



“Kingscliff features an environment of world significant biodiversity and natural beauty that needs to be protected.”



2.0 ENVIRONMENTAL CONTEXT

2.1 Kingscliff environmental context

As noted in the Tweed Community Strategic Plan 2017 – 2027, *the Tweed features an environment of world-significant biodiversity and natural beauty, and distinct cultural and built heritage*. Tweed Shire Council and the community value its protection and consider sustainable, environmental management practices as fundamental to all local strategies, policies and long term plans.

Kingscliff and Cudgen have a history of agricultural use and production that historically formed the basis of economic growth, expansion and development within the area. This history is typical to the eastern coast of Australia which typically saw a dynamic growth of extensive agriculture on land which was cleared of its native vegetation. As townships grew and population increased there has been a corresponding increase in the amount of land cleared to accommodate growth, development and agriculture. In Kingscliff significant amounts of the coastal foreshore were also cleared for sand mining between 1950 and 1980. However since the cessation of sand mining operations there has been significant regrowth of native vegetation along the coastal strip.

Due to historic agricultural and sand mining disturbances, there are limited continuous areas of remnant and regrowth floodplain and estuarine vegetation and habitats. As a consequence all areas of native vegetation in the Kingscliff area are considered ecologically significant. Figure 2.0 Kingscliff Ecological Significance is based on one or more of the following criteria:

- Coastal wetlands under the Coastal Management State Environmental Planning Policy.
- Littoral Rainforest under the Coastal Management State Environmental Planning Policy.
- Endangered Ecological Communities under the *Biodiversity Conservation Act* (BC Act) or the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).
- Habitat for the endangered Tweed Coast Koala Population (BC Act).
- Over cleared vegetation communities (>70% cleared).
- Over cleared landscapes (landscape unit >70% cleared).

The key environmental themes which are explored within this section include:

- Environmental protection, vegetation and koala management.
- Coastal and estuary management.
- Flooding and drainage.
- Acid sulfate soils.
- Topography and slope.
- Soil stability.
- Views and scenic protection.
- Potential development footprint and constraints overlay.

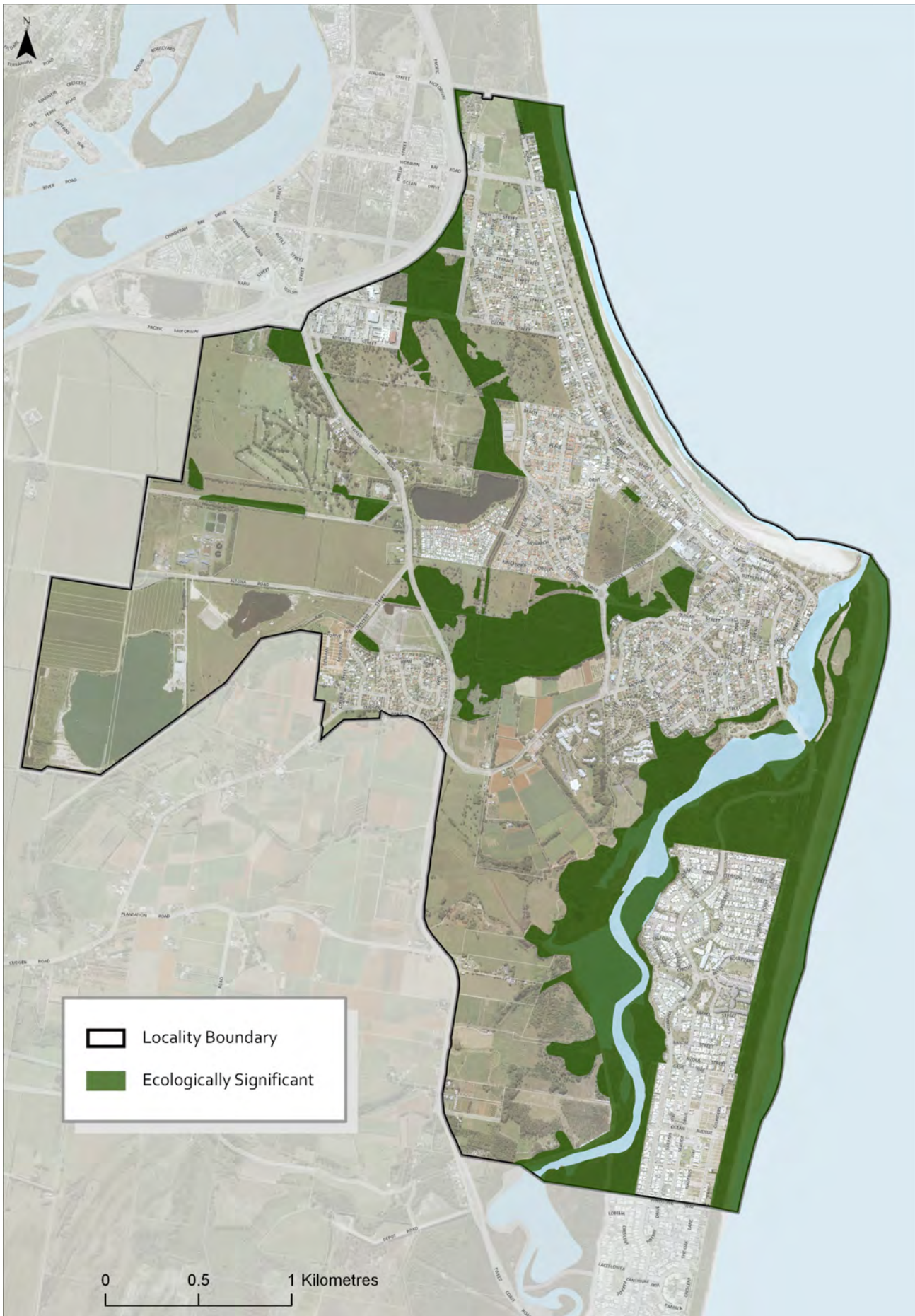


Figure 2.0 Ecologically significant areas

2.2 Threatened flora and fauna

Kingscliff has unique and diverse ecological values that provide habitat for numerous State or Commonwealth listed threatened flora and fauna species. A range of threatened ecological communities including wetland, saltmarsh, rainforest and sclerophyll forest also occur in the study area. Figure 2.2 illustrates the location of threatened flora and fauna records within the subject locality.

2.2.1 Threatened flora and fauna issues

The interface between the key habitat areas for threatened species is a key issue which requires careful management. Urban development within a greenfield context can often reduce the amount of available habitat, fragment retained habitat and sever wildlife corridors. Other impacts of urban development include an increase in stormwater runoff, decrease in the quality of stormwater runoff and the impact of acid sulfate soil which places significant pressure on the receiving natural environment and flora and fauna habitats

2.2.2 Protected flora and fauna opportunities

A key opportunity is to effectively plan for re-introduction of plants and wildlife which were native to the Kingscliff area but have disappeared in consequence of urban development. This could be achieved through effective management of existing habitats, and implementation of appropriate land use zoning and restoration of previously cleared areas to offset unavoidable future habitat losses. Despite the existing environmental zone designation over some parts of greenfield development sites, there will be a requirement for more detailed and updated flora and fauna surveys to determine current ecological status across identified greenfield development sites. This includes the allocation of offset planting areas, wildlife corridors and protected habitat areas implemented through development applications and masterplans.

2.2.3 Threatened flora and fauna strategies

1. Integrate and coordinate ecological corridors, buffers and 'green belts' connecting key habitat areas and identify opportunities to improve the landscape and ecological connectivity through strategic location of potential future areas of environmental protection across existing and future urban development sites.
2. Developers/landowners to undertake detailed flora and fauna assessment over key development sites to determine areas of environmental significance, endangered ecological communities or habitat areas.
3. Developers/landowners are to provide for the restoration, rehabilitation and enhancement of degraded habitat and ensure that comprehensive ecological restoration plans form part of future development applications and masterplans.
4. Developers/landowners are to identify a defined urban footprint boundary through a detailed site and context analysis over development sites which identifies areas of environmental protection, bushland, habitat areas and buffers.
5. Relocate the Wallum Froglet communities from the Turnock street location to the appropriate habitat to the west of Turnock Street as identified as part of DA05/0004 and continue to manage the Wallum Froglet Habitat Area as part of the endorsed 88E Restrictive Covenant.

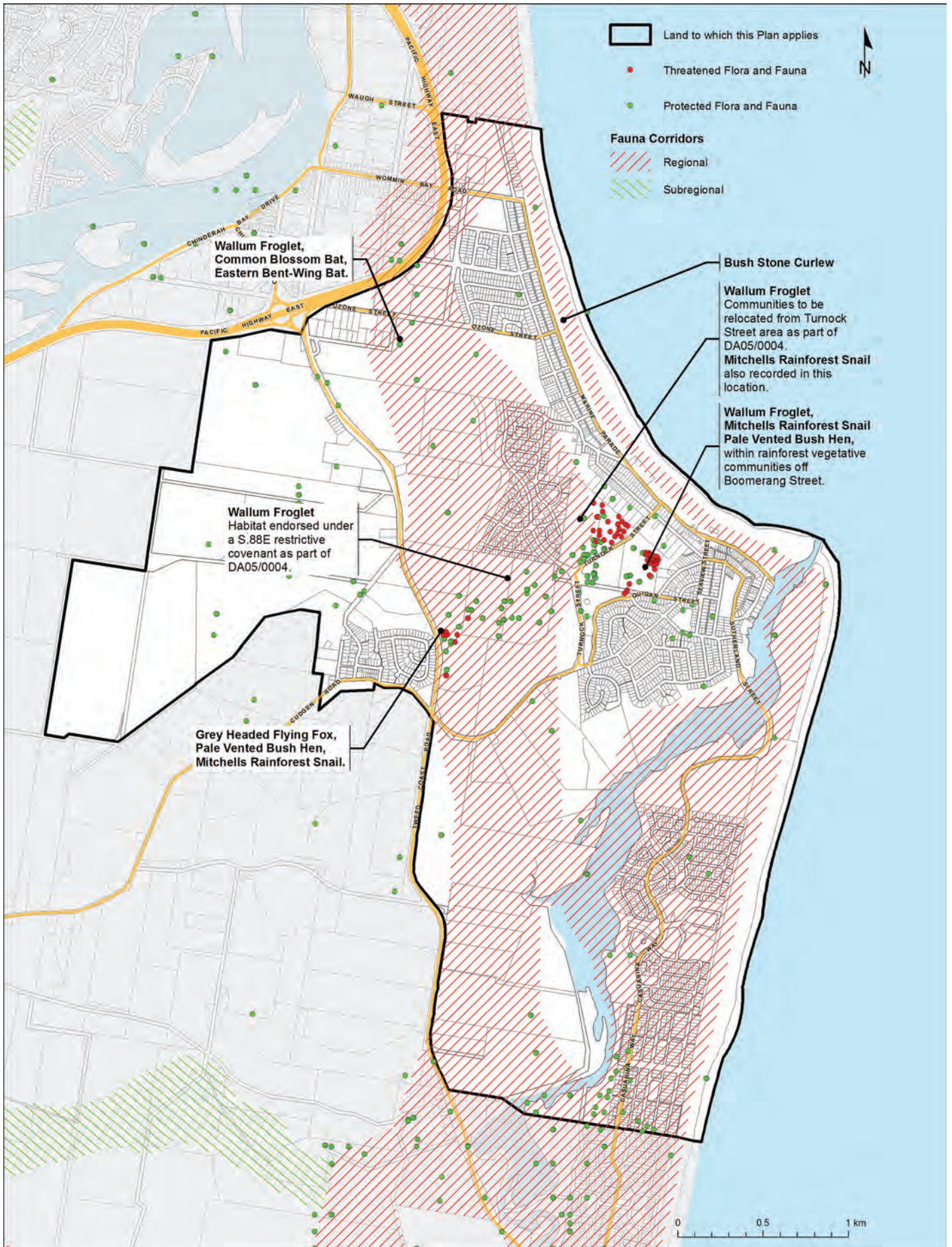


Figure 2.1 Threatened flora and fauna

2.3 Koala plan of management

The Tweed Coast koala population has declined by approximately 50% within the last decade. The extent of the decline means that the remaining koala numbers are now so low that mortalities due to fire, cars and domestic dog attack are no longer sustainable by the population over the long-term. To reverse this declining trend and help koala populations recover to a more sustainable level over the next three koala generations (15–20 years), Council has prepared The Tweed Coast Koala Habitat Study (2011) and a comprehensive Plan of Management (referred to as KPoM, 2015). Both these documents apply to Kingscliff and Cudgen locality's.

2.3.1 Koala management issues

Whilst the Tweed Coast Koala Habitat Study 2011 did not map areas of significant koala activity within the study area, Koalas are occasionally recorded in the area and there is a substantial amount of Preferred Koala Habitat which requires careful future management. Further, the KPoM has identified the Preferred Koala Habitat along both sides of the Cudgen Creek as a critical north-south linkage for remaining koalas in the northern extent of the Southern Tweed Coast Koala Management Area. Future development in this area is required to be consistent with the relevant provisions of the KPOM.

2.3.2 Koala management opportunities

Ecological assessment of environmentally constrained areas, particularly where they relate to key development sites, will form a valuable part of defining development envelopes over key development sites. This process is also likely to involve ground truthing and mapping to identify and define environmentally constrained areas. This process will directly inform land use recommendations for both environmental protection as well as defining areas suitable for development.

There is also significant opportunity to identify key landscape linkage areas within the study area which will contribute to meeting the targets of the KPoM in terms of providing additional preferred koala habitat and linkages. In addition to rehabilitation and restoration of existing bushland and environmental protection areas, there may be opportunities for the establishment of sites that provide compensatory outcomes in this area.

2.3.3 Vegetation and koala management strategies

1. Coordinate strategies and requirements of the Tweed Coast Koala Plan of Management in relation to the Preferred Koala Habitat across the Kingscliff locality including all greenfield sites.
2. Developers/landowners to initiate detailed flora and fauna surveys in consultation with Tweed Shire Council across the identified greenfield development sites to determine ecological value, Koala Management issues and options as part of an overarching site and context analysis which will define potential development footprints.
3. Developers/landowners are to provide for the rehabilitation and enhancement of degraded habitat and ensure that comprehensive ecological restoration plans form part of future masterplans, planning proposals and development applications.

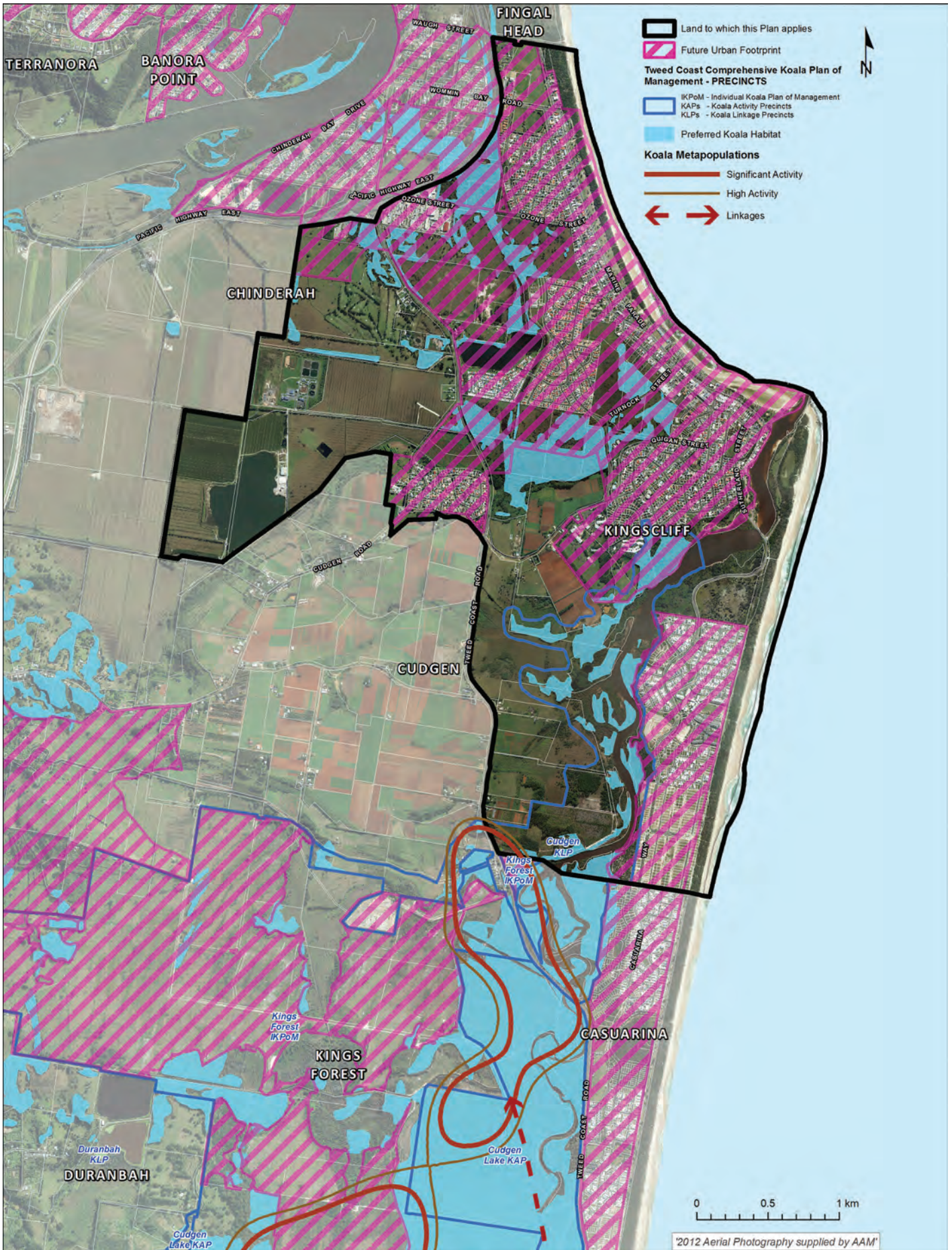


Figure 2.2 Southern Tweed Coast Koala Management Area and precincts – extract from the TKPoM 2015

2.4 Statutory environmental protection

The statutory environmental protection within locality is a consists of commonwealth, state and adopted Shire-wide and/or site-specific development control plans and strategies which define Council's policy position towards environmental management including but not limited to the following:

Biodiversity Conservation Act 2016

Introduced in 2016 the BC Act replaced the *Threatened Species Conservation Act 1995* and sets out a new process for listing threatened plants and animals and establishes the biodiversity conservation program (known as Saving our Species) for threatened species and threatened ecological communities. It also establishes the framework for the biodiversity offsets scheme, including provisions for establishing a method to assess biodiversity and sets out biodiversity assessment requirements for different activities.

Coastal Management SEPP

State Environmental Planning Policy (Coastal Management) 2018 updates and consolidates into one integrated policy SEPP 14 (Coastal Wetlands), SEPP 26 (Littoral Rainforests) and SEPP 71 (Coastal Protection) which are now repealed. The Coastal Management SEPP specifies how development proposals are to be assessed if they fall within the coastal zone by defining four coastal management areas in the Act through detailed mapping and specific assessment criteria for each coastal management area. Councils and other consent authorities must apply these criteria when assessing proposals for development that fall within one or more of the mapped areas.

Tweed Vegetation Management Strategy 2004

The Tweed Vegetation Management Strategy (TVMS) provides information about the status of vegetation including detailed mapping of remnant vegetation (Figure 2.3). The TVMS also provides existing and proposed frameworks for the management and conservation of remnant vegetation, provides an overview of threatened species in the Tweed generally, provides information on soil and water landscapes, as well as providing strategic directions and recommendation on vegetation management. This strategy has largely underpinned Council's proposed environmental zones pursued as part of LEP 2014 which were deferred by the State government pending the outcomes of the Northern Council's E-Zone Review process.

Environmental Protection Zones

Land zoned for environmental protection under the Tweed Local Environmental Plan 2000 (TLEP 2000) and land which meets the North Coast E-Zone criteria is shown in Figure 2.4. Since TLEP 2014 was gazetted the Northern Councils E-Zone review (2015) has been completed and Council has resolved to implement its findings. The areas shown in Figure 2.0 as ecologically significant vegetation communities are consistent with the E-Zone review.

In addition to the current environmental protection zones, there are other areas which are ecologically significant. Of note are the coastal foreshore reserve areas which are ecologically significant which are zoned RE1 Public recreation under the TLEP 2014 and some areas of vegetation within the West Kingscliff Precinct and south of Turnock St and the Turnock street extension which are nominated in part as both 'deferred areas' (7f Environmental Protection Coastal Land under TLEP 2000) and R1 General Residential under the TLEP 2014.

Other parcels of land which are currently under review include Lots 1 and 2 DP 1117599 Kingscliff (previously known as Lot 490). This land forms a green break between the residential subdivision areas of Salt and the south side of Cudgen Creek. It includes significant riparian vegetation to the west of Casuarina Way and coastal heath linking to the dunal system to the east. Whilst part of this site has been modified, it provides an important ecological link from the beach to the creek. In recognition of the site's ecological value, Council has resolved to rezone it as environmental protection. The planning proposal sought a rezoning of this site from SP3 Tourist to E2 Environmental Conservation under TLEP 2014 which has been deferred pending the completion of the E-Zone review process. Notwithstanding this resolution there is a development application for a tourist development approved over the site which the land owner could initiate. A successful aboriginal land claim over these lands was enacted in 2016.

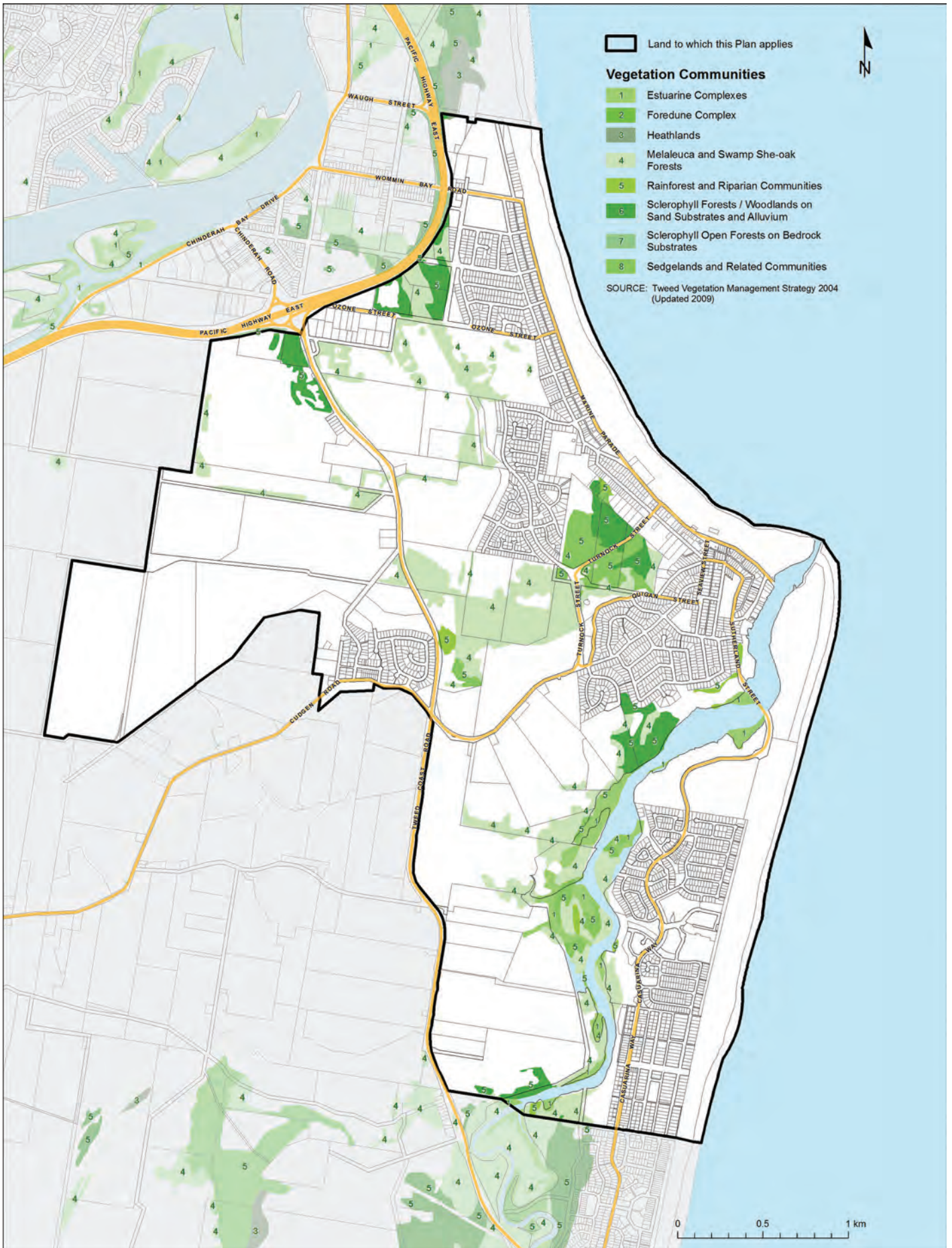


Figure 2.3 Vegetation communities

Tweed DCP A19 Biodiversity and Habitat Management

DCP A19 Biodiversity and Habitat Management was adopted to ensure that, subject to any relevant overarching state or commonwealth legislation, the planning and design of new development maintains or improves ecological values within Tweed Shire. All areas of native vegetation in the Kingscliff area are considered ecologically significant. Many of the greenfield development sites within Kingscliff may require some degree of native vegetation clearing. Dependent on the type and extent of clearing proposed, any development application which involves clearing will have thereby need to satisfy the provisions of DCP A19 and where relevant Biodiversity Conservation Act and Regulations.

Tweed Tree Preservation Order

As part of the process for Council's new Tweed Local Environmental Plan 2014 (gazetted 4 April 2014), Council also concurrently produced revised tree management planning controls, through the adoption of Tweed Development Control Plan Section A16 – Preservation of Trees or Vegetation. Due to the Department of Planning's environmental zone review, DCP A16 does not apply in areas identified as 'deferred matter'. In these areas, three Tree Preservation Orders (TPO), being Tree Preservation Order 1990, Tree Preservation Order 2004 and Tree Preservation Order 2011 as per TLEP 2000 currently apply. These TPOs provide criteria where vegetation removal is exempt, however outside of the set criteria, an application must be lodged with Council prior to works being undertaken. Further to this, depending on the zoning of the land, approval from the NSW Office of Environment and Heritage under the *Native Vegetation Act 2003* may be required.

2.4.1 Environmental protection issues

There is a currently a lack of connectivity between tracts ecologically significant lands. Further, there is a risk that some of this land may be further fragmented as a result of urban development. While some of the ecologically significant areas have been identified as 'deferred matters' reverting to the TLEP 2000 environmental protection land use zones, there are a number of ecologically significant areas that currently do not have an appropriate land use zone. Whilst a number of environmental flora and fauna surveys have been conducted over various sites over a long period of time, this information needs to be updated and synthesised to identify areas with a high conservation area as well as identify any data gaps which would require future survey work to be undertaken.

2.4.2 Environmental protection opportunities

There is an opportunity for the inclusion of additional lands for environmental protection following as part of the implementation of State Government's approach towards environmental zones. This will be complimented by more detailed flora and fauna studies over greenfield development sites to supplement and update existing vegetation mapping and surveys. This process is also likely to involve ground truthing and more detailed mapping to identify and define additional areas of ecological significance. This flora and fauna review process will then directly inform land use recommendations for additional environmental protection as well as identifying less constrained areas suitable for development.

2.4.3 Environmental protection strategies

1. Facilitate the protection and management of land identified as environmentally and/or ecologically important through appropriate land use zoning and provisions for ongoing habitat management.
2. Improve landscape connectivity, vegetation condition and habitat value through strategic location of potential future areas of environmental protection and habitat restoration.
3. Create strong north-south and east-west ecological links following the existing drainage line and establishing a continuous east-west ecological area (south of Turnock Street and future Turnock Street extension) and enhancing ecological areas along Cudgen Creek and across Lots 1 and 2 DP 1117599.



Figure 2.4 Opportunities to enhance environmental protection

2.5 Coastal management

The Kingscliff Coastline comprises a long east and north east facing sandy beach extending from Fingal Headland south to Sutherland Point where training walls define the Cudgen Creek opening. On the south side of the point and creek, the south east facing sandy beach extends south to Norries Headland.

The beach and estuarine areas of Kingscliff are key focal points for a range of social and recreational activities. Community feedback obtained within the community vision survey identified the beaches and estuarine areas as the most loved aspects of Kingscliff with the protection, access and ongoing management a high community priority.

Regionally, the Kingscliff to Dreamtime Beach embayment is part of a long coastal unit that has a continuous south to north longshore transport of sand extending from the Clarence River to Moreton Bay. This coastal unit has a series of controlling headlands past which the sand is moved by the prevailing waves. The volumes of sand movement along the coast can vary significantly and are dependent on a range of climatic, seasonal and storm based influences which can lead to either a recession or build up of sand on beaches.

The shape, in particular of the southern portion of Kingscliff Beach is north east facing which exposes the beach to significant erosive wave action from the north east experienced during the cyclonic period (November – April of any given year). This is exacerbated by the broken and narrowed dunal system, man made structures and built form in this location. Whilst the existing protective rock walls stabilise and anchor the alignment of the coastal edge in these locations, the resultant wave rebound and inability of the sand to be nourished by a dunal system can compound the erosive effects on the beach.

Similarly, as the area was historically extensively sand mined, cleared and being the subject of coastal urban development, the natural dunal systems particular to the south has been significantly altered. These factors, including a diminishing flow of sand from the south, provide for an estimated long term average recession rate of 0.15 m per year. In addition to this is beach recession of up to 90 m due to Sea Level Rise of by 2100.

2.5.1 Coastal management Issues

Kingscliff Beach has been subject to severe and continued erosion since a large storm in May 2009. The erosion was initially in the southern corner and at one stage threatened the structural integrity of the north training wall. Up to 40 to 60 m of vegetated dune were lost along a length of foreshore approximately 500 m long. A significant proportion of Faulks Park including part of a car park was lost. A protective seawall which was constructed immediately in front of the Cudgen Headland Surf Lifesaving Club in August 2010 prevented significant structural undermining of the building.

Figure 2.5 illustrates that the majority of Kingscliff's CBD lying within the 2100 and 2050 coastal hazard zones mapped as part of Tweed Shire Hazards Assessment 2014. The key implications will be how this hazard will be managed in terms of the future erosion risk on the coastal foreshore reserve, Kingscliff Beach Bowls Club, Cudgen Headland Surf Life Saving Club, Kingscliff Beach Holiday Park and the Kingscliff Town Centre whilst retaining access and a high level of amenity to the beach area.

Dreamtime – Kingscliff Beach Coastal Zone Management Plan (CZMP)

Council adopted the CZMP in May 2017 which is a major component of the Kingscliff Foreshore Masterplan adopted by Council in July 2007. The purpose of the CZMP is to investigate longer term solutions to addressing the imminent coastal hazard areas affecting three different precinct areas including Kingscliff beach and the adjoining town centre. The management plan identified a number of different options within a cost benefit framework to confirm a preferred risk management option for Kingscliff coastal protection. The preferred outcome for the town centre stretch of the beach included a combination of the seawall and sand nourishment whereas immediately north and south the management intent is to allow natural coastal process to occur with periodic small scale sand nourishment to repair erosion when needed. The plan includes funding opportunities for works required.

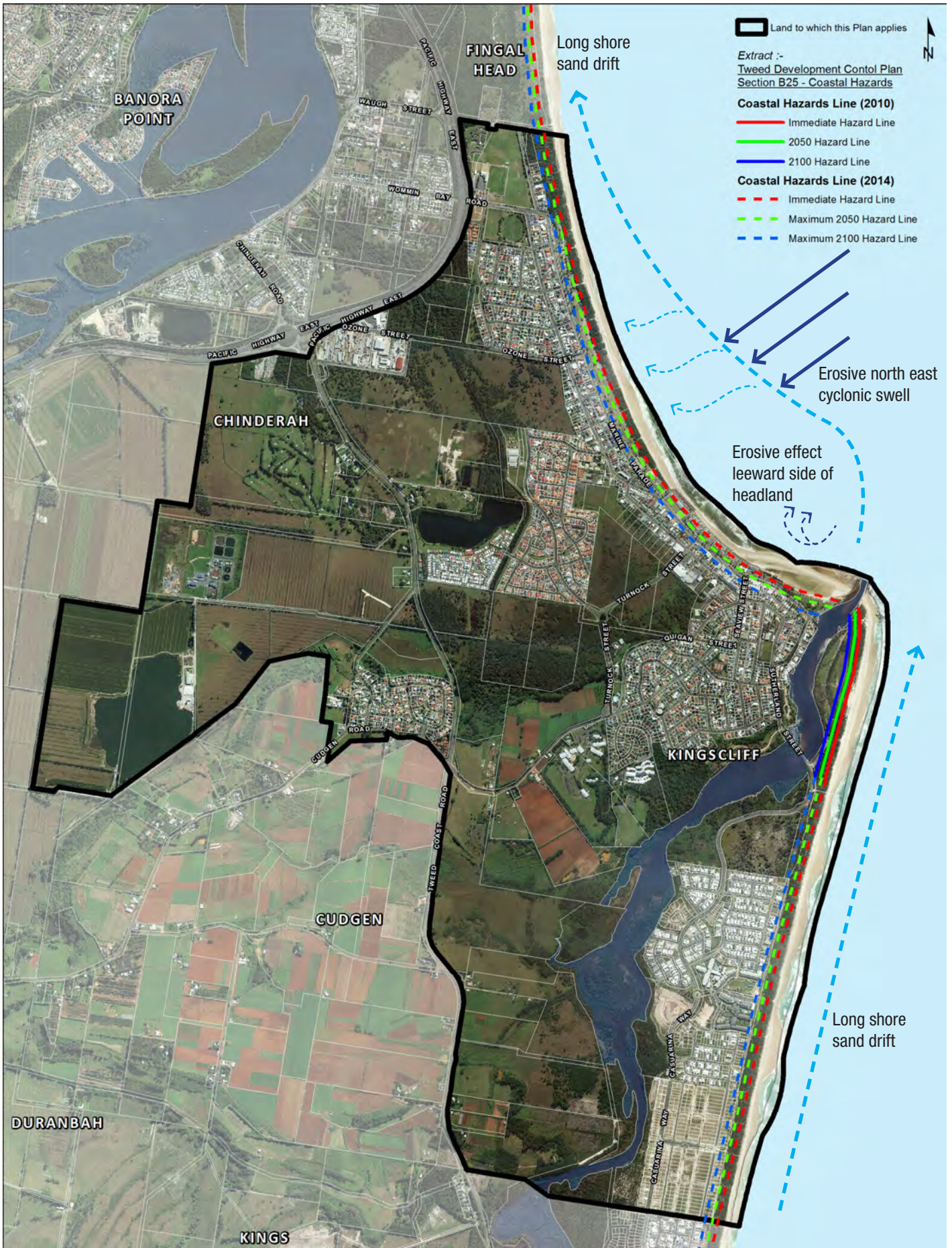


Figure 2.5 Coastal processes

2.5.2 Coastal and estuary management opportunities

- To implement the management intent and actions as defined within the Coastal Zone Management Plan. This included the construction of the protective seawall fronting Rowan Robinson Park and the Kingscliff holiday Park to prevent further significant storm and erosion events from damaging public assets on the Kingscliff Beach foreshore and the Kingscliff town centre in the long term.
- Given the important public interface between the town centre, Rowan Robinson Park, coastal reserve and the beach, it is important that any further future coastal hazard infrastructure works meet urban design, public domain as well as engineering objectives. Similar to the Kingscliff Foreshore Revitalisation Project there is an opportunity to include designed public domain elements improving access to the beach to other coastal foreshore and creek edge locations.

2.5.3 Coastal and estuary management strategies

1. Undertake associated coastal erosion measures as identified within the Coastal Zone Management Plan.
2. Support and, where appropriate, implement the land use strategies and management objectives within the Coastal Zone Management Plan within the coastal foreshore precinct plan contained within the KDCP.
3. Ensure any future coastal hazard protection works are designed to integrate quality public domain areas, pedestrian spaces and access to the beach.
4. Identify and build key pedestrian and swimming points of access to enable more universal, equitable and legible access to the coastal beaches and Cudgen Creek.



Kingscliff foreshore improvements has successfully integrated public domain, pedestrian spaces and beach access with coastal hazard protection measures.



The Kingscliff Coastline is highly valued by residents and tourists alike and is a key focal point for a range of social and recreational activities.



A storm in 2009 caused a significant erosion event along Kingscliff Beach.

2.6 Cudgen creek estuary management

The Cudgen Creek estuary is a 'drowned river valley' highly valued by the community and a focal point for recreation and tourism. There are significant reaches of estuarine wetlands along much of the length of the Cudgen Creek estuary including areas of significant mangroves, coastal wetlands, saltmarsh and seagrass which contribute strongly to its ecological significance (Figure 2.6). The Cudgen Creek entrance, located at Kingscliff, was modified by the construction of training walls in 1967 to maintain a constantly open system. The estuary water body is estimated to cover approximately 2.1 sq km with the catchment area covering approximately 67 sq km. In 2013, Council adopted the Coastal Zone Management Plan with the aim to guide future management of the Tweed Coast Estuaries and their catchments.

2.6.1 Estuary management issues

As identified within the Coastal Zone Management Plan for Tweed Coast Estuaries the major pressures acting upon the estuary include acid runoff from disturbed acid sulfate soils in the catchment above Cudgen Lake and entrance shoaling which inhibits navigation for recreational boating. Further, the Plan identifies existing and potential future pressures resulting from major urban and tourist developments at Casuarina Beach, SALT at South Kingscliff and the Kings Forest site to the south of the creek. Finally, the Plan considers bank and soil erosion from intensive vegetable growing area of Cudgen plateau.

Further to the above, the community vision survey and workshop identified user conflicts between swimmers, recreational fishermen and boat navigation near to the boat ramp and opportunity to relocate the boat ramp to the south side of the creek. Of particular note was the adjacency of fish cleaning facilities with the part of the creek which is popular with swimmers who use the boat ramp to gain access into the creek. The community is also aware that there are not enough formal or constructed creek access points, which leads to the proliferation of unformed tracks and bank erosion. Finally, there is a lack of universal access points to the creek. The area to the east of the boat ramp was generally identified by the community as presenting good opportunity to undertake pedestrian and creek access improvements.

2.6.2 Estuary management opportunities

As identified within the Coastal Zone Management Plan for Tweed Coast Estuaries the long-term vision for the Tweed Coast Estuaries is increased health and resilience of the Cudgen, Cudgera and Mooball Creek estuaries so that they respond naturally to pressures and impacts without requiring excessive management to protect the important values. Given the limited points of access, there is also opportunities to improve and rationalise access to the creeks edge for passive users. This includes the opportunity to improve the current conflict of users at the end of Marine Parade (south end), a popular spot for boat users, pedestrians, swimmers and fisherman to all converge.

2.6.3 Estuary management strategies

1. Support and, where appropriate, implement the land use strategies and management objectives within the Coastal Zone Management Plan for Tweed Coast Estuaries.
2. In consultation with Roads and Maritime Service initiate a Cudgen Creek Boating Area Plan to devise a long term strategy for boating to improving the safety for all users including consideration of alternate boat ramp, creek swimmer access locations.
3. Initiate a plan of management / design masterplan process measures to improve the usability and visual amenity of the creek foreshore area in proximity of the boat ramp. The plan of management / design masterplan process will investigate options to reduce conflicts between swimmers, recreational fishermen (including the fish cleaning area) and boat navigation and manoeuvring within proximity of the boat ramp and measures to improve access between Moss Street Park along the break wall towards the beach.

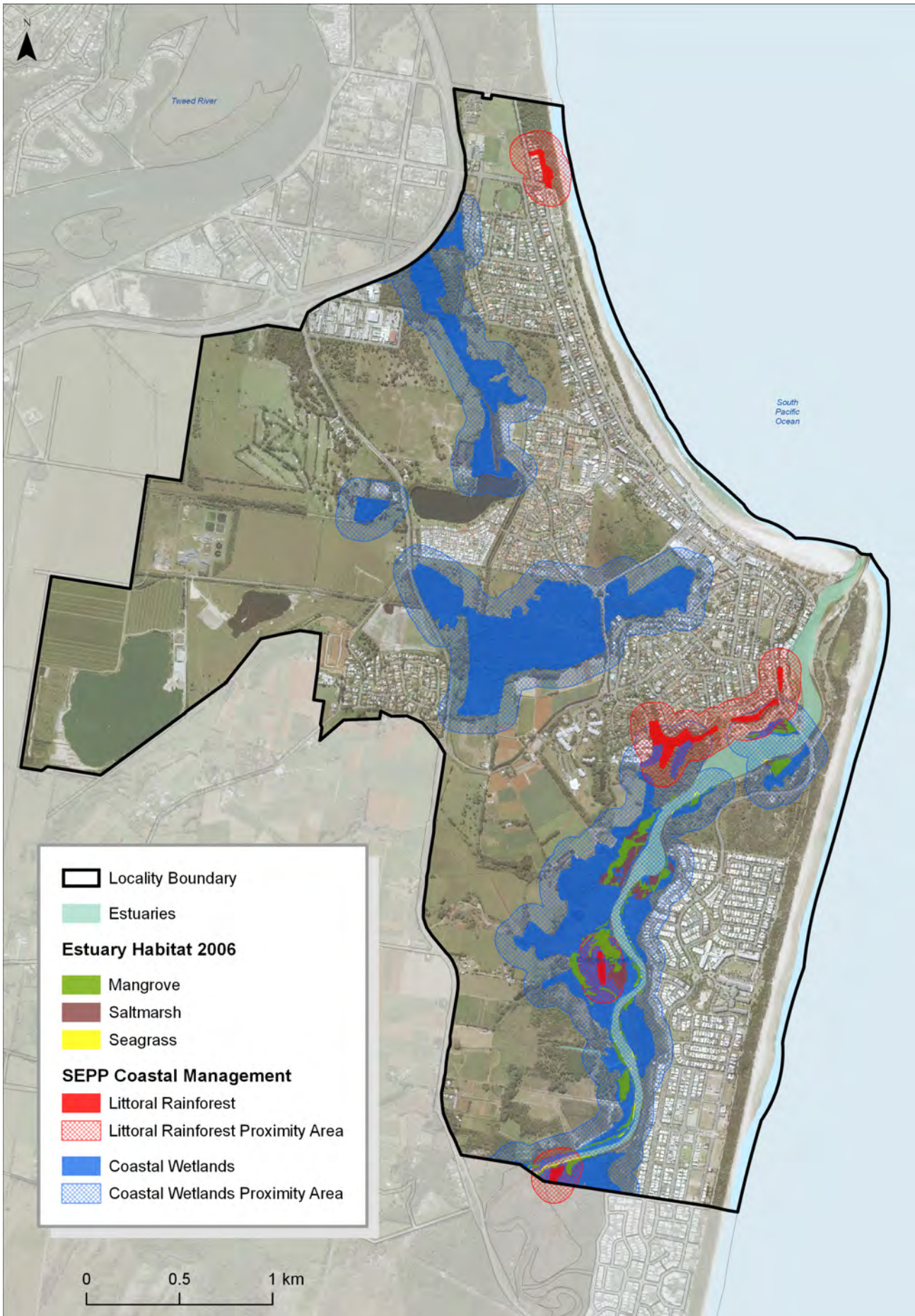


Figure 2.6 Estuary management

2.7 Flooding

The subject locality spans two separate floodplains, the Tweed River floodplain north of Cudgen, and Cudgen Creek to the south. The extent of flooding in the subject locality is illustrated on Figure 2.7 which is an extract from the 2009 Tweed Valley Flood Study Update and the 2010 Tweed-Byron Coastal Creeks Flood Study.

Much of the undeveloped area of Kingscliff north of Cudgen is flood liable including parts of the existing North Kingscliff Precinct. Flood behaviour and hazard varies across the floodplain. While flow velocities are typically low east of the Pacific Highway, flood depths can exceed 2m in the West Kingscliff. Flood depth reduces adjacent to the coast, due to the higher elevation of the coastal dune formation. This area, as well as previously filled urban land is above the 1% AEP flood level of 3.1 – 3.2 m AHD. However in extreme flood events approaching the probable maximum flood (PMF), much of Kingscliff with the exception of Kingscliff Hill and Cudgen is inundated, including breakouts through the coastal dune to the ocean.

Council has recently adopted the Tweed Valley Floodplain Risk Management Study and Plan (TVFRMS 2014, refer Section 8.4.2). This document provides the strategy by which Council will manage existing and future flood risk through a range of recommended options in the areas of flood modification (e.g. flood mitigation devices and engineering solutions), response modification (e.g. Improved emergency response planning in conjunction with the State Emergency Service), and property modification measures (e.g. development controls). Part A3 – Development of Flood Liable Land of the Tweed Development Control Plan 2008 sets the standard for development on flood liable land throughout the shire.

This approach ensures that only appropriate compatible development occurs on flood prone land in the future, by minimising future potential flood damage and ensuring safe occupation without undue reliance on emergency response agencies.

A similar Floodplain Risk Management Study has commenced for the Coastal Creeks, including Cudgen Creek. However as shown on Figure 2.7 existing and remaining development within the urban zoned parts of South Kingscliff and Casuarina has good flood immunity and limited flood constraints.

2.7.1 Flooding issues

The North Coast Regional Plan and Tweed Urban and Employment Land Release Strategy identify a large tract of land to the south of the existing Chinderah industrial estate as ‘employment lands’ and a tract of land to the west of the Kingscliff Town Centre (West Kingscliff) as proposed ‘future urban land release’ area which is identified as flood liable. The development potential of these identified sites will therefore need to be considered against implications of substantial filling which may in consequence lead to a number of other environmental, planning and urban design issues. The volume of bulk earthworks and filling also needs to be understood in the context of the locality's flood modelling scenario, as well as from an urban design, streetscape and visual amenity perspective.

The TVFRMS examined a range of possible filling scenarios in West Kingscliff and beyond, to assess the potential cumulative impacts of loss of flood storage due to filled development in this part of the floodplain. This loss of flood storage, if uncontrolled, has the potential to increase flood levels upstream, and increase flood velocities in the main river channel, as the floodplain experiences a significant constriction in width at Chinderah. Modelling of the fill scenarios has confirmed that the impacts of floodplain development (in terms of changes to flood depth and duration) remain within acceptable limits across adjacent urban and rural land, provided coverage of site filling is restricted to a maximum 65% in the Business and Innovation Precinct. 100% site filling is allowed for other residential zoned areas although impacts of fill on existing urban areas would need to be considered in more detail. Refinement of flood modelling for individual site impacts and stormwater management will still be required for future development applications.

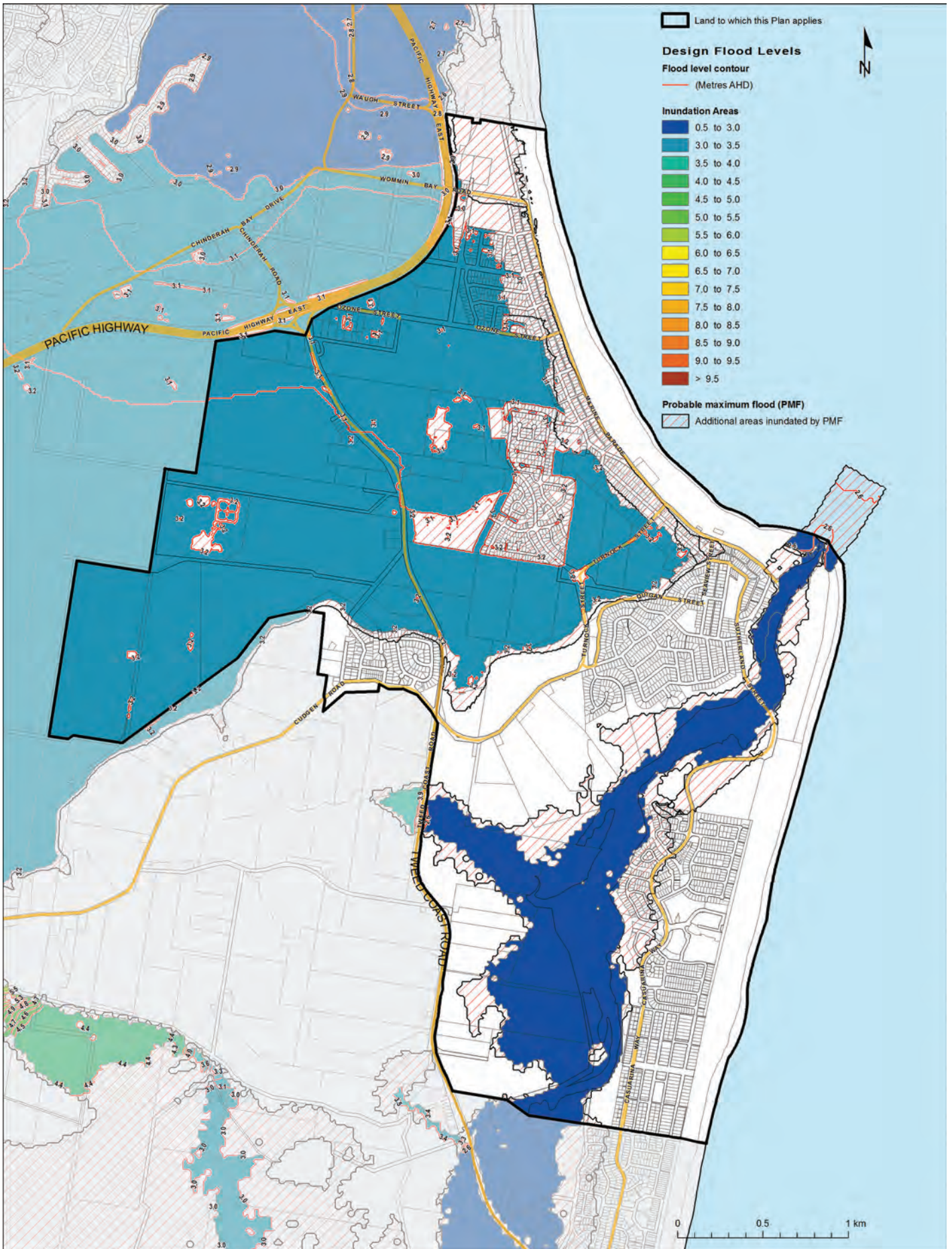


Figure 2.7 Flooding

2.7.2 Flooding opportunities

Whilst much of Kingscliff's Greenfield development sites are flood liable, there is opportunity to fill proportions of these sites to enable urban development.

DCP Part A5 – Subdivision Manual requires that greenfield urban release area be filled to a design flood level that incorporates a climate change allowance and be serviced by high level evacuation routes to land outside of the floodplain. This increases the long term flood resilience of these newer areas as well as reducing current flood risk to existing areas by extending flood evacuation routes.

There is also be a requirement that as existing development areas are renewed, new development will need to be constructed above the nominated design flood level.

2.7.3 Flooding strategies

1. Implement the recommendations of the Tweed Valley Floodplain Risk Management Study and Plan and development controls for urban subdivision, residential and commercial/industrial development in DCP Part A3 Development of Flood Liable Land and Part A5 Subdivision Manual.
2. Over greenfield development sites, developers/landowners are to initiate and fund site specific flood mitigation strategies which identifies lands to be filled, evacuation routes and location of surface drains as integrated with the road and open space structure/networks.
3. Consider the potential impacts of floodplain filling and flood resilient building design on town planning, urban design, and environmental values of the locality.
4. Continue to liaise with State Emergency Services regarding flood emergency response and evacuation plans. Investigate opportunities for emergency response support and/or evacuation facilities within the Kingscliff locality during flood and other emergencies including identification of appropriate operational sites and emergency accommodation venues.



Major flood event in Kingscliff, March 2017

2.8 Drainage

Figure 2.8 illustrates the Kingscliff drainage catchment which covers approximately 500 hectares taking in Salt and Seaside precincts to the south and extending north to Chinderah where a drain discharges into the Tweed River south of Barney's Point.

The general drainage flows relate to the locality's topography with the dominant Kingscliff ridge line defining the northern and southern watersheds. On the northern side of the Kingscliff ridge line, surface water moves into an east west drain running parallel to Turnock Street before merging and travelling along an open northern drain which runs parallel to Elrond Drive, across the open North Kingscliff site, under the Pacific Highway before draining into the Tweed River at Chinderah. East of the Tweed Coast Road, drainage channels direct overland water past the sewerage treatment plant, and then north before being discharged into the Tweed River. Overland flow paths south of Kingscliff ridge line drain into Cudgen Creek. Due to the predominantly sand subsurface of Salt and Seaside estates, storm water drainage generally infiltrates into the ground with some discharge points into Cudgen Creek.

The Kingscliff Catchment and Drainage Management Plan (KCDMP) was prepared to provide a technical analysis to aid the management of development within the Kingscliff drainage catchment and its impact on the local environment.

2.8.1 Drainage issues

One of the emerging issues is acid sulfate soil discharge events into the Tweed River which can lead to a decline in river ecology health including potential for fish kills and damage to seagrass communities. In the context of increasing development pressure, this issue is likely to be exacerbated. In terms of drainage management future development needs to take into account the Catchment and Drainage Management Plan for the purpose of storm water and runoff management. Any changes within the Kingscliff Drain catchment area needs to ensure that future development does not have a detrimental impact on the receiving environment, from the perspective of intrinsic value and amenity. It is also important that problem drains are redesigned and reworked to mitigate the impacts of acid sulphate soils. One identified issue is storm water flows across the Tweed Coast Road north of its intersection with Cudgen Road.

2.8.2 Drainage opportunities

Given the significant existing and future development in and around the study area, there is opportunity to update the KCDMP and investigate alternate options in terms of the longer term storm water drainage infrastructure requirements, water treatment and management strategies. This may include the implementation of a wider north-south drainage corridor which would have the benefit of restoring a marine vegetative environment to treat receiving water, addressing potential acid sulfate soil issues as well as providing a linear open space area and passive movement corridor. It is particularly important at the masterplanning level to implement the principles of water sensitive urban design and on-site water treatment and reuse systems over future development sites.

2.8.3 Drainage strategies

1. Update the KCDMP to take account of potential development scenario's and implement a more holistic and water sensitive urban design approach to managing storm water drainage. This would include revisiting preferred design of key drainage corridors, particularly in dealing with potential acid sulfate soil issues.
2. Require the application of water sensitive urban design treatments over greenfield development sites within early phases of site structure planning and design development.

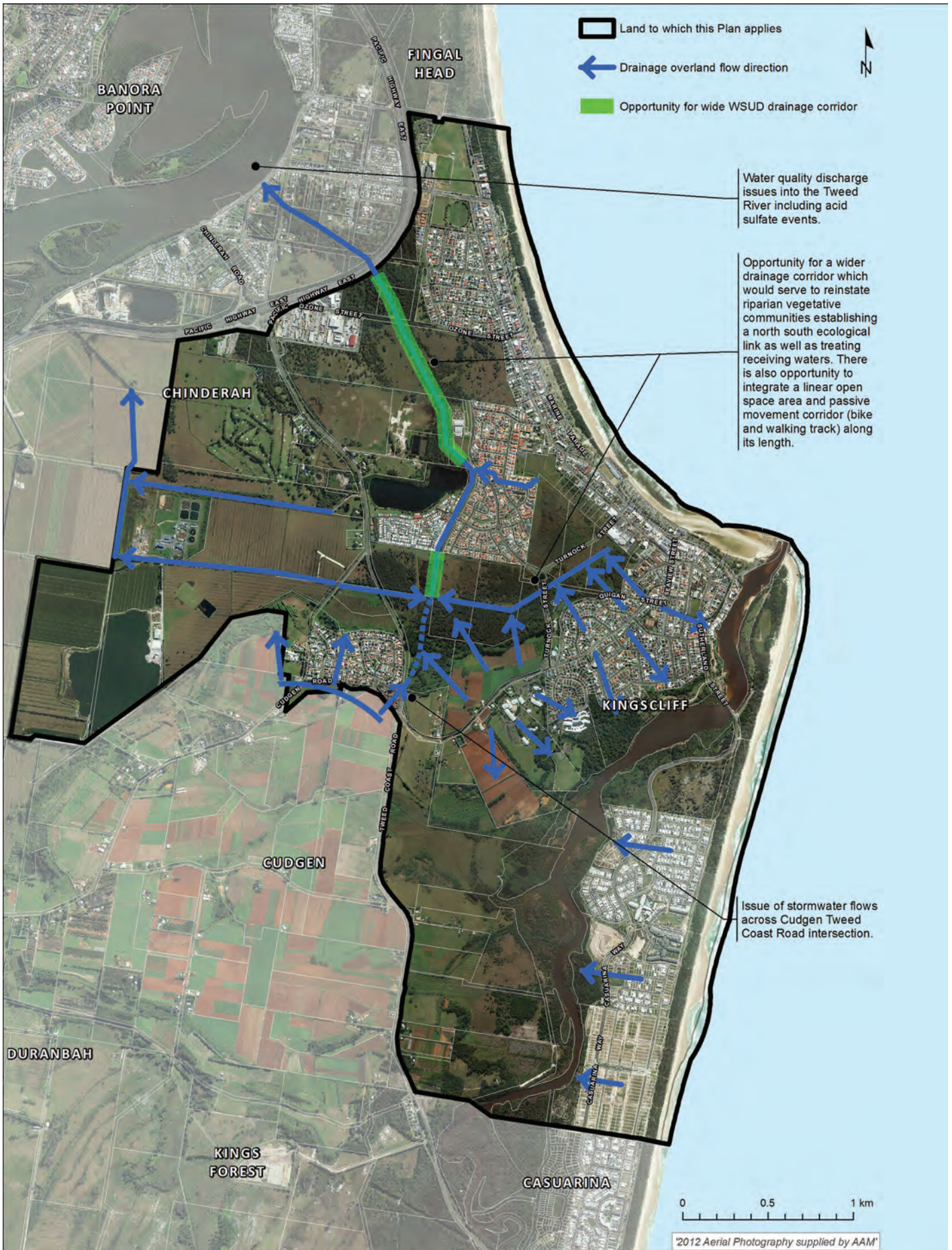


Figure 2.8 Drainage

2.9 Acid sulfate soils

In the Tweed acid sulfate soils (ASS) are common throughout the coastal floodplain which has historically been disturbed agricultural activities. Figure 2.9 illustrates the extent and classes of ASS which can be found within the locality. The most at risk areas are the lower lying greenfield areas north and west of the town centre because of the proximity of potential ASS to the ground surface.

The residential areas located off Elrond Drive have been filled thereby negating ASS disturbance risk. The low lying undeveloped greenfield development sites within the Turnock Street Precinct and North Kingscliff pose a similar ASS risk, but are likely to be similarly filled above design flood levels thereby mitigating potential impacts.

2.9.1 Acid sulfate soils issues

Drainage, excavation and dewatering of these soils exposes the iron sulfide layers to air resulting in the formation of sulfuric acid. The concentrated acid can overwhelm the stream's capacity to neutralise it resulting in adverse effects to the health of fish and other organisms in downstream aquatic environments. There are recorded instances of ASS discharges into the Tweed River via drainage channels. The most significant ASS issues originate in the floodplain to the west of Cudgen Lake causing poor water quality and fish kills in Cudgen Lake but also the Cudgen Creek estuary from time to time.

2.9.2 Acid sulfate soils opportunities

Disturbance of potential acid sulfate soils may be required for activities such as construction works and agriculture. Various management techniques exist for dealing with acid sulfate soil disturbance in order to minimise the release of pollutants to the environment. Within a construction context potential impacts from foundations and basement excavations may be mitigated to a large extent by the requirement to fill development sites above the design flood level.

Future development within the Kingscliff locality provides significant opportunity for a more holistic management strategy for the treatment of water quality and stormwater management. This would include identifying and managing longer term localised acid sulfate soil issues in co-ordination with a review of the Kingscliff Drainage Catchment Management Plan including high risk acid sulfate soil areas further up the catchment.

2.9.3 Acid sulfate soils strategies

1. Avoid disturbance of acid sulfate soils.
2. Continue to manage works affecting acid sulfate soil liable lands through the existing legislative requirements under Part 7.1 of the Tweed LEP 2014.
3. Design key drainage corridors to reduce and mitigate ASS impacts.
4. Address ASS issues west of Cudgen Lake through targeted remediation activities.
5. Undertake studies to further understand the mechanisms for existing ASS discharge events that result in significant iron floc discharges within the Kingscliff drain and the Tweed River. Further studies will be used to inform remedial actions and future works required to address chronic ASS issues in the Kingscliff Drain.

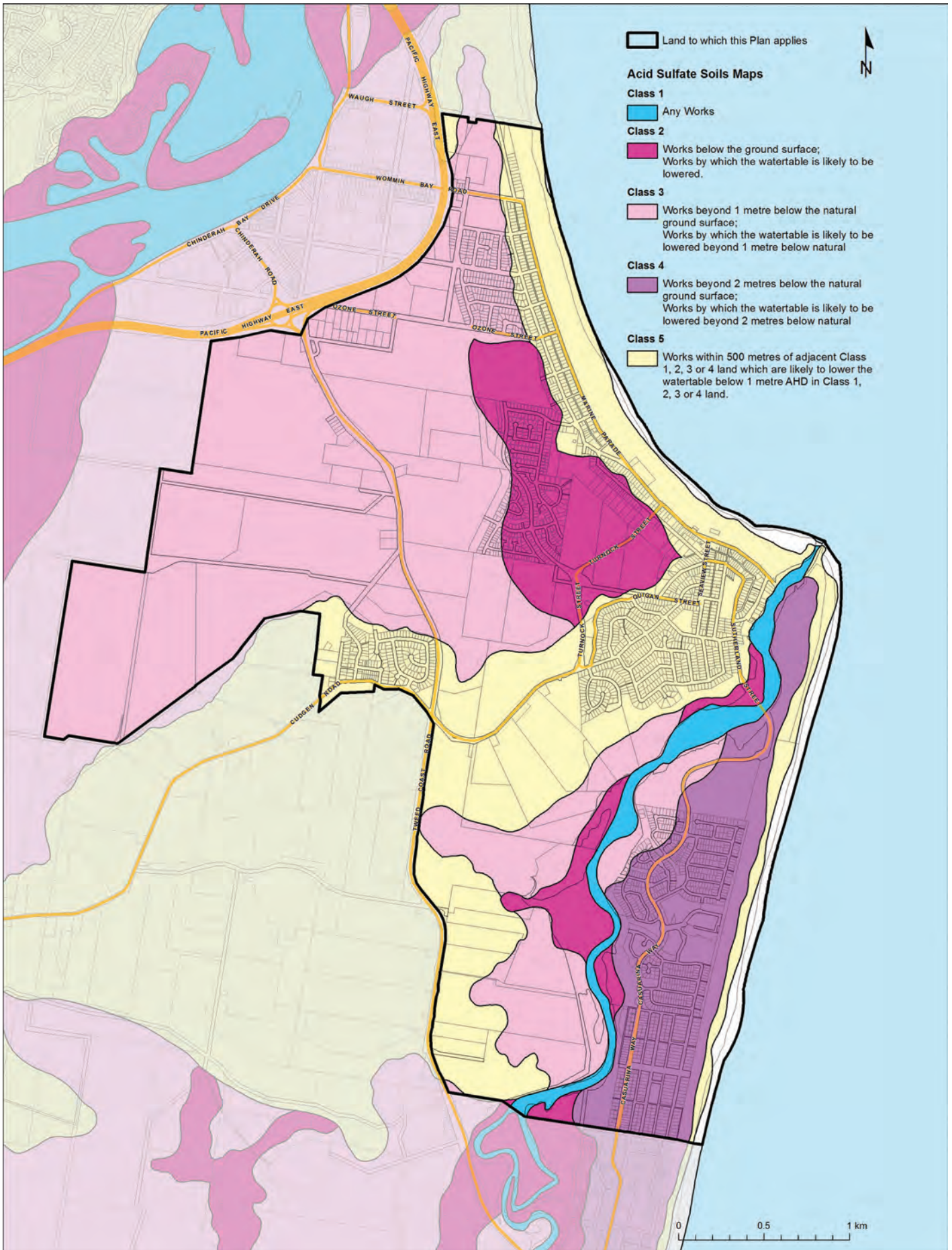


Figure 2.9 Acid sulphate soils

2.10 Topography and slope

The dominant topographic characteristic of the locality is the defined Kingscliff hill ridgeline linking the Cudgen Plateau from the west to Sutherland Point in the east. The ridgeline slopes north towards the flatter low lands within proximity of Turnock Street and south towards Cudgen Creek. The elevations of the locality range from 0 – 2 m along the coastal flats which includes the majority of the Kingscliff settlement and the south Kingscliff settlements of Salt and Seaside up to 50 m along parts of the Kingscliff Hill ridgeline within proximity of McPhail Street. The Cudgen Plateau has an elevation of between 20 – 40 m.

The elevated Kingscliff Hill provides for important regional panoramic views north towards Fingal Head and Cook Island, north west towards the Terranora Ridgeline, West and South West towards Wollumbin and the border ranges and south towards Cabarita Headland. These views are experienced from a number of different vantage points. Similarly, views back to Kingscliff Hill, which forms the backdrop to the town centre and the creek are experienced from various key vantage points around the locality. Coupled with the topographic elevation and dominant ridgeline are small valleys forming drainage paths perpendicular to the ridge line heading south to Cudgen Creek and north towards Tweed River via drainage channels.

2.10.1 Topography and slope issues

Given the highly visible ridgeline, it is important to understand the potential visual impacts from development on elevated parcels. View sharing and potential impacts to important view fields need to be considered as part of the merits assessment processes. Particularly on sloping sites, there is also a potential risk of development without appropriate consideration of the sloping conditions, leading to substantial visual impacts. Excessive cut, fill and high retaining walls can undermine streetscape character and visual amenity as well as disrupting natural landform.

2.10.2 Topography and slope opportunities

- Maintain the integrity of ridge lines, valleys and natural topographic features as an important part of the locality's character.
- Promote subdivision, building design and structural systems which are compatible with the landform with streets that take advantage of view lines and aspect.
- Understand the design relationship of slopes to appropriate construction type to minimise cut and fill and relationships of slope design considerations.
- The watercourses and vegetated drainage lines running through the locality could provide excellent visual, recreational, educational and environmental preservation opportunities and should be integrated with opportunity for pedestrian links between.

2.10.3 Topography and slope strategies

1. Ridgelines, valleys, watercourses and natural topographic should be conserved for the role that they play in adding to the sense of place, landscape and visual character within Kingscliff and Cudgen locality's.
2. Urban structure and subdivision layout of new greenfield areas to be designed in harmony with the topography to avoid large un-landscaped batters and retaining walls for the purpose of creating flood free land or terraced lots on sloping sites.
3. Require slope responsive house design including the use of appropriate structural systems on sloping allotments to minimise excessive cut, fill and retaining walls and thereby mitigate potential amenity and localised stormwater drainage impacts.
4. Integrate a north-south and east-west open space/pedestrian and cycle corridor following the dominant drainage lines.

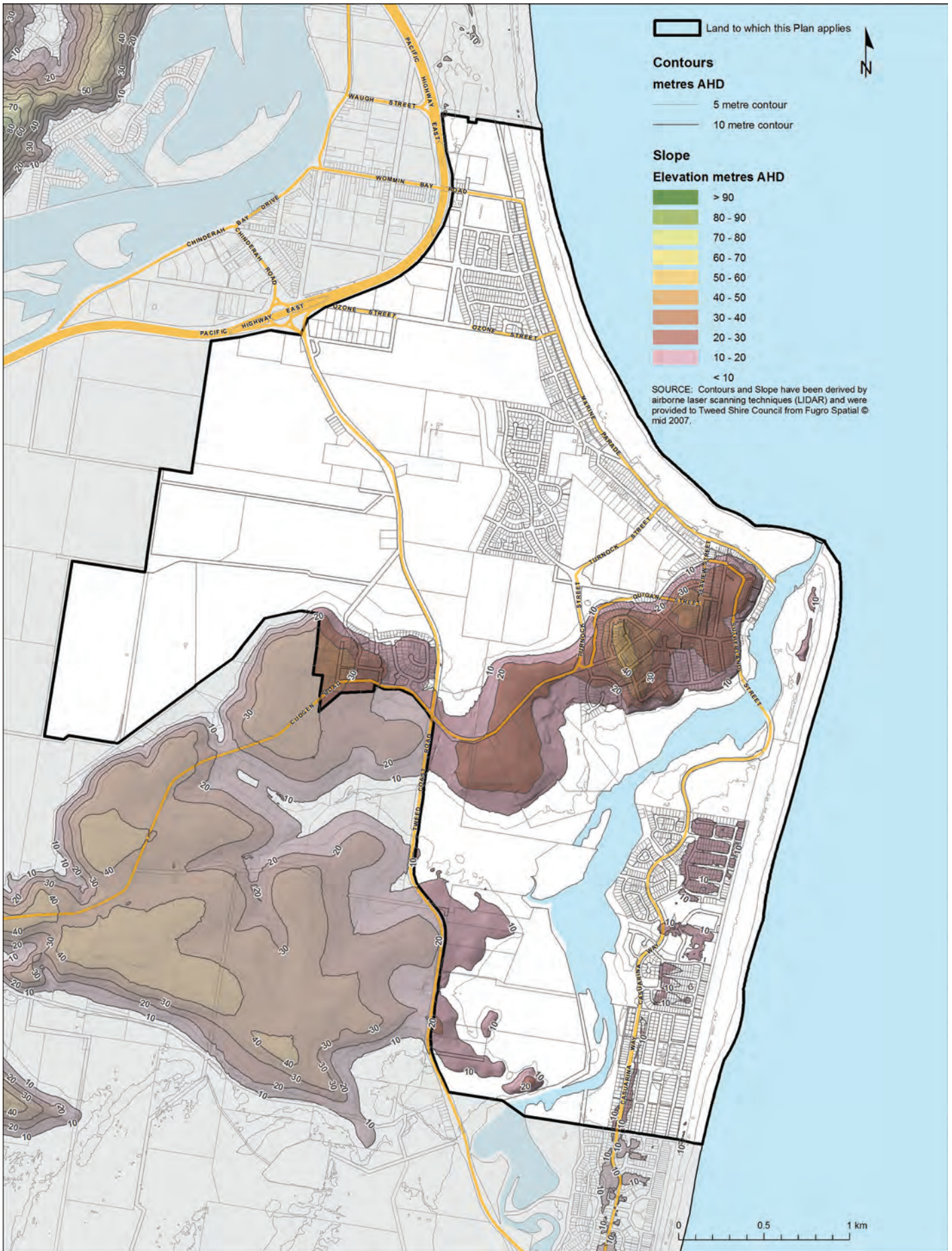


Figure 2.10 Topography and slope

2.11 Views and scenic protection

Part of the defining landscape and visual character of Kingscliff and Cudgen is the high quality scenic landscape characteristics including coastal, estuarine and hinterland view fields which can be experienced from multiple public vantages around the locality. Preserving the visual character was a theme expressed strongly through the community consultation processes with respondents listing the beach, creek, bushland areas as their most valued parts of Kingscliff. These key view fields identified in Figure 2.11 and some of the defining landscape characteristics including:

- Dominant ridge line from Cudgen Plateau to Cudgen Creek and Sunderland Point.
- Agricultural, farmland and hinterland views experienced heading north and south along Tweed Coast Road and East and west along Cudgen Road.
- Elevated north and east elevated views from various aspects on Kingscliff Hill to Fingal Headland, Cook Island and the Pacific Ocean.
- Elevated west and south west elevated views from various aspects on Kingscliff Hill to Cabarita Headland and west around to Mt Warning and the border ranges.
- North and South Coastal views experienced from the beaches, coastal foreshore areas and break walls.
- Views along the creek line (east and west).
- Long views north towards the Terranora ridge and west towards the Border Ranges and undulating hinterland.
- Green break or vegetated buffer (Lot 1 and 2 DP 1117599) between the northern extents of Salt and the Cudgen Creek Bridge.
- Large street trees including the town centre Fig Trees which contribute significantly to the landscape character.

2.11.1 Views and scenic protection issues

Some of the locality's best views are experienced from the highest points of Kingscliff Hill with many experienced from private properties. Maintaining key view lines from private residences has been an ongoing issue in the context of site redevelopment resulting in typically larger replacement development and view loss experienced from existing dwellings predominately experienced within the Kingscliff Hill precinct. It is important that these key vantage points and identified view fields from public areas are not obstructed by future development. It is also important that design principles which identify view sharing principles are applied to new development on Kingscliff Hill.

View loss planning principle

In consideration of the issue of view sharing and view loss, four key planning principle assessment steps established from the Land and Environment Court case *Tenacity Consulting v Warringah Council* (2004) NSWLEC 140 relating to view loss and are a relevant point of reference. These four points include:

Step one: An assessment of the value of views to be affected by reference to their nature, extent and completeness.

Step two: A consideration of how views are obtained and what part of the property the views are obtained from.

Step three: A qualitative assessment of the extent of the impact in terms of severity particularly as to whether that impact is negligible minor, moderate, severe or devastating.

Step four: An assessment of the reasonableness of the proposal causing the impact particularly in terms of compliance with applicable planning controls and whether a different or complying design must produce a better result.

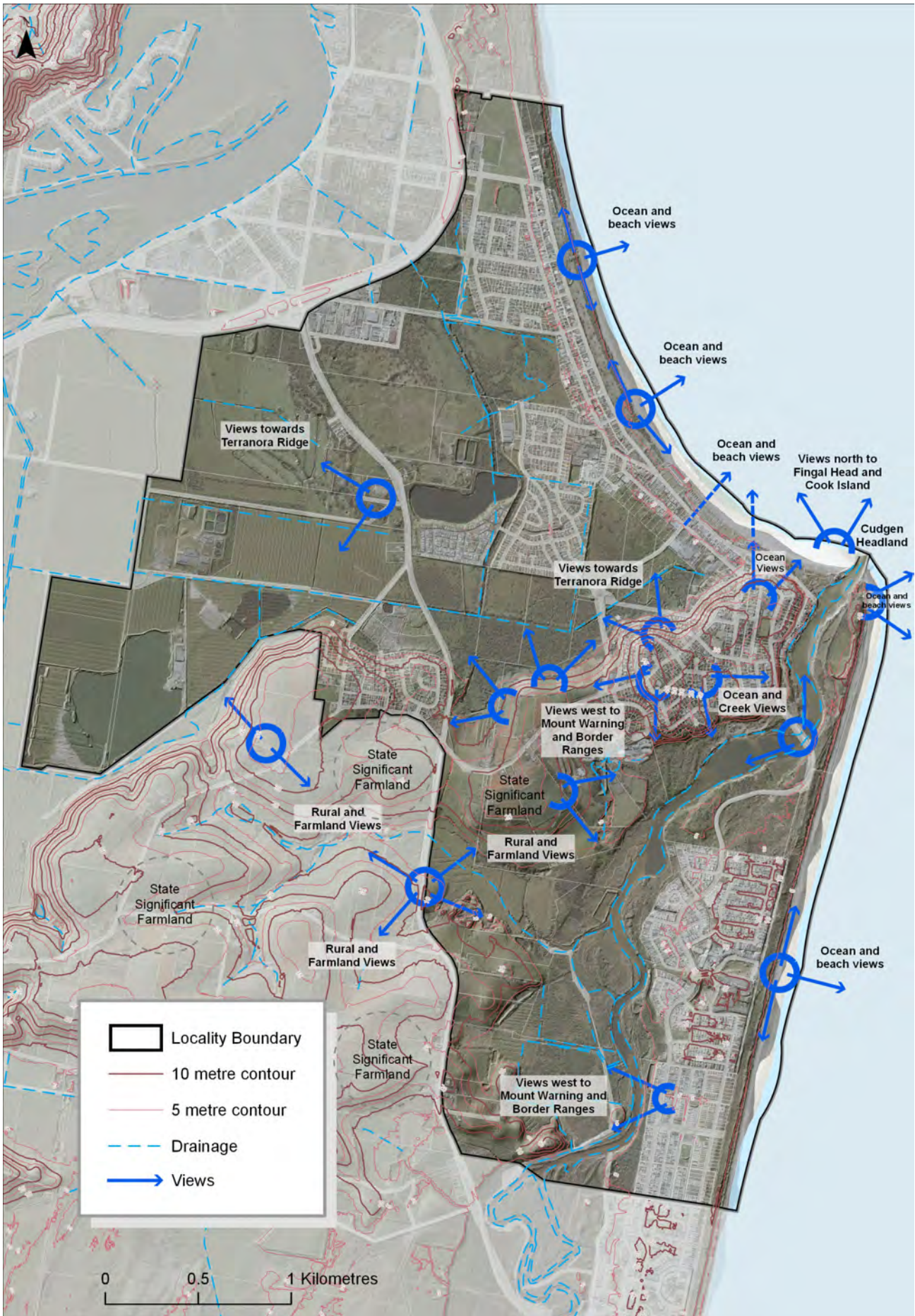


Figure 2.11 Key views

2.11.2 Views and scenic protection opportunities

As derived from the community consultation processes, the scenic management for Kingscliff should maintain the natural setting of the Cudgen Creek and coastal areas as a priority given that these elements largely underpin the visual and landscape character of the area. For many residents, it is these coastal and estuarine landscapes which attracted them to live within the area and as such are deeply embedded with their lifestyle and sense of place. Similarly, residents who have purchased properties that enjoy views are generally fiercely protective of maintaining them.

As such there is an opportunity to identify the key views as experienced from public vantage points within the locality and implement a set of planning controls to maintain this scenic protection. This scenic protection set of guidelines and controls should seek to:

- Retain and enhance key visual character components.
- Realise and retain key visual character components of the site through a contemporary urban structure and built form.
- Provide view sharing and maintenance of view fields.
- Maintain important regional and local views.
- Preserve the visual amenity of and within the site.

Similarly, there is opportunity to implement a set of guidelines and controls which seek to address view sharing from private properties. These guidelines should include:

- Criteria which establishes principles views and the value of those views;
- Consideration of how views are obtained;
- A qualitative assessment of potential for view impact; and
- Measures to assess reasonableness and how impacts could reduced and or mitigated.

2.11.3 Views and scenic protection strategies

1. Ensure key vantage points and identified view fields from public areas are not obstructed by future development.
2. Identifying the key view fields and landscape elements which require protection and careful management within precinct plans within the KDCP and as identified within the Scenic Landscape Strategy.
3. Supplement this view field analysis with key visual and landscape character descriptions, view field development criteria and development controls aimed at protecting the view fields.
4. Provide controls within identified key view field areas requiring development applicants to prepare a visual impact assessment as part of a development application. The visual analysis should address:
 - Four planning principle criteria.
 - Where appropriate prepare visualisations of the development by way of 3D photo montage from key surrounding vantage points around the site.
 - Provide an assessment of the likely visual and scenic impact.
5. Retain remnant vegetation across farmland including existing paddock as windbreaks and as an important elements of the rural landscape and scenic value character.



Elevated views from Kingscliff hill looking south to Cabarita Headland and Cape Byron beyond.



Elevated north and north east views from Kingscliff Hill towards Fingal Headland and Cook Island.



The rural areas of Cudgen and along Tweed Coast Road reinforces the visual character of the urban settlement being surrounded by natural areas and farmland. Sand extraction resulting in a man made waterway in the foreground.



A number of vantages from the creek edge including the bridge offer distant views to Mt Warning and the border ranges which underpins the locality's strong visual and landscape character.



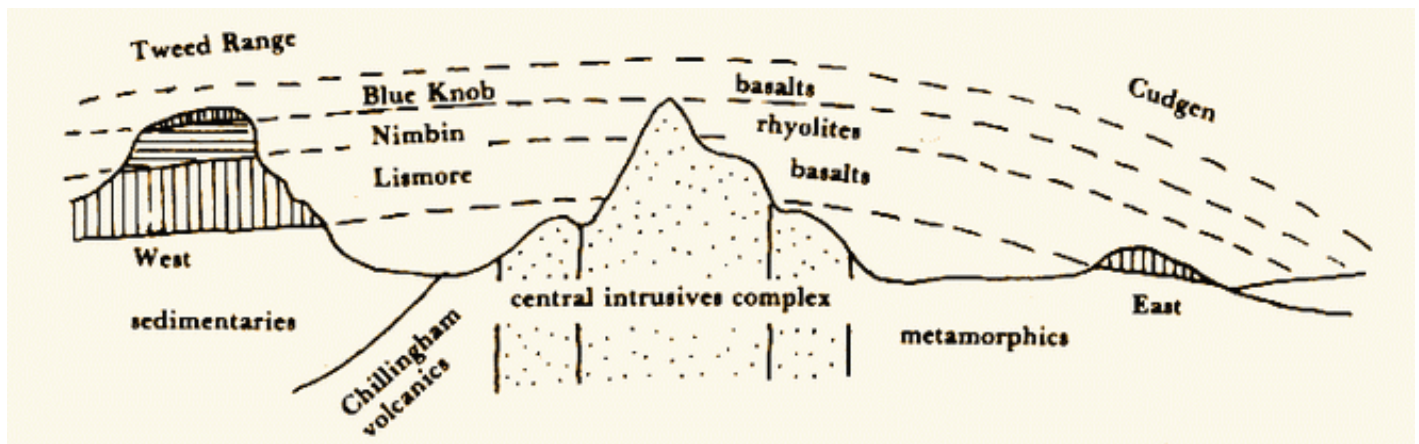
With the town centre directly adjoining the coastal zone, there is a strong visual connection and association with the beach and creek.



Key landscape elements such as the town centre Fig Tree contribute significantly to the overall landscape and scenic amenity of the locality.

2.12 Geomorphology and soil stability

The geomorphology of the Tweed valley is dominated by the remains of the Wollumbin (Mount Warning) shield volcano with the eroded Wollumbin (Mount Warning) central core now approximately 1157m high. The remnants of the outer shield include the Nightcap Range to the south, the Tweed Range to the west and the MacPherson Range to the north.



The geology of the coastal section of the Tweed LGA (the study area) includes:

- Greywacke, slate, phyllite and quartzite of the Neranleigh-Fernvale Group metamorphics which predominate across the erosional upland landscapes of the study area;
- River gravels, alluvium, sands and clay of Quaternary/Pleistocene origin on the floodplains and depressions;
- Quaternary beach and dune sands along the coastal strip; and
- Localised areas of remnant basaltic material associated with the Lamington Volcanics in the Terranora, North Tumbulgum, Cudgen, Clothiers Creek and Farrants Hill areas.

Fertile soils and a favourable subtropical climate produce a diversity of agricultural landscapes in the Kingscliff/Cudgen locality with the rich red volcanic soils of the Cudgen-Duranbah plateau enable intensive horticulture production and the floodplains support sugar cane plantations.

2.12.1 Geomorphology and soil issues

As documented within 'Soil Landscapes of Murwillumbah-Tweed Heads, topsoil erosion is a serious problem in Cudgen area (Cole-Clark 1993). Sheet and rill erosion were also observed as part of that soil landscape survey.

2.12.2 Geomorphology and soil opportunities

Sound understanding of geomorphology in the local context facilitates a sustainable approach to planning and land management solutions. The fertile Cudgen plateau soils offer an opportunity for sustainable farming with reduced reliance on costly fertilisers and pesticides.

2.12.3 Geomorphology and soil strategies

1. Support adoption of better on-farm management practices and safeguards that reduce soil erosion and improve soil structure and stability.
2. Surface features such as rock faces and steep slopes to be incorporated wherever possible into the planned development of a site to add to its unique sense of place.

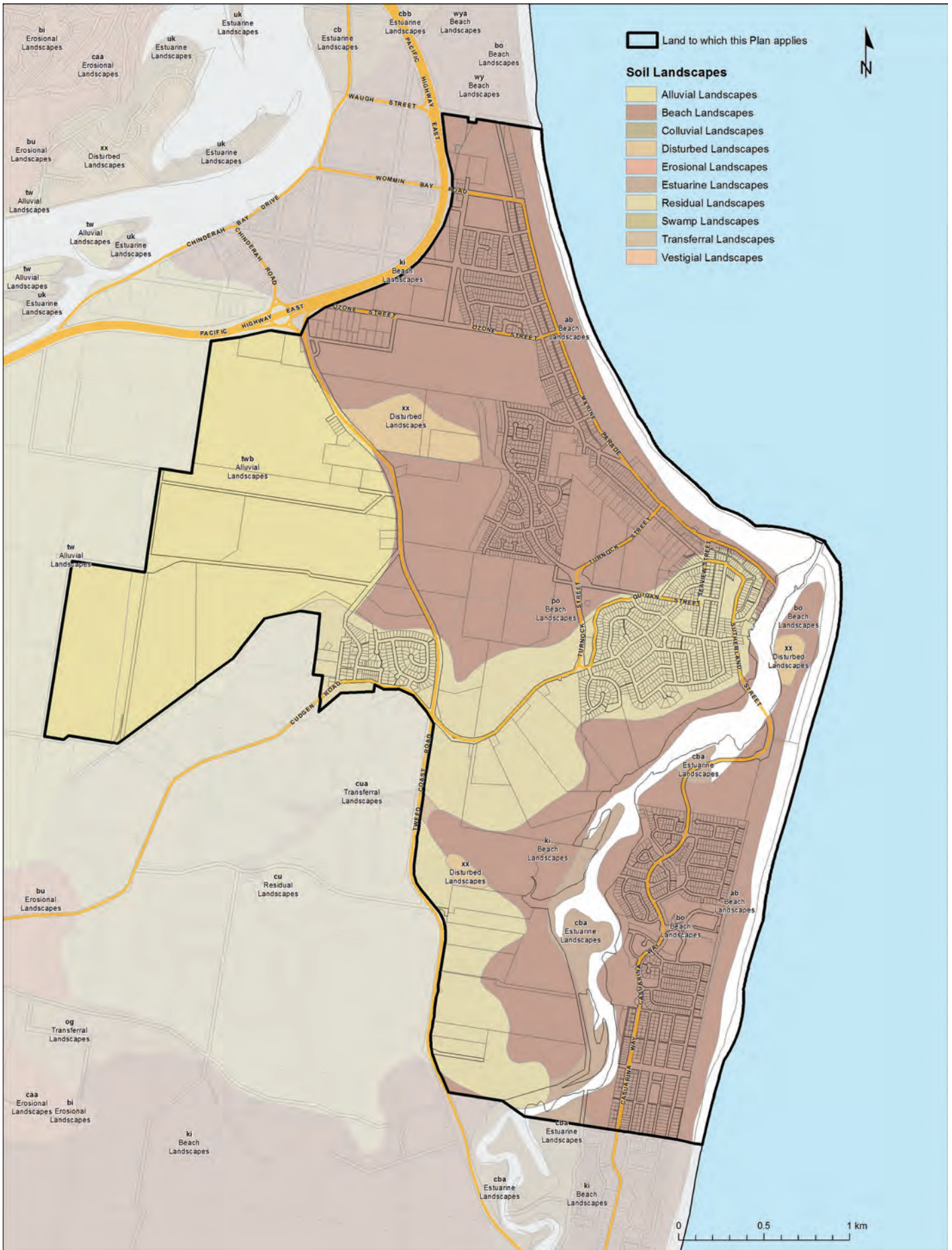


Figure 2.12 Geomorphology and soil stability

2.13 State significant farmland

The Cudgen Plateau is one of the key agricultural areas of the Tweed Shire with good soils (Krasnozems CU1 – Red self mulching light clay topsoil and subsoil – Ap and B Horizons) facilitating the farming of vegetables including sweet potatoes, tomatoes, zucchini, sweet corn, cucumbers, peas and beans and tropical fruits including avocados, bananas, custard apples and mangoes.

The high fertility of the soils inland from Kingscliff (Cudgen) has been recognised through the Northern Rivers Farmland Protection Project 2005. In result a significant portion of the Cudgen locality and a portion of land east of the Tweed Coast Road were classified as 'state significant farmland'. The Farmland Protection Project also identified a large area of 'regionally significant farmland' located inland from Kingscliff, to the western side of the Tweed Coast Road.

Under the NSW planning system, the state and/or regionally significant farmland is protected through the Ministerial Direction provided under s.9.1 of the *Environmental Planning and Assessment Act 1979*. The early version of the Ministerial Direction stated that such land shall not be rezoned for urban or residential purposes. This provision was slightly amended following the adoption of the North Coast Regional Plan 2036 which introduced farmland variation criteria in recognition of the need to update and review the consistency, methodology and application of the Northern Rivers Farmland Protection Project (2005). Pending the completion of the review the interim important farmland variation criteria is used to assess the suitability of pockets of important farmland, which are deemed not suitable for agricultural production, for non-agricultural land use.

2.13.1 State significant farmland issues

Agriculture is a major land use adjacent to the locality. Whilst state and regionally significant farmland is protected by the s.9.1 Ministerial Direction and generally cannot be considered for urban or rural residential rezoning, there is continued pressure from some landowners to pursue alternate land uses to agriculture. This position is often argued on the basis of affected land not being productive. One key land use issue is urban development on the interface with state significant farmland. Without the appropriate buffers it is this interface issue which has the potential to significantly impact farming practices.

2.13.2 State significant farmland opportunities

In alignment with the prevailing s.9.1 Ministerial Direction the KLP&DCP does not nominate any lands within the study area that are designated state or regionally significant farmland land for urban or rural residential purposes.

Community feedback across various community consultation processes indicated the retention of farmland of state and regional significance is a key priority; noted as being important for the local economy and local landscape character. The retention of state and regional farmland has also been a clear position held by elected Council most notably expressed during the Tweed Valley Hospital site selection process and subsequent State Significant Development Application processes.

There is also opportunity assist farmers to be more sustainable, promote value adding agricultural enterprises including agri-tourism and provide the necessary buffers to allow them to continue their operations without conflict from adjoining land uses.

2.13.3 State significant farmland strategies

1. Reinforce the s.9.1 Ministerial Farmland Protection Direction by retain the rural zoning and agricultural primacy of these agricultural land holdings.
2. Support the Rural Land Strategy outcomes including the application of appropriate interface buffers between urban development and state significant farmland and other farmland to negate impacts on farming practices.
3. Support the farming community to adopt sustainable agriculture practices that increase productivity, reduce the loss of topsoil and better utilise natural processes for pest and disease control and nutrient cycling.

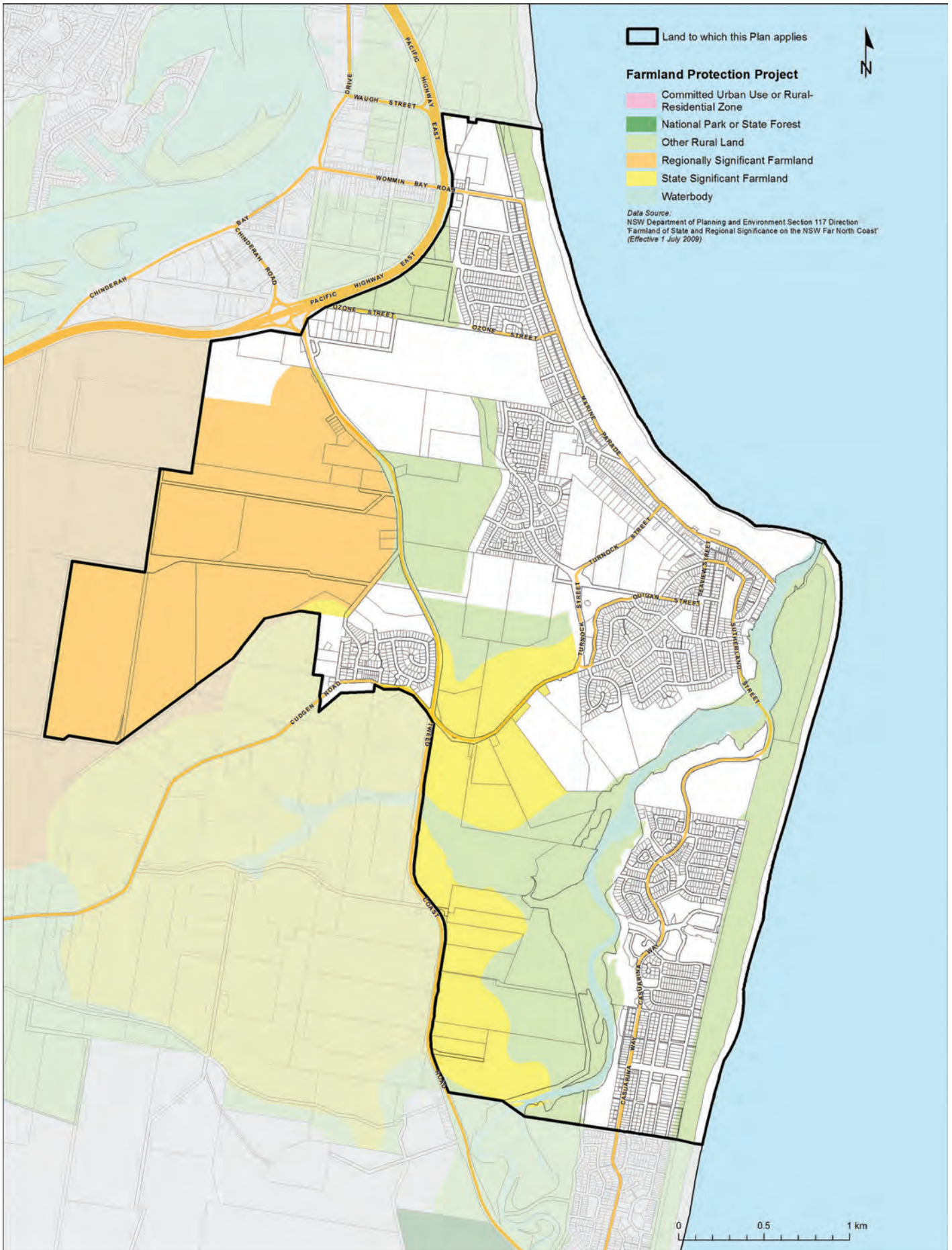


Figure 2.13 State significant farmland

2.14 Conservation and Developable Footprints

2.14.1 Constrained lands

Figure 2.14 provides an overlay of the combined land constraints, which by a process exclusion provides an indication of the availability of developable land. The key development constraints include:

- Ecologically significant land (Figure 2.0).
- Threatened flora and fauna (Figure 2.1).
- Koala habitat (Figure 2.2).
- Vegetation communities (Figure 2.3).
- Flood liable land (Figure 2.7).
- Acid sulfate soil (Figure 2.9).
- State significant farmland (Figure 2.13).

Most of Kingscliff's greenfield development sites have multiple defined land constraints. It is important to recognise that not all environmental constraints are totally incompatible with urban development. For example the presence of Acid Sulfate Soil (ASS) may not preclude urban development providing appropriate development controls are implemented. Similarly, flood risk can be addressed by filling in some cases. On the other hand the retention of ecologically significant areas or State significant farmland is not compatible with urban development; these constraints need to be excluded from the development footprint if their values are to be retained.

Whilst a desktop literature review and aerial mapping can provide a base level of information for key greenfield sites, there is a need for more detailed investigations over these sites to determine the environmentally constrained areas. This process will require flora and fauna surveys and mapping to identify and define areas of environmental significance. Detailed site investigations will directly inform land use recommendations for both environmental protection and areas suitable for development.

2.14.2 Conservation footprint

Responding to community consultation which identified the preservation and strengthening of the natural environment as a high priority, Council has resolved to avoid clearing as far as possible and offset any clearing that does need to occur within the Kingscliff locality (Council resolution 7 December 2017). This approach will ensure efficient use of land, consolidated and strengthened links between existing areas of habitat resulting in better long-term environmental planning outcomes. Figure 2.14 Conservation footprint shows ecologically significant areas proposed for environmental protection (295.9 ha), areas likely to be cleared to facilitate future urban development (3.7 ha) and indicative habitat offset areas (21.8 ha).

In relation to the indicative offset areas, contemporary offset calculators use offset ratios to determine the area to be restored compared to the area cleared in order to achieve a 'no net loss' outcome. Based on the type and condition of the vegetation likely to be cleared in the west Kingscliff area, it is expected that the offset ratio will be in the range of 4 to 6:1. That is for every hectare cleared it is likely that between 4 and 6 ha of land in very poor condition will need to be restored. The areas identified in Figure 2.14 focus on gap filling and consolidating existing habitat, although a significant patch is proposed for highly constrained land on the coastal floodplain adjoining the Kingscliff sewerage treatment plant.

2.14.3 Conservation footprint strategies

1. Protection and manage within the Conservation Footprint including ecologically significant areas and nominated offset planting areas, through appropriate land use zoning, legal agreements (e.g. Covenants, planning agreements, stewardship agreements) and potentially land dedication to a public authority such as Council.

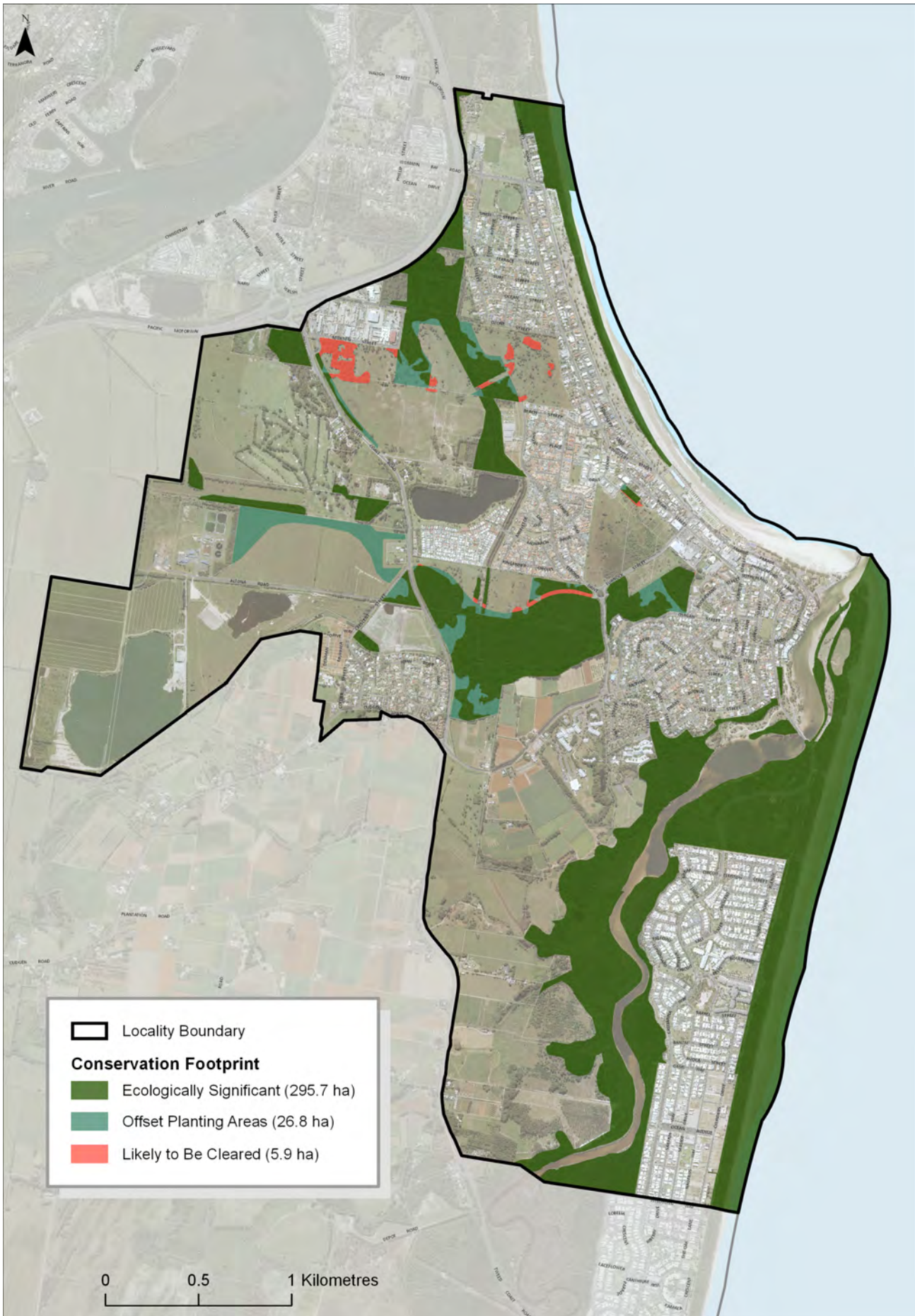


Figure 2.14 Conservation footprint

2.14.3 Developable footprint

The principle lands remaining after the subtraction and overlay of key constraints are represented in Figure 2.15 with indicative developable areas listed in the table below. The actual developable areas would rely on a more detailed investigation and mapping of site constraints. Further, the 'developable area' of these greenfield development sites would also include required road and service infrastructure as well as appropriate provision for community facilities and local open space.

Kingscliff Locality Greenfield Sites		
Release area	Developable Footprint area	Potential use
Turnock Street	19.78 ha	Town centre expansion, medium density housing, community uses, open space.
West Kingscliff	8.78ha	Low density and low rise medium density residential subdivision, community uses, open space.
North Kingscliff	13.96 ha	Low density and low rise medium density residential subdivision
Business and Innovation Precinct	76.65ha	A range of employment generating uses, low and medium residential uses, open space, local centre uses.
Seaside (currently being developed)	32 ha	Low density and low rise medium density residential subdivision with small local retail centre.
Cudgen – Altona Road	10 ha	Low density
Cudgen (currently being developed)	4.5ha	Low density
Total	165.67 ha	

Greenfield development areas within Turnock Street, West Kingscliff, North Kingscliff, Cudgen and the Business and Innovation Precincts will deliver additional housing supply to meet housing need for the next 30 years. The focus will be on providing more diversity of housing typologies to meet demographic and affordability needs. New development sites will be guided by planning and design principles including nominated density targets. This will ensure the finite greenfield areas will achieve a balance of meeting housing supply demands within a contained urban footprint. Increasing density and diversity of housing types in well located areas will reduce the future pressure on developing the agricultural and environmental protection land on the edge of the settlement.

There is also significant opportunity develop additional business and employment generating land uses across the locality. The new Tweed Valley Hospital will be a regional referral hospital and a key economic driver to the region. In addition a new Business and Innovation Precinct has the potential to accommodate many employment generating landuses including a business park, education campus , a new retail centre as well as new residential precincts and areas of open space. This precinct is of sufficient size and area to accommodate a wide range of new business and land use opportunities which could be associated with or in support of the new hospital and other established industry pillars including tourism, education, agriculture and construction.

2.14.4 Developable footprint strategies

1. Enhance the existing 'connected village' urban structure with defined activity centres framed by higher density residential land uses and open space. Use open space and existing ecologically significant areas as nature green breaks and green buffers between precincts. Connect precincts, activity centres and open space with a legible and direct road, pedestrian and cyclepath network.
2. Undertake detailed context and site analysis over each of the greenfield development sites to determine the constraints and development opportunities as a preliminary step of the masterplanning and rezoning and/or subdivision process. Use the outcomes of the context and site analysis to inform design and planning opportunities in terms of vision and desired future character, housing typology and density opportunity, environmental protection, open space and community infrastructure opportunity.
3. Undertake masterplanning processes over greenfield development sites to clearly define areas of development footprint, areas for conservation footprint, required buffers and open space. Apply appropriate land use zoning and development standards based on masterplanning outcomes.

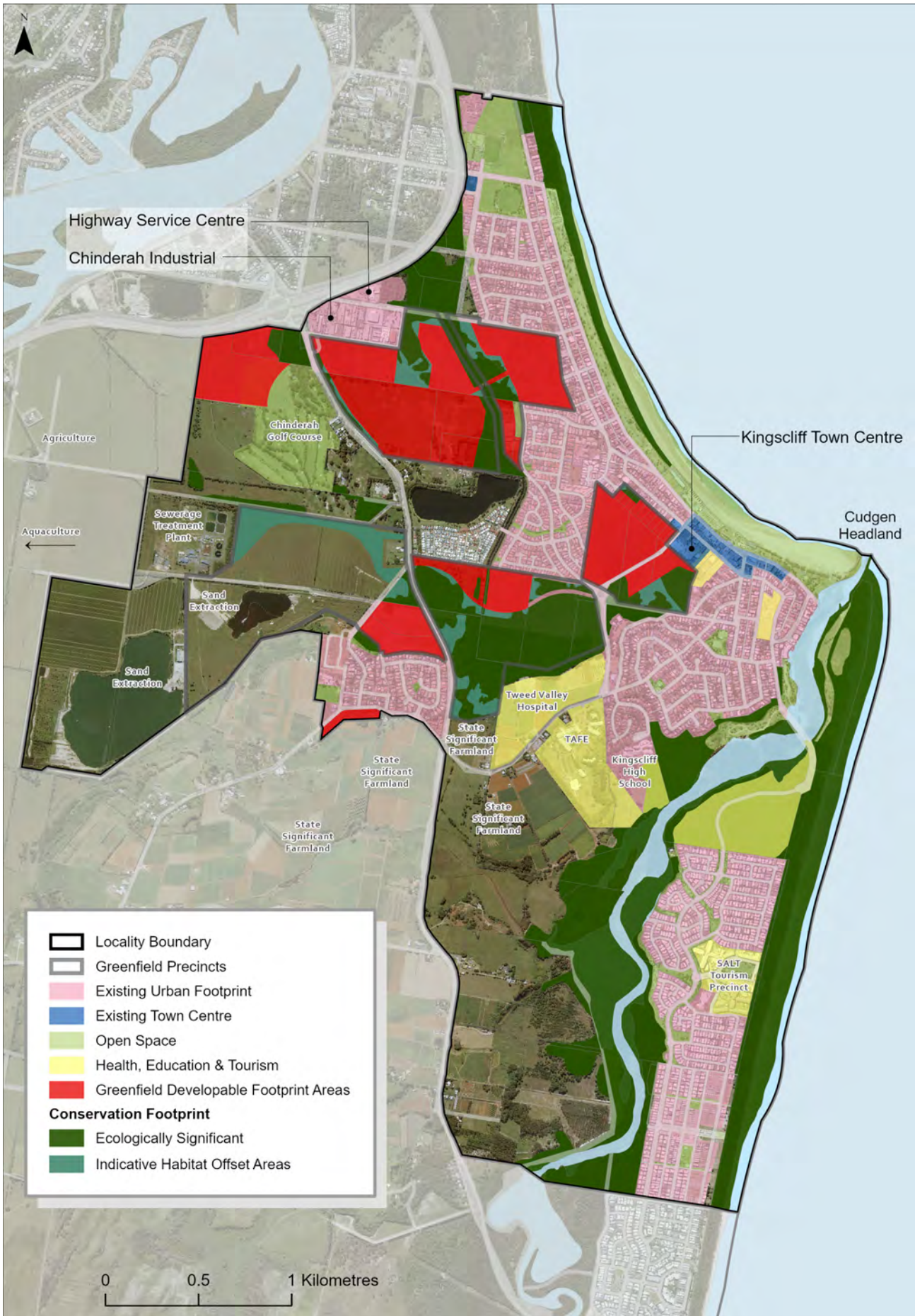


Figure 2.15 Developable footprint