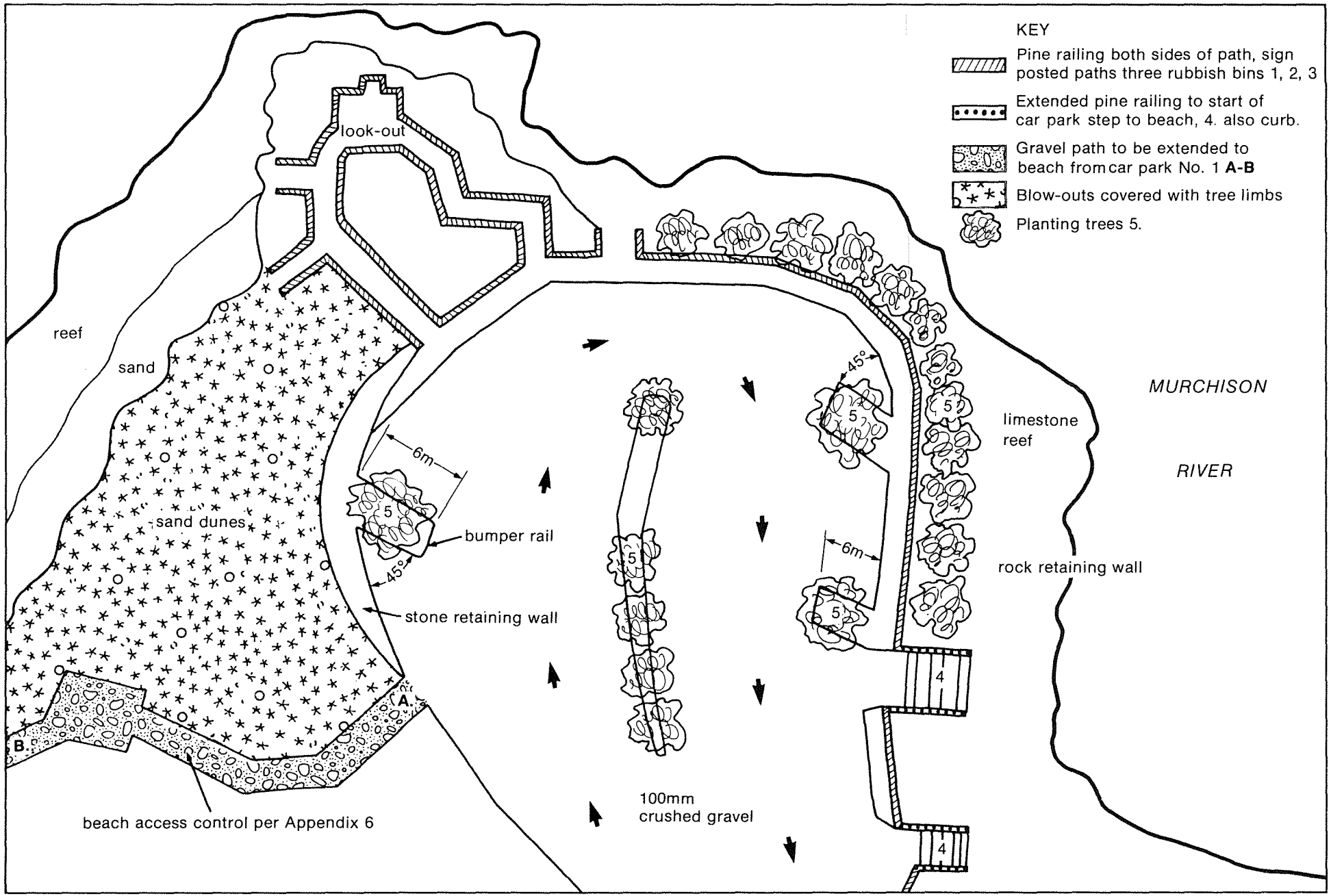


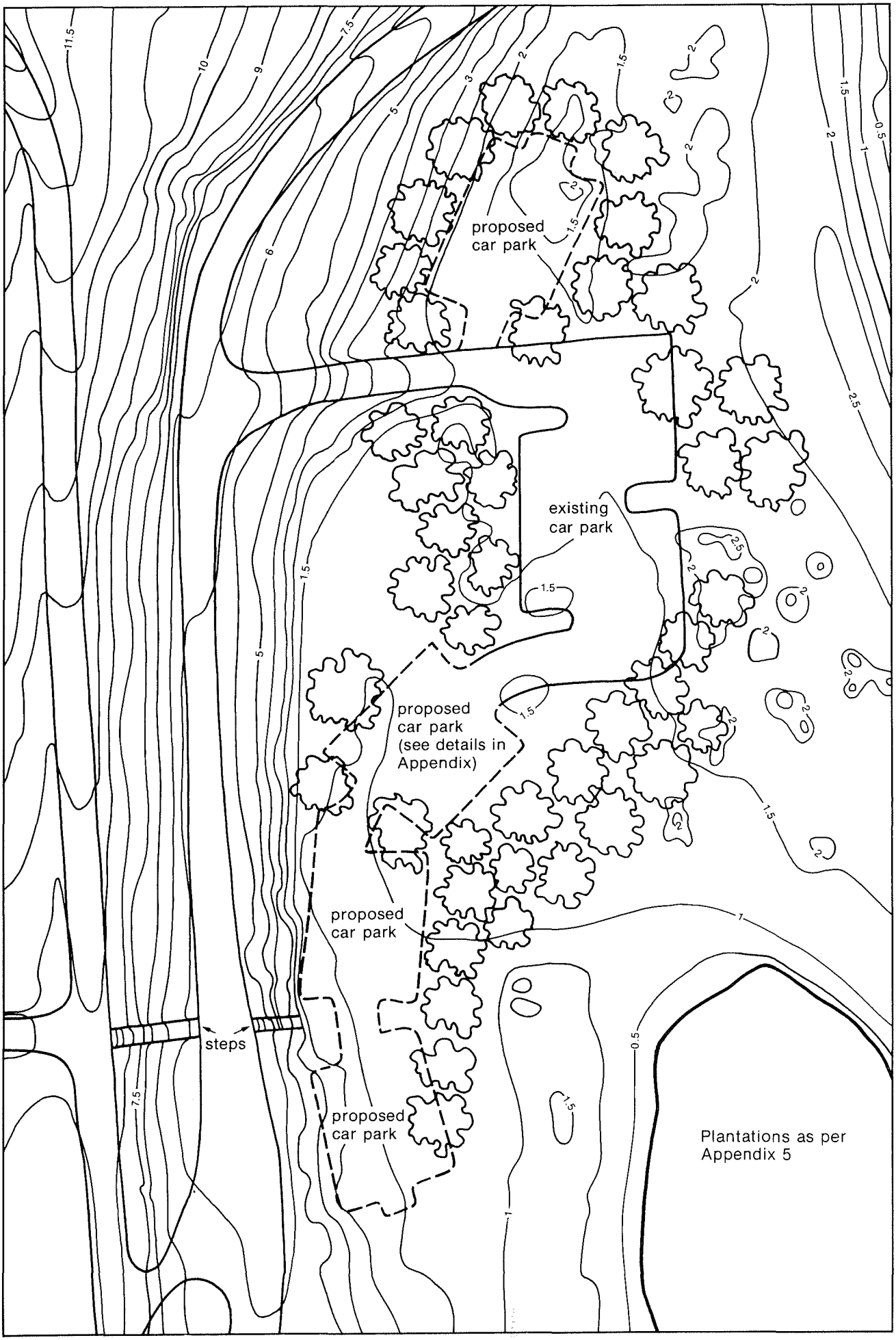
APPENDIX 2 PARKING AREA (TYPICAL DESIGN)



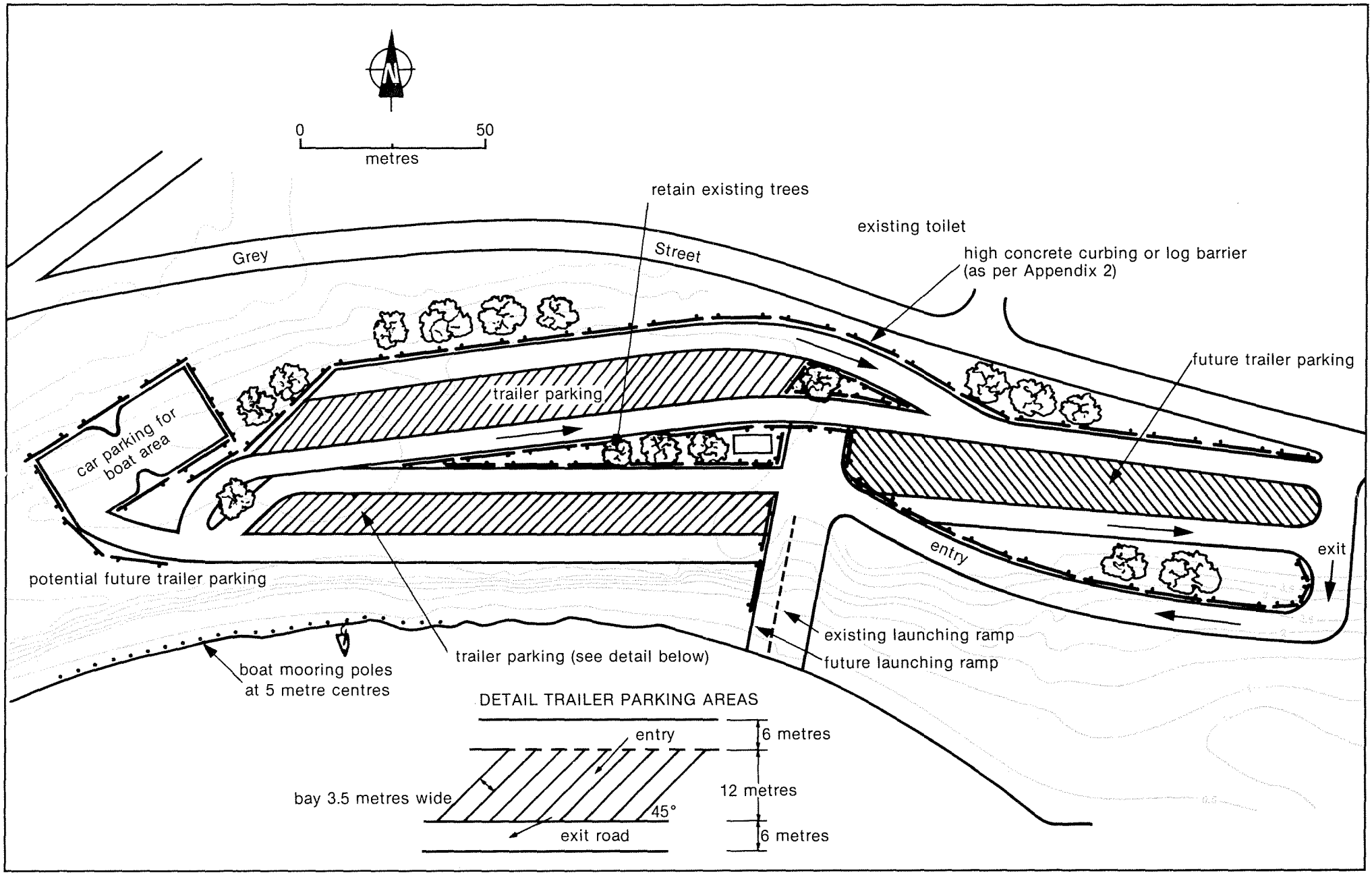
APPENDIX 2A CHINAMAN'S POINT CAR PARK (DESIGN: A. BARTLE)

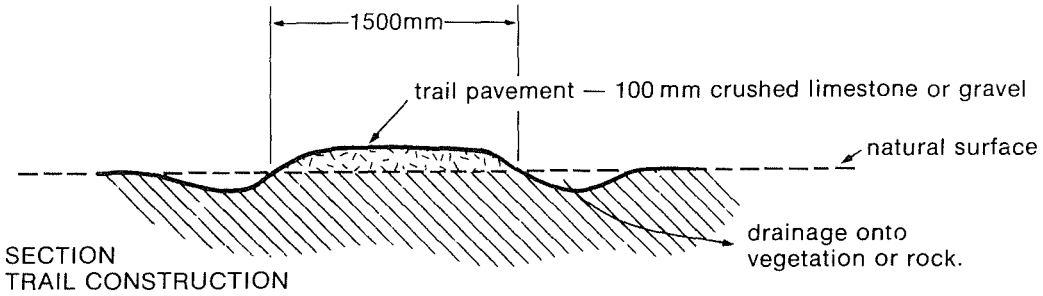
APPENDIX 2A CHINAMAN'S POINT CAR PARK DETAIL (DESIGN: A. BARTLE) (continued)



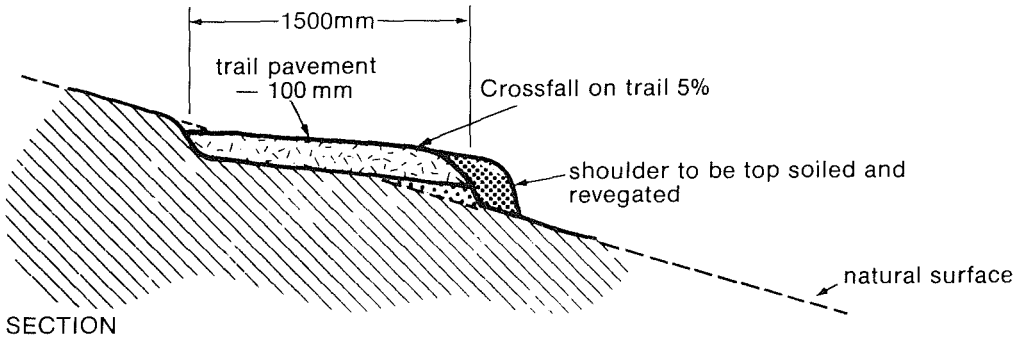


APPENDIX 2B CHINAMAN'S BEACH CAR PARK (DESIGN: A. BARTLE)

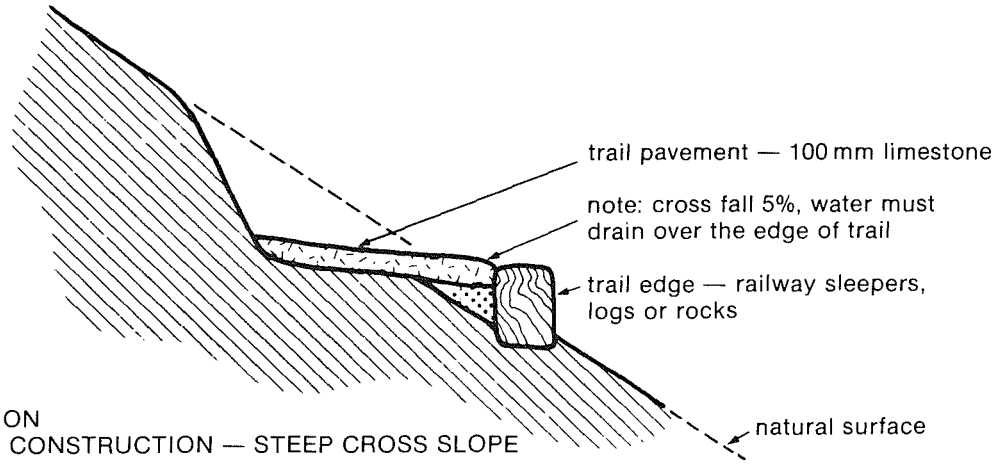

N
0
50
metres
retain existing trees
existing toilet
Grey
Street
high concrete curbing or log barrier
(as per Appendix 2)
future trailer parking
trailer parking
car parking for
boat area
potential future trailer parking
entry
exit
existing launching ramp
future launching ramp
trailer parking (see detail below)
boat mooring poles
at 5 metre centres
DETAIL TRAILER PARKING AREAS
entry
6 metres
bay 3.5 metres wide
12 metres
45°
exit road
6 metres



SECTION
TRAIL CONSTRUCTION

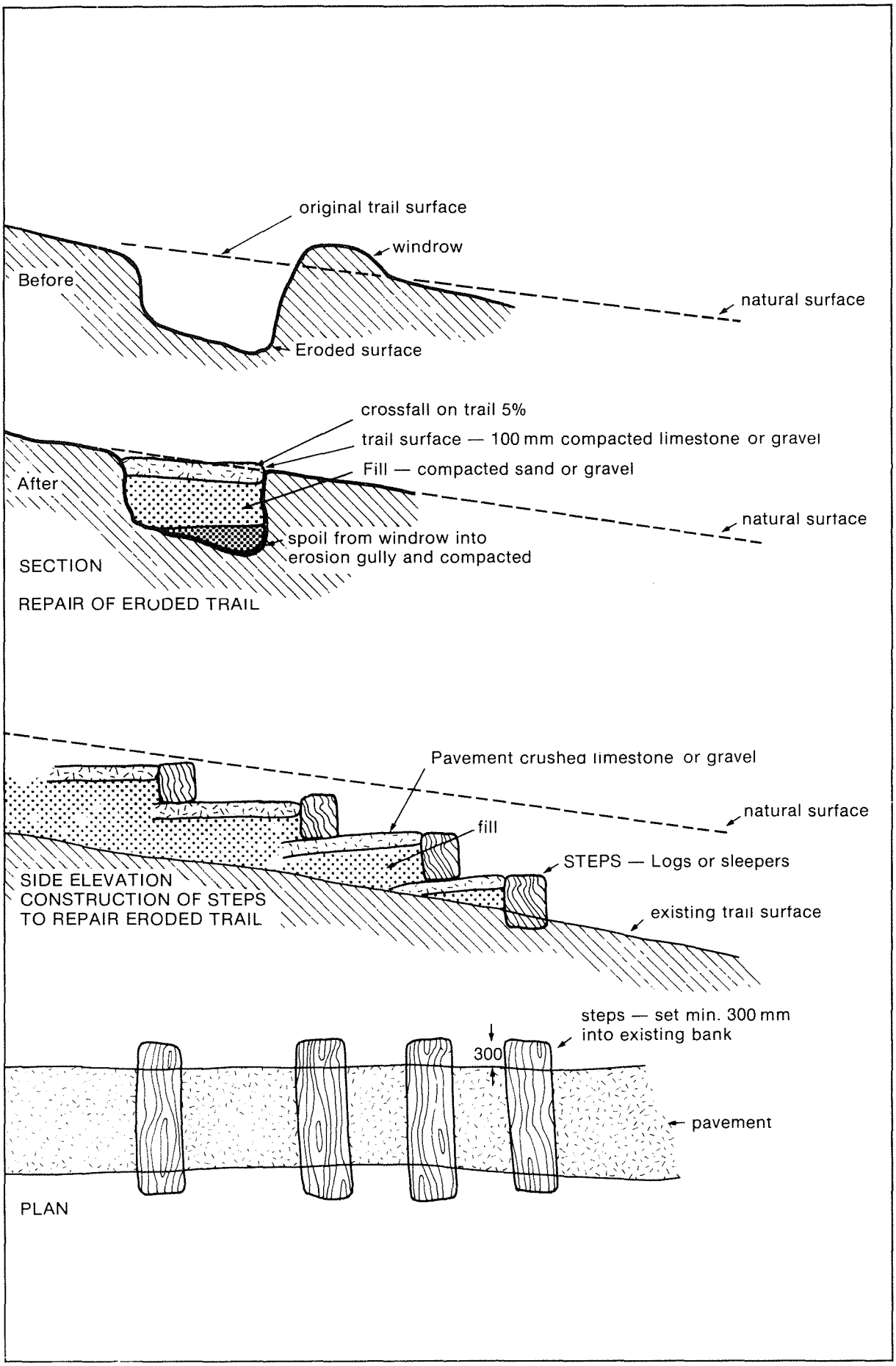


SECTION
TRAIL CONSTRUCTION — GENTLE CROSS SLOPE

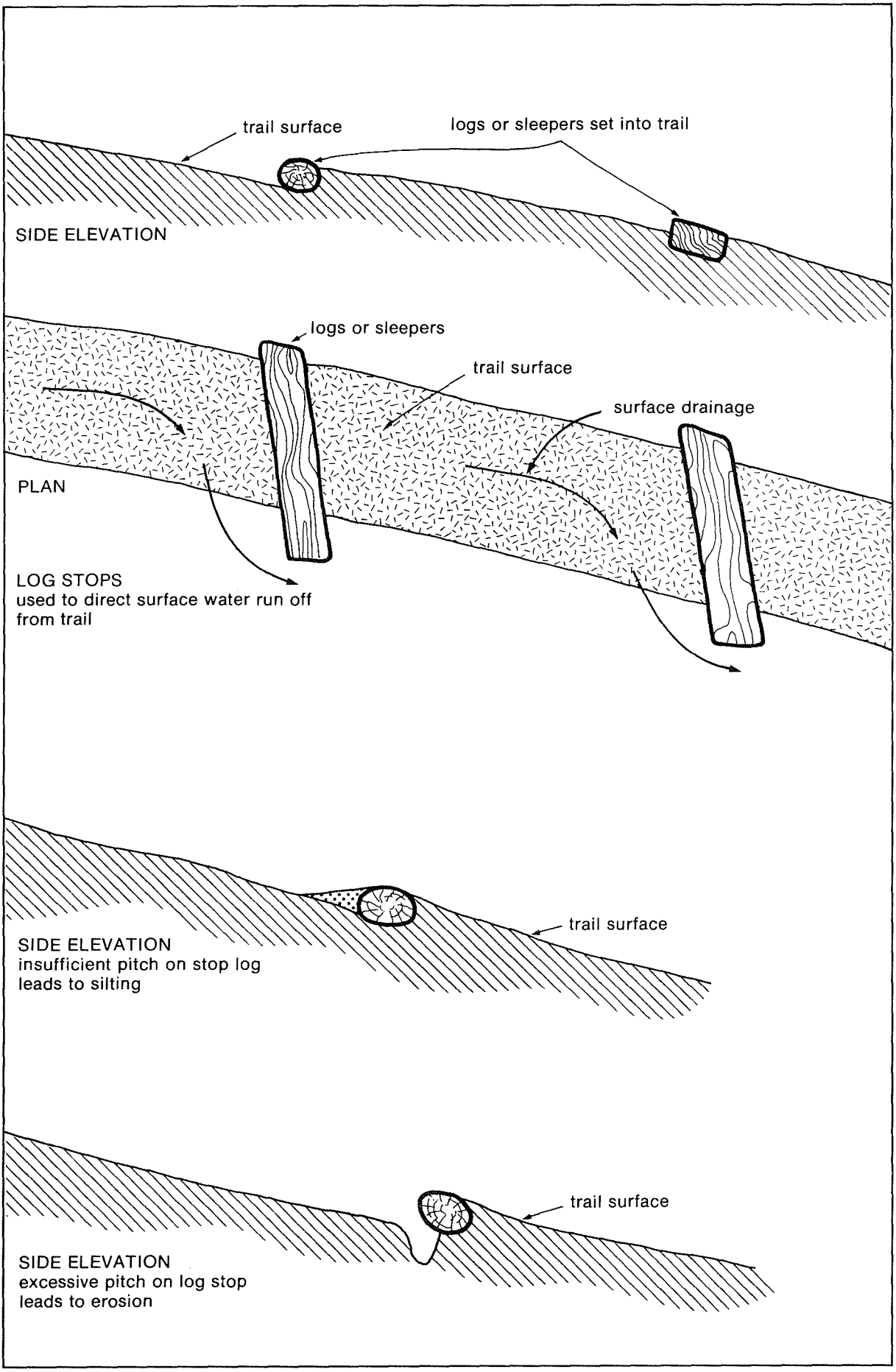


SECTION
TRAIL CONSTRUCTION — STEEP CROSS SLOPE

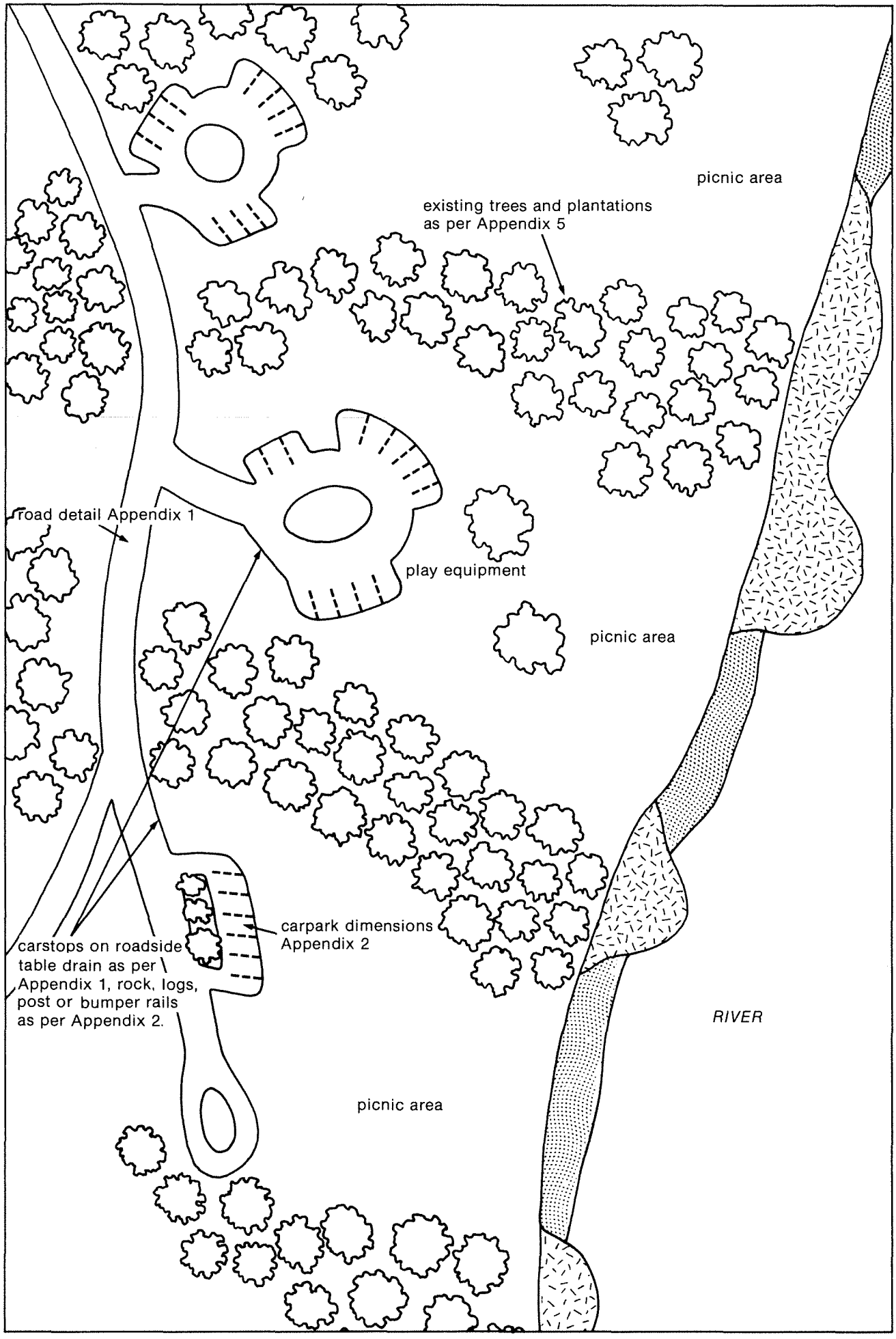
APPENDIX 3 WALKING TRAIL DESIGN



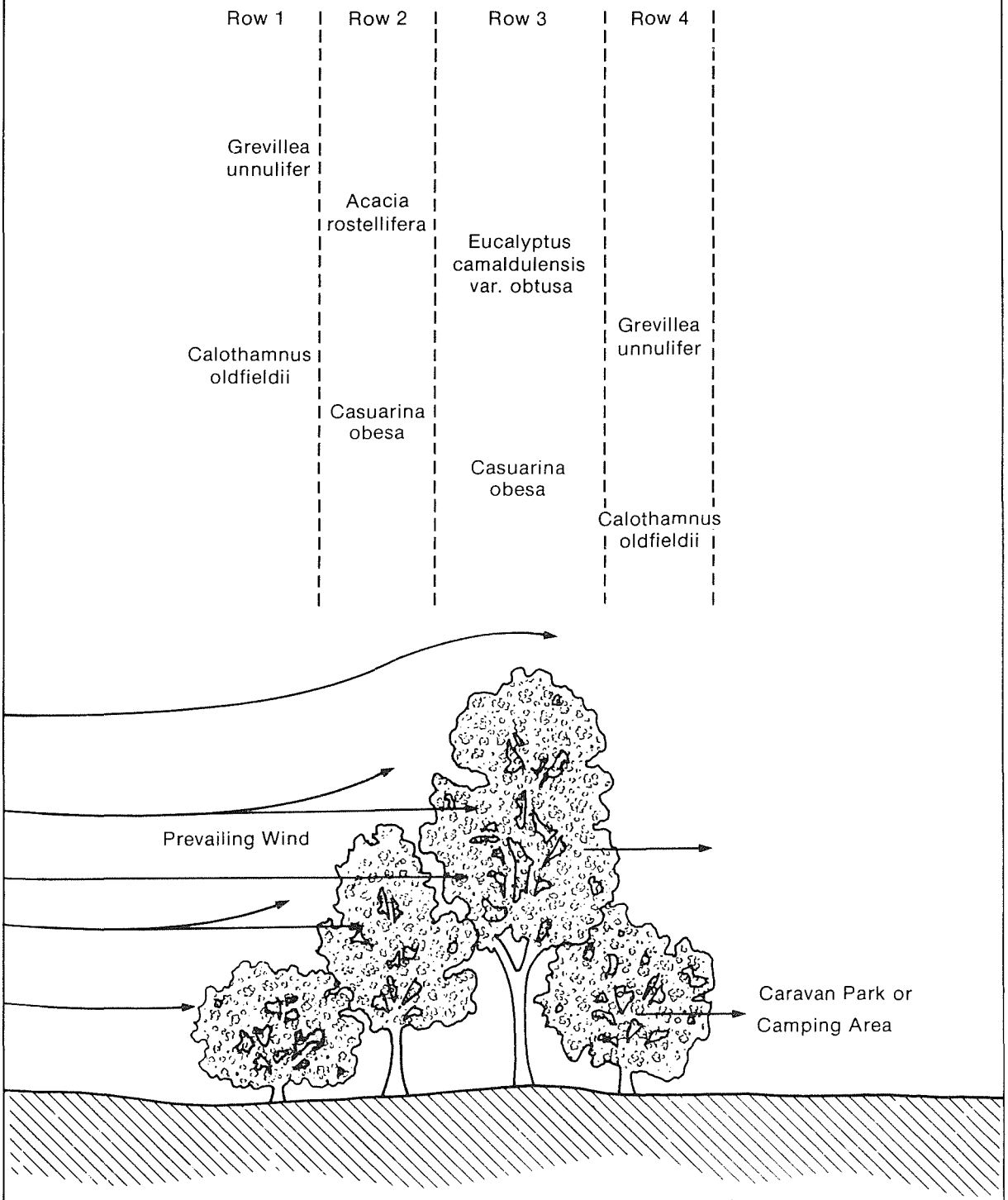
APPENDIX 3 WALKING TRAIL DESIGN (continued)



APPENDIX 3 WALKING TRAIL DESIGN (continued)

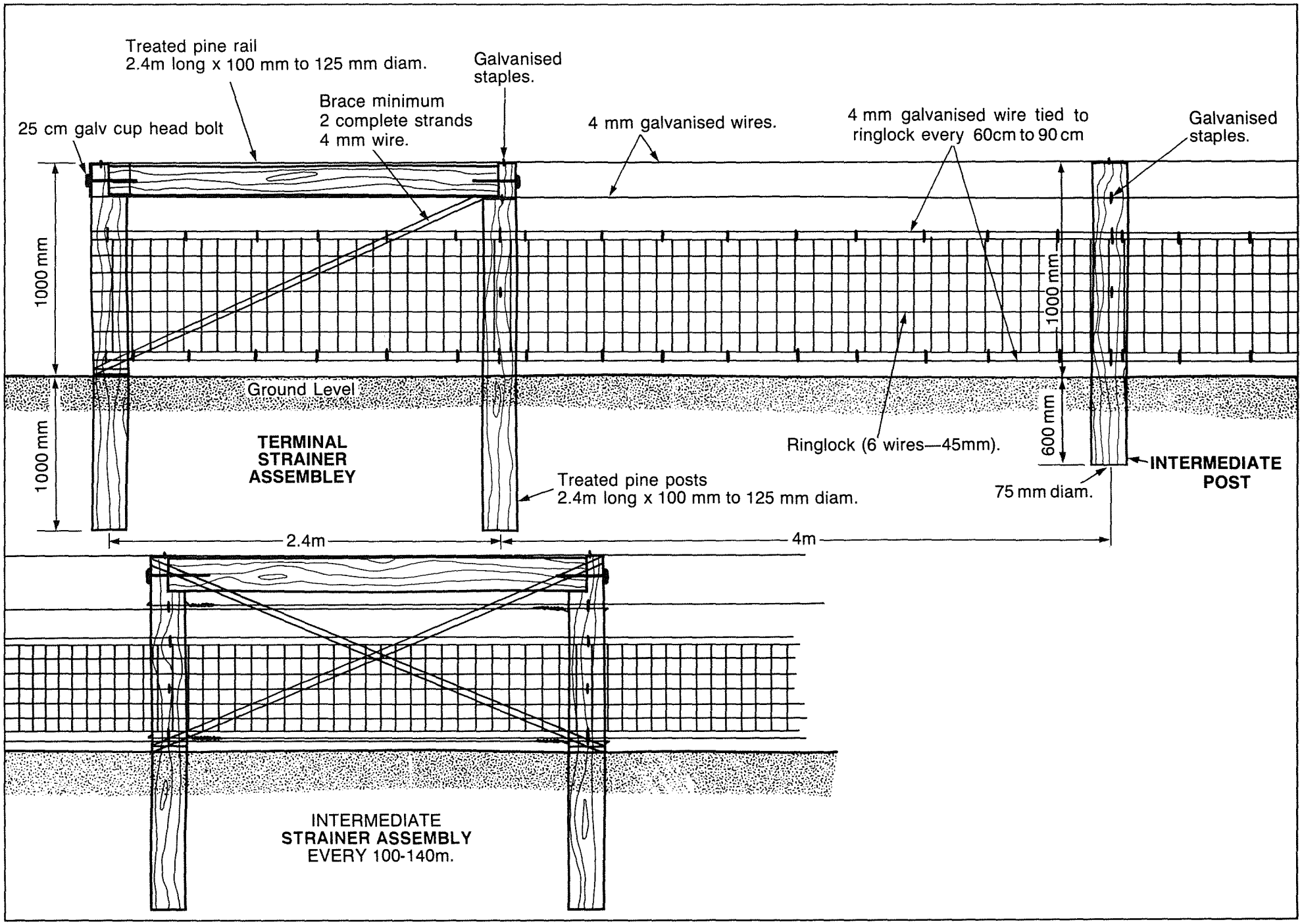


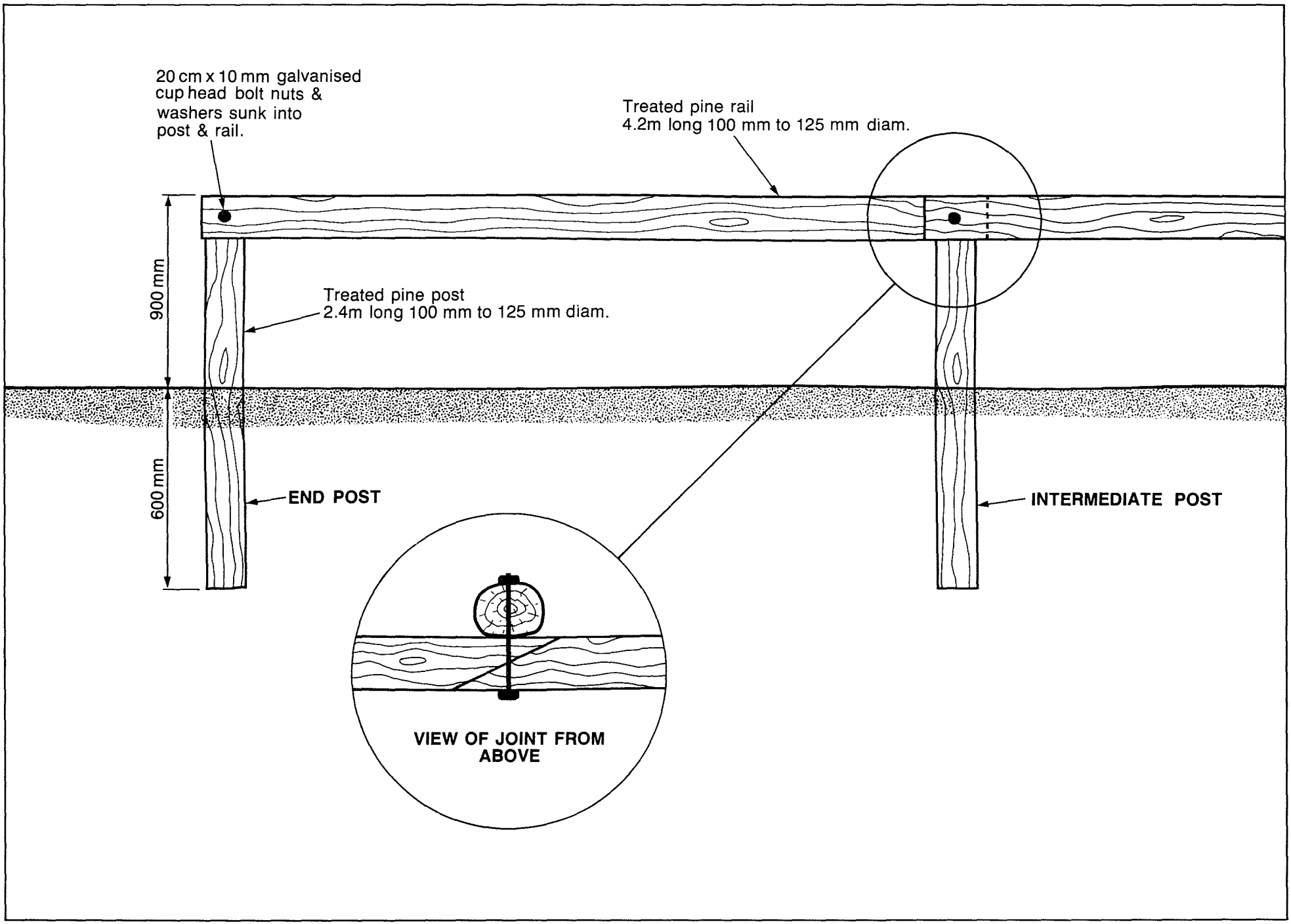
APPENDIX 4 TYPICAL PARKING AND PICNIC AREAS

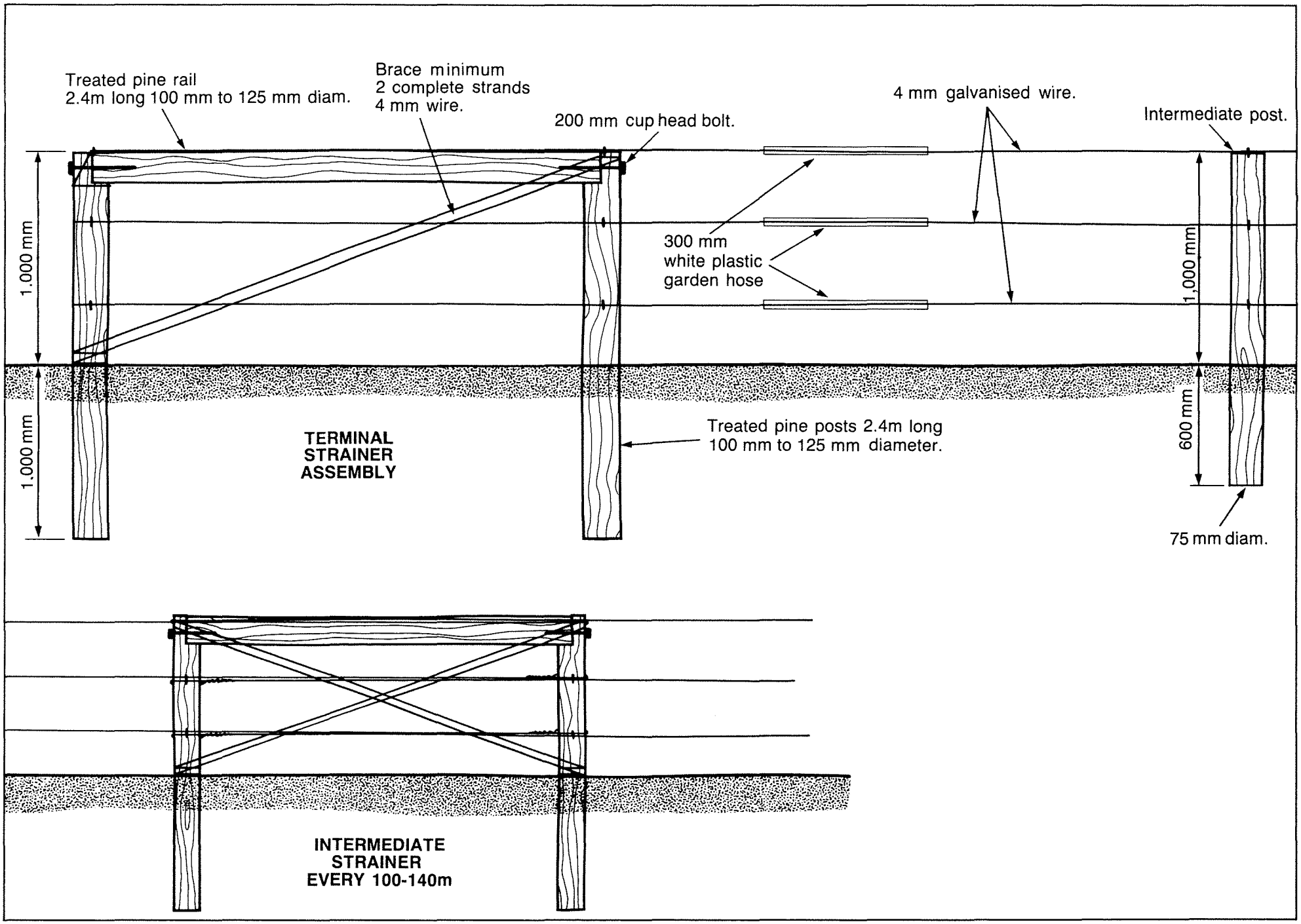


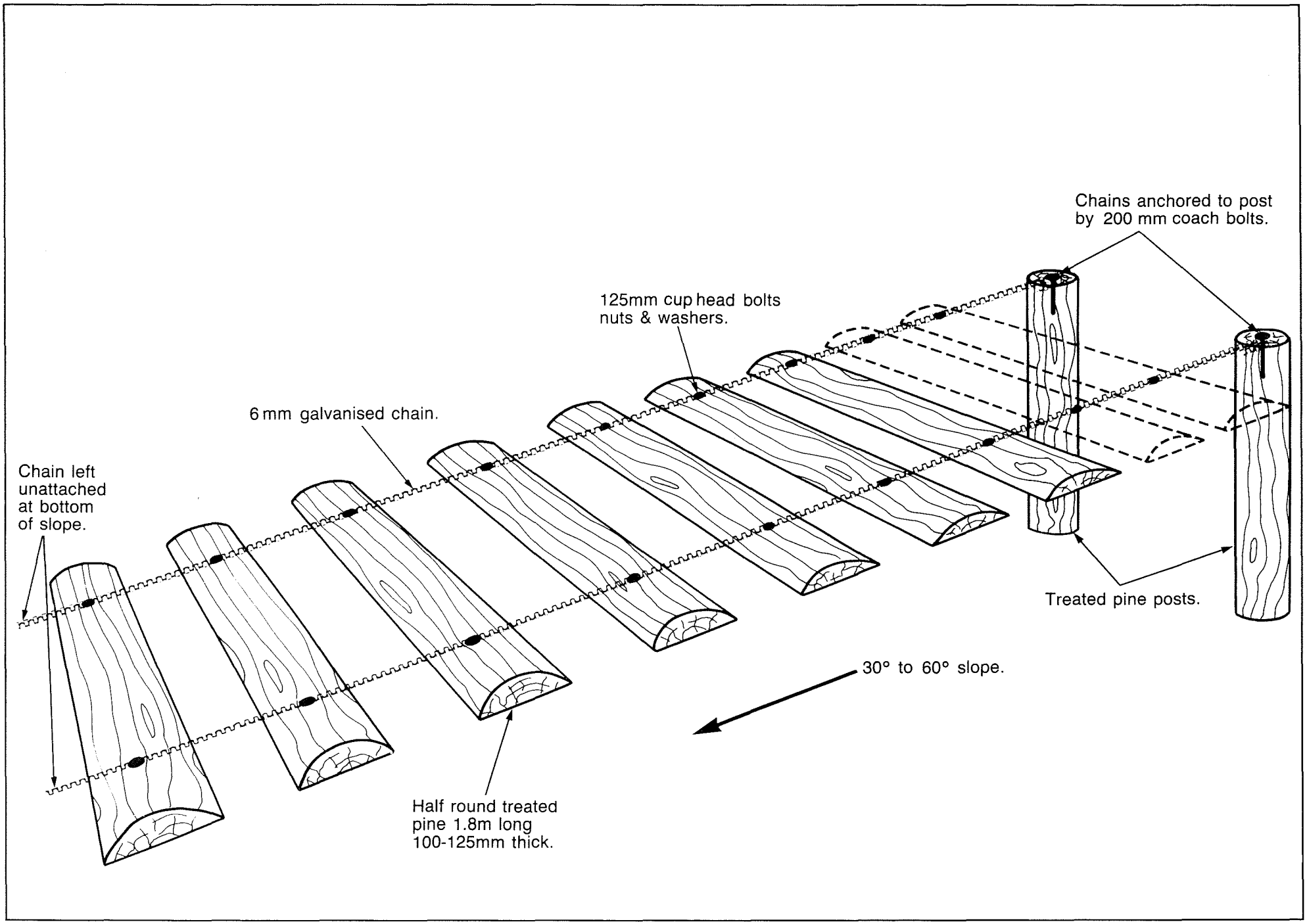
A semi-permeable, multi-rowed belt of bush evergreen plants will provide the most efficient windbreak and visual screen in this situation. If foliage is dense 2 rows will be sufficient. However, if foliage is sparse 3-4 rows will be required.

APPENDIX 5 DESIGN OF WINDBREAKS AND VISUAL SCREENS


Treated pine rail
2.4m long x 100 mm to 125 mm diam.
Galvanised staples.
Brace minimum
2 complete strands
4 mm wire.
25 cm galv cup head bolt
4 mm galvanised wires.
4 mm galvanised wire tied to ringlock every 60cm to 90 cm
Galvanised staples.
1000 mm
1000 mm
1000 mm
600 mm
Ground Level
TERMINAL STRAINER ASSEMBLEY
Ringlock (6 wires—45mm).
INTERMEDIATE POST
Treated pine posts
2.4m long x 100 mm to 125 mm diam.
75 mm diam.
2.4m
4m
INTERMEDIATE
STRAINER ASSEMBLY
EVERY 100-140m.


20 cm x 10 mm galvanised cup head bolt nuts & washers sunk into post & rail.
Treated pine rail 4.2m long 100 mm to 125 mm diam.
900 mm
Treated pine post 2.4m long 100 mm to 125 mm diam.
600 mm
END POST
INTERMEDIATE POST
VIEW OF JOINT FROM ABOVE


Treated pine rail
2.4m long 100 mm to 125 mm diam.
Brace minimum
2 complete strands
4 mm wire.
200 mm cup head bolt.
4 mm galvanised wire.
Intermediate post.
1,000 mm
1,000 mm
300 mm
white plastic
garden hose
1,000 mm
600 mm
TERMINAL
STRAINER
ASSEMBLY
Treated pine posts 2.4m long
100 mm to 125 mm diameter.
75 mm diam.
INTERMEDIATE
STRAINER
EVERY 100-140m


Chains anchored to post by 200 mm coach bolts.
125mm cup head bolts nuts & washers.
6 mm galvanised chain.
Chain left unattached at bottom of slope.
Treated pine posts.
30° to 60° slope.
Half round treated pine 1.8m long 100-125mm thick.