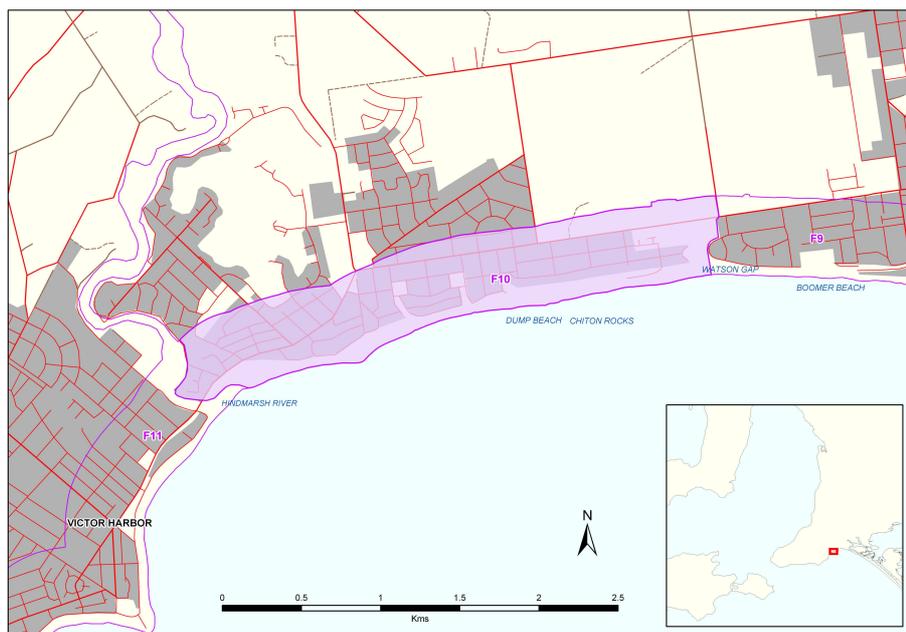


Cell F10 Watson's Gap to the Hindmarsh River



Landforms

From Watson's Gap, where a usually closed small creek reaches the beach, to the Hindmarsh River, wave energy steadily decreases from medium high to medium low. Rocky reefs are common, prominent at the reef-controlled foreland Hayborough Point (photograph above) and emerging as rocks on the beach at Chiton Rocks. The medium to coarse sand beach is often steep and is characterised by many small rips. Dunes, 50 to 200m wide and a talus slope front of a 20m bluff, terminating a sloping coastal plain.

Benthic Habitat/ Biota

Platform reef with patches of sand and seagrass (inshore seagrass is rare between Cape Jervis and Lacepede Bay, making Encounter Bay seagrasses regionally significant as habitat). Olivers Reef (off Hayborough Point), limestone reef in 4-6m. Reefwatch monitoring. Medium to high coastal shrubland on the dunes. Rush and sedge in small swamp at Watson's Gap. Swamp paperbark woodland adjacent to the Hindmarsh River.

Land Use/ Land Ownership

Coastal plain is almost entirely residential development. The coastal reserve, including small reserves above the bluff, the bluff and the dunes are under the care and control of Council.

Values (Field visits and local reports)

Recreational beach, narrow dune buffer zone, tourist rail line through the dune. Walking, swimming, surfing, fishing. Dune has a significant buffer function for railway and other developments.

Draft Encounter Marine Park Zoning

Habitat Protection Zone HP-2.

(http://www.environment.sa.gov.au/coasts/pdfs/encounter_marine_park_zp_tech.pdf)



Hayborough Point, East of the Hindmarsh Estuary: beach, dune, low bluff and suburban coastal plain (Coast Protection Board, 2003)

Threats (Field visits and local reports)

There is damage from storm drains at a number of locations.

Increased visitation and recreational use due to increased local population and tourist promotion and the popularity of whale watching are placing increased pressure on the dunes.

Garden prunings, soil and lawn clippings containing seed banks of weed species from adjacent properties are placed on the low bluff and within the dunes. The existence of many weeds within nearby gardens that are readily spread by people and birds. Taylor (2003) notes problems associated with the railway reserve, which contains many woody weeds; cuttings of these weeds are disposed of in the dunes during track maintenance. Woody weeds are a problem throughout the dunes, from Hindmarsh River to Knights Beach, (cell F9).

Extensive low lying area at Watson's Gap is potentially subject to storm surge or catchment based flooding; this is outside the coastal zone and that zone's hazard provisions on the Development Plan.

Opportunities

Detailed local analysis of weed control and re-planting strategy is available in Taylor (2003).

Wetlands at Watson's Gap (and planned in the immediate upstream catchment) represent improvement in water quality delivered to the coast.

Conservation Analysis (GIS)

The sum of conservation means is medium to low: medium conservation values characterise Watson's Gap swamp, the dunes and the reserve on the East side of the lower Hindmarsh River. Elsewhere low values are found.

Conservation values are present for vegetation communities, with moderate scores for threatened status, rarity of the community in South Australia, and sites with threatened flora and fauna (34 threatened plant species and 14 threatened animal species). There are also values for species richness, bird habitat, reptile habitat and butterfly larvae habitat. A geological monument is located here.

The state vulnerable *Thinornis rubricollis* (Hooded Plover); the state rare *Cereopsis novaehollandiae* (Cape Barren Goose), *Anas rhyncotis* (Australasian Shoveller), *Egretta garzetta* (Little Egret), *Actitis hypoleucos* (Common Sandpiper), *Plegadis falcinellus* (Glossy Ibis), have been recorded in this cell.

Threat Analysis (GIS)

Combined threat totals gave a high value to this cell, compared to others: the 10th highest threat total in the region.

Development zoning, a high proportion of private ownership, viewshed and viewscape scores, a large proportion of exotic plant species and high weed values combine to give this cell a high total threat score. Viewscape and viewshed scores reflect the local topography.

Coastal reserves, however, are not as reduced in width as in many parts of the urban areas. This lowers the land use and ownership threat scores a little.

The following red alert weeds were found within this cell: *Asparagus asparagoides*, *Ehrharta villosa* var. *maxima*, *Gazania linearis*, *Acacia cyclops*, *Lycium ferocissimum*, *Dipogon lignosus*, *Rhamnus alaternus*, *Chrysanthemoides monilifera* ssp. *monilifera*, *Leptospermum laevigatum*, *Polygala myrtifolia*, *Acacia saligna*, *Euphorbia paralias*, *Euphorbia terracina*, *Olea europaea* ssp. *europaea*, *Oxalis pes-caprae*, *Argyranthemum frutescens* ssp., *Coprosma repens*, *Ehrharta calycina*, *Marrubium vulgare*, *Pinus halepensis*.

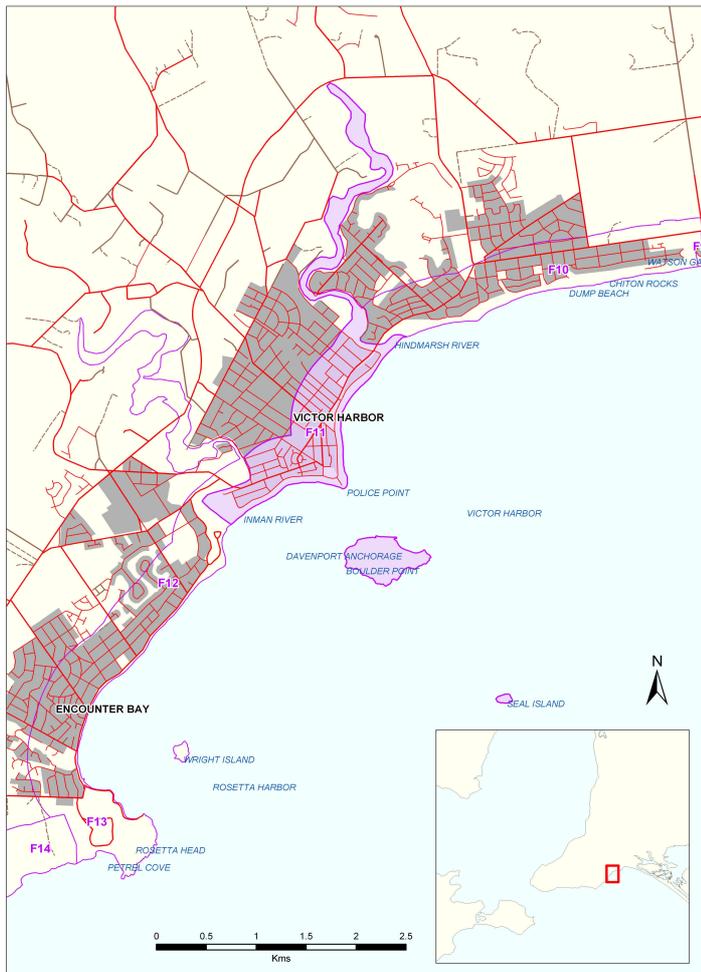
Possible Climate Change Threats

Over time increasing aridity will slow natural recovery from damage to dune vegetation. Rising sea levels will see increased storm damage to foredunes; Bruun Rule calculations of beach recession could be compromised by active littoral drift values here, however, recession of the order 5 – 15m over 50 years could be likely, given current IPCC sea level forecasts. Rising sea levels threaten tidal inundation of low lying land at Watson's Gap.

Changes in wave climate, which increased the long period, swell component would increase the likelihood of foredune damage, as well as changing mean littoral drift speeds and possibly direction. For beaches such as this, where refraction of long period swell will be important, change in wave climate will greatly increase unpredictability in beach response.

COMPONENT	ISSUE	PROPOSED ACTION	PRIORITY OF ACTION	KEY PLAYERS
Dune	Ongoing problems in weed control.	F10.1 Target residences with educational materials, with regard to weeds.	High (Soc / Econ)	Coastcare group and Council
	Re-vegetation with indigenous species. Protection of significant flora and fauna.	F10.2 Implementation of management plan by Taylor (2003).	High (Soc / Econ)	Council and Coastcare group
	Damage and de-stabilisation by foot traffic.	F10.3 Improvement of signage at path entrances and by railway reserve. Strategic use of sand drift fencing.	High (Soc / Econ)	Council and Coastcare group
Bluff	Stormwater erosional damage.	F10.4 Erosion control at outlets. Review of stormwater catchments, to slow peak run-off.	Medium (threat)	Council
Watsons Gap	Potential flooding hazard at Watson's Gap due to sea level rise.	F10.5 Revise zoning provisions to reflect appropriate hazard standards.	Low (Hazard)	Council

Cell F11 Hindmarsh River to Inman River



Landforms

Inman floodplain and the lower Hindmarsh are incised into a relatively flat coastal plain. Low narrow line of dunes, with a narrow low energy beach. Beach plan-shape forms appear to be controlled by the refraction wave patterns resulting from reefs and islands. Offshore reefs and islands reflect the inherited surface form of the granite batholith.

Estuary Assessment (Australian Land & Water Audit, 2000) Hindmarsh River

Transport of fine suspended sediment (2.8 kilotonnes per year) estimated to be fourteen times the rate under pre-European conditions. Fine sediment nitrogen estimated to be four times the rate under pre-European conditions.

Benthic Habitat / Biota

Granite reef, with inshore patches of sand and seagrass (inshore seagrass is rare between Cape Jervis and Lacedpede Bay, making Encounter Bay seagrasses regionally significant as habitat). Granite reef, off South side of Granite Island.

Sand dune low shrubland; eucalyptus woodland and forest in upper part of the Hindmarsh estuary; swamp paperbark in lower estuary.

Land Use/ Land Ownership

Closely urbanised coastal plain. The coastal reserves adjacent to the Causeway, and on both sides, are given over to recreational activities.

A privately owned residential area. Crown land under care and control of the Council along Hindmarsh River and in narrow coastal reserves. Granite Island owned by NPWS.

Draft Encounter Marine Park Zoning

Habitat Protection Zone HP-2 inshore Hindmarsh River to Yacht Club; Special Purpose Area to Causeway; from Causeway to Inman River_Sanctuary zone S-7 begins 200m offshore; Habitat Protection Zone HP-2 inshore

(http://www.environment.sa.gov.au/coasts/pdfs/encounter_marine_park_zp_tech.pdf)



Victor Harbor and the Causeway to Granite Island

(Coast Protection Board, 2003)

Values (Field visits and local reports)

The narrow coastal reserves are a major recreational resource for residents and visitors: a 'front window' for the town. The area between the caravan park, the Inman River and foreshore is a significant and highly visible piece of coastal open space. Granite Island Recreation Park is a traditional recreation site to enjoy the coastal and ocean views from the island footpaths, and to glimpse the Little Penguins that nest amongst the granite boulders immediately above the tide line.

Walking trail (Kaiki Trail) on Granite Island. The area and several sites are important in Ngarrindjeri dreaming stories.

Threats (Field visits and local reports)

Granite Island has a considerable inheritance of imported exotic plants. The Little Penguin population is threatened by cats, rats, dogs and foxes, as well as human harassment. The 2006 Penguin census shows there has not been recovery from the 2002 fall in penguin numbers; however the cause of this decline is unclear.

Beach and dune erosion between the Causeway and the Inman River pose a threat to the adjacent reserve. Continued beach and dune erosion between the Inman outlet and the Causeway, with recession focussed on the middle of this beach and damage to a storm water pipe near Stuart Street. Beach erosion at the Warland Reserve is also an issue. These erosion threats are currently under investigation (8/06).

Opportunities

The area between the caravan park, the Hindmarsh River and foreshore is a significant and highly visible piece of coastal open space and should be given active planning and priority for weed control, re-planting as coastal dunes and a small wetland.

Public education through interpretive signage relating to the nearshore zone, the estuary and dune habitat.

Improvement to the estuarine flora and fauna habitats through the employment of an estuary entrance management support system.

Conservation Analysis (GIS)

Total conservation values for this cell are high: this is the seventh largest sum of conservation means within the region. Although this is essentially a suburban cell with small remnant vegetation blocks, those that remain have high values for threatened vegetation associations, for vegetation rare within the state and for total number of species. These high value areas are found adjacent to the Hindmarsh River estuary between Lamont Road and Welch Road and near the river mouth. Granite Island and some small coastal reserves on the mainland show medium values.

Within the suburban south coast this is relatively a biodiversity hotspot, with high values for species richness (a total of 378 plant and animal species have been recorded here) and threatened species richness. This cell also includes Aboriginal sites of significance. Other conservation layers do not add value to this cell.

Two state vulnerable bird species *Thinornis rubricollis* (Hooded plover) and *Melithreptus gularis gularis* (Black Chinned Honeyeater); and state rare *Cereopsis novaehollandiae* (Cape Barren Goose), *Anas rhynchotis* (Australasian Shoveler), *Plegadis falcinellus* (Glossy Ibis), *Falco peregrinus* (Peregrine Falcon), *Porzana tabuensis* (Spotless Crake), *Gallinago hardwickii* (Latham's Snipe), *Actitis hypoleucos* (Common Sandpiper), *Haematopus fuliginosus* (Sooty Oystercatcher), *Neophema elegans* (Elegant Parrot), *Falcunculus frontatus* (Crested Shrike-tit) have been recorded in this cell. A number of other bird species (not state listed) have been recorded including the regionally vulnerable *Rallus philippensis* (Buff-banded Rail); a colony of *Eudyptula minor* (Little Penguin) is found on Granite Island.

Threat Analysis (GIS) Total 48.15

This cell has moderate to high total threats: development zoning, land ownership, land use, vegetation degradation and weed distribution, viewshed and viewscape are the largest contributors to this total. The urban nature of the large proportion of the area is the major reason, in spite of the presence of Granite Island within the cell. Although the high proportion of exotics is no different to many parts of the Fleurieu coast, the prevalence of many red alert weeds within the coastal reserves and on Granite Island gives a relatively high weed distribution score. The caravan park and some dune instability also make minor contribution to the threat score. The following red alert weeds were found within this cell: *Asparagus asparagoides*, *Gazania linearis*, *Lycium ferocissimum*, *Acacia Cyclops*, *Polygala myrtifolia*, *Chrysanthemoides monilifera ssp. Monilifera*, *Dipogon lignosus*, *Leptospermum laevigatum*, *Rhamnus alaternus*, *Acacia saligna*, *Euphorbia paralias*, *Euphorbia terracina*, *Olea europaea ssp., europaea*, *Oxalis pes-caprae*, *Ehrharta calycina*, *Arctotis stoechadifolia*, *Argyranthemum frutescens ssp.*, *Coprosma repens*, *Marrubium vulgare*, *Pinus halepensis*, *Solanum linnaeanum*.

Possible Climate Change Threats

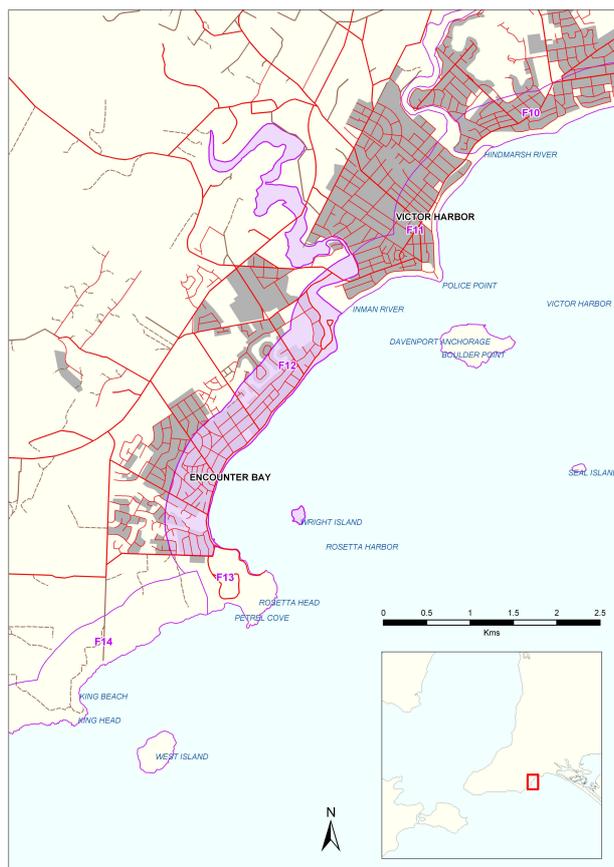
Analysis of climate change projections suggest that the low lying parts of the coastal plain will be subject to both flooding and erosion in the medium term. Rising sea levels will lead to increased foredune damage and recession. Where recession is not possible, beaches in front of hard protection will narrow and may be lost. In the interim beach response to seasonal changes may become more unpredictable. Where the plan form of the shoreline is controlled by reef protection this may suffer radical re-alignment following sea level rise. Changes in wave climate, such that an increasing proportion of energetic long period swell occurs, would have a marked impact on the narrow medium energy beaches and low dunes of this cell, due to refraction effects on long period waves.

(The beach, dune and nearshore sand levels are monitored by a CPB long term monitoring profiles, midway between the Inman River and the Causeway, immediately north of the causeway and near the yacht club. Community beach pole monitoring is carried out, North and West of the Causeway).

COMPONENT	ISSUE	PROPOSED ACTION	PRIORITY OF ACTION	KEY PLAYERS
Granite Island	Heavy visitor foot pressure. Many weeds and exotic plantings.	F.11.1 Continue implementation of Granite Island Recreation Park Vegetation Management Plan 2004-2008.	Medium (KP cell; Cons)	Friends of Granite Island.
	Fall in penguin numbers in 2002 and failure to recover.	F11.2 Support research to clarify causes of population decline. As an interim measure, fence the causeway against foxes, dogs and cats. Implement a rat control program.	High (Soc / Econ)	Friends, NPWS, Council.
Beaches and Dunes	Weed and people pressure.	F11.3 Support council and coastcare campaigns to eradicate red alert weeds. Review access control.	Medium (threat)	Coastcare, Council, NRM.
	Current erosion.	F11.4 Continue beach pole observations. Analyse and report back on existing record as a matter of urgency. Complete engineering study.	High (Hazard)	Coastcare, CPB, Council.
	Strong potential for future erosion, due to sea level rise and possible changes in wave climate.	F11.5 Maintain and analyse profile records. Initiate photopoint monitoring of beaches. Ensure the strongest possible protection within the development plan for coastal reserves (recreation now, buffer zones in the future). Where possible, seek to extend coastal reserves.	Low (Hazard)	C.P.B., Council.
	Flooding risk to low lying areas following sea level rise.	F11.6 Detailed high resolution mapping of topography.	Low (Hazard)	DEH, Commonwealth Natural Disasters Mitigation Program.
	Hooded Plover nests in season threatened by disturbance by walkers and dogs.	F11.7 Community monitoring, fences to mark nests. Notices to alert dog walkers.	High (Cons / threat)	Community, Council.
Hindmarsh River Estuary banks and floodplain	Small areas of remnant vegetation adjacent to the river north of Lamont Road show significant biodiversity values.	F11.8 Significance of small areas of vegetation within the river floodplain needs recognition through proactive management: assess opportunities to establish buffers; signage.	High (Cons / threat)	Council, Community groups.
	Estuary entrance currently opened / closed by Council largely for recreational reasons.	F11. 9 Develop an estuary entrance management support system (1), to investigate other options and reasons for making opening / closing decisions.	Medium (Cons / Soc / Econ)	Council.
Coastal reserves	Narrow reserves under threat to climate change (sea level rise and changing wave climate)	F11.10 Maintain reserves as buffer areas (see beaches and dunes above)	Low (Hazard)	Council.

(1) An Estuary Entrance Management Support System has been developed by Deakin University and a number of Victorian Catchment Boards. This system takes into account a number of uses (including recreation use), conservation and hydrological factors in assisting with the decision to open or close an entrance (refer to Appendix 15).

Cell F12 Inman River to Rosetta Harbour



Landforms

Low coastal plain, with beach and dune virtually absent. Large intertidal nearshore limestone reef. Floodplain and estuary of the lower Inman River. The floodplain is a relatively wide depositional feature in this locality, well defined within a trough.

Estuary Assessment (Australian Land & Water Audit, 2000)

Classified as extensively modified, and under very high pressure due to the WWTP (now upgraded) and vegetation clearance within the catchment. Transport of fine suspended sediment (6.6 kilotonnes/yr) estimated to be thirteen times the rate under pre-European conditions. Fine sediment nitrogen estimated to be four times the rate under pre-European conditions

Benthic Habitat/ Biota

Fringing calcareous intertidal and subtidal reef. Offshore granite surfaces on islands and both exposed and sheltered reef habitats. Limestone intertidal reef. Patches of seagrass and macroalgal assemblages. Low shrubland found on dune reserves; Swamp Paperbark on lower estuary; eucalypt woodland in upper part of the estuary.

Land Use/Land Ownership

Much of this cell is privately owned and developed urban residential land. The coastal reserve is narrow to absent. Relatively large council reserves comprise almost the whole of the lower Inman floodplain.

Draft Encounter Marine Park Zoning

Sanctuary Zone S8 for NE half of the cell. Habitat Protection Zone HP-2 inshore. Special Purpose Area at southern corner of cell.

(http://www.environment.sa.gov.au/coasts/pdfs/encounter_marine_park_zp_tech.pdf)

Values (Field visits and local reports)

The estuarine environment of the Lower Inman is of great potential value to this area, contingent upon improvement in water quality. Inshore seagrass is rare between Cape Jervis and Lacedpede Bay, making Encounter Bay seagrass regionally significant as habitat.

Riparian improvement of the lower Inman floodplain is providing a significant vegetation corridor; however urban stormwater pipes to the river impact on estuarine water quality.



Encounter Bay shore, looking NW across Encounter Lakes development

(Coast Protection Board, 2003)

Threats (Field visits and local reports)

(A recent preliminary proposal for a marina, with residential component has been made for the mouth of the Inman River).

Recent changes to the Victor Harbor wastewater treatment plant has the potential to greatly reduce the very significant past pollution load to the estuary, however the accumulated polluted sediments may continue to impact the area, regardless of the success of the improved facility, which has continued significance for the seagrass and algal habitats of Encounter Bay. The values of the estuary and the nearshore marine environments of Encounter Bay make the water quality issue very significant for this locality. There is continued degradation of the dunes near Kent Reserve, by foot and vehicle traffic.

Stormwater impact on reef adjacent Battye Road, Solway Crescent and Bartel Boulevard (tidal interchange pipe for Encounter Lakes).

Opportunities

The current program of planting the Council reserve adjacent to the Inman River is significant in improving connectivity of the habitat and vegetation block shape within the floodplain, and should be continued and maintained. Rehabilitation of dunes at the Kent Reserve should also be continued.

Public education through interpretive signage at the Kent Reserve, relating to the nearshore zone, the estuary, dune habitat and the Ramindjeri campsite. Considerable educational opportunity for interpretation and the development of educational opportunities at the extensive intertidal platform reef. Community monitoring contributing to the Reefwatch Monitoring Program is in the process of development at this site. The area is important for marine education at Victor Harbor High School. Upgrading of the WWTP provides the opportunity to review actions to reduce urban and farm run-off pollution of the estuary, in order to rehabilitate this extensively modified environment and reduce pollution of the nearshore marine environment.

Conservation Analysis (GIS)

The total of conservation means for this cell is average: the lower Inman floodplain shows medium conservation values totals, residential areas total low values. However, priority based on sites with threatened flora is the highest in the region; rarity of vegetation associations and priority of sites with threatened fauna

also contribute to the total. Smaller values for bird, reptile and butterfly larvae habitat are also present. Vegetation patch size and shape values are not significant. This cell includes Aboriginal sites of significance.

The state vulnerable *Coturnix ypsilophora* (Brown Quail), *Botaurus poiciloptilus* (Australian Bittern), *Rallus pectoralis* (Lewin's Rail), *Thinornis rubricollis* (Hooded Plover), *Sterna nereis* (Fairy Tern), *Melithreptus gularis gularis* (Black-chinned Honeyeater) and 18 state rare bird species have been recorded in this cell.

Threat Analysis (GIS)

Because this cell comprises a residential suburb with small linear remnant vegetation blocks, threat values accumulate to a high total for this part of the coast, the ninth highest for the region. The vegetation blocks are fragmented and their edge to interior ratio adds to this score. Private land ownership proportion of the coastal boundary is high, reflecting the extremely narrow coastal reserve remaining after development. In addition, much of the cell is visible from the sea, giving a high viewshed score. The presence of the sewage treatment plant on the floodplain of the lower Inman further adds to this high threat score. High numbers of exotic plants shows considerable vegetation species value and weed distribution shows numbers of aggressive and invasive weeds within the vegetation remnants.

The following red alert weeds are found within this cell: *Gazania linearis*, *Acacia cyclops*, *Lycium ferocissimum*, *Leptospermum laevigatum*, *Acacia saligna*, *Euphorbia paralias*, *Euphorbia terracina*, *Olea europaea ssp. Europaea*, *Arctotis stoechadifolia*, *Argyranthemum frutescens ssp.*, *Coprosma repens*, *Pinus sp.*

Possible Climate Change Threats

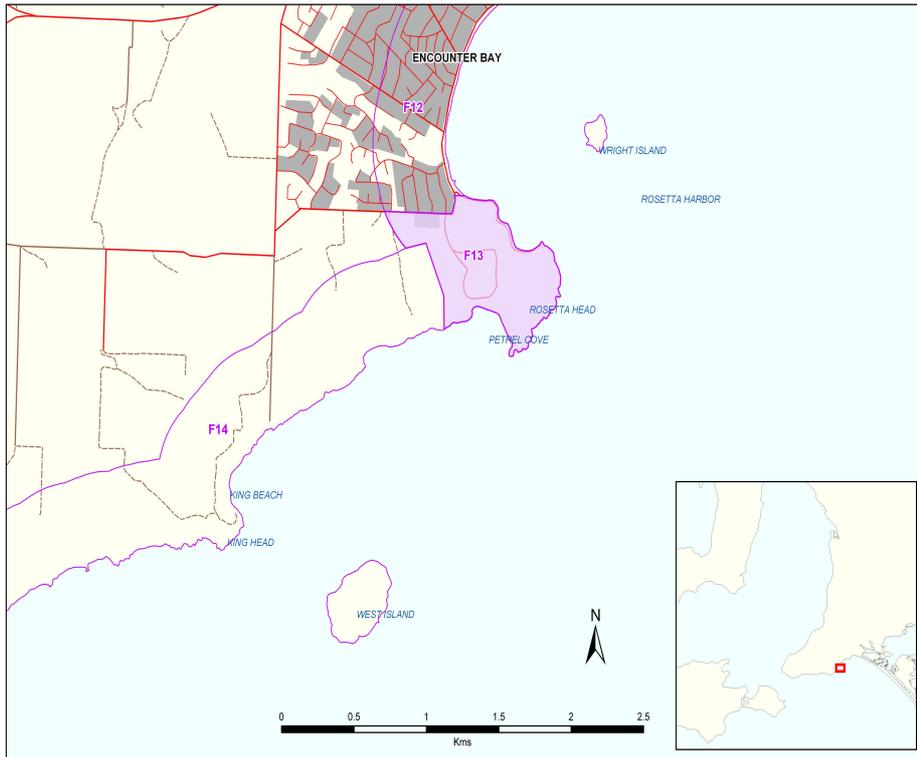
Analysis of climate change projections suggest that the low lying parts of the coastal plain will be subject to both flooding and erosion in the medium term. Rising sea levels will lead to increased foredune damage and recession. Where recession is not possible, beaches in front of hard protection will narrow and may be lost. In the interim beach response to seasonal changes may become more unpredictable. Where the plan form of the shoreline is controlled by reef protection this may suffer radical re-alignment following sea level rise. Changes in wave climate, such that an increasing proportion of energetic long period swell occurs, would have marked impact on the narrow medium energy beaches and low dunes near the mouth of the Inman, due to refraction effects on long period waves.

(The beach, reef and nearshore sand levels are monitored by a CPB long term monitoring profiles opposite Tabernacle Road and NE of Bartel Boulevard)

COMPONENT	ISSUE	PROPOSED ACTION	PRIORITY OF ACTION	KEY PLAYERS
Reefs	The location of a significant reef on the urban foreshore, (Sanctuary Zone S8 in Draft Marine Park Plan).	F12.1 Development of interpretive signage relating to biota of platform reef. Development of educational materials in conjunction with High School.	High (Cons / threat)	DEH (Marine Conservation) Victor Harbor High School Council
	Need for increased knowledge on intertidal and subtidal reefs and impacts on their systems	F12.2 Support setting up of community Reefwatch intertidal monitoring group (data collection, kits, methodology).	High (Cons / threat)	Reefwatch, Flinders University, NRM.
Lower Inman floodplain	Management of high value habitats	F12.3 Continue revegetation program of the Lower Inman floodplain, and habitat management to improve vegetation patch connectivity.	High (Cons / threat)	Council & community.
Dunes near Kent Reserve	High level of foot traffic	F12.4 Continued weed control and access management within the dune area adjacent Kent Reserve. Pursue opportunities for signage.	Medium (Cons)	Council & community.
Estuary Entrance	Estuary entrance blocked with increasing frequency due to low flows	F12.5 Develop an estuary entrance management support system for the Inman, (1), to investigate other options and reasons for making opening / closing decisions.	Medium (Cons)	Council.

(1) An Estuary entrance management support system has been developed by Deakin University and a number of Victorian Catchment Boards. This system takes into account a number of uses (including recreation use), conservation and hydrological factors in assisting with the decision to open or close and entrance (refer to Appendix 15).

Cell F13 The Bluff



Landforms

The Bluff (and Wright Island) represents the eroded surface of an ancient and extensive granite batholith. Petrel Cove (immediately South West of the Bluff) shows exposures of metamorphic contact zone to Kanmantoo Series. Beach at Petrel Cove displays materials weathered materials from the granite, including a heavy minerals suite.

Benthic Habitat / Biota

Extensive platform reef. Exotic grasses and low coastal heath, also areas of acacia woodland.

Land Use/ Land Ownership

This small cell is entirely coastal recreation reserve under care and control of Council, preserving the scenic amenity of the regionally visible Bluff headland.

Values (Field visits and local reports)

Several hundred thousand visitors walk up to the crest of the Bluff from the carpark, annually, to enjoy the view along the coast and, in winter, to observe whales. This activity is serviced by 3 carparks, an interpretation sign and a rocky loop path to the summit. There has been considerable Council and community effort invested in path improvement, weed control and revegetation within this Council reserve.

Draft Encounter Marine Park Zoning

Sanctuary zone S-7 begins 200m offshore; Habitat Protection Zone HP-2 inshore

(http://www.environment.sa.gov.au/coasts/pdfs/encounter_marine_park_zp_tech.pdf)



The Bluff, West Island Conservation Park, Kings Head and Newland Head (Coast Protection Board, May 2003)

Threats (Field visits and local reports)

Foot traffic, especially during whale watching times, may be heavy and extend well beyond the marked tracks.

Opportunities

Interpretation of Geology, Aboriginal significance, European history and whale migration.

Bechervaise (2004, a) proposes the development of a toilet facility.

Conservation Analysis (GIS)

The sum of conservation means makes this one of the more valuable cells within the region: almost the whole cell demonstrates medium to high values. Layer totals for this cell which are relatively high within the region include priority of vegetation species based on the threatened status of the community; priority of the vegetation assemblage based on rarity within South Australia; numbers of endemic plant species that have more than 50% of records within the Southern Fleurieu; significant bird habitat; habitat based on reptile conservation status; European, natural and Aboriginal heritage.

36 threatened plant species and 10 threatened fauna species have been recorded in this cell.

A number of state rare bird species have been recorded in this cell: *Egretta sacra* (Easter Reef Egret), *Falco peregrinus* (Peregrine Falcon), *Actitis hypoleucos* (Common Sandpiper), *Haematopus fuliginosus* (Sooty Oystercatcher), and *Neophema elegans* (Elegant parrot).

Threat Analysis (GIS)

A number of moderate and low scores give this cell a low summary total overall. A high proportion of exotic plant species, but few aggressive weeds, viewshed and viewscape give potential threats. There are modest contributions from vegetation block isolation, shape and size, land use and ownership, and cliff stability.

The following red alert weeds have been found within this cell:

Asparagus asparagoides, Lycium ferocissimum, Leptospermum laevigatum, Euphorbia paralias, Euphorbia terracina, Olea europaea ssp. Europaea, Ehrharta calycina, Solanum linnaeanum, Carpobrotus edulis, Coprosma repens, Marrubium vulgare

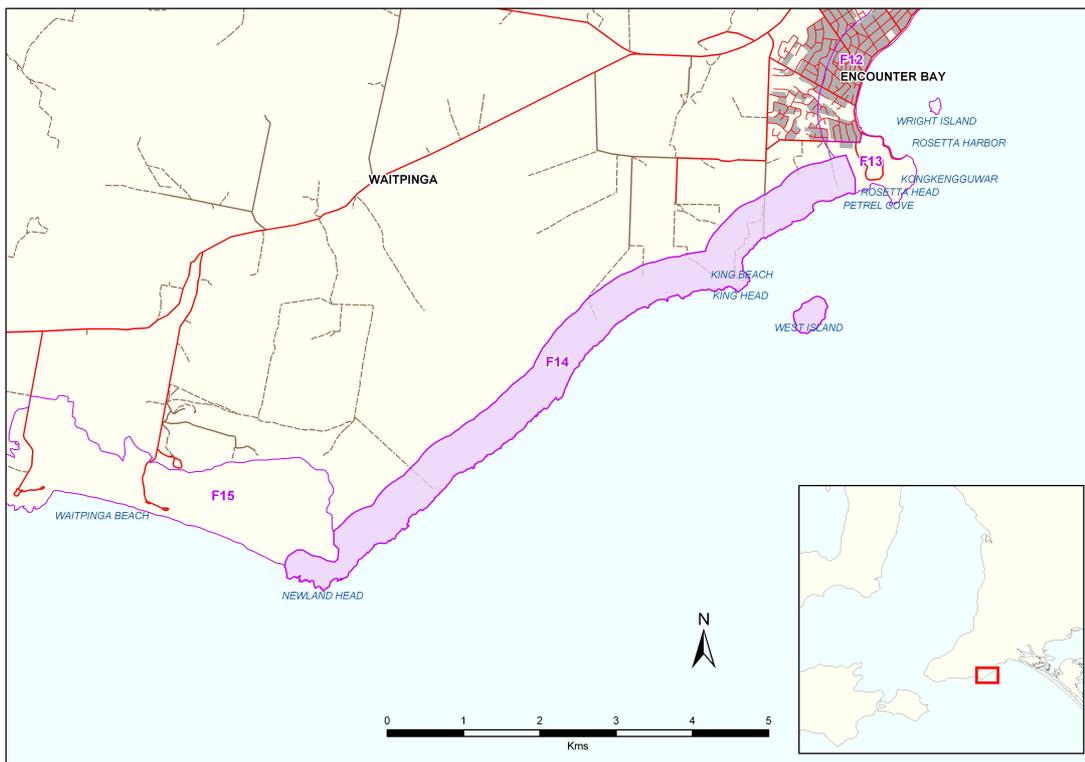
Possible Climate Change Threats

This cell is resilient to some effects of climate change, but plant and animal survival of the displacement of climate zones is a serious concern. Over time increasing aridity will increase stress on remnant vegetation and slow natural recovery from damage. Seasonal surface run-off on slopes will be drastically reduced by soil water budget changes; however, unpredictable intense rainstorms will locally cause fast run-off on slopes. Changes in wave climate, likely to increase the long period swell component, would accentuate high tide changes to backshores in pocket beaches and to talus slopes at the base of cliffs. Tide and water depth dependent habitats on reefs will be impacted by sea level rise.

(Increasing plant and animal resilience to progressive climate change is important for this area, and can be assisted by improving connectivity between remnant vegetation patches).

COMPONENT	ISSUE	PROPOSED ACTION	PRIORITY OF ACTION	KEY PLAYERS
Carpark at base of walking track; walking track	Care in use of site: potential impact of very high visitor numbers. Safety on steep slopes.	F13.1 Maintenance and improvement of car park and walking track and interpretation.	High	Council.
Whole cell	Improvement of native vegetation values (see above).	F13.2 Continuation of Bluff Revegetation Plan.	High (Cons / threat)	Council & Community.
	Reduction in pressure of invasive weeds.	F13.3 Continuation of Bluff Revegetation Plan Target priority weeds.	High (Cons / threat)	Council & Community.

Cell F14 Petrel Cove to Newland Head



Landforms

Dissected plateau, cliffs and reefs of Kanmantoo Series sediments. Some cliff-top dunes and calcarenite. The shoreline includes steep high cliffs in the Western half of the cell; low cliffs with pebble and sand beaches near Kings Head to Petrel Cove. West Island is part of the eroded surface of the Victor Harbor granite batholith.

Benthic Habitat/ Biota

Inshore sand with platform reef offshore. Low to medium coastal heath in conservation park and through the cliff tops from Newland Head Conservation Park to Kings Head.

Land Use/ Land Ownership

The SW quarter of the cell is part of Newland Head Conservation Park. Unallotted Crown land <200m back from cliff edge from conservation park to near Kings Head; otherwise private. Coastal strip from park to near Kings Head was acquired in 2000 with the intention of dedication as part of the Conservation Park. Heritage Agreements 1077 and 1215 SW of Kings Head.

Draft Encounter Marine Park Zoning

Bluff to Kings Head: Sanctuary zone S-7 begins 200m offshore; Habitat Protection Zone HP-2 inshore. At Kings Head and 2km to W: S-7. Then HP-2 to 2 km E of Newland Head, which is S-6. Restricted Area along North side of West Island.

(http://www.environment.sa.gov.au/coasts/pdfs/encounter_marine_park_zp_tech.pdf)



Looking East across Newland Head toward The Bluff and West Island

(Coast Protection Board May 2003)

Values (Field visits and local reports)

Scenic amenity of rugged cliffs and small sandy coves; views of seabirds and marine life. Extension of conservation park east along the cliffs accompanied by considerable erosion control (cliff top dunes) and revegetation by the Friends of Newland Head, both within the park and East of the park.

Threats (Field visits and local reports)

Significant weed infestation (mallow, boxthorn) is reported from West Island; also displacement of Penguins from burrows on the island by seagulls. There is a fall in numbers of penguins.

Within and near Newland Head CP it is reported that high kangaroo numbers threaten regeneration efforts.

Opportunities

The proximity of blocks of valuable cliff top native vegetation on Crown land adjacent to Newland Head Conservation Park, suggests that an extension of the park within the coastal boundary should be considered.

Bechervaise (2004, a) proposes an upgrading of the informal footpath from Petrel Cove to Kings Head, where the path joins the Heysen Trail.

Conservation (GIS Analysis)

The sum of conservation means shows this to be the third most valuable cell within the region. The highest values are found within the remnant vegetation of the eastern half of the cell: the remainder shows totals within the medium range.

Outstanding values accrue for numbers of species, numbers of threatened species, threatened vegetation communities, for bird, reptile and butterfly larvae habitat, also Aboriginal and geological heritage. Average to high values are found for rarity of plant associations within South Australia, numbers of endemic species, vegetation block connectivity, patch size and shape.

Surprising statistics lie behind these values: 155 threatened flora species and 23 threatened fauna species; a total of 567 plant species and 44 animal species have been recorded within this cell.

The state endangered *Haliaeetus leucogaster* (White bellied Sea-Eagle), *Calamanthus pyrrhopygius parkeri* (Chestnut-rumped Heathwren); the state vulnerable *Coturnix ypsilophora* (Brown Quail), *Thinornis rubricollis* (Hooded Plover), *Sterna nereis* (Fairy Tern) and 10 state rare bird species have been recorded in this cell.

Threat analysis (GIS Analysis)

The total of the threat summary layers gives a relatively moderate total for this cell. Principal threat scores arise from the viewscape and viewshed layers, numbers of exotic plants, cliff instability, land ownership and land use. Minor, but significant contributions to the total are made by the distribution of aggressive weeds, dune instability (cliff top dunes near Newland Head Conservation Park), the proximity of the dump to the cell, vegetation block isolation, shape and size.

The following red alert weeds have been detected within this cell: *Asparagus asparagoides*, *Asparagus declinatus*, *Lycium ferocissimum*, *Chrysanthemoides monilifera ssp. Monilifera*, *Leptospermum laevigatum*, *Rhamnus alaternus*, *Acacia longifolia ssp. Longifolia*, *Disa bracteata*, *Euphorbia paralias*, *Olea europaea ssp. Europaea*, *Oxalis pes-caprae*, *Ehrharta calycina*, *Coprosma repens*, *Juncus acutus*, *Solanum linnaeanum*.

Possible Climate Change Threats

This cell is resilient to some effects of climate change, but plant and animal survival of the displacement of climate zones is a serious concern. Over time increasing aridity will slow natural recovery from damage to remnant vegetation. Seasonal run-off in small creeks will be drastically reduced by soil water budget changes; however, unpredictable intense rainstorms will locally cause fast run-off in small catchments. Changes in wave climate, likely to increase the long period swell component, would accentuate high tide changes to backshores in pocket beaches and to talus slopes at the base of cliffs. Tide and water depth dependent habitats on reefs will be impacted by sea level rise.

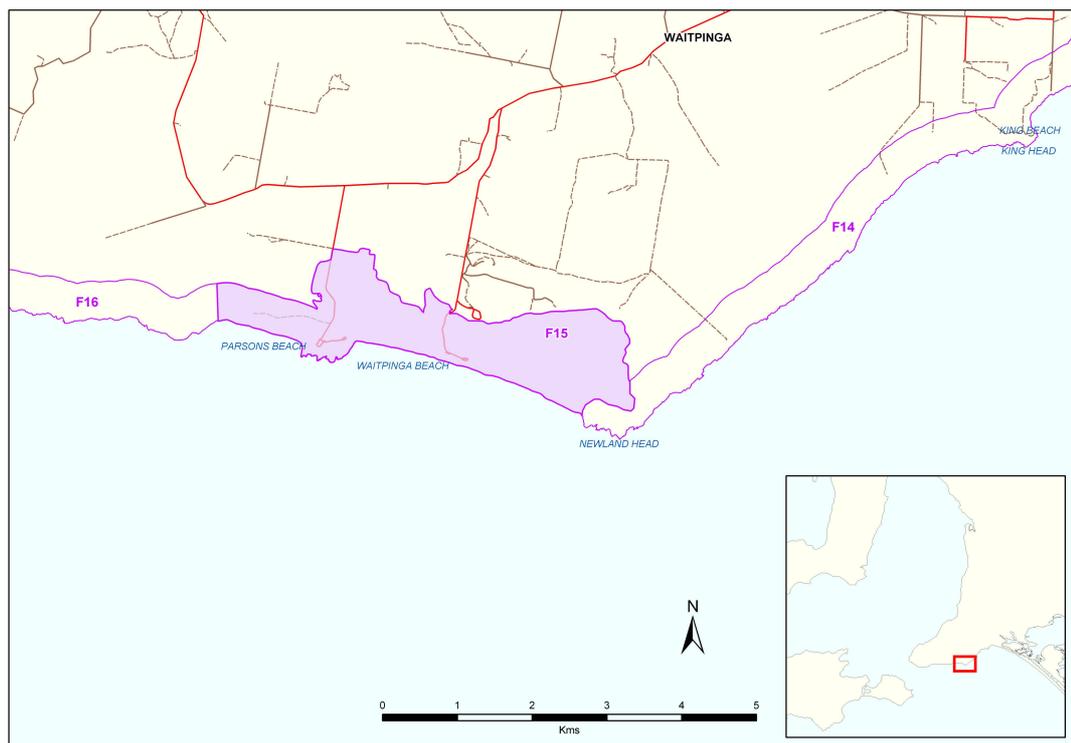
(Increasing plant and animal resilience to progressive climate change is important for this area, and can be assisted by improving connectivity between remnant vegetation patches).

COMPONENT	ISSUE	PROPOSED ACTION	PRIORITY OF ACTION	KEY PLAYERS
Cell outside park	Significant plant associations and fauna habitats along extensive coastal strip	F14.1 Assign high priority to the continuation of work to conserve this area.	High (Cons / threat)	NRM.
		F14.2 Explore opportunities to link remnant vegetation blocks; improving connectivity and long term resilience.	Medium (Cons)	DEH, NRM.
		F14.3 Explore opportunities to buffer remnancy values, through land acquisition or land management agreements.	Medium (Cons)	DEH, NRM.
		F14.4 Explore possibility of further extending the park, to include the whole of this cell.	Medium (Cons)	DEH, NRM.
	High scenic amenity (Viewscape score) strongly linked to tourism opportunity at the Bluff	F14.5 Explore options for protection based on landscape values; cp. Adelaide Hills Face	Medium (Cons)	Planning SA. Tourism SA
		Zone legislation.		
Whole cell	The conservation and threat assessments detected high value vegetation together with many high priority weeds.	F14.6 Continue detailed work to promote indigenous species through erosion control, weed control and planting. Continue and extend targeted weed control strategies aimed at 'red alert' weeds.	High (Cons / threat)	NRM, Friends and Coastcare groups.

The Newland Head Conservation Park, which comprises the SW quarter of this cell, has undergone a recent management plan process, completed in 2004. This involved extensive consultation and review of drafts (2001 – 3). The GIS – based conservation and threats analysis supports the evaluation within that plan, that this is an area of great conservation significance appropriate to its designation and needing priority in effort to implement the management plan.

This project has detected one matter not identified within the park management plan, namely, the significance of the butterfly larvae habitat, as recorded by Grund, 1997.

Cell F15 Newland Head to Parsons Beach



Landforms

Kanmantoo metasediments overlain by calcarenite. Dunes at Parsons and Waitpinga over a sloping calcarenite ramp. Clifftop dunes at Newland Head. Quaternary parabolic dune on Newland Head described by Bourman, 1973.

Benthic Habitat/ Biota

Inshore sand, then platform reef offshore. Well developed dune vegetation succession at Waitpinga and Parsons; coastal heath on Newland and Waitpinga headlands.

Land Use/ Land Ownership

Newland Head Conservation Park. NPWS. Acquired by the Crown in 1976 and dedicated in 1985.

Draft Encounter Marine Park Zoning

Habitat Protection Zone HP-2



Waitpinga Beach, Newland Head Conservation Park

(Coast Protection Board, May 2003)

Values (Field visits and local reports)

Extensive area of remnant native vegetation at the intersection of the Mount Lofty Ranges with the coastal environment. Access to the South Coast of this part of the peninsula is limited: public ownership and road access allow significant walking and fishing opportunities.

Threats (Field visits and local reports)

Large kangaroo numbers threaten revegetation projects. Camping sites within the park focus people pressure.

Conservation Analysis (GIS Analysis)

The total of means of conservation layers for this cell is the highest in the region: almost the entire cell shows high total means. Only small foredune areas show medium totals.

Outstanding values accrue for numbers of species, numbers of threatened species, threatened vegetation communities, for rarity of plant associations within SA, priority of sites with threatened flora and sites with threatened fauna, numbers of endemic species, for vegetation block connectivity, patch size and shape, for bird, reptile and butterfly larvae habitat, also Aboriginal and geological heritage.

155 threatened flora species and 56 threatened fauna species and a total of 566 plant species and 164 animal species have been recorded within this cell. The state endangered *Haliaeetus leucogaster* (White bellied Sea-Eagle), *Calamanthus pyrrhopygius parkeri* (Chestnut-rumped Heathwren); the state vulnerable and EPBC listed *Thinornis rubricollis* (Hooded Plover), and 9 state rare bird species have been recorded in this cell.

Geological Monument 1112, Fleurieu Peninsula South Coast from Coalinga Gully along entire coast to Waitpinga Creek: excellent exposures/ type section of the metasediments of the Kanmantoo Group.

Threat Analysis (GIS Analysis)

This cell, which comprises Newland head Conservation Park, has the lowest threat total in the region. Analysis suggests that the major threats within this cell are dune instability and the distribution of listed weeds. Camping and viewscape contribute minor ratings.

The following red alert weeds were found in this cell: *Asparagus asparagoides*, *Asparagus declinatus*, *Ehrharta villosa* var. *maxima*, *Lycium ferocissimum*, *Chrysanthemoides monilifera* ssp. *Monilifera*, *Euphorbia*

paralias, Euphorbia terracina, Oxalis pes-caprae, Acacia longifolia ssp. Longifolia, Disa bracteata, Olea europaea ssp. Europaea, Ehrharta calycina, Solanum linnaeanum, Carpobrotus edulis, Pinus radiata

Possible Climate Change Threats

This cell is resilient to some effects of climate change, but plant and animal survival of the displacement of climate zones is a serious concern. Over time increasing aridity will slow natural recovery from damage to remnant vegetation and some species may be unable to adapt to reduced soil water levels and die out. Seasonal run-off in small creeks will be drastically reduced by soil water budget changes; however, unpredictable intense rainstorms will locally cause fast run-off in small catchments. Changes in wave climate, likely to increase the long period swell component, would accentuate high tide changes to backshores at Waitpinga and Parsons Beaches. Given the IPCC projections of sea level rise, beach recession of an order of 5 to 15 metres in 50 years could be expected. Some low lying areas adjacent to the Waitpinga Creek estuary, appear to be vulnerable to flooding following sea level rise. Tide and water depth dependent habitats on reefs will be impacted by sea level rise.

(Increasing plant and animal resilience to progressive climate change is important for this area, and can be assisted by improving connectivity between remnant vegetation patches).

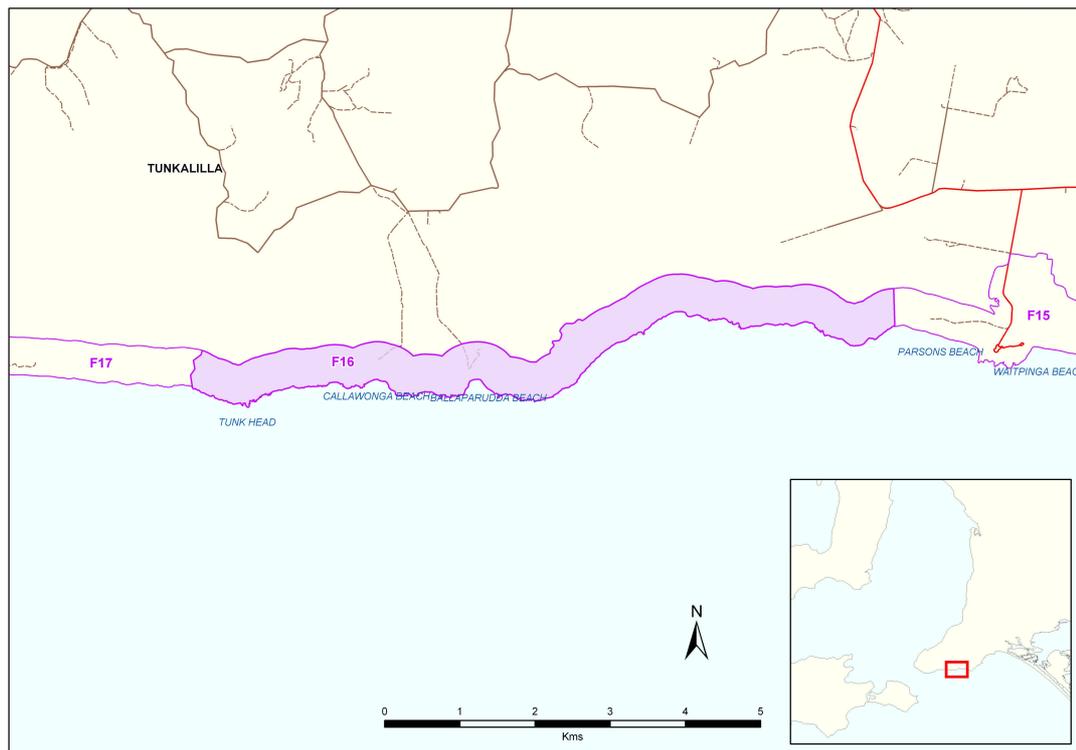
(The beach, dune and nearshore sand levels are monitored by a CPB long term monitoring profile at Waitpinga Beach)

Management Comment

The Newland Head Conservation Park, which comprises the entirety of this cell, has undergone a recent management plan process, completed in 2004. This involved extensive consultation and review of drafts (2001 – 3). The GIS-based conservation and threats analysis supports the evaluation within that plan, that this is an area of great conservation significance appropriate to its designation and needing priority in effort to implement the management plan.

This project has detected one matter not identified within the park management plan, namely, the significance of the butterfly larvae habitat as recorded by Grund, 1997. Friends of Newland Head have commenced revegetation of *Gahnia trifida* within the estuary flat and now manage the area for weeds. The larvae have been seen in 2005 and 2006.

Cell F16 Parsons Beach to Tunk Head



Landforms

Dissected hills and plateau of the Southern Fleurieu Ranges. The coast is dominated by high cliffs, sloping boulder strewn platforms and pocket sandy beaches. This is generally a high energy shore, with limited access.

Benthic Habitat/ Biota

Inshore reefs and bare sand offshore. Terrestrial vegetation has been largely cleared; however the isolated remnant Heritage Agreement 126 remains immediately west of Ballaparudda Beach.

Land Use/ Land Ownership

Private, grazing.

Draft Encounter Marine Park Zoning

General Managed Use zone.

(http://www.environment.sa.gov.au/coasts/pdfs/encounter_marine_park_zp_tech.pdf)



The dissected plateau of the Southern Mount Lofty Ranges: unnamed headland, Ballaparudda Beach in background (Coast Protection Board May 2003)

Values (Field visits and local reports)

High scenic amenity of spectacular coastal cliffs and pocket beaches. The Heysen Trail follows the platforms and small beaches for the eastern half of the cell, before taking an inland loop to 'Balaquider'.

Threats (Field visits and local reports)

Damage by grazing animals to steep coastal slopes is causing accelerated erosion, leading to episodic turbidity in small estuaries and nearshore waters. [Bechervaise (2004, p.8) also comments that "Private ownership to top of coastal headlands and top of coastal dunes" and "Stock grazing right to edge of coastline" are significant.]

Opportunities

There may be opportunity to negotiate track improvement and signage to the Heysen Trail, allowing improved access to the spectacular coastal views through the eastern part of this cell.

Conservation Analysis (GIS)

The total of conservation means is medium to low. This large cell shows low values throughout; however, Heritage Agreement 126 and one small area of remnant vegetation show medium values.

There are a number of high conservation ratings, these include: presence of endemic plant associations, significant bird habitat and some heritage values.

This cell includes Aboriginal sites of significance. Geological Monument 1112, Fleurieu Peninsula South Coast from Coalinga Gully along entire coast to Waitpinga Creek: excellent exposures/ type section of the metasediments of the Kanmantoo Group.

The state vulnerable *Thinornis rubricolis* (Hooded Plover), state rare *Egretta sacra* (Eastern Reef Egret), *Falco peregrinus* (Peregrine Falcon), *Actitis hypoleucos* (Common Sandpiper), and *Neophema elegans* (Elegant Parrot) have been recorded in this cell.

Threat Analysis (GIS)

Threat ratings give a moderate total for this cell. Weed pressure is unusually low for the region, although there are high proportions of exotic plant species. Land use and land ownership and viewscape threat ratings are high, and cliff and slope instability contribute to the threat total.

The following red alert weeds are found in this cell: *Leptospermum laevigatum*, *Euphorbia paralias*, *Ehrharta calycina*, *Solanum linnaeanum*

Possible Climate Change Threats

Over time increasing aridity will stress remnant vegetation and slow natural recovery from damage. Seasonal run-off in small creeks will be drastically reduced by soil water budget changes, however, unpredictable intense rainstorms will locally cause fast runoff in small catchments. Changes in wave climate, likely to increase the long period swell component, would accentuate high tide changes to backshores in pocket beaches. Tide and water depth dependent habitats on reefs will be impacted by sea level rise.

COMPONENT	ISSUE	PROPOSED ACTION	PRIORITY OF ACTION	KEY PLAYERS
Whole cell	Lack of low impact access to spectacular coastal scenery	F16.1 Improve signage and upgrade the Heysen Trail where possible, (whole cell)	Medium (Soc / Econ)	DEH, Natural & Cultural Heritage.
Cliffs and lower slopes of valleys	Accelerated erosion, apparently due grazing pressure on steep slopes, causing episodic raised turbidity levels in coastal waters	F 16.2 For cliffs and lower valley slopes undergoing accelerated erosion, negotiate improved land management practices with landholders	Medium (Threat)	NRM Landowners
	Stock grazing to small creeks (e.g. Coolawang Creek) and on beaches, leading to pollution of small estuaries.	F16.3 Fence estuaries and riparian land against stock.	Medium (Threat)	NRM Landowners