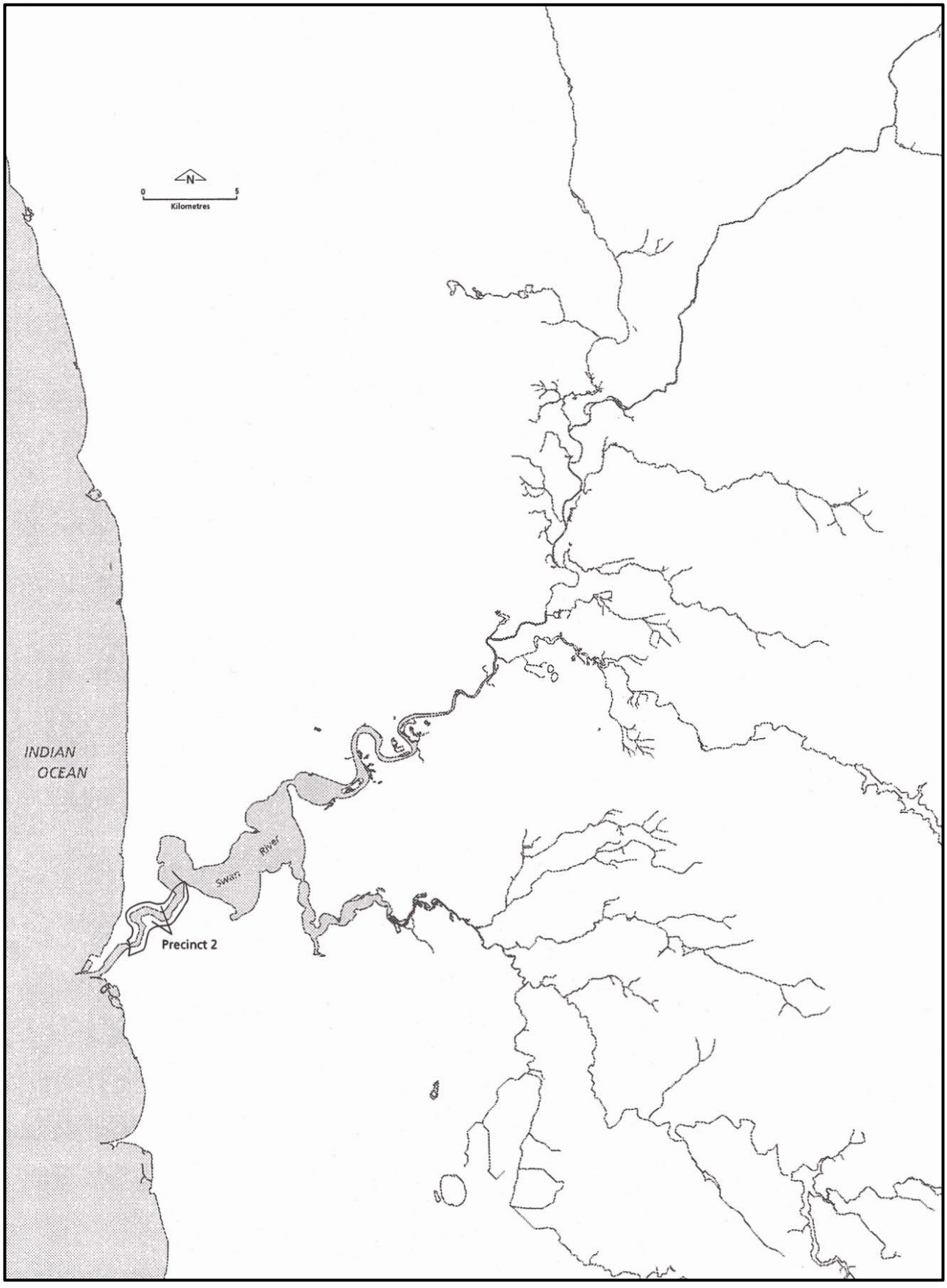
Precinct 2

Fremantle Railway Bridge to Point Walter Reserve and Childley Point



Summary

Fremantle Railway Bridge to Point Walter Reserve and Childley Point

The precinct area is the section of estuary between the Fremantle Railway Bridge to Point Walter Reserve and to Chidley Point. The present day landscape is the result of dramatic modification and yet there are still areas which have high scenic, recreation and conservation value. The most dominant natural features along the foreshore are the limestone cliff faces, which are exposed along much of the precinct.

These cliff faces result from extensive quarrying particularly on the northern side of the river. A number of caves and fossiliferous beds are found within the limestone beds.

Intensive land use has resulted in most of the natural vegetation complexes being substantially modified or removed from the area. The largest remnant vegetation communities are found between Minim Cove and Chidley Point and also along Blackwall Reach. However, there are a number of areas which have been identified as areas of ecological significance. The precinct is also significant for the Nyungar people who recognise several sites of importance. Locations of European historical value are also present.

Land reclamation has occurred along the North Fremantle foreshore. Mosman Park has a history of industrial development which is currently being relocated and the sites developed for residential use. Residential development extends to the river front at several locations within the precinct and is an important landscape feature along river. There are many locations which are highly popular for both passive and active recreation. Public access to the foreshore is made possible with dual use pathways, informal tracks and roads. The limestone cliffs often create a natural barrier to the foreshore.

The riverform is particularly attractive in this precinct, as the water winds through the relatively high limestone cliffs and the low lying sandy embankments. Parts of Rocky Bay cliffs are covered in endemic shrubs which form clusters of green on the weathered limestone. Other cliff faces have been seriously degraded and much of the limestone cliff has been quarried or collapsed. Exotic weeds do not take the endemic scattered clumped forms on the cliff, rather they entirely cover the limestone as can be seen on the cliff face opposite Blackwall Reach.

Along Preston Point, the riparian land use is predominantly water orientated. The numerous water based sport clubs are visually consistent landscape elements. Their club houses range in style but all are functional and indicative of their riparian use. There are a number of residences which are visually inconsistent elements within the Blackwall Reach landscape. These houses have been constructed on and cut into the limestone cliff face. Their designs and building materials are in sharp contrast to the limestone form, colour and texture. Rocky Bay and Minim Cove are currently being redeveloped for residential and recreational purposes. The area was previously quarried and used as an industrial area which has degraded the visual landscape quality of the area. A new redevelopment is currently occurring at this site which will hopefully enhance the present degraded section of the river.

Biophysical Processes and Features

Geological Processes

The precinct occurs within the Tamala Limestone geological 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. 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 (City of Fremantle, 1992). The quartz fragments originated from the eroding crystalline rocks from the Darling Plateau that were transported to the sea by rivers and along the coast by longitudinal water movement (Ecoscope, 1992). Leaching of the overlying dunes has resulted in calcium carbonate cementing the shell material and the quartz grains into a solid limestone. The aeolianite is dominated by unconformity with a loose and friable structure. Surface evidence of the Tamala Limestone includes crossbedding structures as well as some solution pipes and dolines which indicate the erosive forces at work in the limestone. There is also evidence of past shorelines and rhizolith structures left by decaying roots (Seddon, 1972). In places along the Blackwall Reach, rain has physically and chemically attacked the limestone which has produced frequent sharp points and ledges in the limestone. Marine layers containing fossiliferous shell beds are found at Minim Cove and are considered a scientifically valuable site (Kendrick *et al,* 1991).

There are a number of caves within the precinct study area. At Rocky Bay there are two small caves within the limestone cliff faces. There are reputedly many underground caverns and tunnels in the Bicton area (City of Melville, 1986). The Bicton caves are low and narrow (around 1 metre in diameter) and up to 200 metres in length. An underground stream which flowed through the limestone has gradually eroded the rock forming caves. Stalactites have formed by rainwater seeping through the above soil.

The sand is derived from the Tamala Limestone and is characterised by being of low nutrient status and having a low water retention capacity. The overlying sands are yellow and brown sands referred to as the Cottesloe Soil Association. Alluvial soils are found along the foreshore areas and are a result of river sediment transportation.

The soils are made up of fine to medium grained pale grey sands, with whole and broken mollusc shells (Ecoscape, 1993). The soil at Blackwall Reach Reserve is part of the Karrakatta Association. The Tamala limestone is also the parent source for these deep yellow and brown sands (Seddon, 1972).

Topography

In January 1697, three Dutch East India Company ships, commanded by Willem de Vlamingh, reached Rottnest Island and discovered the entrance to the Swan River, Western Australia. An engraving made during the expedition by an unknown artist in 1726 was sent back to Amsterdam and is one of the earliest representations of the area. This engraving has usually been regarded as fanciful, but it may well have been elaborated from a sketch made on the spot. Comparison with the original topography shows reasonable congruity. Arthur Head, the Ferry Point peninsula and Monument Hill are identifiable on the Fremantle side, with Buckland Hill looming up behind Rocky Bay, left margin, north of the river. The other hills on the north side reasonably represent *the Seven Sisters* (which have been levelled by quarrying last century); although their height may be a little exaggerated. Buckland Hill remains as one of the topographic highs and before levelling for the construction of a reservoir, it was 66 m above sea level which is comparable with Mt Eliza. Prior to levelling the other 'sisters' were around 50 m above sea level.

The Swan Coastal Plain is divided into three topographical units all of which are remnant dune systems. The Bassendean Dune System is composed of low hills and leached soils. This precinct lies on the Spearwood Dune System which is younger with higher hills and more fertile soils. The third system is composed of coastal beach sands and is known as the Quindalup Dune System and is not part of this precinct.

The major topographical features of the area are Cantonment Hill, Buckland Hill and the remains of the Seven Sisters. These rounded hills are visually evident and provide an interesting background to the riverscape. All these hills have been substantially reduced in height, up to 10 metres, due to quarrying (Swan River Trust, 1994). There are a number of cliff faces adjacent to the river, including Rocky Bay and Blackwall Reach, and these range from 5 to 15 metres in height. Point Walter Reserve has a steep landscaped topography on its northern face.

The river channel is approximately 500 metres wide and mainly bounded by the aeolianite cliffs until Chidley Point, where it opens up into Mosman and Freshwater Bays. The beaches are narrow and in most places steeply sloping although there is a wider beach on the western side of the spit.

Hydrological Processes

Water features

The Swan River channel is approximately 500 meters wide in this precinct until Chidley Point where it opens up into Mosman and Freshwater Bays. The flow of groundwater to the river is evident in several places such as the Jerrat Road foreshore (Ecoscape, 1992). Springs of freshwater flow from the base of the limestone embankments during the winter months.

Bathymetry

The water depth between the Railway Bridge and Preston Point is very shallow and only reaches to 5 metres in depth. The substrate sediment ranges from a fine, dark grey mud in the Blackwall Reach channel to coarse shell and pebble beds in Rocky Bay (Thurlow *et al,* 1986). As the river velocity slows towards the ocean, fluvial sediments are deposited in the form of lateral accretion at Preston Point. The sediment has been dredged adjacent to the yacht clubs at this point. The river channel deepens along Blackwall Reach and as it opens out into Mosman Bay. Point Walter spit extends into Freshwater Bay and under low tidal conditions is exposed. The spit acts as a natural barrier to river flow and restricts the flow into the narrower channel.

The section of river up to Blackwall Reach is subject to a small daily (astronomical) tidal range of 0.1 to 0.6 metres. The salinity reaches up to 35 parts per thousand in the summer periods as the water is almost completely of marine origin. The autumn and winter rains dilute the surface water so that it becomes almost fresh (Hodgkin, 1987).

Flooding

The precinct is mainly bound by high aeolinite cliffs where flooding by the river is has a very low risk. At Stirling Bridge and Minim Cover there are two small wetlands which are subject to seasonal inundation.

Erosion and accretion

The banks of the river channel for the most part are bound by the limestone cliffs which reduce potential for dramatic erosion and accretion processes. There has been the deposition of fluvial sediment form of lateral accretion at Preston Point resulting in a shallow bathymetry along the southern side of the point.

Vegetation Communities

Native

Cottesloe Complex

Much of the precinct's original vegetation has been cleared for development. The original vegetation would have ranged from a woodland of tuart *(Eucalyptus gomphocephala),* jarrah *(Eucalyptus marginata)* and marri *(Eucalyptus calophylla)* to a closed heath on the limestone outcrops (DCE, 1980). 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).* The types of communities which make up this complex are described below.

Juncus and *Halosarcia* communities

Originally samphire *(Halosarcia* sp) and rush communities fringed the shores of the precinct area. The predominant species would have been the rushes *(Juncus kraussii and Isolepius nodosa).* Dune sheoaks *(Allocasuarina lehmanniana)* occasionally lined the edges of the rush communities. At present, at Blackwall Reach and further downstream, there are pockets of sword sedge *(Lepidosperma gladiatum)* communities. At Minim Cove, wetland species such as seablite *(Suaeda australis),* beaded glasswort *(Sarcocornia quinqueflora)* and samphire *(Halosarcia sp)* occur in an isolated saltwater wetland. These communities have been heavily invaded by grasses and other exotic species.

Melaleuca Complex

Early descriptions of the Cantonment Hill area describe the heath communities on the shallow soils and limestone areas. The dominant species are coastal honeymyrtle *(Melaleuca acerosa)* and the coastal wattle *(Acacia cyclops)* and coojong *(Acacia saligna)* with many low form bushes. The Western Australian Naturalists' Club was able to report 44 species of native plants on Buckland Hill in 1985, including honeymyrtle *(Melaleuca huegelii),* fountain or yellow leschenaultia *(Leschenaultia linarioides)* and cockies tongue *(Templetonia retusa),* (Ecoscape, 1992). A variety of plant species is found along the high cliffs exposed to the salt spray. The vegetation is adapted to the harsh conditions and includes such species as coastal daisy bush *(Olearia axillaris)* and berry salt bush *(Rhadodia baccata).*

Dryandra communities

At Blackwall Reach Reserve, there is a scrub community which supports small to medium sized trees, such as parrot bush *(Dryandra sessilis),* peppermint tree *(Agonis flexuosa),* slender banksia *(Banksia attenuata)* and firewood banksia *(Banksia menziesii),* (City of Melville, 1986).

Woodland

A tall tuart forest *(Eucalyptus gomphocephala)* would have occurred extensively at lower parts of the foreshore areas on deep sandy soils. The canopy has foliage cover between 30 and 70% and the taller trees would have reached up to 30 metres (Swan River Trust, 1994). The understorey would have been made up of banksia *(Banksia* sp), blackboys *(Xanthorrhoea preissii),* perennial shrubs and sedge species and zamia palms *(Macrozamia riedlei)*

.In the shallower soils Rottnest Island pine *(Callitris preissii)* would have formed a closed forest. There would have been little understorey except in clearing between the trees.

This community was once common along the lower Swan River and now is virtually absent (Ecoscape,1993).

Exotic

The extensive removal and disturbance of the native plant communities has encouraged the proliferation of exotic species. Disturbances such as fires, tracks, rubbish dumping and erosion have been the major contributing factor to the destruction of many trees and the lower storey vegetation in the precinct. Many of the exotic invaders are likely to have been introduced from visiting ships although the majority of species would have been intentionally introduced. Exotic grasses such as bearded oat *(*Avena barbata),* and Guildford grass *(*Romulea rosea)* form a strata in areas including Cantonment Hill and Blackwall Reach. At Buckland Hill a number of naturalised exotic plants occur, including many from northern Mediterranean climates, such as wild fennel *(*Foenicultum vulgare),* castor oil bush *(*Ricinus communis)* and pincushion *(*Scabiosa atropurpurea).* Domestic gardens, parks and some reserves have been planted with lawns and exotic flora which now contribute to the character of the area and these include such plants as date palms *(*Phoenix canariensis)* and buffalo grass *(*Stenotaphrum secundatum).*

Historical Land Use & Resulting Environmental Changes

In 1829 Captain James Stirling explored the Swan River and thought Buckland Hill, situated on the northern banks of the river, an excellent site for the proposed settlement. Charles Fraser, the New South Wales Government Botanist with Stirling, wrote in his journal:

These hills are admirably adapted for the site of a town, their elevated situation commanding a view of the whole of Canning Sound [now Cockburn Sound] with the adjacent coast, the interior for some distance, and the meanderings of the river. There [sic] lying open to all breezes, too, is an additional advantage. (in Seddon, 1972)

However, Captain Fremantle's subsequent expedition in 1829 led instead to the choice of Arthur Head site in Fremantle as the place for the initial settlement of Western Australia. The majestic hills of Rocky Bay, including *the Seven Sisters* were later extensively quarried for limestone used in the construction of the harbour and other building materials, Buckland Hill being the remains of a once impressive river mouth.

The foreshore environs were quarried for well over 100 years (Swan River Trust, 1994). Rocky Bay was once considered the most beautiful bay in the Swan River but quarrying destroyed the high cliffs overhung with peppermint trees, cypress pine and many shrubs. The chine stone from this site was used to build the Perth Boys School, part of Government House and the courthouse at the rear of the museum. Capstone from the quarry was used as the first 'metalling' for St Georges Terrace and was also supplied to sailing ships as ballast.

Limestone was also quarried from the western face of Buckland Hill during the late 1800s. The quarry was located just north of Boundary Road, which was at that stage the dividing line between the districts of North Fremantle and Buckland Hill. Some of the quarried limestone went into the Fremantle harbour works and some into buildings (including Winthrop Hall at the University of Western Australia). Further quantities were burned in limekilns on the site, and some limestone was supplied to the goldmines at Kalgoorlie.

Billy Goat Farm was the first recorded farm in the district, established in the 1840s (Tuettemann, 1991). It fronted Minim Cove and existed for many years. Some of the first crops ever grown in the State were grown at this farm. Its semi-isolated location and large area allowed a large herd of goats to be farmed in the early years and in later years it became a dairy.

The Fremantle-Perth road followed the southern side of the river to Preston Point, where there was a ferry across to Minim Cove, this being a short passage and less exposed to strong winds and tidal currents than the alternatives closer to Fremantle. From this point, produce was ferried to various locations along the Swan River.

The northern shores of Rocky Bay to Point Roe have been used for industrial purposes for many years, resulting in dramatic modification of the original landscape. The most significant industries have been quarrying, CSBP and Farmers, the State Engineering Works, and the Colonial Sugar Refinery. These were for many years the only heavy industrial sites on the estuary apart from the Swan Brewery at Kings Park.

The chemical works, a branch of the Mt Lyell Mining and Railway Company of Victoria, was built on the Rocky Bay escarpment. The company manufactured acid and superphosphates using raw materials from Christmas Island and Kalgoorlie. The company after several mergers became known as CSBP (Cuming Smith-British Phosphate) in 1964 (Tuettemann, 1991).

From 1951 pyrites cinders were deposited, with permission, on two additional sites for which formal leases were obtained in 1953. These sites virtually doubled the land used by the company and were situated east and south of the present site of Rocky Bay Village, and in a narrow strip of land on the river south of the original lease. The pyrites cinders dumped by the plant were red, due to the high content of iron. Dust from the cinders dumped in the disused quarry east of Rocky Bay Village left its mark on nearby exposed faces of limestone, giving them a distinctive pink colour (Swan River Trust, 1994). Some colour remains in the rock to the west of Perrott Reserve. This discolouration is a minor legacy in comparison with the problem of chemical contamination left on the site, which ultimately covered the area bounded by: the existing State Engineering Works to the west; a playing oval on Tom Perrott Reserve to the east; McCabe Street, the Buckland Hill (Special) School and the WA Society for Crippled Children to the north; and the Swan River to the south.

CSBP and Farmers Ltd ceased operating on the site in 1969. The company was then required to reclaim the land by demolishing the buildings and removing contaminants. When, in 1973, the Government considered that this had been done to its satisfaction the lease was formally terminated. The acid and phosphate plant had been demolished after the company ceased operations in Mosman Park and transferred to a site on the coast near to Kwinana which provided direct access for shipping.

In 1979, the University of Western Australia acquired the central portion of land on the former CSBP site, intending to develop it. However, when the University authorities learned of the extent of soil contamination, they commissioned studies of the ground water and of the surface soils (Swan River Trust, 1994).

Further investigations in 1984 and 1986 led to the production of a Public Environmental Report in 1987 (Maunsell & Partners, 1987). The main dump, to the east of Rocky Bay Village, was found by the Environmental Protection Authority to contain approximately 70,000 cubic metres of pyritic cinder residue, with a total residue thickness of between nine and ten metres. The report indicated that the entire site was in need of remedial treatment to remove the possible health risk posed by high levels of heavy metal contamination. Lead, copper, zinc, arsenic, mercury and cadmium were all recorded at high levels on the embankment along the Swan River, where there is also some evidence of heavy metal leachate, and beach contamination. The extent of ground water contamination is currently being investigated and it may be possible that leaching has occurred (Tuettemann, 1991).

After a good deal of public agitation, perhaps the biggest decontamination exercise the State has yet seen was undertaken. The site is now about to be developed as a housing site along with the adjoining State Engineering Works site on the Rocky Bay Estate. It is currently a flat terrace mid-way between the level of McCabe Street and the river, bearing no relation to either the original or the surrounding land form. The foreshore sand cliff is entirely artificial.

An old soap factory where soap and washing powder were produced for many years is still found at Rocky Bay. The effluent was tunnelled into the bay with the effect so great that the area was once known as "Soapy Bay". The site was also used as a margarine factory and warehouse (Catomore, 1986). It is now up- market apartments since its conversion in 1982.
The site of the Colonial Sugar Refinery (CSR) has a well conserved natural foreshore. It was originally quite an isolated site and workmen once used a sandy track to get to the factory. In the early 1900s CSR closed refinery operations, however, the factory is still used as a packaging plant. The land is now proposed for subdivision.

Although a little removed from the river foreshores, Buckland Hill is an important part of the river landscape, and a major viewpoint. Locally known as 'Monument Hill' or the 'Monnie', Buckland Hill affords a panoramic view of 360 degrees which rivals the views from Kings Park, Wireless Hill or Reabold Hill.

The panorama encompasses not only the surrounding suburbs but also provides superb vantage over the Swan River's meanderings and an unsurpassed seascape over the Indian Ocean, Rottnest and other islands (Seddon, 1970). The Buckland Hill area was the site of the University endowment block which consisted of 56 hectares. The land was recently sold for residential development.

A water reservoir was built on Buckland hill at the turn of the century. The Water Authority reconstructed the reservoir on top of Buckland Hill in the 1980s; a road leading to a parking area just below the summit was constructed to allow motor vehicle access to the area.

Cypress Hill at North Fremantle was used as an accommodation site for a large number of permanent soldiers at the turn of the century (Lee, 1979).

Cantonment Hill at Fremantle was named after the cantonment established on this site by the 3rd regiment, first colonial militia in 1829 (City of Fremantle, 1992). The hill was a popular picnic spot for the early residents of Fremantle because of its panoramic views.

The area was quarried for construction material at the present site of the Army Store on Canning Highway. The present tower was the Fremantle Port Authority Signal Station until 1964.

The site of the present day Stirling Bridge was the location of the Drivers (Castlemaine) Brewery. It was also the location of the large homestead built by Thomas Carroll, a ship builder, which after many years of deterioration has been converted into 'The Left Bank', a pub and restaurant. Small yacht building companies were located along Preston Point (Lee, 1979).

Blackwall Reach was not well developed and was relatively inaccessible. A tram service was built in 1915 to bring visitors to the area, however this venture was not very successful except in the summer months when it was a relatively popular picnic spot. One of the attractions and source of adventure to the local children were the tunnels and caves of the limestone cliffs (City of Melville, 1986). Many of these tunnels have since collapsed or been blocked off.

Last century, various canals were cut into the Point Walter Spit to reduce travel time. Most of these canals quickly silted up, however Alfred Waylen cut the most long lasting canal in the 1930s which silted up 20 years later. This topic is further discussed in Precinct 5.

Point Roe was named after John Septimus Roe who had a 5 hectare grant here in 1831 (Seddon, 1970). Further land use for this area is discussed in Precinct 3.

Present Land Use and Social Patterns

Residential development is a significant land use along the foreshore of the precinct. The suburbs of East Fremantle, Bicton, North Fremantle and Mosman Park have boundaries which extend to the foreshore reserve. Much of the development in East Fremantle and Bicton is medium to high density housing built from 1950s onwards (Ecoscape, 1993). The North Fremantle and Mosman Park suburbs have residences which have been built earlier this century. The residential development is an important factor in the estuary's landscape as it is a prominent land use which dominates the visual landscape. One of the recent estates to be constructed was on University endowment land which was sold to private developers for the Buckland Hill housing estate.

The main commercial activities found on the precinct's foreshore area include restaurants and cafes. There are commercial marine activities also located along the Point Preston and North Fremantle foreshores, including boat building facilities and marinas. The defence centre is located in the Leeuwin Barracks at Preston Point and covers a large area of the Point.

The Stirling and Fremantle Traffic Bridges are dominant elements and were built in 1974 and 1939 respectively. The North Fremantle bridge was built in 1867 by convict chain gangs who were used to cut the limestone foundations and construct the bridge.

Recreation nodes

The precinct area's foreshore provides a location for both active and passive recreation uses. There are a number of formal sporting reserves, such as the ovals at Preston Point, which are used by local sports clubs. The precinct has two golf courses at Melville and Chidley Point which retain some native vegetation as part of 'the rough'. Yachting and rowing clubs in this precinct are the Swan Yacht Club, East Fremantle Yacht Club and Fremantle Rowing Club. Parks and recreation reserves include J. Dolin, Riverside Reserve, John Tonkin Park and Preston Point Reserve. These reserves and other open spaces are popular locations for various outdoor pursuits such as walking, jogging, nature studies, picnicking and sightseeing.

Popular swimming places are at Blackwall Reach, Mosman Bay, Preston Point and Bathers Beach. Snorkelling is good near the sand bank at Rocky Bay. A ski boat area has been designated adjacent to the reserve at Mosman Bay.

Fishing, crabbing and prawning take place all along the river's edge, off the jetties and under the Fremantle Bridge.

There is provision made for a dual use path along Blackwall Reach, through Bicton to the East Fremantle foreshore. Another dual use path from Rocky Bay to Point Roe provides for pedestrians, cyclists and skate boarders. The old Rottnest Ferry Terminal is located on the eastern side of the Fremantle Bridge. This jetty although used by some ferries has largely been replaced by the new port at North Mole.

Public access

Public access to the foreshore varies throughout the precinct. There is a foot trail along the foreshore adjacent to Jerrat Drive in East Fremantle. Access is possible all along the North and East Fremantle foreshore except through the Army's Perth Water Transport Unit on Wauhop Road and the Water Police Headquarters at Pier 21. Pedestrian access is greatly restricted by the activities of the yacht clubs.

There is a dual use path along the southern water's edge which provides both cyclists and pedestrians with immediate access to the river edge. On the northern side of the river the dual use path extends from Rocky Bay to the CSR site.

The cliffs, steep embankments and often dense vegetation along Rocky Bay and Minim Cove present a natural barrier to the foreshore. However, Rocky Bay and Blackwall Reach have certain spots along the limestone cliff favoured by young people for diving and jumping off. Vehicular access to the river is well provided by the residential nature of the area. There is a large car park at the Rottnest Ferry Terminal and parking is available on Tuckfield Street. There is both private and recreational parking at the various sporting clubs and commercial outlets.
Boats and other small craft can access the river using the boat launching facilities and marinas along the river banks.

Sites of Nyungar & Wider Australian Community Significance

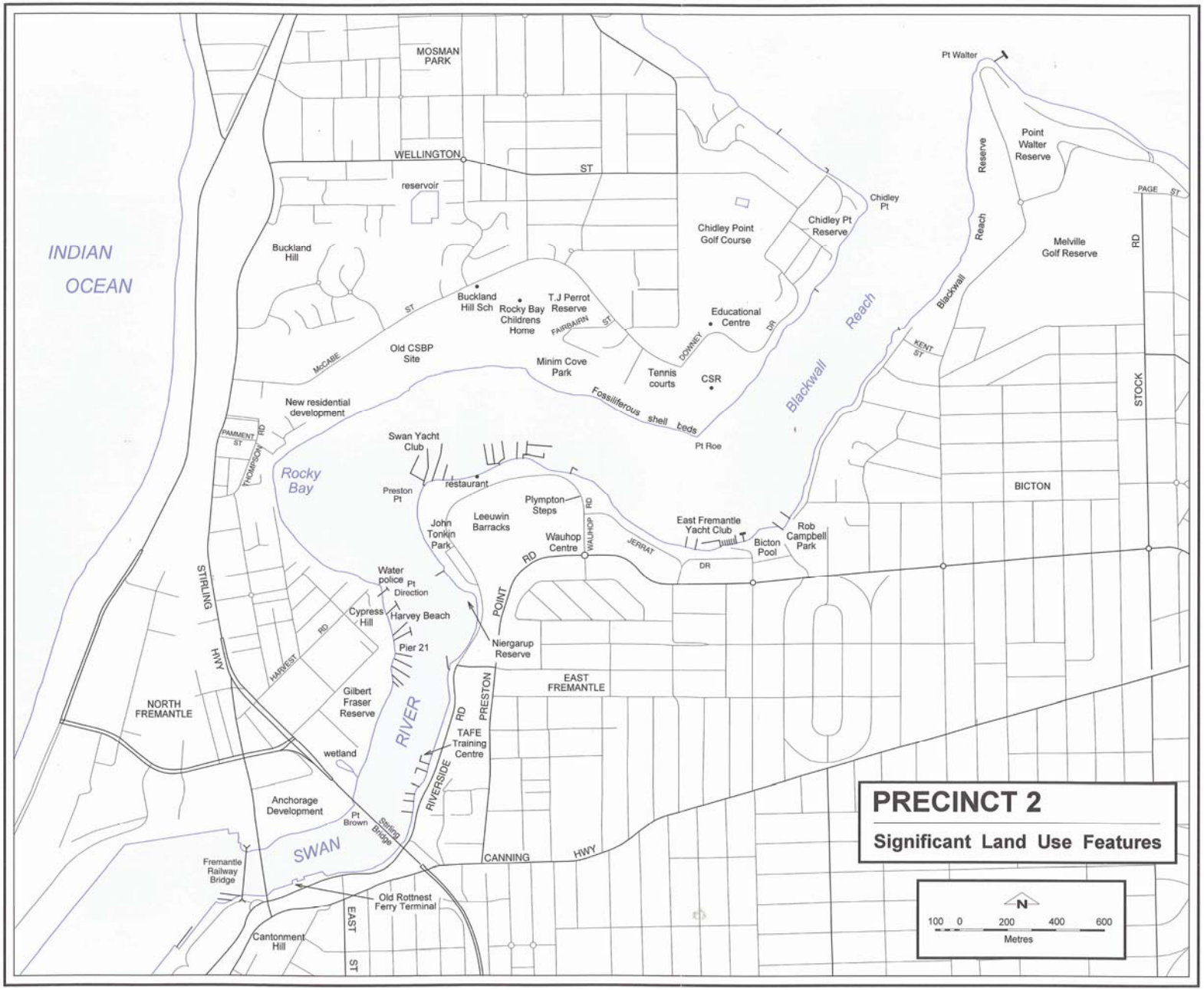
Nyungar Significance

This precinct is part of the Mooro district, which at the time of the establishment of the Swan River Colony was the *boodjar* or land of Yellagonga (Lyon, 1833). This area was bounded by the sea on the west, by Melville Water and the Swan on the south, by Ellen Brook on the east and by Moore River *(Gyngoorda)* to the north. Before colonisation, the area was abundant in food, shelter materials and water. There was an important route from the Perth area along the north bank to North Fremantle. It continues to be a location favoured by Nyungars (Gibbs, 1988). At North Fremantle, the water was shallow enough to swim across to the southern bank where the route continued south to Bibra Lake, Rockingham, Mandurah (place of trade and exchange) and the Murray River. Point Preston is known as *Niergarup* to local Nyungar. This means 'the place where the pelicans are located' (Collard *et al,* 1996).

At Minim Cove, a smooth granite stone was found some feet below the present land surface in an area covered by undisturbed bush. It appears to have been carried from the Darling Range and used for pounding. This suggests that this area is a Nyungar site of some age and importance (Gibbs, 1988). Tools made from small chips of quartz and chert found at Minim Cove have been dated to 9930 years old (Clarke & Dortch, 1977). Minim Cove would also have been a camping ground and a fishing site for Nyungars who stayed in the area while waiting for low tide to cross the river.

The Cantonment Hill area has been identified by Collard *et al* (1996) and Gibbs (1.988) as *Dwerdaweelardinup,* meaning 'the hill where the spirit dogs guard the river entrance' or the 'place of dingo spirit'. The exact locality of the named area is in need of further research and analysis. The Fremantle City Council (1992) notes that Nyungars have recently identified the Old Traffic Bridge site as the place where the Dingo Spirit *Doodaroo* lives. Nyungars have a special *kowin middar* or corroboree for this spirit. Collard *et al* (1996) note that local elders have recently described the story of the seven dogs who guarded the mouth of the river. In this story a crocodile, travelling from the north attacked the dogs. One of the dogs bit off the tail of the crocodile. The crocodile sank to the mouth of the river forming the rocky bar at the river mouth.

It is recorded that a number of fresh water springs in this precinct were used by local Nyungar. One spring, which no longer exists, has been recorded as once being located at a site adjacent to the present day East Street (Gibbs, 1988).


INDIAN OCEAN
MOSMAN PARK
WELLINGTON ST
reservoir
Buckland Hill
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Rocky Bay Childrens Home
T.J Perrot Reserve
FAIRBAIRN ST
Chidley Point Golf Course
Chidley Pt Reserve
Chidley Pt
Pt Walter
Point Walter Reserve
Reserve
Reach
Blackwall
Melville Golf Reserve
PAGE ST
RD
STOCK
Educational Centre
DR
DONNEY
KENT ST
McCABE ST
Old CSBP Site
Minim Cove Park
Tennis courts
CSR
Fossiliferous shell beds
Pt Roe
Blackwall Reach
New residential development
PAMMENT ST
THOMPSON RD
Swan Yacht Club
restaurant
Rocky Bay
Preston Pt
Plympton Steps
RD
John Tonkin Park
Leeuwin Barracks
Wauhop Centre
WAUHOP RD
JERRAT DR
East Fremantle Yacht Club
Bicton Pool
Rob Campbell Park
BICTON
Water police
Pt Direction
Cypress Hill
Harvey Beach
Pier 21
STIRLING HWY
HARVEST RD
POINT RD
Niergarup Reserve
EAST FREMANTLE
NORTH FREMANTLE
Gilbert Fraser Reserve
RIVER
PRESTON RD
TAFE Training Centre
wetland
RIVERSIDE DR
Anchorage Development
Pt Brown
Stirling Bridge
SWAN
CANNING HWY
Fremantle Railway Bridge
Old Rottnest Ferry Terminal
EAST ST
Cantonment Hill
PRECINCT 2
Significant Land Use Features
N
100 0 200 400 600
Metres

Two sites where water sources were used by Nyungars are recorded to have been in the vicinity of Blackwall Reach. The exact location of these sites is unknown (O'Connor *et al,* 1989). The area is known as Jenalup by Nyungars and refers to 'the place where the feet make a track' (Collard *et al,* 1996).

Two caves at Rocky Bay *(Garungup)* are believed to be the final resting place of the rainbow-serpent Warkle or Waugal, who created the Nyungar and their world , before it made the tunnel underneath out to the Gabee - Warden or the Indian Ocean. The rainbow- serpent slept at *Garungup* after it had created the local hills 'Seven Sisters' said to be the back of the Waugal (Ansara, 1989). Before this time, the Waugal made the Avon River, got sunburnt, constipated and had to shake off its skin. The stones at *Garungup* represent its hard-baked excreta. The name means the 'place of anger' or a place to be avoided (Collard *et al,* 1996).

Other significance

The Western Australian Museum has identified a circular limestone structure which formed the base of a capstan on the southern side of the river, east of the Fremantle Bridge. This was used to pull large boats out of the river for repairs and to tow barges (Tuettemann, 1991).

The precinct has had many popular picnic and recreational spots. These locations have changed with changes in land use. Harvey Road beach and jetty was a local recreational node and a point for swimming lessons for the North Fremantle children. Areas, such as Minim Cove, are recorded as being popular with picnickers and are significant in the local history of the area. Some areas, such as Blackwall Reach, remain to this day as important regional recreation sites.

Minim Cove is an important location of scientific value. The fossiliferous shell beds represent one of four separate marine transgressions in the Swan estuary that occurred in the Middle to Late Quaternary times. The sites include highly diverse and rich fossil remains and are of important palaeontologic and stratigraphic significance. The sites are important research areas and valuable teaching areas (Clarke & Dortch, 1977).

Thomas Carroll House at Fremantle was constructed in 1900 and the two storey limestone and iron house is registered with the National Trust.

Hillcrest was built in 1890s for Francis Pearse. The facade is classified by the National Trust.

There are several wrecks in the river at Fremantle including the e Carnac (built 1929), Eva (built 1879) and the Priestman Grab Crane (1945). The Mayfield (built 1899) is sunk at Rocky Bay. At the Black Wall Reach, the wrecks include the City of Perth (1872) and two steel barges (Thurlow *et al,* 1986).

Conservation areas

Wetlands

There are no conservation wetland areas in this precinct, although the Minim Cove and North Fremantle small wetlands are incorporated into local government management plans.

System 6

M55 - Buckland Hill, Mosman Park

This land was identified as being important for two main reasons. Firstly, it has historic value, as it was identified as one of the sites Captain Stirling chose for the Swan River Colony. Secondly, it was until recently the only large undeveloped area (apart from Kings Park) on the Stirling Highway north of the river. It was recommended that a management plan be developed for the area, in particular, encouraging the growth and regeneration of the area and retaining the open nature of the area (DCE, 1983). Two-thirds of the area has been developed for housing and the remaining portion is included in a management plan (EPA, 1993b).

M56 - Foreshore Reserves, Mosman Park

Three reserves at Childley Point, including the golf course, were identified for their conservation and recreational value. Regional park recommendations were made for this area. This area is still being considered for a regional park plan by the MFP.

M57 - Minim Cove Foreshore, Mosman Park

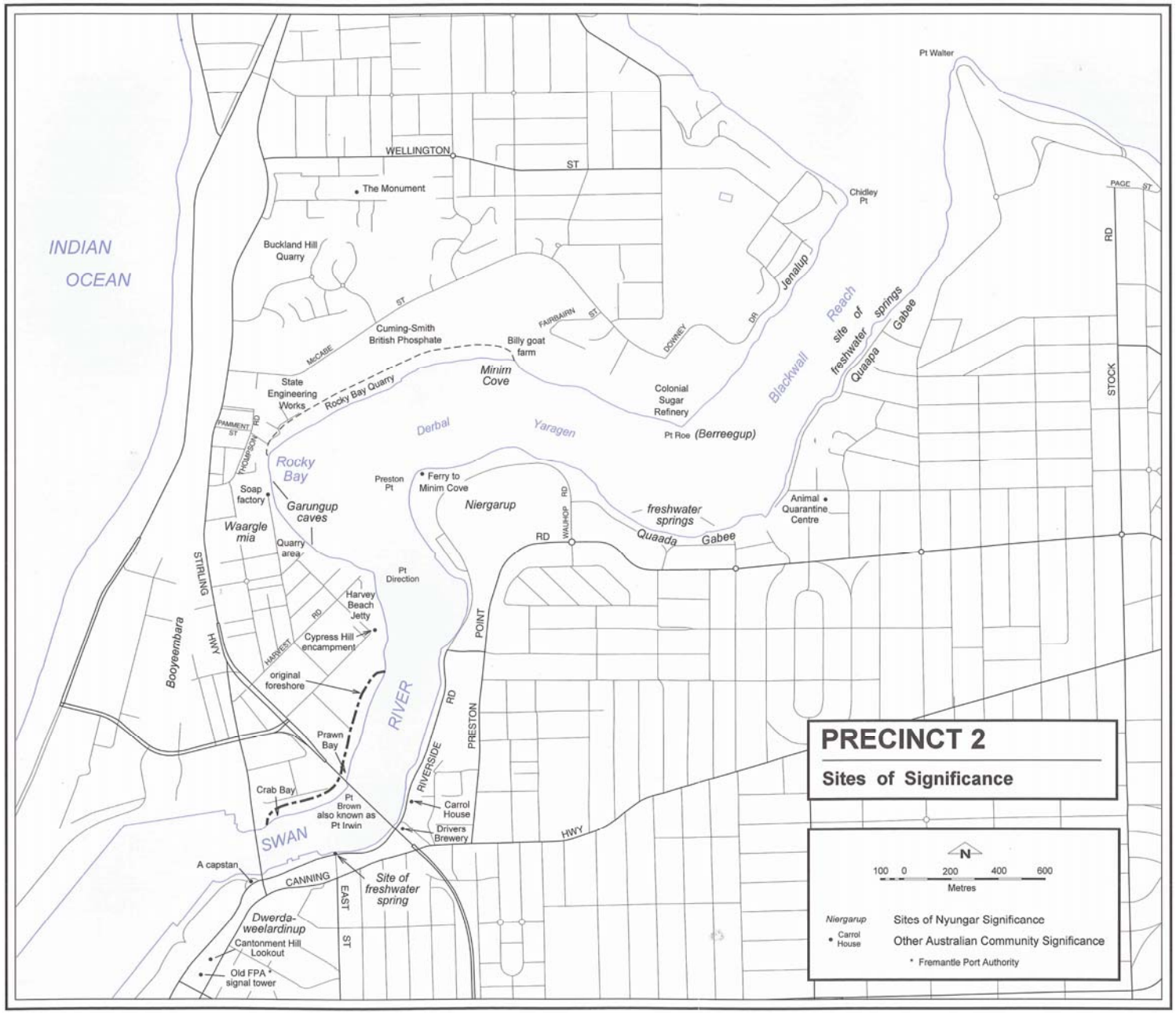
The area contributes to open area space of regional significance because of its high conservation, recreational and educational value. It has fossiliferous shell beds in the exposed cliffs which are an important geological site. The management of the site is still being considered and the Swan River Trust has recently produced a fact finding report to assist with further management decisions.

M71 - Cantonment Hill Fremantle

The site has historical value as one of the first named sites in the region and the early Fremantle town used the location as a point of embarkation for local ferries. The area is a remnant of natural open shrubland. The local authority has a management plan for the area.

M58 - Blackwall Reach Foreshore, Bicton

Blackwall Reach contains the only relatively untouched area of river limestone left in the region and provides high conservation and recreation value. Part of the area has been declared a Conservation of Flora and Fauna Reserve and the local authority has a management plan.


INDIAN OCEAN
WELLINGTON ST
The Monument
Buckland Hill Quarry
Cuming-Smith British Phosphate
Billy goat farm
Rocky Bay Quarry
State Engineering Works
Minim Cove
Colonial Sugar Refinery
Pt Walter
Chidley Pt
Jenalup
Blackwall Reach
site of freshwater springs
Gabee
Quaapa
PAGE ST
RD
STOCK
Pt Roe (Berreegup)
Derbal
Yaragen
Rocky Bay
Soap factory
Garungup caves
Waargle mia
Quarry area
Preston Pt
Ferry to Minim Cove
Niergarup
freshwater springs
Quaada
Gabee
Animal Quarantine Centre
WAUHOP RD
Pt Direction
Harvey Beach Jetty
Cypress Hill encampment
original foreshore
Booyeembara
STIRLING HWY
HARVEST RD
POINT
PRESTON RD
RIVERSIDE
RIVER
Prawn Bay
Crab Bay
Pt Brown also known as Pt Irwin
Carrol House
Drivers Brewery
SWAN
HWY
A capstan
CANNING EAST ST
Site of freshwater spring
Dwerda-weelardinup
Cantonment Hill Lookout
Old FPA signal tower
PRECINCT 2
Sites of Significance
N
100 0 200 400 600
Metres
Niergarup Sites of Nyungar Significance
Carrol House Other Australian Community Significance
* Fremantle Port Authority

Precinct Description

Waterform

In this precinct the Swan River channel is on average approximately 500 metres wide. It takes the form of a visually straight channel up to Pt Direction before the water opens into Rocky Bay. There are two small bays which indent Preston Pt giving the promontory a scalloped neck. From the northern bank at the old CSBP site, the viewer is presented with a visually balanced water body as the river curves around Preston Pt. The river is equally wide on either side of the Preston Pt which makes the u-shaped meander a dominant feature of the precinct. The river curves around Pt Roe to a visually straight channel along Blackwall Reach to Chidley Pt. On the smaller scale there are slight undulations in the channel which create visual interest.

Natural riparian zone

There is a small wetland adjacent to Stirling Bridge. The area of inundation has a narrow channel leading to the river and occurs on a flat sand bank. North Fremantle has a flat tide-scalloped beach face which is very narrow (less than a metre). There is another similar sandy beach at the western side of Point Preston; however, this has a steeper gradient. Other small areas of gently sloped sandy beaches are dotted along the Bicton and Pt Walter Reserve foreshore. The Pt Walter spit extends from the point towards Keanes Point. This provides a long linear feature which attracts the viewer's attention and divides the water body visually as well as physically. At Minim Cove, there is small wetland area which is seasonally inundated. Here rocks emerge from a sandy beach and the shape of the beach appears to be quite natural compared with the adjacent areas. Much of the riparian zone near CSBP has limestone blocks which have broken off from the cliff or limestone which has been dumped into the water as rubble from the levelling of the hill. These rocks have not been subject to long term weathering so their shapes are unnaturally blocky and regular. Along Rocky Bay the river runs along the curved limestone cliffs. There are several rocks emerging from the water which gives the water junction a jagged uneven effect.

Landform

North Fremantle has a flat topography adjacent to the foreshore, which gently rises to the steep hilly form of Point Direction. Similarly on the southern bank the Preston Point area has a flat promontory which rises to the more gently curved hill crest. The steeply sloping undulating hill at East Fremantle has an exposed vertical (5 metres) face which extends to the adjacent Tonkin Park boat ramp. Here the slope becomes increasingly gentle and the land appears to spread into a flat headland from a visually steeper and undulating land mass.

Rocky Bay is characterised by a limestone cliff face which has been heavily eroded to form pinnacle shaped rocks as part of the face. At the base of the cliff, the water action has undercut the limestone giving a small shadowed ridge above the water line. The weathering has created a jagged texture and the limestone is mottled from dark grey to cream. The overall horizontal line of the cliff is sinusoidal as it dips in the centre due to probable quarrying in the region of the old Soap Factory. Blackwall Reach has a long stretch of cliff face which has a height of approximately 10 metres. Like Rocky Bay, the limestone has been weathered into pinnacles which in certain places are the highest point of the cliff face. These pinnacles are more distinct from the cliff face and give the limestone wall an undulating effect along this stretch of the river. Behind Blackwall Reach is a gently undulating hill which rises from Kent St and then tapers towards the Pt Walter spit. Adjacent to the reach is a large limestone hill which has an exposed limestone face.

On the northern side of the river, the landform has been dramatically altered from its original form of seven hills. At present, the old CSPB site and adjacent land is undeveloped. The land is currently cut into flat terraces which are devoid of any interesting undulating form and are unnatural. The hill has a steep face adjacent to the river, which is made up of small rocks used as a retaining wall. From Pt Roe, the hill face is steep and some of the original limestone cliff face is still present, although most of it is in the form of broken rock pieces. Chidley Point appears to stick out from the northern bank due to a slight indent in the hill to form a small bay adjacent

to the point. The background landform is the remains of Buckland and Monument Hills which rise above the Rocky Bay area. These have sharp quarry faces which contrast with the naturally gently sloping unquarried sides of the hill.

Vegetation

At North Fremantle there have been efforts to revegetate the wetland with native species. The bushes are rounded and have a soft dusty texture due to the small leaves. At present, the stand is immature and as a result the dominant ground cover is lawn. The wetland at Minim Cove has some native wetland species, however, the area has also grasses and other weeds which detract from the naturalism of the wetland community.
The areas west of the Stirling Bridge and the old Rocky Bay industrial area have been recently cleared of their last land use and as a result vegetation is sparse. Weeds, such as fennel and caster-oil bushes, are the dominant vegetation type and these form solitary clumps on the bare landscape.

The steeply sloping limestone faces, such as Rocky Bay, East Fremantle, Cantonment Hill and Blackwall Reach Parade, have small shrubs dotted on the cliff face. The oval forms of the bushes rarely overlap and due to the small sized leaves, have a soft blurry texture against the exposed rock. Along Riverside Road, the hill face is covered by a mix of native bushes and exotic plants. These provide a horizontal green band along the roadside. Minim Cove Park, Chidley Point and Blackwall Reach are visually dominated by native shrubs and trees. This vegetation extends to the cliff face and in more gently sloping areas reaches to the water in the form of small bushes. These three areas, although not in pristine condition, provide the area with a visual focal point and suggest pockets of natural landscape.

Lawn and parkland areas occur along Riverside Road, North Fremantle Preston Point, the ridge of Rocky Bay and Campbell Park. These provide visually smooth open areas of green lawn. They attract the viewer's attention due to the visual uniformity of the area. These parkland areas are well maintained and are indicative of their land use. Exotics, such as date palms and pine trees have been evenly planted along the river. They are regular in spacing and height and give the effect of an ordered urban environment. The residential areas are characterised by predominantly exotic species which are usually planted in the visual form of Anglo-Australian parkland design or other patterns which are indicative of a maintained and controlled environment. This vegetation planting is in keeping with the suburban land use and gives visual distinction from adjacent areas such as Blackwall Reach.

Riparian land use

The foreshore along East Fremantle and Bicton is mainly retained by limestone walls. These are built in block form and on average are one metre high. They restrict the river from cutting the foreshore and give a confined and structured urban nature to the riverine landscape. Due to the collapse of the limestone cliff adjacent to the new residential area at Rocky Bay, there have been attempts to build a sloping vegetated retaining wall. Although the small rocks are unnatural shapes, they are consistent in colour and material with the limestone cliffs. The most dominant features in the riparian section are the boat jetties at Swan Yacht Club and the Boardwalk complex. These stretch out into the river approximately half way and are balanced on either side of the Preston Pt headland. They provide a visual focus point as the crowded, angular, white forms of the boats form two large shiny white nuclei in the river. The angular shapes of the Boardwalk roofs are consistent with the angular forms of the boats. The Swan Yacht Club is less visually harmonious; however its style suggests functionality. East Fremantle Yacht Club is less visually intrusive as it does not extend into the river as much as the other marinas and is in a bay of the river. The jetties at Pier 21 and other complexes are relatively small and consistent with the river orientated land use.

Land use

The Railway, Fremantle and Stirling Bridges are visual and physical barriers. They are dominant features which cut the river and landscape into sections. The Fremantle Bridge has a solid structure and is of Federation style. It acts as a gateway to the historic buildings in the area and is important in setting the mood of the historic city. The Railway Bridge is simple and although not conforming with the style of the Fremantle Bridge, it is visually consistent with the adjacent industrial harbour precinct which has functional, angular, steel forms.

The Stirling Bridge is a large modern structure and was built in 1973. It has wide caps and piles and the super-structure is a thick concrete body. The viewer adjacent to the bridge will see an isolated and dominant structure over the river, while to the driver over the bridge, the structure will be visually insignificant as the spacing of the railings is such that they blur at driving speed.

Leeuwin Barracks is a prominent land use at Preston Point. It consists of mixed colours and styles surrounded by manicured lawns. There is a visual line between the Barracks and the East Fremantle residential area. The two land uses are visually separated by the wide, flat and uniform area of Wauhop Park ovals and Preston Point Road. There are no large trees in this area which would help soften the line. The viewer's attention is drawn to the crest of the hill, as it has a strong linear form and rises above the surrounding residential area.

Along Blackwall Reach Parade, there are a number of residences which have been built on top of an exposed steep limestone hill face. These are visually inconsistent with the landform as their bold, modern and brutalist styles stand out from the curve of the hill. As the limestone vegetation is small and shrubby, there is not enough vegetation height to soften the line between the houses, retaining walls and the hill. The result is a visual incontinuity which is continued with the planting of palms and other exotics which draw attention to the houses rather than blend them into the landform. Beneath these houses there are more houses which are similarly at odds with the landform. Most have been built by quarrying large flat faces into the limestone. These scars cannot be hidden by vegetation due to the lack of soil on which mature trees can develop. The buildings are mixed in style, the majority having building materials which are in contrast to the limestone colour and texture.

Residential areas such as those around Campbell Park and Kent Street, Bicton and Riverside Road are more in sympathy with the landform. The houses and units are built in the valleys of the hills or back from the cliff edge. This allows vegetation to be planted around the homes which mutes the linear forms of the houses. The houses are built in a layered effect as the natural gradient steepens, therefore providing visual interest. Although the styles and building materials are mixed this provides interest in the context of a suburban land use.

Buckland Hill estate was made available to developers in the late 1980s with the sale of the University endowment land. The resulting development was an expensive subdivision which has typically large modern designs. Due to the windy and salty nature of the location only salt tolerant vegetation grows in the area. There has been an unsuccessful transplanting of date palms at the entrance of the estate.

Rocky Bay and the Minim Cove area are currently being redeveloped. At present, there is a cluster of red brick flats which perch on the cliff face. These are slowly being replaced with small architecturally interesting units, whose building materials and colours are more consistent with the limestone cliff faces. This new building project has had a positive effect on the residential nature of the Rocky Bay, and it is clear that the mistakes of building houses which do not enhance the landscape have been recognised by these planners.

Nine large blocks have been allocated between Thomson Road and the river. These have not yet been built on, however, curved roads and underground electricity cables are in place. The land is still flat from previous land use and it would have been beneficial to terraced it to provide interest in building height, however, the results of this land release have yet to been seen. Similarly, the old CSBP site has not yet been landscaped. Mosman Park City Council has developed a landscape management plan (1990) which addresses the need to provide a harmonious landscape. At present, a terraced retaining wall is the dominant feature of the cleared blocks. The CSR building is a old style factory which has historic significance. The red brick and iron sheet building is hardly evident due to surrounding mature trees which soften the verticalness of the building. The buildings themselves have long been a familiar landmark on the river, and are of a scale and form well suited to mark their prominent site at Point Roe. They are good expression of directly functional industrial architecture.

Landscape Interpretation

Dominant Landscape Character

This precinct has a very complex landscape character. Originally, the landform would have been a Cottesloe landscape character with low open woodland and shrublands on a hilly limestone landform. There is a section of this natural landscape character at Blackwall Reach where the remnant vegetation and visually minimal land use is evident. At present, the major landscape character is suburban. There is variety in the suburban landscape character due to the prominent limestone outcrops and cliffs which provides a interesting natural landform on which the suburban landscape has been created. A difficult area to classify was the old CSBP site which was originally an industrial landscape, however has recently been cleared. The site is currently being redeveloped into a suburban development, however due to its transitory landscape character it does not neatly fit into the classification and has been identified as been a modified landscape.

There is a narrow viewscape which can be classified as industrial landscape character at Rocky Bay. This is due to the few light industrial buildings and the now residential Soap Factory. There is a section of industrial character west of Fremantle Bridge. The old warehouses and sheds are soon to be redeveloped into a commercial and residential area. The CSR buildings give an industrial landscape to a small portion of Point Roe. Unlike the other industrial landscapes of the area, the buildings style and remnant vegetation communities make a less intrusive industrial character.

At Gilbert Fraser Reserve, Point Roe, Blackwall Reach and Preston Point, the dominant landscape character is recreational. The first three sites are open space or parkland in nature, however at Preston Point the recreational character is derived from the yacht clubs and sporting fields.

Significant Viewscapes

This section of the Swan River has several attractive viewscapes due to the raised nature of the limestone cliffs, remnant hill forms and the wide meandering nature of the river. From the river or foreshore, the viewer is presented with relatively short segments of river before it meanders around a promontory or point. In most sections of this precinct, the river curve is emphasised by the cliff line such as Rocky Bay. The view from Minim Cove to Point Preston is a well balanced viewscape with the river curving around the point with almost equal widths of water on either side of the Point.

There is a gradual rise and fall of the Cottesloe dune form and this hill peaks in line with the centre of Preston Point. From Preston Point, the viewscape is not as spectacular due to the present preparation of the land for residential development. Several tracks and quarried rock faces detract from the viewscape. In addition, the prominent powerlines and several unattractive warehouse can be seen. From several locations along Blackwall Reach the view is framed by the limestone outcrops and the steep slopes of the opposite bank.

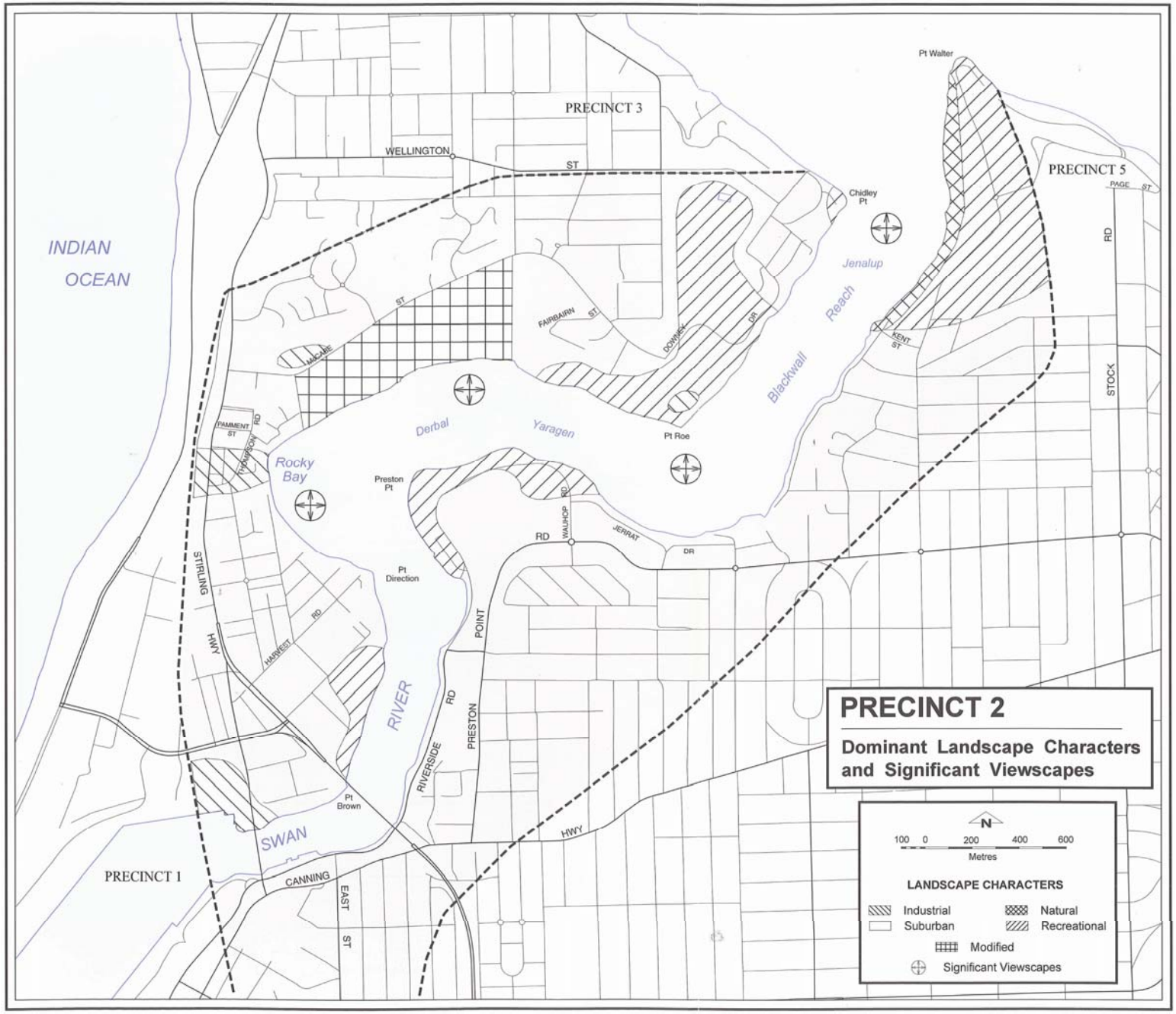
Conforming and Non Conforming Elements in the Landscape

Harvey Beach was a popular swimming spot for the local North Fremantle community and it has great potential to once again be an important recreational node to the local community. It is important that the beach remains easily accessible and the new urban development adjacent does not give the impression that the beach is private. At present, the beach has an enclave character which could be retained by ensuring that vegetation and adjacent land uses are retained in sympathy with this feature. The rocky foreshore and minimal intrusion of surrounding land uses are important features in the North Fremantle area.

Vegetation at Rocky Bay has been greatly improved as a result of local community groups replanting native species. Removal of some weeds which are detracting from the natural isolated clump forms of the native species would enhance the cliff landscape. It would also be advantageous to improve the grassed area in front of the Soap Factory by planting low form native shrubs. This would not inhibit the view of the houses behind the cliff and would eliminate the detracting lawn from the lie of the cliffs.

The old SEW site is currently being redeveloped. Developers and planners should recognise that the blocks could be staggered to create a more interesting landscape than the present flat surface. The redevelopment provides the opportunity to revegetate the slope with native species which would reflect the attractive and distinctive forms found at Rocky Bay.

The housing styles at Blackwall Reach Parade are an example of development which is not congruous with the surrounding landform. Similarly, the old Government Housing Flats at Rocky Bay are detracting elements in the environment. Adjacent new developments are more sympathetic to the landform.


PRECINCT 2
Dominant Landscape Characters and Significant Viewscapes
N
100 0 200 400 600
Metres
LANDSCAPE CHARACTERS
Industrial
Suburban
Natural
Recreational
Modified
Significant Viewscapes
INDIAN OCEAN
PRECINCT 3
PRECINCT 5
PRECINCT 1
WELLINGTON ST
Pt Walter
Chidley Pt
Jenalup
Reach
Blackwall
Derbal
Yaragen
Rocky Bay
Preston Pt
Pt Roe
Pt Direction
Pt Brown
SWAN
RIVER
POINT
PRESTON RD
RIVERSIDE RD
STIRLING HWY
HARVEST RD
CANNING EAST ST
WALHOP RD
JERRAT DR
FAIRBAIRN ST
DOWNEY DR
KENT ST
PAGE ST
STOCK RD
PAMMENT ST
THOMPSON RD
MCCABE ST

Recommendations for Maintenance and Enhancement of the Present Landscape Character

- At present, the land beneath the northern bank of Stirling Bridge is unused and is dotted with derelict buildings and weeds. The new North Bank development will need to complement the surrounding historical and nautical character of East Fremantle to enhance the landscape character of this area.
- To enhance and create a natural landscape character, the Rocky Bay area and the new suburban area wall could be revegetated with native species. Their planting should be in a pattern/distribution that is similar to native species present on Rocky Bay cliffs.
- Further development at Blackwall Reach Parade should be discouraged as the landform is not suited for housing. Residences should be encouraged to grow native ground covers over retaining walls and it would be useful to consider a project to reduce the impact of cuts into the limestone face.
- Revegetation programs along Blackwall Reach should be continued and they should ensure that natural landscape character is maintained.
- Point Roe has a substantial amount of rubbish dumping of the vegetated cliff face. The vegetation would also be improved by re- establishment of native species and weeding.

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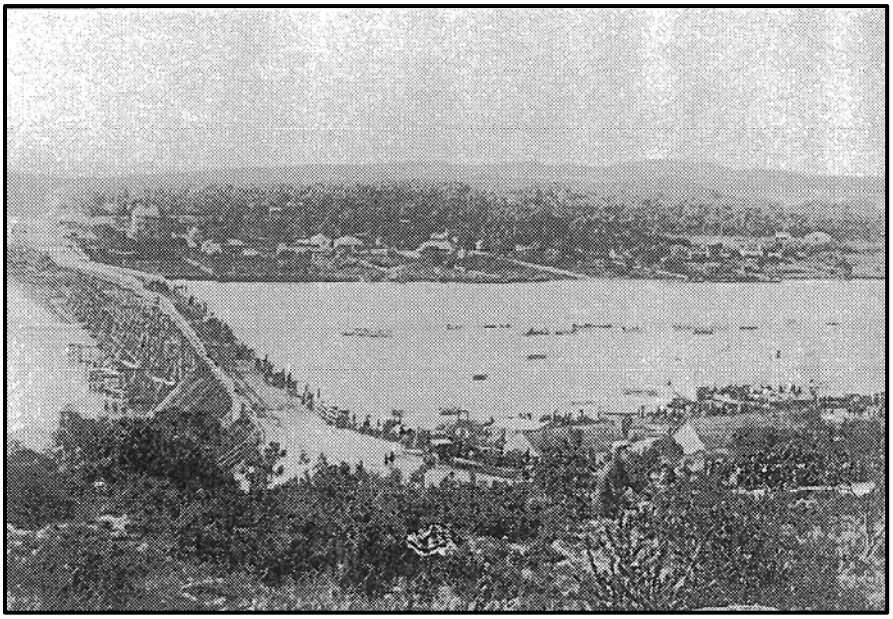
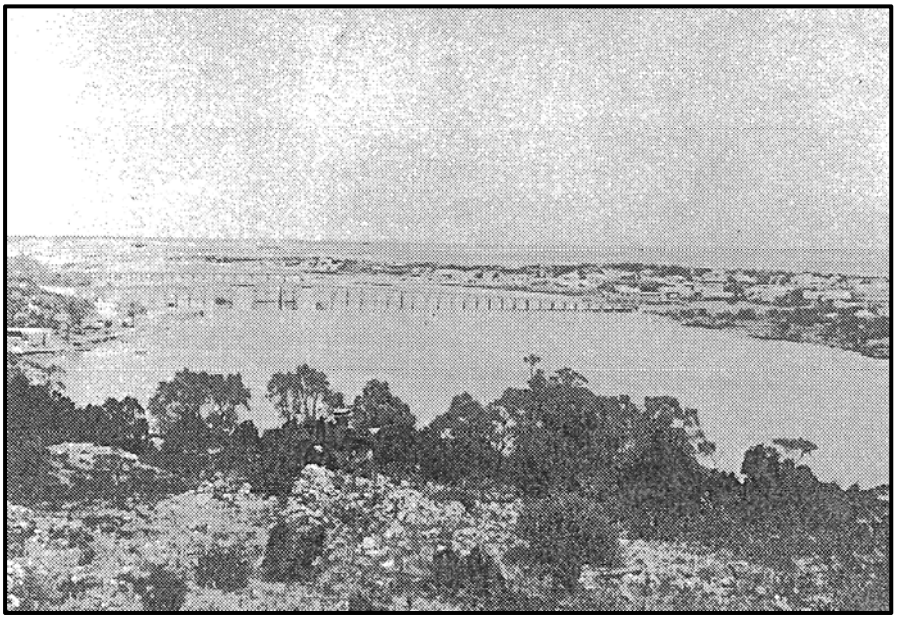
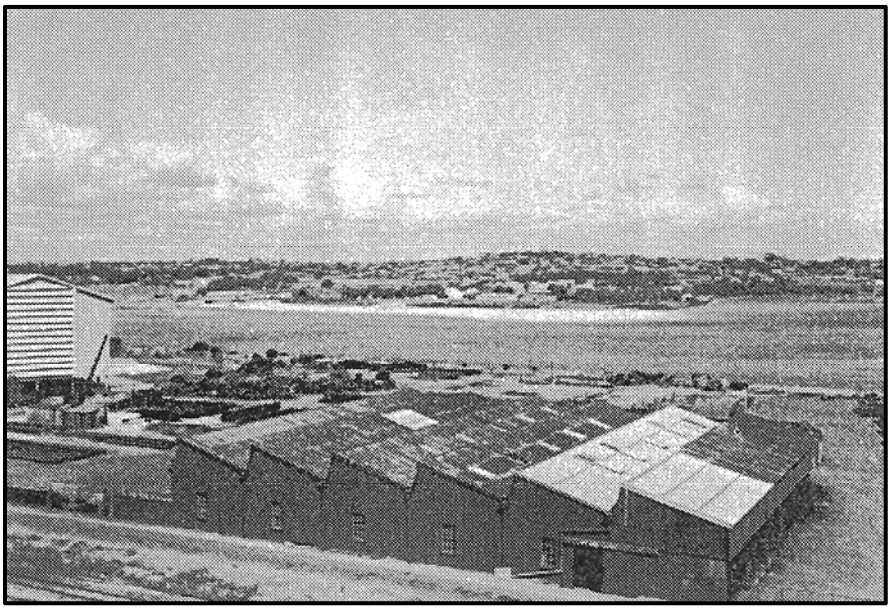


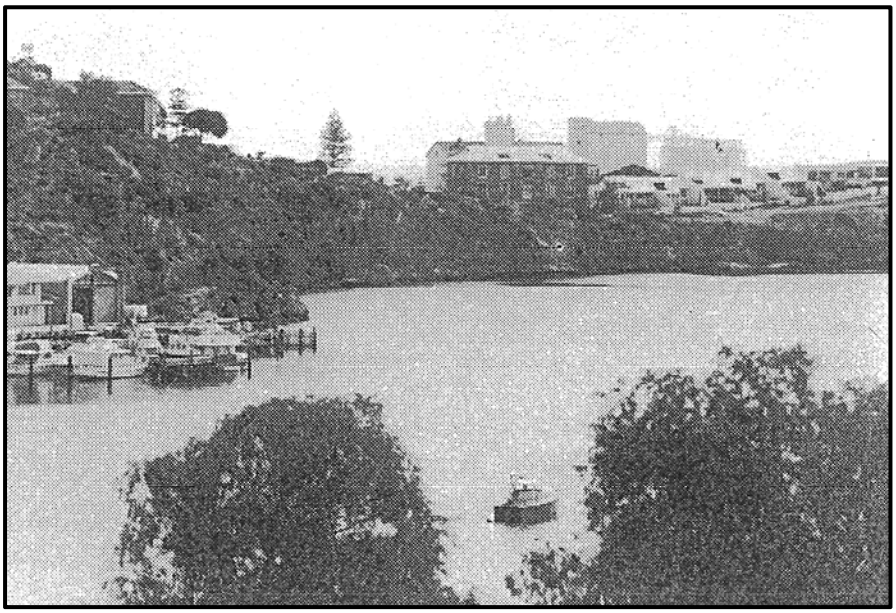
Fremantle Bridge, c1980.
Battye Library 5478B/8.



View from East Fremantle, c1890.
Battye Library 54629P.



Preston Point from McCabe Street, Buckland Hill, Nov 1963.
Swan River Trust.



Blackwall Reach Parade, Bicton, c1996.
Swan River Trust.