6 Habitat Connectivity

6.1 Introduction

Scotts (2003, cited in DECC 2009) defines corridors as regional landscape connections of existing or potential habitats likely to support or provide movement for populations of certain fauna species. DECC (2009) also considers corridors to supplement habitat of wide-ranging, nomadic and migratory species and that corridors provide linkages to facilitate fauna movement within and between areas of habitat. For flora, habitat corridors assist in the dispersal of seeds and exchanges of reproductive materials (e.g. by assisting the movement of fauna vectors across the landscape). Habitat corridors help provide movement of genetic material and are essential in the maintenance of genetic diversity within both fauna and flora populations.

Regional corridors provide major landscape linkages in situ and dispersal habitat for fauna species; while sub regional corridors are landscape corridors that serve more as routes for dispersal and movement of fauna, rather than habitat in their own right (Scotts 2003, cited in DECC 2009). Local corridors provide habitat and movement potential for fauna at more localised scales (CHCC 2009).

CHCC (2009) reviewed available literature regarding corridor widths. Results of this review were used to identify minimum effective corridor widths, which are provided below:

- Regional Corridors: minimum 650 m width;
- Sub regional Corridors: minimum 350 m width; and
- Local Corridors: minimum 100 m width.

It has also been identified that stepping-stone habitats or fragmented corridors contribute to functional connectivity, through assisting the movements of individuals (Doerr *et al*., in review, cited in CHCC 2009).

Vegetation clearing and modification on the MREMP study area floodplain as part of urban, agricultural and infrastructure developments have resulted in smaller and fragmented pockets of habitat areas, each with varying conditions. ID Landscape Management (2006) identified that the Key Habitats and Corridors modelled by the DECCW which overlap the MREMP study areas are important local corridors. The riparian corridor was also identified as a priority corridor for undertaking regeneration efforts. Identifying, protecting and managing habitat corridors are a major component of maintaining and enhancing the biodiversity values of the MREMP study area floodplain.

Aim

The aim of this component of the study is to:

- identify existing and potential local corridors on the floodplain, particularly between key habitat areas. Consideration will be given to the type of threatened and migratory species that may potentially use the subject corridors; and

- suggest potential management actions to conserve or regenerate identified corridors.
- Make a brief comment on the connectivity of estuarine habitats and management strategies to maintain and enhance it.

6.2 Existing Identified Corridors

6.2.1 DECCW Regional Corridor Mapping

The DECCW mapped regional corridors relevant to the MREMP study area floodplain are shown in **Figure 6.1**. In total, parts of 12 interconnecting regional corridor sections and one sub regional corridor overlap the floodplain. These corridors along with the DECCW identified focal species are listed below. Species groups potentially able to utilise each corridor within the MREMP study area floodplain based on current habitat linkages are also provided based on aerial photograph interpretation. Terrestrial species known to occur on the MREMP study area floodplain were nominated into their respective group and are shown in **Table 6.1**.

Regional Corridors:

- **Collombatti Rail**. This backwards 'L' shape corridor overlaps the western fringes of the MREMP study area floodplain near Collombatti. It provides a corridor between DECCW mapped key habitat to the north and west.
- *Focal Species*: Yellow-Bellied Glider, Brush-tailed Phascogale and Rufous Bettong.
- *Potential Species Groups Able to Use the Subject Corridor Section*: High (Flying), High (Terrestrial) and Moderate (Forest/Woodland Dependant). Low only within suitable habitats in the corridor rather than across broad areas.

- **Richardsons Crossing**. This corridor crosses the southern fringes of the MREMP study area floodplain, connecting Hat Head National Park in the east to Maria River National Park to the west, as well as mapped key habitat areas in between.
- *Focal Species*: Yellow-Bellied Glider, Brush-tailed Phascogale and Rufous Bettong.
- *Potential Species Groups Able to Use the Subject Corridor Section*: High (Flying), High (Terrestrial) and Moderate (Forest/Woodland Dependant). Low only within suitable habitats in the corridor rather than across broad areas.

- **Hat Head** and **Hat Head National Park**. These two north-south running corridors overlap Hat Head National Park and adjacent fringes of the MREMP study area floodplain.
- *Focal Species Hat Head*: Yellow-Bellied Glider, Eastern Chestnut Mouse and New Holland Mouse.
- *Focal Species Hat Head National Park*: Not Specified.

- *Potential Species Groups Able to Use the Subject Corridor Section*: All.

- **South West Rocks – Macksville**. This north-west to south-east running corridor links key habitats near Hat Head and South West Rock, to key habitat areas near Yarrahapinni Wetlands national park and Clybucca Historic Site and Aboriginal Area, as well as adjacent locally mapped key habitat. It runs through habitat near the Macleay River Mouth.
- *Focal Species*: Eastern Chestnut Mouse.
- *Potential Species Groups Able to Use the Subject Corridor Section*: High (Flying) only across the broader landscape. Others groups only within potential habitats along corridor.

- **Willawong**. This north-west to south-east running corridor links Hat Head National Park in the east with, to key habitat areas near Yarrahapinni Wetlands national park and Clybucca Historic Site and Aboriginal Area, via Clybucca.
- *Focal Species*: Eastern Chestnut Mouse.
- *Potential Species Groups Able to Use the Subject Corridor Section*: High (Flying) only across the broader landscape. Others groups only within potential habitats along corridor.

- **Clybucca Historical Site**. This small section of a larger east-west and north linking corridor section overlays Clybucca Historical Site.
- *Focal Species*: Not specified.
- *Potential Species Groups Able to Use the Subject Corridor Section*: All species, though this corridor section provides only a minor link in the broader landscape corridor network.

- **Tamban-Clybucca**. This short east-west running regional corridor joins Clybucca Historical Site and associated areas with Tamban State Forest and adjacent key habitat mapped areas.
- *Focal Species*: Eastern Chestnut Mouse.
- *Potential Species Groups Able to Use the Subject Corridor Section*: Moderate (Forest/Woodland Dependant) only within potential habitat areas within corridor. Other groups may potentially use corridor to move across the broader landscape.

- **Way Way-Tamban**. This north-south running corridor overlaps relatively limited areas on the north-western fringes of the MREMP study area floodplain. It provides a small component of a network of corridors between Tamban State Forest and Way Way State Forest.
- *Focal Species*: Brush-tailed Phascogale.
- *Potential Species Groups Able to Use the Subject Corridor Section*: High (Flying), High (Terrestrial) and Moderate (Forest/Woodland

Dependant). Low only within suitable habitats in the corridor itself rather than across broad areas.

- **Fishermans-Clybucca**. This north-south running corridor overlies part of the northern section of the MREMP study area floodplain between Clybucca Historical Site and Fishermans Bend Nature Reserve.
- Eastern Chestnut Mouse and Eastern Blossom-bat.
- *Potential Species Groups Able to Use the Subject Corridor Section*: All species.

- **Fishermans Bend Nature Reserve**. This small section of a larger north-south running corridor which overlays Fishermans bend Nature Reserve.
- *Focal Species*: Not specified.
- *Potential Species Groups Able to Use the Subject Corridor Section*: All species, though this corridor section provides only a minor link in the broader landscape corridor network.

- **Stuarts-Point**. This north-south running corridor overlaps a small part of the MREMP study area floodplain near Stuarts Point. It forms a small component of a larger network of local north-south and east-west running regional corridors.
- *Focal Species*: Eastern Chestnut Mouse and Golden-tipped Bat.
- *Potential Species Groups Able to Use the Subject Corridor Section*: High (Flying), High (Terrestrial) and Moderate (Forest/Woodland Dependant). Low only within suitable habitats in the corridor rather than across broad areas.

- **Verges Creek**. This corridor overlaps small areas in the southern fringes of the MREMP study area floodplain. It connects Maria National Parks with DECCW mapped key habitat areas.
- *Focal Species*: Yellow-Bellied Glider, Brush-tailed Phascogale and Rufous Bettong.
- *Potential Species Groups Able to Use the Corridor*: High (Flying), High (Terrestrial) and Moderate (Forest Dependant). Low only within suitable habitats in the corridor rather than across broad areas.

Sub regional Corridors:

- **Belmore Swamps**. This east-west running corridor crosses the Belmore Swamp and links Hat Head National Park to the east with key habitat mapped areas to the west.
- *Focal Species*: Yellow-bellied Glider and Eastern Chestnut Mouse
- *Potential Species Groups Able to Use the Corridor*: High (Flying) and High (Terrestrial) only to move across broad landscape. Moderate (Forest/Woodland Dependant) only within suitable habitats in the corridor rather than across the broader corridor landscape network.

Table 6.1 Local Terrestrial Threatened Fauna Mobility Groups

Mobility Groups	***Threatened Species***
High (Flying)	Magpie Goose (*Anseranas semipalmata*), Australasian Bittern (*Botaurus poiciloptilus*), Glossy Black-Cockatoo (*Calyptorhynchus lathami*), Barred Cuckoo-shrike (*Coracina lineate*), Black-necked Stork (*Ephippoorhynchus asiaticus*), Little Lorikeet (*Glossopsitta pusilla*), Brolga (*Grus rubicunda*), Sooty Oystercatcher (*Haematopus fuliginosus*), Pied Oystercatcher (*Haematopus longirostris*), Black-breasted Buzzard (*Hamirostra melanosternon*), Comb-crested Jacana (*Irediparra gallinacea*), Black Bittern (*Ixobrychus flavicollis*), Swift Parrot (*Lathamus discolor*), Blue-billed Duck (*Oxyura australis*), Wompoo Fruit-Dove (*Ptilinopus magnificus*), Rose-crowned Fruit-Dove (*Ptilinopus regina*), Eastern Osprey (*Pandion cristatus*), Little Tern (*Sterna albifrons*), Grass Owl (*Tyto capensis*), Sooty Owl (Tyto tenebricosa), Hoary Wattled Bat (Chalinolobus nigrogriseus), Golden-tipped Bat (*Kerivoula papuensis*), Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*), Eastern Freetail-bat (*Mormopterus norfolkensis*), Grey-headed Flying-fox (*Pteropus poliocephalus*), Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*), Greater Broad-nosed Bat (*Scoteanax rueppellii*), Common Blossom-bat (*Syconycteris australis*) and Little Bentwing-bat (*Miniopterus australis*).
High (Terrestiral)	Spotted-tailed Quoll (*Dasyurus maculatus maculatus*), Koala (*Phascolarctos cinereus*) and Brush-tailed Phascogale (*Phascogale tapoatafa*).
Moderate (Forest/ Woodland Dependant)	Squirrel Glider (*Petaurus norfolcensis*).
Low	Wallum Froglet (*Crinia tinnula*), Green and Golden Bell Frog (*Litoria aurea*), Green-thighed Frog (*Litoria brevipalmata*), Stuttering Frog (*Mixophyes balbus*) and Stephens' Banded Snake (*Hoplocephalus stephensii*).

In summary, while a broad range of species may be able to utilise the habitats on a local scale that are overlapped by the subject corridors, regional movements for species with limited mobility (e.g. Common Planigale, Wallum Froglet, etc) would be restricted by the occurrence of natural barriers such as the Macleay Estuary and other potential barriers (e.g. local roads, pastoral areas, etc). Hence these corridors are typically expected to support the regional and sub-regional movements for more mobile species (e.g. birds, Flying-foxes, etc).

6.2.2 DECCW Climate Change Corridors

The DECCW undertook a strategic mapping program to help identify land for conservation efforts to assist adaptation to the potential adverse effects of climate change (DECC 2009). The networks of key climatic gradient corridors were identified to provide for three broad fauna assemblages: Coastal Complex, Dry Forest and Moist Forest. Those overlying the MREMP study area floodplain area outlined below:

- ***Coastal Complex Corridors***: Two Coastal Complex Corridors cover a substantial portion of the MREMP study area floodplain (refer to **Figure 6.2**), referred to as:

- **Macleay – Crescent Head**: This north-south running corridor overlaps the eastern fringes of the MREMP study area floodplain and Belmore Swamp, as well as adjacent coastal land to the east. Wetlands waterbirds and the Squirrel Glider are identified target species.

- **Nambucca – Macleay**: This north-east to south-west running corridor overlaps the northern portion of the MREMP study area from roughly north of Kempsey to Stuarts Point. The Eastern Blossom Bat and Grey-headed Flying-fox are identified target species of this corridor.

- ***Dry Forest Corridors***: Two Dry Forest Corridors overlap small areas of the MREMP study area floodplain in the far north and south, as follows (refer to **Figure 6.3**):
  - **Macleay River – Collombatti**: This east-west running corridor overlaps relatively small areas on the northern fringes of the MREMP study area floodplain. The Brush-tailed Phascogale is identified as a target species of this corridor.

  - **Carrai Plateau-Macleay Lowlands**: This east-west running corridor overlaps relatively small areas on the southern fringes of the MREMP study area floodplain. The Little Bentwing-bat and Brush-tailed Phascogale are identified target species of this corridor.

- ***Moist Forest Corridors***: A small part of the Yarrahapinni-Escarpment corridor overlaps relatively small areas on the northern fringes of the MREMP study area floodplain (refer to **Figure 6.4)**. The Grey-headed Flying-fox and Wompoo Fruit-Dove are identified as target species of this corridor.

As with the regional mapped DECCW corridors, while a broad range of species may be able to utilise the habitats on a local scale that overlap the subject corridors, regional movements for species with limited mobility would be restricted by the occurrence of potential natural and man-made barriers. Hence this corridor is typically expected to support the regional and sub-regional movements for more mobile species.

6.2.3 Riparian Corridor

As mentioned previously, ID Landscape management identified the riparian corridor along the Macleay Estuary as a significant local corridor. Based on the CHCC (2009) findings, the width of a local corridor should be a minimum of 100 m on either side of the estuary (refer to **Figure 6.5**). Due to the currently fragmented and limited extent of habitats within this area, its current function would be as a "stepping stone corridor" for predominantly high mobility species moving along the riparian zone, or north-south across the floodplain.

6.2.4 Other Local Corridors

Collectively, the above corridors overlay a mosaic of habitats areas and disturbed land, particularly pastoral areas. Establishing a network of local corridors between existing habitat areas within the broader regional and sub regional corridors should be undertaken to help maintain and improve the functional values of corridors. In order to identify realistic inter regional/sub regional corridors, further investigations would be required to:

- review GIS layers of high conservation value habitat within the footprint of the identified regional/sub regional corridors, and priorities;
- liaison with relevant landowners and stakeholder to:
    - explore opportunities to protect and maintain existing priority habitats;
    - identify opportunities to improve connectivity between key habitat areas (e.g. explore options for creating stepping stone or linear linkages, explore potential options that provide dual landuse benefits (e.g. vegetation screens and windbreaks); and
    - investigate establishment and protection opportunities of the interlinking corridor features.

Other key local corridor areas which require further investigation into their potential establishment and protection include:

- establishing a north – south running corridor to the west of Kempsey to provide connectivity between (refer to **Figure 6.6** for approximate suggested alignment); and
- establish connectivity between habitats on the east and west sides of Gregory Street/South West Rocks Road at South West Rocks (refer to **Figure 6.7** for approximate suggested alignment).

6.3 Estuarine Habitat Connectivity

A number of the species of great importance to the commercial and recreational fisheries on the Macleay utilise freshwater and estuarine habitats in the Macleay River, eg sea mullet, river eels and bass (see **Section 3** of this report). A further group of important species are limited to tidal waters but are highly mobile and widely distributed throughout both the marine and brackish waters or utilise different parts of the estuary during different phases of their lifecycle (see **Section 3**). These include mud crabs, bream, luderick, mulloway and school prawns. These movements highlight the importance of the connectivity of estuarine habitats, particularly those that offer cover such as vegetative habitats and snags. As many of the above migrations and movements occur as juvenile fish that have a demonstrated dependence on vegetative habitats (eg bass, river eels) the connectivity of vegetative habitats

Habitat connectivity is a common theme in terrestrial studies but has not received much attention in the aquatic sciences. However, catch per unit effort of nearshore commercial fisheries has been linked to a variety of connectivity measures such as patch size, landscape connectivity and Euclidean distance for mangroves, seagrass and channels at a broad scale (Meynecke *et al* 2007).

An assessment of habitat connectivity in the Macleay River is facilitated by a number of existing data sources. These are;

- The estuarine macrophytes mapping layer produced as part of the Comprehensive Coastal Assessment project (CCA 2006). This information is reproduced in this study in **Figure7.1**;
- The riparian vegetation maps produced by ID Management as part of the Macleay River Estuary Data Compilation study (in Telfer 2005). This map is partially reproduced in this report, see **Figure 2.1**.
- The bass habitat mapping project undertaken with funds from the recreational fishing trust (West *et al* 2004). This information has been summarized in a draft report but the spatial data is not available for use;
- Macrophyte mapping undertaken as part of the current study (see **Figure 5.3**).
- Spatial data layers describing the position of floodgates and agricultural drains. This data is available from Kempsey Shire Council.

Whilst methods for the quantification of habitat connectivity exist (see Meynecke *et al*. 2007), they are complex and beyond the scope of this study. For the purposes of managing habitat connectivity in the Macleay a brief qualitative description of habitat features in broad reaches of the estuary system is sufficient. This is included in **Table 6.2**. The reaches used for this description refer to the broad sedimentary process zones in the main channel of the Macleay River (described by Cohen in Telfer (2005) and corresponding with vegetative process zones) and the main tributaries and other features.

Table 6.2 Assessment of features contributing to habitat connectivity in major reaches of the Macleay estuary.

Estuary Reach	***Habitat Features***	***Riparian Condition***	***Significant Barriers***	***Overall Connectivity***
Macleay River Marine Tidal Delta	Continuous rock walls, deep channels a feature. Some intertidal sand flats. Very little seagrass growing sparsely, significant large patches of mangroves and patchy, disturbed saltmarsh.	Almost entirely classed as highly disturbed. Relatively small areas of low-moderate and moderate disturbance corresponding with mangrove habitat around Pelican Island and Rainbow Reach. Extensive rock work, mostly pastured banks with small areas of mangroves and saltmarsh	Rockwork reduces the distribution of mangroves and intertidal sand flats.	Rock walls provide continuous habitat for some species and deep channels an important feature.
Macleay River Transition Zone	Continuous rock walls. Some areas of significant growth of *Phragmytes australis*. Intertidal sand and mud flats.	Exclusively highly disturbed. No intact vegetation. Extensive rockwork and mostly pastured banks.	Rockwork reduces the available habitat for rushes and riparian veg. Floodgates blocking minor tributaries and large drainage pathways and restricting connectivity with floodplain wetlands.	Poor habitat connectivity. Characterised by high levels of disturbance and anthropogenic influence. Large areas of floodplain wetland habitat disconnected.

Estuary Reach	*Habitat Features*	*Riparian Condition*	*Significant Barriers*	*Overall Connectivity*
Macleay River Fluvial Reach	Large macrophyte beds dominated by Egeria but also containing ribbon weed and pond weed species. Continuous rock walls. Large sections of bank toe stabilized by rushes including *P. australis*, cumbungi and *Eleocharis spp.*. Some intertidal mud flats	80-90% highly disturbed. Small sections of low-high, low-moderate and moderate disturbance mostly on the left bank downstream of Frederickton. No Intact vegetation. Most banks pastured though there is some introduced scrub and some swamp oak.	Rockwork reduces the available habitat for rushes and riparian veg. Floodgates blocking minor tributaries and large drainage pathways and restricting connectivity with floodplain wetlands.	Macrophyte beds, though mostly made up of pest species, provide important connectivity with upstream habitats. Extensive stands of rushes a key feature. Large areas of floodplain wetland habitat disconnected.
Macleay Arm	Large continuous seagrass beds, saltmarsh patches and mangroves. Large intertidal sand flats.	More than half intact and large areas of low disturbance. Areas of high disturbance correspond with areas of prior sand mining activities. Vegetation dominated by mangroves but saltmarsh, banksia, swamp oak and significant Blackbutt/bloodwood communities found.	No significant barriers.	High level of habitat connectivity. Large and intact instream and riparian habitat features.
Clybucca Creek	Mostly bare sediment instream, some intertidal sand/mud flats. Large continuous mangrove and saltmarsh patches.	More than half low or low-moderate disturbance. Other areas are mostly highly disturbed, corresponding with agricultural land uses. Very little intact vegetation. Vegetation dominated by mangroves downstream, pasture upstream. Large areas of saltmarsh and some tuckeroo communities present.	Clybucca floodgates restricting connectivity with floodplain wetlands. Improved connectivity due to opening of Yarrahapinni floodgates.	Good connectivity in downstream areas, extensive upstream wetlands disconnected due to floodgates.
Spencers Creek	Seagrass has disappeared from Spencers Creek. Large continuous mangrove communities.	Right bank and 'the lag' majority intact vegetation. Left bank mostly high or moderate disturbance. Vegetation dominated by mangroves on the right bank and pasture on the left bank. Significant areas of saltmarsh and brush box forest also found.	Rockwork limiting the distribution of mangroves. Floodgates have a tidally operated gate installed.	Moderate habitat connectivity.
Belmore River	Not known.	Vast majority (>95%) highly disturbed. Banks primarily pastured	Extensive floodgating restricting connectivity with floodplain wetlands.	Poor connectivity. System characterized by high levels of disturbance.

Estuary Reach	*Habitat Features*	*Riparian Condition*	*Significant Barriers*	*Overall Connectivity*
Kinchela Creek	Not known.	All highly disturbed. Banks primarily pastured.	Extensive floodgating restricting connectivity with floodplain wetlands.	Poor connectivity. System characterized by high levels of disturbance.
South West Rocks Creek	Continuous saltmarsh and mangrove communities. Some intertidal sand flats, patchy seagrass. Rockwork at the entrance.	Not mapped by ID management. Known to be mostly intact with some disturbance related to development. Veg includes mangroves, saltmarsh, swamp oak and eucalypt forests.	Tidal movement to upstream areas and subsequent extent of wetlands restricted by narrow culvert under road bridge and installed levees.	Moderate habitat connectivity.

6.4 Habitat Connectivity Management Issues

Issue 6.1: Reductions in habitat connectivity due to floodgates and riparian degradation in the upper estuary

The fluvial and transitional reaches of the Macleay and of the Belmore River, Kinchela Creek and Clybucca Creek are all characterised by highly degraded riparian zones. The lack of vegetation represents reduced habitat for fish and invertebrates and reduced connectivity of habitats as vegetative habitats in the channel are not generally a feature of transitional process zones in particular. The floodgates on the major tributaries are a very significant barrier and represent an almost complete loss of connectivity between the estuarine waters and upstream habitats.

Issue 6.2: Habitat fragmentation on the floodplain

Historic clearing and modification of the MREMP study area floodplain has resulted in significant habitat fragmentation and isolation posing significant pressure on local biodiversity.

Issue 6.3: Lack of corridors to suit species of low mobility

existing mapped regional, subregional and local corridors are generally only suitable for species with high mobility.

Issue 6.4: Lack of a program to address wildlife corridors in LEP

KSC LEP mapping suggest there is currently no strategic programs to enhance or protect wildlife corridors.

6.5 Management Options

See **Options 2.1, 2.2, 2.3** and **3.3** for strategies to improve the connectivity of habitats in the upper estuary.

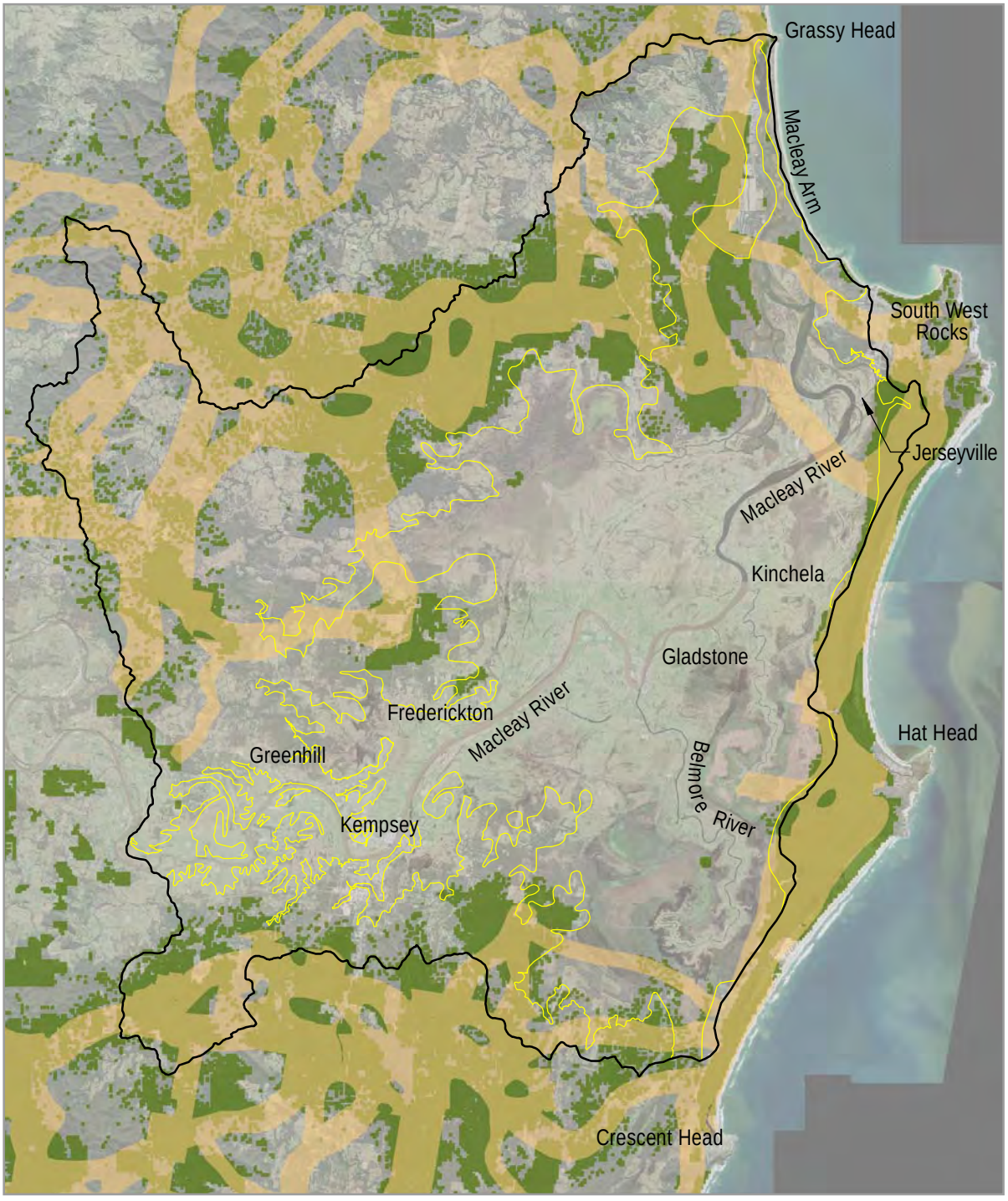
Option 6.1: Maintain and improve habitat connectivity on the floodplain

The following management options are recommended to maintain and improve habitat connectivity across the MREMP study area floodplain:

- prioritise EECs and significant species habitats (refer to **Section 4**) for conservation and management that overlap:
    - DECCW key habitat and regional corridors, and climate change corridors; and
    - Macleay Estuary Riparian Corridor.
- liaise with relevant landowners and stakeholders to:
    - explore opportunities to protect and maintain existing priority habitats;
    - identify opportunities to improve connectivity between key habitat areas through inter-corridor linkages. For example explore options for creating stepping stone or linear linkages between high conservation value habitat areas. This may include exploring potential options that provide dual landuse benefits for land management and conservation such as vegetation screens and windbreaks); and
    - investigate establishment and protection opportunities of the interlinking corridor features.
- develop and implement programs to protect regional, sub regional and local corridors.

Information shown is for illustrative purposes only

Drawn by: RE Reviewed by: MVE Date: May 2010
Source of base data: Kempsey Shire Council and DECCW



LEGEND

- Study area
- MREMP floodplain study area
- Corridors
- Key habitats

0 5 km

North

DECCW Mapped Regional Corridors

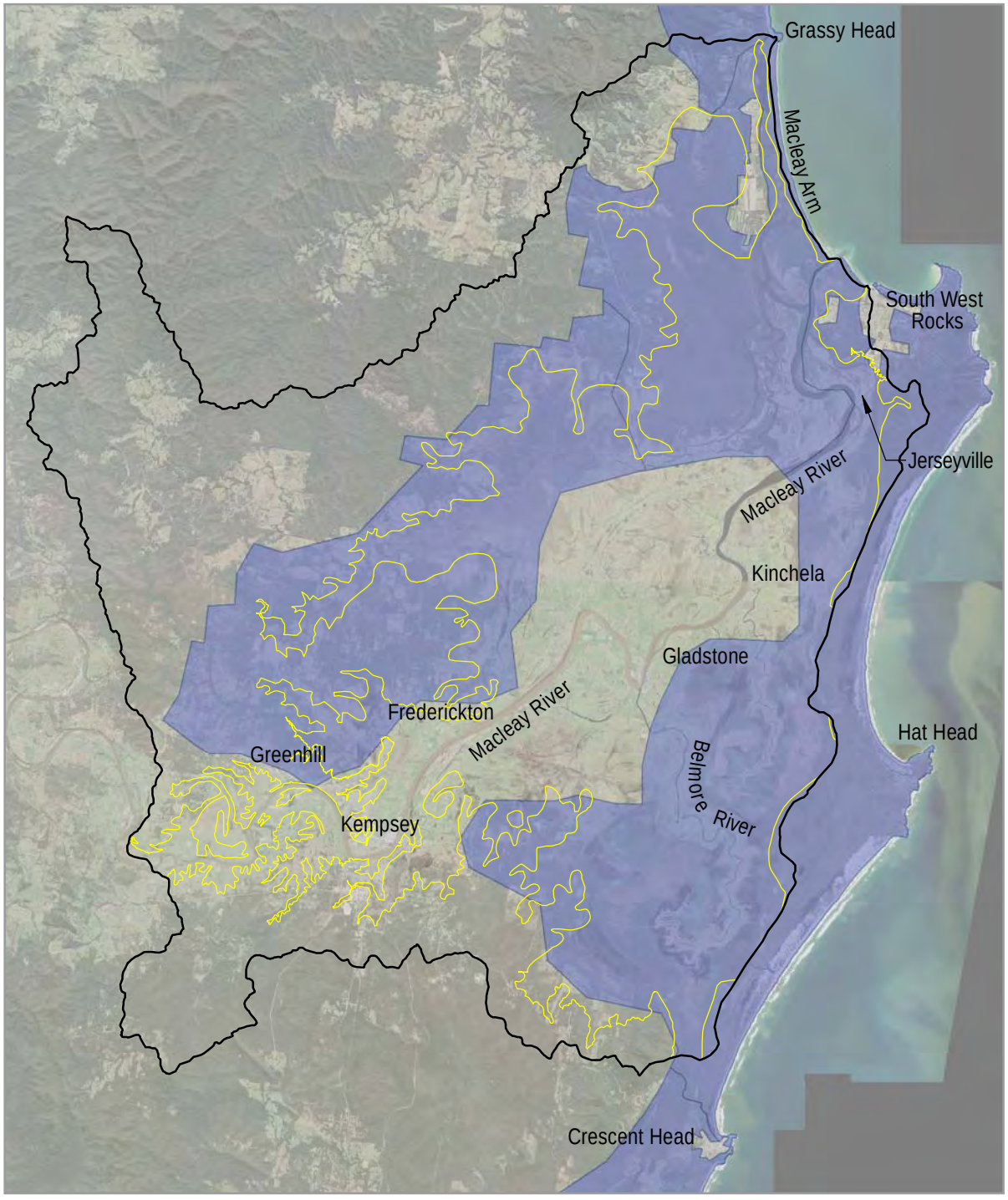
GeoLINK environmental management and design

Macleay Ecological Study
1484857

Figure 6.1

Information shown is for illustrative purposes only

Drawn by: RE Reviewed by: MVE Date: May 2010
Source of base data: Kempsey Shire Council and DECCW



LEGEND

- Study area
- MREMP floodplain study area
- Coastal corridor

0 5 km

North

DECCW Mapped Coastal Complex Climate Change Corridors

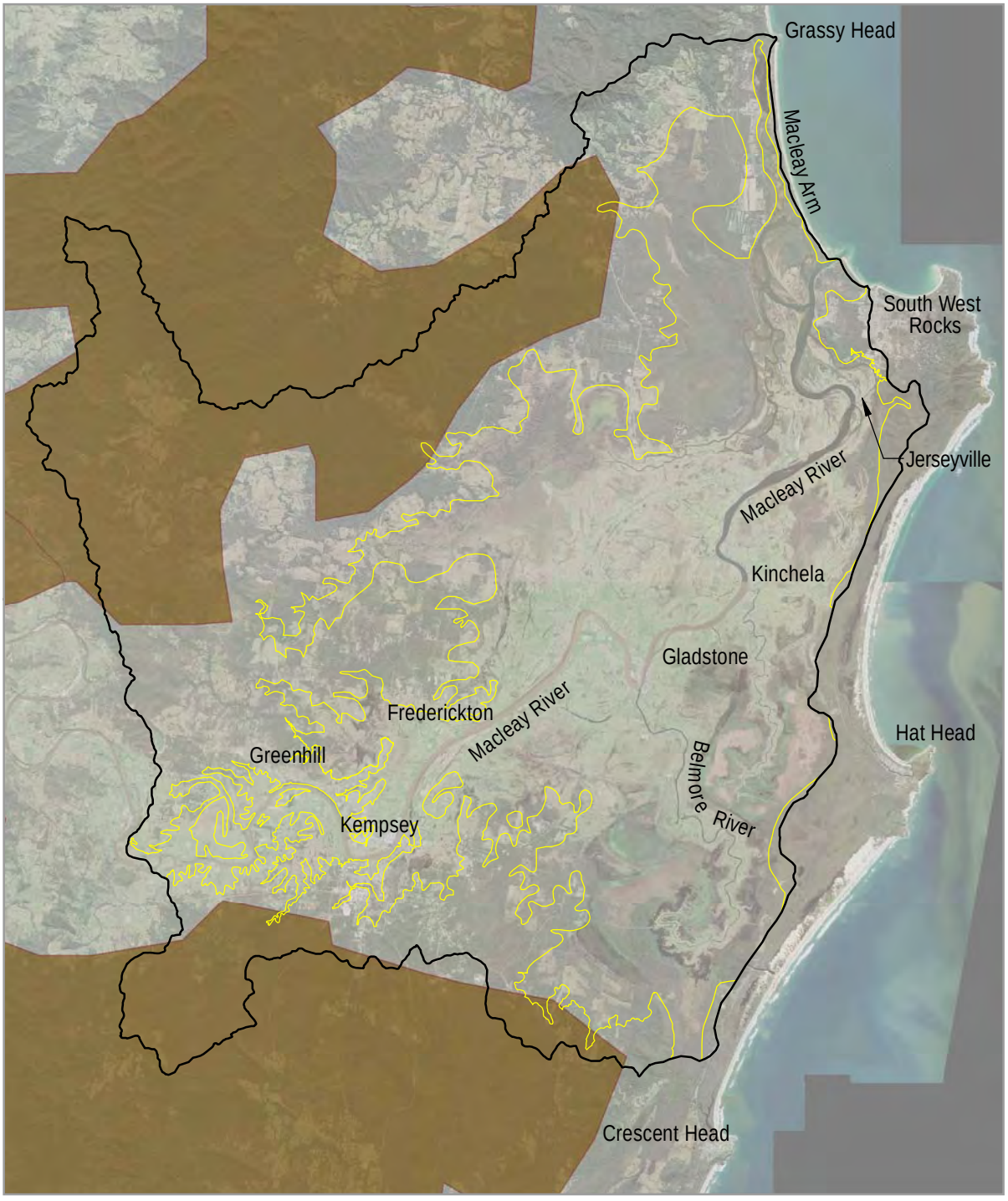
GeoLINK environmental management and design

Macleay Ecological Study
1484858

Figure 6.2

Information shown is for illustrative purposes only

Drawn by: RE Reviewed by: MVE Date: May 2010
Source of base data: Kempsey Shire Council and DECCW



LEGEND

- Study area
- MREMP floodplain study area
- Dry corridors

0 5 km

North

DECCW Mapped Dry Forest Climate Change Corridors

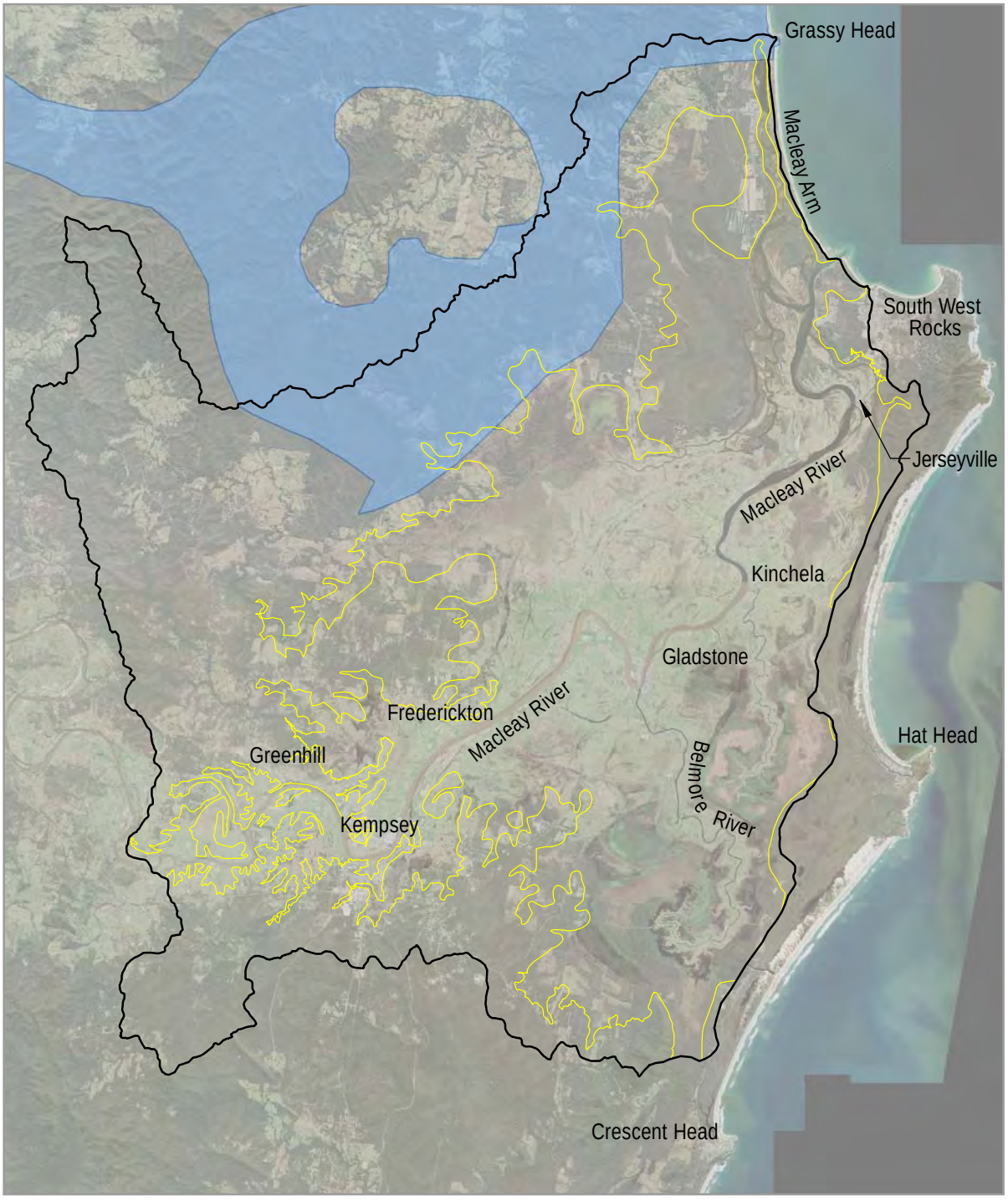
GeoLINK environmental management and design

Macleay Ecological Study
1484859

Figure 6.3

Information shown is for illustrative purposes only

Drawn by: RE Reviewed by: MVE Date: May 2010
Source of base data: Kempsey Shire Council and DECCW



LEGEND

- Study area
- MREMP floodplain study area
- Moist corridors

0 5 km

North

DECCW Mapped Moist Forest Climate Change Corridors

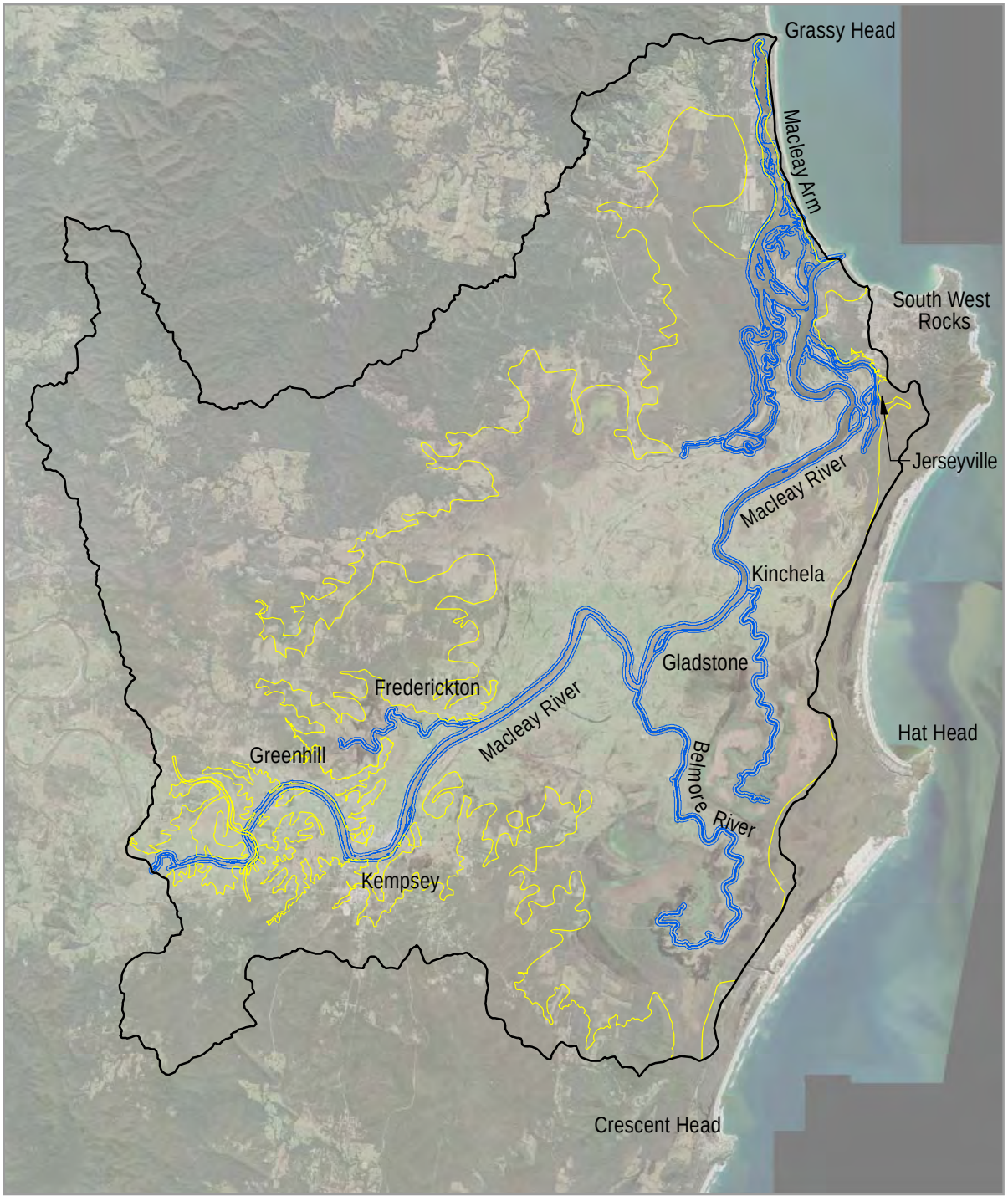
GeoLINK environmental management and design

Macleay Ecological Study
1484860

Figure 6.4

Information shown is for illustrative purposes only

Drawn by: RE Reviewed by: MVE Date: May 2010
Source of base data: Kempsey Shire Council



LEGEND

- Study area
- MREMP floodplain study area
- Macleay estuary riparian corridor

0 5 km

North

Macleay Estuary Riparian Corridor

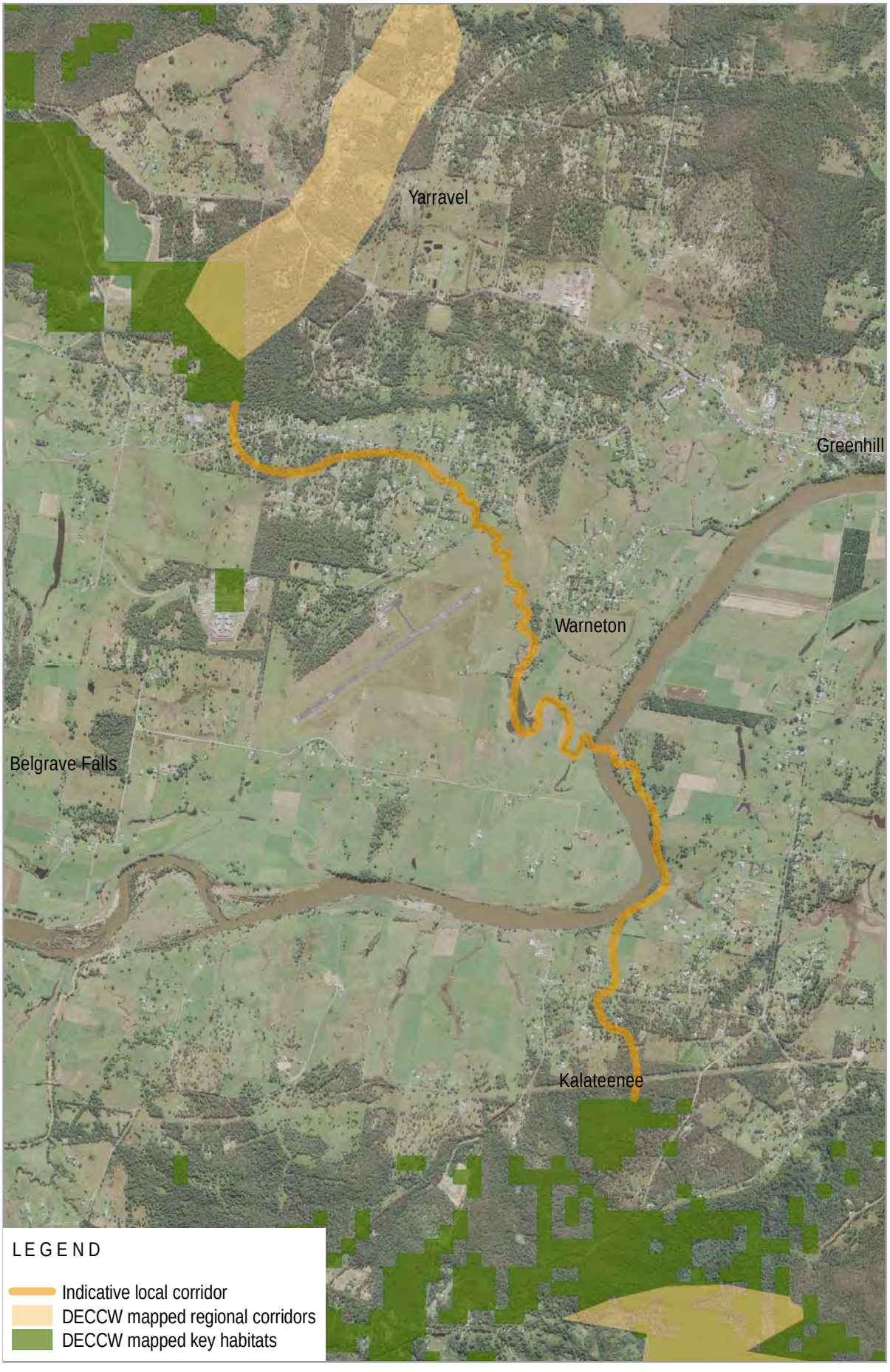
GeoLINK environmental management and design

Macleay Ecological Study
1484861

Figure 6.5

Information shown is for illustrative purposes only

Drawn by: RE Reviewed by: MVE Date: May 2010
Source of base data: Kempsey Shire Council and DECCW



0 1.5 km

North

Indicative Local Corridor - West of Kempsey

GeoLINK environmental management and design

Macleay Ecological Study
1484869

Figure 6.6

Information shown is for illustrative purposes only

Drawn by: RE Reviewed by: MVE Date: May 2010
Source of base data: Kempsey Shire Council and DECCW

0 600

North

Indicative Local Corridor - South West Rocks

GeoLINK environmental management and design

Macleay Ecological Study
1484871

Figure 6.7