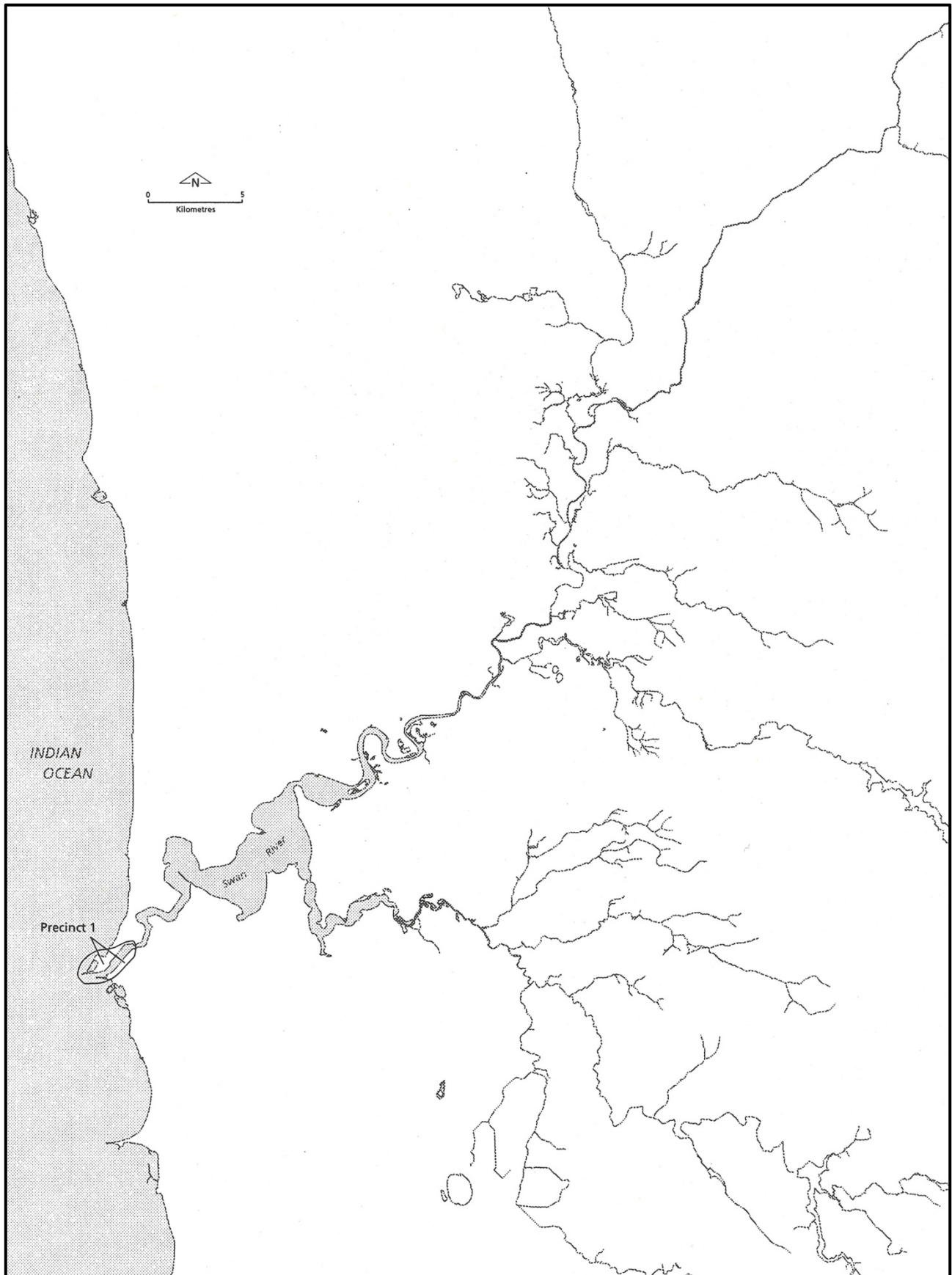


Precinct 1

Fremantle Harbour Groynes to Railway Bridge



Summary

Fremantle Harbour Groynes to Railway Bridge

The precinct is defined as the section of river from the Fremantle moles to the Railway Bridge. This section is the Port of Fremantle and is characterised by industrial, commercial and marine activities. The original beach and river banks were filled during the construction of the Fremantle Harbour last century.

The harbour has dramatically affected the natural river environment by changing the channel characteristics and therefore the degree of water flushing. Today, the estuary banks are bound by high retaining walls constructed with large blocks of limestone and rubble from Rous Head to the Fremantle Bridge. There is little remaining natural vegetation as clearing has been extensive. Exotic vegetation is present in the form of weeds and those species intentionally planted.

The area is heavily used by recreational fishermen and as an access route for recreational boating. The dominant land use is the industrial activities of the harbour precinct, although there are some commercial and retail activities within the area.

The main visually defining elements of the landscape are the linear walls of the harbour channel, the cranes and storage sheds. The harbour walls are constructed with rough angular blocks of limestone. The quays accentuate the geometric forms as they are built using timber and steel pillars and planks. The linear forms and textures of rock and steel are visually consistent with the industrial land use. The river viewer is prepared for the industrial landscape by colourful angular forms of the loading cranes which rise above the skyline of holding sheds. The harbour precinct is visually and physically separated from the Fremantle city by the railway. However, the port land use is linked to the city centre by the restoration of old storage sheds for new activities. The river user is not able to view the town centre due to the harbour buildings and the relatively flat topography.

Biophysical Processes and Features

Geological Processes

The precinct occurs within the Tamala Limestone formation which extends from the coast to Mount Helena. Tamala Limestone was formed in the Quaternary period (12 000 - 15 000 years ago) by aeolian processes (McArthur and Bettenay, 1974). The ancient dune system of quartz and marine calcareous shell fragments has been cemented by calcium carbonate and the resulting rock is referred to as aeolianite. Originally, both Rous Head and Arthur Head were hilly outcrops of calcarenite and caprock. Much of this has been removed by quarrying and the construction of the harbour.

The Cottesloe Soil Association consists of shallow yellow and brown sands which are derived from Tamala Limestone. The top soil is shallow with a low water retention capacity and low nutrient status. Alluvial soils were originally found along the foreshore areas and were the result of river sediment transportation. On the ocean side of the precinct there would have been a white sandy beach that is part of the coastal belt system, however, this was excavated with the harbour development. The coastal belt is a 10 -15 km wide zone of calcareous sand dunes, calcarenite, calcrete and leached siliceous sand hills that is part of the Safety Bay geological unit and corresponds to the Quindalup Soil Unit (Collins, 1987).

Topography

The precinct is classified geomorphically as part of the Spearwood Dune system and it has parallel dune ridges and limestone outcrops (McArthur and Bettenay, 1974). Rous Head and Arthur Head were both hilly outcrops of calcarenite and caprock. Originally, at the confluence of the river and ocean was a bar of dense coralline limestone which was in most places less than 2 metres below the surface of the water (Riggert, 1979). The foreshore was very irregular and the promontory leading to Ferry Point on the south side of the river was made up of swamp, reed beds, a salt lagoon, samphire flats and undulating white sand with bushes.

Hydrological Processes

Water features

The confluence of the Swan River estuary and the Indian Ocean occurs between the once high rocky outcrops of Arthur and Rous Heads. At the confluence, the channel was originally 1.8 to 2.5 metres deep and 15 metres across (Riggert, 1979). The river mouth was blocked by a coralline bar which greatly restricted water access into the channel. At low tide the rocky bar was visible as a broad outcrop, and as the tide rose water would flow over it to a narrow channel up the Swan River. These features have been dramatically altered with the construction of the harbour, including the removal of the bar and the extension of the channel into the ocean.

Bathymetry

The river originally reached a depth of approximately 5-7 metres, however due to dredging the channel is now approximately 11 meters in depth. The river channel is now approximately 500 metres across and bound by the limestone moles. The mean tidal range at Fremantle is approximately 0.8 metres, the effect of which has been increased in the river due to the removal of the bar at the river mouth. The flow of the river has been historically restricted by the old Railway Bridge at North Fremantle. Until the bridge was removed in 1968, it had acted as a submerged weir, distorting the lower levels of the tide and lessening the high water in the estuary (Riggert, 1978). The outflow of the water was so restricted that boats could 'surf down on the out-flowing tide.

The water salinity is equivalent to normal sea salinity in the Swan estuary mouth due to tidal influx of ocean water. The surface salinity does not noticeably decrease in winter in this section of the estuary despite the increase in fresh water from the seasonal rainfall in the catchment.

Flooding

This precinct is rarely subject to seasonal fluvial flooding as the harbour walls are deep and are capable of supporting most flood waters which would have once overflowed the natural channel banks. The area originally supported samphire flats which were subject to seasonal inundation. The offshore wave climate is mild, with an average significant wave height of 1.5 metres (Eliot *et al*, 1982). Wave heights of more than 4 metres are likely to be exceeded less than 1 % of the time, while heights of less than 1.0 m occur more than 80% of the time. Closer to the shore the swell is refracted by offshore reef systems and greatly attenuated by shoaling in the inner continental shelf and nearshore environment (Eliot *et al*, 1982).

Precinct 1 - Fremantle Harbour Groynes to Railway Bridge

The highly variable wind - wave climate is superimposed on this swell regime and as a result the overall wave size is often increased due the wind wave climate. The harbour has been designed so that the incoming waves into the harbour channel are substantially reduced in size.

Erosion and accretion

A sand bank or promontory, known as Willis Point, had formed at the river mouth. This was the result of the slowing of the fluvial waters as they reached the ocean confluence. The promontory extended from the southern side almost to the northern bank; however, this feature was dredged early this century. It is likely that due to the rocky and stable nature of the limestone heads at the river mouth, the morphology of the river mouth was fairly stable with only small seasonal changes in the erosion and accretion of sandy beaches.

Vegetation Communities

Native

Cottesloe Complex

The original vegetation would have ranged from a woodland of tuart (*Eucalyptus gomphocephala*), jarrah (*Eucalyptus marginata*) and marri (*Eucalyptus calophylla*) to a closed heath around limestone outcrops (Beard, 1990). The understorey includes chenille honeymyrtle (*Melaleuca huegelii*), tangling melaleuca (*Melaleuca cardiophylla*), hazel (*Trymalium ledifolium*), spider net grevillea (*Grevillea thelemanniana*), stinkwood (*Jacksonia sternbergiana*) and tree smoke bush (*Conospermum triplinervium*).

There is little original vegetation remaining in the precinct. The area once supported a tall stand of eucalyptus close to the river foreshore (City of Fremantle, 1992). Early photos showed that Arthur Head had small scrubby bushes on the sandy patches between the limestone rocks which may have been similar to that of Bathers Beach today. It is likely that salt tolerant species such as coast daisy bush (*Olearia axillaris*) and sea-berry salt bush (*Rhagodia baccata*) would have prevailed in the harsh conditions. Willis Point is recorded as having samphire (*Sarcocornia quinqueflora*) and rushy flats. The area was also recorded as having Geraldton wax (*Chamaelaucium uncinatum*).

Charles Fraser in 1827 observed quantities of *Brunonia* (probably common *dampiera*, *Dampiera linearis*) growing in great luxuriance on the margin of a salt marsh, its flowers of a brilliant sky blue.

Here I likewise gathered a magnificent species of *Melaleuca* (probably one sided bottle brush, *Calothamnus quadrifidus*) with scarlet flowers and species of *Metrosideros*, and various other plants which, their being neither in flower nor in fruit I could not attempt to describe (in Seddon, 1972).

Exotic

Exotic species have been introduced into the precinct by ship ballasts and other accidental processes. Weeds, such as, bearded oat (*Avena barbata*), sweet alyssum (*Lobularia maritima*) and tree tobacco (*Nicotiana glauca*) occur in small pockets of soil adjacent to buildings. Other species, such as fennel (*Foeniculum vulgare*), may have been intentionally introduced for food, and now are common weeds in industrial sites in the precinct. The recently built Rous Head harbour has blocks of land which have yet to be built upon. These sites support clumps of weeds and some salt tolerant exotics such as sea spinach (*Tetragonia decumbens*)

Historical Land Use & Resulting Environmental Changes

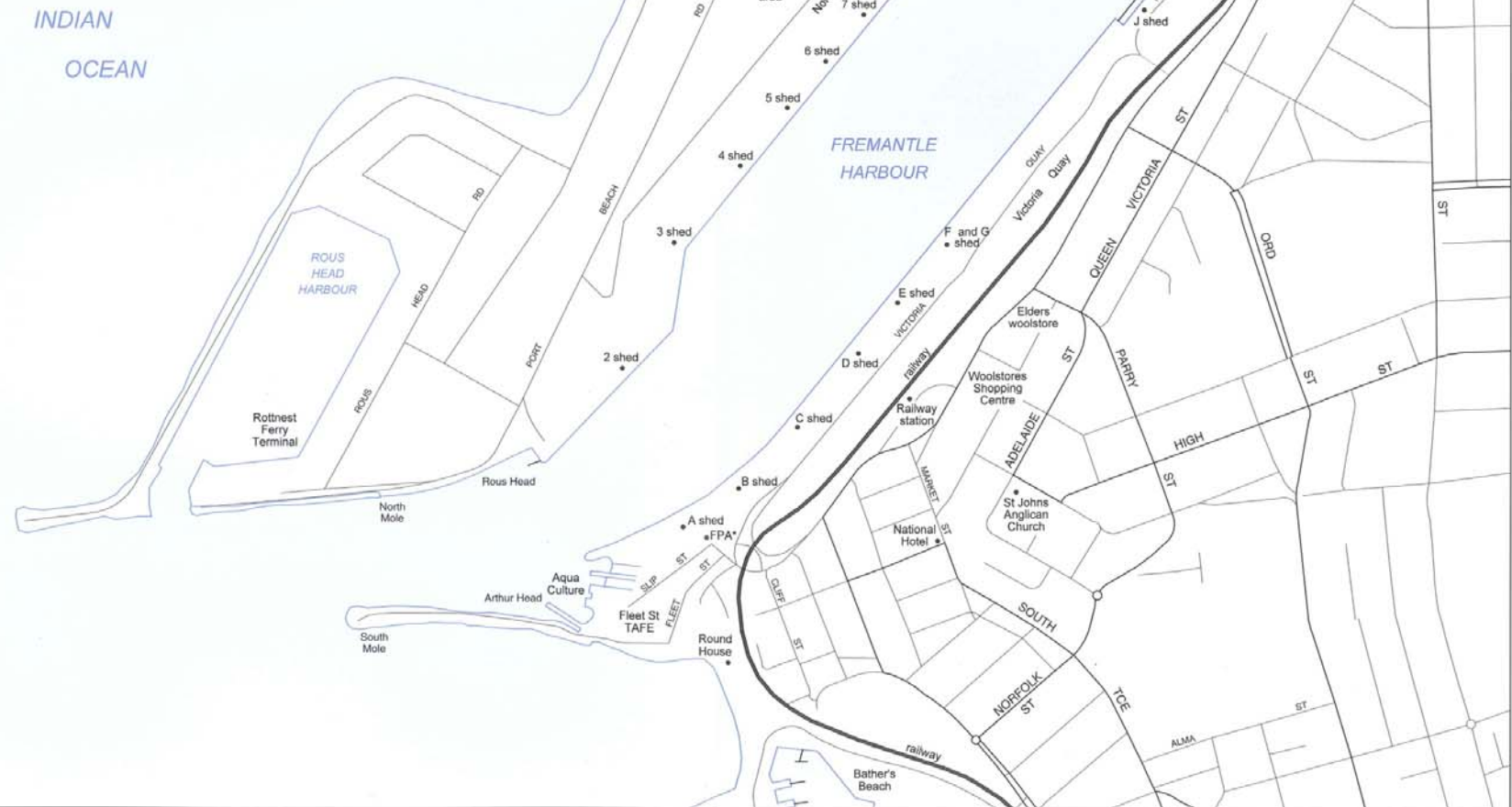
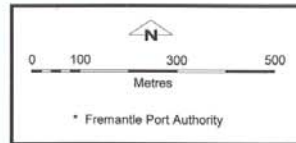
The harbour precinct has been dramatically altered from its original form. From the beginning of colonial settlement access to the river mouth by large vessels was impossible. Augustus H. Gilbert, ship's clerk of the *Success*, wrote an optimistic account in his journal about the possibilities of constructing access by canal to the Swan River (Hitchcock & Stevens, 1929). He considered that if this canal access could be constructed through to Rocky Bay it would form the best harbour in the world, safe from 'enemy bombardment'.

Our expectations of the advantages of a settlement at Swan River are now fully confirmed, and although it would be impossible for vessels of above ten tons to enter the river at any state of the tide in safety, at the present entrance, it would be practicable at small expense to cut a canal at about four miles [actually two miles] from the mouth of the river to the sea.

The distance necessary to cut, is only 1 mile, and would immediately lead into water of 12 fathoms both in the river and in the sea. The land is rocky and would afford excellent sides to the canal. [The area referred to is between Leighton Beach and Rocky Bay.]

PRECINCT 1

Significant Land Use Features



The original harbour shoreline was a thin white sandy beach from Arthur Head to Market Street. Arthur Head was originally a headland but was quarried back to a cliff face (Hitchcock & Stevens, 1929). On the southern side from Market Street was a sand bank covered in bushes and rushes stretched half a kilometre into the river. This promontory, known as Willis Point, almost reached out to the northern shore leaving only a narrow deep channel. The bank and associated ephemeral salt lagoon was removed during the construction of the harbour (Hitchcock and Stevens, 1929).

In 1849, due to the restriction of ships entering and anchoring the estuary mouth the first attempt to remove the bar was made (Riggert, 1978). Efforts to blast out the rocky bar which blocked the mouth of the river were unsuccessful. A new jetty giving better protection was built in 1873 and known as Long Jetty. In 1891, C.Y.O'Connor was appointed Engineer in Chief of Public Works and Manager of Railways. His first project was building a suitable harbour for the small colony. It involved levelling the south side of Arthur Head and blasting away the rocky bar blocking the harbour's entrance. The plan also included a scheme to dredge a 130 metre channel to a depth of 9 metres which was later further deepened by 2 metres (Riggert, 1978). In 1892, the Governor's wife, Lady Robinson, pulled the handle to tip the first load of stone on Rous Head to commence construction of the north mole. The sand spoil from the dredging was used to construct Victoria and North quays, making the total area of reclamation 50 hectares. The port was used by cargo ships, great passenger liners and mail-ships, some of these activities continue to the present day. The overseas passenger terminal was used up until the 1960s as the main gateway for visitors and migrants to Western Australia (Ewers, 1971).

The Fremantle town site was planned in March 1833 by John S. Roe (Seddon, 1972). The site neatly fits into the point between South Bay and the mouth of the Swan River. To the east and west were some limestone cliffs which helped to restrict the town's growth and create the compact urban environment, still evident today.

Present Land Use and Social Patterns

Today, the Fremantle Port plays a less important transportation role than in the earlier half of this century. Large warships, cruise liners, livestock ships and cargo ships all use the harbour; however, the role of passenger transport has been largely filled by aeroplanes and motor vehicles. Much of the land on the southern mole is under-utilised by shipping activities. However, new land uses have recently been encouraged by the local city council. The sheds, which dominate the riverscape, are currently being used as a small shopping complex, a market, a base for sailing ship training, a historic boats museum, a convention display centre and an area for music concerts.

The water adjacent to Arthur Head is currently being used by the Western Australian Fishing and Aquaculture Centre to house trial fish farms. The cages are used to trial aquaculture techniques, and to grow fish species, such as bream.

The North Quay has ten berths and the riverscape is dominated by the container holdings and the cranes used to download the container ships. The newly completed Rous Head Harbour has a number of light industrial and commercial developments, including the new Rottnest Ferry Terminal and a helicopter landing area.

The town site of Fremantle is cut off from the river and harbour precinct by the railway. The town has retained many of the turn of the century limestone buildings which are both important landscape features and sites of historical interest. The town centre is mainly made up of two storey buildings and the pedestrian scale of the centre has been maintained due to the lack of redevelopment up until the 1980s. Recent plans by the local council and the Department of Planning and Urban Development (1994) have ensured that the city retains its historic buildings and character

Recreation nodes

Both the groynes and walled banks of the harbour are popular areas for recreational fishing. South Mole is a popular spot for scuba diving due to its sheltered water and easy access. The new Rous Head Harbour holds the Rottnest Ferry Terminal which is the site of embarkation for many day-trippers and holiday makers. The recently converted storage sheds are now a popular market place which bustles with weekend shoppers.

Public access

The mouth of the Swan River is easily accessed by sealed road which runs along the groynes. Victoria Quay is accessible to pedestrians as the area is bituminised and the local authority is in the process of designating a zone of public use. The northern mole is mainly restricted access due to the harbour activities.

The use of the harbour precincts by recreational boaters is restricted by the shipping lanes, however it is heavily used by small craft to access the ocean. There is ample parking along both Arthur and Rous Heads for users of the recreation nodes and the TAFE college.

Sites of Nyungar & wider Australian community significance

Nyungar significance

Nyungar refer to the Fremantle coast and limestone hills as *Booyeembara* (Gibbs, 1988). The river confluence with the ocean is known as *Majarree* and both sides of inland Fremantle area as *Walyalup* meaning place of the eagle (Collard *et al*, 1996). The Swan River from the ocean confluence to Melville Water is named *Derbal Yaragan* and is a significant fishing area for Nyungars (O'Connor *et al*, 1984). Nyungars frequently traversed a track from Perth Water to North Fremantle. Before the Fremantle Harbour was altered, in summer, it was only a short swim from the northern shore to the southern banks from where the track continued to Bibra Lakes (O'Connor *et al*, 1989). The original Willis Point was known as *Walyubup* 'place of the kangaroo rat' (Collard *et al*, 1996). Before colonisation, the area was mainly frequented in summer when the estuary was a plentiful fishing resource and the coastal plain was relatively dry. Green (1986) notes that a popular fishing technique was for groups of 20 or more women and children armed with branches to drive schools of mullet into the shallows to be speared by the men. The dry vegetation was easily burnt which encouraged the propagation of young vegetation which in turn attracted game for hunting. In winter, local Nyungars moved inland to avoid the flooding of the coastal plain and river banks. There was a freshwater spring approximately one kilometre from Arthur Head which was an important resource for Nyungars and this point served as a meeting place.

Other significance

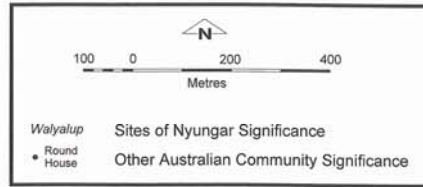
Arthur Head was named after Governor Arthur of Van Diemens Land. On 2 May 1829, Captain Stirling of *HMS Challenger* hoisted the Union Jack flag and laid a formal claim to the entire western half of New Holland.

Rous Head was named by Captain Stirling after Captain H.J. Rous who was based in New South Wales and later explored the northern rivers of that State (Seddon, 1970).

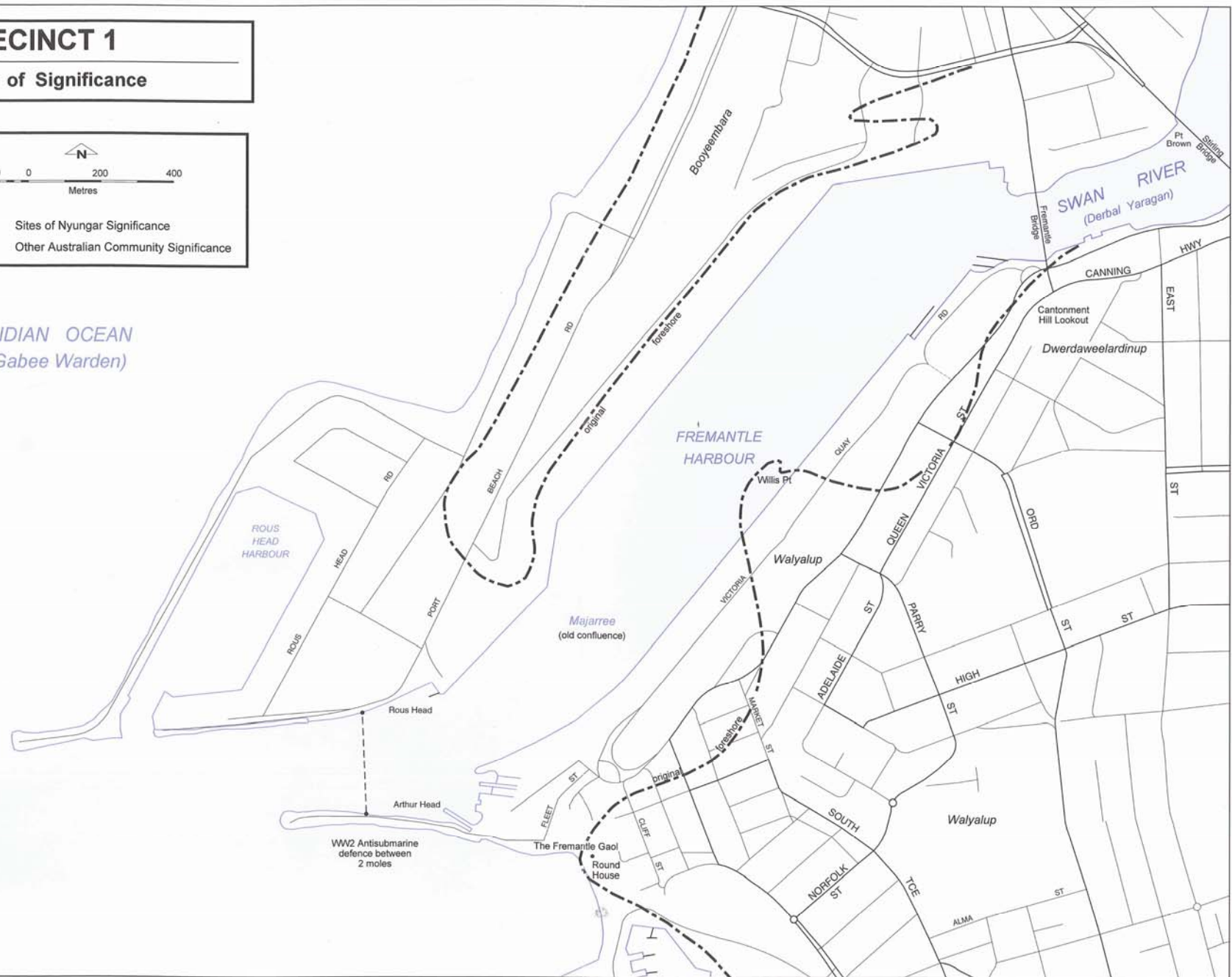
There are a number of buildings in the Fremantle City Centre that are significant to the European history of the area. The Fremantle Goal (Round House) was built on the rocky cliff of Arthur Head and once dominated the town and riverscape. It is the oldest surviving public building in the State. There are also a number of elegant public buildings such as St John's Church (Kings Square), National Hotel and the Lionel Samson and Son Building (Apperly *et al*, 1989). The city has been designated as an area of historic value and its early Federation styled buildings are now recognised as worthy of being retained to ensure this atmosphere is maintained.

PRECINCT 1

Sites of Significance



INDIAN OCEAN
(Gabee Warden)



The once busy harbour has slowed as other forms of transport have emerged. The Fremantle Passenger Terminal was once the first place of disembarkment for the many migrants to Western Australia. Most of the storage buildings have been demolished or used for other purposes such as the Fremantle Woolstore Shopping Centre.

Conservation areas

Wetlands

There are no remaining wetlands in this precinct.

System 6

This precinct has no areas recommended for management by the System 6 Report (1983).

Landscape Description

Waterform

The Swan River confluences with the Indian Ocean at this precinct. Despite the confluence being walled by the harbour, the water body is still one of the most attractive landscape elements. The wide and deep channel allows the ocean waves to continue through the precinct and the tidal influence creates attractive flow patterns. Depending on the weather conditions the water surface is either dull or highly reflective.

Riparian land use

The river channel has limestone banks which are made up of rough angular blocks derived from quarrying. They form straight, roughly textured moles which due to their linearity give the viewer the impression of functionality rather than naturalism. The individual limestone blocks are subject to weathering and erosive processes and have begun to take on a more rounded and natural form, despite the overall artificial form. The loading jetties are supported by timber and steel pillars which are visually dominant to the water user. The linear forms and the textures of rock and steel are visually consistent with the industrial land use and the riparian zone is not expected to have a natural form.

Land use

The most prominent feature of the landscape is the colourful angular forms of the loading cranes which rise above the buildings. These metallic and linear forms dictate to the viewer the industrial landscape. The landform is flat with large bituminised areas for cargo holding bays. Cargo containers stacked on the North Mole provide regularly shaped and multiple coloured nuclei. There are several sheds which are wooden and steel and of a functional style. The Fremantle Port Authority building is a simple 1960s style building which towers above the city and harbour sky line. In the context of the harbour, the building does not detract from the landscape. The harbour is usually holding several boats which have smooth steel surfaces which also contribute to the artificial and industrial character of the area. At the end of South Mole there is a lighthouse and toilet block which is both prominent features of the landscape.

The harbour precinct is visually and physically separated from the Fremantle city by the railway.

Visually the overhead electric lines provide a linear barrier between these land uses, and these give the impression of separate entities. However, the port land use is linked to the city centre by buildings, such as Elders Wool Store, the Woolstore Shopping Centre and the Harbourside Hotel. These were built in a Federation functional and industrial style and the uniformity of style helps visual continuity. The Victoria Quay sheds are now being used for commercial and other land uses. The sheds, linear and wooden and steel forms have not been altered and therefore are still indicative of their previous land use. The Railway Station is built in a Federation free classical style and its location and preservation provide visual continuity with the surrounding city centre buildings which were built during a similar era.

The water user is not able to view the town centre from the river as the high linear wharf and buildings block the view to the topographically flat town centre. However, the residential area behind the city is on a hill and is visible as background. The pedestrian viewer has also limited views, however, the view of the harbour is made interesting by the angular and dynamic forms of the harbour activities.

Dominant Landscape Character

The dominant landscape character type for this precinct is an industrial character. The original natural landscape has been dramatically altered leaving little of the original calcareous sands and limestone outcrops which would have been covered by the low coastal dune vegetation. The present industrial character is typified by several elements. These are the linear concrete harbour walls which provide an unnatural interface of water and land; the tall cranes and numerous ocean carriers; the wooden sheds, the lack of vegetation, and the man-made flat landform.

Significant Viewscapes

A narrow and attractive viewscape is the view from the harbour sheds to the ocean which is focused by the harbour groynes. Similarly, the view from the harbour groynes facing eastward, shows the harbour landscape with the backdrop of East Fremantle.

Conforming and Non Conforming Elements in the Landscape

The Fremantle Harbour precinct is an important element to the Swan River. Apart from being the confluence to the ocean it is also the only harbour landscape. *The Fremantle Regional Strategy (1994)* identifies the uniqueness of the landscape and the need to enhance and maintain the historic theme and harbour land use. There have been efforts to reduce the effect of the railway visually and physically separating the harbour from the rest of the city. The Fremantle City Council has planned to revitalise the port area by designating some of the Victoria Quay sheds to new land uses. This enterprise has been quite successful with the nautical theme being maintained in the shopping complex and the Historic Boats Museum. The merging and overlapping of land uses by retaining the original buildings has helped develop a physical continuity between the entities. Visually, however, the buildings' original forms are still evident so the visual distinction is still present. This raises the question whether it is preferable that the visual distinction be maintained or minimised.

On the northern mole there has been successful mixing of industrial and commercial outlets within the new Rous Head Harbour. Their land use link is that they all have a nautical and industrial interest. Visually, most of the buildings are functional; however, there are a few offices which are built in a style which is indicative of modern and prestigious companies. Visually, the viewer is conditioned by the port activities to expect functional and minimalist buildings. The new harbour is visually congruous with the adjacent land use.

The recreational user is restricted in the harbour to certain navigation channels due to the industrial nature of this precinct. However, this is hardly restrictive to the water viewer as the whole precinct is such a small length of the river and is interesting as limited and restricted water use. There has been improved access to the moles for the land based recreational user. These provide the viewer a panoramic view of the industrial landscape and the ocean and it is important that this access be encouraged and maintained.

Recommendations for Maintenance and Enhancement of the Present Landscape Character

To maintain the unique and attractive industrial character type of this precinct, the following recommendations may be considered.

- Maintain the wooden sheds and ensure that future development is in keeping with the style and form of the sheds.
- Maintain the linear harbour walls and moles.
- Retain the vibrant colours of the cranes. The cranes are an essential dynamic element.
- In the adjoining Fremantle city area encourage sympathetic building designs in the utilitarian styles of the turn of the century. This does not necessarily mean mimicking the styles, rather having similar heights and sympathetic building materials.
- If in the new harbour development vegetation landscaping is considered desirable, indigenous plants may be considered. They would not only be a reminder of the past vegetation, they would be suitable for the harsh conditions of this industrial landscape.

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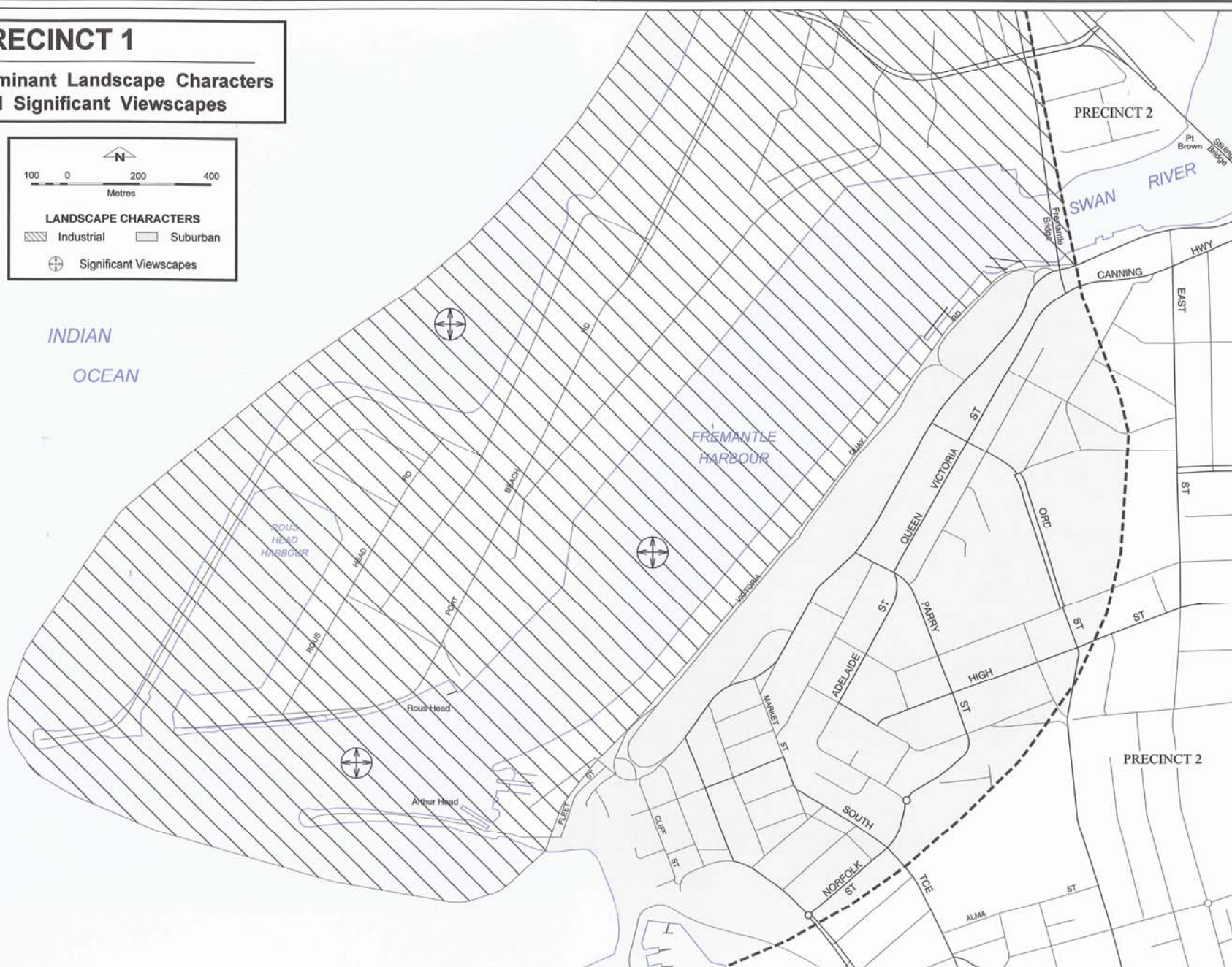
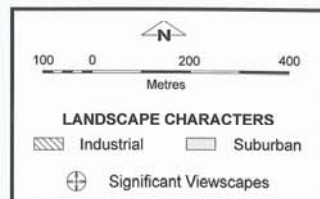
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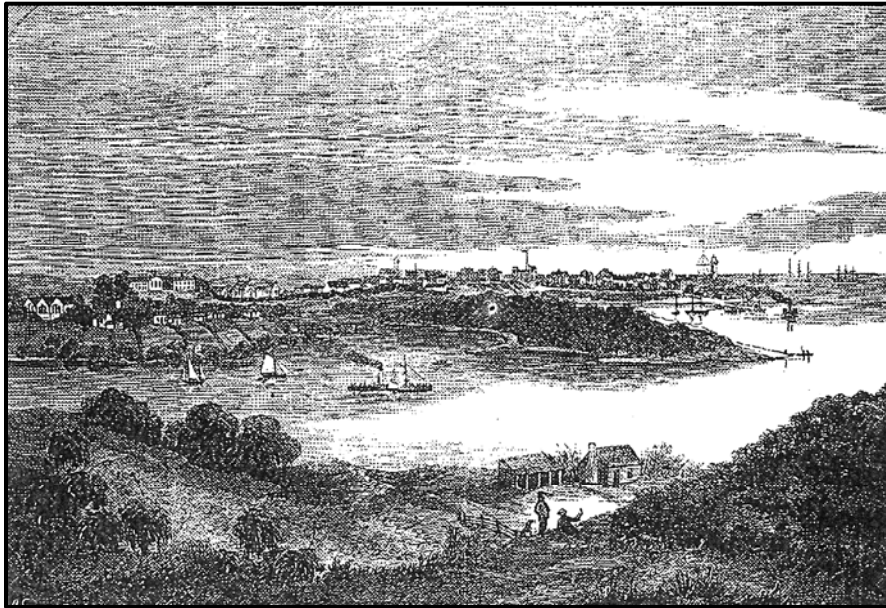
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PRECINCT 1

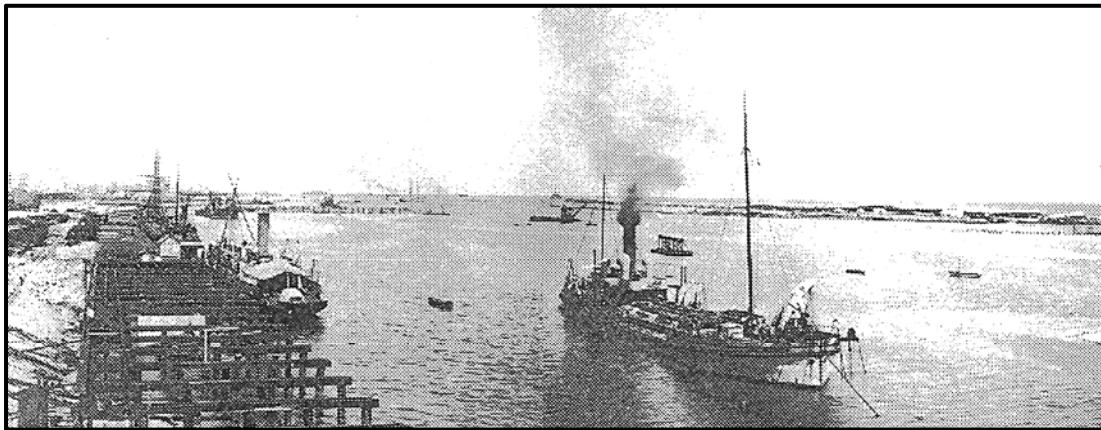
Dominant Landscape Characters and Significant Viewscapes



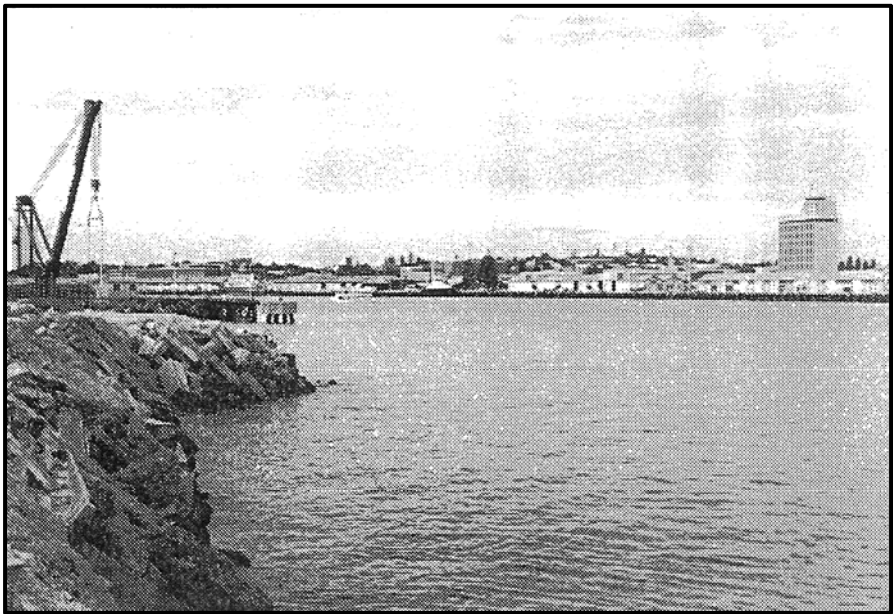


Fremantle, Western Australia. c1866.

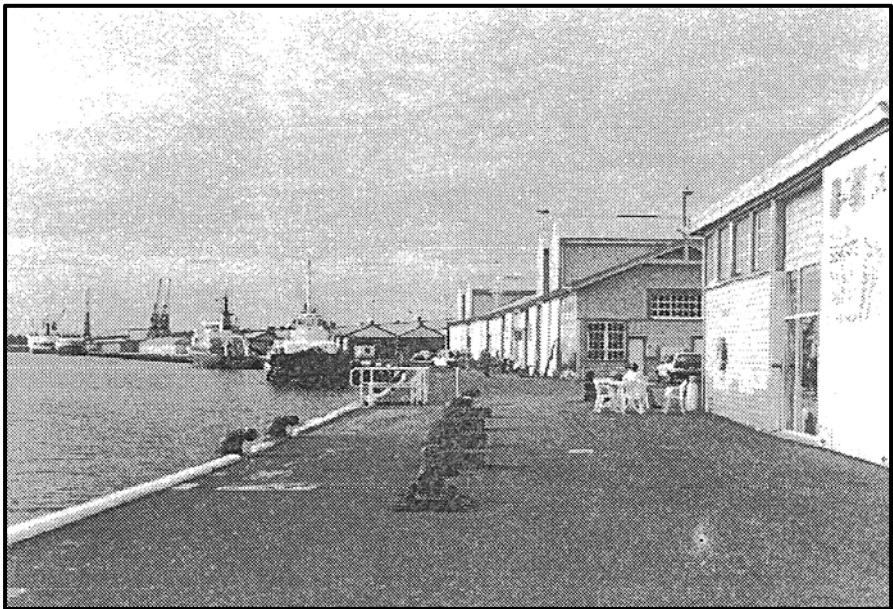
Fredrick Grosse, 1828-1894. Wood engraving (in National Library of Australia).



Fremantle Harbour construction. c1897. Photograph (from original in Swan River Trust).



North Mole, Fremantle Harbour. 1995.



South Mole, Fremantle Harbour. 1995.