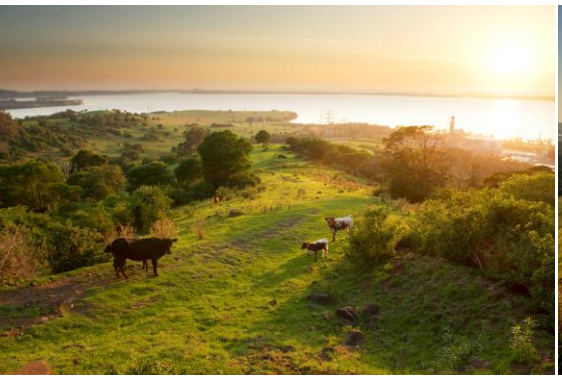
TALLAWARRA LANDS

LANDSCAPE PLAN



Corkery Consulting
Landscape Consultants

December 2010

TALLAWARRA LANDS –

LANDSCAPE PLAN

Prepared for

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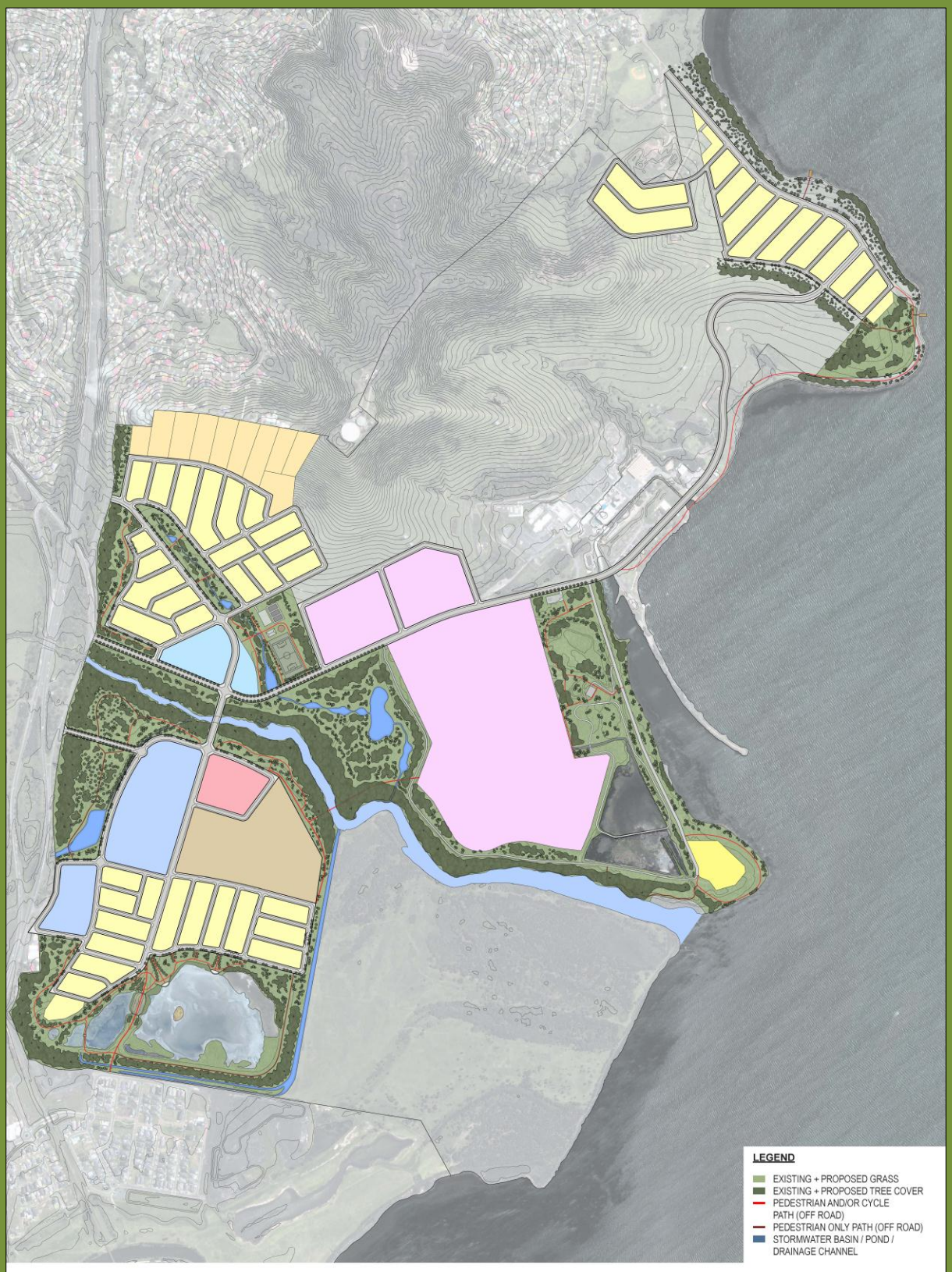
Contents



OPEN SPACE NETWORK
TALLAWARRA LANDS

DWG NO: LC-10-004-0001
DATE: DECEMBER 2010

0 1500m

Corkery Consulting

1.0 Introduction and Preliminaries

1.1 BACKGROUND AND PURPOSE

This Landscape Plan has been prepared for the proposed mixed use development Tallawarra Lands. The Tallawarra Lands Project has been declared as a 'major project' by the Minister for Planning and is therefore subject to the provisions of Part 3A of the *New South Wales Environment Planning and Assessment Act* 1979 (EP&A Act). Planning and design of the public domain and open space within the Tallawarra Lands has been carried out in accordance with the Director General's Requirements.

The Landscape Plan provides an integrated approach to the planning and design of all landscape components, including open space and recreation areas as well as streetscapes and environmental reserves. The Plan has been prepared through a process of collaboration with other members of the project team and has been coordinated with the Tallawarra Lands Masterplan prepared by Warren Lee Urban Design Pty. Ltd.

1.2 PROJECT SITE

The entire Tallawarra Lands Site covers approximately 572ha., which includes the Tallawarra gas-fired power station developed by TRUenergy and commissioned early 2010. This Landscape Plan is primarily focused on the 536ha. of land that is located outside of the power station precinct.

The Tallawarra Lands Site is located on the western foreshore of Lake Illawarra, south of Koonawarra and south-east of Dapto, within the Wollongong Local Government Area. A 6km section of lake foreshore, which is located along the northern edge of the Site, is owned and managed by the Lake Illawarra Foreshore Authority. It was therefore does not form part of the Tallawarra Lands Site, although account has been taken of the landscape master plan prepared by others.

While much of the Tallawarra Lands site has been cleared and currently used for grazing, a wide diversity in landscape character occurs throughout site. There is a dramatic variation in landform over a relatively short distance, with the high elevation and steep slopes of Mount Brown contrasting strongly with the flat lake foreshore along the eastern edge of the site and the extensive areas of flat low elevation land within the southern portion of the site.

Much of the vegetation on the site has been impacted by weed invasion and grazing. While native vegetation communities occur in some patches, these communities have been extensively invaded by weed species that form much of the understory (Eco Logical, 2006). Several patches of endangered ecological communities (ECC) are located on the Site but they are relative small.

Water resources throughout the Site have been modified by previous land use. Where extensive clearing for grazing has occurred, many of the natural drainage lines have been altered via stormwater culverts and the like. Although Duck Creek and areas of wetland in the south-east portion of the Site are largely in their original condition, extensive dumping of ash from the former coal-fired power station have significantly altered the drainage pattern in a substantial area in the south east portion of the Site as well as the area between Duck Creek and the power station.

Soil types vary greatly across the Site with well drained loams occurring on the upper portion of Mount Brown and a variety of clay soils on the mid-slopes and the south-western portion of the Site. Alluvial and swamp soils associated with a high water table occur in the low-lying portions of the Site adjoining Duck Creek and Lake Illawarra.

A more detailed analysis of the landscape conditions of the Site is presented in Appendix 1 – Tallawarra Lands Landscape Assessment.

FIGURE 1 – REGIONAL CONTEXT

FIGURE 2 – AERIAL OBLIQUE VIEW NORTH ALONG LAKE ILLAWARRA FORESHORE

FIGURE 3 – AERIAL OBLIQUE VIEW NORTH-WEST ALONG DUCK CREEK CORRIDOR

FIGURE 4 – LANDSCAPE CHARACTER IMAGES

1.3 DEFINING THE PUBLIC DOMAIN

The 'public domain' of the Tallawarra Lands site includes not only open space containing playgrounds, picnic grounds and playing fields, but also streetscapes, urban plazas, open space corridors and all other places in the urban environment that people use for recreation and social interaction.

The Public Domain Network throughout the Site incorporates:

- Parks and reserves;
- A sports field;
- Playgrounds;
- Civic spaces;
- Road corridors and local streets;
- Pedestrian and cycle paths;
- Lake foreshore open space ;
- Creek corridors; and
- Ecological conservation areas.

This Landscape Plan provides an integrated approached to the design and development of the various components of the public domain.

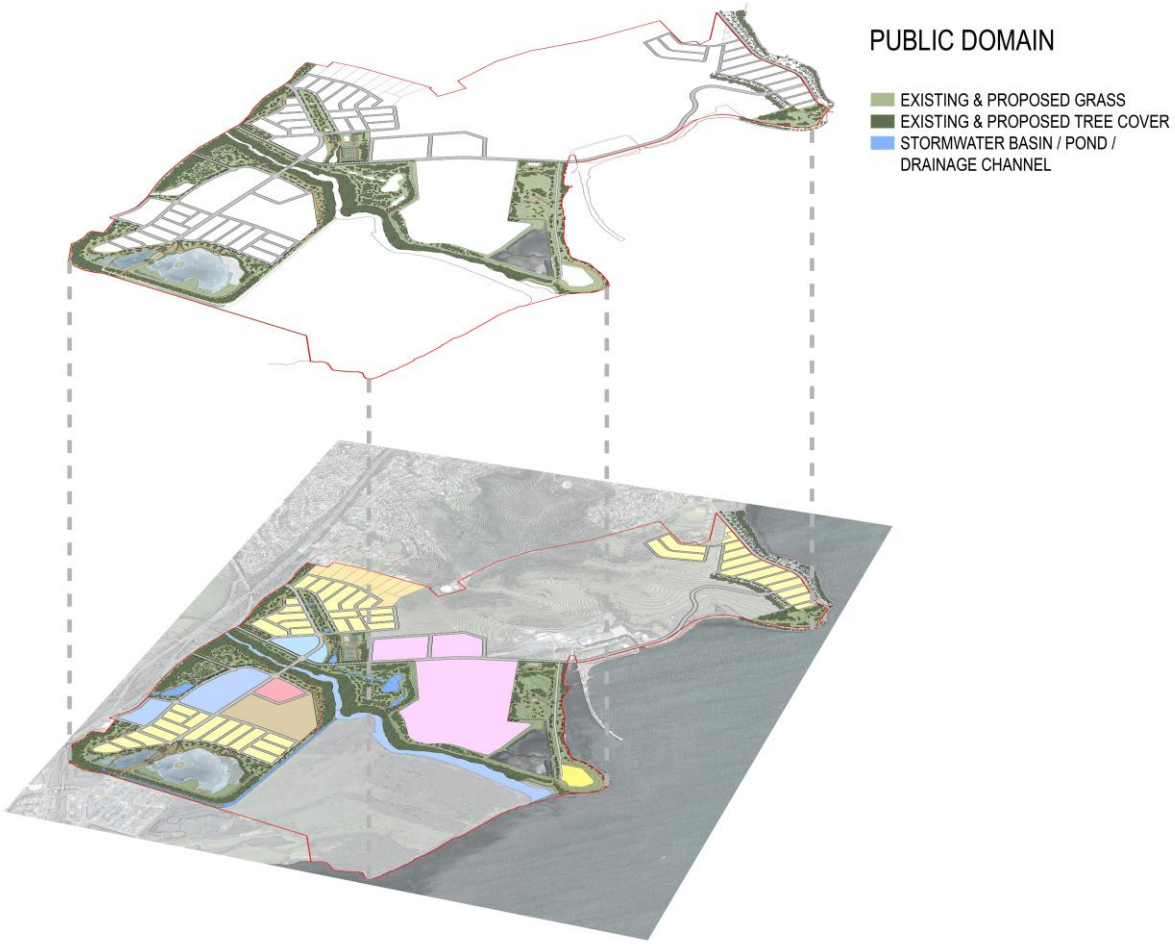


FIGURE 5 – THE PUBLIC DOMAIN NETWORK

1.4 LANDSCAPE PLAN VISION

The vision of this Landscape Plan is to create an open space network that is strategically planned to function at the regional and local scale. The vision aims to preserve and enhance the existing landscape character of the Tallawarra Lands as a distinguishing feature of the new community. This vision is underpinned by landscape design that will create an engaging, delightful, safe and enjoyable public domain incorporating the principles of sustainability through water sensitive urban design, crime prevention through environmental design and enhancement of biodiversity.

The Landscape Plan adopts a comprehensive and integrated approach to planning and design of the public domain that responds to the Masterplan, prepared by Warren Lee Urban Design.

Key components of the Landscape Plan are illustrated on Figure 6 and include:

- An integrated network of open space and recreation opportunities incorporating foreshore parks, a playing field and other sports facilities;
- A network of pedestrian paths, share ways and cycle lanes;
- A hierarchy of streetscapes that incorporate street trees and other planting with water conservation measures;
- A local centre with public spaces;
- A school with recreation facilities;
- Rehabilitated environmental conservation areas; and
- Stormwater treatment ponds and constructed wetlands.

Details of the various components of the Landscape Plan are explained in following sections of this Report, which also presents the site analysis that forms a basis for the Plan.

LANDSCAPE PLAN SUMMARY KEY (REFER FIGURE 6)

No.	Title	Report Reference
1	Main Entry	-
2	Secondary Entries (West)	-
3	Secondary Entry (North)	-
4	Entry Avenue	Section 5.2, 5.3
5	Lake-edge Drive	Section 5.2, 5.3
6	Residential on slopes of Mount Brown	Section 5.2, 5.3, 6.2
7	Open Space Drainage Corridor	Section 3.5.1
8	Commercial Centre	Section 6.4
9	Sports Facilities	Section 3.5.1
10	Riparian Open Space	Section 3.5.1
11	Duck Ck. Riparian Conservation Corridor	Section 3.5.1
12	Woodland Conservation Zone	Section 3.5.1
13	Open Space Buffer Zone	Section 3.5.1, 3.5.3
14	Employment, School & Retirement Living on ash disposal area	Section 5.2, 5.3, 6.3
15	Residential on flat ash disposal area	Section 5.2, 5.3, 6.2
16	Bird habitat ponds & open space	Section 3.5.3
17	Environmental conservation area	-
18	Tourism facility	-
19	Lake Foreshore Open Space	Section 3.5.2
20	Settling ponds (saltmarsh)	Section 3.5.2
21	Cycling facilities on ash disposal area	Section 3.5.2
22	Employment on ash disposal area	Section 6.3
23	Employment on lower slopes of Mount Brown	Section 5.2, 5.3, 6.3
24	Open space on headland	Section 3.5.4
25	Woodland planting buffer zone	Section 3.5.4
26	Residential on northern slopes	Section 5.2, 5.3, 6.2
27	Foreshore open space (LIFA)	Section 3.5.4

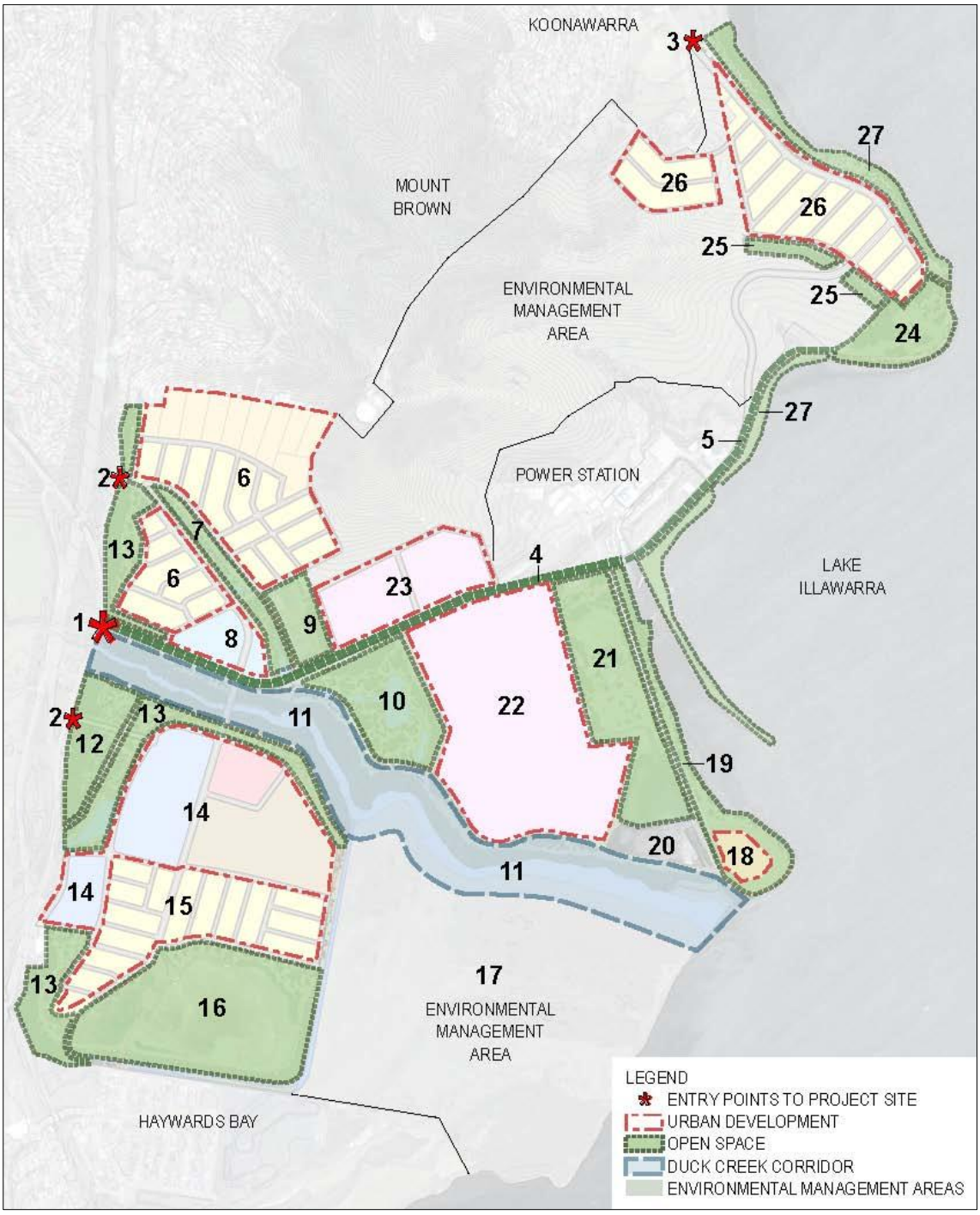


FIGURE 6 – LANDSCAPE PLAN SUMMARY

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2.0 Context and Analysis

2.1 RELEVANT STUDIES

The Tallawarra Lands site has been the subject of a series of studies and reports associated with various development proposals. This Landscape Plan has taken account of the findings of all relevant reports and plans, including:

- *Tallawarra Lands Ecological Assessment,* Eco Logical Australia, 2010
- *Tallawarra Lands Vegetation Management Plan,* Eco Logical Australia, 2010
- *Tallawarra Lands Bushfire Planning Assessment,* Eco Logical Australia, 2010
- *Tallawarra Lands: Part 3A Concept Plan – Aboriginal Archaeological Assessment*, Biosis Research, July 2010
- *Tallawarra Lands Traffic Impact Assessment,* Gabites Porter, 2010
- *Visual, landscape and scenic resource management consideration*, Richard Lamb & Associates, 2010
- *Tallawarra Lands Structure Plan Report,* Cox Richardson, June 2009

Key Principles presented in the Structure Plan Report are illustrated on the following diagram.

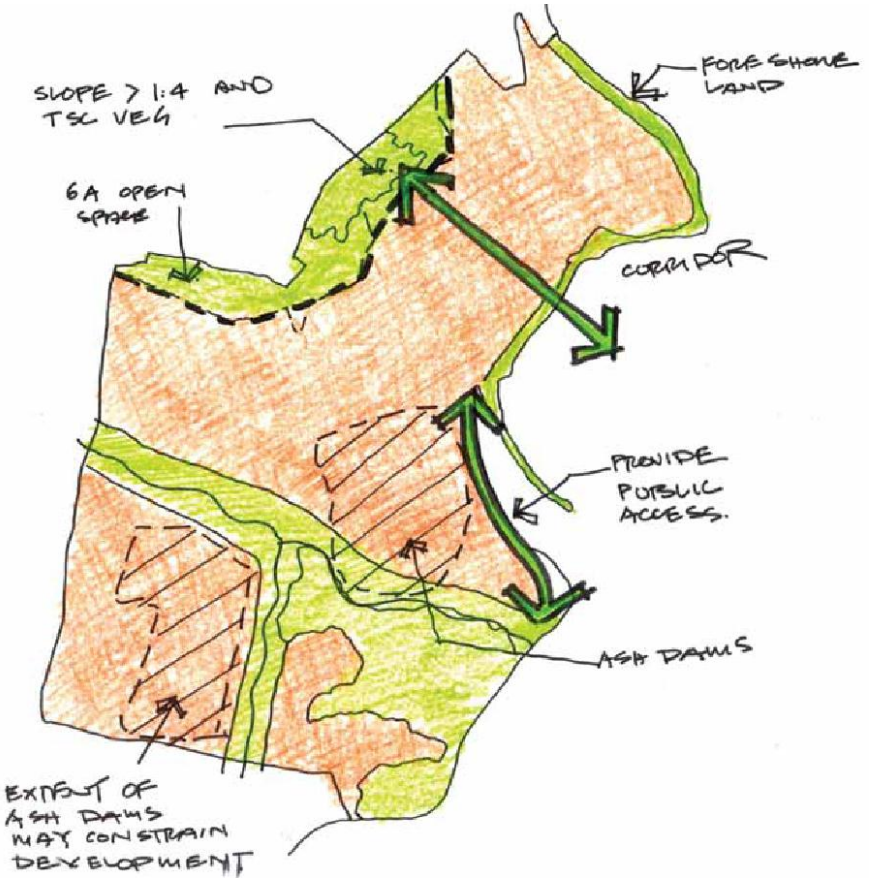

FIGURE 7 – PRINCIPLES PRESENTED IN THE 2009 STRUCTURE PLAN
(Source: Cox Richardson/Context, 2009)

2.2 LOCAL CONTEXT

Located on the western foreshore of Lake Illawarra within the Wollongong Local Government Area (Figure 8) the Tallawarra Lands cover approximately 572ha. and include the gas-fired power station developed by TRUenergy. A 6km long section of lake foreshore located along the northern edge of the Tallawarra Lands is owned and managed by the Lake Illawarra Foreshore Authority. Adjoining suburbs include Koonawarra and Dapto to the north and Haywards Bay to the south.

The various aspects of site context that have influenced the planning and design of the public domain network are identified in the following table.

CONTEXT	GENERAL DESCRIPTION	INFLUENCE UPON PUBLIC DOMAIN PLANNING AND DESIGN
Lake Illawarra	The Lake abuts the eastern boundary of the Tallawarra Lands. This shallow coastal lagoon has approximately 39km of shoreline and is considered a significant resource for its recreational and habitat value. (Context 2009)	The lake foreshore provides pedestrian and cycle connectivity opportunities that have the potential to be integrated into the wider pedestrian and cycle network of the Tallawarra Lands development
Haywards Bay Urban Development	Haywards Bay is a new residential development that adjoins the southern boundary of the Tallawarra Lands.	There is an opportunity for a pedestrian / cycle connection between Haywards Bay Drive and open space within the southern portion of the Tallawarra Lands.
Dapto Urban Development	Dapto is an established urban area that adjoins the north-western boundary of the Tallawarra Lands.	Connection to the Dapto town centre, which is located approximately 3km to the north, is via the Princes Highway. This connection has the potential to become an integrated part of the regional road and cycle network.
Koonawarra Urban Development	Koonawarra is an established residential area that adjoins the north-eastern boundary of the Tallawarra Lands.	Mount Brown Reserve adjoins the south-western edge of Koonawarra and vegetation extends from this Reserve into the elevated portion of the Tallawarra site.

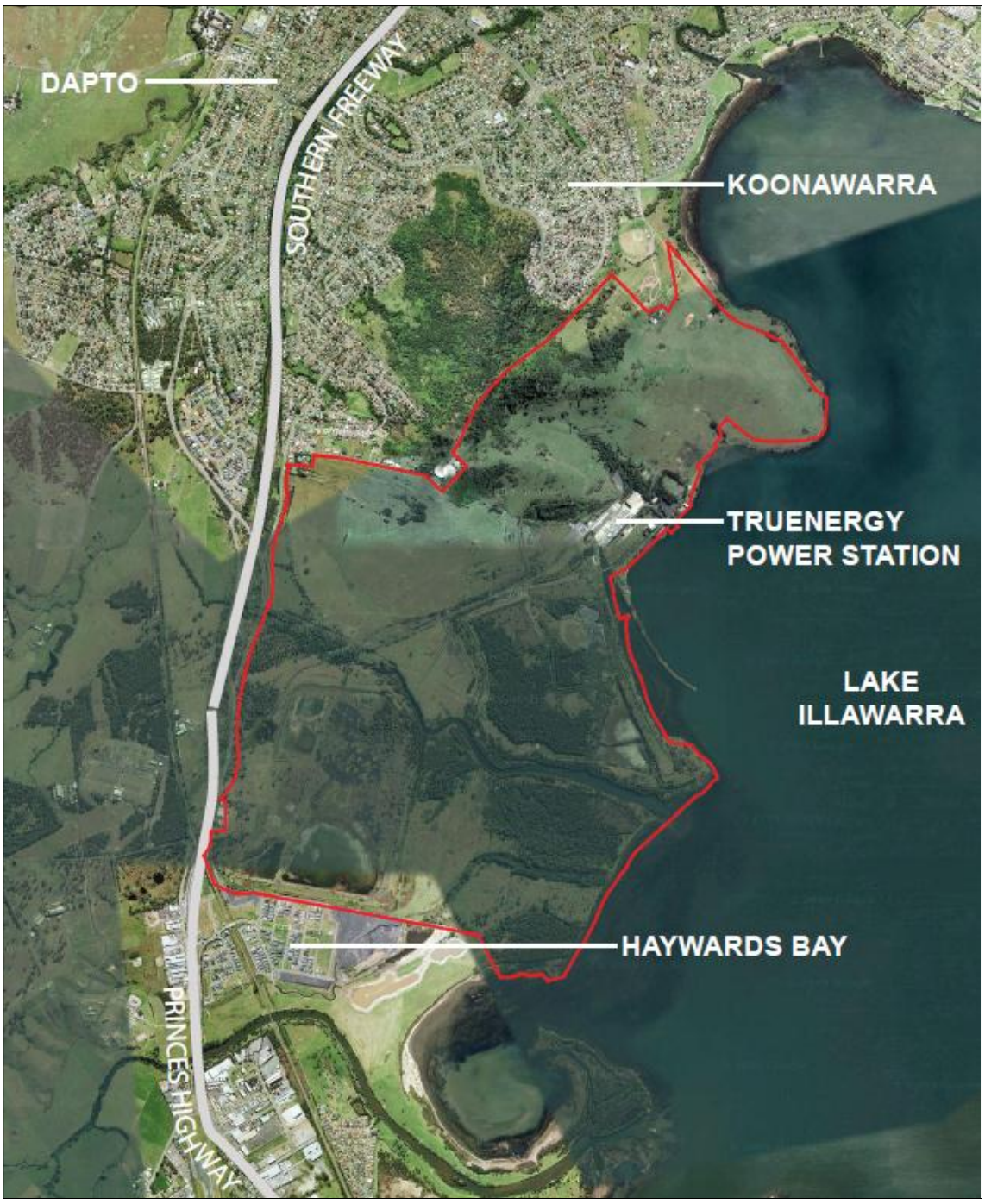

FIGURE 8 – LOCAL CONTEXT

2.3 DESIGN FRAMEWORK

The Landscape Plan incorporates the principles of sustainable design and development, which include protection and management of ecological values, applying water sensitive urban design and crime prevention through environmental design. These components of the design framework are discussed in the following sections.

2.3.1 ECOLOGICAL VALUES

Ecological values identified within the Tallawarra Lands Site present both opportunities and constraints for the planning and design of the public domain. In addressing these values the following characteristics were considered:

- Significance of existing vegetation communities.
- The structural condition of vegetation remnants.
- Type and severity of disturbance and resulting recovery potential.
- Connectivity between remnants on and off the site.
- The value of the remnant vegetation as threatened species habitat.

The ecological assessment carried out by Eco Logical Australia identifies a wide range of vegetation communities, seven (7) of which are classified as Endangered Ecological Communities (ECCs). The vegetation communities include:

- Alluvial Swamp Mahogany Forest (part of the EEC - Swamp Sclerophyll Forest on Coastal Floodplains on the NSW North Coast, Sydney Basin and South East Corner Bioregions).
- Coastal Grassy Red Gum Forest (part of the EEC – Illawarra Lowlands Grassy Woodland of the Sydney Basin Bioregion).
- Coastal Swamp Oak Forest (part of the EEC – Swamp Oak Floodplain Forest on the NSW North Coast, Sydney Basin and South East Corner Bioregions).
- Estuarine Alluvial Wetland.
- Floodplain Wetland (part of the EEC - Freshwater wetlands on Coastal Floodplains on the NSW North Coast, Sydney Basin and South East Corner Bioregions).
- Lowland Dry-subtropical Rainforest (part of the EEC - Illawarra Subtropical Rainforest in the Sydney Basin Bioregion).
- Lowland Woollybutt-Melaleuca Forest (part of the EEC – Illawarra Lowlands Grassy Woodland of the Sydney Basin Bioregion).
- Moist Box-Red Gum Foothills Forest.
- Saltmarsh (part of the EEC – Coastal Saltmarsh of the Sydney Basin Bioregion);
- Artificial Wetlands.
- Acacia Scrub. (Eco Logical Australia, 2010).

Habitat and biodiversity protection is required by State and Federal legislation, which includes the NSW Threaten Species Conservation Act 1995 and the Environmental Protection and Biodiversity Conservation Act 1999. Management of the Endangered Ecological Communities and the Duck Creek corridor is also required by this legislation.

The Landscape Plan incorporates the existing vegetation communities and takes account of the potential impact that urban development may have upon their integrity of these communities. Details of how the planning and design of the public domain has preserved and enhanced the site's existing vegetation are presented in later in this Report.

2.3.2 WATER SENSITIVE URBAN DESIGN

The Water Sensitive Urban Design (WSUD) principles have been adopted in the Landscape Plan with the aim of achieving a more sustainable approach to water resources management throughout the Public Domain. The aim is to maintain or replicate as much as possible the hydrology of the pre-development landscape and avoid impacts that can result from:

- Intensification of flows in watercourses potentially creating in stream bank erosion and sedimentation.
- Increased contamination of receiving aquatic environments resulting in generally adverse impacts on aquatic ecosystems;
- Increased use of water resources for domestic, commercial/industrial uses as well as outdoor irrigation of gardens and open space areas; and
- The occurrence of more severe flooding and increased extent of flooding.

More detailed information about the application of WSUD initiatives to the planning and design of the Public Domain is presented in later sections of this Report.

2.3.3 CRIME PREVENTION THROUGH ENVIRONMENTAL DESIGN

Crime Prevention Through Environmental Design (CPTED) involves a multi-disciplinary approach to deter criminal behaviour through the design of urban environments. CPTED strategies rely upon the ability of good design to influence the decisions of potential criminals that precede their intended criminal acts, aiming to deter them by ensuring that the situations within which crime is most often committed are reduced and/or removed through design. CPTED aims to create environments that are safer and ultimately more sustainable.

The Landscape Plan responds to the potential impacts of crime upon the viability of urban development and the best practice principles that can mitigate such impacts. Further details of how CPTED initiatives have been included within the public domain planning and design process are presented in the later sections of this Report.

2.4 LANDSCAPE ANALYSIS

The Tallawarra Lands Site is located within the coastal plain that extends from Lake Illawarra to the Illawarra Escarpment. Widening of the coastal plain in the vicinity of the Tallawarra Lands is the result of watercourses such as Duck Creek and Wollingurry Creek carving into the Escarpment (Biosis Research, 2010). Over an extended period of time, the process of erosion and disposition associated with these watercourses has resulted in the current site conditions.

The variation in landscape conditions throughout the Site itself is the result of the volcanic outcrop of Mount Brown and erosion of its slopes. Depositional processes associated with the low-lying riparian areas adjoining Duck Creek and Lake Illawarra have been major factors influencing the existing landscape of the Site. These landscape formation processes of erosion and deposition are illustrated on Figure 9.

The resulting variations in landform, drainage, vegetation and soil structure are discussed in the following pages and detailed further within *Appendix 1 – Tallawarra Lands Landscape Assessment*.

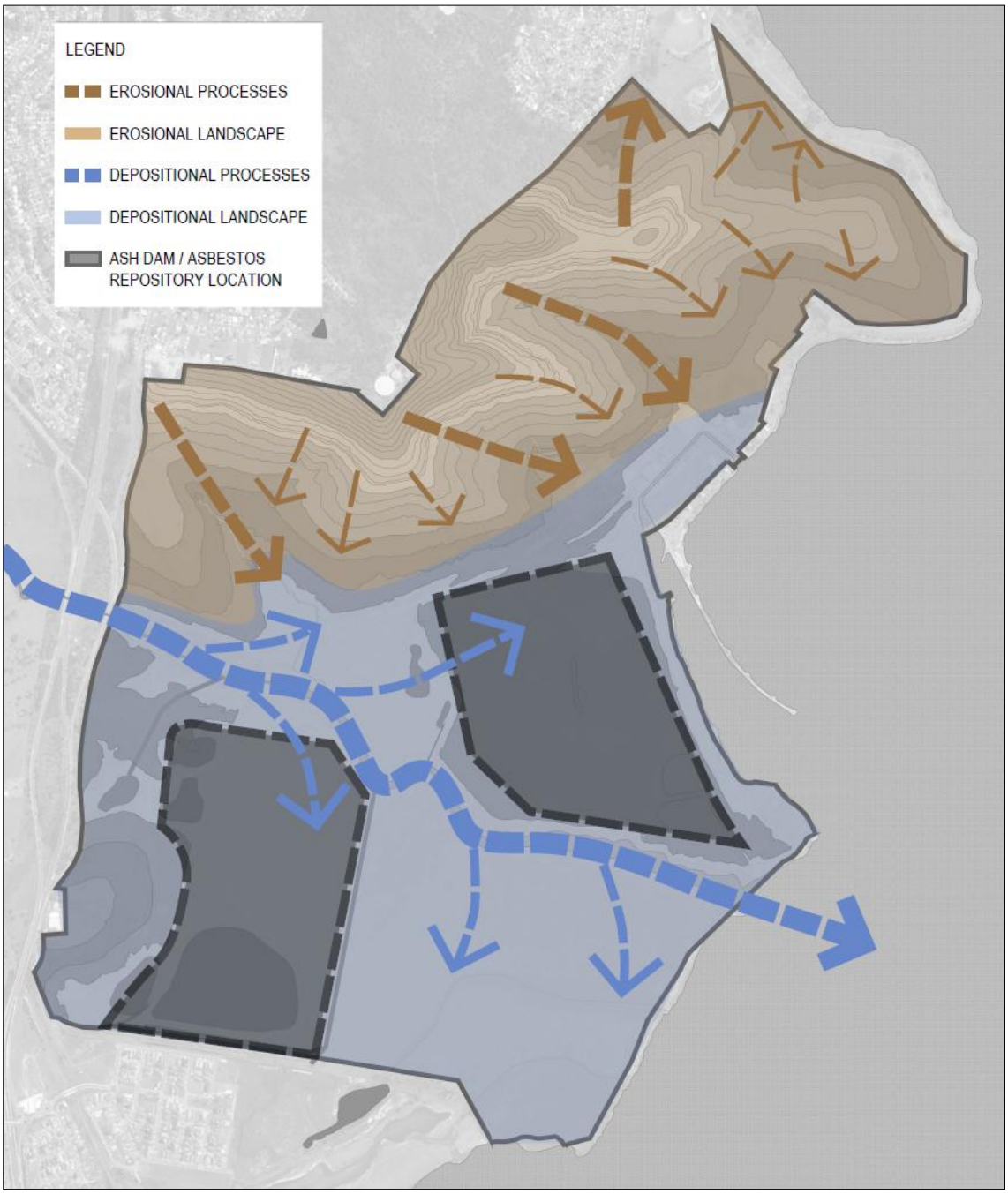

FIGURE 9 – EROSIANAL AND DEPOSITIONAL PROCESSES

2.4.1 LANDFORM AND DRAINAGE

The Site contains dramatic variations in landform over a relatively short distance. The high elevation and steep slopes of Mount Brown contrast strongly with the flat lake edge that forms the eastern edge of the Site. Extensive areas of flat low elevation land, including former ash disposal dams, occur in the southern portion of the Site, with Duck Creek forming a distinctive riparian corridor extending through the centre (Figure 10).

Drainage throughout the Site has been modified by previous land uses. Where extensive clearing and grazing has occurred, many of the natural drainage lines have been altered by the installation of stormwater culverts and construction of levee embankments. These areas include the mid-slopes of Mount Brown and the drainage canal south of Duck Creek located in the southern portion of the Site. A number of water storage dams have been constructed for stock and artificial ponds have resulted from ash disposal activities associated with the former coal-fired Tallawarra power station. Duck Creek and associated wetlands to the south are largely in their original condition.

The character of the existing landform and drainage has been taken into account the planning and design process throughout the public domain.

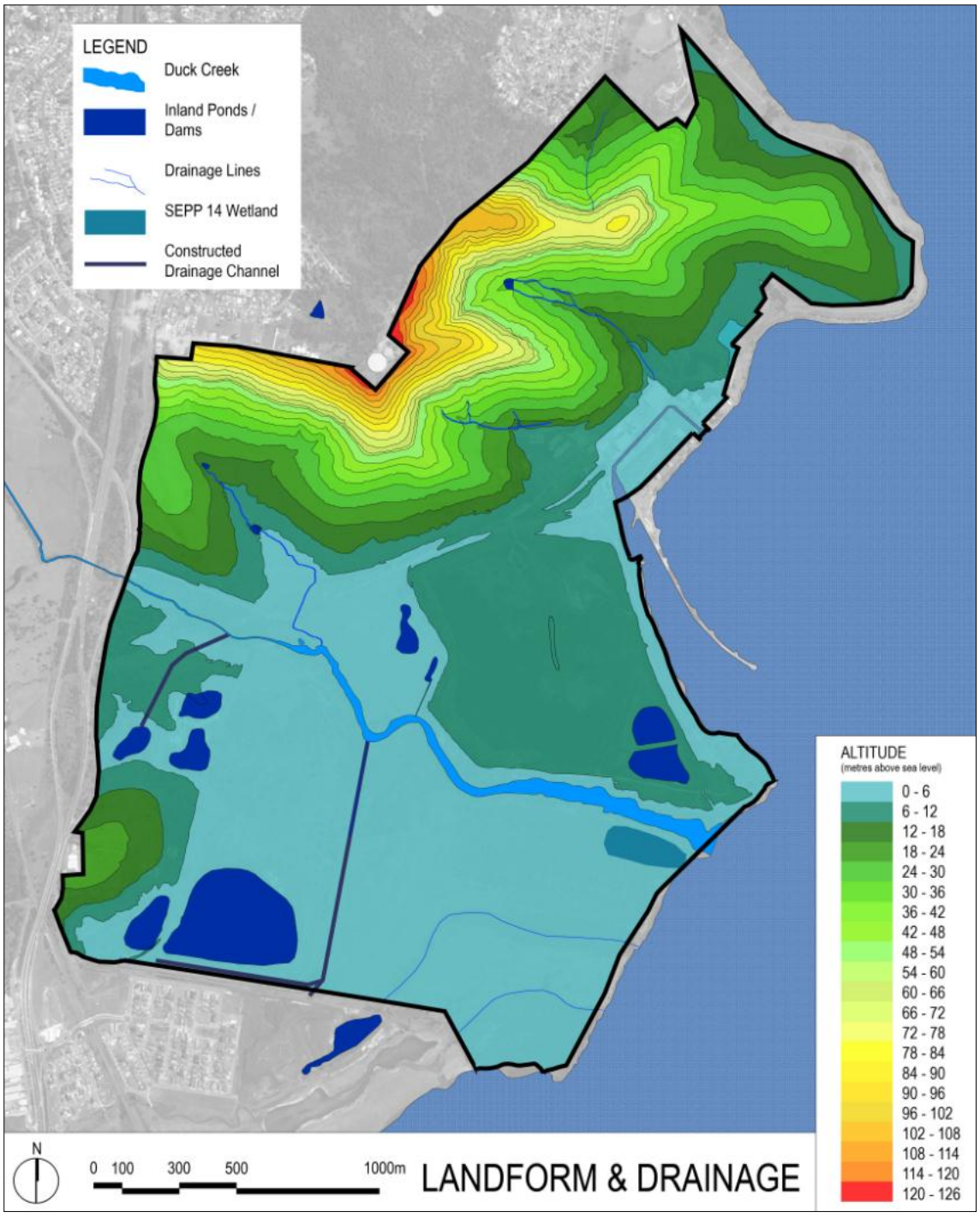

FIGURE 10 – LANDFORM AND DRAINAGE

2.4.2 VEGETATION

While much of the Site has been cleared and extensive areas are currently used for grazing there are significant areas of remnant vegetation. However, a large proportion of this remnant vegetation is impacted by weed invasion and grazing. Lantana and other weeds form much of the understory in the areas of remnant vegetation (Eco Logical, 2006).

Patches of Endangered Ecological Communities (ECC) are located on the Site, although these are generally small, with the exception of the south east corner of the Site (Figure 11), where an extensive ECC is located.

The character and significance of the existing vegetation communities across the Site, and their diversity, have been addressed in the planning and design process for the public domain within this Landscape Plan.

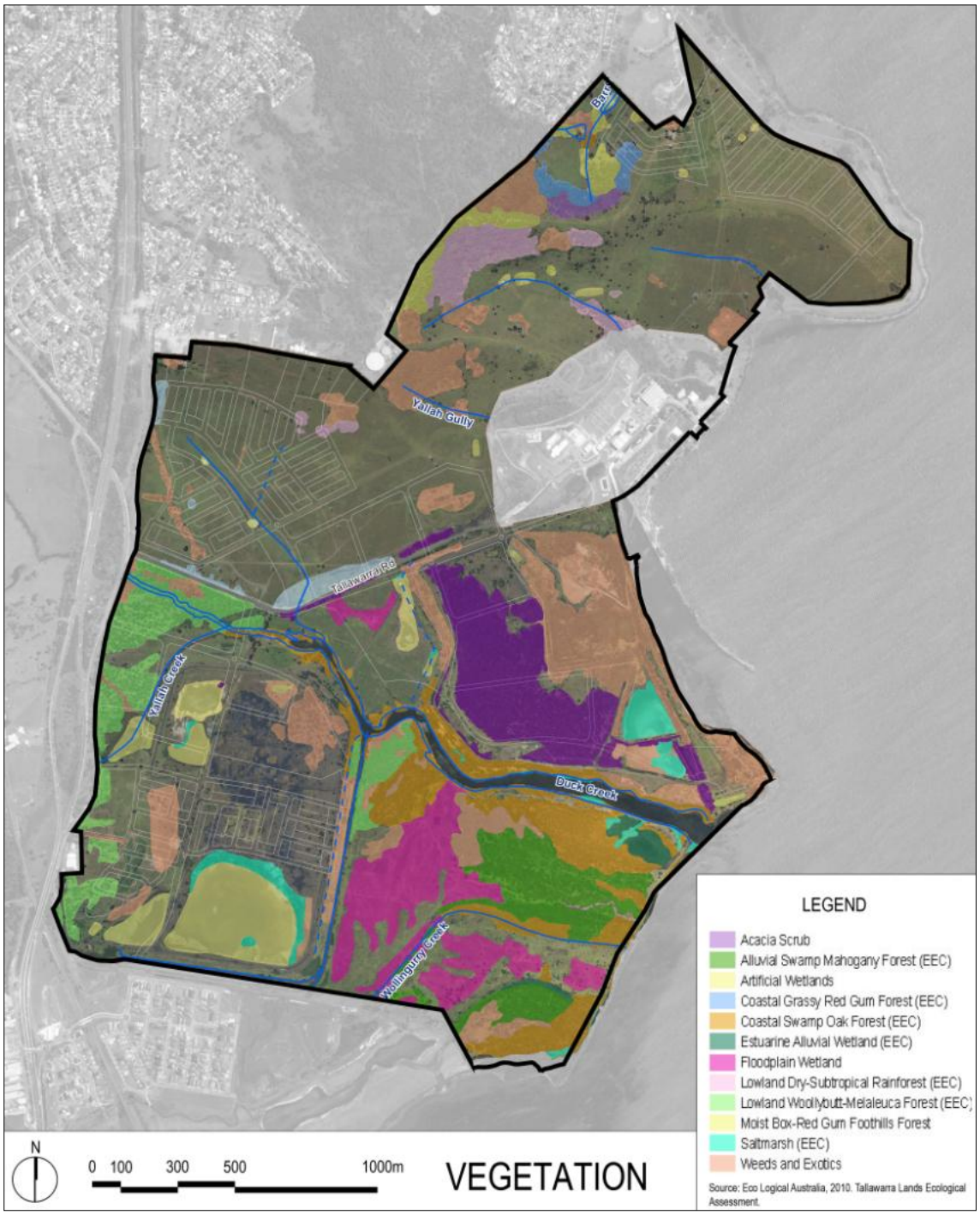

FIGURE 11 – VEGETATION COMMUNITIES

(Source: Eco Logical Australia, 2010)

2.4.3 LANDSCAPE CHARACTER ZONES

A detailed analysis of the existing landscape of the Site was carried out to provide a major input to the Landscape Plan. Details of the analysis are presented in Appendix 1 and key aspects summarised here.

The analysis identified a series of Landscape Character Zones (LCZ's) throughout the Site. The LCZ's are areas with a distinct visual character that results from a particular combination of landform, drainage and vegetation (Figure 12).

In preparing landscape concepts for each of the public open spaces, the distinct characteristics of the LCZ in which they occur was carefully considered.

The relationship between the various LCZ's and the varistion in landscape character throughout the Tallawarra Lands are illustrated in the oblique aerial photos presented on the following pages (Figures 13 to 17).

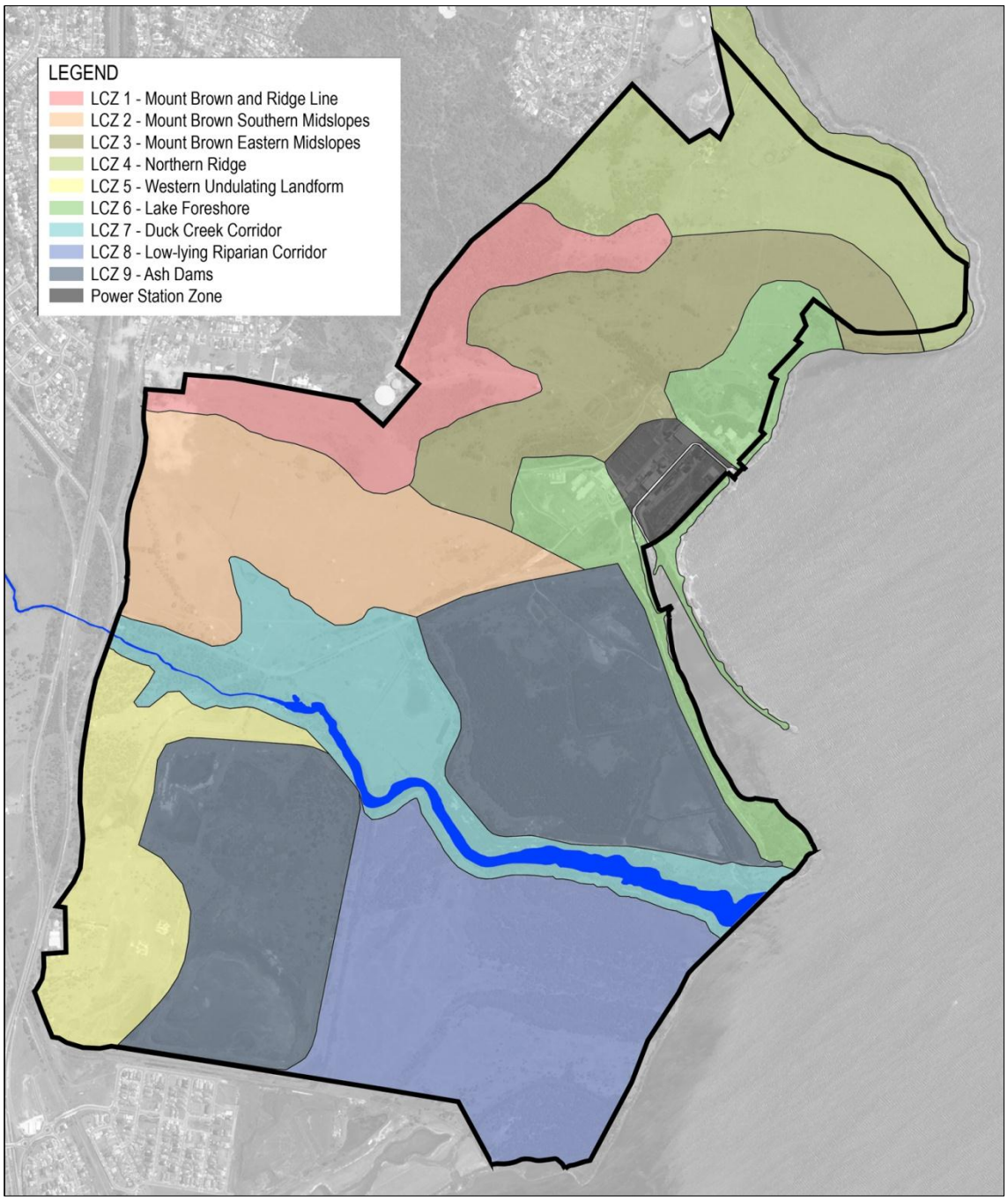

FIGURE 12 – LANDSCAPE CHARACTER ZONES

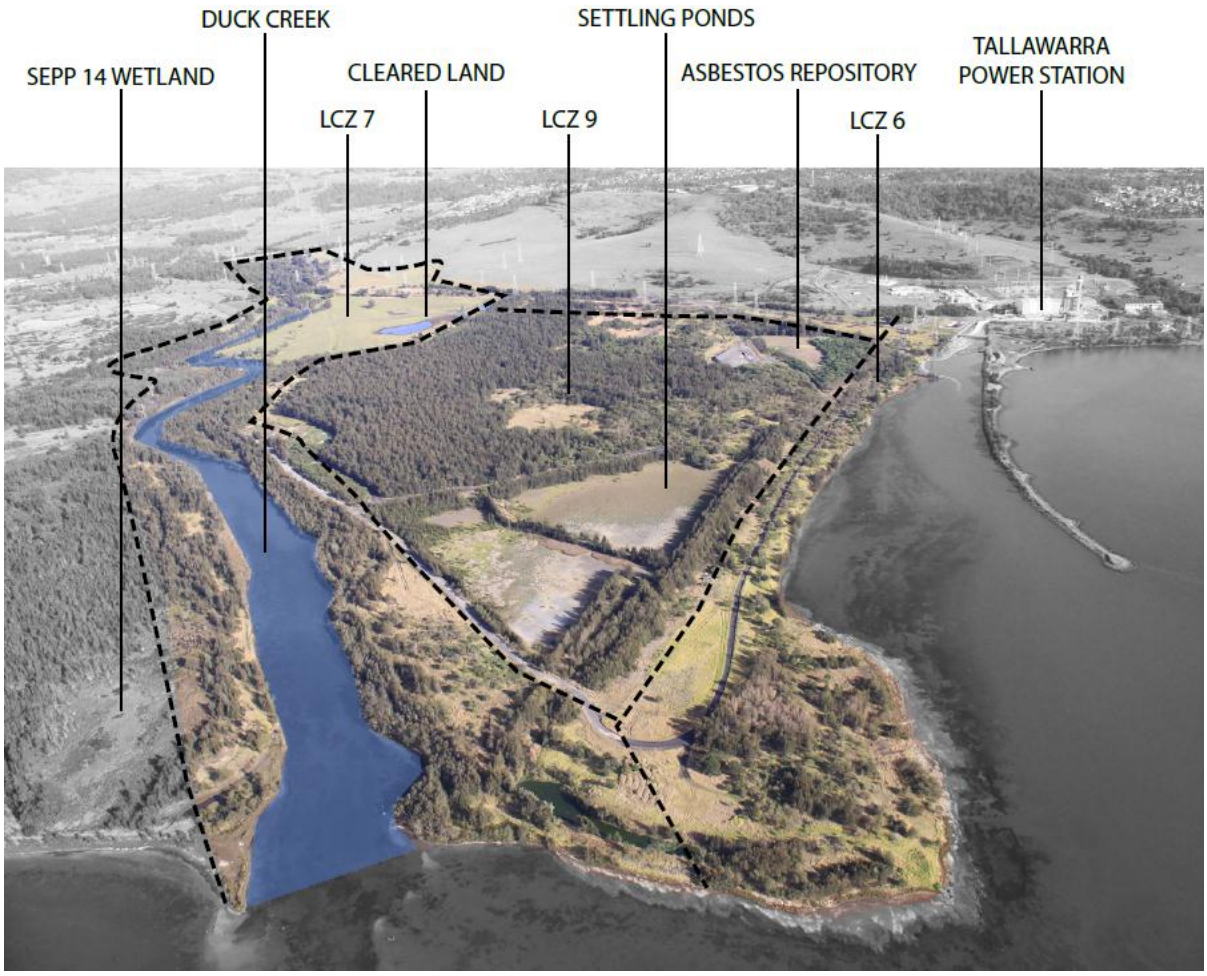

FIGURE 13 – AERIAL OBLIQUE VIEW OF DUCK CREEK CORRIDOR AND ADJOINING LANDS

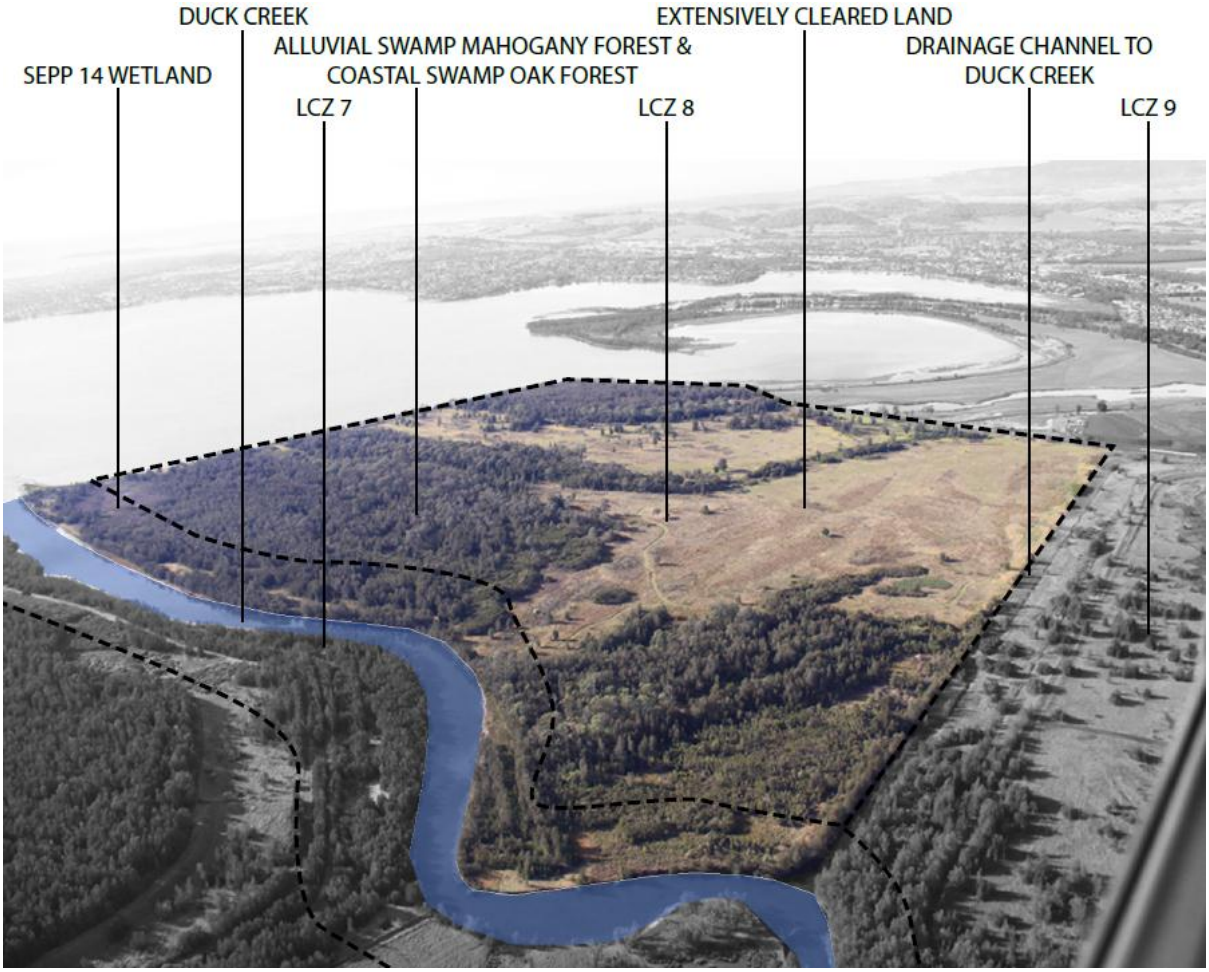

FIGURE 14 – AERIAL OBLIQUE VIEW OF DUCK CREEK CORRIDOR AND SOUTHERN PORTION OF THE SITE

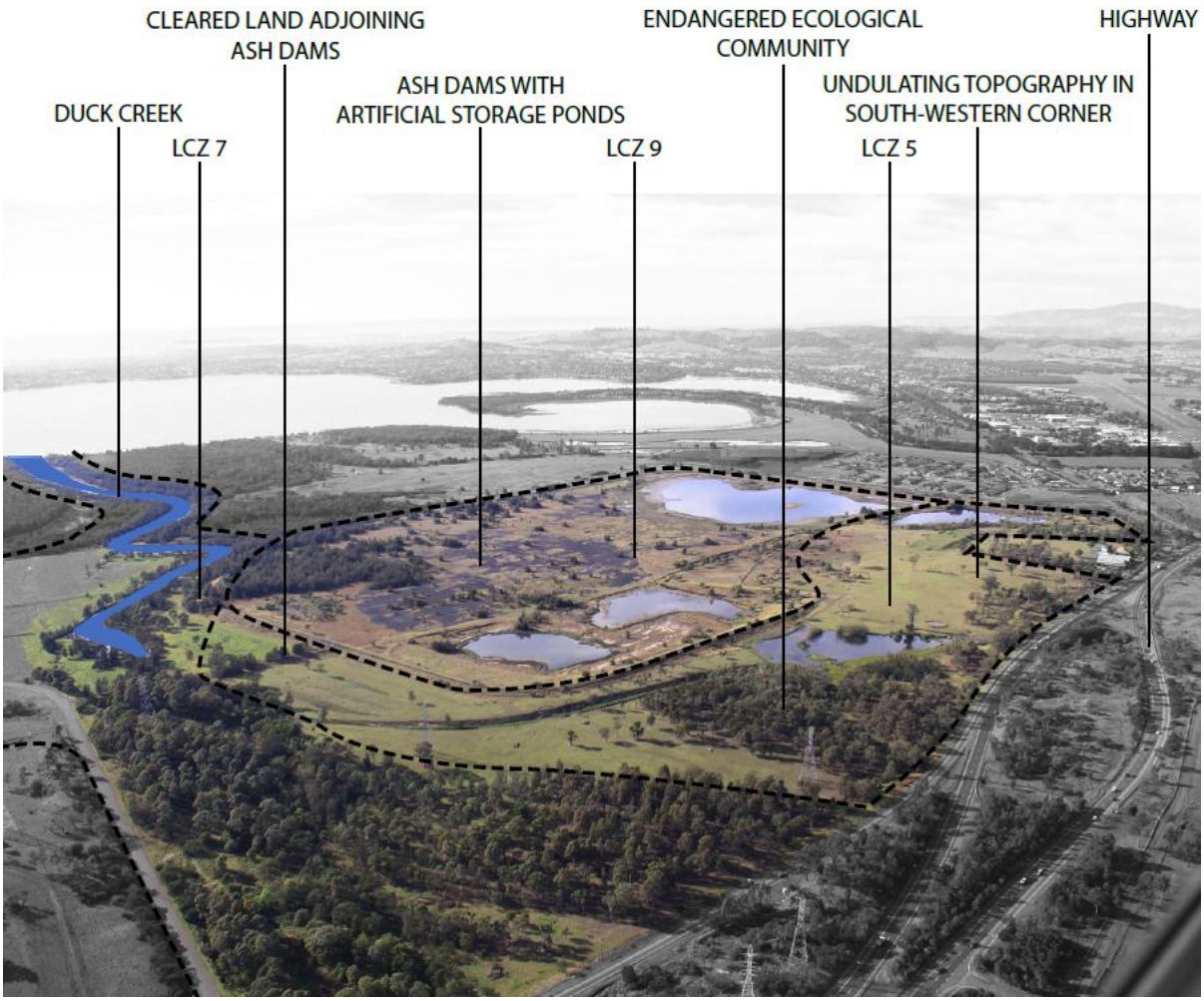

FIGURE 15 – AERIAL OBLIQUE VIEW OF SOUTHERN PORTION OF THE SITE

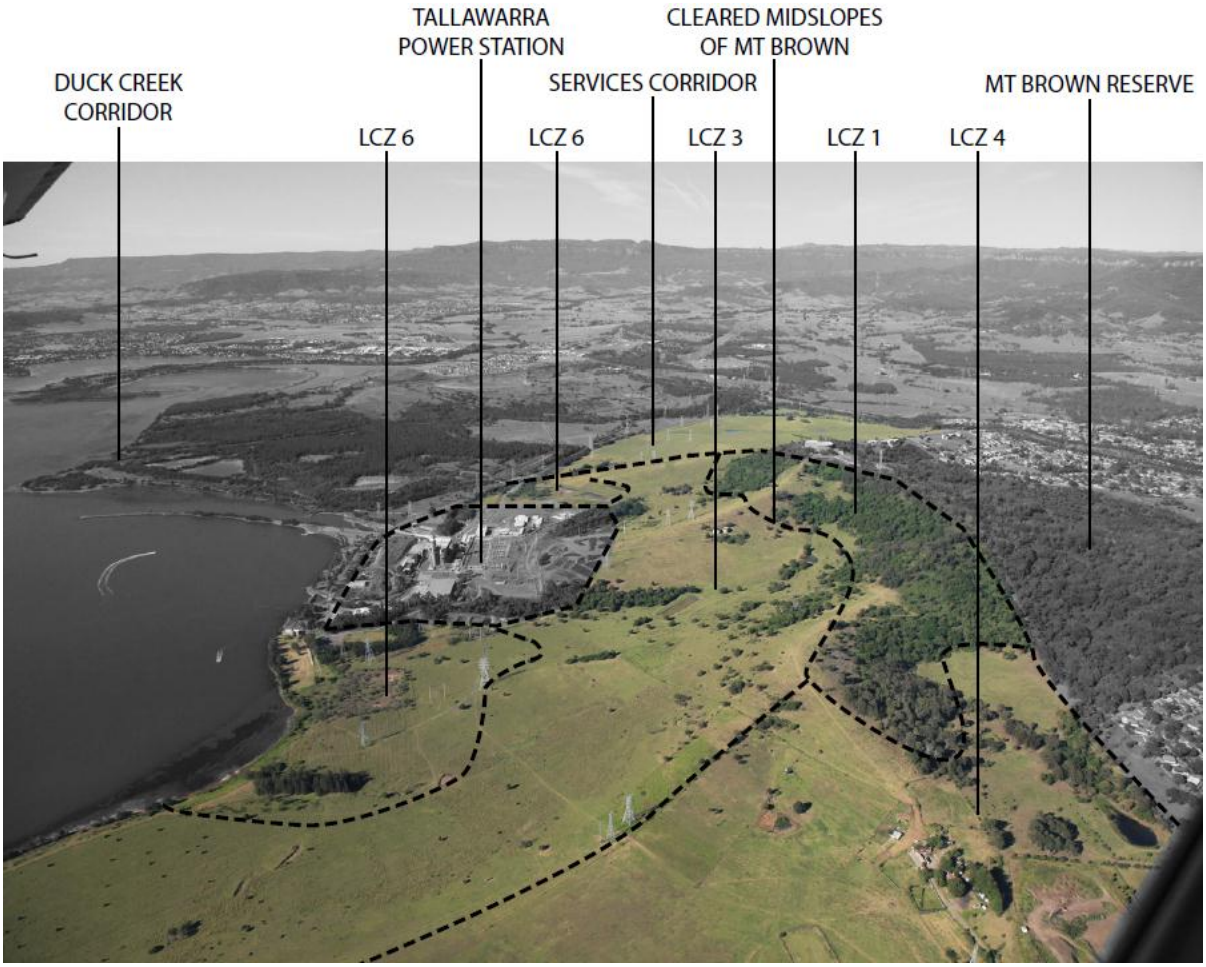

FIGURE 16 – AERIAL OBLIQUE VIEW OF THE NORTHERN PORTION OF THE SITE

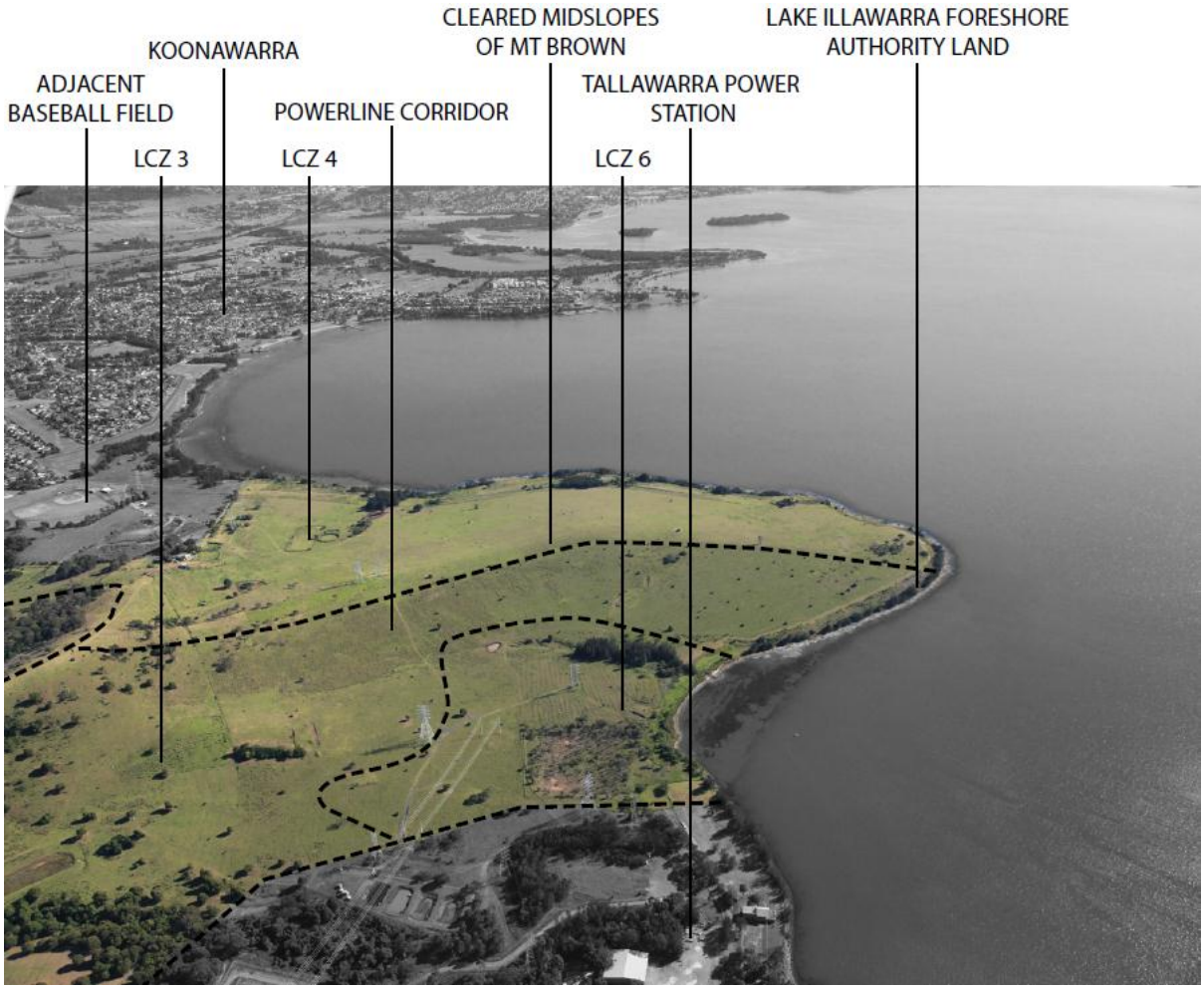

FIGURE 17 – AERIAL OBLIQUE VIEW OF NORTHERN PORTION OF THE SITE

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2.5 LANDSCAPE STRATEGY

The Landscape Plan presented in this Report provides the basis for the planning and design of the public domain network throughout the Tallawarra Lands.

The Master Plan prepared by Warren Lee Urban Design identifies four planning Precincts that include:

- **Central Precinct** – incorporating residential development, industrial employment, the Neighbourhood Centre, and areas of open space.
- **Lake Illawarra Foreshore Precinct** – areas of open space along the foreshore of Lake Illawarra.
- **Southern Precinct** – incorporating a combination of residential development, commercial employment, a primary school, retirement living and areas of open space.
- **Northern Precinct** – proposed residential development and areas of open space along the foreshore of Lake Illawarra.

The Master Plan was overlaid on the Landscape Character Zones Plan to provide the basis for the Landscape Plan. The result shows the relationship between each of the four Master Plan Precincts and the Landscape Character Zones (Figure 18).

The distinctive characteristics of each of Landscape Character Zone and their relationship to the Precincts have been taken into account in planning and design of the open space network throughout the Site. These relationships are described on the following sections of the Report.

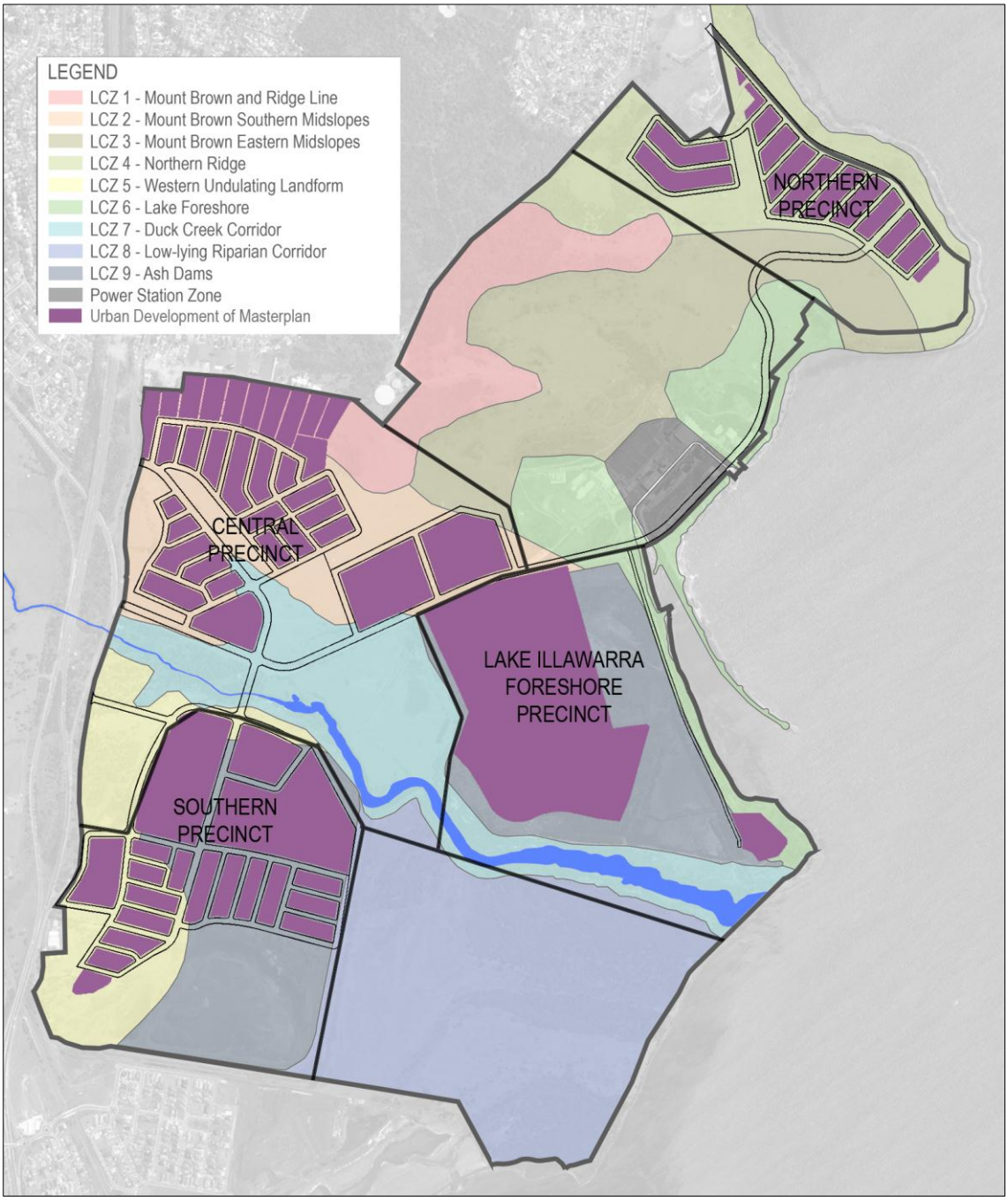

FIGURE 18 – MASTER PLAN PRECINCTS OVERLAID ON THE LANDSCAPE CHARACTER ZONES.

CENTRAL PRECINCT

The Central Precinct is located on the middle and lower slopes of Mt Brown, which have been extensively cleared for grazing, with some scattered remnant vegetation remaining. A single drainage line with constructed water storage ponds is located on the mid-slopes.

The Landscape Character Zones associated with this Precinct are summarised in the following table.

LANDSCAPE CHARACTER ZONE	GENERAL DESCRIPTION
LCZ 1 – Mount Brown and Ridge Line	- Mount Brown and ridge line; varying aspect but generally to east and south. - Vegetation includes an endangered ecological community (ECC), exotics and weeds. - High elevation land with a high wind exposure, steep slopes and loamy fertile soils.
LCZ 2 – Mount Brown Southern Mid-slopes	- Slopes of Mount Brown, adjacent to Princes Highway; predominantly southern aspect. - Vegetation includes exotics, weeds and extensive grazing land. - Mid elevation land with moderate wind exposure, with moderate to gentle slopes and fertile clay soils.
LCZ 7 – Duck Creek Corridor	- Low elevation generally flat riparian zone adjoining Duck Creek. - Vegetation includes an endangered ecological community (ECC), exotics, weeds and some areas of grazing. - Generally protected from winds by trees, flat alluvial soils with high water table and restricted drainage.

The ecological assessment identified several vegetation communities within this Precinct, including:

- Acacia Scrub;
- Artificial Wetlands;
- Coastal Swamp Oak Forest (part of the EEC – Swamp Oak Floodplain Forest on the NSW North Coast, Sydney Basin and South East Corner Bioregions);
- Lowland Woollybutt-Melaleuca Forest (part of the EEC – Illawarra Lowlands Grassy Woodland of the Sydney Basin Bioregion); and
- Weeds and Exotics.

Soil conditions within this Precinct include:

- *Mount Brown Loams* – slowly permeable with impeded drainage, posing a very high erosion hazard in their present condition with no free water or signs of salinity observed. No significant organic matter in the A_0 layer. Potential for high soil loss with high rainfall if de-vegetated.
- *Heavy Brown Clays* – moderately permeable with medium drainage, posing a slight erosion hazard under their present use. No organic matter in the A_0 layer. Potential for moderate soil loss if de-vegetated.
- *Light Yellow Brown Clays* – moderately permeable with free drainage, posing a moderate erosion hazard in their present condition. Contains no organic A_0 layer. Potential for high soil loss with high rainfall if de-vegetated.
- *Duck Creek Alluvium* – moderately permeable and moderately drained, posing a low erosion hazard under their present use. Contains no organic A_0 layer. Potential for continued soil loss by creek bank erosion.

LAKE ILLAWARRA FORESHORE PRECINCT

This Precinct is located within the low-lying depositional lands associated with Lake Illawarra and the Duck Creek. Much of the area is either cleared or contains weeds and exotics growth, associated with ash disposal areas and asbestos repository mound located in the Precinct.

The Landscape Character Zones associated with this precinct are summarised in the table below.

LANDSCAPE CHARACTER ZONE	GENERAL DESCRIPTION
LCZ 6 – Lake Foreshore	- Foreshore extending north from Duck Creek prominent ridge north of the Power Station; flat to gentle slopes with predominantly eastern aspect. - Vegetation includes an endangered ecological community (ECC), exotic species and weeds. - Low elevation land with a moderate to high exposure to wind along Lake edge, extensive alluvial soils with high water table and restricted drainage.
LCZ 7 – Duck Creek Corridor	- Low elevation generally flat riparian zone adjoining Duck Creek. - Vegetation includes native endangered ecological communities (ECC), exotics, weeds and some areas of grazing. - Generally protected from winds by trees, flat alluvial soils with high water table and restricted drainage.
LCZ 9 – Ash Dams	- Ash Dams 1 & 2 north of Duck Creek and adjacent Lake Illawarra. - Vegetation includes a native endangered ecological community (ECC), exotics and weeds. - Low elevation flat land generally protected from wind by tree cover - Ash deposits have thin or no soil cover.

The ecological assessment identified several vegetation communities within this Precinct, which include:

- Artificial Wetlands;
- Coastal Swamp Oak Forest (part of the EEC – Swamp Oak Floodplain Forest on the NSW North Coast, Sydney Basin and South East Corner Bioregions);
- Estuarine Alluvial Wetland;
- Floodplain Wetland (part of the EEC - Freshwater wetlands on Coastal Floodplains on the NSW North Coast, Sydney Basin and South East Corner Bioregions);
- Saltmarsh (part of the EEC – Coastal Saltmarsh of the Sydney Basin Bioregion); and
- Weeds and Exotics.

Soil conditions within this precinct include:

- *Light Yellow Brown Clays* – moderately permeable with free drainage, posing a moderate erosion hazard in their present condition. Contains no organic A_0 layer. Potential for high soil loss with high rainfall if de-vegetated.
- *Duck Creek Alluvium* – moderately permeable and moderately drained, posing a low erosion hazard under their present use. Contains no organic A_0 layer. Potential for continued soil loss by creek bank erosion.
- *Ash Dam Deposits*

SOUTHERN PRECINCT

This Precinct is located within the low-lying riparian zone and flood plain associated with Duck Creek. The Haywards Bay residential development is located to the south. Creation of Ash Dam No. 3 has resulted in much of the area being cleared, although some regrowth is occurring. A number of artificial ponds are located within the Precinct.

The Landscape Character Zones associated with this Precinct are summarised in the table below.

LANDSCAPE CHARACTER ZONE	GENERAL DESCRIPTION
LCZ 5 – Western Undulating Landform	- Gently undulating landform adjacent to Princes Highway along western edge of the Site; predominantly eastern aspect. - Vegetation includes an endangered ecological community (ECC), exotics and weeds. - Low elevation, low wind exposure, moderate to gentle slopes and sandy clay soils.
LCZ 9 – Ash Dams	- Ash Dam 3 located inland south of Duck Creek. - Vegetation includes an endangered ecological community (ECC), exotics and weeds. - Low elevation flat land generally protected from wind by tree cover - Ash deposits have thin or no soil cover.

The ecological assessment identified several vegetation communities within this Precinct, which include:

- Acacia Scrub;
- Artificial Wetlands;
- Coastal Swamp Oak Forest (part of the EEC – Swamp Oak Floodplain Forest on the NSW North Coast, Sydney Basin and South East Corner Bioregions);
- Lowland Woollybutt-Melaleuca Forest (part of the EEC – Illawarra Lowlands Grassy Woodland of the Sydney Basin Bioregion);
- Saltmarsh (part of the EEC – Coastal Saltmarsh of the Sydney Basin Bioregion); and
- Weeds and Exotics.

Soil conditions within this Precinct include:

- *Mottled Sandy Clays* – very low permeability with impeded drainage, posing a very low erosion hazard under their present use. Contains a shallow A_0 layer with a very low potential for soil loss.
- *Ash Dam Deposits*

NORTHERN PRECINCT

This Precinct is located on the lower slopes of Mt Brown, which have been extensively cleared for grazing. Only scattered clumps of trees and shrubs remain. Two drainage lines with artificial water storage ponds are located on the slopes of this Precinct.

The Landscape Character Zone associated with this Precinct is summarised in the following table.

LANDSCAPE CHARACTER ZONE	GENERAL DESCRIPTION
LCZ 4 – Northern Ridge	- Upper and mid-slopes of Mount Brown, adjacent Koonawarra and Lake Illawarra; predominantly north-eastern aspect. - Vegetation includes endangered ecological communities (ECC), exotics, weeds and extensively grazed land. - Moderate to low elevation land with a moderate to high exposure to wind. - Gentle slopes and fertile clay soils.

The ecological assessment identified several vegetation communities within this Precinct, which include:

- Artificial Wetlands;
- Coastal Grassy Red Gum Forest (part of the EEC – Illawarra Lowlands Grassy Woodland of the Sydney Basin Bioregion);
- Coastal Swamp Oak Forest (part of the EEC – Swamp Oak Floodplain Forest on the NSW North Coast, Sydney Basin and South East Corner Bioregions);
- Moist Box-Red Gum Foothills Forest; and
- Weeds and Exotics.

Soil conditions within this Precinct include:

- *Heavy Brown Clays* – moderately permeable with medium drainage, posing a slight erosion hazard under their present use. No organic matter in the A_0 layer. Potential for moderate soil loss if de-vegetated.
- *Light Yellow Brown Clays* – moderately permeable with free drainage, posing a moderate erosion hazard in their present condition. Contains no organic A_0 layer. Potential for high soil loss with high rainfall if de-vegetated.

3.0 Open Space Network

3.1 INTRODUCTION

An integrated network of public open spaces forms a key component of the Tallawarra Lands Mater Plan and includes:

- A central park adjoining the Neighbourhood centre that incorporates a playing field and other sports facilities;
- A regional cycling facility in open space adjoining the lake foreshore south of the power station;
- Smaller park areas within open spaces adjoining proposed residential and employment development;
- Lake foreshore open space with recreation facilities;
- Remnant vegetation conservation areas and riparian corridors with limited public access.

The Landscape Plan incorporates these open spaces and presents preliminary concept for each of them. The purpose of these individual open space plans is to illustrate the design intent and provide the basis for the more detailed design development that will follow.

The open space concept plans have responded to the following Design Principles:

- **Create a distinct sense of place** – by using a combination of landform, view opportunities, existing vegetation, proposed planting, urban elements, signage and public art where appropriate.

- **Promote a diversity of uses within the Open Space** – to ensure the open space facilities are able to adapt over time to future changes in recreation demand, and to ensure that a wide variety of user groups are catered for.

- **Encourage social interaction** – by using landscape elements to provide opportunities for both intentional and incidental social contact and interaction.

- **Promote accessibility and connectivity** – to ensure that open space resources can be easily accessed and moved through by all potential user groups. Refer to Section 4.0 – Circulation.

- **Promote a healthy lifestyle** – by ensuring that open space resources, such as pedestrian and cycle paths, are integrated into the urban environment and readily accessible to all sectors of the community.

- **Aim for sustainability** – by addressing environmental sustainability through WSUD and ecological principles, social sustainability with CPTED initiatives, and economic sustainability throughout the Tallawarra Lands.

These Design Principles will also guide the future detailed design of individual open space areas through the implementation stage.

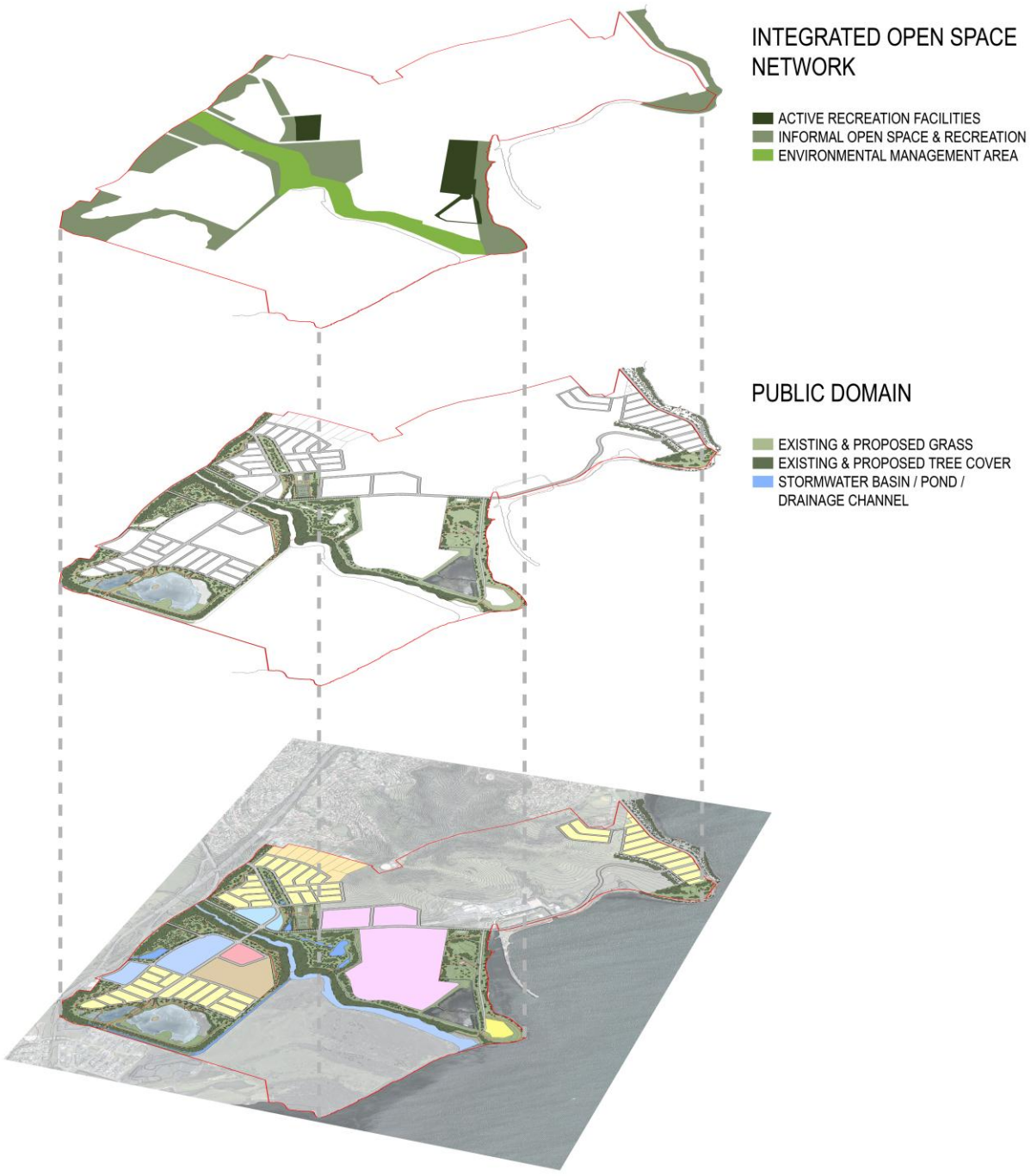

FIGURE 19 – OPEN SPACE NETWORK

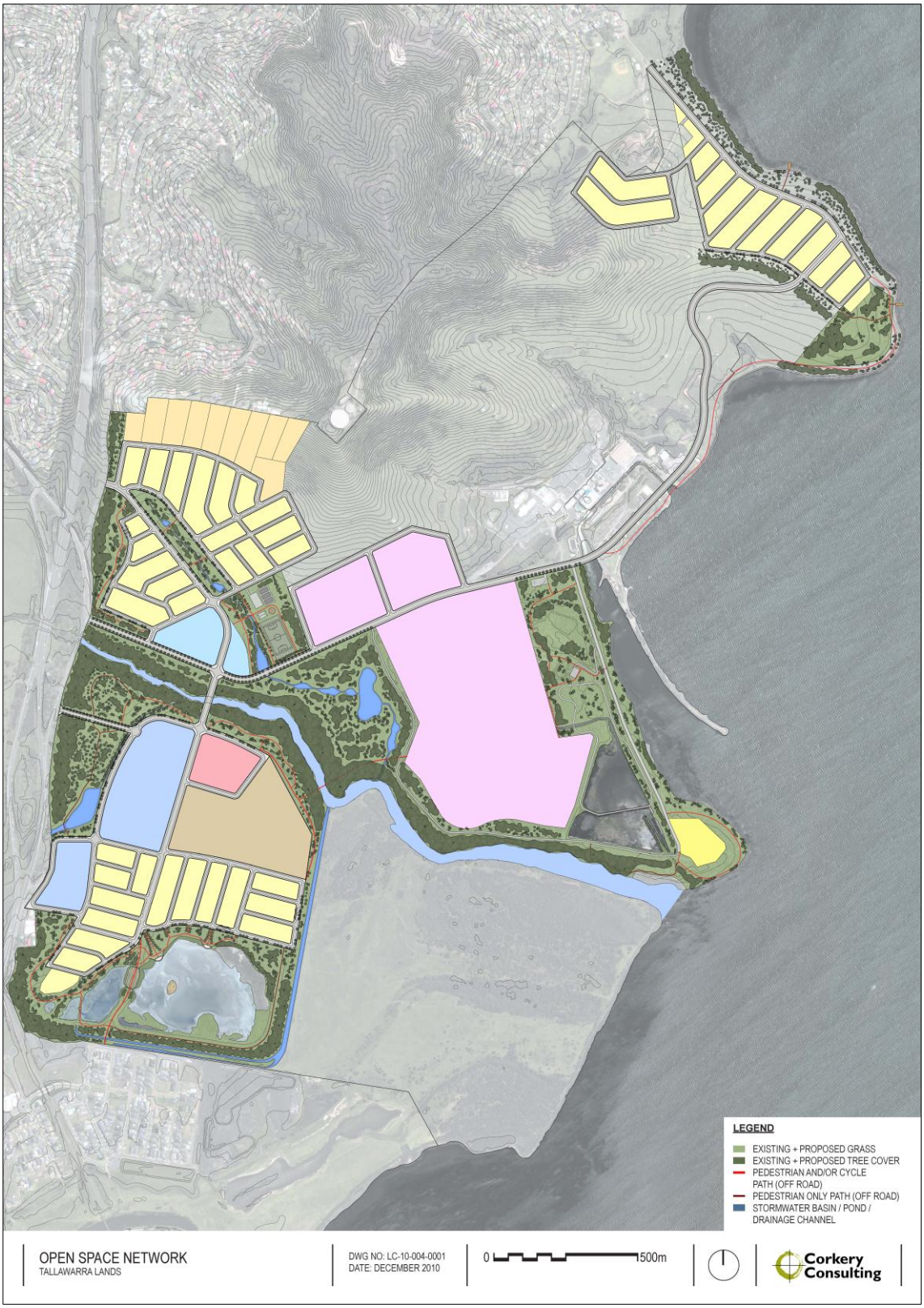

FIGURE 20 – THE OPEN SPACE NETWORK

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3.2 ECOLOGICAL VALUES

The ecological values identified by Eco Logical Australia within the open space network have been taken into account in preparing the landscape concepts for each individual open space area while keeping in mind their relation to the overall ecological values of the Tallawarra Lands.

The Vegetation Management Plan prepared by Eco Logical Australia provides the basis for management and restoration of remnant vegetation, including the Endangered Ecological Communities and Duck Creek corridor. As a result, the following management principles have been adopted for the planning and design of Open Spaces:

- **Ecological Restoration of Duck Creek Corridor** – revegetation works to protect, enhance and preserve creek corridor.
- **Conservation of lakes located on the Site** – either in current form or as a close resemblance.
- **Revegetation works** – edge treatments to waterways and site boundaries.
- **Recreational activities** – in open space along the interface between residential and employment lands while maintaining and enhancing ecological values.
- **Control of noxious and environmental weeds** – to prevent further degradation of vegetation communities within the Reserve.
- **Water quality management** – through infiltration and treatment systems to improve water quality within the lakes and along drainage lines flowing to Duck Creek.

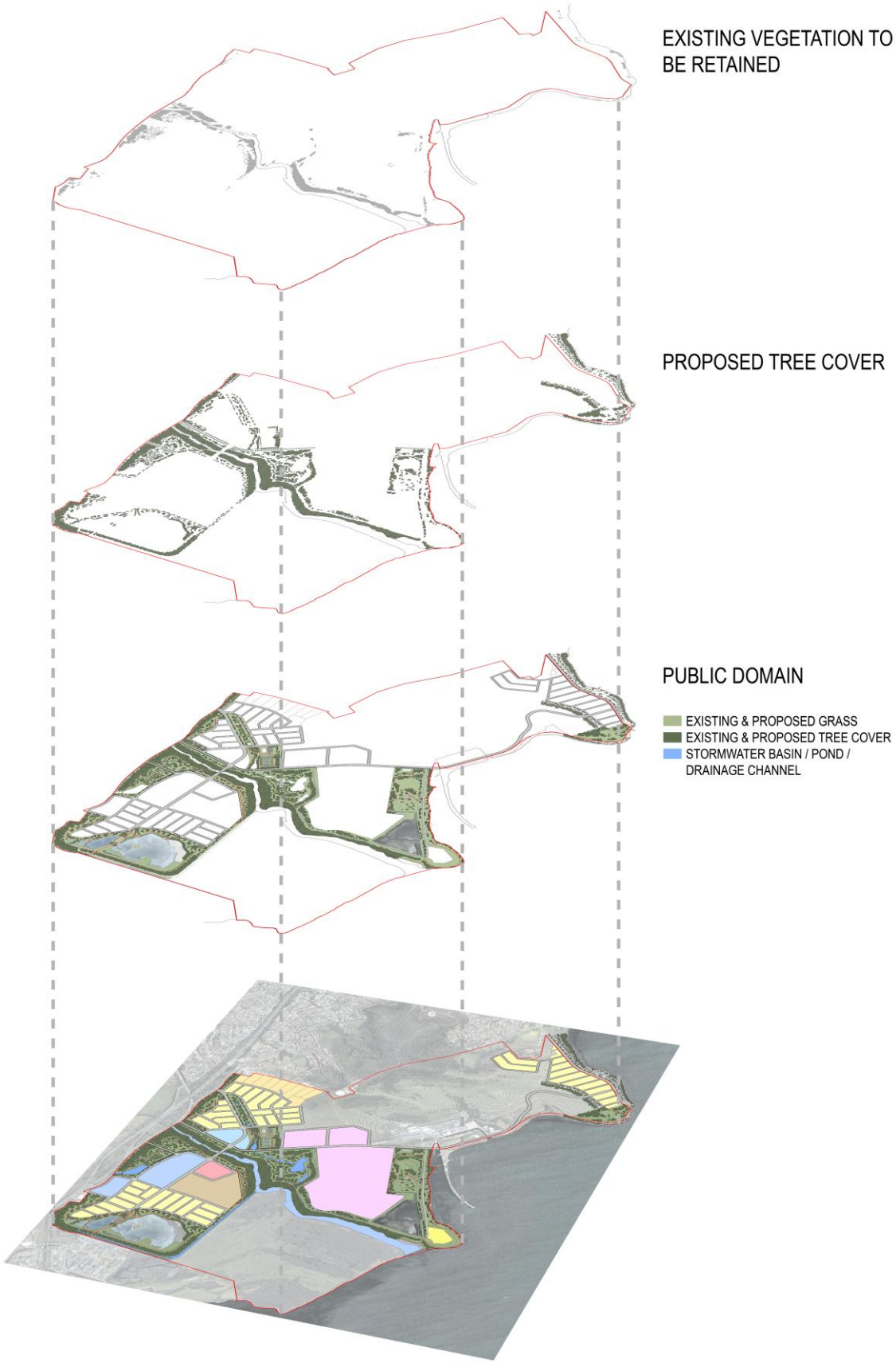

FIGURE 21 – EXISTING AND PROPOSED VEGETATION STRUCTURE